ENVIRONMENTAL IMPACT ASSESSMENT FOR THE 66 kV POWER EVACUATION LINE FROM NAMAACHA WIND POWER PROJECT TO BOANE SUBSTATION

Environmental Impact Study

Final Report

Volume I – Introduction, Project Standards, Methodology, Project Description, Area of Influence and Baseline Assessment

November 2023

Prepared for:

ELECTRICIDADE DE MOÇAMBIQUE, E.P.

EDM – Electricidade de Moçambique, E.P.

Prepared by:

CONSULTEC

Consultec – Consultores Associados, Lda.

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ENVIRONMENTAL IMPACT STUDY

FINAL REPORT

VOLUME I – INTRODUCTION, PROJECT STANDARDS, METHODOLOGY, PROJECT DESCRIPTION, AREA OF INFLUENCE AND BASELINE ASSESSMENT

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LIST OF ACRONYMS AND ABBREVIATIONS

AEJA	Youth and Adult Literacy and Education (*Alfabetização e Educação de Adultos e Jovens*)
AHP	Analytical Hierarchy Process
AIDS	Acquired Immunodeficiency Syndrome
ANAC	National Administration of Conservation Areas
ANE	National Road Administration (*Administração Nacional de Estradas*)
AP	Administrative Post
AQUA	The National Agency for the Control of Environmental Quality
ARA	Regional Water Authorities
ARENE	Energy Regulatory Agency
ART	Anti-retroviral
CEN	Central Eléctrica da Namaacha
DINAB	National Directorate for Environment
DNA	National Water Directorate
DNE	National Directorate of Energy
DPTADER	Provincial Directorate of Land and, Environment and Rural Development
DUAT	Land use rights
EDM	Electricidade de Moçambique, E.P.
EIA	Environmental Impact Assessment
EIS	Environmental Impact Study
EMP	Environmental Management Plan
EN	National Road
EP	Primary School
EPC	Complete Primary School
EPDA	Environmental Pre-feasibility and Scope Definition Study
ES	Ecosystem Services
ESG	General Secondary School
EIA	Environmental Impact Assessment
FIPAG	Investment Fund for Water Supply (*Fundo de Investimento e Património do Abastecimento de Água)*
FUNAE	Mozambique Energy Fund (Fundo de Energia)
GDB	Boane District Government
GDN	Namaacha District Government
GDP	Gross Domestic Product
GoM	Government of Mozambique's
HH	Household
HIV	Human Immunodeficiency Syndrome
HU	Health Unit

HV	High Voltage
IAN	Namaacha Agricultural Institute (*Instituto Agrário de Boane*)
IBA	Important Bird and Biodiversity Areas
IF	Infrastructure
IFC	International Finance Corporation
IFP	Teachers Training Institute (*Instituto de Formação de Professores*)
INE	National Institute of Statistic (*Instituto Nacional de Estatística*)
ISETT	Higher Institute of Education and Technology
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Areas (KBAs)
km/h	Kilometres per hour
kV	Kilovolt
m	Metre
MAE	Ministry of State Administration (*Ministério da Administração Estatal*)
MCDM	Multicriteria Decision-Making
MIMAIP	Ministry of the Sea, Inland Waters and Fisheries (Ministério do Mar, Águas Interiores e Pescas)
MIREME	Ministry of Natural Resources and Energy
MISAU	Ministry of Health (*Ministério da Saúde*)
MTA	Ministry of Land and Environment
OHL	Over Head Line
PA	Administrative Post
PAV	Vaccination Expanded Programme (*Programa Alargado de Vacinação*)
PESOD	District Economic and Social Plan and Budget (*Plano Económico e Social e Orçamento Distrital*)
PESOE	Economic and Social Plan and State Budget
PPP	Public Participation Process
PS	(IFC Environmental and Social) Performance Standards
PSAA	Small Water Supply Systems (*Pequenos Sistemas de Abastecimento de Água*)
PSESR	Physical and Socioeconomic Survey Report
PT	Transformer Stations (*Posto de Transformação*)
RGPH	General Census of Population and Housing (*Recenseamento Geral da População e Habitação)*
SADC	Southern African Development Community
SAPP	Southern African Power Pool
SDAE	Economic Activities District Service (*Serviço Distrital de Actividades Económicas*)
SDEJT	Education, Youth and Technology District Service (*Serviço Distrital de Educação, Juventude e Tecnologia)*
SDPI	Planning and Infrastructure District Service (*Serviço Distrital de Planeamento e Infraestruturas*)
SDSMAS	Health, Women and Social Affairs District Service (*Serviço Distrital de Saúde, Mulher e Acção Social*)
SES	Simplified Environmental Study

SMI	Mother and Child Health (*Saúde Materno-Infantil*)
SNS	National Health System (*Sistema Nacional de Saúde*)
SPA	Provincial Environmental Services
ToR	Terms of Reference
WHO	World Health Organization
WPP	(Namaacha) Wind Power Project

1 Introduction

1.1 General Considerations

EDM (the Proponent), with the support of its implementation partners Globeleq and Source Energia[1], propose the construction of a transmission line, for the evacuation of energy generated by Central Eléctrica da Namaacha Project (CEN[1]), through two 66 kV overhead lines that connect the wind farm to Boane Substation.

To obtain the Environmental License required in terms of the Environmental Law (Law No. 20/1997, of 1 October) for the development described above (hereafter the "Project"), the Proponent must conduct an Environmental Impact Assessment (EIA) Process. Consultec - Consultores Associados, Lda, was appointed by the Proponent to carry out the EIA process on their behalf.

The EIA Process is initiated through the submission of a Screening Report to the Ministry of Land and Environment (MTA), to allow Project categorisation. The Screening Report was submitted to MTA on May 2022. Following MTA's pre-assessment, the Project was classified as Category A on 16 June 2022 (letter ref. 601/SPA/DA/407/220/2022 – see **Annex II, Volume I**), thus requiring a full EIA Process.

The next step in the EIA Process is the submission of an Environmental Pre-Feasibility and Scope Definition Study (EPDA) to MTA. The EPDA's main goals are to (i) determine potential fatal flaws associated with the proposed Project and (ii) define the Terms of Reference (ToR) of the environmental assessment to be undertaken in the following phase of the EIA process - the Environmental Impact Study (EIS[2]).

The EPDA draft report was disclosed to Public Participation Process (EPDA-PPP) in November 29th, 2022. Two public meetings were held for the EPDA phase PPP, one per each district crossed by the line, namely Namaacha and Boane, in the 13th and the 14th of December 2022, respectively. The final EPDA report was submitted to MTA in January 2023. Following MTA's review, the EPDA Report was approved on 28th of April 2023 (letter ref. 158/MTA/183/GM/220/23 - see **Annex II**; **Volume I**).

Following the EPDA's approval, the next step in the EIA process is the development of the EIS, in compliance with the approved Terms of Reference (ToR).

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[1] Central Eléctrica da Namaacha (CEN) Project, whose shareholders are Globeleq, Source Energia and EDM, consists of the construction of a 120 MW wind farm within a site of approximately 855 ha near Namaacha tow and had its own EIA process. The CEN has secured its environmental license from MTA.

[2] In the Mozambican context, the EIA process has three phases: screening, scoping and impact assessment. The Environmental Impact Study (EIS) is the report that presents the findings of the third phase of the EIA process, including baseline assessment, impact assessment and mitigation and the EMP. In the international context, this is usually referred to as the EIA report. As such, the terms EIS report and EIA report are interchangeable and should be read as synonyms.

The Environmental Impact Study Draft Report was disclosed to the Public Participation Process (EIS-PPP) in the beginning of October 2023 and public meetings were held in Namaacha and Boane on the 18th and on the 19th of October 2023, respectively. Details about the EIS-PPP can be found in the PPP Report (**Volume V**).

After the completion of the EIS phase PPP, this document constitutes the Environmental Impact Study Final Report to submit to the MTA for appraisal.

1.2 Project Proponent

The Project Proponent is **EDM – Electricidade de Moçambique E.P..** Contact details are provided in the following table.

Table 1-1 – Proponent Contacts

ELECTRICIDADE DE MOÇAMBIQUE, E.P.	Address	Av. Eduardo Mondlane Nr.1390, 5º andar Maputo – Mozambique
	Contact person	Olga Utchavo | olga.utchavo@edm.co.mz

1.3 Environmental Consultant

Consultec – Consultores Associados, Lda. (Consultec) was appointed by the Proponent to undertake the EIA process on their behalf. Consultec is a Mozambican consulting company, that provides engineering, environmental, and social consulting services. Consultec is registered with MTA as an EIA Consultant since 2002 (see **Annex I, Volume IV**).

Consultec's contacts regarding this study are presented in the table below.

Table 1-2 – Consultant Contacts

CONSULTEC Consultores Associados, Lda	Address	Rua Tenente General Oswaldo Tazama, No. 169 Maputo, Moçambique
	Person of contact	Nuno Silva; Tiago Dray
	Contact Number	+ 258 21 491 555
	E-mail	nsilva@consultec.co.mz; tdray@consultec.co.mz;

Members of the EIA team responsible for preparing this report, their relevant experience and roles within the team are listed in **Table 1-3**.

Table 1-3 – EIA team members responsible for the EIS report

Name	Role	Qualifications and Experience
Tiago Dray	Project Director	Honours degree in Biology. Director at Consultec and overall manager of the environmental department.
Nuno Silva	Project Manager	Honours degree in Environmental Engineering. 23 years of experience in environmental consultancy.
Décio Camplé	PPP management	Honours degree in Environmental Engineering. and Master in Agribusiness Management. 13 years of experience in the management of PPP processes.
Miguel Barra	Climate, Air Quality and Noise	Honours degree in Environmental Engineering. Post-graduation on Health and Safety Management in Civil Construction. 17 years of experience in environmental consultancy.
Susana Paisana	Geology and Soils Water Resources	Honours degree in Geology. Post-graduations in Geotechnics and in Geological Engineering. 18 years of experience in environmental consultancy.
Marta Henriques	Biodiversity; Landscape	Honours degree in Biology. Post-graduation in Environmental Management Policy. 16 years of experience in environmental consultancy.
Julieta Jetimane	Biodiversity	Honours degree in Forestry Engineering. Master's degree in Biodiversity Management and Conservation. 8 years of experience in environmental consultancy.
Rafael Noronha	Socioeconomics	Master's degree in Social Policy and Management. Over 12 years of experience in environmental consultancy.
Natasha Soeiro	Socioeconomics	Honours degree in Cellular and Molecular Biology. Over 10 years of experience in social studies and development consultancy.
Carlos Bento	Biodiversity - Birds	Honours degree in Biology. Master's degree in Zoology. Avifauna specialist with more than 15 years of experience in research and environmental impact assessments.
Valério Macandza	Biodiversity – Fauna, including Bats	BSc(H) in Veterinary Medicine and a MSc in Management and Conservation of Biodiversity Resources .. Over 15 years of experience as a biodiversity specialist and in impact assessments.

1.4 Purpose of the Report

The EIS's main goals are to assess project risks and impacts, define mitigation to minimize negative impacts and enhance positive impacts, and to inform the environmental authority's decision process, for the issuance of the environmental license for the proposed activity. The EIS Report must include the following information, as per Article 11 of the EIA Regulation (Decree No. 54/2015, of 31 December):

- A legal framework pertaining to the proposed activity;
- A description of the proposed project, considering all phases of its life cycle;
- A description and detailed comparison of project alternatives;
- The definition of the project areas of influence;
- A description of the environmental and social baseline conditions of those areas of influence;

- The identification and assessment of the project's impacts, including cumulative impacts where relevant;
- The definition of the required mitigation measures, to avoid, reduce or compensate the negative impacts and optimize the positive ones; and
- An Environmental Management Plan (EMP) for the activity, including monitoring programs, if relevant.

The EIS phase will also include a PPP, to provide the opportunity for Interested and Affected Parties (I&APs) to review and comment on the project and the EIS. A Draft EIS Report was compiled to support the public consultation activities of the EIS phase. Details about the EIS-PPP can be found in the PPP Report (Volume V).

This Final EIS Report was prepared after the completion of the PPP, incorporating the results.

1.5 Report Structure

The EIS Report is structured in five Volumes, the content of which is listed in Table 1.5 below.

Table 1-4 – Draft EIS report structure

Volume	Chapter	Content
Volume I	Chapter 1	**Introduction** Provides a background to the proposed Project and the EIA and provides information about the Proponent, the EIA consultant team and the report's main goals and structure.
	Chapter 2	**Legal and Regulatory Framework** Outlines the legal framework within which the EIA is undertaken and identifies other environmental legislation, standards, and guidelines applicable to the project.
	Chapter 3	**EIA Approach and Methodology** Presents the proposed approach and methodology for the EIA.
	Chapter 4	**Project Description** Discusses the Project background and desirability and describes the Project components, as well as the activities planned for the construction, operation, and decommissioning phases. Also presents the project alternatives considered.
	Chapter 5	**Project Areas of Influence** Defines the areas of direct and indirect influence of the project.
	Chapter 6	**Baseline Assessment** Describes the biophysical and socioeconomic baseline of the project's areas of influence.
	Annexes	Provides support information to the EIS, in the form of annexes.
Volume II	Chapter 7	**Impact Assessment and Mitigation Measures** Identifies and assesses potential project impacts and defines relevant mitigation measures to avoid, reduce, compensate, or enhance Project impacts (as applicable).
	Chapter 8	**Public Participation Process** Provides a summary of the PPP activities undertaken in the EIA process up to this point and describes the proposed approach for the EIS PPP activities.
	Chapter 9	**Conclusions and Recommendations** Presents the main findings of the EIS report and recommendations for the following phases of the project.

Volume	Chapter	Content
	Chapter 10	**References** Lists references cited in the report
Volume III – EMP	**Environmental Management Plan** Presents the project EMP, organizing all mitigation, management and monitoring requirements set out in the EIS into thematic management programs.	
Volume IV – PSES/RPF	**Physical and Socioeconomic Survey Report (Resettlement Policy Framework)** Presents the results of Resettlement Plan Framework, corresponding to the first phase of the resettlement process, in accordance with the Technical Directive on the Elaboration and Implementation Process of Resettlement Plans (Ministerial Decree No. 156/2014 of 19 September)	
Volume VI – PPP	**Public Participation Process** Presents the results of Public Participation Process during the EIA process as required by Decree No. 54/2015, of December 31st - Regulation on the EIA Process and Ministerial Decree No. 130/2006, of July 19th - guidelines for the PPP of the EIA Process.	

A Non-Technical Summary (NTS) was also prepared to support the EIS phase PPP and makes part of the present EIS/EIA process, highlighting the main issues, findings, and recommendations of the main Report.

2 Legal and Regulatory Framework

2.1 Introduction

The EIA Process is being developed in compliance with Mozambique's national legislative requirements and with applicable international guidelines. This Chapter presents the national and international development and environmental and social legal frameworks applicable to the proposed Project, including:

- National Development Framework: national development and strategic plans with relevance to the proposed Project (see section 2.2);
- Institutional Framework: relevant governmental institutions and authorities with jurisdiction over the Project or over relevant environmental or social aspects (see section 2.3);
- Legislative Framework: legal requirements which are relevant for the Project's impact assessment (see section 2.4);
- Relevant International Conventions (see section 2.5);
- International Best Practice Guidelines and Policies (see section 2.6).

2.2 National Development Framework

2.2.1 National Development Strategy (2015-2035)

The National Development Strategy (2015-2035), approved in July 2014 (GoM, 2014), defines the Government of Mozambique's (GoM) main development strategies to achieve the goal of "*raising its people's quality of life through the structural transformation of the economy and the expansion and diversification of the production base*".

The National Development Strategy believes that industrialisation, grounded in an inclusive and sustainable growth model, is the main way to achieve Mozambique's vision of prosperity and competitiveness. To materialise industrialisation, the strategy defines four main development pillars, namely:

- Human capital development;
- Infrastructure development;
- Research, innovation, and technological development; and
- Institutional coordination and articulation.

With regards to infrastructure development, the strategy considers that massive investment in the infrastructure sector is required and is a determinant factor for economic growth. As such, the strategy lists the main infrastructure that should be the focus of investment, including:

- Logistics - transport and storage infrastructure (the latter with a focus on storage of agricultural, fisheries, mineral and hydrocarbon products);
- Maritime cabotage for cargo transport at long distances;
- Power generation, including alternative energy sources;

- Natural gas supply systems;
- Sustainable management of water resources;
- Social infrastructure; and
- Tourism infrastructure.

The Project under assessment proposes the development of a transmission line, which will evacuate the power produced at the Namaacha WPP. This is in full alignment with the infrastructure development strategic goals, as defined in the National Development Strategy for the 2015-2035 period.

2.2.2 Governmental Five-Year Plan (2020-2024)

The main objective of the Government's Five-Year Plan for the current period (2020-2024), approved in April 2020 (GoM, 2020), is the improvement of well-being and quality of life of the Mozambican people, the reduction of poverty and social inequalities, the creation of an environment of peace, harmony and tranquillity, and a strong focus on job creation. To achieve these goals, the five-year plan defines strategic areas of development on which the GoM should focus its action, and on which private and public investment should be incentivised.

The development of economic and social infrastructure (including energy infrastructure) is one of these strategic areas, for which the five-year plan sets the following overall strategic goal: "*prioritize investment in quality infrastructure, such as energy, telecommunications, ports, roads and railways, that facilitate economic activity, reduce transactional costs, create jobs, promote regional and national integration, and improve the population's life conditions*".

The CEN - Boane transmission line is an energy infrastructure that will facilitate regional integration and improve life conditions in its area of influence, through increased power supply reliability to the main consumption centers in the region. As such, the goals of the proposed Project are fully aligned with the strategic goals of the GoM's Five-Year Plan (2020-2024).

2.2.3 Economic and Social Plan for 2022

The Economic and Social Plan and State Budget (PESOE) is an instrument for the implementation of the economic and social objectives defined in the 5 Year Government Program (2020-2024). It defines objectives regarding economic growth, inflation, export, net international reserves, public good production, basic social services, and public finances.

The 2022 PESOE (approved by Law No. 6/2021, of 30 December) includes several programs for human, social and economic development, which translate the GoM's main strategic objectives. With regards to economic development, one of the subprograms pertains to infrastructure development, including the energy sector. The PESOE 2022 plans a continued effort for expansion of the power production, transmission, and distribution infrastructure, including the construction of solar, hydro and gas-fed power plants, the expansion of the transmission network (both 400 kV and 110 kV) and the construction of several new substations.

Although not specifically mentioned in the PESOE 2022, the proposed CEN Project and transmission line is in line with its overall strategic goals of development for Mozambique's power infrastructure.

2.2.4 Energy Sector Strategy

The Energy Sector Strategy was approved by Resolution No. 10/2009, of 4 June, and establishes strategic guidelines for the implementation of the Energy Policy (approved by Resolution 5/98, of 3 March). This strategy recognises that energy is one of the main factors contributing to national economic growth and poverty relief, and believes that Mozambique has a significant potential, in terms of energy resources, sufficient to respond both to national and regional demands, in the context of Southern Africa.

The strategy sets forth some principles for the energy sector, which include, among others:

- Sustainable increase of access to electricity;
- Sustainable development and preservation of the environment;
- Institutional coordination and consultation with all stakeholders;
- Exploration of the regional market, enabling large power projects; and
- Efficient use of energy.

The proposed project will increase the availability of electricity in the southern region, thus improving the reliability of energy supply hence expected to stimulate investments and economic growth. The proposed Project is thus fully in line with the goals of the Energy Sector Strategy.

2.2.5 New and Renewable Energies Development Policy

The Project is aligned with the New and Renewable Energy Development Policy, approved in 2009 by the Government of Mozambique and established as one of the strategic priorities of implementation the evaluation of new and renewable energy resources. In this context of the evaluation of resources, the Policy and, later, the Strategy for the Development of New and Renewable Energies, approved in 2011, established as measures to develop, inter alia, the mapping of the water, wind, solar, biomass, geothermal and maritime potential, as well as the identification and mapping of the sites of occurrence. In this context, the Mozambique Renewable Energy Atlas emerges, which has addressed one of the strategic priorities defined in the Policy and Strategy of the Government of Mozambique.

2.3 Institutional Framework

2.3.1 Energy Sector

The **Ministry of Mineral Resources and Energy** (MIREME) was created by Presidential Decree No. 1/2015, of 16 January. The Ministry's attributions are defined by Resolution No. 14/2015, of 8 July, and include, among others, promoting improved knowledge of national energy resources and their development and usage and the development of energy production to satisfy national needs and to seize the opportunities of the regional market.

The **Energy Regulatory Agency** (ARENE) was created by Law No. 11/2017, of 8 September, replacing the former National Electricity Council. ARENE possesses supervision, regulation, inspection, and sanctioning powers over the energy sector.

The **National Directorate of Energy** (DNE), created by Resolution No. 14/2015, of 8 July, is the department of MIREME responsible for the conception, promotion, assessment, execution, and monitoring of the electricity sector policies.

Electricidade de Moçambique, E.P. (EDM) was created in 1977 by Decree-Law No. 38/77, of 27 August, as the state-owned national electricity utility. It became a public enterprise in 1995, expected to operate on commercial terms (Decree No. 28/95, of 17 July). EDM is under the tutelage of MIREME and is tasked with the establishment and operation of the public service of production, transmission, distribution, and commercialisation of electricity in Mozambique, and as such manages the national electrical grid (Decree No. 43/2005 of 29 November).

2.3.2 Environmental Authorities

The **Ministry of Land and Environment** (MTA), established by Presidential Decree No. 1/2020, of 17 January, is the central authority that plans, coordinates, controls and ensures the execution of policies related to the management of land, forests and wildlife, environment, conservation areas and climate change. Presidential Decree No. 4/2020, of 7 February, defines MTA's role and scope of intervention. At the provincial level, MTA is represented by the **Provincial Environmental Services (SPA)**.

EIA applications are managed by MTA through the **National Directorate for Environment (DINAB)** at the national level, and through SPA at the provincial level.

The management and monitoring of environmental quality, such as pollution control, water, soils and air quality, noise emissions and waste management, are also a part of MTA's attributions. The **National Agency for the Control of Environmental Quality** (AQUA) was created by Decree 80/2010, of 31 December, amended by Decree 2/2016, of 10 February, and is responsible, among other attributions, to develop and implement strategies for the integrated control of water, air, and soil pollution.

Management of conservation areas falls under the responsibility of the **National Administration for Conservation Areas (ANAC)** created by Decree 11/2011, of 25 of May, amended by Decree 8/2016, of 15 of April.

2.4 Legislative Framework

The Constitution of the Republic of Mozambique defines the right of all citizens to a balanced environment and the duty to protect it (Article 90º). Additionally, the State is required to ensure: *(i)* the promotion of initiatives to ensure ecological balance and environmental preservation, and *(ii)* the implementation of policies to prevent and control pollution and integrate environmental concerns in all sectorial policies to guarantee the citizen the right to live in a balanced environment supported by sustainable development (Article 117º).

The proposed Project must comply with the legal requirements for environmental licensing, taking into consideration not only the specific EIA regulations but also all the applicable environmental regulation (physical, ecological, social, and economic) that may be relevant to the Project throughout its life cycle (construction, operation, and decommissioning).

The environmental instruments and regulations relevant to the proposed Project's EIA Process, as well as the relevant legal framework in place for the Energy Sector, are discussed in Table 2-1 below.

Table 2-1 – Key environmental and social legislation

Legislation	Description	Relevance
ENVIRONMENTAL IMPACT ASSESSMENT		
Resolution 5/95 - National Environmental Policy	Establishes the basis for all environmental legislation. According to clause 2.1, its main goal is to ensure sustainable development, to maintain an acceptable balance between socioeconomic development and environmental protection. To reach this goal, the Policy requires the integration of environmental considerations in the socioeconomic planning, the management of the country's natural resources and the protection of ecosystems and of the essential ecological processes.	The Project should strive to meet the policy's goals, integrating environmental considerations in its design, thus minimizing impacts on natural resources and ecosystems. The environmental and social assessment developed in this EIA will generate inputs to the project's design.
Law 20/97 - Environmental Law	Defines the legal basis for the sound use and management of the environment towards the sustainable development of the country. The Environmental Law applies to all public and private activities that may directly or indirectly affect the environment.	The Project should strive to meet the sustainable development principle defined by the Environmental Law, throughout its life cycle. This EIA is part of that effort.
Decree 54/2015 - Regulation for the EIA Process	Establishes the EIA Process as one of the fundamental instruments for environmental management, aiming at mitigating the negative impacts that public or private projects may cause to the natural and socio-economic environment, through the undertaking of environmental studies prior to commencement of the projects. Defines the EIA Process, the required environmental studies, PPP, studies review process, project environmental feasibility decision process and environmental license issuance. Applies to all public or private activities with direct or indirect influence in environmental components.	The Project needs to be submitted to a formal EIA Process, in accordance with this regulation. An environmental license needs to be obtained from MTA, and the issuance of the environmental license precedes any other license or permit required for the Project. The EPDA is the second step in the Project's EIA Process, as described in Chapter 3.
Ministerial Decree 129/2006 - General Guidelines for Environmental Impact Studies	Provides details on environmental licensing procedures, as well as the format, structure, and contents of the environmental impact assessment report. The objective is to standardise procedures followed by various role-players in the EIA process.	The EIS report must conform to the guidelines outlined in this Ministerial Decree. During the compilation of the EIS, the requirements of this legislation will be considered.
Ministerial Decree 130/2006 - guides the PPP of the EIA Process	Defines the basic principles, methodologies, and procedures for the EIA consultation process. Considers public participation as an iterative process that initiates at the design stage and continues throughout the lifetime of the project.	The PPP for the EIA Process (including for this EPDA) is being developed in compliance with the guidelines provided in this Ministerial Decree.
Decree 25/2011 - Regulation on the Environmental Audit Process	Defines an environmental audit as a documented and objective instrument for management and systematic assessment of the management system and relevant documentation implemented to ensure protection of the environment. Its objective is to assess compliance of work and operational processes with the environmental management plan, including the environmental legal requirements in force, as approved for a project.	Throughout the Project's lifecycle, the Proponent should conduct independent environmental audits at least once a year. In addition, public environmental audits may be requested under this decree.

Legislation	Description	Relevance
Decree 11/2006 - Regulation for Environmental Inspections	Regulates the supervision, control, and verification of compliance with environmental protection rules at a national level.	During the construction or operational phases of the Project, MTA may undertake inspections to ascertain compliance with environmental legislation and the Environmental Management Plan (EMP). The Proponent must allow for and facilitate such inspections.
ATMOSPHERIC EMISSIONS AND AIR QUALITY		
Law 20/97 - Environmental Law	Article 9 forbids the discharge of any toxic substances to the atmosphere if exceeding the legal standards. The emission standards are defined by Decree No. 18/2004 (see below).	The Project must comply with the air quality emissions limits, as defined in this regulation. Given the nature of the project, this will mostly be applicable to the emissions of vehicles and machinery.
Decree 18/2004 (as amended by Decree 67/2010) - Regulation for Environmental Standards and Effluent Emissions	Establishes parameters for the maintenance of air quality (Article 7º); patterns of emission of gaseous pollutants for various industries (Article 8º); and standards for emission of gaseous pollutants from mobile sources (Article 9º) - including light and heavy vehicles.	
Decree 24/2008 of July 1st - Approves the Regulation on the Management of Substances that Deplete the Ozone Layer	It establishes the general bases of the environmental protection regime, the discharge into the atmosphere of any toxic or polluting toxic or polluting substances, the production and deposit in the soil, and assigns to the Government the responsibility to ensure that measures are taken for the protection of the ozone layer.	
Resolution No.78/2009, of December 22nd (on the banning of import, export, production, commercialization, and transit of Ozone-Depleting Substances	It aims to strengthen the legal framework for the implementation of the Vienna Convention on the Protection of the Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer. As part of the adoption of measures to protect the Ozone Layer, this Resolution bans the import, export, production, marketing and transit of substances that deplete the ozone layer. The banned substances are Chlorofluorocarbons (CFC's), Halogenated hydrocarbon (Halon-1211, Halon-1301 and Halon-2402) and Carbon Tetrachloride (CCL4).	The banned substances must not be used in any of the project phases
WATER RESOURCES AND WATER QUALITY		
Law 16/91 - Water Law	This law is based on the principles of public water use, basin scale management, and user-pays and polluter-pays. Intends to safeguard the ecological balance and environment. Water uses require either a water concession (permanent or long-term water uses) or a water license (short term water uses). Licenses are given for a period of 5 renewable years, while concessions are valid for a period of 50 renewable years. Article 54 of this Law stipulates that any activity with the potential of contaminating or degrading public waters, in particular the discharge of effluents, is subject to a special authorisation to be issued by the Regional Water Administration and payment of a fee.	The project needs to include measures to prevent the pollution of any water resources in the construction and operation phases. If the Project requires the discharge of effluents into water bodies, a discharge license must be obtained.
Decree 18/2004 – Regulations for Environmental Quality Standards and Effluent Emissions	Determines that when industrial effluent is discharged into the environment, the final effluent discharged must comply with discharge standards established in Annex III of the decree. The discharge of domestic effluent must comply with the discharge standards in Annex IV.	The Project must comply with the effluent emission limits established by this regulation. This may be applicable to any construction camps used in support of the Project's construction.

Legislation	Description	Relevance
POLLUTION AND WASTE MANAGEMENT		
Law 20/97 – Environmental Law	Limits the production and / or disposal into the soil or subsoil and the disposal into water or the atmosphere of any toxic or polluting substances, as well as the practice of activities that accelerate erosion, desertification, deforestation, or any other form of environmental degradation to those limits established by the law (Article 9).	The Project needs to include measures to prevent pollution during and after implementation. Any project must conform to the requirements outlined in this regulation. The EMP will include such measures.
Decree 94/2014 - Regulation for Urban Solid Waste Management	Establishes the legal framework for urban solid waste management. The key objective is to establish rules for the generation, collection, and disposal of urban solid wastes, so as to minimise their impacts on public health and the environment. Urban solid wastes are to be classified in accordance with the Mozambican Norm NM339 – Solid Wastes – Classification. Waste management is a responsibility of Municipal Councils and District Governments, as applicable.	The project should implement suitable waste management practices throughout its life cycle, in compliance with the requirements outlined in this regulation. To the effect, a Waste Management Plan will be included in the EMP.
Decree 83/2014 - Regulation for Hazardous Waste Management	Establishes the legal framework for hazardous waste management. The key objective is to establish rules for the generation, collection, and disposal of hazardous wastes, so as to minimise their impacts on public health and the environment. Annex IX of this decree provides waste classifications. MTA is the competent entity to manage hazardous wastes, namely by licensing waste management units. Only entities which are licensed by MTA can collect and transport hazardous wastes, beyond the limit of the facilities where they were generated.	
Decree No. 8/2003 of February 18th - Regulation on Biomedical Waste Management	Aims to establish the rules for the management of biomedical waste in order to safeguard the health and safety of health care facility workers, ancillary workers and the general public and to minimize the impacts of such waste on the environment.	
BIODIVERSITY		
Law 20/97 – Environmental Law	Articles 12 and 13 state that the planning, implementation, and operation of projects should guarantee the protection of biological resources, particularly of plant or animal species threatened with extinction or that, by their genetic value, ecological, cultural, or scientific, require special attention and this issue is to extend their habitats, especially those built within areas of environmental protection.	The Project must consider protected biodiversity. The presence of potentially relevant biodiversity values in the Project area will be assessed in the EIA. The EMP will include adequate mitigation to minimize the Project's impacts on biodiversity.
Law 10/99 - Forests and Wildlife Law	Establishes the principles and basic rules on protection, conservation and sustainable use of forest and wildlife resources.	The Project must consider the protection of forest and wildlife. The Proponent must notify MTA if a species listed in this regulation is affected or disturbed.
Decree 12/2002 – Regulation on the Forests and Wildlife Law	Applies to protection, conservation, use, exploration and production activities of fauna and flora resources. Includes the commerce, transport, storage and primary artisanal or industrial transformation of these resources. Annex I include a list of classification of wood-producing species, including precious wood and woods of 1st, 2nd, 3rd, and 4th grades. Annex II includes a list of protected fauna species, for which hunting is prohibited.	

Legislation	Description	Relevance
Decree No. 25/2008 – Regulation for the Control of Invasive Alien Species	Article 8 of this decree prohibits activities involving invasive alien species without prior authorization and states that 'after hearing the Interinstitutional Group for the Control of Exotic Species Invasive, the National Environmental Authority (MTA) may prohibit any activity which, by its nature, may involve the spread of invasive alien species'. Activities include the following: - Import of any type of invasive exotic species, whether by sea, land or air; - Possess any type of invasive exotic species; - Develop, breed or otherwise propagate any type of invasive alien species; and - Transport, move or relocate any type of invasive alien species	The Project must ensure the control of the propagation of invasive alien species. Article 11 of the decree suggests that adequate methods must be implemented to control and eradicate invasive alien species. The Project should include mitigation measures for potential impacts related to invasive alien species, which must be binding and ensure compliance with the requirements of the Regulation by the proponent.
Law 16/2014 (as amended by Law 5/2017) – Protection, Conservation and Sustainable Use of Biodiversity Law and its Regulation	This Law regulates the creation and management of all conservation areas in Mozambique, revoking the Forestry and Wildlife Law competences in this matter. Article 16 states that all activities that could result in changes to vegetation cover, or that could disturb flora, fauna, and ecological processes up to the point of compromising their maintenance, are interdicted within national parks, except if required for scientific reasons or management needs. Article 26 states that activities can be approved within conservation areas, if planned in the area's management plan, which among other things defines the construction of the infrastructure required for the area's management or that aimed to improve the quality of life of the local populations.	No protection or conservation areas are interfered by the Project.
Decree No. 89/2017 of December 29th - Regulation of Protection, Conservation and Sustainable Use of Biological Diversity;	The present Regulation applies to the set of values and natural resources existing in the national territory and in the waters under national jurisdiction, covering all public or private entities that may directly or indirectly influence the national system of the country's conservation areas, under the terms of the Law No. 16/2014 (Amended by Law 5/2017), law for the Protection, Conservation and Sustainable Use of Biological Diversity.	
Decree 51/2021 of July 19th - Regulation for the Protection, Conservation and Sustainable Use of Avifauna	This decree regulates the protection, conservation and sustainable use of avifauna, including its natural, continental, marine, lake and river habitats. Art 5 defines as avifauna protection zones the "Key Areas for Biodiversity", and "Important Areas for Birds" and art. 4 prohibits the exercise of any activity or construction of infrastructure capable of disturbing the avifauna or its habitat in the protection areas, as well as any economic or social infrastructure, to be built in sensitive areas for birds, must respect the international standards of good practice, ensuring the placement of signalling devices that prevent collision of birds or any other damage that affects the avifauna. Appendices A and D define the protected species whose exploitation is not permitted; Appendix B defines the species of avifauna in Mozambique included in CITES.	The Project must consider the protected avifauna as well as their habitats. The presence of relevant potential avifauna values in the Project area, namely "Key Areas for Biodiversity", and "Important Areas for Birds", should be assessed in the EIA.
Ministerial Diploma No. 55/2022 of May 19th – Adoption of the Biodiversity Counterbalances Directive	Establishes the principles, methodologies, requirements and procedures for the correct implementation of Biodiversity Counterbalances, integrated into environmental impact assessment processes.	The Project must consider Biodiversity Counterbalances if significant residual impacts over key biodiversity areas, critical habitats or threaten species or ecosystems are identified. Biodiversity Action Plan should be part of the EMP.

Legislation	Description	Relevance
LAND OWNERSHIP AND RESETTLEMENT		
Resolution 10/95 – Land National Policy	Establishes that the State must provide the land for each family to build or possess their own habitation, and is responsible for land use and physical planning, although plans can be made by the private sector.	The Project must conform to the principles of this policy, as per the regulations defined in the implementing legislation, which is discussed below.
Law 19/1997 – Land Law	Defines land use rights (DUAT), including details on customary rights and procedures for acquisition and use of land titles by communities and individuals. This law recognises and protects the rights acquired through inheritance and occupation (customary rights and duties of good faith), except for legally defined reserves or areas where land has been legally transferred to another person or institution.	The Land Law and its regulation define total and partial protection zones. In these zones, land use is restricted. According to this regulation, the corridor of 50 m to each side of a new transmission line is considered to be a partial protection zone (the line's RoW). The approval of power transmission line projects by the Council of Ministers or by the relevant competent authorities automatically implies the creation of the respective partial protection zones. The establishment of the RoW may create the need to compensate existing assets and resettle existing settlements within the RoW. This issue will be investigated in the EIS. Please see section 4.4, Project Land Take Requirements for more details.
Decree 66/98 – Regulation for Land Law	Defines total protection areas, set aside for nature conservation and State defence, as well as partial protection areas, where land use titles may not be granted, and where activities cannot be implemented without a license. Partial protection areas, which include, amongst others, the 50 m strip of land along lakes and rivers, 100 m strip of land along the seafront and estuaries, 50 m along aerial, surface or underground pipelines/cables for electricity, telecommunications, oil, gas and water, 30 m along primary roads and 15 m along secondary and tertiary roads.	
Decree 31/2012 – Regulation for the Resettlement Process Resulting from Economic Activities	Defines rules and basic principles for resettlement processes from the implementation of public or private economic activities. Article 15 states that the Resettlement Plan is part of the EIA Process and that its approval precedes the issuance of the environmental license. There are three steps in the Resettlement Plan (article 19): a) Physical and socioeconomic data collection; b) Resettlement Plan; and c) Resettlement Action and Implementation Plan.	If physical displacement results from the Project, this regulation is applicable, and a resettlement action plan will be required. Any potential economic displacement (such as the loss of farming plots or other assets) will also need to be assessed in the EIA and, if present, duly compensated for, in abidance with the Land Law. Note that for electricity projects, expropriation procedures may apply (please see Decree 21/97 below).
Technical Directives No. 155/2014 and 156/2014	TD 155/2014 approves the internal regulation for the Monitoring and Supervision Technical Committee for Resettlement. TD 156/2014 approves the technical requirements for the preparation of RAP. Section 3 describes in detail the requirements for the 3 steps of the RAP: a) Physical and Socioeconomic Survey Report; b) Resettlement Plan; and c) Resettlement Action and Implementation Pan. It also defines the requirements of the RAP's Public Consultation and Participation Process.	The Resettlement Plan to be prepared has to follow the technical requirements stated on Technical Directive 156/2014, regarding the process steps and specifications. The Physical and Socioeconomic Survey Report is developed along with the ESIA.

Legislation	Description	Relevance
Law 12/2022, Electricity Law	Approves the new Electricity Law, revoking previous Law n.º 21/97. Article 43, concerning land use and expropriation, states that: 1) The land to carry out energy production, transportation and distribution activities is governed by the Land Law and related applicable legislation; 4) The construction or deployment of electrical facilities, including overhead, surface, underground and subsea power lines, for the transport and distribution of electricity, as well as for the connection of production installations to transport or distribution grids, requires the creation of an administrative servitude, to be defined in accordance with the tension levels and technical and safety standards, up to 50 metres of confining land from the line's axis; 5) The terms and conditions of the confining strip of land indicated in paragraph 4 of this Article is in accordance with tension levels and other technical and safety standards, and is assessed in function of the rural or urban environment; 6) (…) a safety zone for the electrical facilities, corresponding to the adjacent strip. is established, within the servitude area; 8) The acquisition of the right of land use, as well as the creation of the servitude for the purpose of carrying out energy supply activities is subject, where applicable, to the resettlement rules and the payment of compensations, in accordance with the applicable legislation.	According to this law, a servitude of up to 50 m from the 66 kV line's axis needs to be established in accordance with the tension levels and technical and safety standards. Within this area, a safety zone shall be established. The technical and safety standards to define the specific width of these areas are yet to be published.
Decree 23/2008 – Regulation for Land Planning	Aims to establish regulatory territorial planning measures and procedures to ensure the rational and sustainable use of natural resources, regional potentials, infrastructure, and urban centres, and to promote national cohesion and safety of the people. Articles 68 to 71 deal with expropriation procedures for private property for national public interest reasons. Article 70 states that expropriation should be preceded by fair compensation.	If expropriation of land or land rights is required for Project implementation, the requirements of this regulation should be complied with. Expropriation requires the issuance of a declaration of public interest for the Project, as defined in the Electric Energy Law.
Ministerial Decree 181/2010 – Guidelines for the Expropriation Process Resulting from Land Planning	Establishes procedures for expropriation processes resulting from land planning, including procedures for the issuance of a declaration of public interest, compensations for expropriation (including calculation methods) and the expropriation process itself.	If expropriation of land and land rights within the Project area is required, the procedures established in these guidelines should be followed.
CULTURAL HERITAGE		
Law 10/88 - Cultural Heritage Law	Aims to legally protect material and non-material assets of the Mozambican cultural heritage. Under this law, cultural heritage is defined as a "group of material and non-material assets created or integrated by the Mozambican people through history, with relevance to the definition of the Mozambican cultural identity". Material cultural assets include monuments, groups of buildings with historic, artistic, or scientific importance, places or locations (with archaeological, historic, aesthetic, ethnologic or anthropologic interest) and natural elements (physical and biological formations with particular interest from an aesthetic or scientific point of view).	The potential presence of cultural heritage on the Project area will be assessed in the EIS. Archaeological objects may also be found during the construction phase of the Project. In such cases, the Proponent must immediately communicate the finding to the relevant cultural heritage agency.

Legislation	Description	Relevance
	WORK AND SAFETY	
Law 23/2007 - Labour Law	Defines general principles and establishes the legal framework applicable to individual and collective employment relationships in respect of work rendered to an employer for remuneration.	The project must, throughout its entire life cycle, abide by Mozambique's labour law.
Law 19/2014 - Law of Protection of People, Workers and Job Applicants Living with HIV/AIDS	This law establishes the general principles that aim to ensure that all employees and job applicants are not discriminated against in the workplace or when applying for jobs, for being suspected of having or having HIV / AIDS. It is prohibited testing of HIV / AIDS to workers, job seekers, or candidates to training or promotion, at the request of employers, without the employee's or job seeker consent.	Testing job applicants for HIV / AIDS is prohibited. Testing of workers without the employee's consent is also prohibited. The proponent must train and reorient all HIV positive workers who are able to fulfil their duties at work, with activities compatible with their capabilities.
Decree 45/2009 - Regulation on the General Labour Inspectorate	This Regulation lays down the rules on inspections, under the control of the legality of work. Paragraph 2 of Article 4 provides for the employer's responsibility for the prevention of occupational health and safety risks for the employee.	The Proponent shall comply with the requirements. In the case of an inspection, the proponent must help to provide all necessary information to the inspectors.
Decree 62/2013 - legal regime for accidents at work and occupational diseases	Establishes the legal regime for accidents at work and occupational diseases and aims to bring the legal in line with the current labour law, introduce new formulas for calculating pensions and indemnities, as well as the possibility of revising pensions as a result of the aggravation or corrosion of the elements that served as the basis for its calculation.	The Proponent shall comply with the requirements.
	ELECTRIC ENERGY	
Law 12/2022, Electricity Law	Same as above.	Same as above.
Decree 42/2005 – Regulation establishing rules for the national electric grid	Article 3 reinforces that the construction and operation of power transmission infrastructure requires the issuance of a concession, as required by Law No. 21/97.	EDM has been designated as the managing entity of the national power transmission grid, as per Decree No. 43/2005. As such, EDM will be the operator of the proposed transmission line.
Decree 57/2011 – Safety Regulation for High Voltage Power Lines	This Decree establishes several standards and guidelines for the design of power lines, to ensure their safety. Article 28 (clause 3) states that in order to ensure a safe operation of high voltage power lines, trees close to the power line may need to be cut, within a protection zone with a maximum width of: *(i)* 30 m, for lines under 66 kV, and *(ii)* 50 m, for lines equal or over 66 kV.	According to this decree, trees and other obstacles that may result in a risk to the infrastructure will need to be removed. Note that the protection zone named in this decree is a safety zone, and is not equivalent to the line's partial protection zone (the Project's RoW), as defined in the Land Law.

2.5 Relevant International Conventions

Relevant international conventions for the Project under assessment are provided in **Table 2-2**.

Table 2-2 – Relevant international conventions

Convention	Description
	BIODIVERSITY
African Convention on the Conservation of Nature and Natural Resources (AU 1968) as well as its Revised Version (AU 2017)	Under this Convention, the Contracting States commit to take action to ensure the conservation, use and development of soil, water, flora, and fauna resources in accordance with scientific principles and with due regard to the best interests of the people. Pursuant to Resolution 18/81, of 30 December 1981, the Republic of Mozambique acceded to this convention.

Convention	Description
United Nations Convention on Biological Diversity (UN 1992)	The main goals of this convention are the conservation of biodiversity, the sustainable use of biodiversity, and the fair and equitable sharing of the benefits arising from the use of genetic resources. Its overall objective is to encourage actions which will lead to a sustainable future. Mozambique ratified this convention in 1994, through Resolution 2/94.
Convention on Wetlands of International Importance, Especially as Waterfowl Habitat – Ramsar Convention (UNESCO 1971)	Pertains to the sustainable use and conservation of wetlands. Ratified by Mozambique in 2003.
Convention on the International Trade of Endangered Species of Wild Fauna and Flora (CITES 1973)	Aims to ensure that international trade in specimens of wild animals and plants does not threaten the species survival. It accords varying degrees of protection to more than 33,000 species of animals and plants. Convention ratified by Mozambique through Resolution 20/81.
Convention on the Conservation of Migratory Species of Wild Animals (CMC 1979)	Aims to foster protection measures for migratory species of wild animals throughout their natural range, through a conservation strategy of wildlife and habitats on a global scale. Ratified by Mozambique in 2008.
SADC's Protocol on Wildlife Conservation and Law Enforcement (SADC 1999)	Aims to ensure the conservation and sustainable use of wildlife resources. Ratified by Mozambique in 2002.
NON-HAZARDOUS AND HAZARDOUS WASTE	
Basel Convention on the control of Trans-boundary Movements of Hazardous Wastes and their Disposal (UNEP 1989)	This convention regulates the import, export, and trans-boundary movement of hazardous waste. The Basel Convention was superseded by the Bamako Convention (see below). The Republic of Mozambique ratified the Basel Convention on the control of Trans-boundary Movements of Hazardous Wastes and their Disposal by way of Resolution 18/96 of 26 November.
Convention on the Ban of the Import into Africa and the Control of Transboundary Movements and Management of Hazardous Wastes within Africa (AU 1991)	During the negotiation of the Basel Convention, the African states represented by the Organisation for African Unity adopted the Bamako Convention believing that the Basel Convention was not strict enough. The Bamako Convention totally prohibits the import of hazardous waste into Africa. The Convention came into force on April 22, 1998. The Republic of Mozambique ratified the Bamako Convention by way of Resolution 19/96 of 26 November.
AIR QUALITY / CLIMATE CHANGE	
The United Nations Framework Convention on Climate Change (UNFCCC 1992) and the Kyoto Protocol (UNFCCC 1997)	UNFCCC is an international environmental treaty produced with the objective of achieving stabilisation of greenhouse gas concentrations in the atmosphere at a low enough level to prevent dangerous anthropogenic interference with the climate system. The Kyoto Protocol to the UNFCCC was adopted in December 1997, whereby the signing parties agreed to legally binding reductions in greenhouse gas emissions of an average of 6 to 8% below 1990 levels between the years 2008-2012, defined as the first emissions budget period. The UNFCCC was ratified by way of Resolution 1/94, of 24 August and the Kyoto Protocol acceded to by the Republic of Mozambique by way of Resolution 10/2004, of 28 July.
Vienna Convention for the Protection of the Ozone Layer (UNEP 1985)	Under this Convention, the parties committed to take appropriate measures to protect human health and the environment against adverse effects resulting or likely to result from human activities which modify or are likely to modify the ozone layer. Pursuant to Resolution 8/93, of 8 December, the Republic of Mozambique acceded to the Vienna Convention for the Protection of the Ozone Layer and to its 1990 and 1992 Amendments.
The Montreal Protocol on Substances that deplete the Ozone Layer (UNEP 1987), London Amendment (UNEP 1990), Copenhagen Amendment (UNEP 1992), Montreal Amendment (UNEP 1997)	Designed to control the production of ozone depleting substances to reduce their abundance in the atmosphere, and thereby protect the earth's fragile ozone Layer. Forbids the use of chlorofluorocarbons. Mozambique ratified this convention through Resolution 9/2009.

Convention	Description
POLLUTION PREVENTION	
Stockholm Convention on Persistent Organic Pollutants (UNEP 2001).	Action and control at world level of chemicals that persist in the environment, bio-accumulate in the food chain, and pose a risk to human health and the environment. These substances are listed in Annex I. Mozambique ratified this convention in 2005.
CULTURAL HERITAGE	
UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage (UNESCO 1972)	Designed to help identify and protect both cultural (monuments, groups of buildings and sites) and natural heritage (natural features, geological and physiographical formations, and natural sites). Mozambique ratified the convention in 1982.
UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage (UNESCO 2003)	Aims to safeguard to ensure respect for the intangible cultural heritage of communities, groups, and individuals. Ratified by Mozambique in 2007.
UNESCO Convention on the Protection and Promotion of the Diversity of Cultural Expressions (UNESCO 2005)	Aims to protect and promote the diversity of cultural expressions, promote dialogue between cultures and promote respect for cultural diversity. Ratified by Mozambique in 2007.
HUMAN RIGHTS	
International Labour Organisation Conventions	Forced Labour Convention, ratified in June 2003: Convention concerning Forced or Compulsory Labour (ILO 1930) Freedom of Association and Protection of the Right to Organise Convention, Dec 1996: Convention concerning Freedom of Association and Protection of the Right to Organise (ILO 1948) Right to Organise and Collective Bargaining Convention, Dec 1996: Convention concerning the Application of the Principles of the Right to Organise and to Bargain Collectively (ILO 1996) Equal Remuneration Convention, Jun 1977: Convention concerning the equal remuneration for men and women workers for work of equal value refers to rates of remuneration established without discrimination based on sex (ILO 1977) Abolition of Forced Labour Convention, Jun 1977: Convention concerning the Abolition of Forced Labour (ILO 1977a) Discrimination (Employment and Occupation) Convention, June 1977: Convention concerning Discrimination in Respect of Employment and Occupation (ILO 1977b) Minimum age specified: 15 years Jun 2003: Convention concerning Minimum Age for Admission to Employment (ILO 2003) Worst Forms of Child Labour Convention, June 1999: Convention concerning the Prohibition and Immediate Action for the Elimination of the Worst Forms of Child Labour (ILO 2003a)
International Covenant on Civil and Political Rights (UN 1966)	Recognises equal and inalienable rights to all human beings in terms civil and political freedom. Ratified in 1993.
International Covenant for the Elimination of Racial Discrimination (UN 1969).	The signing parties undertake to pursue by all appropriate means and without delay a policy of eliminating racial discrimination in all its forms and promoting understanding among all races. Ratified in 1983.
Convention on the Elimination of Discrimination against Women (UN 1979)	States have the obligation to ensure the equal rights of men and women to enjoy all economic, social, cultural, civil, and political rights. Ratified in 1997; 2008.
Convention Against Torture (UN 1985)	State parties prohibit themselves under any circumstances from committing acts of torture and other cruel, inhuman, or degrading treatments or punishments. Ratified in1999.
Convention on the Rights of the Child (UN 1989)	Guarantees protection of children's rights. Signed in 1990 and ratified in 1999.
International Convention on the Rights of Migrant workers (UN 1990)	Its primary objective is to protect migrant workers and their families, a particularly vulnerable population, from exploitation and the violation of their human rights. Signed in 2012; ratified in 2013.

Convention	Description
International Convention on the Rights of Persons with Disabilities (UN 2007)	States have the obligation to protect the rights and dignity of persons with disabilities; signed in 2007.
African Union related protocols	Several protocols and charters promoting and protecting human rights and basic freedoms, children rights and others on the African continent.

2.6 International Best Practice Guidelines and Policies

This EIA is being developed in compliance with national regulations and in line with international best practice, notably the environmental and social policy and performance requirements as defined by the World Bank / International Finance Corporation (IFC). The most important of these international standards and guidelines applicable to the Project are described below.

2.6.1 IFC Performance Standards

The IFC Performance Standards (PS) on Environmental and Social Sustainability, which were published in January 2012 (IFC, 2012), are among the most comprehensive standards available to international finance institutions working within the private sector. The principles provide a framework for an accepted international approach to the management of social and environmental issues.

The seven IFC PS applicable to the proposed Project are:

- **PS 1: Assessment and Management of Social and Environmental Risks and Impacts** underscores the importance of managing environmental and social performance throughout the life of a project. PS 1 requires the client to conduct a process of environmental and social assessment and to establish and maintain an Environmental and Social Management System (ESMS), appropriate to the nature and scale of the project and commensurate with the level of its environmental and social risks and impacts;
- **PS 2: Labour and Working Conditions** recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers;
- **PS 3: Resource Efficiency and Pollution Prevention** recognizes that increased economic activity and urbanization 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;
- **PS 4: Community Health, Safety and Security**, recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts;
- **PS 5: Land Acquisition and Involuntary Resettlement**, recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land;

- **PS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources**, recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development;
- **PS 8: Cultural Heritage** recognizes the importance of cultural heritage for current and future generations.

It should be noted that PS 7 (Indigenous People) is not applicable to the Project, as the concept of Indigenous People, as defined in this PS, is not applicable to Mozambique. Under this PS, Indigenous Peoples are groups who, by virtue of their economic, social, and legal status and/or their institutions, custom, culture and/or language may be characterized as distinct from mainstream society, and that maintain a collective attachment to distinct habitats or ancestral territories. Although Mozambican society is composed of several different ethnicities, they are all integrated into one mainstream society and do not have differentiated claims over the territory.

PS 1 establishes the importance of *(i)* integrated assessment to identify the environmental and social impacts, risks, and opportunities of projects; *(ii)* effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them; and *(iii)* the client's management of environmental and social performance throughout the life of the project.

IFC PS's 2, 3, 4, 5, 6 and 8 present requirements to avoid, reduce, mitigate, or compensate for impacts on people and the environment, and to improve conditions where appropriate. Where social or environmental impacts are anticipated, the client is required to manage them through its ESMS consistent with PS 1.

2.6.2 IFC Environmental Health and Safety Guidelines

IFC's Environmental Health and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice, as defined in IFC's PS 3 on Resource Efficiency and Pollution Prevention.

The EHS Guidelines contain the performance levels and measures that are normally acceptable to IFC and are generally considered to be achievable in new facilities at reasonable costs by existing technology. For IFC-financed projects, application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets with an appropriate timetable for achieving them. The environmental assessment process may recommend alternative (higher or lower) levels or measures, which, if acceptable to IFC, become project- or site-specific requirements.

Relevant Industry Sector IFC guidelines applicable to the proposed Project include:

- EHS General Guidelines (IFC, 2007a);
- EHS Guidelines for Electric Power Transmission and Distribution (IFC, 2007b).

2.6.3 Southern African Power Pool Guidelines

The Southern African Power Pool (SAPP) is a regional body that was formed in 1995 through a Southern African Development Community (SADC) treaty to optimize the use of available energy resources in the region and support one another during emergencies. SAPP is comprised of twelve SADC member countries represented by their respective Electric Power Utilities, including Mozambique, represented by EDM.

SAPP's Environmental Sub-Committee has developed a number of environmental management guidelines, aiming to ensure that energy sector activities are developed sustainably. The following SAPP guidelines were taken into consideration:

- EIA Guidelines for Transmission Infrastructure for the SAPP Region (September 2010) - provides a recommended framework and guide to a systematic approach to performance of EIA for power transmission infrastructure projects in the SAPP region;
- SAPP Occupational Health, Safety and Environmental Guideline (November 2007).

2.6.4 AfDB's Integrated Safeguard System

Other lender standards that will be applicable include the ones from the African Development Bank (AfDB). AfDB's Integrated Safeguard System consists of an Integrated Safeguards Policy Statement, Operational Safeguards (OSs), a revised set of Environmental and Social Assessment Procedures (ESAPs) and Integrated Environmental and Social Impacts Assessment (IESIA) Guidance Notes. The set of 5 OSs is globally aligned with IFC PSs' as well as the ESAPs.

3 EIA Approach and Methodology

3.1 General Considerations

The EIA Process, as defined in the EIA Regulation, is a preventive environmental management tool that aims to identify and assess, both quantitatively and qualitatively, positive and negative environmental effects of a proposed project, and to define the necessary mitigation, to reduce the negative effects and optimise the positive ones.

This section briefly outlines the approach to the EIA and the process that has been followed to date. The approach to this EIA complies with all applicable Mozambican environmental legal requirements and is in line with relevant international guidelines.

3.2 Overview of the EIA Process

The EIA Regulation (Decree 54/2015) states that every private or public activity that may directly or indirectly affect the environment, must be subject to environmental assessment (Article 3). The level of environmental assessment depends on the sensitivity of the environment and nature of the project, and is determined by MTA, through a Pre-Assessment process, based on a Screening Report submitted by the Proponent. Article 4 defines the following categories for proposed projects:

- **Category A+**: Developments that due to their complexity, location and / or irreversibility and magnitude of potential impacts, deserve not only a high level of social and environmental monitoring, but also the involvement of expert reviewers in the EIA Process. Annex I of the EIA Regulation lists the activities that are included in this category. Category A+ projects require an Environmental Impact Study (EIS), including an Environmental Management Plan (EMP), with supervision by independent expert reviewers with proven experience. An Environmental Pre-Feasibility and Scope Definition Study (EPDA) and the Terms of Reference (ToR) for the EIS must be compiled and approved by MTA prior to the commencement of the EIS;
- **Category A**: Developments with potential impacts of high duration, intensity, magnitude and significance on living beings and environmentally sensitive areas. Annex II of the EIA Regulation lists the activities that are included in this category. Category A projects require an EIS, including an EMP. An EPDA and the ToR for the EIS must be compiled and approved by MTA prior to the commencement of the EIS;
- **Category B**: Developments with potential impacts on living beings or environmentally sensitive areas which are likely to be of lower duration, intensity, magnitude, and significance than those of Category A projects. Annex III of the EIA Regulation lists the activities that are included in this category. Category B projects require a Simplified Environmental Study (SES) and EMP. While no EPDA is required, the ToR for the SES must be approved by MTA prior to the commencement of the SES;

- **Category C**: Developments with negligible or insignificant negative impacts, that do not cause irreversible impacts and which positive impacts and more significant than the negative. Annex IV of the EIA Regulation lists the activities that are included in this category. Category C projects require the submission of environmental management best practice procedures for MTA's approval.

The proposed Project entails the construction and operation of a transmission power line and, as such, was classified as Category A by MTA (see **Annex II**). It is therefore subject to a comprehensive EIA Process that consists of three phases, namely:

- **Screening Phase (Screening Report)**: in the first phase, the project is submitted to MTA for categorization, through a Screening Report, which describes the project characteristics and location, the proposed activities and provides a brief description of the receiving environment. Based on this information, MTA formally categorises the project and defines the level of environmental assessment required;
- **Scoping Phase (EPDA Report)**: the main objectives of the second phase are to identify potential fatal flaws and impacts of the project, and to define the ToR for the EIS. The EPDA Phase thus aims to identify key issues and concerns associated with the proposed development. These could include project-related activities which may have the potential to contribute to or cause potentially significant impacts to environmental and socio-economic receptors and resources in the area;
- **Impact Assessment phase (EIS Report)**: the main objectives of the third phase are to assess the impacts identified in the EPDA, to define the mitigation measures and to compile an EMP. The EIS Report supports the relevant authorities in the decision-making process, resulting in the environmental licensing or rejection of the activity. The main tasks undertaken in this phase are the following:
    - *Specialist Studies*: these studies are undertaken to review and ascertain existing environmental and social conditions relevant to the project area and its surroundings and to highlight receptors and resources sensitive to potential impacts;
    - *Assessment of Impacts and Mitigation:* the focus is to identify and evaluate the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria, to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that persist after mitigation is implemented;
    - *Environmental Management Plan:* the identified mitigation measures are integrated into a suite of customised management programs. The EMP is developed to guide environmental and social management throughout the project's life cycle. This is the mechanism whereby mitigation and monitoring of environmental impacts (as defined in the EIS Report) are integrated with project implementation.

Figure 3-1 illustrates an overview of the EIA process for Category A projects, while the main phases of these process are described in detail in the following sections.

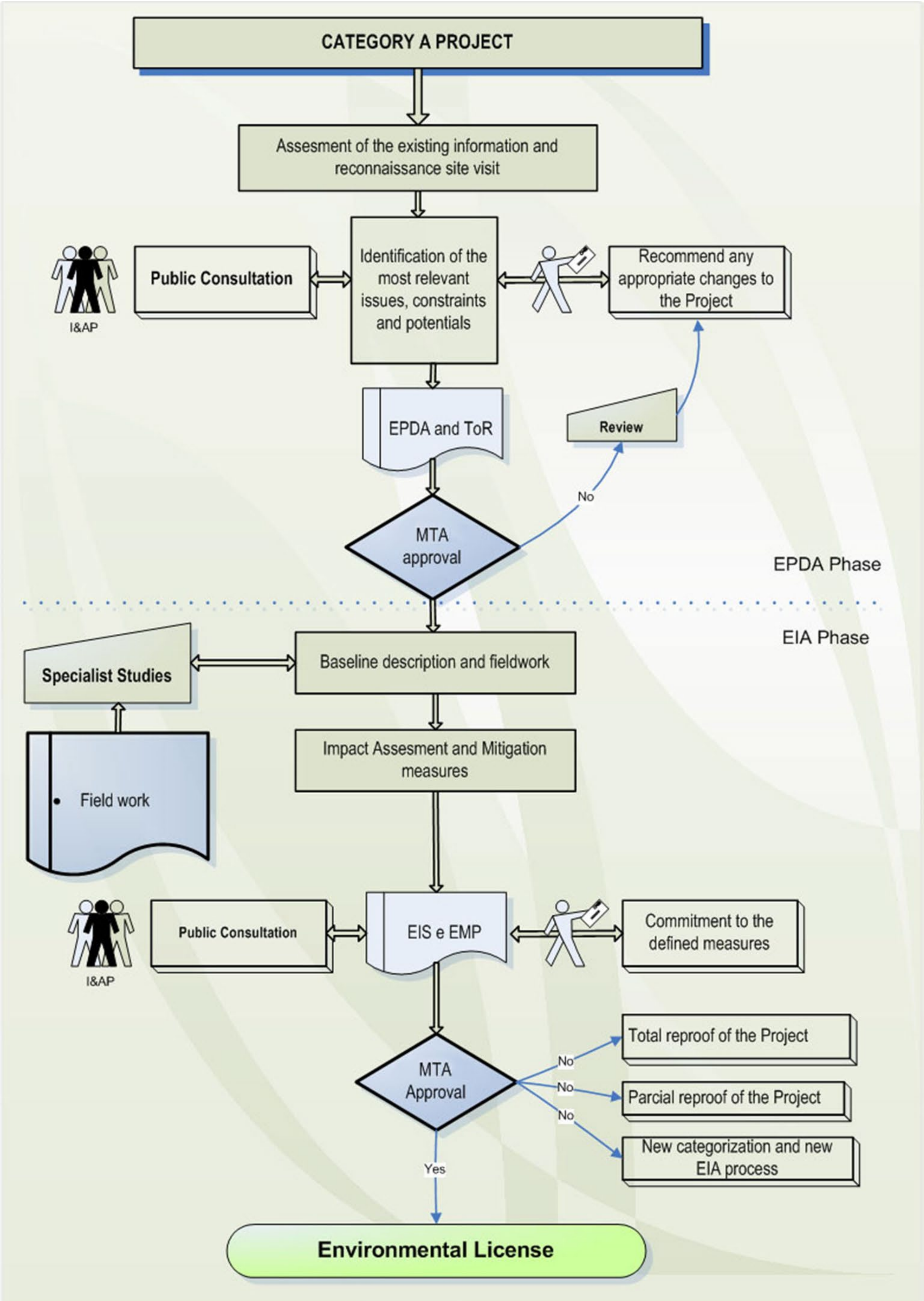


Figure 3-1 – Overview of the EIA Process for Category A projects

3.3 Phase 1: Screening Phase

The first step of the EIA Process was the Screening Phase. During this phase, a Screening Report was compiled and submitted to MTA, to assist them in determining the level of environmental assessment required. The Screening Report contained information regarding the proposed Project and a description of the biophysical and socio-economic context of the area. A Preliminary Environmental Information Form was appended to the Screening Report.

The Screening Report and the Preliminary Environmental Information Form were submitted to SPA-Maputo May 2022. SPA-Maputo confirmed that the Project is classified as Category A (letter Ref. N.° 601/SPA/DA/407/220/22, dated 16th June 2022 - see **Annex II**), and must therefore be subjected to a full EIA Process.

3.4 Phase 2: EPDA / Scoping Phase

3.4.1 EPDA's Objectives

As per Article 10 of the EIA regulation, the EPDA's main goals are to *(i)* determine potential fatal flaws associated with the activity and, if no fatal flaws are identified, *(ii)* define the scope of the environmental assessment to be undertaken in the EIS Phase. The goals of the EPDA Phase are to:

- Review existing data about the Project area to understand the sensitivity of the affected biophysical and social environment;
- Present the proposed development to Interested and Affected Parties (I&APs) and identify issues and concerns about the proposed development;
- Identify potential positive and negative environmental and socioeconomic impacts as well as fatal flaws;
- Develop the ToR for the specialist studies and for the EIS; and
- Compile Project information and results of the PPP into an EPDA Report and submit to MTA for decision-making.

3.4.2 EPDA Report

To support the goals described above, the EPDA Report provides the following information (as per Article 10 of the EIA Regulation):

- Non-Technical Summary (NTS), with the main issues, findings, and recommendations of the Report;
- Information regarding the Proponent of the Project, as well as the consulting team responsible for the EIA Process;
- Definition of the preliminary Project areas of influence;
- Legal framework;
- Description of the Project activities throughout its life cycle;

- Brief baseline description of the affected biophysical and socio-economic environment;
- Identification of potential impacts, negative or positive, that the proposed development might have on the environment and communities;
- Identification and assessment of any potential fatal flaws (environmental and social risks) that may threaten the viability of the Project; and
- Identification of the detailed studies to be undertaken in the EIS and development of the respective ToR.

The EPDA Report was compiled based on a desktop review of secondary data. Secondary data was gathered from a variety of sources, including other EIA processes undertaken in the region, such as the Central Eléctrica da Namaacha Project ESIA, information provided by several governmental and non-governmental institutions and organisations, maps, and satellite imagery, among others. Additionally, a site visit was conducted in August 2022, including contacts with district services.

This Final EPDA Report is also compiled based on the public consultation activities of the EPDA phase (see following section) as the information gathered through the PPP activities was considered and integrated into the Final Report.

3.4.3 EPDA Public Participation Process (EPDA-PPP)

The EPDA Phase includes a PPP (as per Article 15 of the EIA Regulation), aiming to present the proposed Project, the proponent and the consultant to all I&APs and identify issues and concerns about the proposed development. The main objectives of the EPDA-PPP are:

- Identify I&APs and compile a I&AP database (including directly affected local communities, authorities, environmental organizations, interested members of the public and community-based organizations), to be updated throughout the EIA process;
- Provide information regarding the proposed project and its potential impacts;
- Provide I&APs with the opportunity to participate effectively in the scoping process and identify any issues and concerns associated with the proposed activity;
- Allow I&APs to review how identified environmental and social issues will be addressed in the EIS Phase; and
- Elicit comments from I&APs with regards to the ToR.

The PPP started right after the draft EPDA Report was disclosed for public comment in November 29th, 2022. Two public meetings were held for the EPDA phase PPP, one per each district crossed by the line, namely Namaacha and Boane.

Table 3-1 – EPDA public meetings summary

Location	Venue	Date	No. of participants
Namaacha	Centro de Formação de Professores	13/12/2022	49
Boane	Boane District Administration Meeting Venue	14/12/2022	37

No fatal flaws associated with the Project were identified and the EPDA Report, including the ToR for the EIS, was submitted to MTA in January 2023. Following its review, MTA approved the EPDA and ToR on 28th April 2023 (letter ref. 158/MTA/183/GM/220/23 - see **Annex II**; **Volume I**), and informed that the EIA Process should move forward to the EIS Phase.

3.5 Phase 3: EIS

3.5.1 EIS Objectives

The main goals of the EIS phase are to:

- Undertake the specialist studies, in accordance with the ToR approved by MTA;
- Assess the environmental impacts associated with the Project;
- Define the mitigation measures for adverse impacts and the enhancement measures for positive impacts, adopting a mitigation hierarchy approach to:
    - Anticipate and avoid risks and impacts;
    - Where avoidance is not possible, minimize or reduce risks and impacts to acceptable levels;
    - Once risks and impacts have been minimized or reduced, mitigate; and
    - Where significant residual impacts remain, compensate for or offset them, where technically and financially feasible.
- Integrate those measures in an EMP, as clear, practical measures applicable to the local conditions, based on best practice and relevant legislation.

3.5.2 EIS Report

To support the above-described goals, the EIS Report provides the following information (as per Article 11 of the EIA Regulation and IFC PS1):

- NTS, with the main issues, findings, and recommendations of the Report;
- Information regarding the Proponent of the Project, as well as the consulting team responsible for the EIA Process;
- Legal framework of the activity and its context within the existing planning instruments;
- Description of the activities to be carried out under the proposed Project, for all phases (planning, construction, operational and, where relevant, decommissioning), as well as alternatives considered;
- Definition of the Project areas of influence;
- Baseline assessment of the receiving biophysical and socio-economic environment;
- Identification and assessment of the Project social and environmental impacts;
- Definition of mitigation measures;
- Integration of the mitigation measures in an EMP for the activity, also including monitoring programs and other management tools, where relevant; and

- PPP report.

Some of the key aspects of the EIS phase, such as the specialist studies, the development of the EMP and the PPP, are further described in the following sections.

3.5.3 Specialist Studies

Specialist studies were undertaken during the EIS, in accordance with the ToR developed in the EPDA Phase and approved by MTA. These detailed studies focus on the environmental and social aspects that could be impacted by Project activities.

The specialists and/or specialist teams responsible for the appointed specialist studies are presented in Table 1-3 (see Section 1.3). During the EIS phase, interaction between the specialists was encouraged to fully explore the linkages, commonalities, and inconsistencies among the different aspects of the social, biological, and physical environment, and the assessments thereof.

3.5.4 Environmental Management Plan

The EMP is a fundamental part of the EIA Process. External decision-makers will rely on the EIS findings (e.g., significance of residual impact ratings) in the decision-making process. Because an EIS is based on predictions made in advance of an activity taking place, it effectively makes assumptions that the Project will implement controls and mitigation measures. If the controls do not happen, then the EIS is undermined as a tool for I&APs and external decision-makers.

It is important, therefore, that these “assumptions”, i.e., the mitigation measures, are commitments that will be implemented. Thus, once potential impacts have been identified and mitigation measures have been developed, agreed with the Proponent, and described in the EIS, their integration within the Project is required to ensure their future implementation. The EMP is the tool that ensures this integration of mitigation within the Project.

As such, this EIS includes an EMP (**Volume III**), which will integrate the mitigation and monitoring measures of environmental impacts, as identified in the EIS Report, into a suite of management and monitoring actions and plans. Additional studies or plans/procedures may be identified during the EIA process, and the EMP will also provide guidelines for their development and implementation. Also, a Grievance Redress Mechanism is provided in the EMP.

The implementation of such plans should ensure that any unforeseen impact or issues that may arise will be dealt with in an effective manner in accordance with the relevant laws and regulations of Mozambique and international best practices. In this way, I&APs and external decision-makers should have confidence in the EIS as a tool to aid the decision-making process on the Project.

Keeping in mind that project development is a dynamic process, involving construction and operation, the proponent will continue to review the effectiveness of mitigation measures during the entire project's lifecycle. If there is a need to modify the mitigation measures, due to changes in project design and/or environmental conditions, the project proponent shall duly inform the relevant Authorities and Institutions and obtain their consents.

3.5.5 EIS Public Participation Process

In line with the requirements of Mozambique's EIA Regulation (Decree 54/2015, article 15), the EIS phase also includes a PPP (EIS-PPP), with the following main objectives:

- Update the I&AP database compiled for the EPDA Phase;
- Provide updated information of the proposed project;
- Present the results of the specialist studies, impacts assessed, mitigation measures defined and the EMP;
- Refer to the issues raised by I&APs APs during the EPDA PPP, and the way they were considered in the EIS phase;
- Provide I&APs with the opportunity to participate effectively in the process and identify any additional issues and concerns associated with the proposed activity, considering the more detailed studies undertaken during the EIS; and
- Record comments from I&APs with regards to the EIS report and the EMP.

The PPP was organized according to the General Guidelines for Public Participation Process in the EIA process – Ministerial Diploma No. 130/2006, of July 19th. It was also in line with Equator Principles v4 (July 2020) and IFC PS 1, regarding stakeholder engagement requirements. It is important to note that PPP is part of the Stakeholder Engagement Plan which will be planned and programmed throughout the life of the project.

The PPP for the EIS followed the same global methodology used for the EPDA phase. For PPP purposes, a draft EIS Report was compiled and made available at strategic locations for I&APs to access and provide comments.

A detailed description of the EIS-PPP activities can be found in the PPP Report (Volume V).

3.5.6 EIS Submission to MTA

Following the PPP, the the draft EIS Report was updated to reflect comments and inputs from I&APs, and to be submitted to MTA for approval. Upon approval of the EIS and issuance of the environmental license for the Project, all associated activities shall be governed by the EMP, as well as any additional conditions that may be stated in the environmental license.

The EMP (see **Volume III**) will need to be adopted and further developed, by the Proponent, into an Environmental and Social Management System (ESMS), to ensure that the Project is conducted and managed in a sustainable manner. The Proponent should also ensure that its contractors abide by the EMP, by making it a part of the contractors' contractual obligations, whenever applicable and pertinent.

4 Project Description

4.1 Project Overview

4.1.1 Objective and Desirability

In Mozambique, EDM has been designated as the managing body of the national power transmission network, in accordance with Decree 42/2005. Article 9 states that the transmission of electricity requires the issuance of a concession for this purpose. Article 14 provides that the management of the national energy transmission network is allocated to a public entity and that private capital may participate in the development of the national energy transmission network.

The Central Eléctrica da Namaacha SA will conclude a contract for the purchase and sale of energy with EDM for a period of 25 years. Central Eléctrica da Namaacha Project is responsible for the production of electricity through the existing wind resource in the Namaacha district. An infrastructure for evacuating the generated electricity is required and the future buyer, EDM, defined the delivery point as the Boane substation, located in the District of Boane.

The Transmission Line Project aims to mitigate the problems that include restructuring, rehabilitation and enhancement of the energy transport infrastructure in the southern region of Maputo province, by reducing transmission losses and providing the delivery of quality energy.

The Central Eléctrica da Namaacha Project will export power via two 66 kV lines that shall run from the wind farm in Namaacha to Boane substation with a length of approximately 33.5 km. The purpose of the two separate overhead lines is to provide n-1 redundancy on the connection of the WPP to the EDM network in Boane Substation, in accordance with the Mozambican grid code requirements.

The Central Eléctrica da Namaacha Project, together with the transmission power line, are aligned with the environmental and energy policies recommended not only in the country, but also worldwide, in order to enable the fulfilment of international commitments in reducing greenhouse gas (GHG) emissions, with particular emphasis on the targets set out in the Paris Agreement, and resulting from the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21), signed by Mozambique on 22 April 2016.

The Project is aligned with the New and Renewable Energies Development Policy, approved in 2009 by the Government of Mozambique, which has established as one of its strategic priorities the evaluation of new and renewable energy resources. In this context of the evaluation of resources, the Policy and, later, the Strategy for the Development of New and Renewable Energies, approved in 2011, established as measures to be developed, among others, the mapping of the water, wind, solar, biomass, geothermal and maritime potential, as well as the identification and mapping of the sites of occurrence. In this context, Mozambique's Renewable Energy Atlas emerges, which has addressed one of the strategic priorities defined in the Policy and Strategy of the Government of Mozambique.

According to the Energy Sector Strategy (adopted by Resolution No. 10/2009 of 4 June), in Mozambique "*the existing potential for electricity production, valued at 12000 MW in the water component, corresponding to 60000 GWh/year, the equivalent of 21600TJ/year, which is increased by 500 MW on the basis of natural gas and 5000 MW of coal-fired gas, is quite high. However, electricity will still take some time to replace biomass fuels because the country is large and rural population centres are dispersed.*

Currently only 32% of the population has access to electricity. However, the country aims for a set of energy solutions that take into account this concrete reality, which include the intensification of the use of electricity in the areas served by the national grid and, in remote areas, by hybrid solutions using the resources of sustainable biomass, solar, wind, water."

4.1.2 Project Location

The proposed Project is located in Maputo Province and in the Districts of Boane and Namaacha. The District of Boane is divided into two Administrative Posts (AP) and five Localities. The district of Namaacha is divided into two administrative posts (AP) and eight localities. The Project crosses Namaacha Sede and Boane Sede administrative posts.

Table 4-1 – Administrative units crossed by the power line

Province	Districts	Administrative posts
Maputo	Namaacha	Namaacha Sede
	Boane	Boane Sede

Figure 4-3 illustrates the administrative location of the Project.

4.1.3 Project Alternatives

Two preliminary alternative routes were initially provided by the proponent, followed by an additional 3 options (3 to 5) proposed by a technical advisor (Zutari), totalling 5 route options for the transmission line from the Central Eléctrica da Namaacha (CEN) project site to Boane substation. All 5 alternative routes are presented in Figure 4-2**.**

Line option 1 has a total of 33,64 km and takes a more direct route from the CEN towards Boane Substation. Line Option 2 develops to the South of the first to be able to follow the N2 road and the existing 33 kV transmission line route for the longest possible distance, until it deviates to find the shortest possible distance to get to Boane Substation, and totals 39,62 km. Both options share its last 6,600 m, including a final section to be buried when approaching Boane's Substation.

Option 3 starts in a similar manner to Option 1 and 4, before following rural tracks to exit the Lebombo Mountains. The line then develops towards the south-east before it crosses the mountain folds in a parallel manner to the existing 400 kV overhead line (≈ 23 km). Moving slightly more east, the line crosses Movene River, passes two quarries and a community before approaching the N2. The last 4.8 km are common for Option 3, 4 and 5, including the 400 m section to be buried when approaching Boane's Substation.

Option 4 starts in a similar manner to Option 1 and 3, before heading west towards one of the mountain fold openings (≈ 13 km). It then turns in a south-easterly direction along the edge of a community for approximately 8 km. The remainder of line continues along the R401 before crossing the N2 towards Boane Substation. The last 4.8 km are common for Option 3, 4 and 5, including the 400 m section to be buried when approaching Boane's Substation.

Option 5 starts is identical to Option 1 for the first 25.5 km. The remainder of the line follows the same route as Option 3. The last 4.8 km are common for Option 3, 4 and 5, including the 400 m section to be buried when approaching Boane's Substation.

The technical advisor (Zutari) has conducted a Multicriteria Decision-Making (MCDM) process to determine the most feasible route and to inform the following project stages and the EIA. The MCDM method that was applied was the Analytical Hierarchy Process (AHP), developed by Prof. Thomas L Saaty. It is widely used and accepted as the most reliable method. It is a defendable method that allows for easy application, while still being able to check the validity and consistency of the decision making.

The line route alternatives were assessed through the application of several environmental, social, technical (including financial) criteria, including (Zutari, 2022):

- **Technical category:** This relates to the impact of a specific route alignment with regard to achieving the technical goals of the project while reducing cost and increasing ease of both construction and maintenance activities.
- **Environmental category:** This component refers to the need to select a route that minimises the risk to ecosystem functioning and environmental integrity. Therefore, the environmental criterion prioritises the anticipated impacts on both terrestrial and aquatic fauna (especially avifauna who are negatively impacted by high voltage transmission lines) and flora.
- **Social Category:** This aspect considers the impact of route alignment on people. Specifically avoiding residential areas, areas where assets and livelihoods may be affected (e.g., the loss of agricultural land for tower structures, the impact on tourism activities in game farm areas) and the need for compensation. Visual impacts and the impacts on heritage resources is also an important consideration in routing power lines.

Table 4-2 – MCDM Criteria

Category	Criteria	Description
Technical (including Financial)	Te1. Slope	Avoid steep slopes more than 1:10
	Te2. Access	Access to site
	Te3. Length	Line length and associated cost
	Te4. Constructability	Ability to construct the line
	Te5. Maintainability	Ability to maintain the line after construction
Environmental	En1. Biodiversity	Aquatic and terrestrial ecology; ecological services (based on the information available)
	En2. Avifauna	Flight paths: nesting areas, focal points (based on the information available)
Social	So1. Compensation & Resettlement	Homes or other assets that will require resettlement or other compensation
	So2. Communities & Visual Impact	Proximity to existing large villages or towns that will remain. Distance to communities. Distance from commercial areas. Visibility on ridges for nearby communities.

Source: Zutari (2022)

An MCDM workshop was held in Maputo, Mozambique, on the 20th of October 2022 to interrogate the potential route alignments identified to aid the project team; with the selection of the best route alignment corridors to be taken forward to more detailed study.

Within the MCDM workshop, participants representing each field of expertise or interests were asked to discuss and assess the suite of options against one another, on a one-to-one basis, and reach consensus on which option is preferred and by what margin. This process was repeated until all options and scenarios had been compared with all other options and scenarios using each of the pre-selected criteria. The MCDM Model then arithmetically collated preference scores and provided an overall ranking of the options.

The criteria were weighted to ensure that criteria considered as more important in terms of route selection were given more significance in the route selection process. The criteria weighting was determined through the application of the AHP method at the workshop. This required participation from all attendees such that when the weighting was applied to the results, it was done on the basis that everyone is aligned and in agreement on the way forward. The weighting is detailed below.

Table 4-3 – Criteria weighting from the MCDM Workshop

Category	Criteria Weighting
Technical (including Financial)	49%
Environmental	20%
Social	31%

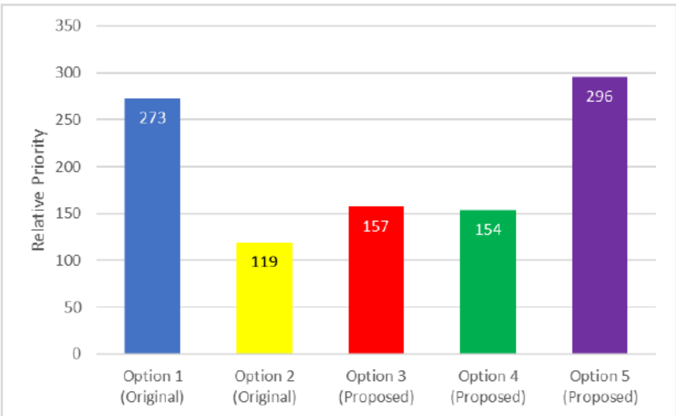
Source: Zutari (2022)

The results indicated an overall preference for Option 5, followed very closely by Option 1. Option 1 and Option 5 share similar results for most of the criterion, but Option 5 was preferred for most of the technical criteria. Option 2 showed the lowest preference for all criteria, except with regards to access.

Table 4-4 – Preferences per category and criterion for each route (1 = most favoured and 5 = least favoured)

Category	Criteria	Option 1	Option 2	Option 3	Option 4	Option 5
Technical (including Financial)	Te1. Slope	2	5	4	1	2
	Te2. Access	4	1	2	5	3
	Te3. Length	1	5	3	4	2
	Te4. Constructability	3	5	2	4	1
	Te5. Maintainability	4	3	1	5	2
Environmental	En1. Biodiversity	1	5	4	3	1
	En2. Avifauna	1	5	4	3	1
Social	So1. Compensation & Resettlement	1	5	4	3	2
	So2. Communities & Visual Impact	2	5	4	3	1

Source: Zutari (2022)



Source: Zutari (2022)

Figure 4-1 – Overall preference for each route based on all criteria

Given the alternative assessment described above, **Option 5** (as presented in Figure 4-2, along with the other alternatives) **has been selected as the preferred alternative**, and was the one selected for a more detailed assessment in the EIS phase.

During the EIS preparation and the field work phase, some adjustments to former option 5 route were introduced to further minimise impacts, namely:

- Going around Mabanja, between km 27 and km 29 of the route, to avoid affecting houses;
- Using EDM's 33 kV line servitude about to be decommissioned along the N2 approaching Boane (between km 29 and km 32), to minimise new land take.

Figure 4-3 presents the location map of the selected route.

In addition to the wider route alternatives, the project also evolved to transition from an overhead line to a buried cable in the last 310 m approaching Boane substation, where the density of surrounding houses is highest along the route, to minimise new land take and avoid affecting the existing houses.

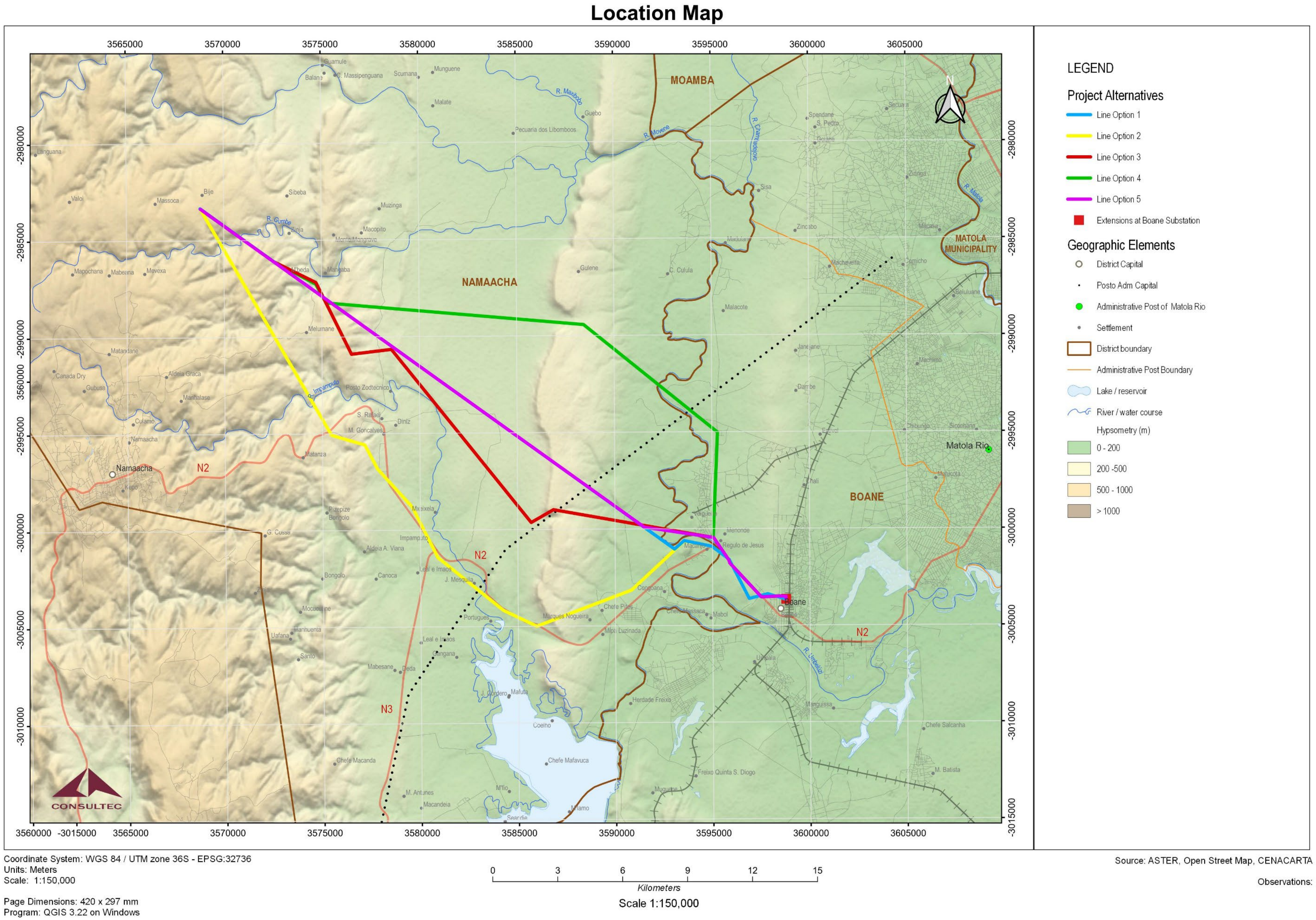


Figure 4-2 – Location map of the proposed alternative power line routes

Location Map

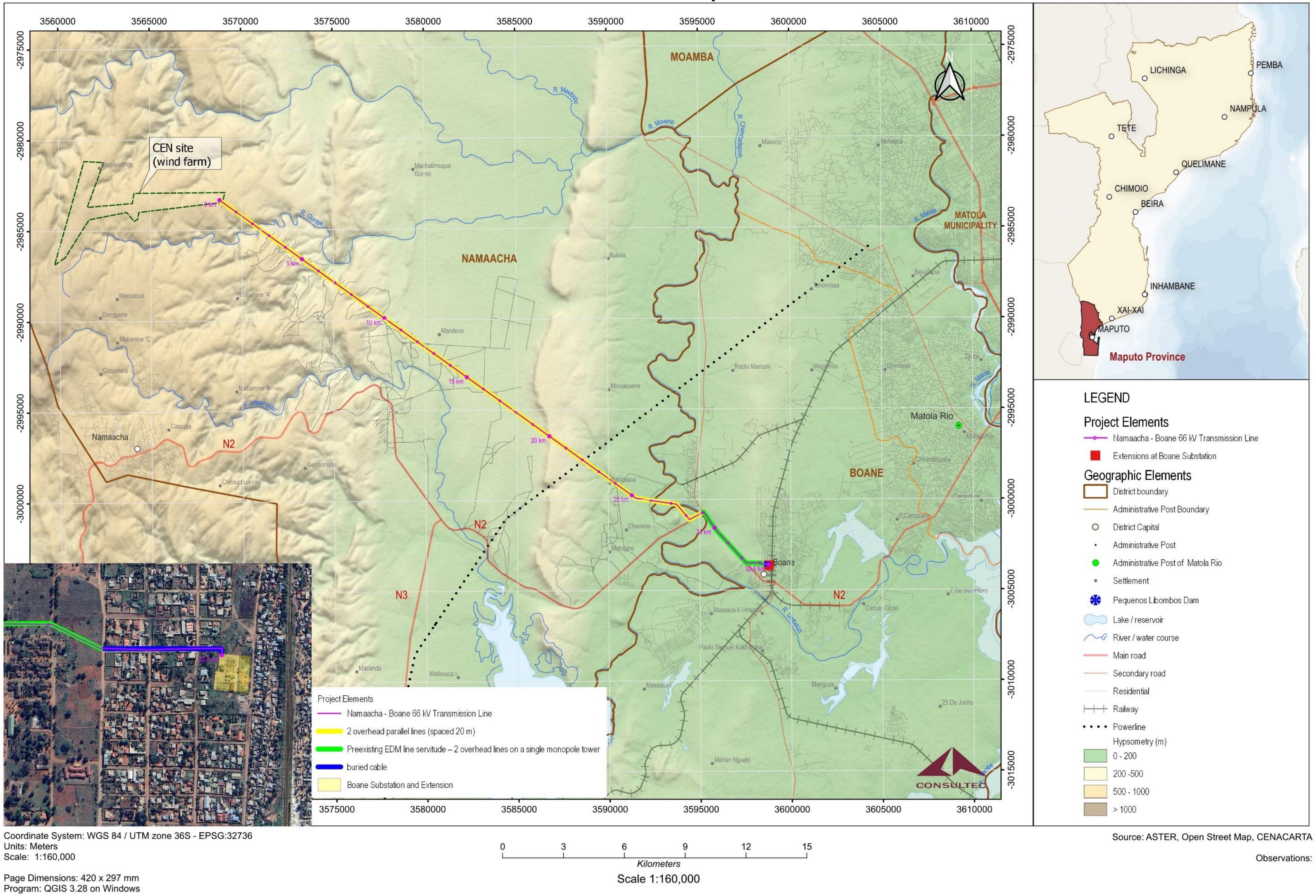


Figure 4-3 – Location map of Project

4.1.4 Land Take Requirements

As presented in Table 2-1, the safety regulation for high voltage power lines (Decree 57/2011) requires (Article 28) a protection zone with a maximum width of 50 m for lines equal or over 66 kV. This is the current standard practice within the energy sector in Mozambique and is in line with what has been accepted in recent power line projects (such as the STE phase 1 project) as the corridor to consider for compensation and resettlement purposes. This is also in line with the recently published Electricity Law (Law 12/2022), which in its article 43 states that the administrative servitude required for power lines, while up to 50 m of confining land from the line's axis, shall be defined according with the tension levels and technical and safety standards, which point out to Decree 57/2011 referred above. Thus, the Project intends to follow the same approach and adopt a general 50 m wide corridor (25 m to either side of the line) for compensation and resettlement purposes. Where the two 66 kV lines will run parallel to each other (i.e., in the first 29 km from Namaacha side), at a distance of approximately 20 m, the protection zone will result in a 70 m wide corridor, accounting for both lines (25 m outward from line 1, 20 m between line 1 and line 2 and 25 m outward from line 2). Where the transmission line follows the existing EDM servitude (km 29 to ~km 33.2) and will be installed on monopole towers (double circuit overhead line), this corridor would be 50 m (25 m to each side). For the last 310 m on the approach to the Boane substation the line will be buried, and as such, the land take will be significantly less. A corridor of 2 m will be required for this section of the route.

In the same way as the recently published Electricity Law (Law 12/2022), the land law (Law 19/97) and its regulation (Decree 66/98), state that the construction and operation of high-voltage transmission lines will result in the establishment of a servitude area – the Partial Protected Zone (PPZ)[3] - of 50 m to either side of the transmission line (thus, a 100 m wide corridor per line). Within this PPZ, all existing DUATs will be expunged, no new DUAT's may be issued, and any land use subject to special licenses, as per article 9 of the land law. The purpose and 'spirit' of the PPZ, as set out in the legislation, is to provide protection to both surrounding communities and human settlements as well as the Project infrastructure itself (from potential damage by third parties, such as new constructions encroaching into the transmission zone, etc). However, article 9 of the land law, in-conjunction with sector specific regulations (specifically the above-mentioned Decree 57/2011 on the safety of high-voltage transmission lines and the Electricity Law - Law 12/2022) as well as legal precedent does, however, enable land use rights as well as the limits of a PPZ to be amended through ministerial decision[4], based on technical and safety standards and tension

3 For public utilities, including pipelines and power lines, the Mozambican land law sets a PPZ of 100 meters (50 m on either side) of the linear infrastructure. A PPZ, similar, although not entirely interchangeable with a right of way (RoW), is defined as a strip of land earmarked for the protection/security of both the infrastructure and the surrounding population, as well as serving as a means to secure access/maintenance of the infrastructure. Within a PPZ, all active land use rights are expunged, and no further rights may be granted, unless specifically exempted by a competent authority. Specifically for energy transmission lines in Mozambique, however, it is common practice that limited or restricted land use rights, within the PPZ, are granted to local subsistence farmers, i) as the risks to farmers are low, ii) to reduce the negative impact on households with agriculture based livelihoods, and ii) as land clearing and subsistence agricultural activity protects the infrastructure from excessive overgrowth and trees which may damage or be hazardous to the transmission line.

4 MTA (and former MITADER) have previously drawn on the regulatory framework to amend both the limits and land use rights of PPZ's for both energy transmission lines and gas pipelines, in order to bring them in line with international and regional standards.

levels. Thus, in order to further minimise the socioeconomic and resettlement impacts, from a technical and safety perspective, it has been concluded that the effective protection of the transmission lines and surrounding communities do not require a 100 m wide zone, but rather, as per safety of high-voltage transmission lines regulation mentioned above, a 50 m protection zone (25 m on either side of the line's axis).

In light of all the above, it is expected that the transmission lines protection zone will be defined as a 50 m wide corridor on the basis that:

- the proposal is consistent with the existing legal boundaries established by the new Electricity Law (i.e. the project sectorial legislation) for the creation of the protection zones for the servitudes. Furthermore, it also conforms with the safety standards for electrical lines, as established in the Decree 57/2011;
- the land law contains provisions for such a reduction, which is in turn provided under the Law 12/2022 and Decree 57/2011;
- the narrower protection zone will be able to significantly avoid and reduce unnecessary involuntary resettlement and disruption of livelihoods of the population living along the transmission lines route, without comprising safety; and
- the proposed 50-meter corridor will bring the project in line with general norms under the Southern African Power Pool (SAPP) and current standard practice within the energy sector in Mozambique.

4.2 Project Description

4.2.1 Main Project Components

The main Project components are the following:

- Two 66 kV powerlines, approximately 33.5 km long, connecting the CEN to Boane substation (see section 4.2.1.1 for details);
- 66 kV electrical extensions at Boane substation (see section 4.2.1.2 for details).

The following sections provide additional information for each of these project components.

4.2.1.1 Transmission Line

The CEN will export power via two 66 kV powerlines that shall run from the site in Namaacha to Boane substation with a length of approximately 33.5 km. The purpose of the two separate overhead lines is to provide n-1 redundancy (i.e., the full export of the wind farm capacity on one of the lines, if the other line fails) on the connection of the WPP to the EDM network in Boane Substation, in accordance with the Mozambican grid code requirements. For the first 29 km of the route (starting from the Namaacha wind farm site), two parallel 66 kV lines will be installed on monopole towers. From this point onward, the transmission line will follow the EDM existing servitude of an older transmission line that has been decommissioned. In this area a single monopole tower will be used, with two lines installed to minimize the corridor affecting resettlement. In the last 310 m of the route, the transmission line will transition to a buried underground cable.

The overhead lines shall be designed, supplied and installed, based on the following criteria:

- Arrangement: two single-circuit monopole lines (first 29 km from Namaacha wind farm), 20m minimum separation, one double-circuit monopole line (from km 29 to km 33.2), underground buried cable (in the last 310 m approaching Boane substation);
- Conductor: 2xDove, 2xBear or 2xCondor;
- Shield Wire: ACS 12_48 OPGW on each line.

The line is expected to be supported by the following main types of lattice steel towers:

- Suspension towers, which support the conductors on straight stretches of line;
- Tension towers, which are used at points where the route changes directions;
- Terminal towers, which are used to connect to substations.

Monopole towers will be used (see Figure 4-4).

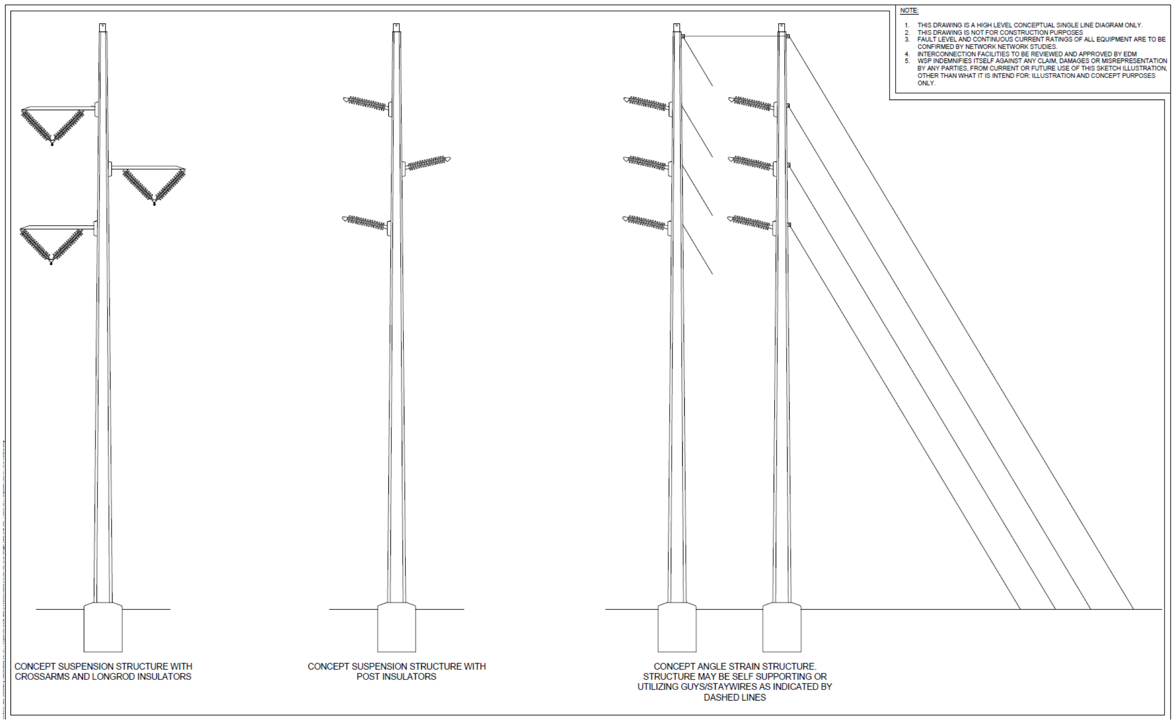


Figure 4-4 – Concept of 66 kV line tower arrangement

Distance between towers (span length) will typically be 200 m but may be longer in areas of difficult terrain. Tower height will be dependent on the terrain, height above sea level and span length. Table 4-5 provides an overview of the transmission line's technical features.

Table 4-5 – Overview of technical features of the transmission line

Technical Characteristics	66 kV Transmission Line
Approximate number of towers	approx. 169
Typical distance between towers (span length)	aprox. 200 m
Typical tower height	20 – 25 m

Source: Globeleq/Source.

All towers shall be equipped with an approved guard against birds' device immediately above each suspension and tension insulator string attachment, to prevent perching and injuries of birds.

Tower footprints and foundation requirements will vary, depending on site specific geotechnical characteristics. Anti-vandalism steel monopoles can have a tower base diameter vary between 600 and 1800 mm. The below ground foundation on intermediates would typically be 3x3m and on the strains it would be dependent on the bending moment but can be as large as 6 m x 12 m.

4.2.1.2 66 kV Extensions at Boane Substation

At Boane 66/33kV Substation, a second busbar is to be added and allow for the connection of two new 66 kV line bays at the substation to accommodate the new 66 kV Namaacha WPP export lines.

The complete Boane substation 66 kV existing busbar conductor and associated clamps and support structures is to be replaced to allow for an uprated conductor to be used.

The two new 66 kV line bays are to be installed in the existing Boane substation control building and are to match those that are already in place at Boane substation. The two new line bays are to be interfaced to the EDM remote SCADA system by means of a separate gateway for the two modern integrated control and connection panels.

The existing 66 kV substation yardstone is in need of replacement, therefore new yardstone and curbstone is required to improve the safety for touch and step potential. A new earth electrode is to be established for the new expansion, and this electrode is to be connected to the existing electrode.

Lightning protection coverage shall be implemented by means of shield wire strung across the new section of the substation. No lightning masts are required.

A Stacom (27MVAr) is to be supplied and installed at Boane substation.

In order to accommodate the additional busbar and the two incomer 66kV feeder lines from the Namaacha WPP, as well as the Statcom, the Boane substation yard is to be extended by approximately 25m to the East. Figure 4-5 below shows the anticipated extension area. Figure 4-5 The extension is planned inside EDM's current DUAT area, that has no infrastructures or agricultural occupation.

Figure 4-5 – Existing Boane substation (yellow) and proposed extension (red)

4.2.1.3 Support Components and Activities

Overview

Further to the Project's main components, described above, the implementation of the transmission line will require complementary components and activities, which are required to support the Project's construction or to allow its operation and maintenance. These include:

- Construction of access roads, for line construction and maintenance purposes;
- Exploration of borrow pits to provide aggregates and inert materials;
- Establishment of construction camps;
- Development and maintenance of right-of-way (RoW).

These activities are discussed in further detail below.

Construction of access roads

During the construction phase, road access will be required to access tower locations. Preferably, this will be done either through the line's RoW or through existing roads. In general, an access track will be built along the line route (RoW), with 4 m minimum width. This will be the main access for construction and maintenance, and it will be located within the RoW.

Access roads (estimated in approximately 25 km) are mainly expected to be just bush clearance, some slight grading to take place, perhaps with some additional gravel in places. Location will need to be confirmed at a later stage of the Project.

Opening and exploration of borrow pits

The inert materials and aggregates required for access construction and civil works associated with the line and substation will be sourced from borrow pits. These materials will be sourced as close to the work site as possible. The location of these borrow pits has yet to be defined at this phase of project development and is normally selected by the construction contractor with approval from the Proponent and District authorities.

Worker accommodations and services

Currently the contractors expect to utilise local accommodations for the staff rather than having an independent accommodation unit. A bus transportation service shall be provided. There shall be a construction compound at the CEN[5] site in Namaacha that will contain catering, changing rooms, welfare (including showers), parking, workshop, laydown area, first aid, septic tank, etc. Area expected to be circa 22,500 m^2. The transmission line construction will also be supported by this main camp.

Establishment of right-of-way (RoW) and vegetation clearance

As discussed in section 4.1.4, in the line section with two parallel single circuit lines (first 29 km from Namaacha), the Project considers a 70 m wide corridor (25 m outwards each of the two parallel power lines, plus the 20 m spacing between lines) to be established as the transmission line protection zone (here considered to be equivalent to the right-of-way - RoW), in accordance with the Decree 57/2011, concerning to the security of high-voltage transmission lines and Law 12/2022. From this point onwards (from km 29 to km 33,2, approaching Boane substation), where the line will follow the EDM existing servitude of an older transmission line that has been decommissioned, as a one double-circuit monopole line, the considered corridor is 50 m wide (25 m to each side).

The RoW is required to protect the system from windfall, contact with trees and branches and other potential hazards that may result in damage to the system, power failures or forest fires. The RoW will also be utilized to access, service and inspect the transmission line.

Large trees and other large vegetation may need to be cropped, cut back or removed from the RoW whichever applies best, if it constitutes a risk to the power line. Similarly, built structures located within the RoW may need to be removed or relocated if they constitute a risk to the infrastructure. This could result in some localized resettlement impacts, which will be investigated throughout the EIA process.

Table 4-6 lists the minimum requirements for vegetation clearance within the RoW, in compliance with Decree No. 57/2011 (Article 28).

[5] Out of scope of the present EIA/EIS. CEN (WPP) has an independent EIA process.

Table 4-6 – Standards for vegetation clearance within the line RoW

Item	Construction clearance	Operational maintenance
Centreline (minimum clearance strip)	Clearance of all vegetation in a 5 m corridor (area directly under the line to be cleared). This strip of land shall be completely cleared of all trees, scrub, and undergrowth by felling not more than 150 mm above ground.	Re-growth inside the same 5 m corridor cleared during construction shall be cut within 150 mm of the ground and maintained through manual labour, as necessary.
Vegetation within the RoW (outside the minimum clearance strip)	Selective trimming or cutting down of trees interfering or posing threat to the integrity of the power line. This includes clearing or selective trimming of trees, by ensuring that any tree after falling will not be less than 2.5 m clear of the tower outermost conductor.	Selective trimming to maintain 6 m between the top of trees and the conductor cables (at resting position).
Tower sites	Clear all vegetation within the proposed tower position and within a maximum radius of 6 m around the position.	Re-growth shall be cut within 150 mm of the ground and maintained through manual labour, as necessary.

Source: Decree No. 57/2011; Consultec (2021).

Vegetation clearance shall not be done by bull-dozing or other mechanical equipment, to minimize soil compaction and erosion. Care shall be taken to avoid unnecessary removal of topsoil, damage or interference to farm roads, ploughed lands, water courses, contours, and land ridges to avoid soil erosion. Should such damage be incurred, the Contractor shall make repairs where necessary to the satisfaction of the land users and the Owner. All timber and bush shall be removed to the outer limits of the cleared strip, except when used as erosion protection in seasonal stream courses.

4.2.2 Construction Phase

4.2.2.1 Main Activities

The main activities of the construction phase will involve civil construction works, including:

- Preliminary earthworks - preparation of the site work areas will start with preliminary site survey and earthworks activities which include, removing of shrubs and trees, surface slope and grading, drainage line and containment according to the design drawings;
- Setting up of the site and mobilization of equipment and auxiliary structures;
- Transmission line survey, environmental and social clearance surveys;
- Land clearing – the construction areas will be marked and cleared, including the clearing of vegetation and tree roots and the removal of the upper layer of soil;
- Earthworks – including cuts and fills to model the terrain and prepare the foundations;
- Transportation of construction materials and workers to/from site;
- Operation of vehicles and heavy equipment;
- Construction of the transmission power line and Boane substation expansion;
- Installation of the equipment and control systems;

- Pre-commissioning and commissioning activities.

Specifically for overhead lines, the following typical tasks can be listed:

Table 3-7 – Typical tasks associated with overhead line construction.

Task	Description
Site preparation	This may include vegetation clearance, verification of local utilities and underground services, and geotechnical surveys, as necessary.
Site enabling works	Vehicle access to each tower site is required either via direct access road or along the RoW. This may require the construction of one or more temporary access roads.
Civil works	Tower foundations are mechanically excavated and filled with concrete. Piled foundations may be required in some areas where ground conditions are unstable. The dimensions of the excavation will differ depending on local conditions. Concrete will be delivered by ready mixed concrete truck from batching plants.
Steel structure fabrication	Steel structure fabrication may not be carried out in Mozambique. In such case the materials need to be transported via Maputo Port to the tower location along the power line route.
Steel erection	Steelwork sections for the towers will be delivered by road using a four-wheel drive vehicle. Cranes may be necessary to support the assembly of higher sections of the towers.
Conductor stringing	Stringing is undertaken using a winch to pull the conductor along the towers and a "tensioner" at the other end to keep the conductor above the ground.
Testing of equipment	Overhead line components including conductors, insulators, towers, joints, and fittings are designed and tested to prove compliance with structural, mechanical, and electrical requirements.
Reinstatement of tower construction area (during construction decommissioning)	At completion, the area and materials will be disassembled and transported for reuse or recycled. Site along the PPZ will be, cleared and tidied up. Access routes and disturbed land will be reinstated in agreement with the land users and title owners or Mozambique Authority.

4.2.2.2 Construction Materials and Equipment

Materials

The following materials are expected to be required for the construction phase:

- Inert materials and aggregates required for civil works (accesses, tower bases and substation bays). These will be sourced from borrow pits, to be selected by the construction contractor(s). No estimate is currently available for the required volumes of these materials;
- Soils: approximately 2,000 m^3 for the structure foundations. This will just generally be excavated material that would be re-used as backfill. Should there be any excess, a plan shall be used for appropriate disposal.
- Others: approximately ~1,500 m^3 of concrete; approximately 150 x 18 m high steel monopole structures, plus 200 m of re-bar; 80 km electrical overhead lines (for the 2 parallel lines).

It is not expected that the project would need a dedicated concrete batching plant. Concrete will be sourced either from external providers or from the CEN WPP project construction site.

Chemical products

No relevant chemical products will be required for the construction phase, other than normal chemicals used in any civil construction works (such as lubricants, oils, cleaning products, etc.).

Equipment

The construction phase will use common civil construction equipment, including the following:

- 2 x excavators (TLB) (50 tonne)
- 2 x dumper/tipper truck (50 tonne);
- 2 x excavators (30 tonne);
- 2 x dumper/tipper truck (30 tonne);
- 1 x roller/compactor (15 tonne);
- 1 x blader/graders;
- 4 x diesel generators;
- 2 x mobile crane (30/50 tonne);
- 2 x access platform (cherry picker) 16m;

Fuel and Oil Requirements

During construction, fuel and lubricating oil will only be required to operate the construction machinery, and as such will be similar to any similarly sized construction work. Fuel and oil will be sourced from commercial entities in the national market.

Water and Energy Consumption

During construction, electricity will only be required to supply construction sites and/or camps and will be sourced diesel generators: ~50,000 kWh (based on 8kW generators x 4, approximately 6 hours a day, for 52 weeks (over the 18 month period).

Water will be required for concrete batching and to supply construction. Total approximately 2,300 m^3 (2.3 m litres): 1.5 million litres (for roads based off approximately 20 km of roadways, 3 m width), 300,000 litres for concrete (based on 190 litres/m^3 of concrete), 500,000 litres (for personnel, based on average of 50 staff, 20 litres/day, 18 months). The required volumes will be sourced from local sources or public supply.

4.2.2.3 Waste Management

The waste management procedures for the construction phase are defined in the EMP (see **Volume III**).

4.2.2.4 Construction traffic

Construction traffic is related to transportation of supplies, equipment, construction materials and spoil disposal, as well as workers' transportation.

Early estimated point to approximately 400 containers for equipment/supplies and plant, approximately 3 busses for worker transportation, plus 5 additional pick-up trucks. This includes both the transmission line and the wind farm construction. Major transportation route for equipment is along the main road from Maputo Port to the site.

4.2.2.5 Workforce

The required labour force quantities for the construction phase are currently estimated to be no less than 200 workers for the transmission line, which will include civil construction, electromechanical, transport teams, assembly, Inspection teams, Owner of Work, among others. Most of these workers will be national. A small number of foreign workers may be required to provide specialized knowledge.

4.2.3 Operational Phase

4.2.3.1 Main Activities

Transmission line operation

Once built, the transmission line will be handed over to EDM, that will be responsible for the maintenance and operation.

The expected average annual evacuated electricity through the transmission line is 350GWh/yr.

The main works associated with transmission line operation are the maintenance of the RoW, tower and line inspections and line maintenance works. Control of vegetation regrowth is necessary to avoid disruption to the overhead line and towers. If tree and plant growth is left unchecked, there are higher risks of power outages from contact with trees, forest and bush fires, corrosion of steel equipment, equipment access blockages, and interference with grounding equipment. The requirements for vegetation control in the RoW during the operational phase are in Table 4-6.

Access for technical inspection and repairs will be intermittent and use existing access roads and take place within the existing RoW. One aspect that will be monitored during technical inspections is the encroachment of new infrastructure and settlements into the RoW, which may constitute a risk.

Substation

During operations, the substation will be mostly automated. A few EDM workers will monitor the substation operation, as it is already the case for the existing Boane substation. Maintenance works will be intermittent and within the operational site boundary.

4.2.3.2 Materials and Equipment

Materials

No raw materials will be required for the operational phase.

Equipment

During the operational phase, only standard equipment, such as light vehicles for RoW inspection and hand tools for vegetation clearance, will be used.

Fuel and Oil Requirements

The fuel and oil requirements during the operational phase will be negligible, as they will be limited to the vehicles used for RoW inspections and the emergency diesel generator (3-phase 50kW 420V).

Water and Energy Consumption

No relevant water or energy consumption needs were identified for the operational phase.

4.2.3.3 Waste Management

The waste management procedures for the construction phase are defined in the EMP (see Volume III).

4.2.3.4 Workforce

The operation of the line and substation will be done by EDM's existing personnel. Small teams (e.g., <5 individuals) may be employed to perform maintenance clearance of the RoW.

4.2.4 Decommissioning Phase

The design lifetime of the infrastructure is 35 years[6], although this may be prolonged via maintenance and/or upgrades. The Project's decommissioning phase is thus likely to occur in a relatively distant timeframe, and as such the degree of confidence regarding the activities to be developed at that stage is relatively low. In general, however, the decommissioning phase will include the following activities:

- Removal of foundations and towers;
- Removal of wastes and decontamination of sites;
- Disposal of wastes and hazardous materials, in adequate waste disposal facilities; and
- Devolution and reuse of RoW, in line with the proposed end use.

Given the distant timeframe of these activities, a Decommissioning Plan should be developed by EDM prior to decommissioning, which should include all specialist studies required to guide the decommissioning activities and minimize their environmental and social impacts.

[6] The useful life could be considered 35 years. The Concession Agreement is a BOOT (Build Own Operate Transfer) arrangement, therefore after the term of the PPA (25 years), the asset transfers to EDM.

4.3 High-level Project Schedule

Total project development will take 18 months, of which 9 to 12 will be the construction, depending on the contractor and terrain issues.

The CEN (wind farm project) will be constructure approximately in the same timeframe.

The design life of the line and substations is usually around 35 years. However, with adequate maintenance and/or upgrading it may stay in operation for longer than that.

4.4 Investment Budget

The construction of the transmission line from Central Eléctrica da Namaacha Project to Boane Substation will have an investment of approximately USD $ 30,000,000 (line + statcom).

5 Project Areas of Influence

5.1 General Considerations

The EIA Regulations define the Area of Influence (AoI) as the geographical space directly or indirectly affected by an activity's environmental impacts. The IFC's Performance Standard 1 has a slightly more expanded definition:

"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."

Despite these seemingly straightforward definitions, in practice the definition of a project's AoI is not an easy task, given that the AoI is a function of many factors which have changing and varying degrees of influence on the areas surrounding the project throughout the course of the project's lifecycle.

The AoI can be thought of as the sum of several fluctuating factors. The geographical extent of some of these can be partially quantified (e.g., the area of vegetation cleared in the RoW), while the extent of others is very difficult to measure (e.g., direct and indirect economic effects). Project impacts also change over time, e.g., a project employing hundreds of workers during construction, but only a small number once operational, has a very different social AoI in those two phases.

A further consideration is the presence of other organisations or developments - each with their own AoI - within the AoI of the proposed project, making it very challenging to assign an AoI to each individual development. To this end it is often useful to consider and/or adopt existing units, such as shorelines, catchments, cadastral boundaries (national, provincial, local), linear infrastructure and/or natural features (notably railway lines, roads, rivers, canals etc.) when defining the AoI.

Considering the above, determining the AoI therefore requires informed but subjective judgment, based on available information and the knowledge of previous and similar project impacts.

The EIA Regulations require the definition of an Area of Direct Influence (ADI) and an Area of Indirect Influence (AII):

- **Area of Direct Influence (ADI)** – is defined as the geographic area affected by the project's direct (or cumulative) impacts, including the project's footprint (the area where the project's infrastructure is constructed) and the areas where the impacts deriving from the construction and operation of the project are felt (e.g., the area affected by the project's noise emissions);

- **Area of Indirect Influence (AII)** – is defined as the geographic area indirectly affected by the project, that is, the area where the secondary impacts resulting from the direct or cumulative impacts are felt (e.g., the project may attract other investments to the region, resulting in indirect socioeconomic impacts).

The following sections outline the AoI for the proposed Power Evacuation Line in line with the considerations described above.

5.2 Area of Direct Influence (ADI)

The Project's ADI is made up of two components:

- The footprint area, i.e., the area occupied by the Project's infrastructure; and
- The area where direct (or cumulative) impacts from the construction and operational activities will be felt.

The footprint area includes the area occupied by the line's towers, the substation, and the RoW to be established. In the construction phase, the footprint also includes any ancillary infrastructure that may be required, such as temporary access roads, laydown areas or construction camp sites. It is expected that this ancillary infrastructure will be located in the immediate vicinity of the Project site, but their exact location is not yet known at this stage.

Within the footprint area, several activities will be implemented such as vegetation clearing, soil stripping, earth movements, etc., that can lead to direct impacts. The main impacts that are expected from these activities include loss of soils, loss and degradation of vegetation and habitats, noise and dust emissions, among others. It is expected that all direct impacts resulting from project construction and operation will be limited within a corridor centred in the line's alignment, with maximum width of 600 m (300 m to each side of the center line). This width accounts for the RoW (i.e., 50 m), where most impacts will occur, plus an additional area where some direct impacts, such as noise and dust emissions, may be felt.

Direct impacts are also to be expected in the areas where the construction camps will be located, as well as any areas affected by access construction and borrow pit exploration. However, the locations of these areas are not known at the present time, and thus will not be taken into account for the definition of the preliminary Project ADI.

The Project ADI is thus defined as a 600 m corridor centred in the alignment and includes the Boane Substation. The ADI is illustrated in Figure 5-1.

5.3 Area of Indirect Influence (AII)

The Project's AII is the geographic area where indirect impacts are likely to be felt, or in other words, where secondary impacts resulting from direct ones are felt.

In terms of the biophysical environment, few or no indirect impacts are expected outside of the ADI. Socioeconomic indirect impacts such as the development of informal commercial activities due to the mobilisation of workforce are likely to be experienced mostly in the areas closer to the alignment and to the location of construction camps. As such, the boundaries of the districts crossed by the transmission line - Boane and Namaacha - were adopted as the limits of the preliminary Project AII. As for the ADI, this preliminary AII is likely to be reassessed during the EIS.

Figure 5-2 below illustrates the AII for the proposed Project.

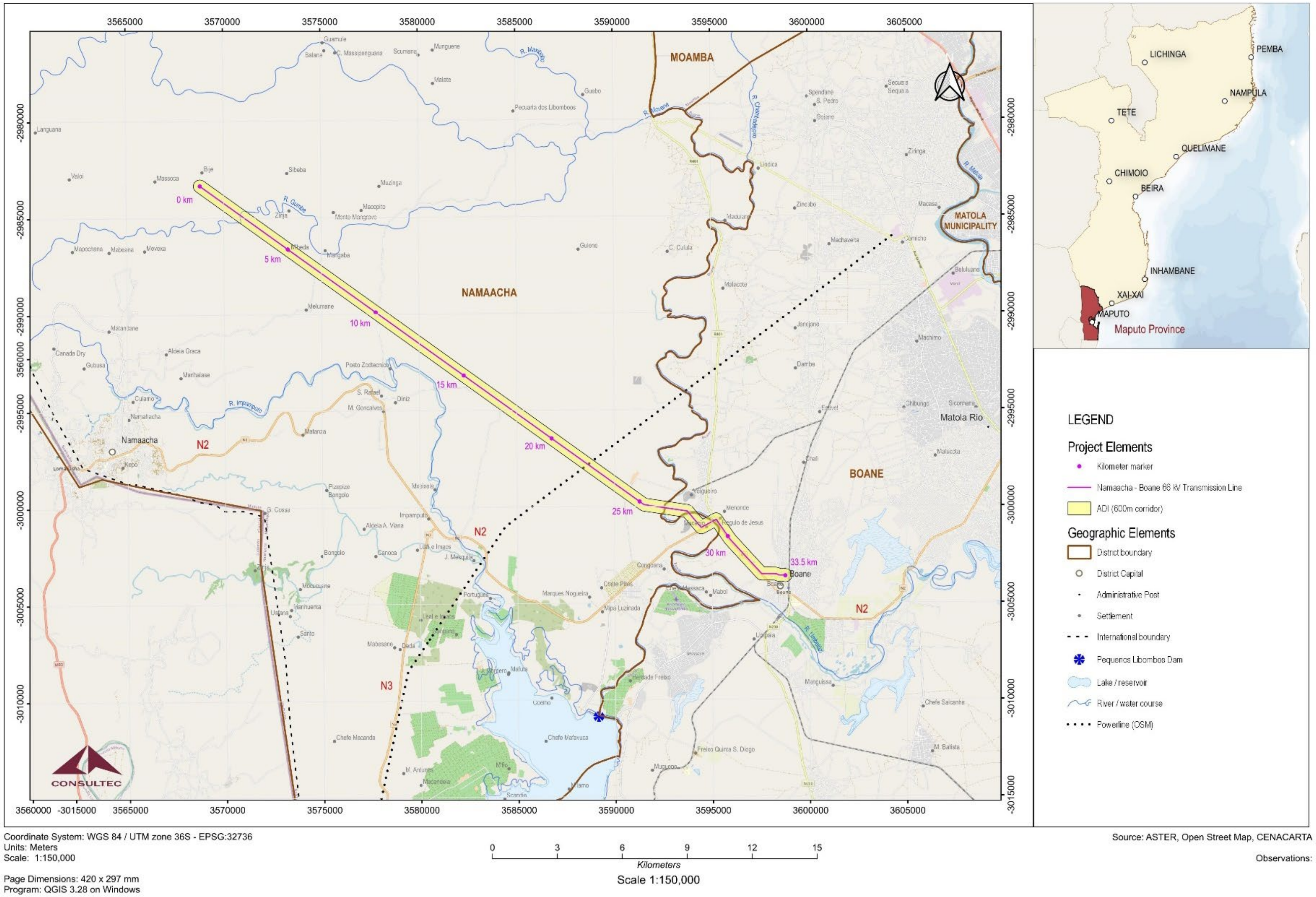
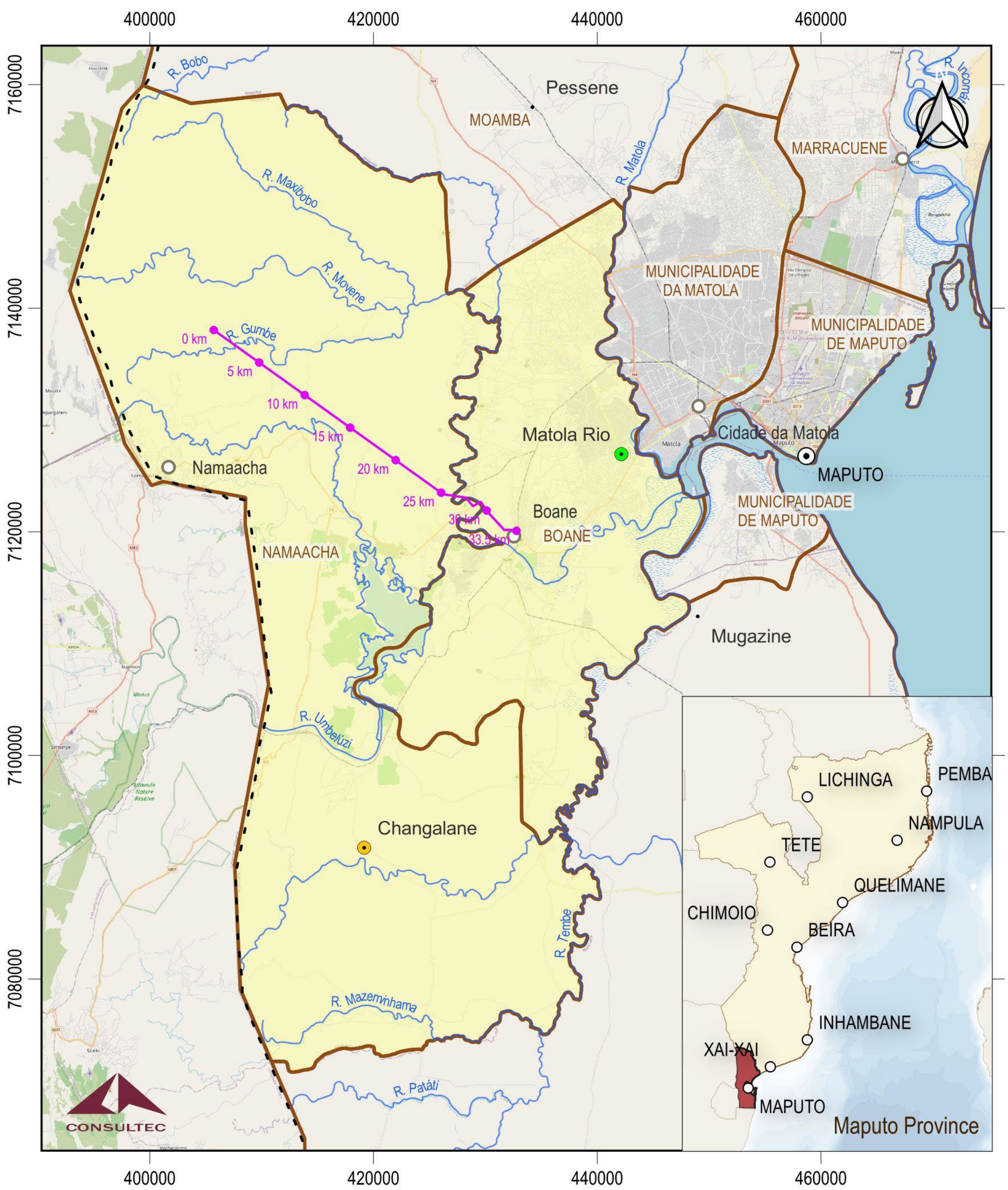


Figure 5-1 – Area of Direct Influence (ADI)



Coordinate System: WGS 84 / UTM zone 36S
Units: meters
Source: Open Street Map

0 10 20 km

Project Elements
- Namaacha - Boane 66 kV Transmission Line
- All Districts

Geographic Elements
- Provincial Capital
- District Capital
- Administrative Post
- Administrative Post of Changalane
- Administrative Post of Matola Rio
- International boundary
- River / water course
- District boundary

Figure 5-2 – Area of Indirect Influence (AII)

6 Baseline Assessment

This Chapter provides a brief baseline assessment of the potentially affected environment within the preliminary Project's AoI, as defined in Chapter 5. The baseline assessment is based on desktop review of available secondary information for the study area and direct field observations collected during a site visit to the Project area (August 2022). An effort was made to focus the baseline on the more relevant environmental and social components, given the Project typology and expected potential impacts. Table 6-1 shows the structure of the EIA baseline assessment.

Table 6-1 – Structure of the baseline assessment

Environment	Component
Physical Environment	– Climate and Climate Change – Air Quality – Noise – Geology – Soils – Water Resources – Landscape
Biotic Environment	– Flora and Vegetation – Fauna – Conservation Areas – Natural, Modified and Critical Habitat – Ecosystem Services
Socioeconomic environment	– Administrative Division and Governance – Population and Demographics – Culture and Cultural Heritage – Ethnicity, Language and Religion – Education – Health – Land Use – Housing and Living Conditions – Basic Services and Infrastructures – Economic Activities

6.1 Physical Environment

6.1.1 Climate and Climate Change

6.1.1.1 Climate

According to Köppen's climate classification, most of the coastal territory of Mozambique has a tropical savannah rainy climate (Aw), which is influenced by the movement of the Intertropical Convergence Zone and expressed through a reduction or increase in the temperature of the Indian Ocean – a phenomenon known as El Niño (increased temperature) and La Niña (reduced temperature).

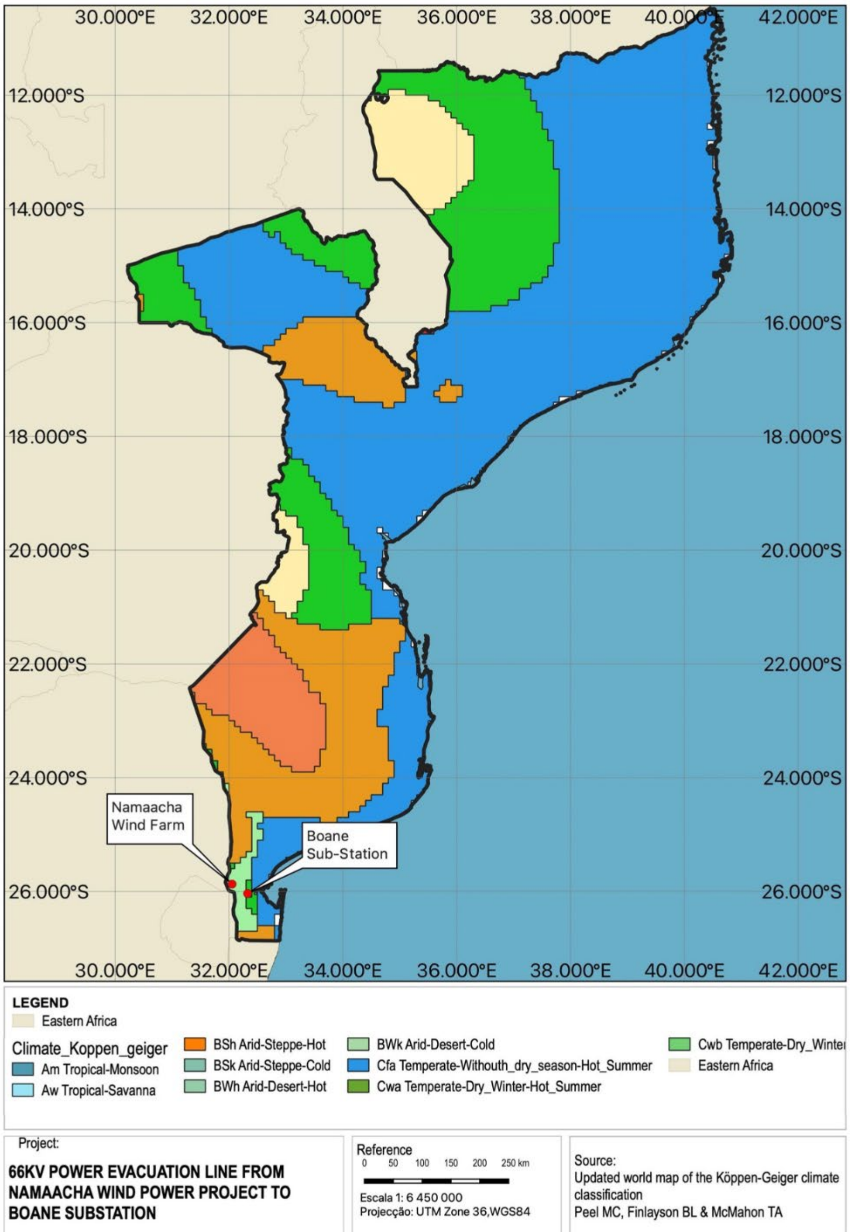


Figure 6-1 – Köppen classification in the south of Mozambique

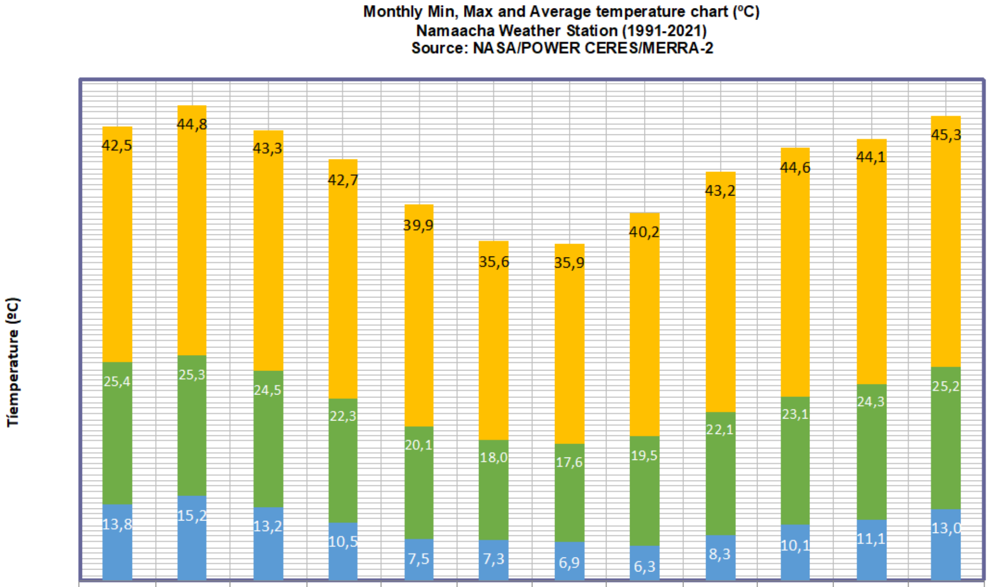
The Aw climate type is characterised by two well-accentuated climatic periods caused by seasonal temperature variations: A rainy season that occurs typically from November to April, and a cool dry season from May to October. Also, according to Köppen's climate classification (Peel, 2012), the Power evacuation line route falls under the C type of climate, more specifically the Cfa climate type, which is a monsoon-influenced Humid Subtropical Climate where average monthly temperatures can descend below 18 °C (Figure 6-1 above).

Local Climatic Parameters

Local meteorological parameters for this region were collected from the NASA/POWER CERES/MERRA2 Native Resolution Climatology covering a period of 31 years (1991-2021) for the project region (with a reference point location of Latitude: -25.9825 & Longitude 32.0904)

Temperature

Based on the 1991-2021 time series database, the lowest temperatures across the year occur during the dry season (April to September), with June and July being the coldest months with an average monthly temperature below 18 ºC. The hottest months occur during the rainy season (October to March) where from December to March the average temperatures are around 25 °C.



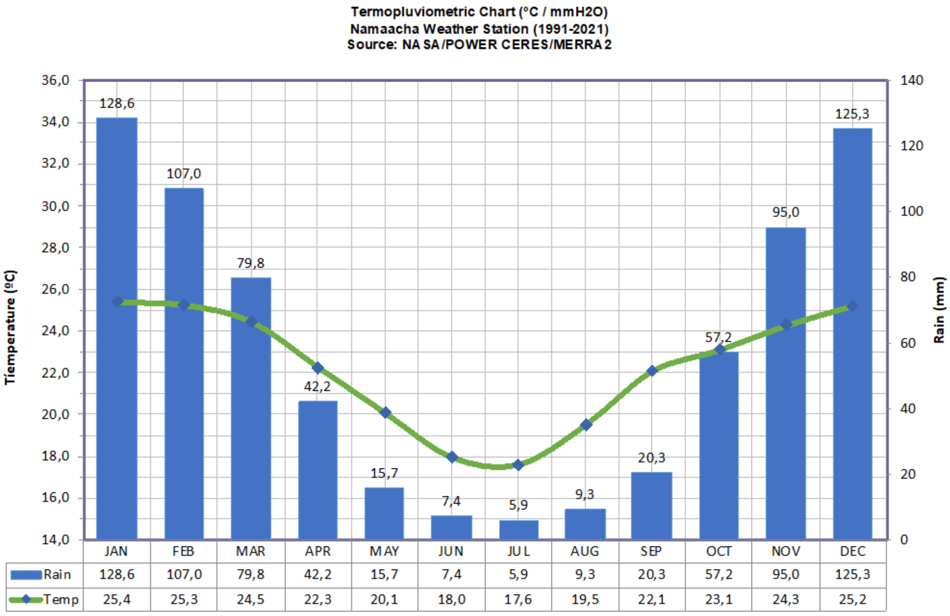
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
T_MAX	42,5	44,8	43,3	42,7	39,9	35,6	35,9	40,2	43,2	44,6	44,1	45,3
Temp	25,4	25,3	24,5	22,3	20,1	18,0	17,6	19,5	22,1	23,1	24,3	25,2
T_MIN	13,8	15,2	13,2	10,5	7,5	7,3	6,9	6,3	8,3	10,1	11,1	13,0

Source: NASA/POWER CERES, 2022

Figure 6-2 – Maximum, average and minimum monthly temperature

Rainfall

The seasonal distribution of rainfall is very pronounced, with over 80% of annual precipitation occurring during the wet season (November to April). Precipitation episodes in this region may occur in the form of storm, where individual precipitation events can be quite intense. This precipitation pattern creates an irregular rainfall distribution throughout the wet season. January is the wettest month with rainfall reaching maximum values near 129 mm followed by February. June to August are the driest months, with rainfall reaching minimum values below the 10 mm. Figure 6-3 correlates the temperature and precipitation variation throughout the year.

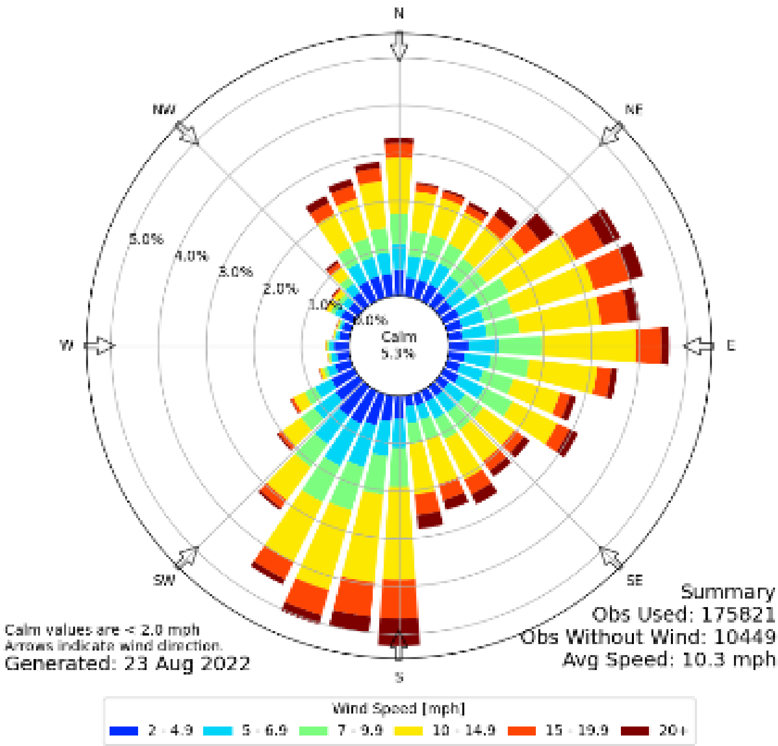


Source: NASA/POWER CERES, 2022

Figure 6-3 – Thermo-pluviometric graph

Wind Regime

In southern Mozambique, the wind regime is characterised by prevailing winds from the south, northwest and northeast quadrants, as illustrated in the Figure 6-4 below. Atmospheric circulation in the southern region of the country is also affected by the influence of SE trade winds, with easterly and southerly prevailing winds throughout the year. The graph represented in Figure 6-4 illustrates the annual distribution of wind speed and prevailing directions between 1991-2021 in the Maputo observatory weather station. The average wind speed is of 10.3 mph.



Source: IEM 2022.

Figure 6-4 – Annual average wind speeds and predominant directions

Natural Disasters

Mozambique is a country vulnerable to natural disasters from meteorological origin such as droughts, floods and tropical cyclones due to its geographic location with about 2,700 km of coastline and several international rivers emptying into the Indian Ocean as well as several areas below sea level. Extreme weather events have cumulative and devastating impacts on a population, on infrastructure (eg. roads, bridges, power lines) leading to economic losses as well.

Other factors such as the lack of capacity to predict extreme events, inadequate timely warning notices, extreme poverty and dependence on natural resources which in turn depends on climate variability, contribute to the country's vulnerability to extreme meteorological events. Cyclones tend to be cyclic, with an increasing frequency due to climate change effects. The cyclone season in Mozambique occurs between November and April, peaking in December and January and usually affecting the central region of the country, as illustrated in Figure 6-5 below.

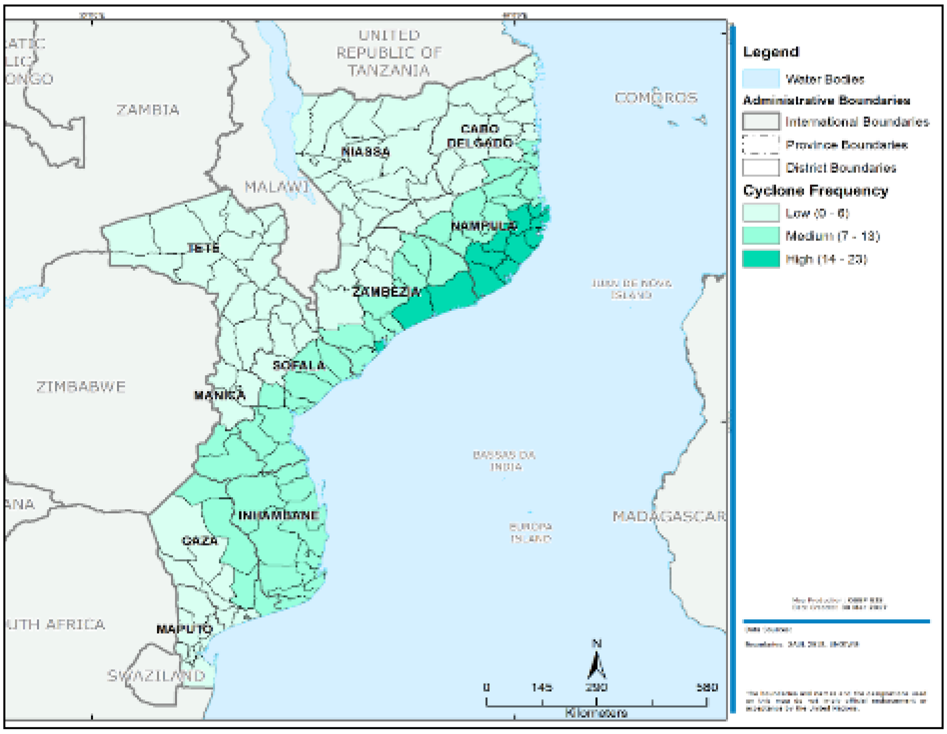


Figure 6-5 – Cyclone hazard frequency and distribution

In general, hurricane wind top speeds range from 63 km/h up to speeds higher than 212 km/h following the Saffir-Simpson Scale classification (National Hurricane Center, 2018). The most frequent hurricanes reaching Mozambique have winds from categories 1 to 4, with speeds ranging from 63 to 212 km/h respectively. Category 5 hurricane wind speeds of over 212 km/h are rare (Table 6.2, bellow).

Between 1993 and 2017, more than 40 cyclones have occurred in the Mozambican Channel, with an average of two per year reaching Mozambique's coast, none of which affected the Namaacha region. **Table 6.2** lists the cyclones hitting the Mozambican Chanel with some affecting the Mozambican coast in the first two decades of XXI century (2000-2019) as per the Joint Typhoon Warning Center data records retrieved from the United States Naval Oceanography Portal (https://www.metoc.navy.mil/jtwc/jtwc.html).

Table 6.2 – Main cyclones and storms that hit Mozambique (2000 to 2019)

Name	Duration	Max Wind Intensity	Classification	Category	Affected areas (Provinces)
Astride	23/12/99 –03/01/00	95 km/h (60 mph)	Severe Tropical Storm	Category I	Nampula
Leon-Eline	07/02/00 -22/02/00	185 km/h (115 mph)	Intense Tropical Cyclone	Category IV	Maputo and Gaza
Hudah	24/03/00 -08/04/00	220 km/h (140 mph)	Very Intense Tropical Cyclone	Category IV	Zambezia and Nampula
Dera	05/03/00 -12/03/01	140 km/h (85 mph)	Tropical Cyclone	Category IV	Zambezia and Nampula
Cyprien	30/12/01 –03/01/02	100 km/h (65 mph)	Severe Tropical Storm	Category IV	Sofala and Zambezia Coast

Name	Duration	Max Wind Intensity	Classification	Category	Affected areas (Provinces)
Atang	04/11/02 - 12/11/02	55 km/h (35 mph)	Tropical Storm	---	Cabo Delgado Coast
Delfina	30/12/02 –05/01/03	90 km/h (55 mph)	Severe Tropical Storm	---	Nampula and Northern Zambezia
Japhet	25/2/03 – 06/3/03	112 km/h (70mph)	Intense Tropical Cyclone	Category IV	Inhambane, Manica and southern Sofala
Cell	05/12/03 –21/12/03	120 km/h (75 mph)	Tropical Cyclone	Category I	Mozambique Channel
Elita	26/01/03 –12/02/03	120 km/h (75 mph)	Tropical Cyclone	Category I	Mozambique Channel
Gafilo	01/03/04 –1/03/04	230 km/h (145 mph)	Very Intense Tropical Cyclone	Category V	Inhambane and Sofala Coast
Ernest	16/01/05 –25/01/05	165 km/h (105 mph)	Intense Tropical Cyclone	Category III	Sofala and Zambezia Coast
Boloetse	20/01/05 –06/02/06	155 km/h (100 mph)	Intense Tropical Cyclone	Category III	Zambezia
Anita	26/11/06 –04/12/06	83 km/h (52 mph)	Moderate Tropical Storm	---	Mozambique Channel
Favio	11/02/07 23/02/07	222 km/h (138mph)	Intense Tropical Cyclone	Category IV	Inhambane and Vilanculos
Jaya	26/03/07 -08/04/07	22 km/h (138mph)	Intense Tropical Cyclone	Category III	Northern coast of Mozambique
Elnus	29/12/07 –05/01/08	65 km/h (40 mph)	Moderate Tropical Storm	---	Mozambique Channel
Jokwe	02/03/08 –16/03/08	195 km/h (120 mph)	Intense Tropical Cyclone	Category III	Nampula and Zambezia
Fanel	18/01/09 –23/01/09	185 km/h, (115mph)	Intense Tropical Cyclone	Category III	Mozambique Channel
Izilda	24/03/09 –27/03/09	20 km/h (75 mph)	Severe Tropical Storm	Category I	Mozambique Channel
Joel	26/05 -29/05/10	20 km/h (75 mph)	Tropical Depression	---	Mozambique Channel
Funso	19/01/12-28/01/02	212 km/h 132 mph	Very Intense Tropical Cyclone	Category IV	Mozambique Channel
Haruna	19/02/13-25/02/13	194 km/h (121 mph)	Tropical Cyclone	Category II	Zambezia
Guito	18/02/14-22/02/14	120 km/h (75 mph)	Tropical Cyclone	Category I	Mozambique Channel
Hellen	28/03/14-01/04/14	102 km/h (63 mph)	Tropical Storm	---	Mozambique Chanel (Cabo Delgado Coast)
TC15S Fifteen	05/03/15-07/03/15	46 km/h (29 mph)	Tropical Depression	---	Mozambique Channel
Dineo	13/02/17-16/02/17	157 km/h (28 mph)	Tropical Cyclone	Category II	Central Mozambique (Inhambane)
IDAI	09/03/19-15/03/19	213 km/h (132 mph)	Very Intense Tropical Cyclone	Category IV	Central Mozambique (Beira, Sofala)
Kenneth	23/04/19-25/04/19	231 km/h (144 mph)	Very Intense Tropical Cyclone	Category IV	North Mozambique (Cabo Delgado Coast)

Source: Naval Oceanography Portal. https://www.metoc.navy.mil/jtwc/jtwc.html?cyclone

Figure 6-6 illustrates the main cyclones routes hitting the Mozambican channel between year 2000 -2019.

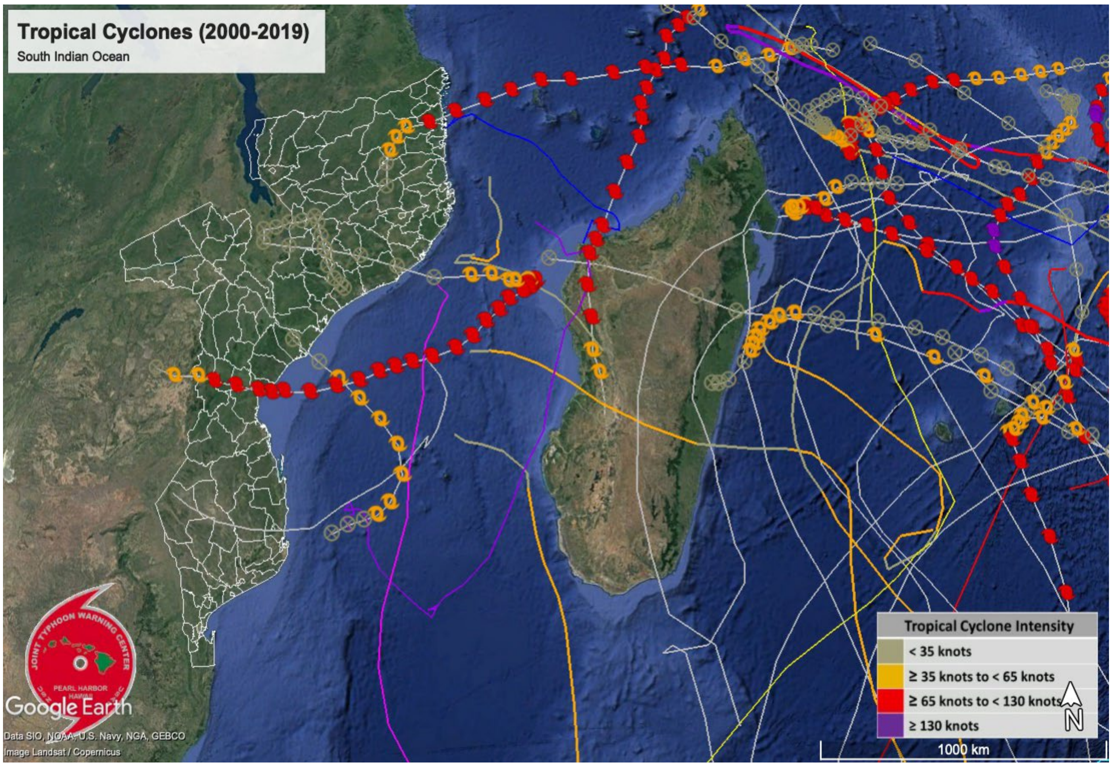
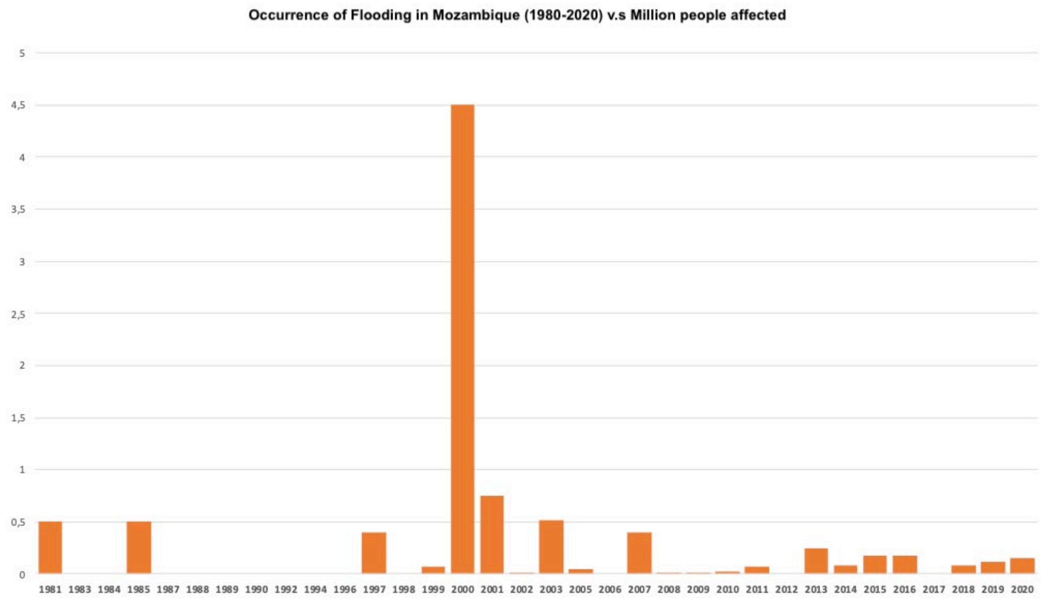


Figure 6-6 – Main cyclones routes along the Mozambican Channel

Floods

The environmental risk of floods results from the action of natural phenomena that, although not directly the result of man's action, are currently magnified by the action of this, often with serious implications in the territory, loss of life and generating emergencies/natural disasters. This extreme phenomenon is enhanced by climate change to which Mozambique is particularly vulnerable. The chart below illustrates the number of flood episodes that occurred in Mozambique between 1980 and 2020 and relates these episodes to the number of people affected. Since the year 2000 flooding events occur with an annual frequency.

Storm Freddy hit the Mozambican coast on March 12th, 2023, with its epicenter in the district of Namacurra, locality of Macuze, with winds of 148 Km/h and gusts up to 213 Km/h, and heavy rains, of more than 200mm, affecting several Mozambican provinces, including the south of Mozambique. This storm caused 165 deaths registered and 511 people injured, 886,487 people (corresponding to 191,146 families) were affected counting in 98,975 people displaced. 5,059km of roads were affected and floods affected a total area of 347,862 ha. Severe rains flooded vast areas of Boane District and caused major damages, as well as in parts of the Namaacha district.



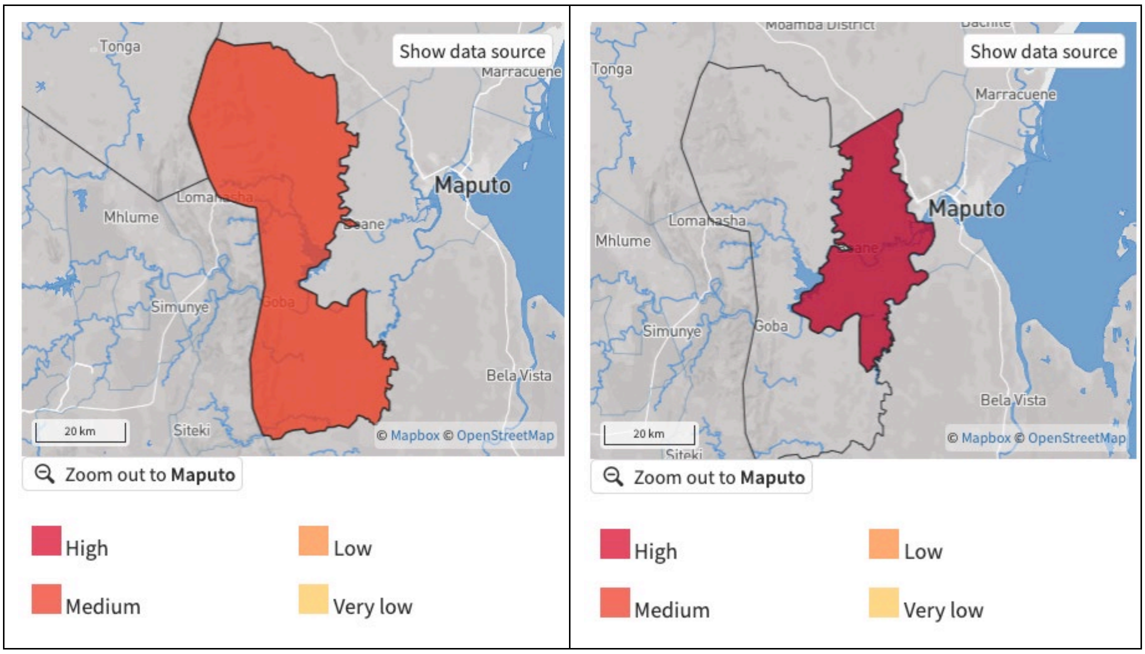
Fonte: CCKP, 2022, adapted.

Figure 6-7 – Floods in Mozambique and number of affected persons

The Global Facility for Disaster Reduction and Recovery (GFDRR) is a global multi-donor partnership together with World Bank Group that helps low and middle-income countries better understand and reduce their vulnerability to natural hazards (heat waves, cyclones, urban and river floods, Tsunami, landslides) and climate change.

In the Namaacha area, River flood hazard is classified as **medium** based on modeled flood information currently available in the GFDRR tool. This means that there is a chance of more than 20% that potentially damaging and life-threatening river floods occur in the coming 10 years.

In the Boane area river flood hazard is classified as **high** based on modeled flood information currently available in the GFDRR tool. This means that potentially damaging and life-threatening river floods are expected to occur at least once in the next 10 years. Project planning decisions, project design, and construction methods must consider the level of river flood hazard.



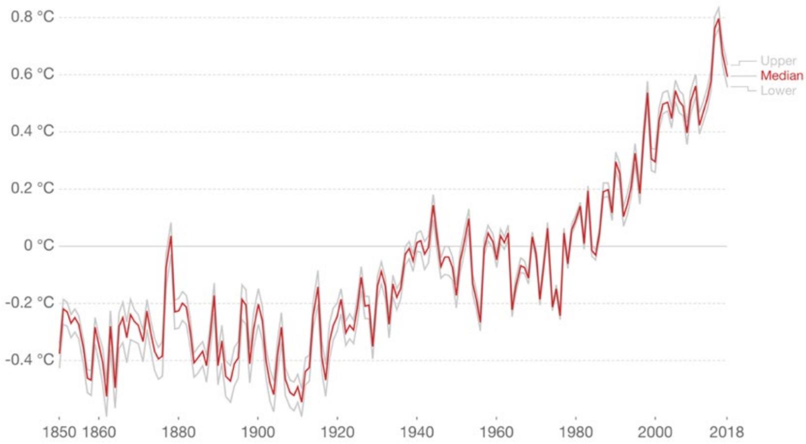
Data Source: INAM, INGC & ARCC, accessed November 2022.

Figure 6-8 – River flood Risk Hazard classification for Namaacha and Boane

6.1.1.2 Climate change

Climate change refers to any change in the current climate, attributed directly or indirectly to human activity, to which is added the natural climate variability observed over comparable time periods (MTA, 2007). It is widely accepted by the scientific community that climate pattern worldwide is already changing and that the trend will be towards an overall increase in average air temperature, greater variability in rainfall regime, rise in the average level of the sea and the increased occurrence of extreme situations such as flooding phenomena, cyclones and extended periods of drought. The observed warming since the mid-twentieth century is largely due to the increased concentration of greenhouse gas (GHG) emissions resulting from human activities. Excessive increase of greenhouse gas affects the amount of retained heat has increased and the planet has warmed, which is currently affecting the climate globally. Some of the most common gases that create the greenhouse effect include carbon dioxide, water vapor, methane, nitrogen oxides and chlorofluorocarbons (CFC's). The most relevant elements are water vapor, carbon dioxide and Methane. Carbon dioxide, for example, remains in the atmosphere for centuries after being emitted, and it is stored on earth in different forms. Water vapor is a potent greenhouse gas due to the capacity to absorb and emitting infrared radiation, as heat energy.

In 2010, the world global average temperature showed an 0,53 ° C increase in relation to the 1961-1990 average values period. Together with 1998, 2018 was the higher temperature year on the planet (Hadley Center, 2018). The World Meteorological Organization confirmed that the last ten years were the hottest, since 1984. **Figure 6-9** illustrates this trend of rising average global temperature of the planet from 1880 to 2018.



Source: Hadley Center, 2018

Figure 6-9 - Temperature anomalies in relation to the 1961-1990 global average.

In the southern African region, the meteorological observations from the last 50 years suggest that temperatures have been increasing considerably over the second half of the 20th century and the heating rate has also increased, especially in the last two decades of the twenty-first century. From 1961 to 2014 the temperature increased at a rate of 0,4 ° C per decade. The temperature patterns throughout the seasons indicate a slightly higher heating in the austral summer (December - January - February) and also during the period from March to May compared to the rest of the year.

Mozambique's climate change

Mozambique has become a signatory of the Kyoto Protocol, having ratified it in 2005. Mozambique is classified as a non-Annex I party to the Protocol which means that it has no specific emissions targets that it is obligated to meet. Being a signatory of the Kyoto protocol and being among the first States that have signed the Paris Agreement, Mozambique is an active country in the effort to reduce Climate change negative effects. According with the National Strategy for Climate Change report (2013-2025), published by MITA, Mozambique is particularly vulnerable to climate change due to: the geographical location, in the inter-tropical convergence zone and in the downstream shared hydrographic basins; the long coastal area and the existence of large areas with altitude below the current sea level.

Contributing also to Mozambique's vulnerability and low adaptive capacity are factors such as: poverty, limited investments in advanced technology, and the fragility of the infrastructure and social services, particularly health and sanitation. In the country, climate changes are observed through the changes in temperature patterns. A report published by (INGC,2009), indicates that for the 45 years' period between 1960 and 2005, a clear trend of increasing temperature in most of the country has been already observed.

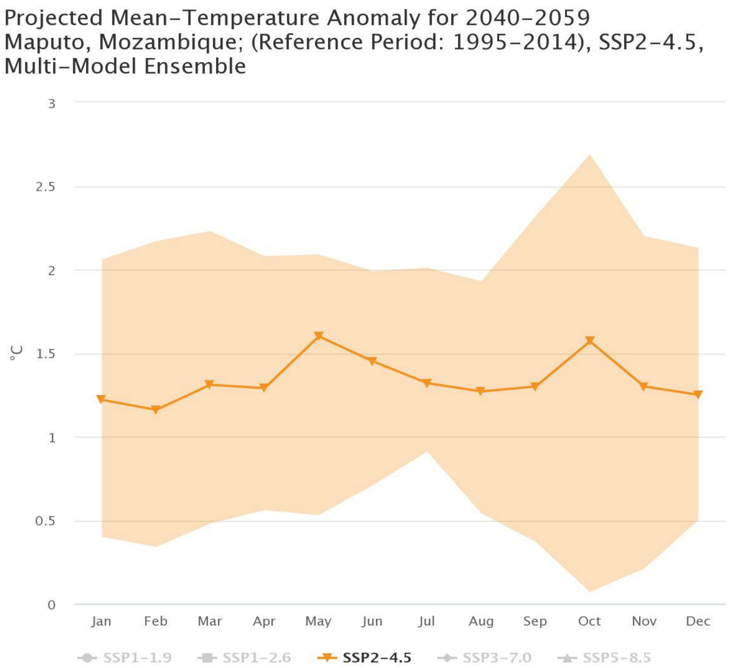
Temperatures in Mozambique may increase considerable until 2095. The rainfall variability will increase, potentially affecting the beginning of the rainy season and the rainfall distribution and resulting in more humid rainy seasons and drier dry seasons. The central provinces are more prone to floods, tropical cyclones and epidemics, followed by the Southern and Northern provinces. The South with its savanna climate, tropical and dry, is more prone to droughts than the central and northern regions, which are respectively dominated by a rainy tropical climate and moderately humid climate modified by altitude (INGC, 2009).

Temperature past and future trends

Since the 1960s, mean temperatures across Mozambique rose by an average of 6°C (0.15-0.16°C per decade), especially during the rainy season. The number of hot days (defined as the temperature exceeded on 10% of days or nights in the current climate of that region and season) increased by 25 in the last 40 years, and much of this has occurred during the southern hemisphere autumn (GFDRR, 2011).

Based in the Climate projection data modeled data published by UNDP Mozambique Country Profile and World Bank Climate Change Data Portal, it can be concluded that the mean annual temperature in Mozambique is to increase by 1.4-3.7 °C by 2060, with warming more rapid in southern and coastal areas. The number of hot days and nights (defined as the temperature exceeded on 10% of days or nights in the current climate of that region and season) are projected to increase throughout the country, with hot days by 17- 35% in 2060 and hot nights by 25-45% in 2060.

Figure 6-10 illustrates the projected mean temperature anomaly for 2040-2059 period under a SSP2-4.5 scenario for the Maputo Province. (SSP2- 4.5 - Medium challenges to mitigation and adaptation) a scenario with intermediate GHG emissions.



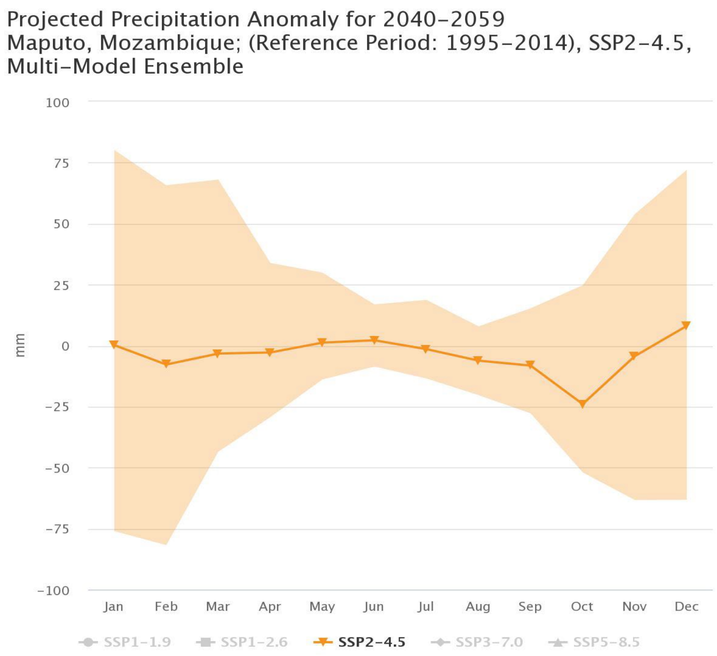
Source: CCKP/World Bank, 2021

Figure 6-10 – Projected Temperatures anomaly for Maputo.

Precipitation past and future trends

Since the 1960s, mean rainfall decreased by an average of 2.5 millimeters per month (3.1%) per decade. Spatial manifestations are varied, with increased rainfall over the northern regions, highly variable conditions in the central regions, and persistent drought periods coupled with episodic floods in the south (GFDRR, 2011). In what regards future precipitation patterns, Rainfall projections are less certain for the country as a whole and vary by region. Seasonal level projections are more certain and indicate decreased dry season rainfall (January-June) and increased wet season rainfall (July-September). The number of heavy rainfall events (defined as a daily rainfall total which exceeds the threshold that is exceeded on 5% of rainy days in the current climate of that region or season) is projected to increase by 2060, particularly during the dry season (January-June).

Figure 6-11 illustrates the projected precipitation anomaly for 2040-2059 period under a SSP2-4.5 scenario.



Source: CCKP/World Bank, 2021

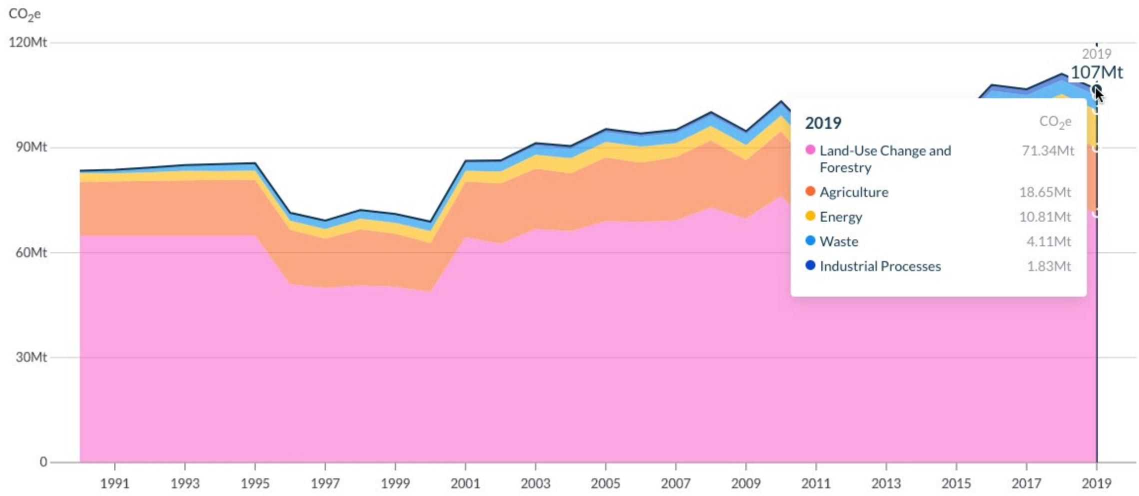
Figure 6-11 – Projected precipitation anomaly

Based on this analysis, it may be concluded that climate change may potentially impact the project's region through:

1. A possible increase in the number of episodes of extreme rainfall with possible occurrence of floods;
2. An increase in temperature at an average increase 1.4-3.7 °C by 2060, with warming more rapid in southern and coastal areas.
3. Rainfall projections are less certain for the country as a whole and vary by region. Seasonal level projections are more certain and indicate decreased dry season rainfall (January-June) and increased wet season rainfall (July-September).
4. The number of heavy rainfall events (defined as a daily rainfall total which exceeds the threshold that is exceeded on 5% of rainy days in the current climate of that region or season) is projected to increase by 2060, particularly during the dry season (January-June).

6.1.1.3 National greenhouse gases emissions

Total Mozambican Greenhouse Gases Emissions when expressed in global warming potential (CO_2 eq.), reached in 2019 an equivalent amount of 106.74 MtCO2e/year, (WRI, 2022). This quantified data was retrieved from the World Resources Institute database (CAIT, Country Greenhouse Gas Emissions Data (1850-2019)). This includes the accounting of emissions from land-use change and deforestation (LUCF), calculated by FAO.



Source: WRI, CAIT. 2022

Figure 6-12 – National Greenhouse Gas emissions

Of the total amount of 106.74 Mton$CO_{2eq.}$, 71.3 million tons of CO_2 eq. are from changes in land use and Forestry (LUCF), 18.7 Mton CO_{2eq}. are emissions from agricultural activity, and the remaining emissions have their origin from the energy sector (10.8 Mton), transport and industrial process sectors. The most significant greenhouse gas is CO_2. Other greenhouse gases such as CH_4 and N_2O are emitted on a smaller scale, but still in quantities considered relevant. It should be noted that CO_2 is mainly emitted by industries associated with the energy sector, manufacturing and construction industries, transport and other sectors, namely the residential, commercial/institutional and fisheries/agriculture/forestry sectors.

Greenhouse gas emissions from energy industries are mostly related with diesel used to generate electricity. The emissions from the energy sector in Mozambique emanate from the combustion of carbon-based fuels (fossil and biomass).

On a global scale and in relative terms, Mozambique's contribution for Global Greenhouse Gas Emissions is insignificant at 0.15% of the global GHG emissions (Our World in Data, 2019).

6.1.1.4 National Climate Change Adaptation and Mitigation Strategy

As cited in the Intended Nationally Determined Contribution (INDC) of Mozambique to the United Nations Framework Convention on Climate Change (UNFCCC) and established in the National Climate Change Adaptation and Mitigation Strategy (NCCAMS) (MTA, 2012), the national priority is defined in its mission "*to increase resilience in the communities and the national economy including the reduction of climate risks, and promote a low-carbon development and the green economy through the integration of adaptation and mitigation in sectorial and local planning*".

The present and future planned actions (post2020) directed at the increase of resilience and risk reduction will correspond to the update of the adaptation component of this Strategy which will correspond to the Mozambican National Adaptation Plan (NAP). The country will update and implement its NAP for the following time periods: short (2015 to 2019), medium (2020 to 2024) and long (2025 to 2030) terms. The strategic actions to be included in the NAP are:

- Reduce climate risks through the strengthening of the early warning system and of the capacity to prepare and respond to climate risks.
- Improve the capacity for integrated water resources management including building climate resilient hydraulic infrastructures.
- Increase the effectiveness of land use and spatial planning (protection of floodplains, coastal and other areas vulnerable to floods).
- Increase the resilience of agriculture, livestock and fisheries, guaranteeing the adequate levels of food security and nutrition.
- Increase the adaptive capacity of the most vulnerable groups.
- Reduce people’s vulnerability to climate change related vector borne diseases or other diseases.
- Ensure biodiversity’s protection.
- Reduce soil degradation and promote mechanisms for the planting of trees for local use;
- Develop resilient climate resilience mechanisms for infrastructures, urban areas and other human settlements and tourist and coastal zones.
- Align the legal and institutional framework with the NCCAMS
- Strengthen research and systematic observation institutions for the collection of data related to vulnerability assessment and adaptation to climate change.
- Develop and ameliorate the level of knowledge and capacity to act on climate change. and
- Promote the transfer and adoption of clean and climate change resilient technologies**.**

Mozambique is part of the group of countries which are implementing the Pilot Programme for Climate Resilience (PPCR), which encompasses support for the institutional and policies’ reform, for the funding of pilot projects (roads, agriculture, early warning systems, coastal cities and irrigation) and for knowledge management. In addition to the PPCR, the World Bank is also funding actions in water resource sectors and conservation areas. The country is also implementing other projects supported by the Least Developed Countries Fund (LDCF), the PASA, the African Development Bank, the JICA, the USAID and the Portuguese Carbon Fund, among others. (MTA, 2015).

The Namaacha Power Plant Project, together with the transmission power Line, are aligned with the environmental and energy policies recommended not only in the country, but also worldwide, in order to enable the fulfilment of international commitments in reducing greenhouse gas (GHG) emissions, with particular emphasis on the targets set out in the Paris Agreement, and resulting from the 21st Conference of the Parties to the United Nations Framework Convention on Climate Change (COP21), signed by Mozambique on 22 April 2016.

6.1.2 Noise

6.1.2.1 Noise standards and guidelines

Mozambique has yet to establish national ambient noise guidelines. National environmental quality standards are established through Decree No. 18/2004 (Regulation on Environmental Quality Standards and Effluent Emissions), as amended by Decree No. 67/2010 which determines environmental standards and effluent emission limits, aiming to control and maintain acceptable concentrations of pollutants in the environment. This decree also states that ambient noise guidelines will be established by MTA. However, to date, specific guidelines regarding noise monitoring have yet to be published.

WHO's recommended noise guidelines have been determined considering the potential negative effects of noise on health and specific environments. Under WHO's noise guidelines, residential areas, schools and hospitals are considered sensitive receptors / land uses. Table 6-3 lists WHO's ambient noise guidelines for such sensitive receptors.

Table 6-3 – WHO Ambient Noise Levels Guidelines

Land use / Specific Environment	Guideline (L_{Aeq} in dB (A))	Reference Period	Effect on Health
Outdoor of residential areas (daytime)	55 dB(A)	16 hours (06h00 – 22h00)	Serious annoyance
Outdoor of residential areas (night-time)	45 dB(A)	8 hours (22h00 – 06h00)	Sleep disturbance

Source: Berglund *et al*. (1999).

WB and IFC also have ambient noise guidelines, which state that noise impacts from a particular project should not exceed the levels presented in Table 6-4 or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.

Table 6-4 – WB/IFC Noise Levels Guidelines

Receptor	One Hour Laeq (dB(A))	
	Daytime (07:00 - 22:00)	Night-time (22:00 – 07:00)
Residential; institutional; educational	55	45
Industrial, commercial	70	70

Source: IFC (2007).

As can be seen from the table above, the WHO noise guideline for outdoors of residential areas are the same as the WB/IFC's guidelines for residential, institutional or educational receptors, for both the daytime and night-time periods. In the absence of national regulation, WHO and WB noise guidelines are referenced and proposed as project standards.

6.1.2.2 Local noise emission sources

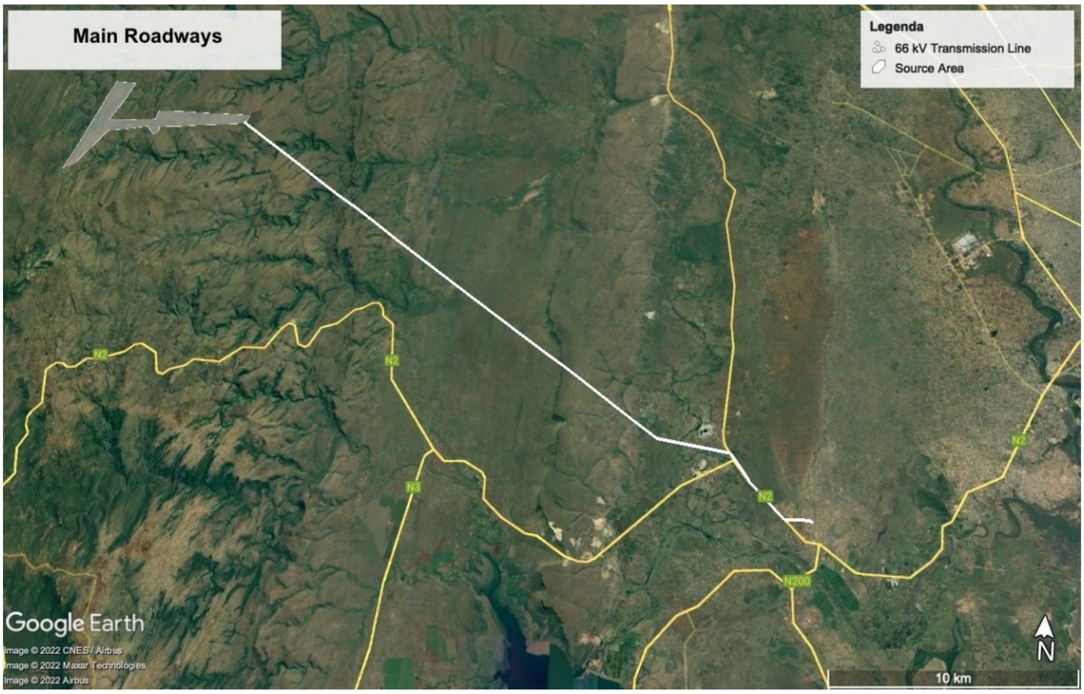
Land Use

The project area is mostly located in area with scarce population density and a low level of development and industrialisation. Consolidate habitation is to be found only on the last 300 meters of the future Transmission line near the Boane substation. It can be concluded that, the majority of the territory in the vicinity of the future wind farm is mostly described as being 'natural'. The mainland uses around the project area are non-mechanised farming and woodlands and croplands.

Noise Sources

As mentioned no significant anthropogenic noise or vibration sources have been identified. The main noise sources that define the acoustic environment in the project area are:

- Natural noises – such as the noise induced by wind, rainfall and animals (insects, birds, frogs, etc.);
- Scattered Human settlements – Noise generated from human activities such as people talking, children playing, music, etc.; and
- Vehicular traffic – noise caused by the heavy and light motorised vehicles that cross the N2, a primary road. Vehicular traffic across Mozambique's road network is low to very low, accounting a low volume of vehicles/day along primary roads (AICD World Bank, 2008). Only one primary road (the N2) is located in the vicinity of the project Transmission Line Solution 2 route, and, as such, the vehicular traffic noise is anticipated to be of low significance.



Source: Google Earth (2022)

Figure 6-13 – EN-2 location within the project's area

As for vibration, no relevant sources have been identified in the project's area.

6.1.2.3 Baseline noise characterization

Noise survey

The baseline ambient noise levels characterization in ADI was based on *in situ* noise measurements made during January 2023. Noise measurements were recorded in several locations (eight) along the proposed site implantation route, in areas considered to be sensitive to noise in order to:

- Determine as rigorously as possible the existing ambient noise levels in the project area of influence;
- Obtain a general perspective, as representative as possible, of the acoustic environment in the areas that may be potentially affected by the noise emissions generated by the project.

Noise monitoring locations were selected based on the proximity to sensitive receptors to the project's potential noise emissions (essentially residential areas). These sensitive receptors were preliminarily identified through aerial photographic coverage and were then ground-truthed in the field. The selection of the monitoring locations was based on the following criteria:

- Locations considered to be representative of the current noise levels in residential areas;
- Locations with dwellings in close proximity to the project's ADI;
- Easy access by road in current conditions;

- Safety conditions for undertaking the noise measurements;
- Existing restrictions to perform night-time measurements;
- Settlements that expected to continue to exist after the project implementation and are therefore valid for comparison purposes in future noise monitoring activities.

The field survey included a photographic record of the selected monitoring locations and the measurement of noise parameters, including the equivalent continuous noise level (LAeq), L_{max}, L_{min} and statistical parameters such as the L_{10}, L_{50} and L_{90} indicators. The location of these monitoring points is illustrated in Figure 6-14 and listed in the table below. Note that all sampling locations are associated with residential properties that would be considered Noise Sensitive Receptors (NSRs). This table also offers information regarding the tested noise indicators, the sampling equipment and the duration of the acoustic samples.

Table 6-5 – Noise monitoring points - location, parameters, sampling equipment and duration

Monitoring point	Coordinates (WGS84)	Description	Parameters	Equipment	Sample Duration
NSR1	25°55'31.63"S 32° 8'21.36"E	Dwellings	LAeq dB(A) L_{10}, L_{50}, L_{90} dB(A) Lmax and Lmin	Black Solo Sonometer dB Lab Class I	3 independent 10 minutes' runs during daytime and night-time
NSR2	25°55'47.16"S 32° 8'40.57"E	Isolated Dwelling	LAeq dB(A) L_{10}, L_{50}, L_{90} dB(A) Lmax and Lmin	Black Solo Sonometer dB Lab Class I	3 independent 10 minutes' runs during daytime and night-time
NSR3	25°59'53.49"S 32°15'1.07"E	Dwellings	LAeq dB(A) L_{10}, L_{50}, L_{90} dB(A) Lmax and Lmin	Black Solo Sonometer dB Lab Class I	3 independent 10 minutes' runs during daytime and night-time
NSR4	26° 0'4.83"S 32°15'14.37"E	Dwellings	LAeq dB(A) L_{10}, L_{50}, L_{90} dB(A) Lmax and Lmin	Black Solo Sonometer dB Lab Class I	3 independent 10 minutes' runs during daytime and night-time
NSR5	26° 0'35.39"S 32°17'14.06"E	Residential Settlement	LAeq dB(A) L_{10}, L_{50}, L_{90} dB(A) Lmax and Lmin	Black Solo Sonometer dB Lab Class I	3 independent 10 minutes' runs during daytime and night-time
NSR6	26° 0'37.58"S 32°17'30.30"E	Residential Settlement	LAeq dB(A) L_{10}, L_{50}, L_{90} dB(A) Lmax and Lmin	Black Solo Sonometer dB Lab Class I	3 independent 10 minutes' runs during daytime and night-time
NSR7	26° 2'16.00"S 32°19'35.02"E	Residential Settlement	LAeq dB(A) L_{10}, L_{50}, L_{90} dB(A) Lmax and Lmin	Black Solo Sonometer dB Lab Class I	3 independent 10 minutes' runs during daytime and night-time
NSR8	26° 2'9.96"S 32°19'35.02"E	Residential Settlement	LAeq dB(A) L_{10}, L_{50}, L_{90} dB(A) Lmax and Lmin	Black Solo Sonometer dB Lab Class I	3 independent 10 minutes' runs during daytime and night-time

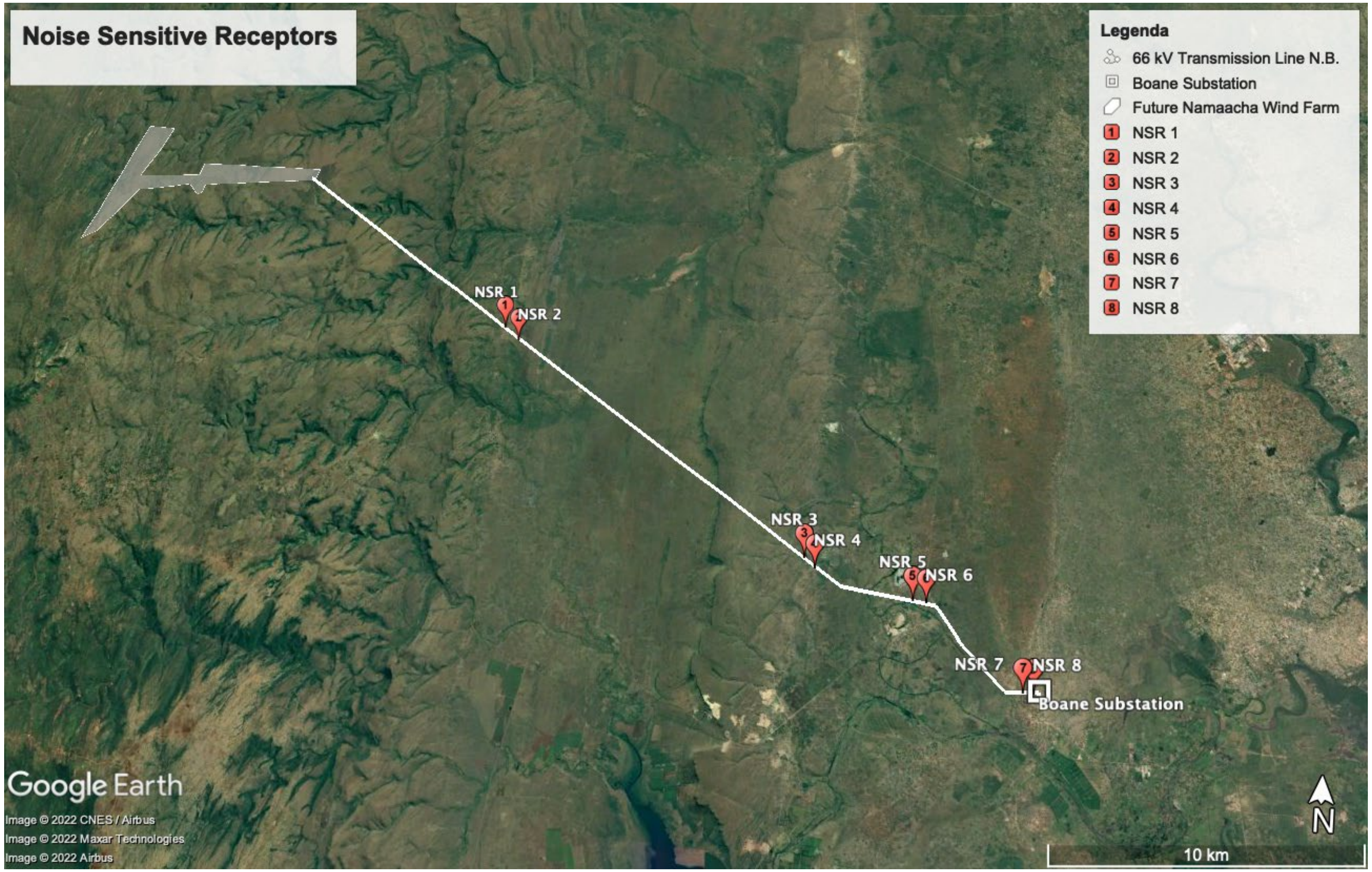
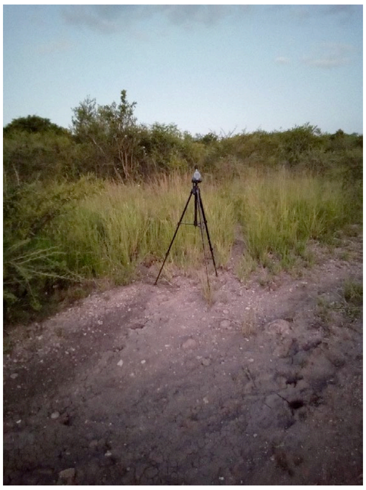


Figure 6-14 – Location of the monitoring points

Pictures bellow illustrate the acoustic survey carried out in the 8 pre-established monitoring points.



Noise Sensitive Receptor 1

Noise Sensitive Receptor 2

Noise Sensitive Receptor 3

Noise Sensitive Receptor 4

Noise Sensitive Receptor 5

Noise Sensitive Receptor 6

Noise Sensitive Receptor 7

Noise Sensitive Receptor 8

Noise Sensitive Receptor 8

Two major residential areas were found along the transmission line route, one located in the vicinity of the Boane substation (NSR 7 and NSR 8) and the other where NSR5 and NSR 6 are located. Scattered dwellings and small communities along the route were identified within NSR1 to NSR4. No health center or places of worship are within the area of direct influence. A school is located 280 meters south of the future transmission line, within the military compound located west of the Boane Substation, as illustrated below.

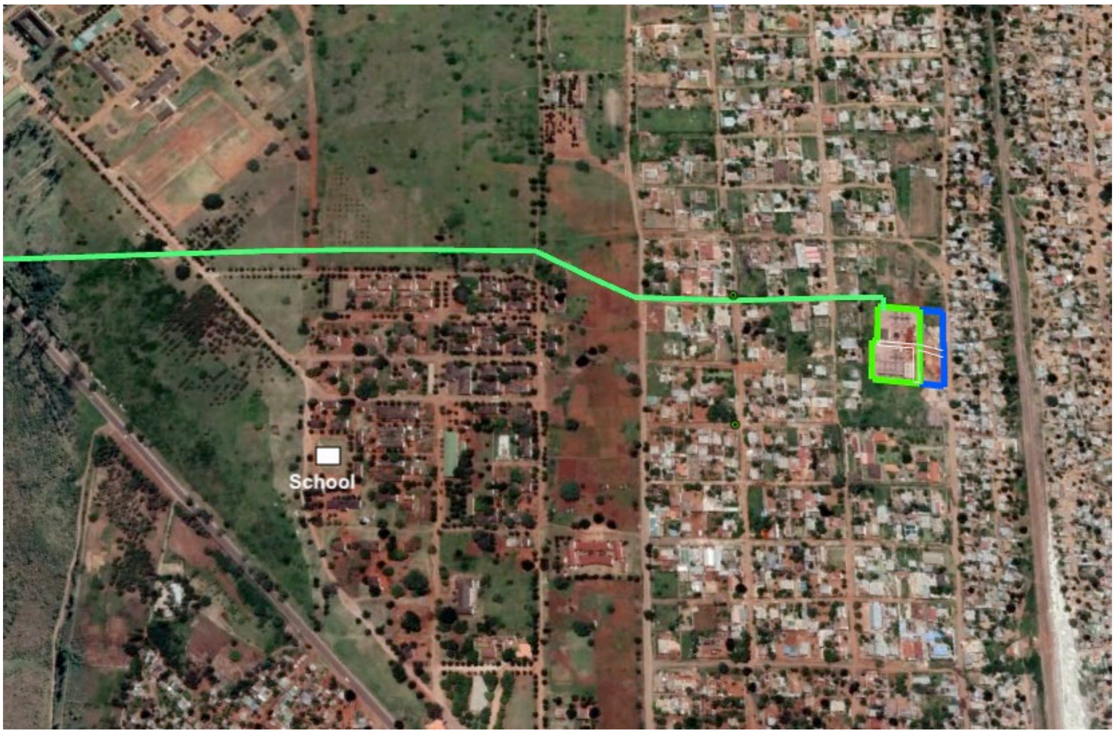


Figure 6-15 – School located south of the transmission line (inside the military compound)

6.1.2.4 Noise monitoring methodology

The noise monitoring procedures abided by the recommendations of international standards for noise measurement, namely:

- ISO EN 1996-1: 2016 – Acoustics – Description, measurement and assessment of environmental noise – Part 1: Basic Quantities and assessment procedures;
- ISO EN 1996-2: 2018 – Acoustics – Description, measurement and assessment of environmental noise - Part 2: Determination of environmental noise levels.

The following noise measurement procedures were followed:

- The acoustic samples were collected through the use of a Type 1 digital integrating sonometer (Solo – BlackSolo 01 dB), compliant with international standards. This sonometer is equipped with a high sensitivity electronic microphone and octave bands statistical analyses filters;
- During the sampling, the microphone was fitted with a wind guard, to prevent the recording of wind induce low frequency signals. Any residual energy from the filtering is irrelevant since all measurements were A-weighted;

- The sonometer was duly calibrated, prior to the start of the sampling and at the end of each sampling day. The equipment's acoustic sensibility was checked before and after each independent measurement through the use of an acoustic calibrator with a 94 dB(A) reference level. The sampling results were discarded if a discrepancy greater than 0.5 dB(A) was noted in the levels checked before and after the measurement;
- The ambient noise levels were assessed with the SLM impulse integration option on, through a noise sampling with duration equal to 3X10 min for each sampling point.
- For each measurement the equivalent continuous noise level (LAeq), by 1/3 octave band spectrum and in dB(A), of the monitoring period was recorded. The LAeq parameter reflects the average value of the sound pressure levels. It is the equivalent continuous sound which would contain the same sound energy as the time varying sound which is measured in the sampled environment;
- The L_{10}, L_{50} and L_{90} statistical parameters, and 1/3 octave band spectrum and in dB(A), were also recorded for each monitoring period. The L_{10} parameter correspond to the noise levels that are exceeded 10% of the monitoring time and the L_{90} is the noise level that is not exceeded during 90% of the measuring time under consideration;
- The coordinates of each sampling point were recorded using a Garmin GPS equipment, in the WGS 84 coordinate system. A photographic record of each sampling point was also taken.

Daytime noise levels

Table 6-6 presents the recorded daytime ambient noise levels for the 8 monitoring locations. Red colour denotes an exceedance above the guideline value for residential areas during the daytime period as per WHO criteria.

Table 6-6 – Recorded daytime noise levels

Monitoring point	Coordinates (WGS84)	Daytime Ambient Noise Levels (07h-22h)					
		LAeq [dB(A)]	L10 [dB(A)]	L50[dB(A)]	L90 [dB(A)]	Lmin [dB(A)]	Lmax [dB(A)]
NSR1	25°55'31.63"S 32° 8'21.36"E	47,0	48,5	47,2	44,0	41,6	49,7
NSR2	25°55'47.16"S 32° 8'40.57"E	42,3	45,1	38,2	34,7	32,5	57,3
NSR3	25°59'53.49"S 32°15'1.07"	44,4	47,8	39,8	35,8	32,3	60,4
NSR4	26° 0'4.83"S 32°15'14.37"E	41,0	43,8	36,8	32,7	30,1	56,6
NSR5	26° 0'35.39"S 32°17'14.06"E	48,0	50,8	44,8	41,5	38,2	63,4
NSR6	26° 0'37.58"S 32°17'30.30"E	45,8	49,0	45,9	40,3	38,5	56,5

Monitoring point	Coordinates (WGS84)	Daytime Ambient Noise Levels (07h-22h)					
		LAeq [dB(A)]	L10 [dB(A)]	L50[dB(A)]	L90 [dB(A)]	Lmin [dB(A)]	Lmax [dB(A)]
NSR7	26° 2'16.00"S 32°19'35.02"E	58,9	61,5	56,5	50,5	43,1	71,1
NSR8	26° 2'9.96"S 32°19'35.02"E	52,3	55,3	44,2	46,2	37,6	68,0

The noise levels measured during the daytime period show that the baseline acoustic environment has a low degree of noise disturbance, as all the noise levels measured across the selected sampling points, with the exception of NSR7, did not exceeded the daytime applicable IFC noise guideline (i.e., 55 dB(A)). The recorded noise levels were mostly due to noise caused by human activity occurring in or near the residential areas under assessment. The noise level in sampling locations NSR7 and NSR 8 were also partially influenced by road traffic induced noise.

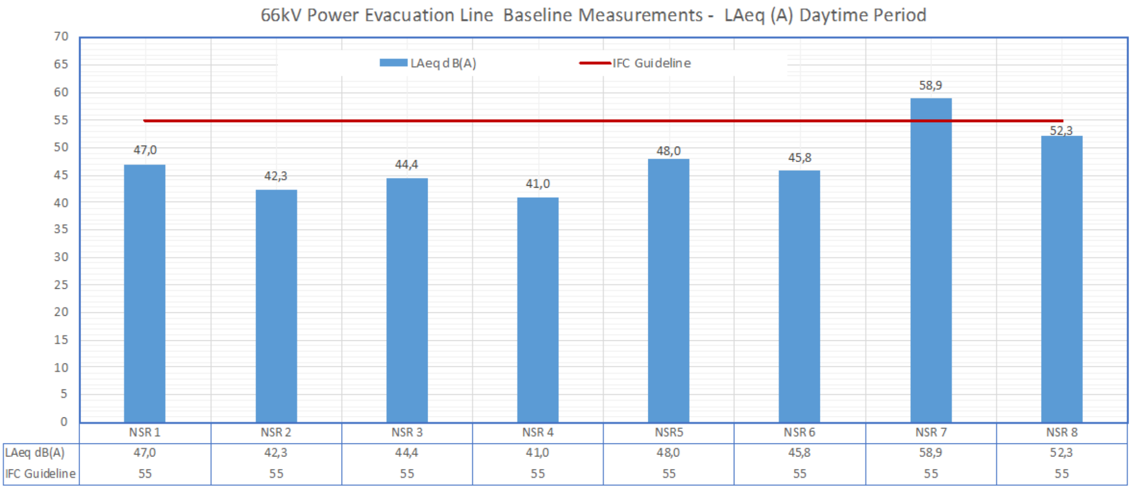


Figure 6-16 – Daytime baseline noise levels

In the measured sampling points, daytime ambient noise levels ranged between a minimum of 41.0 dB(A) – NSR4 and 58.9 dB(A) – NSR7, this last location was the only one above the 55 dB(A) daytime IFC guideline for residential area use.

Night-time noise levels

Table 6-7 presents the recorded night-time ambient noise levels for the 8 monitoring locations.

Table 6-7 – Recorded night-time ambient noise levels

Sampling Point	Coordinates (WGS84)	Night-time Ambient Noise Levels (22-07h)					
		LAeq [dB(A)]	L10 [dB(A)]	L50[dB(A)]	L90 [dB(A)]	Lmin [dB(A)]	Lmax [dB(A)]
NSR 1	25°55'31.63"S 32° 8'21.36"E	47,6	48,5	47,5	46,3	44,2	50,9

Sampling Point	Coordinates (WGS84)	Night-time Ambient Noise Levels (22-07h)					
		LAeq [dB(A)]	L10 [dB(A)]	L50[dB(A)]	L90 [dB(A)]	Lmin [dB(A)]	Lmax [dB(A)]
NSR 2	25°55'47.16"S 32° 8'40.57"E	45,6	46,5	45,6	43,7	39,7	48,8
NSR 3	25°59'53.49"S 32°15'1.07"	46,0	46,7	45,6	44,9	43,6	52,4
NSR 4	26° 0'4.83"S 32°15'14.37"E	36,4	37,3	35,2	33,3	32,2	52,1
NRS 5	26° 0'35.39"S 32°17'14.06"E	48,1	49,6	45,5	40,6	38,1	64,0
NRS 6	26° 0'37.58"S 32°17'30.30"E	43,6	43,8	45,9	41,9	40,7	53,1
NRS 7	26° 2'16.00"S 32°19'35.02"E	45,1	45,8	37,3	34,7	33,2	63,4
NSR 8	26° 2'9.96"S 32°19'35.02"E	46,5	45,4	42,7	41,2	39,2	66,6

The noise levels measured during the night-time period revealed low levels of acoustic disturbance as well. The recorded ambient noise levels in the sampled locations ranged between a minimum of 36.4 dB(A) – NSR4 to a maximum of 48.1 dB(A) at NSR5 measured near a large house cluster.

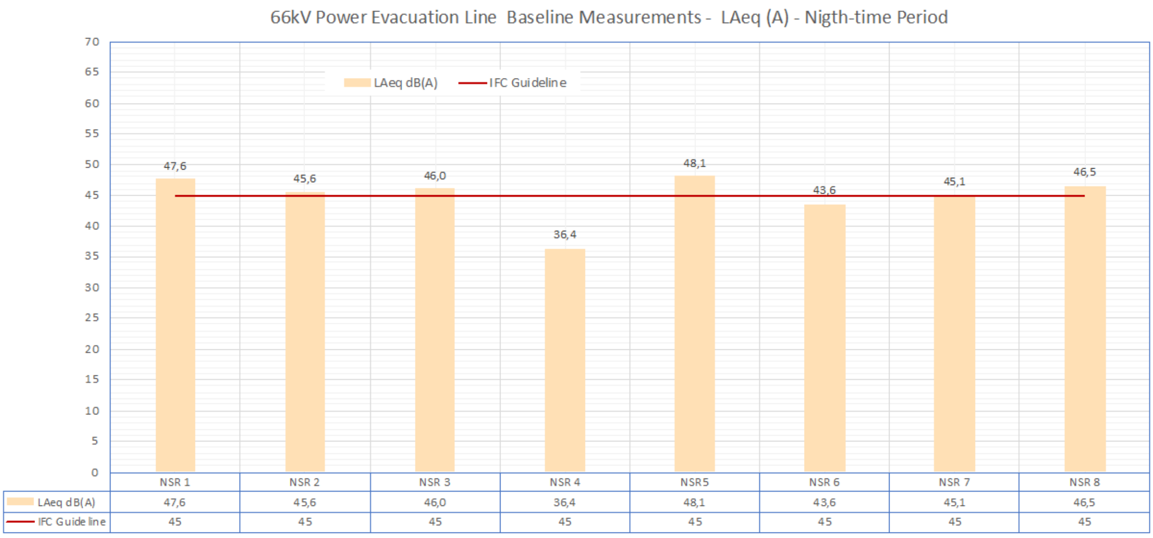


Figure 6-17 – Night-time baseline noise levels

Slight exceedances of the night-time applicable noise guideline (45 dB(A)) could be verified, but as could be observed by the Consultec noise surveyor team, the predominant noise is from natural origin (wind, nocturnal wildlife and nocturnal insects) and by human activity like people talking, moving around near the evaluated human settlements.

Noise baseline summary

Globally, the acoustic environment of the project area of influence can be classified as good, with low acoustic levels being typical of natural/rural areas that are mainly influenced by natural acoustic sources (such as wind and fauna) and by some vehicular traffic noise along the N2 roadway. Exceedances of the WHO/IFC recommended noise guidelines for the daytime (LAeq 55 dB(A)) were found in only one sampling location (NSR 7). The night-time (LAeq 45 dB(A)) was slightly exceeded in several sampling locations but essentially due to natural noise sources and due to human activities found within the settlements. The results from this noise survey are consistent with the inventory of the existing noise sources, as described previously in the baseline characterization.

6.1.3 Air Quality

6.1.3.1 Air quality standards and guidelines

In general, air quality standards aim to safeguard public health and the protection of ecosystems. They are established taking into consideration the different forms of absorption of gaseous compounds or particulate matter present in the atmosphere. Air quality standards in Mozambique are established through Decree No. 18/2004, of 2 June (Regulation on Environmental Quality Standards and Effluent Emissions), as amended by Decree No. 67/2010, of 31 December.

These regulations define ambient air quality standards and pollutant emissions limits for several types of fixed and mobile sources. At present, Mozambique has ambient air quality standards for sulphur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), and Total Suspended Particulate Matter (TSP). Table 6-8 lists Mozambique's ambient air quality standards.

Table 6-8 – National ambient air quality standards

Pollutant	Unit	Concentration	Averaging period
Total Suspended Particles (TSP)	µg/m^3	150	Average daily maximum
		60	Annual average
Nitrogen Dioxide (NO_2)	µg/m^3	190	Average hourly maximum
		--	Average hourly maximum
		10	Annual average
Sulfur Dioxide (SO_2)	µg/m^3	500	Instantaneous value – 10 min average
		800	Average hourly maximum
		100	Average daily maximum
		40	Annual average

Pollutant	Unit	Concentration	Averaging period
Carbon Monoxide (CO)	µg/m³	30 000	Average hourly maximum
		10 000	8 hour maximum
		60 000	30 min maximum
		100 000	15 min maximum
Ozone (O_3)	µg/m³	160	Hourly maximum value
		120	8 hours maximum
		50	24 hours maximum
		70	Annual average

Source: Decree No. 18/2004, as amended by Decree No. 67/2010.

Mozambique has yet to establish standards for particulate matter with size up to 10 µm (PM10). In the absence of national standards, the World Health Organization (WHO, 2021) standards for this pollutant were considered: maximum concentrations of 45 µg/m³ (24-hour averaging period) and 15 µg/m³ (annual averaging period). For reference, Table 6-9 presents other relevant international air quality guidelines, namely those established by WHO, European Union and South Africa, in comparison with Mozambique's standards.

Table 6-9 – Comparison of national and international ambient air quality standards

Pollutant	Averaging Period	Mozambique (µg/m³)	WHO (µg/m³)	European Union (µg/m³)	South Africa (µg/m³)
PM10	24 hours	--	45	50	--
	1 year	--	15	40	--
SO2	Instantaneous	--	--	--	500
	1 hour	800	--	350	--
	24 hours	100	40	125	125
	1 year	40	--	20	50
CO	1 hour	30 000	--	--	--
	24 hours	10 000	4 000	10 000	--
NO2	1 hour	190	--	200	376
	24 hours	--	25	--	188
	1 year	10	10	40	94

6.1.3.2 Emission sources

The Project area presents a predominantly rural and natural (non-disturbed) character. The proposed transmission line route cross one main primary road and a low number of human settlements. Some relevant sources of atmospheric pollutant emission can be identified as summarized below:

- Road traffic – line source responsible for the emission of gaseous and particulate emissions, generated by internal combustion vehicles exhaust emissions and vehicle entrainment on unpaved roads;
- Miscellaneous fugitive dust sources – area sources of dust emissions, generated by wind erosion from open areas (with low vegetation cover);

- Household fuel burning – gaseous and particulate emissions from household fuel burning found in human settlements; and
- Biomass burnings – gaseous and particulate emissions from biomass burning, including wildfires and slash-and-burn agricultural practices.

Road network - In Mozambique, roads are classified as primary, secondary, or tertiary in nature. Most primary roads have been recently upgraded and have a generally good quality infrastructure. The country's traffic density can be classified in general terms, as low across all existing networks. The main roadways crossed by the one of the transmission line alternatives is the N2. Given the restricted vehicle activity in the area, vehicle entrainment of dust and vehicle exhaust emissions are anticipated to be of minimal significance. As such, no heavy air pollution is expected to arise from vehicular traffic across the study area.

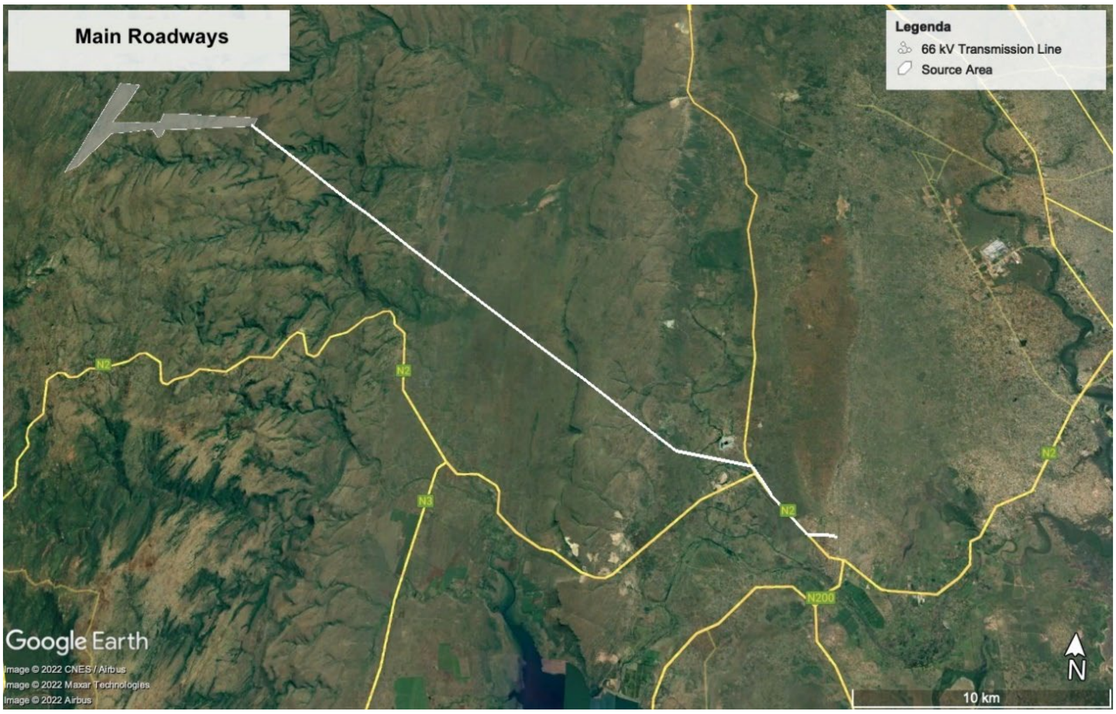


Figure 6-18 – Road Network in the project region

Miscellaneous fugitive dust sources - Fugitive dust emissions can be generated from wind erosion in open areas, such as newly planted farming areas, scarcely vegetated areas and others naked soil exposed areas. The extent, nature and duration of agricultural activities and/or the moisture and silt content of exposed soils are required to be known to quantify fugitive emissions from this kind of dust potential emitting source since the quantity of wind-blown dust is a function of the wind speed, the extent of exposed areas and the moisture and silt content of such areas. Some open areas are expected to occur along the proposed project alignment which will constitute a fugitive dust airborne source. Farming activities occurs in the study area, but traditional sustenance agriculture accounts for the majority of farming lands, with low vegetation control. Considering the mainland uses along the proposed Project alignment, fugitive dust emissions can be a contributor to air pollution in the Project's region.

Household fuel burning - Energy use within the residential sector is given as falling within three main categories, namely: *(i)* traditional - consisting of wood, dung and bagasse, *(ii)* transitional - consisting of coal, paraffin and LPG, and *(iii)* modern - consisting of electricity (increasingly includes use of renewable energy). Except for the major cities, which are electrified, most human settlements in the Project's region resort to wood and coal as the main domestic energy sources. It should be noted, however, that it is unlikely that household fuel burning emissions levels are sufficient to cause exceedances to the Mozambican air quality standards.

Biomass burnings - Biomass burning includes the burning of evergreen and deciduous forests, woodlands, grasslands, and agricultural lands, and may result either as wildfires or as human induced fires, as part of a slash-and-burn agricultural practice. Biomass burning is an incomplete combustion process, with CO, methane and NO_2 gases being emitted to the atmosphere. Approximately 40% of the nitrogen in biomass is emitted as nitrogen, 10% is left is the ashes, and it may be assumed that 20% of the nitrogen is emitted as higher molecular weight nitrogen compounds. The visibility of the smoke plumes is attributed to the particulate matter content.

Prior to the rainy season, from July up to September/October a considerable number of set fires which aim to clear new areas for traditional agriculture are expected to occur in rural areas. Slash-and-burn practices are common in this region, and this type of biomass burnings can be a significant emission source of Particulate Matter and NO_2, mainly.

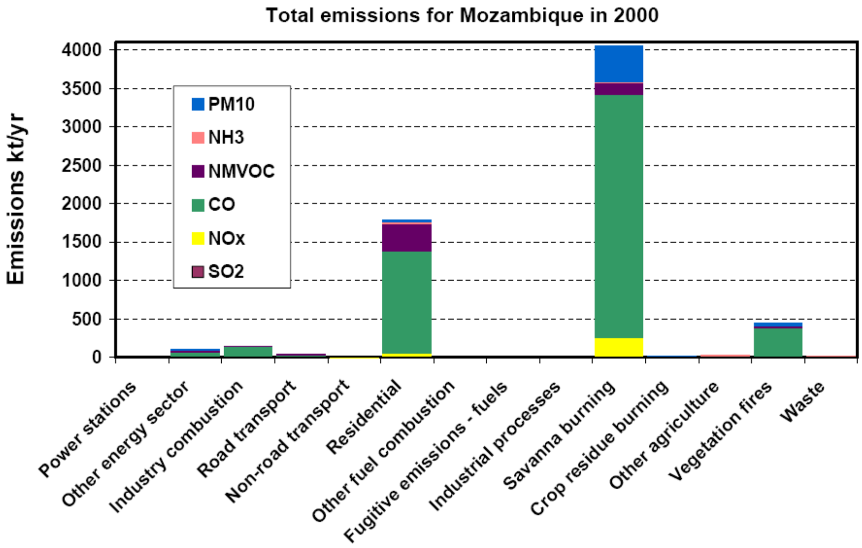
6.1.3.3 Air quality baseline characterization

In Mozambique the degree of industrialization is still low in general, but already relevant in and around cities like Maputo, Beira and Matola. In these locations, pollution may result, among other reasons, from the combined effect of industrialization, waste management problems and automobile traffic-related emissions (particularly CO_2, CO, NO_x). Uncontrolled bush burning in rural zones is other of the main sources of pollutants. In fact, burning of biomass was the main source of particulate matter pollution, followed by industrial activities (Schwela, 2007). Schwela points to the uncontrolled burnings in rural zones especially as one of the main sources of emissions of air pollutants into the atmosphere resulting in air pollution. Crutzen & Andreae (1990) reinforce this thesis referring that, of the different pollutant emission sources, biomass burning assumes a significant relevance as atmospheric emission source in the tropics.

There is also significant emission of CO_2, methane (CH_4) and NO_2 in production, transportation and the use of vegetable coal in certain areas of the country (Sitoe, 2021).

Cumbane (2004) points to biomass burning is one of the main sources of emission of particulate matter into the atmosphere, followed by emissions from industrial activities. Cumbane & Ribeiro (2004) indicate that the main potential sources of pollutant emissions into the atmosphere in Mozambique are biomass burning of natural and/or induced occurrence, including the preparation of soil for subsistence agriculture; burning of household waste (urban solid waste); road vehicle traffic; open-air burning of solid waste; industrial activities and the burning of firewood and coal.

As seen Figure 6-19 below in the largest emission sources of pollutant gases into the atmosphere in Mozambique, in 2000, were caused by savannah burnings, followed by natural vegetation fires and residential fuel burning.



Source: adapted from Gondwe, Kenneth J., (APINA)

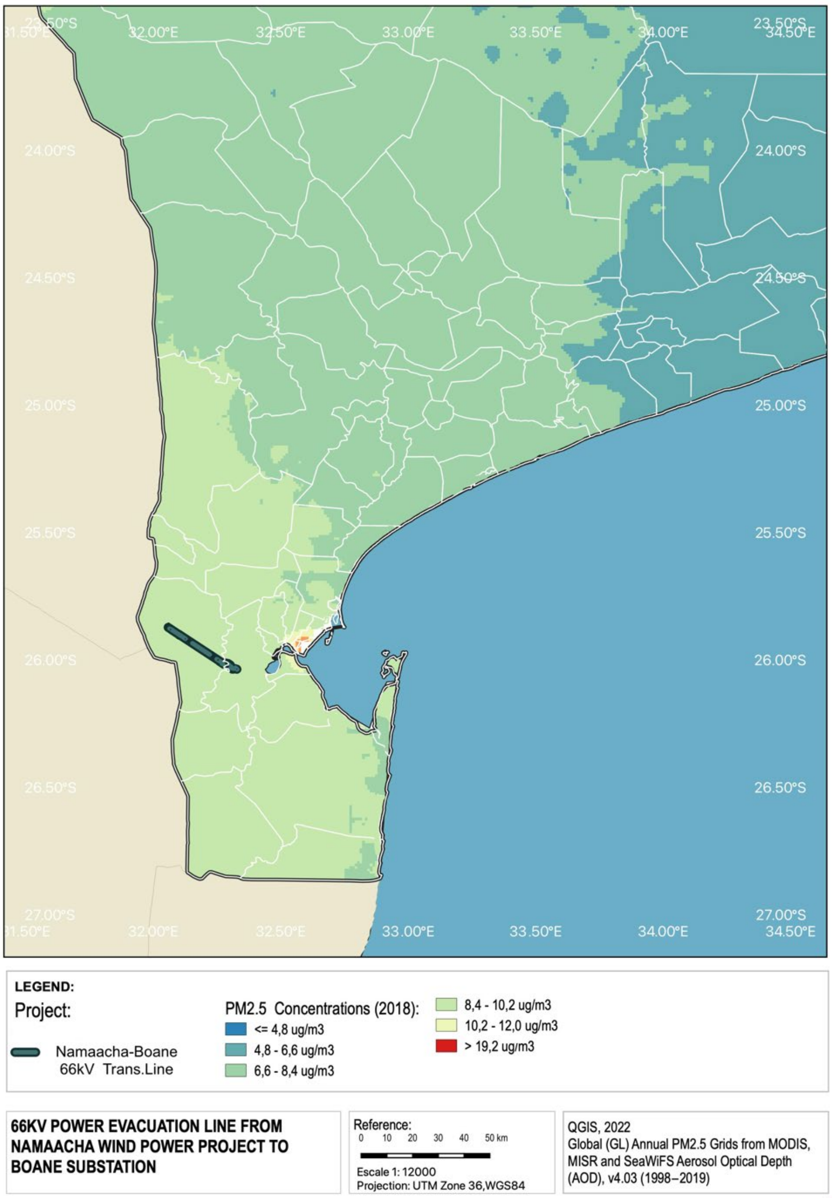
Figure 6-19 – Total emissions for Mozambique in 2000

Other sources of air pollution in Mozambique are: Industry (manufacturing, services), transport, power generation (corporate utilities, households), agriculture and waste (Cumbane, 2011). Taking into account the system of household production and the use of widespread practice of burning in Mozambique, agriculture is also responsible for the emission of air pollutants, mainly greenhouse gases (MTA, 2014).

No air quality monitoring network (and data) is available from air quality monitoring stations in Mozambique. As such, a qualitative assessment of the existing air quality is presented based on literature review and considering the major pollution emission sources that may be expected to be present in the study area Secondary data was retrieved through international databases as the NASA's Earth Observing System Data and Information System and the European Copernicus Monitoring Service.

Particulate Matter

Figure 6-20 represents the modelled estimate of PM2.5 (particulate matter with a diameter of less than 2.5 µm), within the ADI according with the NASA's Earth Observing System Data and Information System for the period 1998-2019 (MODIS/MISR and SeaWiFS Aerosol Optical Depth, V4.03 prediction Model).



Source: Adapted from NASA's Earth Observing System Data and Information System (EOSDIS, 2019).

Figure 6-20 – PM2.5 concentrations distribution (µg/m³)

Based on the above, the background concentration of Particulate Matter with a diameter of less than 2.5 µm (PM2.5) in the project area ranges between a minimum of 8.4 µg/m³ up to a maximum of 10.2 µg/m³.

In what regards the background concentration of Particulate Matter with a diameter of less than 10 µm (PM10), Seinfield & Pandis, suggest that globally background concentrations for particulate aerosols, among them PM10, have concentrations of 5 µg/m³ in remote locations, 15 µg/m³ in rural zones and 32 µg/m³ in urban areas.

Nitrogen Dioxide

Figure 6-21 illustrates the Nitrogen Dioxide (NO_2) concentration at surface level expressed as 24h average during the 2022 dry season (June 2022) from the EAC4 (ECMWF Atmospheric

Composition Reanalysis 4) datasets grids published by the Copernicus Monitoring Service within the project region. As can be visualized below, NO_2 at surface ranges between 0.40 and 0.80 ug/m^3 along the Transmission Line route, thus below both WHO, 2021 Air Quality Guidelines (25 ug/m^3 24h average) and below the National Decree nº 67/2010 (set as 10 ug/m^3 Annual average) as well.

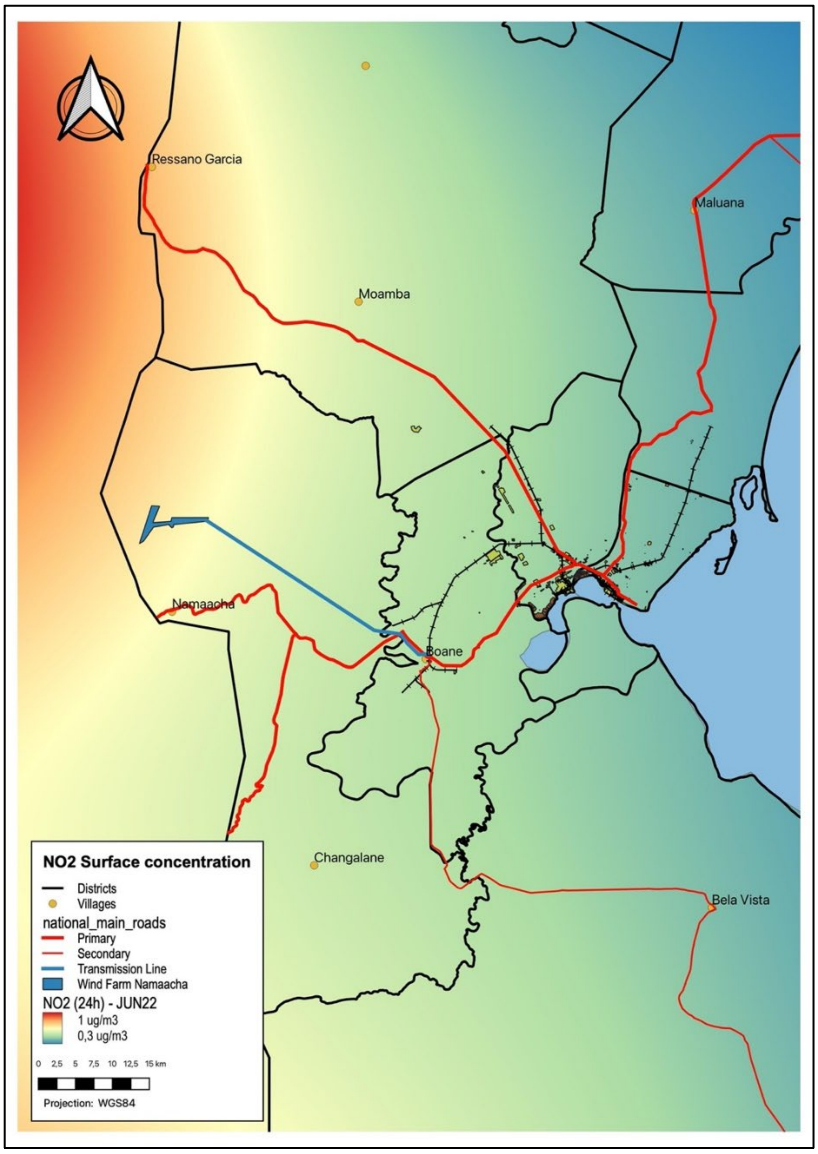


Figure 6-21 – NO_2 surface concentration

6.1.3.4 Air quality sensitive receptors

Along the Transmission Line pathway scattered dwellings, small communities and cultivated fields and a school have been identified. A consolidated urban area near the Boane Substation has been identified as well. No health centers are to be found in the direct influence area of the transmission line. Figures below illustrate those receptors along the route that will be sensitive to any long-term air quality impacts. For short-term impacts, the entire AoI should be considered as sensitive.

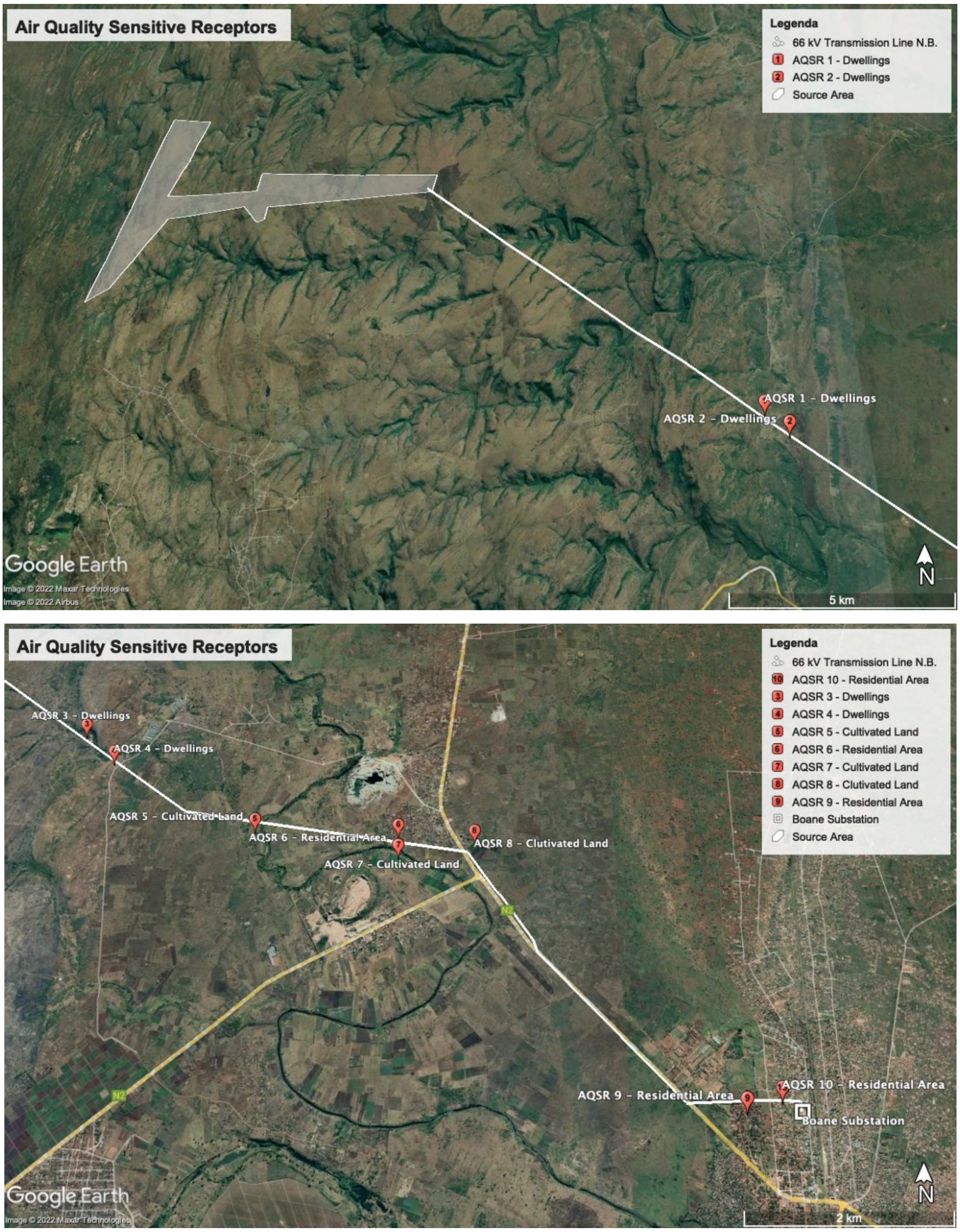


Figure 6-22– Air quality sensitive receptors

6.1.3.5 Baseline summary

Few atmospheric pollution emission sources were identified in the Project area, and none of them are of high intensity. Considering the low significance of the existing emission sources along the project area and based on the background concentrations of atmospheric pollutant, as discussed above, the ambient air quality of the study area can be described as being relatively good. The ambient levels of key pollutants, such as Particulate Matter and Nitrogen dioxide are low and in full compliance with the limit values established by the national air quality standards. In conclusion, the ambient air quality is expected to be relatively good as the study area will fall mainly in mostly undeveloped and rural areas with one significant residential area near the Boane substation.

6.1.4 Geology

The geological assessment of the study area was based on literature review. Of the several bibliographic sources reviewed, special mention should be made to the geologic maps of the National Directorate of Geology (1:250 000), in particular sheets 2531/2532 and 2632 that cover the study region.

The following sections present the geologic characterization of the study area. Information is provided both at a regional point of view and at a more local perspective, focused on the corridor surrounding the proposed power lines.

6.1.4.1 Geomorphology

Physiographically, the Mozambican territory is divided into four zones (Afonso *et al*. 1998). These units (see below) are delimited by more or less accentuated escarpments and, as a general rule, the altitude progressively increases from the coast to inland.

- **Mountainous Zones**, with elevations of more than 1000 m. This region occurred as a result of the permo-carbonic Gondwana movements. The mountain tops and ridges are intrusive-tectonic in metamorphic formations of the Upper Archaean and Proterozoic Eras.
- **Great Plateau Zone**, with elevations from 500 to 1000 m, resulting from the erosive cycle associated with the break-up of the Gondwana during the Lower Cretacic. These are characterised by erosive-denuded surfaces, ruffled by granitic inselbergs carved in the Pre-Cambric formations and Karoo rocks.
- **Middle Plateau Zone**, with elevations from 200 to 500 m, resulting from the tilting movements during the middle Tertiary. These regions have flat areas, depressions, volcano-sedimentary rock surfaces and accumulation lowlands.
- **Great Coastal Plains Zone**, with elevations of less than 200 m, attributed to the Congo cycle, which probably initiated in the Plio-Pleistocene. This zone, dominated by tertiary and quaternary sediments, covers the region south of the Save River and the coastal strip.

The study area crosses several geomorphological units, from the Lebombo Mountains to the alluvial plain in Boane (Figure 6-23).

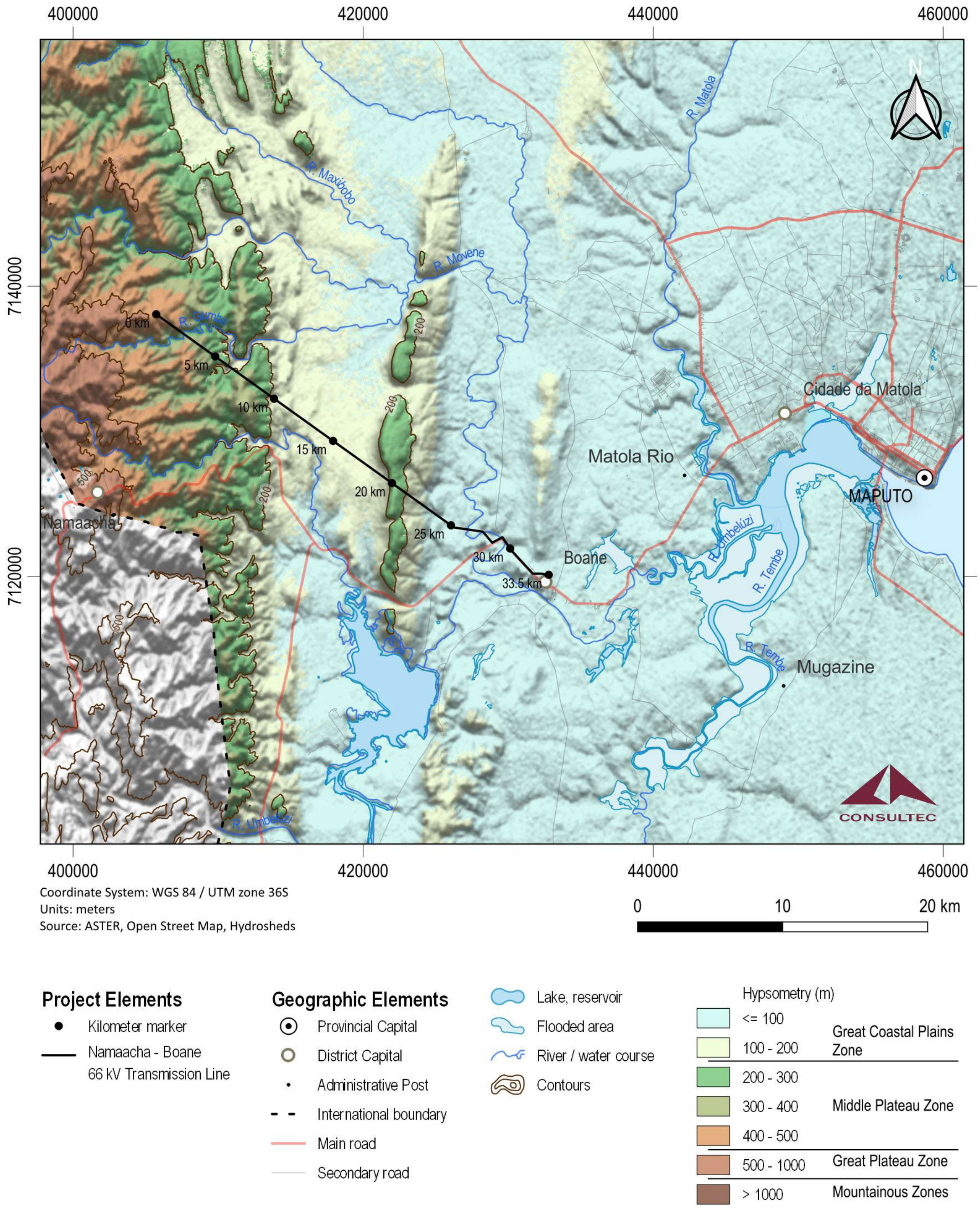


Figure 6-23 – Hypsometric map

The transmission line begins above 450 m in the transition zone between the medium and high plateaus. This first part of the route, with a length of about 10 km, corresponds to an area of more rugged relief as a result of crossing several valleys and water lines that cut the comfort, highlighting the Gumbe River valley at pk 2+200, which bottom is at 255 m, located about 140 m below the top of its slopes (175 left slope and 105 right slope).

From pk 9+500, the line enters the great coastal plain, crossing a small relief flattened between pk 19+680 and pk 21+285. In the Movene River valley, the line is deployed in flattened areas at elevations below 50 m. Figure 6-24 shows the topographic profile along the powerlines with an overelevation of 15 times.

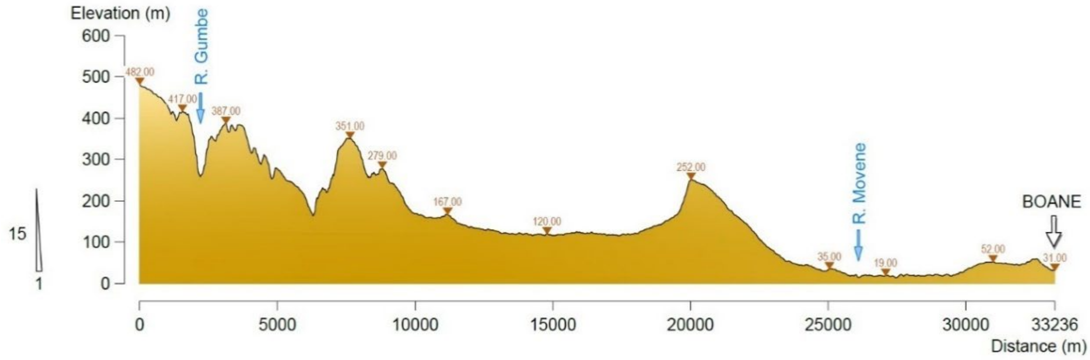


Figure 6-24 – Topographical profile of the transmission line route

At the geomorphological level, in the study area, the transmission line crosses two distinct morphological structures:

- Accumulation reliefs, in particular, lowered valley bottoms with alluvial deposits
- Volcanoes and lava covers, particularly, Jurassic rhyolite massifs and denuded basaltic mantles from the lower Jurassic.

The denuded lower Jurassic basaltic mantles are morpho-structures widely represented in southern Africa, related to fracture volcanism.

The Lebombo Mountains, also called Lubombo Mountains (Portuguese: *Montes Libombos*), are a narrow (~30km) range of mountains in Southern Africa and Mozambique (the name of the mountains is derived from the Zulu word *ubombo* meaning "big nose"). They stretch from Hluhluwe in KwaZulu-Natal in the south to Punda Maria in the Limpopo Province in South Africa in the north, and parts of the mountain range are also found in Mozambique and Eswatini (Watkeys, 2002).

In Mozambique, the *Montes Libombos* are located from the Limpopo River to the Maputo River, bordering with the coastal plain. They are constituted by two mountainous alignments: (i) The *Pequenos Libombos*, bordered directly by the coastal plain, extend from the vicinity of the Incomati River to Changalane, with a maximum altitude of 291 m, and (ii) The *Grandes Libombos*, extend over 500 km on the western border of the region and have an average altitude of 580 m, the highest altitude being located on Mount Imponduine, north of the Namaacha Town (809 m).

Geologically the Lebombo Mountains are a monocline - a 600 km long and 5–30 km wide linear flexure (N-S and dips to the east) along the border between South Africa and Mozambique. It is composed of a sequence of Jurassic age volcanic rock, both basaltic lavas and rhyolitic flows and tuffs. The sequence rests on essentially horizontal Karoo Supergroup sedimentary rocks of the Kalahari Craton to the west and is overlain by Cretaceous to recent sediments to the east.

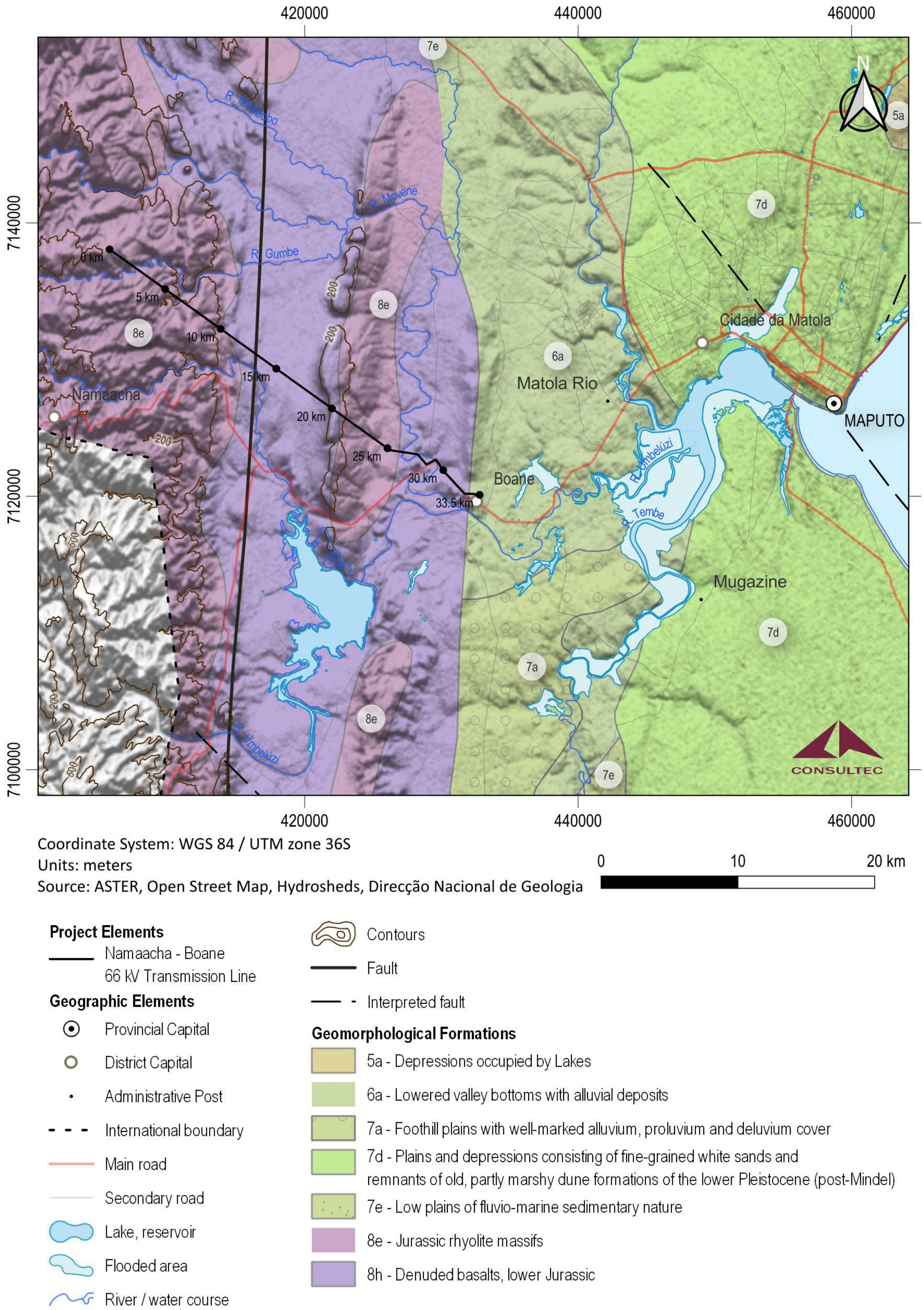
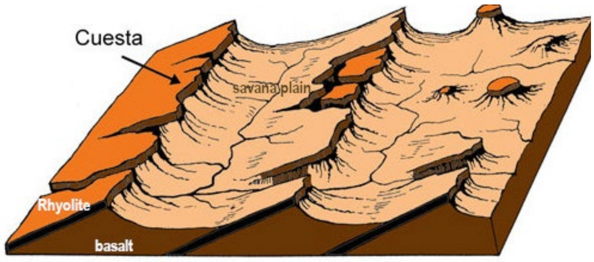


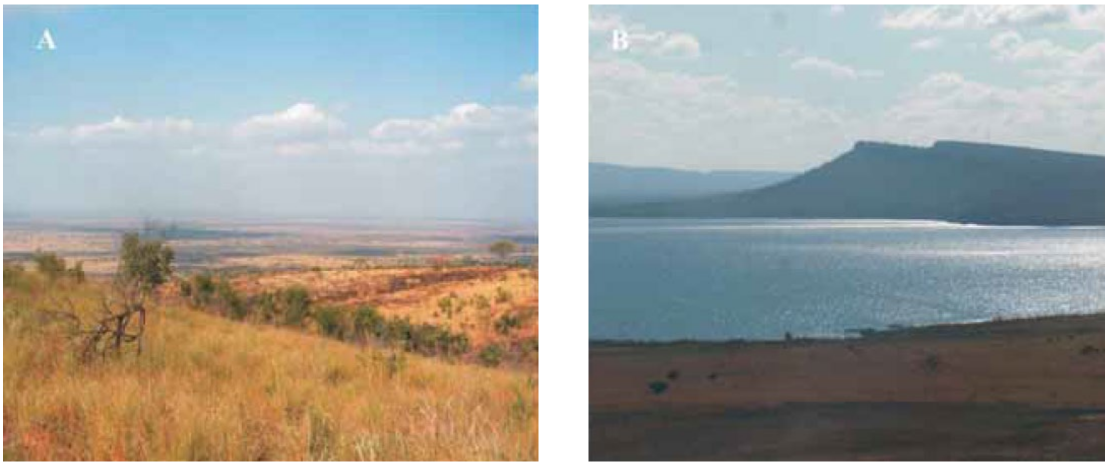
Figure 6-25 – Excerpt from the Geomorphologic Map

Source: DNG (1983)

In the Lebombo monocline, mafic and felsic volcanism occurred in pulses, and rhyolites forming the “Great” (Grandes) and “Little” (Pequenos) Lebombo mountains are interlayered with Movene basalts. As basalts are poorly exposed due to intense weathering and soil formation, they generally form plain savannas. The most exposed rocks are rhyolites that form cuesta-type geomorphology, slightly tilted to east. Hence, the regional geomorphology is characterised by alternation of cuestas and plane valleys (Figure 6-26).



When the rocks are uplifted by the mountain building process and are tilted in one direction, erosion of the softer, less resistant rock occurs leaving a ridge of the more resistant rock. If the angle of dip is low, the ridges are called Cuestas



a) Typical geomorphology of Lebombo monocline associated basalt plain savannas in Mozambique. b) Rhyolites of the Pequenos Libombos Mountain, slightly tilted cuestas ~40 km SW of the city of Maputo (adapt form: Manninen *et al*, 2008).

Figure 6-26 – The alternating resistant rhyolite and easily eroded basalts produce a series of parallel sharp cuesta ridges separated by savanna plains

6.1.4.2 Geological framework

Mozambique has a rich and complex geology, including formations as old as the Mesoarchaic age (3200 million years), occupying one third of the country, mainly in the centre and southern regions and in the NE coastal strip, to formations of the Quaternary age.

The Mesozoic Karoo large igneous province is one of three continental flood-basalt provinces that are associated with voluminous, possibly plume related magmatism at ~183 Ma and subsequent break-up of the Gondwana supercontinent during the Early-Middle Jurassic period. Volcanic and intrusive rocks belonging to the Karoo province are widespread in southern Africa, but they are also found in western Dronning Maud Land, Antarctica.

The Karoo volcanic rocks, which generally overlie various sedimentary formations of the Karoo Supergroup, consists mainly of tholeiitic to picritic lava flows, felsic pyroclastic rocks, and related dyke swarms and sills, emplaced prior to the break-up of Gondwana and the opening of Indian Ocean.

The Karoo always occurs in Mozambique in superimposed depressions, graben-type structures or volcanic zones (chains). In contrast to the classic Karoo Basin in South Africa, the Karoo in Mozambique is always controlled by tectonic zones of weakness, lineaments, fractures, structural sutures as well as ancient mobile belts. In the study area it occurs in Volcanic zones (chains), i.e., the Lebombo Mountains.

Local geology

The description of geological formations in the study area is based on GTK Consortium mapping of the Karoo volcanic rocks and related hypabyssal intrusions in southern and central Mozambique and of the quaternary deposits, subdivided into Pleistocene deposits such as the Internal Dunes, Fluvial Terraces, Coastal Sandstones (or 'Beach Rock') and Lacustrine Limestones and Holocene deposits such as flood plain deposits of a sandy-clayey or mud composition. Figure 6-27 shows an overview of the geological formations in the study area.

The dominant geologic units in the study area are the Upper Karoo, the Movene and Umbeluzi Formation. To a lesser extent, Tertiary and Quaternary formations of sedimentary nature occur.

Table 6-10 and identifies the geologic units intercepted by the project (powerlines) and the respective symbology that can be found on the map (Figure 6-27 below).

Table 6-10 – Geologic Formations Intercepted by the Project

CODE	GROUP | SUITE FORMATION	LITHOLOGY	ERA PERIOD	EXTENSION
TeB	Boane Formation	Silstone, conglomerate	Paleocene Pliocene	1 047.9 m
JrM	Upper Karoo | Movene	Basalt	Jurassic	15 222.1 m
JrMr		Pequenos Limbombos; Member; rhyolite		4 899.7 m
JrMq		Quartz latite		784.1 m
JrUr	Upper Karoo | Umbelúzi	Rhyolitic ash-flow tuffs and ignimbrites		11 283.0 m

Source: Consórcio GTK (2006)

Umbelúzi Formation

A smoothly E-dipping succession of dacitic and rhyolitic rocks assigned to the Umbelúzi Formation overlie basalts of the Sabie River Formation, comprising high-grade ignimbrites, pyroclastic ash-fall deposits, and random lava interflows.

In the Lebombo Mountains, rhyolitic flows form smoothly (~10 – 15°) east tilting terraces, with thickness of single flows probably ranging from some tens of metres up to 200 – 300 m. Although the rhyolitic rocks generally show gentle dips, patterns developed during the emplacement and cooling of single flows, including shrinkage jointing and ramp structures, may occasionally show variously steep, or even vertical attitudes. In addition to rhyolitic rocks, the Umbelúzi Formation also includes minor interflows of basaltic lavas and subvolcanic sills and dykes.

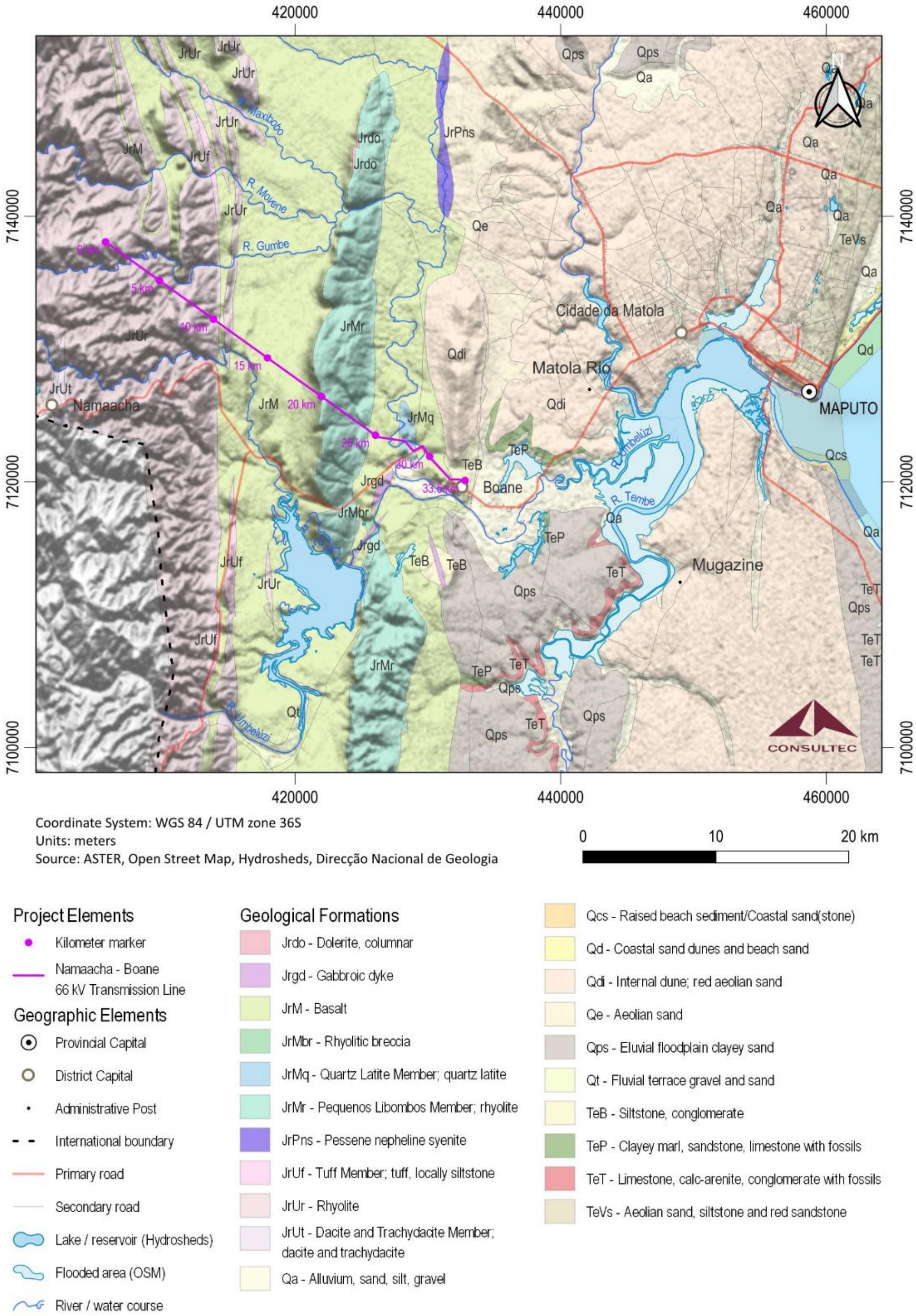


Figure 6-27 – Geological formations in the study area

Movene Formation

The Movene (Basalt) Formation represents the uppermost lithological unit of the Lebombo Monocline. Dominating the fertile lowlands between the rhyolitic Lebombo mountain range in the west and Quaternary formations in the east, the Movene Formation mostly comprises a succession of basaltic lava flows but includes also intercalated rhyolite flows of the Pequenos Libombos Member in the upper part of the basaltic lava pile.

Boane Formation

Rocks attributed to the Boane Formation (previously Boane Sandstone Formation) are exposed in a few small polygons around and south of the Boane town. The lithology is predominantly siltstone and slightly sandy siltstone. Texturally these siltstones are highly immature and consist of a deeply weathered feldspathic framework resulting in a friable, poorly consolidated rock.

These highly immature, thoroughly weathered siltstones are derived from distal (peri) volcanic erosion products, including tuffs. Combined traction (channel) and gravity sliding took place on an unstable, low-angle slope dipping towards the east. Some traction transport and deposition were shortly followed by gravity sliding. This scenario supposedly reflects an unstable continental margin during incipient rifting.

6.1.4.3 Mineral Resources and Mining Titles

Industrial Minerals and Rocks In Mozambique many deposits and occurrences of industrial minerals and rocks are known to occur in basement rocks as well as in the Meso–Cenozoic cover. Although an evaluation of these occurrences indicated during successive investigations that such minerals could be mined economically, only some minerals were exploited and this predominantly for local use.

Figure 6-28 shows the location of mineral deposits and occurrences (DNG, 1998 and 2004) referenced for the study area.

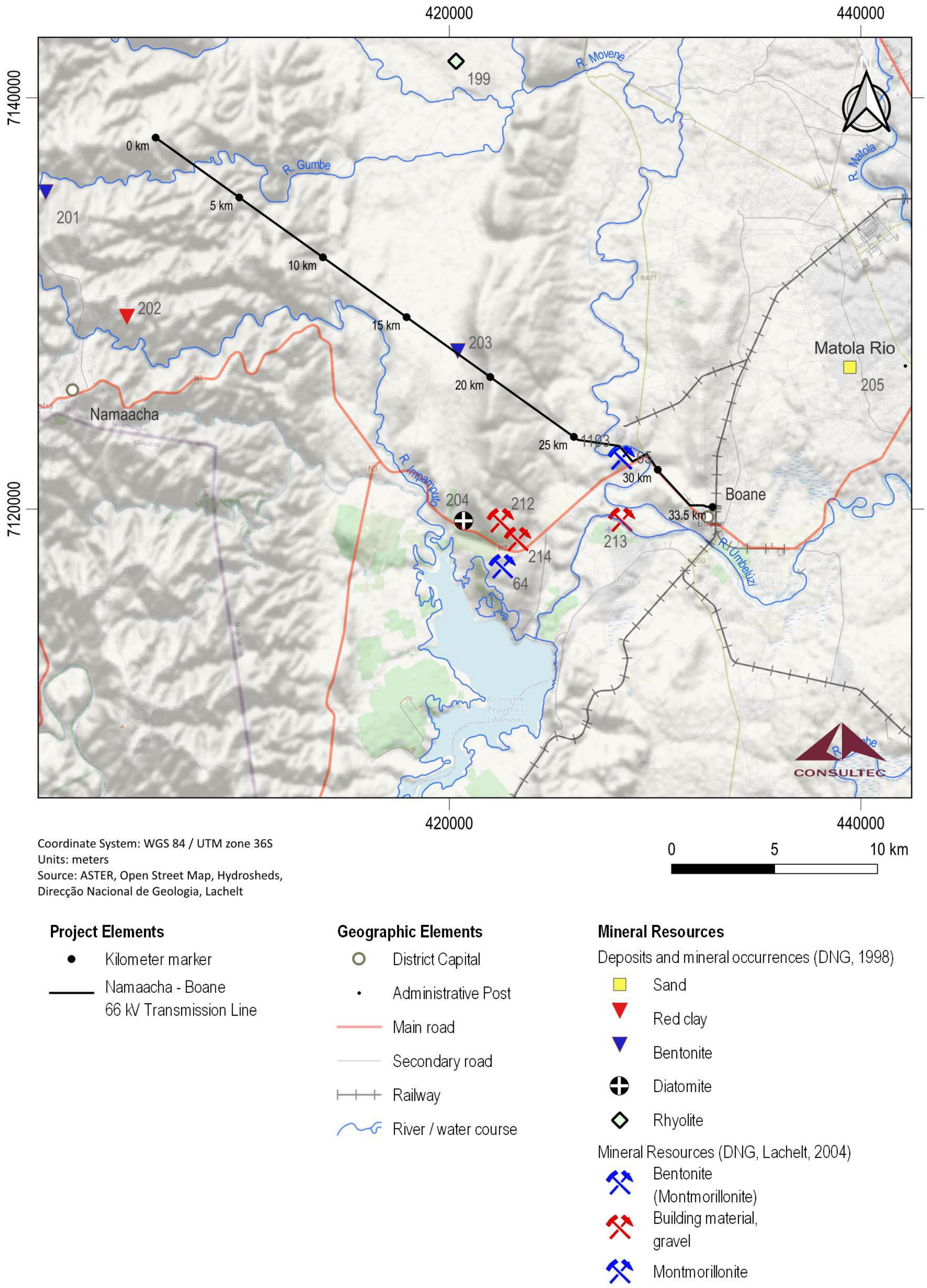


Figure 6-28 – Known mineral resources in the study area

Mining Cadastre

The mining industry in Mozambique has been making great strides in recent years. Many investors have come to Mozambique in search of coal, heavy sands, gold, ruby, gas, and oil, among others.

The country has a higher occurrence of minerals in the central and northern areas. Currently, it is possible to observe the large-scale evolution of mining activities and their contribution to the country's development, specifically in the regions (provinces) where geological resources occur and where they are traded.

Obtaining a mining title is necessary to carry out mining activities in Mozambique. This title may be a license or an authorization, which are distinguished in that the license confers the right to carry out an activity the law prohibits (except when the Government, through a license, permits it). The authorization allows someone to exercise a pre-existing right. The following table lists the mining titles registered in the study area and can be observed in Figure 6-29.

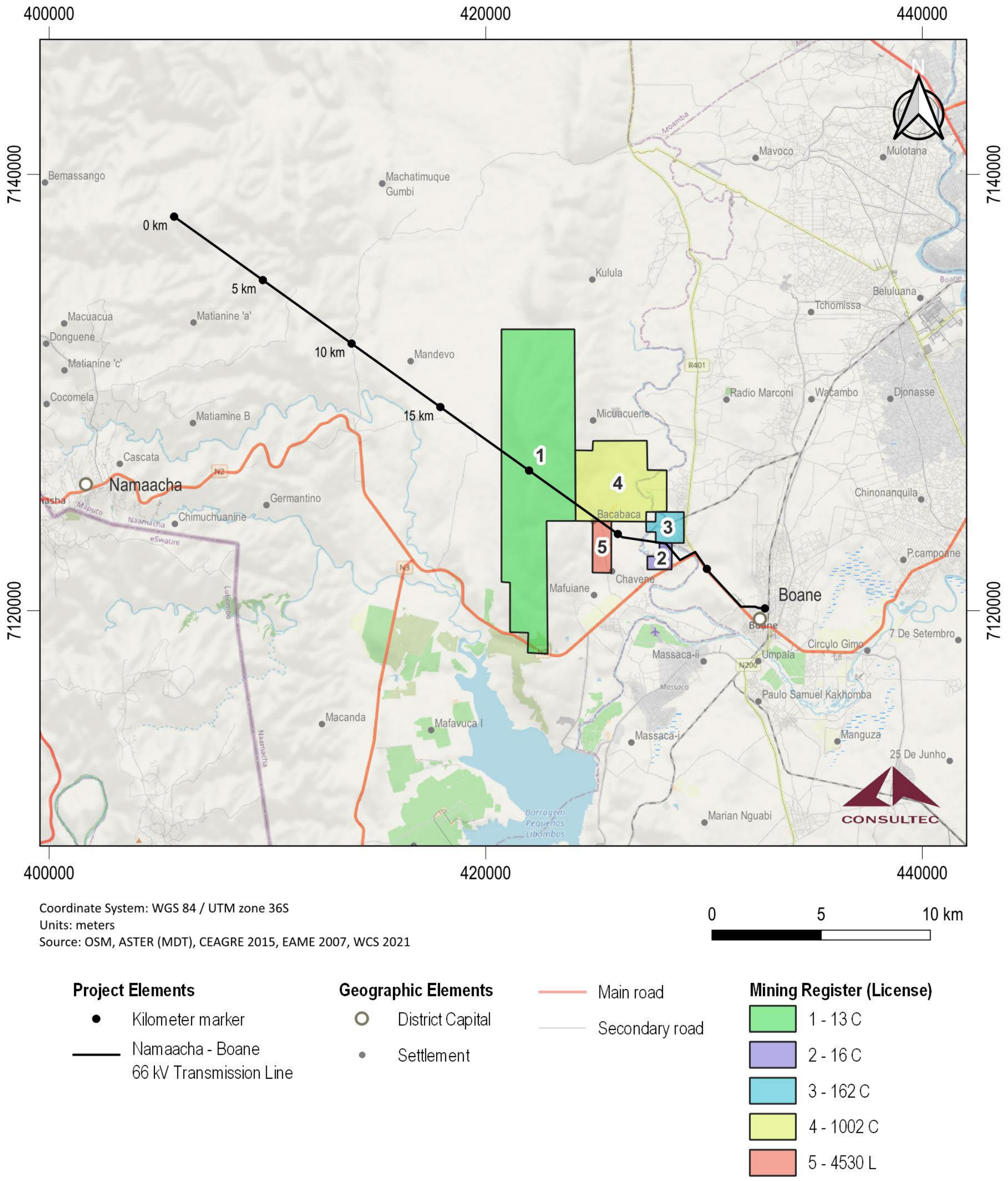


Figure 6-29 – Mining cadastre

Table 6-11 – Registered mining titles crossed by the powerline

CODE	COMPANY NAME	PRODUCT	CONCESSION AREA (ha)	STATUS
Prospecting and Research License				
4530 L	Namaasha Mining, Lda	Bentonite	192,42	Valid title
Mining Concession				
13 C	Riólitos, Limitada	Rhyolites	3 965,01	Valid title
1002 C	MIMOC – Minerais Industriais de Moçambique, Lda	Bentonite	1 347,25	Valid title
16 C	Sulbrita, Limitada	Rhyolites	102,62	Title pending extension
162 C	Probrita S.A.R.L.	Construction stone	192.43	Title pending extension

Source: MIREME (2023)

The following table shows the main known applications of the mineral resources that are the subject of current mining titles. “Construction stone” is a generic term that can refer to various types of natural or artificial stones that are used in construction projects. These stones can be used for a variety of purposes, such as building walls, foundations, or decorative features.

Table 6-12 – Main known applications of the identified resources

Rhyolites	**Construction**: Rhyolite can be used as a building material for both interior and exterior applications. It is commonly used as a decorative stone for walls, floors, and countertops due to its unique colours and patterns. **Aggregates**: Crushed rhyolite can be used as a construction aggregate in concrete and asphalt mixtures. It provides good durability, strength, and resistance to weathering. **Jewellery**: Rhyolite is a popular material for making jewellery, particularly in the form of beads and pendants. Its unique patterns and colours make it an attractive material for jewellery makers. **Glass and ceramics**: Rhyolite can be used as a raw material for glass and ceramic production due to its high silica content. It can also be used as a glaze material for ceramics.
Bentonite	**Drilling**: Bentonite is widely used in the drilling industry as a drilling fluid, which helps to lubricate and cool the drill bit, carry rock cuttings to the surface, and maintain the stability of the borehole. **Foundry**: Bentonite is used as a bonding material in foundry sands to improve the performance of molds and cores in casting processes. It can also be used as a binder in iron ore pelletization and green sand molding. **Cat litter**: Bentonite is a popular material for making cat litter due to its high water absorption capacity and clumping properties. It can effectively absorb moisture and odours, making it an effective and convenient option for pet owners. **Geosynthetic clay liners**: Bentonite is used as a component of geosynthetic clay liners, which are used to line landfills, ponds, and other containment structures. The high water absorption capacity of bentonite helps to prevent leakage and contamination of the surrounding environment. **Pharmaceuticals**: Bentonite is used in the pharmaceutical industry as a binding agent and excipient in tablets, capsules, and other formulations. **Cosmetics**: Bentonite is used in cosmetic products, such as facial masks and body wraps, due to its ability to absorb excess oil and impurities from the skin. **Wastewater treatment**: Bentonite can be used as a coagulant in wastewater treatment processes to remove suspended solids and other contaminants from the water.

6.1.4.4 Seismicity

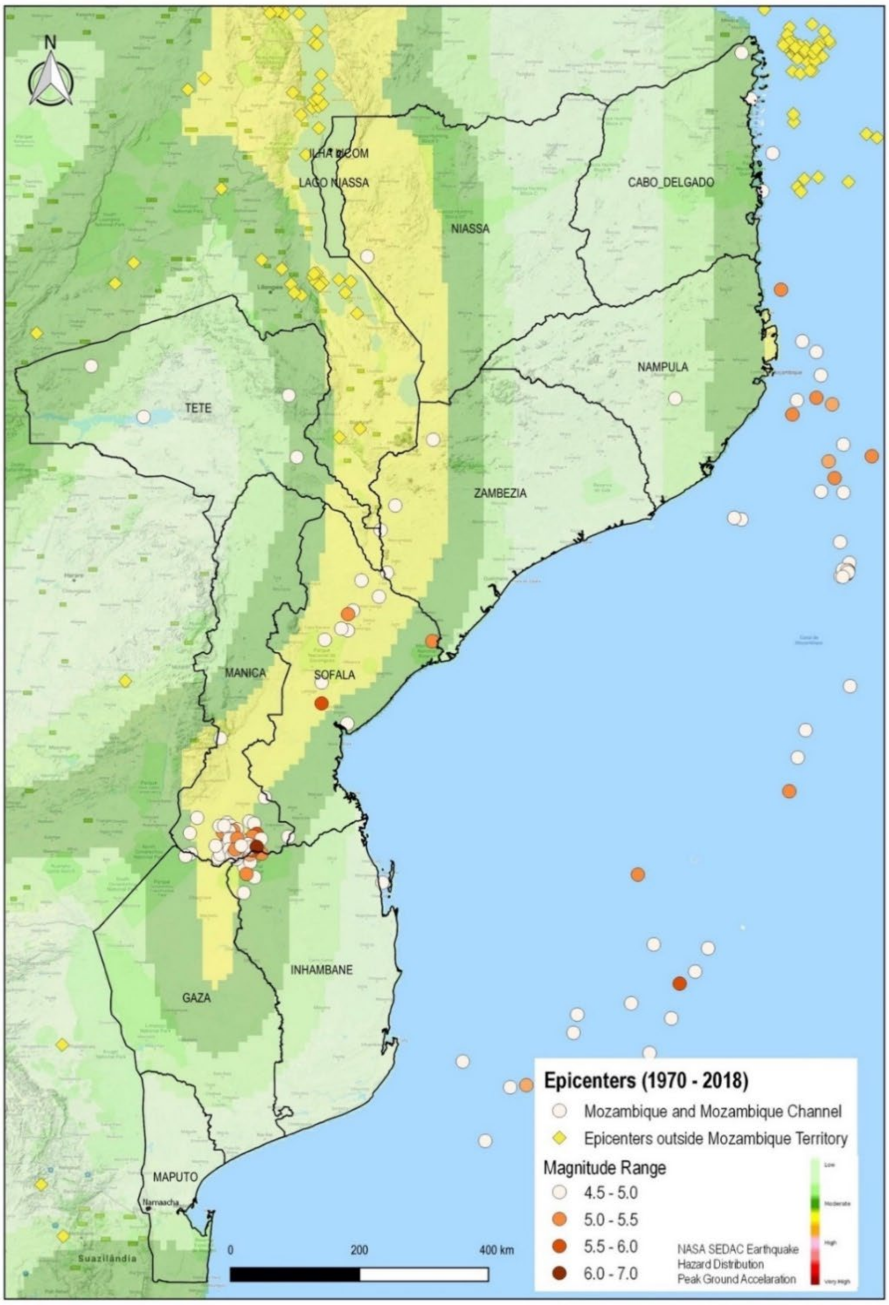
Central Mozambique is under the influence of the Great Rift Valley, which separates the Arabian, African and Indian plates, extending in a north-south direction from northern Syria to central Mozambique.

In Africa, the Rift begins in the Red Sea, in the separation of the African and Arabian plates, extending along the NW-SE direction to the Gulf of Aden. Then, it is directed south to the Urema region, within the African plate. Prolongations of this Rift to the south can also be observed in the area of Machaze (Manica) in the Graben region of Funhalouro, apart from others in the same region. The southern section is part of Lake Niassa, following the Shire River until it flows into the Zambezi River, about 250 km downstream from Moatize.

According to USGS (2018), 133 earthquakes of magnitude higher than 4.5 were registered in Mozambique between 1970 and 2018 (38 of which in the Mozambique Channel) (Figure 6-30). More than 75% of these had a magnitude of less than 5.0 (liquid oscillates in containers, sleeping people wake up), and 24% had a magnitude lower than 6.0 (difficult to stand up, cracks in saturated soils, small structural damages).

In Mozambique, only one earthquake measuring 7.0 (highest magnitude recorded) occurred on 22 February 2006 in the Machaze District in the south of Manica Province. Most of the epicentres of recent continental seismic activity were located in the Machaze region.

From the information presented, it can be concluded that the seismic activity in Mozambique is recurrent but generally of reduced magnitude. However, the recent tectonic evolution of the Miocene Rift system throughout East Africa, represented in Mozambique by the Lake Niassa - Chire - Urema - Sofala branch, may be responsible for an increase in the frequency of recorded earthquakes.



Source: USGS 2018.

Figure 6-30 – Earthquake epicentres with a magnitude greater than 4.5 between 1970 and 2018

6.1.5 Soils

6.1.5.1 Introduction

Soils are complex mixtures of minerals, organic compounds and living organisms that interact continuously in response to natural and imposed biological, chemical, and physical forces. The world's soil resources are finite, essentially non-renewable, unevenly distributed across several eco-regions and fragile to drastic disturbances.

Despite its inherent resilience, inadequate manage can lead to soil degradation or to the reduction of its quality. Soil sustainable use requires a full understanding of its properties and quality management processes, to ensure the preservation of its function and value for human beings.

Soil conservation is crucial because soil is a finite and non-renewable resource that takes hundreds or thousands of years to form. Once degraded, it can be difficult or even impossible to restore to its original state. Nex table summarizes the importance of soil conservation, overall, is essential for maintaining healthy ecosystems, protecting food security, and mitigating the impacts of climate change.

Table 6-13 – Soil conservation importance

Maintains soil fertility	Soil conservation helps to maintain soil fertility by preventing erosion, nutrient depletion, and soil compaction. This is important because soil fertility is essential for crop production and ensuring food security.
Prevents soil erosion	Soil erosion is a natural process, but it can be accelerated by human activities like deforestation, overgrazing, and improper land use practices. Soil conservation measures like contour plowing, terracing, and cover cropping can prevent soil erosion and protect valuable topsoil.
Protects water quality	Soil conservation practices can also help to protect water quality by reducing the amount of sediment and nutrients that enter waterways. This is important because sediment and nutrients can cause water pollution, harm aquatic life, and even pose a health risk to humans.
Mitigates climate change	Healthy soils are an important carbon sink, storing significant amounts of carbon in the form of organic matter. Soil conservation practices like no-till farming and cover cropping can help to sequester carbon in the soil and mitigate the impacts of climate change.

6.1.5.2 Soil Groups

The description of the soil units in the study area is based on the Soil Map of Maputo Province, at a scale of 1:1 000 000 (INIA, 1995), which allows the identification and description of the soil units in the study area (Figure 6-31).

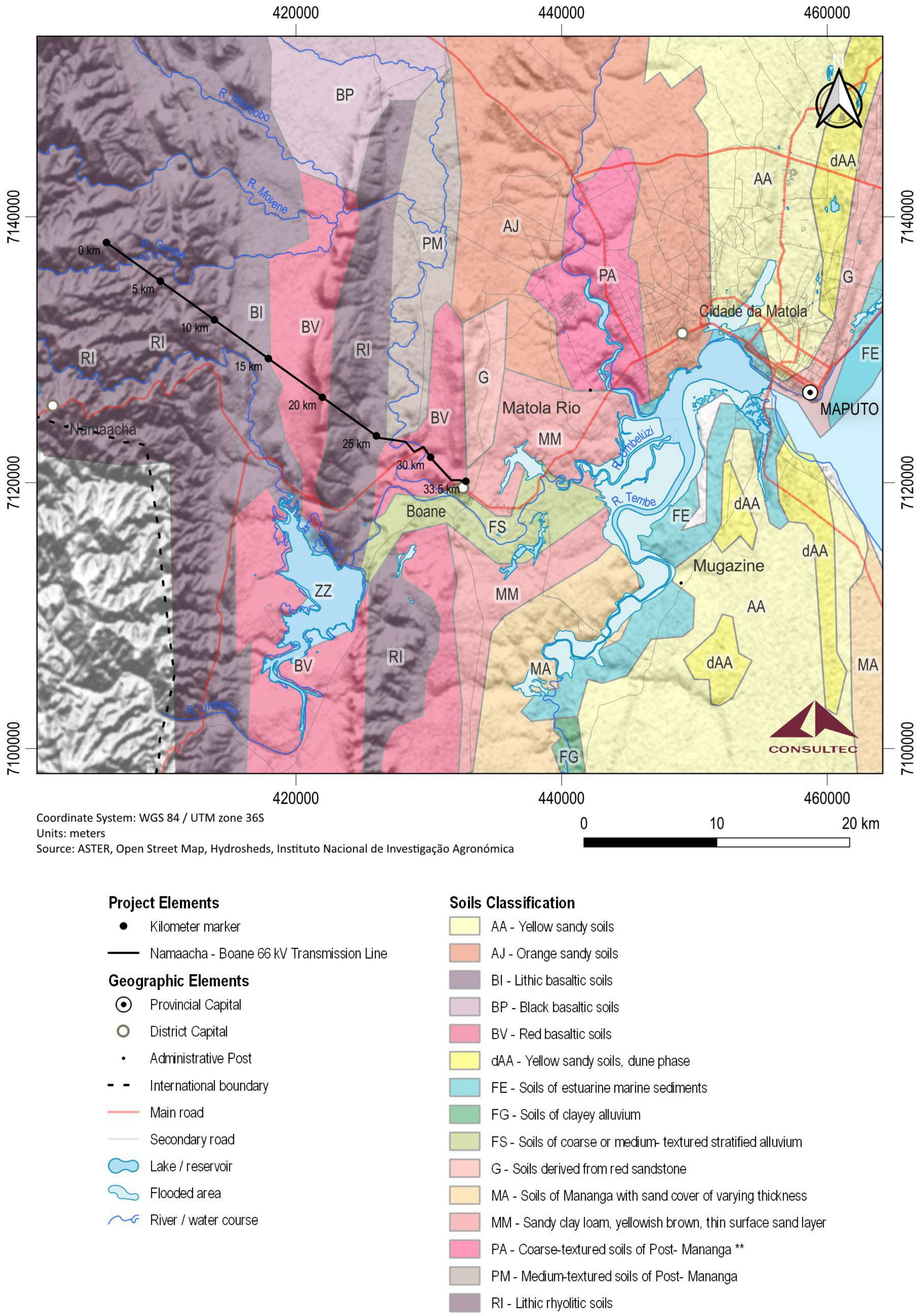


Figure 6-31 – Types of soils in the project area (see legend in Table 6-15)

The soils present in the study area originate from areas of igneous rocks, although the pedogenetic processes are the result of the interaction of several factors (Table 6-14), and their influence can vary depending on the specific location and environmental conditions.

Table 6-14 – Factors influencing pedogenetic processes

Parent material	The nature and composition of the parent material (rock or sediment) from which the soil is formed can influence the physical and chemical properties of the resulting soil.
Climate	Climate, including temperature and precipitation, plays a crucial role in soil formation. The rate of chemical weathering and organic matter decomposition is affected by temperature and moisture levels.
Organisms	Soil organisms, including bacteria, fungi, and animals, can significantly influence soil development. They play a vital role in nutrient cycling, organic matter decomposition, and soil structure formation.
Relief	Relief refers to the physical features of the landscape, such as slope, aspect, and elevation. These factors can affect soil formation by influencing the amount of sunlight, water, and wind exposure that a soil receives.
Time	Soil formation is a slow process that can take hundreds or thousands of years. The length of time that a soil has been developing can influence its physical and chemical properties

Main soil units in the study area are therefore associated with volcanic conditions and, in line with the classification criteria used by INIA, soils are grouped into one major physiographic unit - Igneous Rocks Areas. These soils occur in areas associated with the Limbobos' volcanic range, Karroo rhyolites in elevated regions with non-level topography. Table 6-15 shows the major soil units and the respective symbology that can be found on the map.

Table 6-15 – Soil classification key in the study area

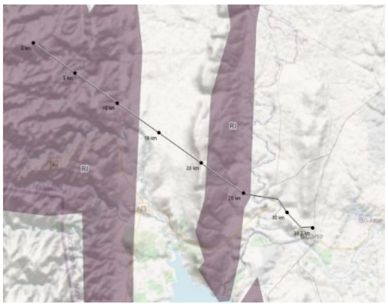
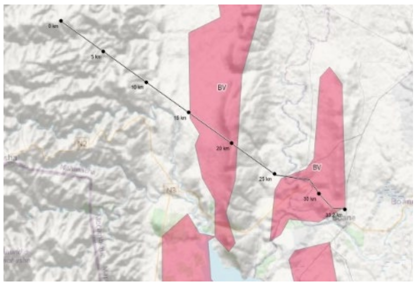
SYMBOL	INIA DESIGNATION	FAO DESIGNATION	EXTENSION (M)
Alluvial and Fluvio-marine Areas			
FS	Soils of coarse or medium- textured stratified alluvium	Eutric Fluvisols	330.6
Igneous Rocks Areas			
RI	Lithic rhyolitic soils	Eutric Leptosols	17 637.1
BI	Lithic basaltic soils	Eutric Leptosols	2 532.9
BV	Red basaltic soils	Ferric Lixisols	12 263.2
PM	Medium-textured soils of Post-Mananga	Haplic Lixisols	472.8

Lithic Rhyolitic soils (equivalent to Eutric Leptosols of FAO's classification) are shallow soils (less than 50 cm deep) typically found on steep slopes or ridges. They are characterized by a low (to moderate) organic matter content, high calcium carbonate content, and a low nutrient-holding capacity. They are typically well-drained and have a coarse texture, with a high proportion of sand and/or gravel (lithic fragments). Their fertility is often limited due to the low availability of water and nutrients. These soils are unsuitable for intensive agriculture but can be used for grazing, horticulture, and forestry.

Red basaltic soils (equivalent to Ferric Lixisols of FAO's classification) are deep soils characterized by a high content of iron oxides and low nutrient-holding capacity due to the high clay content, and it is often strongly compacted. They have a reddish-brown to yellowish-brown colour, with a well-developed, clay-enriched subsoil horizon containing a high iron oxide concentration. They are typically found on undulating to rolling uplands, with slopes ranging from 2% to 15%.

The following table summarizes the main characteristics of the predominant soils in the area crossed by the route.

Table 6-16 – Main characteristics of the predominant soils

Main Characteristics	Lithic rhyolitic soils (RI)	Red basaltic soils (BV)
Map (relative location)		
Dominant characteristics	Sandy clay loam, yellowish brown, shallow over weathered rock	Clayey, dark reddish brown, varying depth
Geology	Limbobos' volcanic range, Karroo rhyolites	Basaltic mantle along the Precambrian shield and the Limbobos' volcanic range, Karroo basalts
Geomorphology	Cuestas and valleys' side slopes	Plains and slopes
Texture*	Top soil: LS-SCL weathered rock	Top soil: SCL-C Sub soil: CL-C
Drainage	Moderate	Good
Acidity and alkalinity (pH)	moderately acid (5-6)	Top soil: 4.8-6.5 Sub soil: 5-7.5
Main limitations for agriculture	Soil depth	sometimes soil depth
Organic matter	Moderate	Moderate-high
USDA (1992) classification	Typic and Lithic Ustorthents	Kanhaplic Rhodustalfs
Land capability (USDA)	Marginal pastures / forests	Good-Moderate
Land suitability for irrigation (USBR)	not recommended (potentially suitable)	Very to marginal
Vegetation Type	wooded savannah or open shrubland	Wooded savannah, grassland

* SC: sandy clay; siC: silty clay; siCL: silty clay loam; L: loam; siL: silt loam.

6.1.5.3 Soils suitability for irrigation

The Umbeluzi River valley in Mozambique is one of the most favourable areas in the south of Mozambique for irrigated crop production due to the existing socioeconomic facilities and proximities to South Africa and Swaziland's major crop commodity markets.

Assuming irrigated agriculture as a potential land utilisation type in the study area, the land was classified to establish the extent and degree of its suitability for sustained irrigation development.

The National Irrigation Program (INIR, 2015) was the basic document for identifying and distributing soils with suitability for irrigation. As part of the PNI studies, cartography of soils with irrigation potential was prepared, which allowed for the grouping of soils into suitability classes, according to their potential and limitations, particularly in their ability to support the usual irrigated crops, for sufficiently long periods, without resulting in their degradation.

The Map of Soils Suitable for Irrigation (Figure 6-32) was fundamentally based on soil characteristics, topography and drainage. Its definition was based on the production potential of the soils in conditions close to those currently existing, i.e., without investments to adapt them to irrigation. The work carried out resulted in four soil classes:

1. **Soils suitable for irrigation:** This class includes soils considered good in their physical, chemical and biological characteristics. Its effective thickness is greater than 1.0 m. The slopes are less than 20% and do not present risks of salinization;
2. **Soils with doubtful aptitude:** This class includes soils whose characteristics do not allow them to be classified in one of the other defined classes. In other words, soils whose nature is considered doubtful concerning their physical, chemical and biological characteristics. Their effective thickness is greater than 0.30 m but less than 1.0 m. They present slight risks of salinization;
3. **Soils with special aptitude for irrigation:** The machongos are included in this class. These are soils characterized by high natural fertility and by providing a year-round type of subsurface irrigation resulting from a high water table near the surface;
4. **Soils not suitable for irrigation:** Soils whose nature is considered poor concerning their physical, chemical and biological characteristics are included in this class. Their effective thickness is less than 0.30 m. The slopes are greater than 20% and present risks of salinization.

It is important to emphasize that this classification does not consider the factors that can be changed. Changeable factors include fertility, salinity, exchangeable sodium, pH, micro-relief, water table depth, flood hazard, and soil cover. These could be subject to a management level since the constraints may be removed in time depending on the possibilities and feasibility of proposed investments for land improvement.

The soils with the most excellent suitability for irrigation are found near the end of the route, in the lowland area, in the Movene River Valley.

The mountains area, for topographical reasons, is not suitable for irrigation.

In the sub-basin of the Impamputo River, the soils have some aptitude for irrigation. This area benefits from the existence of the Libombos Dam, which is a water source, allowing the potential infrastructure of potential irrigated areas.

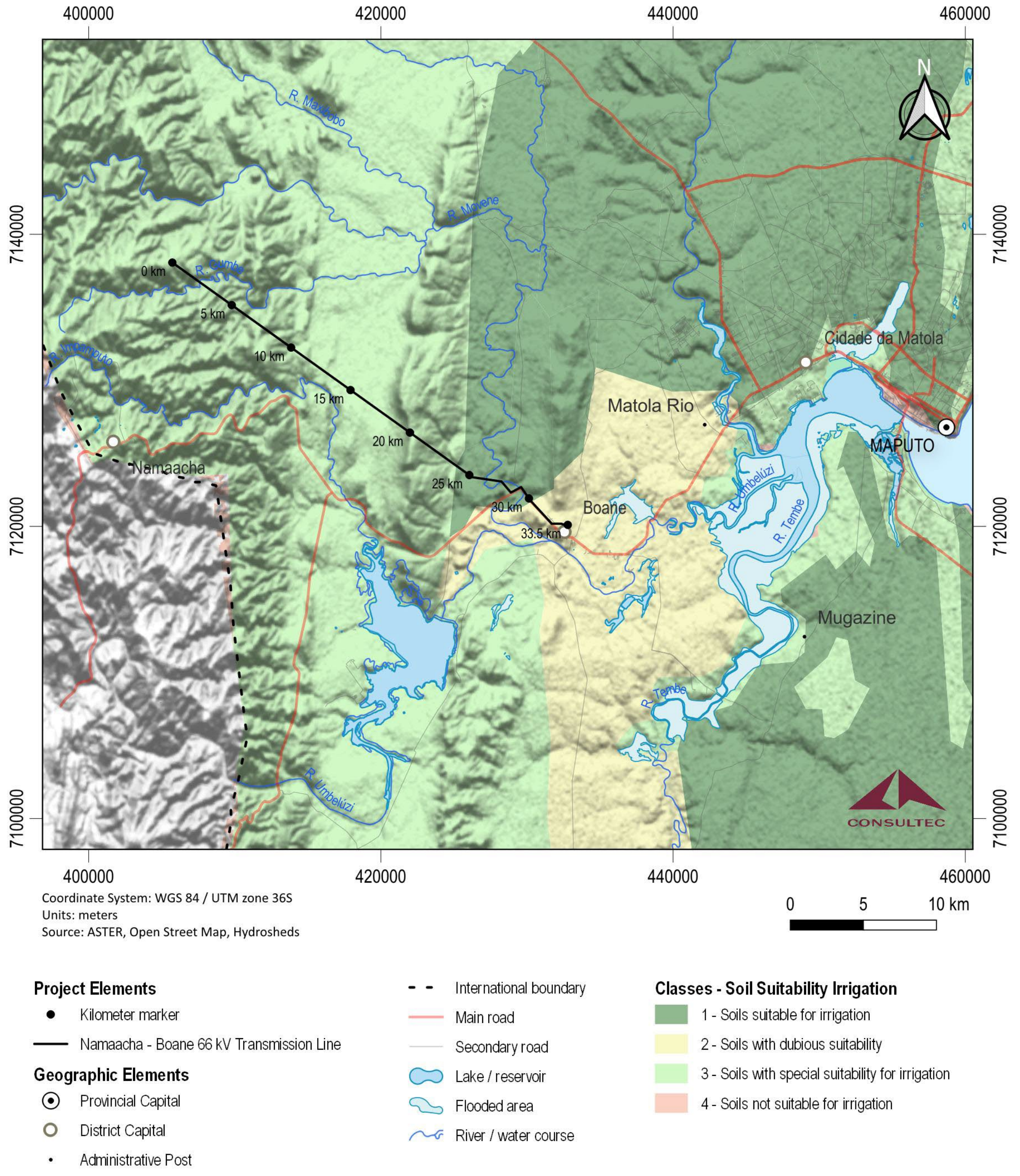


Figure 6-32 – Soil suitability for irrigation

6.1.5.4 Erosion risk

The available erosion risk information for the study area is the Mozambique Erosion Risk Map, produced at a national scale (1:2 000 000). Erosion risk for the study area is shown in Figure 6-33.

Soil formation and soil erosion are two natural and opposing processes. Many natural, undisturbed soils have a formation rate balanced by the rate of erosion. Under these conditions, the soil appears to remain in a constant state as the landscape evolves. Generally, rates of soil erosion are low unless the soil surface is exposed directly to wind and rainwater. Erosion problems arise when the natural vegetation cover is removed, and rates of soil erosion are greatly accelerated. In such cases, the rate of soil erosion greatly exceeds the rate of soil formation, and erosion control practices are required to reduce erosion rates and maintain soil productivity.

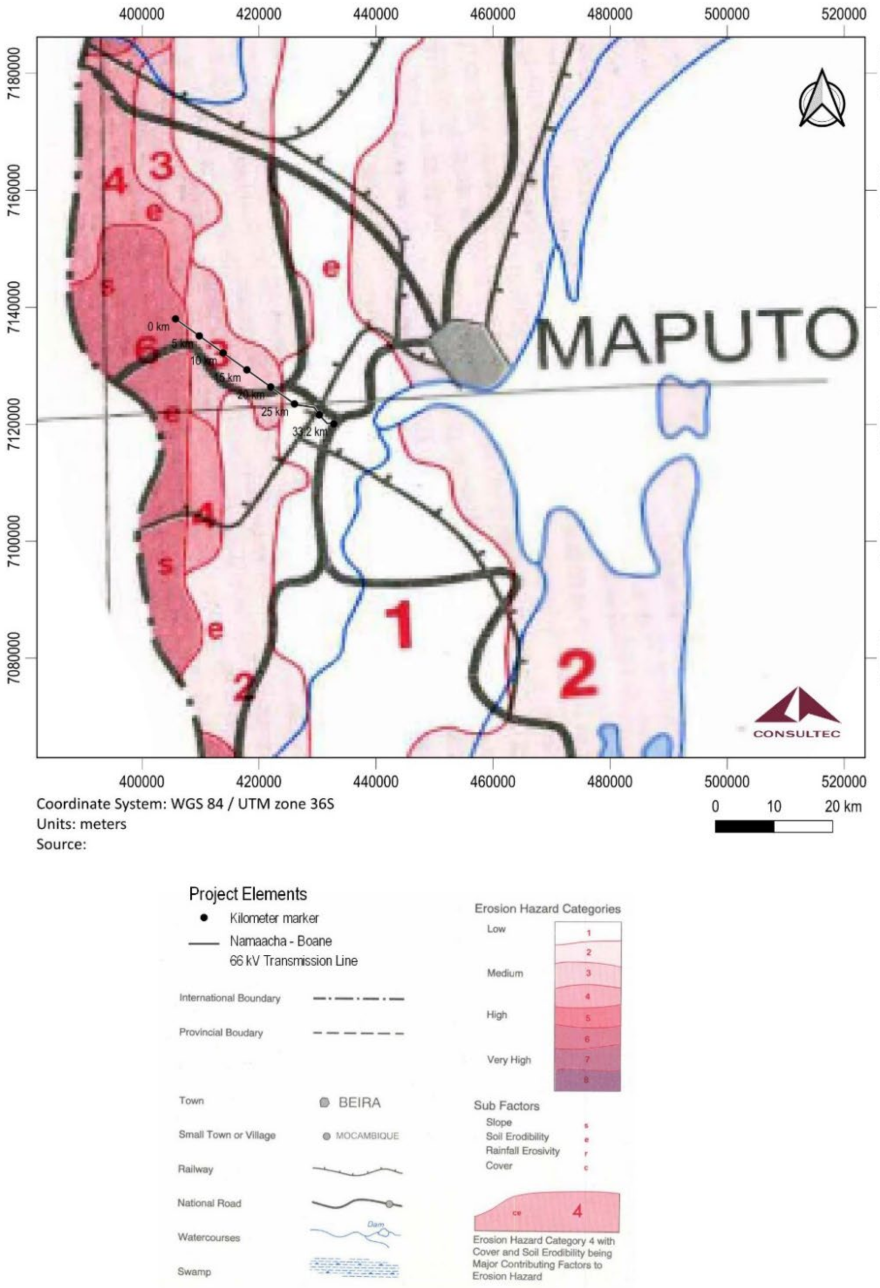


Figure 6-33 – Erosion risk map of Mozambique

As can be seen in the figure above, at the regional level, the proposed at the beginning of the routes is within a region with a very high erosion risk due to sloping terrain. Rainfall is typically concentrated in high energetic torrential rains and removal of vegetation on or close to slopes is likely to increase erosion.

6.1.6 Water Resources

6.1.6.1 Regional hydrological framework

The proposed transmission power line route fall on the Umbeluzi River basin (Figure 6-34). The Umbeluzi River catchment area is shared with Mozambique, South Africa, and eSwatini, and has a total area of 5,460 km^2 (of which only 41% is in Mozambique). The Umbeluzi Rivers enters Mozambique in Goba. The river headwater is in eSwatini, close to its western border with South Africa. The river flows in an easterly direction and discharges into the Maputo Bay.

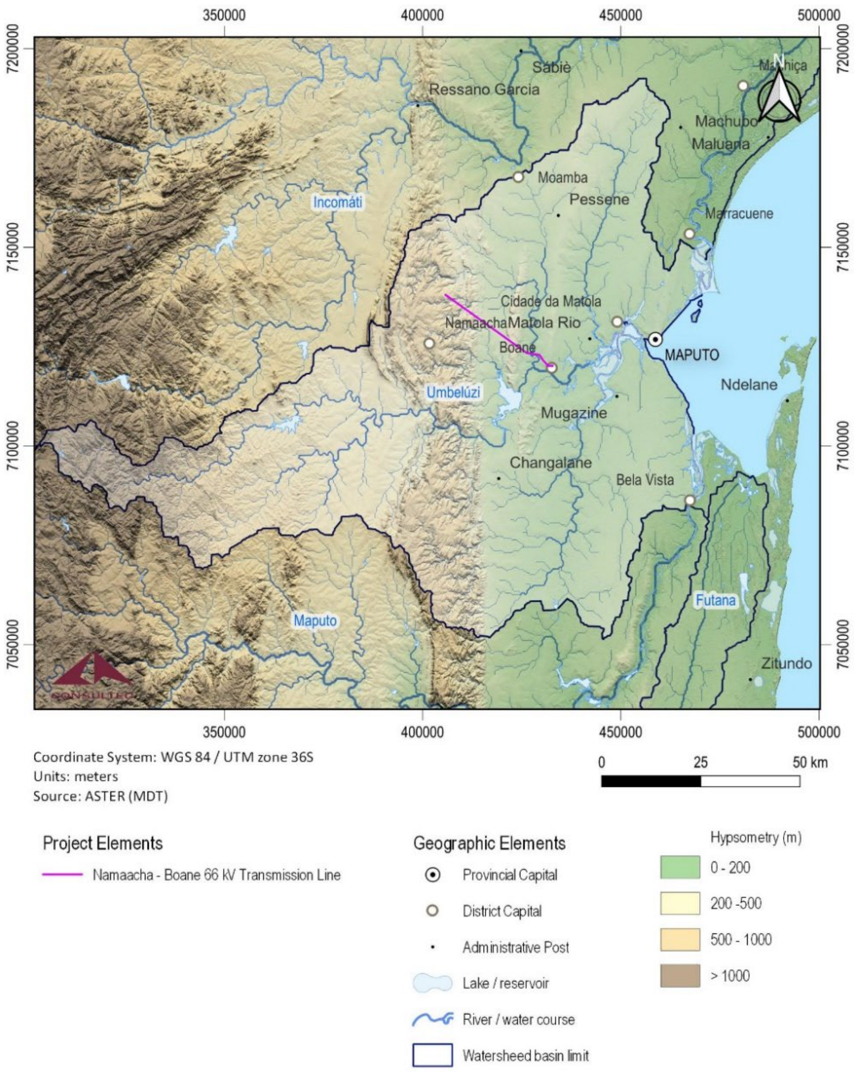
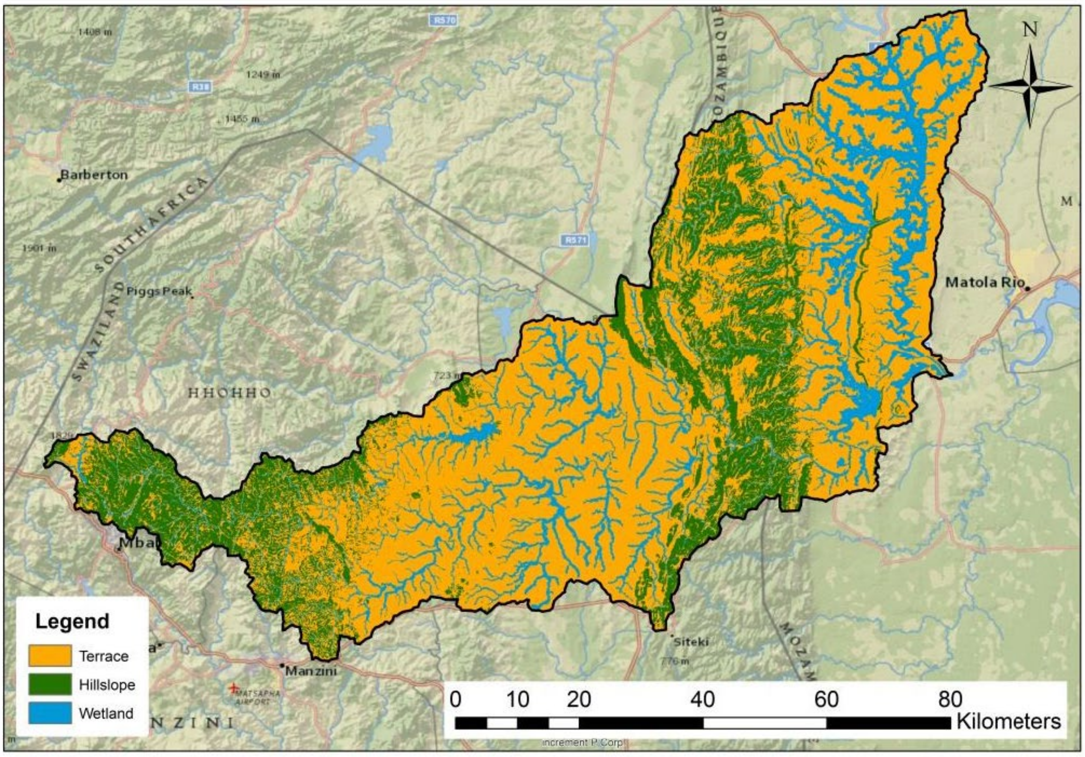


Figure 6-34 – Umbeluzi river basin

The elevation of the Umbeluzi River basin varies from 10 to 1809 meters above mean sea level and is distributed over two hilly and two flat areas. The river springs in the steep 'Ngwenya Hills' of South-Africa and Swaziland, after meandering through a vast plateau area. Then, after crossing the border with Mozambique, it is fed with water originating from the *Pequenos Libombos* hills just before draining into the Indian Ocean (Figure 6-35).

The western part of the watershed is mountainous, while the central part is a plain area with several sugar cane productions. A small mountain range (Pequenos Limbobos) separates the central plain area from the coastal plain area to the east. The landscape is ordered by three classes (Gijsbers, 2015): wetland (16%), hillslope (21%) and terrace (63%).



Source: Gijsbers (2015)

Figure 6-35 – Landscape classification of the river basin

6.1.6.2 Local hydrological framework

As mentioned, the Umbeluzi river flows in an easterly direction to Maputo, the capital city of Mozambique and a major harbour on the Indian Ocean. The main tributaries of the Umbeluzi are the White and the Black Umbeluzi in Swaziland as well as the Movene and the Impamputo rivers in Mozambique in the ADI (Figure 6-36).

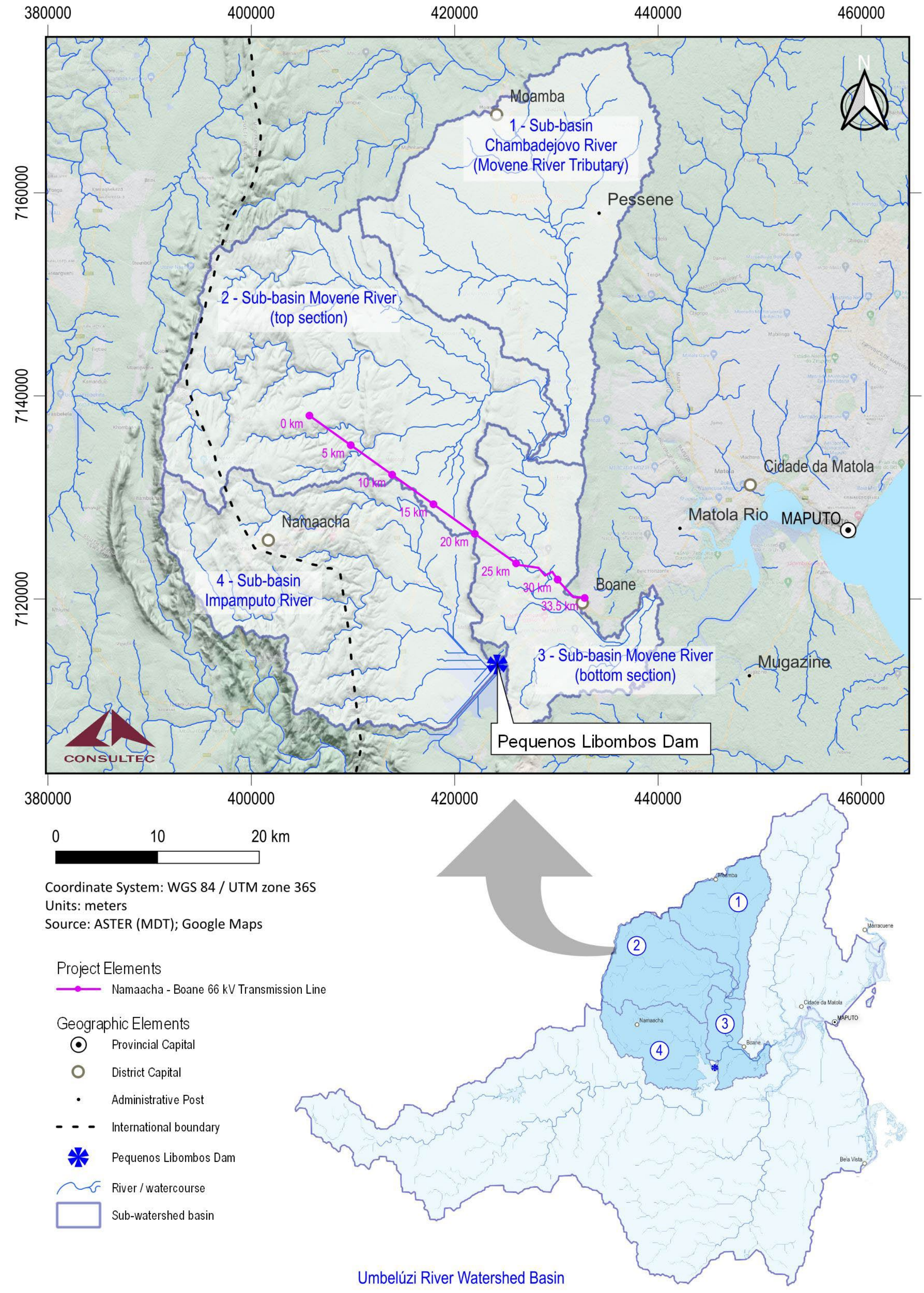


Figure 6-36 – Umbeluzi sub basin intercepted by the proposed power line route

The **Movene River** flows from the left bank, meeting the Umbeluzi near the town of Boane. Most of the tributaries and sub-tributaries on Mozambican territory originate in the great Libombos. Almost every year, Calichane and Movene dry up in the dry season. Each of them has its main tributaries:

- The Matalha, Maxibobo and Cumbe are tributaries of the Movene;
- The Impocuane, Mabelebele, Impamputo and Machuanine rivers are from Calichane;

Given the great length of the **Impamputo River**, which rises a little north of the village of Namaacha, several documents refer to the Calichane river as Impamputo - Calichane. Several abandoned flood arms retain the name Impamputo-Calichane River without, however, showing a permanent or stable connection with its rivers or tributaries main rivers or tributaries. For example, the case of Changalane and the Muguane, both on the right bank between Goba and Boane.

6.1.6.3 Main Hydraulic infrastructures

The Umbeluzi is a perennial river, with an average annual runoff flow rate of approximately 500 Mm^3 (http://www.ara-sul.gov.mz/). The Umbeluzi watershed has two main dams, which have an important role:

- **Mnjoli in Swaziland** - is situated upstream the major sugarcane growing area (Royal Swaziland Sugar Corporation – RSSC), some 70 km upstream the Mozambican border, and was completed in 1978. The released flow to the River is determined by domestic (mainly to the Maputo area) and ecological demands downstream.
- **Hawane in Swaziland -** which supplies water to the city of Mbabane. Is located in the Ezulwini Valley, which is a popular tourist destination due to its scenic beauty and wildlife. The dam was constructed between 1992 and 1996 to supply water to the nearby towns.
- ***Pequenos Libombos*** in Mozambique. This Reservoir is situated some 35 km west of Maputo City. It was built in 1983-1987 with function of providing the ever growing city with water. Other important reasons for building the reservoir were flood mitigation and water supply for irrigation.

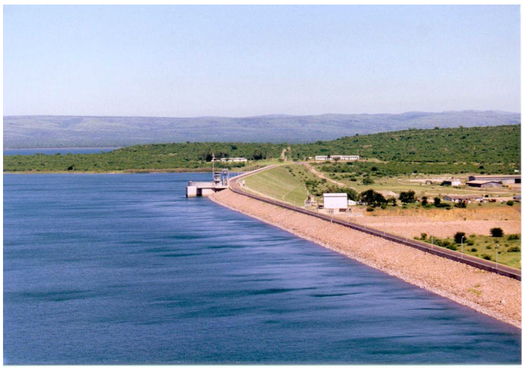



Figure 6-37 – Pequenos Libombos Dam

Sustainable management of Umbeluzi water resources in Mozambique is of the responsibility of ARA-Sul.

About five kilometres downstream from the town of Boane is the Umbeluzi Water Treatment Plant, under the management of the Water Supply Investment and Assets Fund (FIPAG), which provides water to the cities of Maputo and Matola with an average abstraction flow of 2,2 m3/s. Near the estuary, downstream of the Umbeluzi Water Treatment Plant, a saltwater weir has been built to reduce the effect of saltwater intrusion at times of low river flows and at high tide, and evaluations by Chonguiça and Brett (2003), indicated positive results.

6.1.6.4 Ecological state

The Umbeluzi River in Mozambique has been subject to a range of ecological stresses over the years, which have had negative impacts on the river's ecological state. The river is a vital water source for the country, providing water for agriculture, domestic use, and industrial activities, but the high levels of pollution and other factors have reduced the quality of the river's water and impacted its ecosystem.

One of the main ecological concerns for the Umbeluzi River is the high levels of pollution from various sources, including industrial discharges, agricultural runoff, and domestic wastewater. These pollutants have led to a decline in water quality, with high levels of nutrients, suspended solids, and organic matter in the water. This has led to eutrophication, where algae growth is promoted, leading to reduced oxygen levels and negatively affecting the river's ecosystem.

Another ecological concern is the impact of sedimentation on the river. The river is subject to high levels of erosion, particularly in the upper parts of the basin, which leads to sediment being washed into the river. This sedimentation can negatively impact the river's ecology, causing changes in the river's flow dynamics and making it more difficult for aquatic life to survive.

There are also concerns about the impact of invasive species on the river's ecosystem. Species such as water hyacinth have been introduced to the river and have rapidly spread, causing problems such as clogging of waterways and changes in the river's flow regime.

Some of the most serious pressures include:

- Cessation of flow;
- Dams and weirs that inundate riverine habitats, retard migration of fish, and change downstream flow patterns;
- Spread of alien vegetation that lead to significantly reduced low flows, unstable banks and reduced biodiversity;
- The removal of natural riparian vegetation and associated bank erosion;
- water quality problems associated with agricultural return flows and industrial and domestic wastewaters that lead to proliferation of benthic algae and in the lower reaches, the proliferation of the floating aquatic alien weed, *Salvinia molesta*.

Despite these challenges, there are efforts underway to improve the ecological state of the Umbeluzi River. The government of Mozambique has implemented various measures, including legislation to control pollution, and programs to reduce sedimentation and remove invasive species. However, more needs to be done to ensure the sustainable management of the river and the protection of its ecosystem for the future.

6.1.6.5 Groundwater

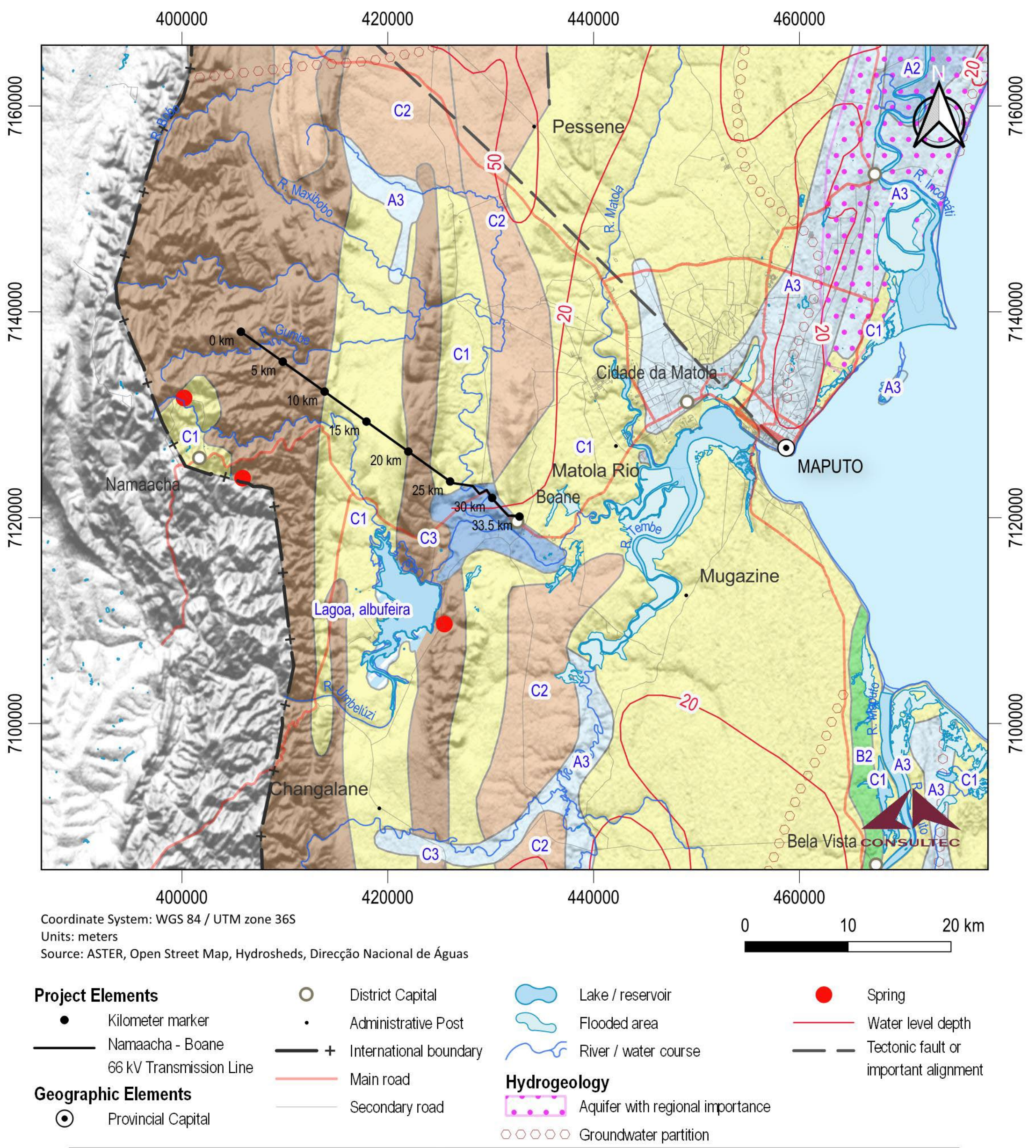
From a hydrogeological point of view the areas in the Umbeluzi River basin do not favour any larger groundwater yield and is thus not suitable for large municipal water supply. The major part of the areas is characterised by crystalline rocks, basalts and consolidated sedimentary rocks with no primary porosity. In such areas, groundwater occurrence is restricted to secondary features such as zones of fracturing or deeper weathering.

The description of groundwater resources provided is based on information from the Explanatory Notes of the hydrogeological map of Mozambique (scale 1:1,000,000) (Ferro & Bouman / DNA, 1987).

The Mozambican part of the Umbeluzi River Basin can be roughly characterized by a large variability of the groundwater resources presenting all major types of predominant aquifers in the country (classes), namely (A) aquifers in intergranular formations, (B) groundwater in fissured formations belonging to the crystalline complex and (C) aquifer sites in fissured or limited productivity intergranular formations. This division into 3 classes (A, B, C) is based on the dominant porosity type, the extend of the aquifers and the productivity of the formations. Each class was assigned a color:

- **The blue colored Class A** – represents aquifers in which the water predominantly circulates through intergranular pores. Generally, they are continuous and consist of unconsolidated or semi-consolidated material. Yield prospects range from 3 to over 50m^3/h.
- **The green colored Class B -** represents aquifers in which the water predominantly circulates through fractures and fissures. Usually, they are discontinuous and consist of consolidated rocks. Yield prospects range from 3 to over 50m^3/h. Class B also includes karsic rocks, in which the fissures might be widened by chemical solution.
- **The brown colored Class C –** comprises areas with limited or local groundwater resources. The porosity can be intergranular of fissured. Yield prospects generally range from less than 1 to over 5m^3/h.

Given the nature of the geological formations along the alignment, surface aquifers are likely to behave in a similar way to Unconsolidated intergranular aquifers (Figure 6-38).



Type of Aquifers	Classes and Groups of Groundwater occurrence		Groundwater development characteristics		
	Intergranular formations	Fissured formations	Average yield (m^3/h)	Maximum pumping period (h/day)	Probable Water Supply Capacity
	Class A	Class B			
Productive Aquifers	A1	B1	>50	24	Large cities, industries and irrigation schemes
	A2	B2	10 – 50	24	Towns (>5000inh), medium-sized industries and irrigation schemes
	A3	B3	3 – 10	16	Villages (2000-5000 inh), small-sized industries and irrigation schemes
Areas with limited or no groundwater resources	-	Class C			
	-	C1	<5	5	Villages (1000-2000 inh) Cattle (<2000 head)
	-	C2	<3	5	Small villages (<1500 inh) Cattle (<1500 head)
	-	C3	<1	6	Groups of houses (<250) Cattle (<250head)

Figure 6-38 – Types of aquifers along the power line route

Groundwater plays an important role in supplying water for the rural communities within the basin. For many of these communities, groundwater is the sole source of water for the domestic supply. Groundwater is relatively cheap to develop and is less vulnerable to drought than surface water. Moreover, the resource is considered to be under-utilised within the basin and has thus potential to be further developed.

Water springs

Thermal and mineral water springs are common in the Karoo rhyolite zone close to the South African border (Lebombos). There, springs such as the Namaacha and Goba are well known for good quality bottled water.

Thermal and mineral water springs are both types of natural springs, but they differ in their composition and temperature:

- **Thermal springs** are springs that contain water that is heated by geothermal activity deep below the Earth's surface. This heat can come from magma chambers or from the natural geothermal gradient of the Earth's crust. Thermal springs can have a wide range of temperatures, from just above ambient temperature to boiling hot. In general, thermal springs have a higher temperature than mineral springs.
  Thermal springs are often used for their heat, which can help to relieve muscle and joint pain, improve circulation, and promote relaxation.
- **Mineral springs** are springs that contain water that is rich in minerals, such as calcium, magnesium, and potassium. These minerals are often dissolved from the surrounding rocks and soil and are present in the water in varying concentrations. Mineral springs can have a range of temperatures, but they are generally cooler than thermal springs.
  Mineral springs are often used for their mineral content, which can have a range of health benefits depending on the specific minerals present. For example, calcium-rich mineral springs may be beneficial for bone health, while magnesium-rich mineral springs may help to reduce stress and promote relaxation.

Both thermal and mineral springs have been used for their therapeutic properties for centuries.

The Figure 6-39 shows the location of the water springs in the project area, highlighting the presence of the mineral waters:

- Fonte de Ferrão 1 and 2 in the karoo rhyolites (marked in the figure with nº10)
- Goba 1 and 3, also springing from the Karoo streams (marked on the picture with a 10)

These springs are believed to contain therapeutic properties and are used by locals for medicinal purposes. The water from Goba 1 is said to be particularly effective in treating skin conditions, while the water from Goba 3 is believed to be useful for treating digestive problems.

The water from Fonte de Ferrão 1 and 2 is believed to have high levels of iron and other minerals and is used by locals for drinking and cooking purposes. The high iron content of the water has also led to the formation of iron deposits around the springs, which are sometimes harvested and used for ornamental purposes.

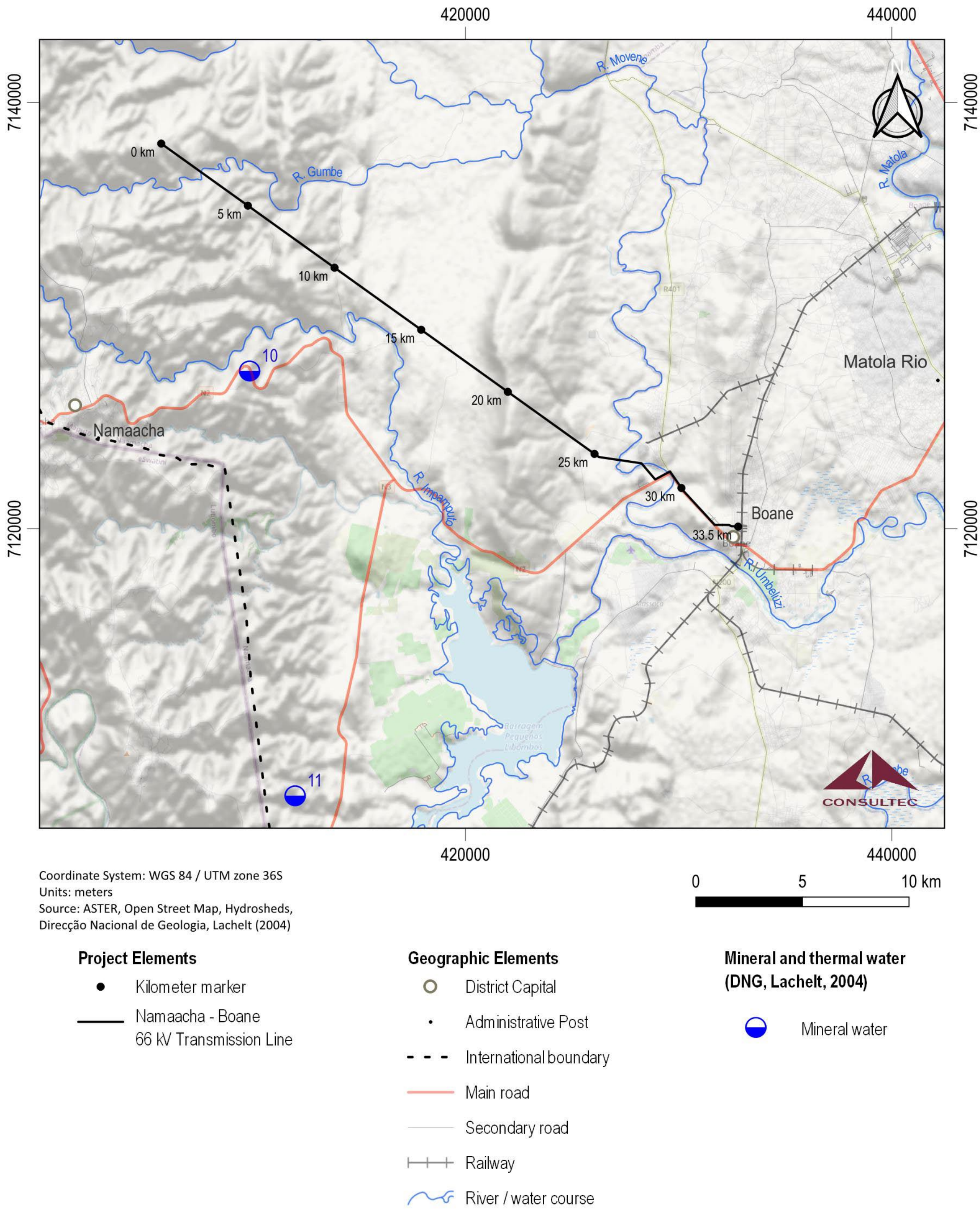


Figure 6-39 – Water springs in the study area

6.1.7 Landscape

6.1.7.1 General considerations

This subchapter aims to present the reference situation of the landscape resources of the areas of influence of the project under analysis - construction of a transmission line between Namaacha Wind Farm and Boane Substation.

The objective of this environmental factor is to characterize the landscape features of the study area, through a visit to the project implementation area, so that this description will provide a basis to analyse later the intensity of use of the proposed site, in terms of its effect in the Landscape.

Landscape can be defined as "a part of the territory, as it is perceived by the people, whose character results from the action and interaction of natural and human factors" (EC 2000). A landscape unit is understood to mean not only "an area limited by relief or other elements, within which all points are seen mutually" (Neuray 1982), but also one in which the landscape presents a certain homogeneity in relation to the relief, geology, vegetation and humanisation.

The evaluation of the quality of the landscape stems from the scenic value attributed to it and from the landscape sensibility.

6.1.7.2 Methodology

The description of the study area was carried out in two phases. The first phase was based on the review of secondary data: bibliographic review, Google Earth image analysis and Mozambique Topographic Chart analysis, Mozambique Geomorphological Chart and Relief Charter, to the scale of 1/2 000 000.

The second phase comprised the recognition of the area for primary data collection and was based on visits to the project area of influence. Site visits were made to key locations by ESIA team members. Site visit photos along the entire routing have been used to assist in the assessment of visual impact and landscape character.

Through the field work, information was collected on the sites with visibility, i.e. the villages and population clusters (sites with potential observers), throughout the project area of influence.

The data collected in the field was then later treated in GIS software, in particular for the delineation of the viewing basins.

6.1.7.3 Zone of Visual Influence

The Zone of Visual Influence (ZVI) is defined as the extent of potential visibility to or from a specific area or feature. However, the large scale of the proposed project and the accessibility issues over some of the areas and lack of access roads create difficulties in identifying the real extent of the ZVI.

A review of the ZVI was made for existing infrastructure developments (existing substation of Boane) to inform the setting of an indicative spatial scope. The indicative spatial scope has been defined for the Project area as approximately three kilometres (3 km) from the OHL alignment to address the potential impacts on the existing landscape character and visual amenity.

The Project ZVI includes a varied cross section of the Maputo province, including the valleys of Movene and other rivers of lesser concern. Land use patterns also vary considerably reflecting sparsely populated areas and suburban areas, areas of natural vegetation, cultivated areas and exploited areas. A full overview is provided in the following sections.

6.1.7.4 Landscape character

Landscape character includes the natural and man-made attributes of the study area, including topography, land cover and vegetation. The character and sensitivity of the visual environment within the study area varies at a local scale, depending on the presence of water bodies, ridges, agricultural use, roads, and urban or rural settlements. The overall landscape character is influenced negatively by incompatible activities, or positively by the presence of natural or man-made features that enrich the character.

The alignment traverses various landscape types and therefore the sensitivity to visual impacts for each of the landscape types will differ.

Topography

Based on the relief shapes observation (Muchangos, 1999) it is possible to interpret and characterize the physiography of the territory. The Namaacha District, where the study area is located, can be divided according to the following geomorphological units:

- Highlands - the Complex of the Libombos chain;
- Medium plateaus - adjacent to the first;
- Slopes; and
- Small plains of 100 - 200 m in the alluvial valleys along the rivers.

It is marked by the Libombos mountain range, which extends in a north-south direction, with its highest point about 800 m, on Mount Mponduine. The surface of applanation descends towards the east, with several rivers cutting the mountains in a W-E direction.

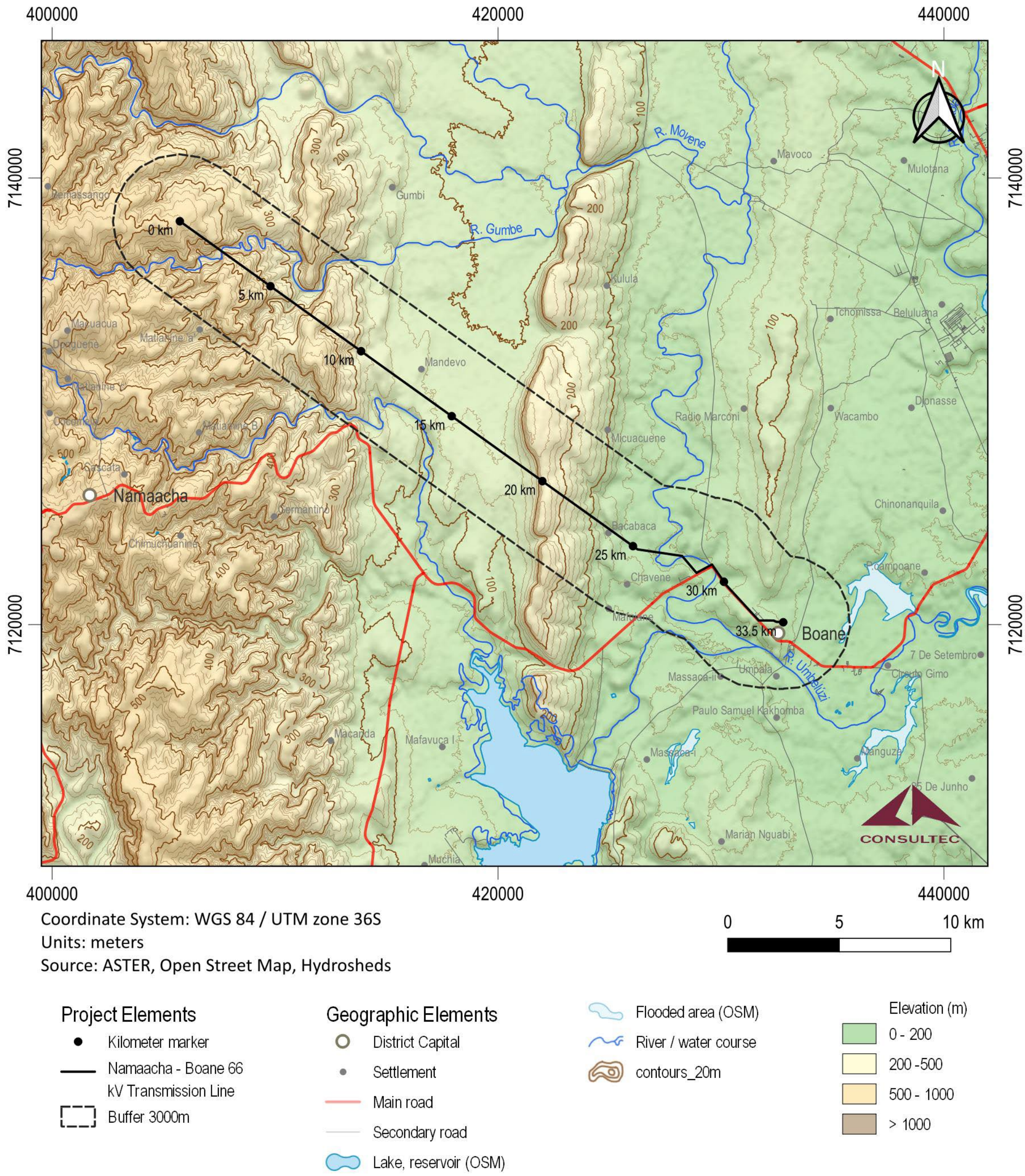


Figure 6-40 – Land morphology within project area

Landscape type

Landscape types were determined by mapping land cover. Land cover describes the physical make up of an area based on interpretation of satellite imagery.

Land cover in the project area has mixed characteristics, ranging from areas of natural vegetation with some scenic value, punctuated by agricultural areas. The main land uses in the proposed area are shrubs and agriculture.

Although the Kruger National Park and Phongolo Nature Reserve are part of and protected parts of the range, they lie far to the north and south of the site, respectively.

Figure 6-41 – Example of herbaceous / shrubby land cover

Vegetation cover

The land of the site and surrounding areas of the transmission line is currently mainly shrubby vegetation and woodland areas within the low-lying hills of Lebombo (Figure 6-42). Other areas are vacant lands are used for pasture farming and agriculture, with the main agricultural products being corn, cassava, cowpea, peanut, and sweet potato.

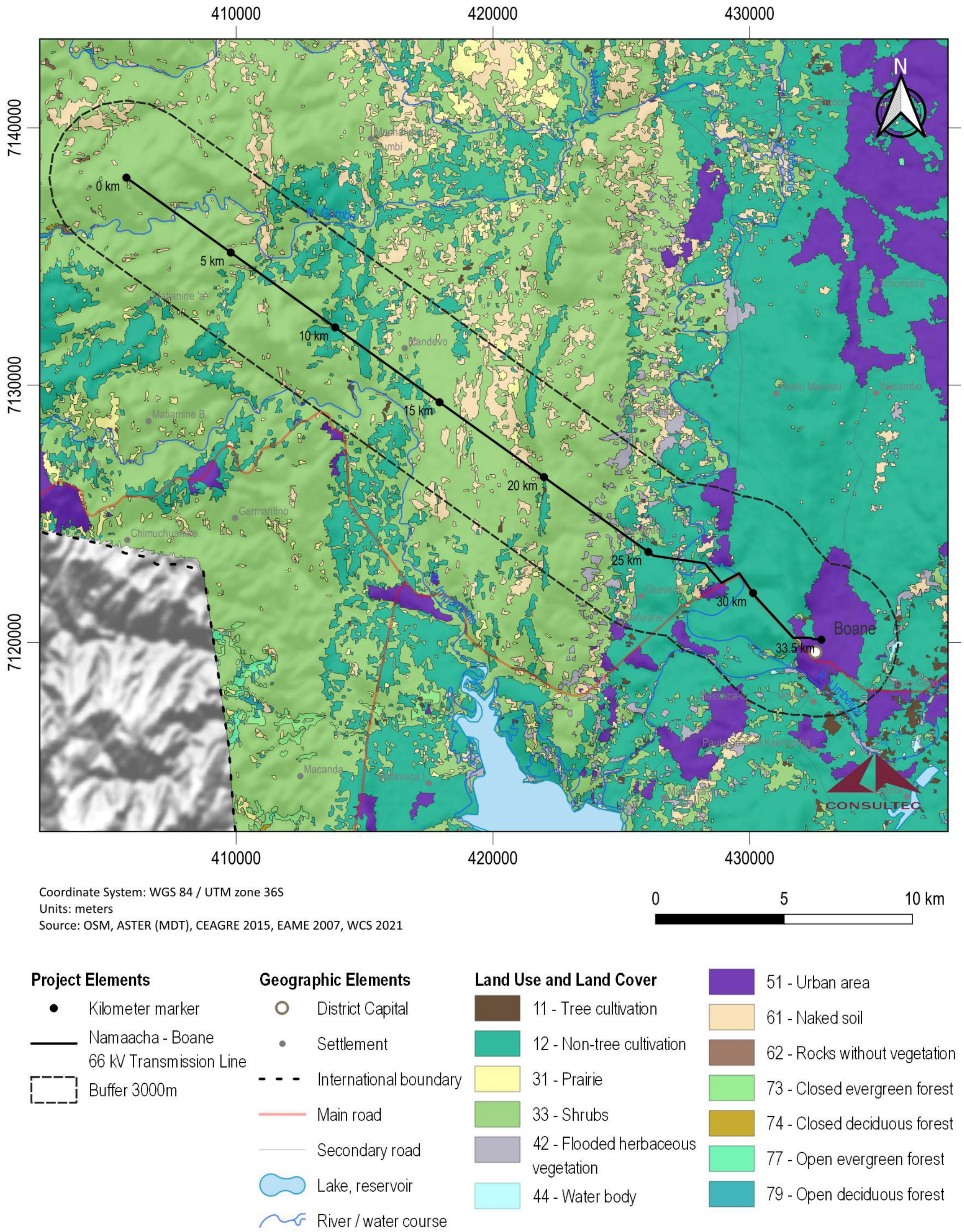


Figure 6-42 – Land Cover and Vegetation Unit in project area

6.1.7.5 Sense of place

The sense of place in the study area derives from the combination of all landscape types and their impact on the senses and is influenced negatively or positively by natural or man-made features or activities that interrupt the vast open space. The sense of place is informed by the aspects of scale, texture, landform, enclosure and land use.

The proposed study area has a rural feel with an even outstretched natural landscape, intercepted by dispersed rural settlements, homesteads and infrastructure associated with agricultural activities.

Landscape is separated by patchworks of subsistence farming dotted with more mountainous areas and dirt roads that connect various smaller settlements.

The proposed alignment runs partially parallel to N2 road linking Boane from km 28 to the end.

6.1.7.6 Landscape quality

Landscape quality is based on human perceptions and expectations in the context of the existing environment. The landscape quality is based on a combination of the landscape's intrinsic physical properties, consisting out of the landform, vegetation, water, colour, adjacent scenery, scarcity, cultural or man-made modifications and the Visual Absorption Capacity (VAC) (Aurecon, 2017).

Landscape quality increases with the presence of water, topographic ruggedness and where diverse patterns of vegetation occur. Areas that contain more natural features or harmonious man-made compositions will have a more favourable landscape quality than areas with non-harmonious human activity.

Table 6-17 – Landscape quality rating

Landscape quality rating	Criteria
High	• **Unmodified landscape**: The landscape is almost free from human encroachment, Visual integrity occurs and where human intervention is visible, no visual discontinuity occurs, and visual order is harmoniously maintained. Strongly defined landforms are noted, including mountains and large bodies of water. Distinct visual patterns are formed through patterns, colours and textures
Moderate	• **Moderately transformed/disturbed landscape**: There is average visual integrity between the natural and manmade landscape. Some visual encroachment is visible which lacks visual order. There is some disruption of the natural and man-made patterns. Moderately distinctive landscape patterns are visible, including rolling hills and smaller water bodies
Low	• **Extensively transformed human intervention**: There is low or no visual integrity between the natural and manmade natural features. The visual integrity of the landscape is disrupted, and visual order is entirely lost. Little visual patterns are formed and vegetation patterns, colours and textures are not noticeable.

Regarding the quality of the landscape in the study area it was considered that landscape occurs with different degrees of quality.

6.1.7.7 Visual Absorption Capacity

Visual Absorption Capacity (VAC) is an indication of the ability of the landscape to visually conceal the development. Areas with high VAC can accommodate and absorb physical changes in the landscape without transforming its visual character and quality. The factors that contribute to the VAC factor include slope, vegetation height and visual pattern.

Table 6-18 – VAC Rating

Rating	Topography	Visual Pattern/Diversity	Vegetation Height
High	Slope >7%	A diverse visual pattern, such as build up areas and industrialized zones, where tall structures provide a high degree of screening	> 5m
Moderate	Slope between 3 -7%	A moderate diverse visual pattern, such as rural and medium to low density urban and rural areas	Between 1-5m
Low	Slope <3%	A uniform visual pattern, such as naturally landscaped areas with no man-made structures	<1m

Along the proposed alignment the landscape is uncluttered, creating a homogenous visual quality with minimal vertical elements.

The vegetation height is variable. It is characterized by shrub and woodland areas with subsistence agriculture, dominated by undifferentiated woodlands and acacia woodland areas with agricultural plots (machambas).

Thus, we can consider that the VAC, in terms of vegetation height, is **moderate** for the most part of the alignment, punctuated by **low** vegetation in agricultural plots and in the end of the alignment where the line enters the Boane district in a peri-urban area.

As described above, topography is **high** from Namaacha (Lebombo) from km 0 to km 10, moderate from km 10 to the alignment end.

The visual pattern/diversity landscape rating is considered **low to moderate** because of the dominant horizontal scale of the study area, minimal man-made structures, little visual discontinuity, and interruption of the natural environment.

6.1.7.8 Receptors

Receptors for visual impacts are potential viewers of the proposed alignment. Receptor sensitivity refers to the degree that a project affects people. Receptor sensitivity type depends on the number of people viewing the line and their perceptions of the study area (Table 6-20).

Perception of an object is linked to the purpose for which a viewer is present in the study area (Table 6-19) (i.e. the reason for their visit). The sensitivity of an individual to the visual impact of a proposed development may, therefore, also vary over time as they experience different features and land uses in the area.

Table 6-19 – Visual receptor's sensitivity criteria

Visual receptor's sensitivity criteria
Familiarity with the actual scene
Circumstances that bring them into contact with that view
Nature of the view (full or glimpsed, near or distant).

Receptor sensitivity (Table 6-20) is also affected by how likely the receptors are to be affected. It is also dependent on their perception of the area and their ability to adapt to changes in their environment and can include how frequently they are exposed to the view.

Table 6-20 – Overall receptor sensitivity rating

Rating	Receptor type	Receptor sensitivity	Receptor perception
High sensitivity	Settlements, less than 100 people.	Views to and from nature reserves, coastal areas and scenic routes or trails.	People attach a high value to aesthetics, such as in or around a game reserve, coastal areas, scenic routes or conservation areas, and the project is perceived to significantly impact on this value of the landscape.
Moderate sensitivity	Settlements along provincial roads with less than 1000 people.	Views to and from residential areas, agricultural areas, sporting / recreational areas or places of work.	People attach a moderate value to aesthetics, such as neighbourhoods and smaller towns, where natural character is still plentiful and in close range of residency.
Low sensitivity	Towns and cities along major national roads with more than 1000 people.	Views to and from industrial, mining or degraded areas.	People attach a low value to aesthetics, when compared to employment opportunities. Environment has already been transformed.

The selected viewpoints are based on viewing position and are used as a basis for determining potential visual impacts.

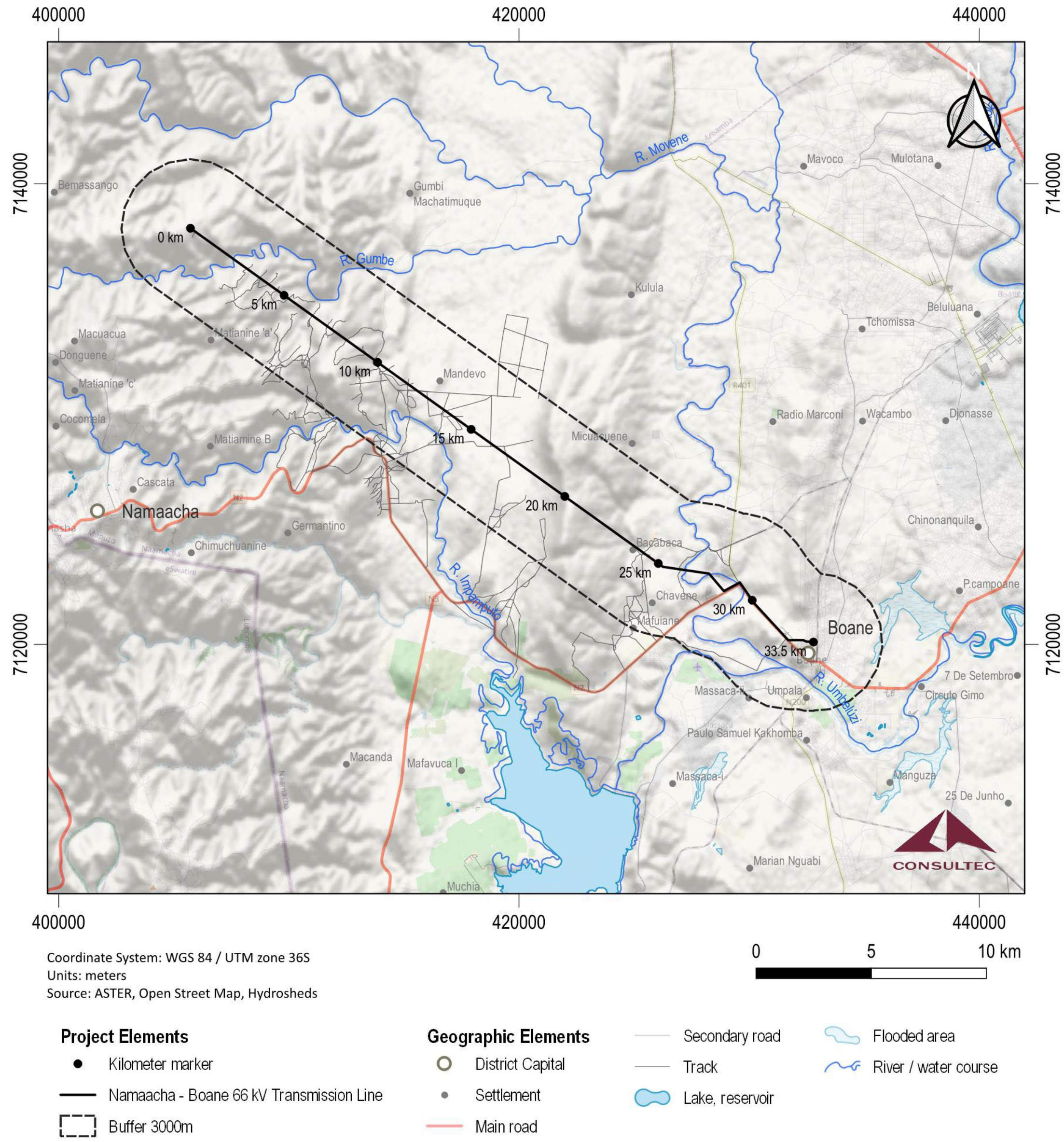


Figure 6-43 – Potential visual receptors

The most sensitive receptors will be people permanently residing in the area (formal residential as well as informal settlements). These areas are associated with a few dispersed settlements mostly located along access roads.

The overall receptor sensitivity is **low** as from previous experience lower income residents may view transmission lines as a sign of progress.

6.1.7.9 Visual accessibility and visibility

The visibility or viewshed (zone of theoretical visibility or ZTV) of the project is the area from which the project will be visible. The ZTV is theoretical as it assumes direct line of sight between any point within the viewshed and the object being viewed.

In this analysis we consider two basic components, the point of observation and the visibility basins. The visualization potential is a function of the topographic conditions of the site, the degree of incidence and visual absorption, the natural accessibility and the proximity of populated areas and communication routes.

The point of observation is defined as the fixed point from which a given observer has a visual perspective. In this study, the populations closest to the high voltage line were considered. The visibility basin is defined as the physical area of land, air or water, which is visible to the human eye from a point of observation.

A GIS has been used to generate the viewshed analyses for the proposed transmission line and related infrastructure. The system has three-dimensional topographical modelling capabilities, including a line of sight analysis. For this project, the viewshed analysis was generated by means of contours and using the conceptual design of the proposed transmission line.

Visibility basin boundaries are generally high points in the landscape such as mountains, slopes or ridges. The visibility basin includes areas with visual accessibility, which in this case may or may not include the location of the high voltage line.

In general terms, visual accessibility increases with proximity to the area, being lower from distant points of observation. Along access routes, visual accessibility may be variable, partially limited by the visual barriers formed by arboreal vegetation cover and relief accidents as high zones.

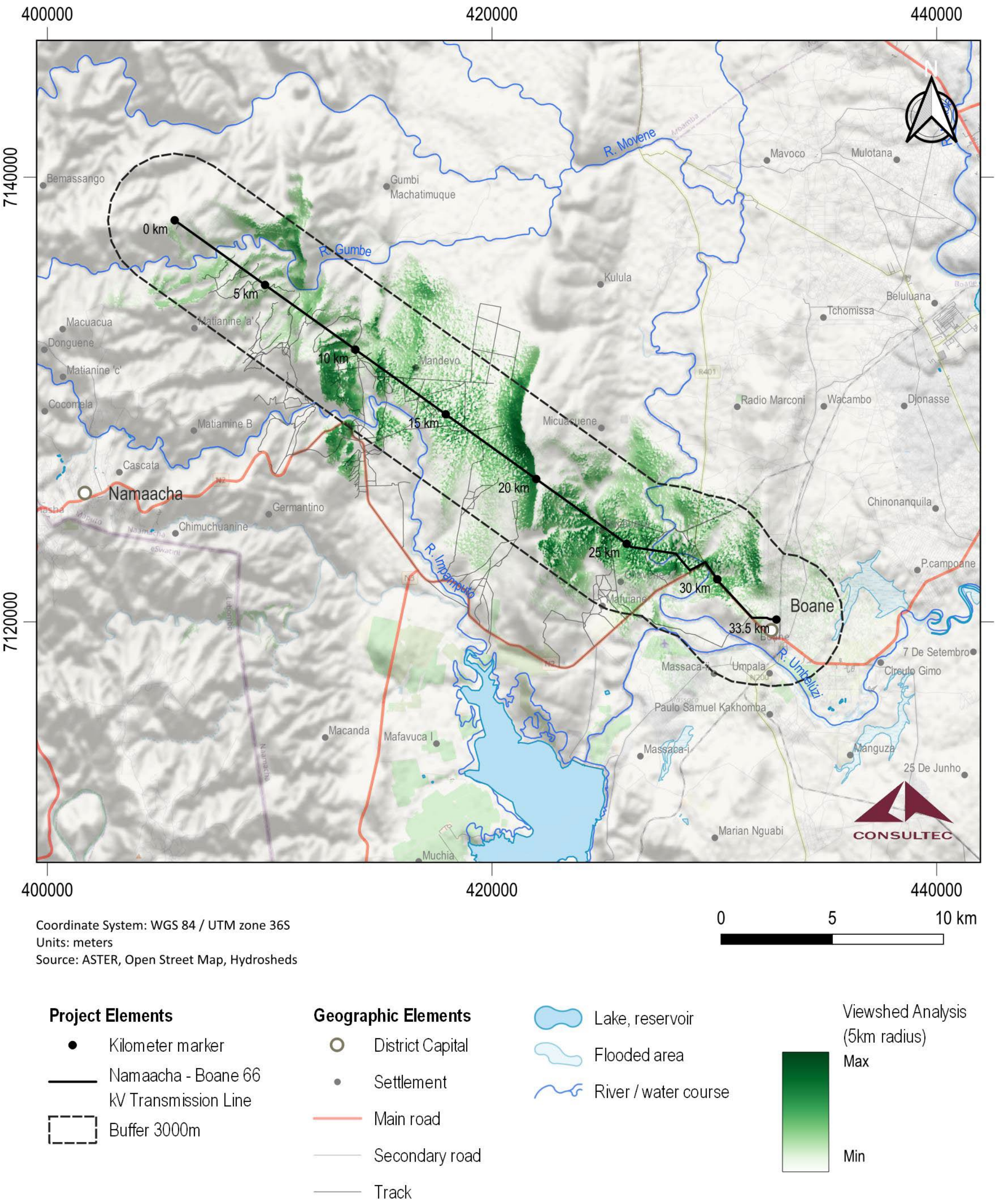


Figure 6-44 – Visual accessibility and visibility - Zone of Theoretical Visibility

6.2 Biological Environment

6.2.1 Methodology

The characterization of the flora and fauna in the study area was carried out through the collection of secondary and primary data. Secondary data were obtained through literature review in the preparation phase for the field survey and includes data collection based on the interpretation of land use and land cover maps based on the forest inventory (2018), observation of Google Earth 2022 imagery, as well as the characterization of terrestrial plant communities.

To complement secondary data collection, a field survey was conducted between October 31st and November 4th, 2022 (dry season) to allow primary data collection on flora, vegetation and habitats, terrestrial vertebrates, birds and bats. A second field survey was conducted between March 16th to 20th, 2023 to complement the information for birds and bats for the wet season.

The study area considered for the terrestrial ecology assessment was defined as a 300 m buffer around the transmission line.

6.2.1.1 Flora and vegetation

Sampling

For flora sampling sites, a random sampling method was used, in which the sampling points were distributed along the transmission line in order to cover the entire study area. This procedure allowed for the coverage of the project area and an analysis of the plant communities that traverse the study area. A total of thirteen (13) sampling sites were sampled mainly along the most natural areas (Figure 6-45). The identification of the sample points began with the overlapping of the different strata and the plotting of the OHL route. Subsequently, the thirteen (13) sample points were randomly marked in ArcGis 10.3, and their accessibility was determined. The geographic coordinates of these points were then recorded and entered into a GPS (Global Positioning System) device to locate the points and establish the lines on the ground.

Some more disturbed areas were also visited, but were mostly registered as ad-hoc observations, as well as the species present at those sites. Flora species inventories at each sampling location were developed by a botanist, with experience in Mozambique flora and vegetation. When there was uncertainty regarding species identification during the fieldwork, specimens were collected, labelled, and taken to the Eduardo Mondlane University botanical laboratory in Maputo for identification using herbarium samples and the Flora Zambesiaca (Kew, 2014) as references.

All primary data on vegetation units and habitats were processed through GIS to help refine the mapping of vegetation units and habitats within the study area, which was drafted during secondary data analysis.

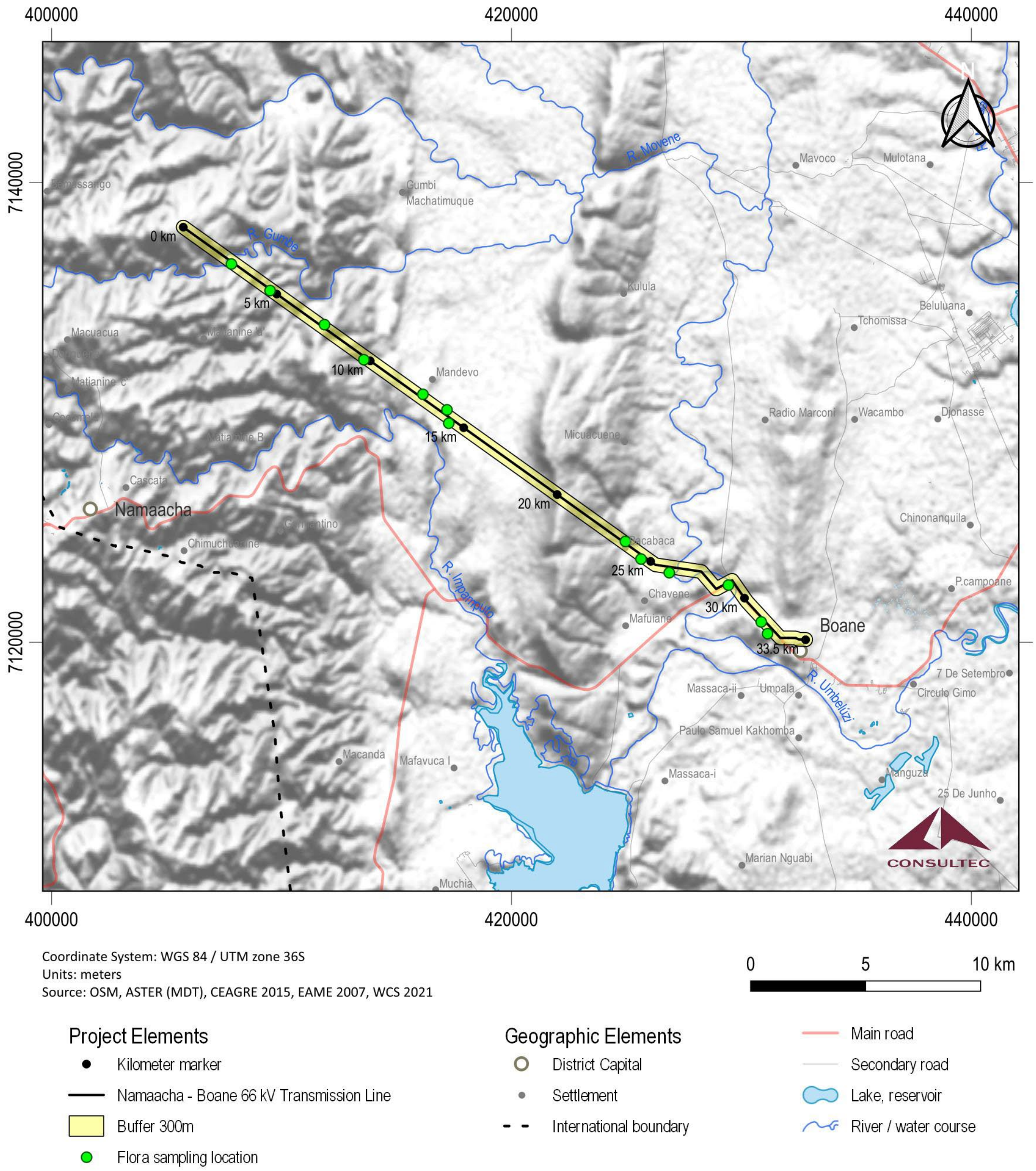


Figure 6-45 – Sampling sites for flora

Data Collection

In each transect, the vegetation communities (habitats) were identified, and the dominant species were quantitatively and qualitatively assessed in each of the strata, through walks along the total length of the plots. To obtain qualitative data observations were made to characterize the different types of vegetation, level of degradation, percentage of cover, identification of sensitive areas, and type of stratum (herbaceous, arboreal and shrub). For quantitative data, the total heights in meters (m) and DBH's (Diameter at Breast Height) in centimetres (cm) of trees and shrubs were recorded, i.e., adult trees and trees in regeneration, i.e., with DBH ≥ 5 cm. Figure 6-46 represents the sampling scheme to be followed.

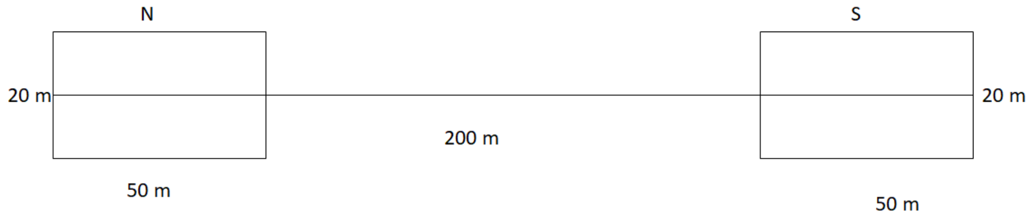


Figure 6-46 – Sampling scheme

Figure 6-47 – Demonstration of plot establishment

In each transect, with a length of 500 m, three (3) 20 m x 50 m (0.4ha) plots were established (Figure 6-47), one at the beginning and one at the end of the transect. Within the sampled plots (transect), all trees with diameter at breast height (DBH) greater than or equal to 5 cm (DBH≥5cm) were measured. The measured trees were identified by local and scientific name with the help of a field botanist and by consulting flora manuals to produce information on floristic composition. For the individuals that could not be identified in the field, specimen samples were collected for further identification at the herbarium of the Eduardo Mondlane University in Maputo.

After identifying the species, each was classified according to the IUCN Red List of Threatened Species (IUCN, 2022): Least Concern (LC), Vulnerable (VU), Endangered (EN), Critically Endangered (CR), Extinct (E), and Not Assessed (NE).

The data collected in the field were analysed to obtain an ecological characterization of the study area. The Importance Value Index (IVI) was determined, which allows for a comprehensive view of the structure and/or to characterize the importance of each of the species or habitat. To obtain this index, the values of Relative Abundance (number of individuals per unit area), Relative Dominance (basal area per unit area) and Relative Frequency (occurrence or non-occurrence of a species in a given plot) are added for each species.

6.2.1.2 Fauna

There is no specific literature on the fauna of the area of direct influence of the project (600 m transect around the power line). Therefore, secondary data was collected through a comprehensive literature review on mammals (including bats), reptiles and amphibians of the broad Namaacha and Boane region. Literature review consisted on the analysis of species distribution maps from books on the distribution of mammal of Mozambique (Smithers and Tello, 1976) and southern Africa (Walker, 1996; Stuart and Stuart, 2001 and Skinner and Chimimba, 2005), reptiles of southern Africa (Branch, 1998) and amphibians of southern Africa (Caruthers, 2001). Literature was also consulted to report the conservation status of the species recorded in the area, namely the IUCN Red Data List of species threatened with extinction (IUCN, 2022), the List of Species Protected by Law in Mozambique (Decree nº 12/2002 of 6 June) and the species listed in CITES appendices.

Field data collection was conducted in November 2022, corresponding to dry season. A wet season survey was conducted in March 2023.

Mammals (including bats), reptiles and amphibians were documented through direct and indirect observations. Twelve sampling points were established for vegetation assessment (see vegetation report). From each vegetation sampling point, a 600 m long and 5 m wide transect perpendicular to the power line trajectory was walked and along the transect data on fauna species was collected through search and direct observation and identification of mammals using field guides (e.g. Stuart & Stuart, 2001); observation and identification of indirect evidences of occurrence of mammal species such as spoor/footprints, droppings, feedings signs and food leftovers, burrows and diggings (Walker, 1996), direct observation and identification of reptiles following Branch (1998) and of amphibians following Carruthers (2001).

Specific sampling effort for bats consisted of active inspection in potential microhabitats or roosting places such as abandoned buildings, hollows in rocks, trees with dense crown cover and areas with fruit trees, to observe bats or indirect evidence such as guano. Local people were interviewed about the occurrence of bat species in the project area. Additional search effort was devoted to microhabitats favoured by reptiles such as dead logs and rocky areas and by amphibians such as seasonal pans and waterlogged areas.

Data was also obtained through consultations with local people about fauna species of historical and current occurrence. In the consultations or interviews with local people, field guides of mammals with coloured photographs (e.g., Stuart and Stuart, 2001) were used to assist in the identification of species by the interviewed people. From the interviews only species mentioned with high confidence by the interviews, including reports of recent observations in the area, were included in the species list.

6.2.1.3 Avifauna

Bird sampling targeted raptors, passerines, and water birds. Raptors and passerines sampling was undertaken through walking transects, with 30 minutes duration.

Along the route where the wind transmission line will pass, random bird sampling points were established. A total of 22 sampling sites were sampled mainly along the most natural areas (Figure 6.48).

Figure 6.48 shows the areas visited during the bird surveys, which took place in the dry season (early November 2022) and in the wet season (late March 2023). It was not possible to reach some areas of the route due to difficult access in the mountain area and or bad track conditions or inexistent tracks due to massive flooding caused by cyclone Freddy remains that hit the study area in mid-March 2023. Additionally, the route passed through some private property, and some areas were closed to the public. Additionally, we can observe differences in the two sampled seasons, as some areas were completely inaccessible during the rainy season. In these cases, the option was to visit alternative areas as close as possible to the previous ones. The mobility that the birds present and, on the other hand, the homogeneity that the adjacent areas presented, enabled the team to conclude that they can support the same type of avifauna.

Despite the above mentioned limitations, the results are considered satisfactory to support informed conclusions.

Point counts targeting water birds were undertaken at water bodies and rivers for a variable amount of time, according to the water body size. The water bodies sampled were both inside the study area and in its surroundings, because of possible waterbird movements crossing the study area. All birds seen or heard were identified and counted. The observations were undertaken using binoculars.

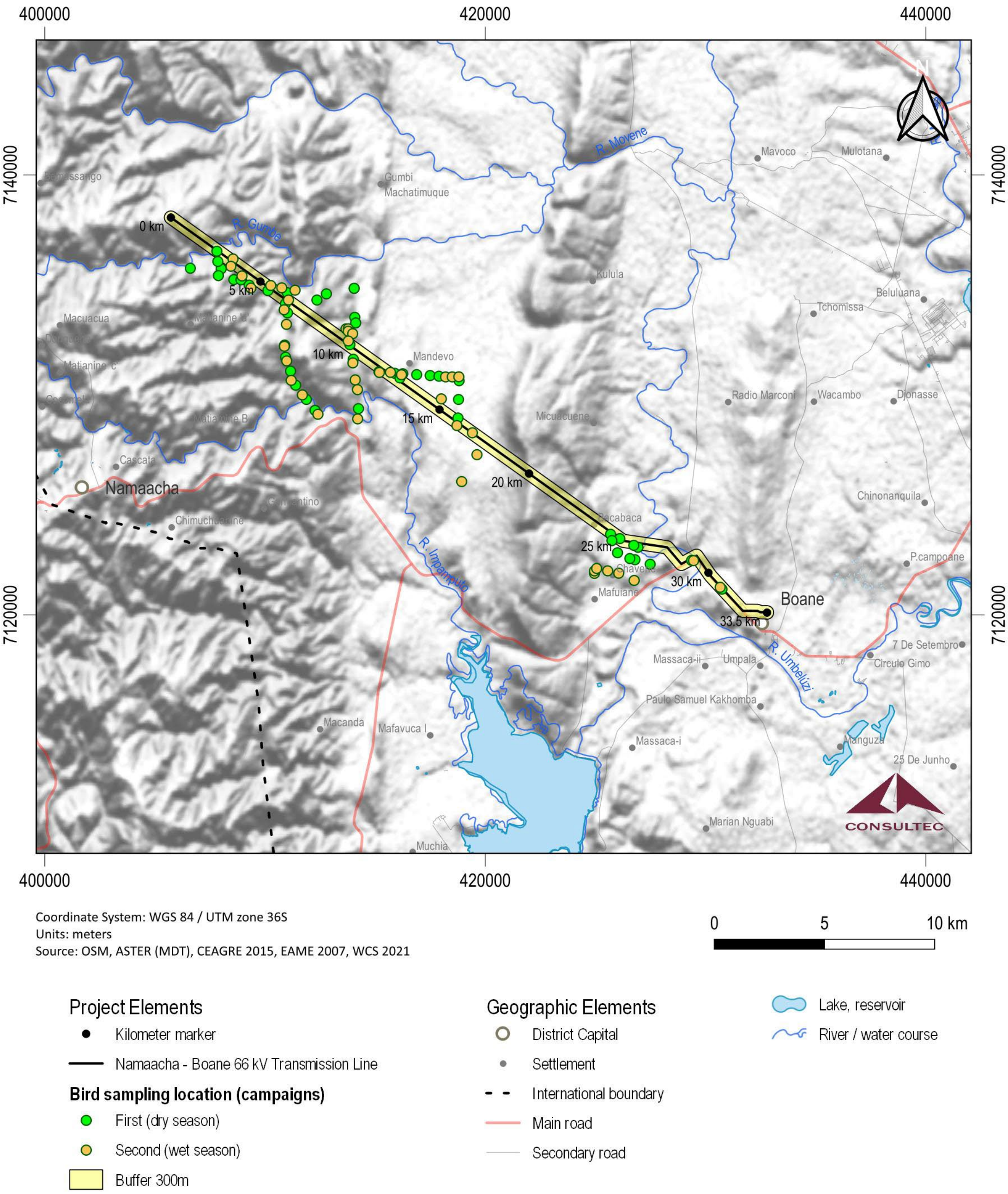


Figure 6.48 – Birds sampling points (winter/dry and summer/wet seasons)

Species Density

At each listening point, an imaginary circle with a maximum radius of 100 meters was established. Birds heard within 30 meters of distance were considered as being within the listening radius, while birds heard outside the 30 m range were considered as being outside the listening radius. This exercise was performed at two different times, that is, in winter (dry season) and summer (wet season).

With the collected information it was possible to calculate the density of each species. Density calculation was based on the following formula:

$$D = \ln\left(\frac{n}{n^2}\right)\cdot\left(\frac{n}{m(\pi r^2)}\right)$$

- n = total number of birds counted
- n^2 = number beyond the fixed radius
- m = total number of counts
- r = fixed radius

Species richness index

Bird species richness index is calculated using the following formula (Ludwing & Reynolds, 1988):

$$R^2 = \frac{S}{\sqrt{n}}$$

- R^2 = Menhinick Index
- S = total number of species in the community
- n = total of individuals observed

Birds of prey

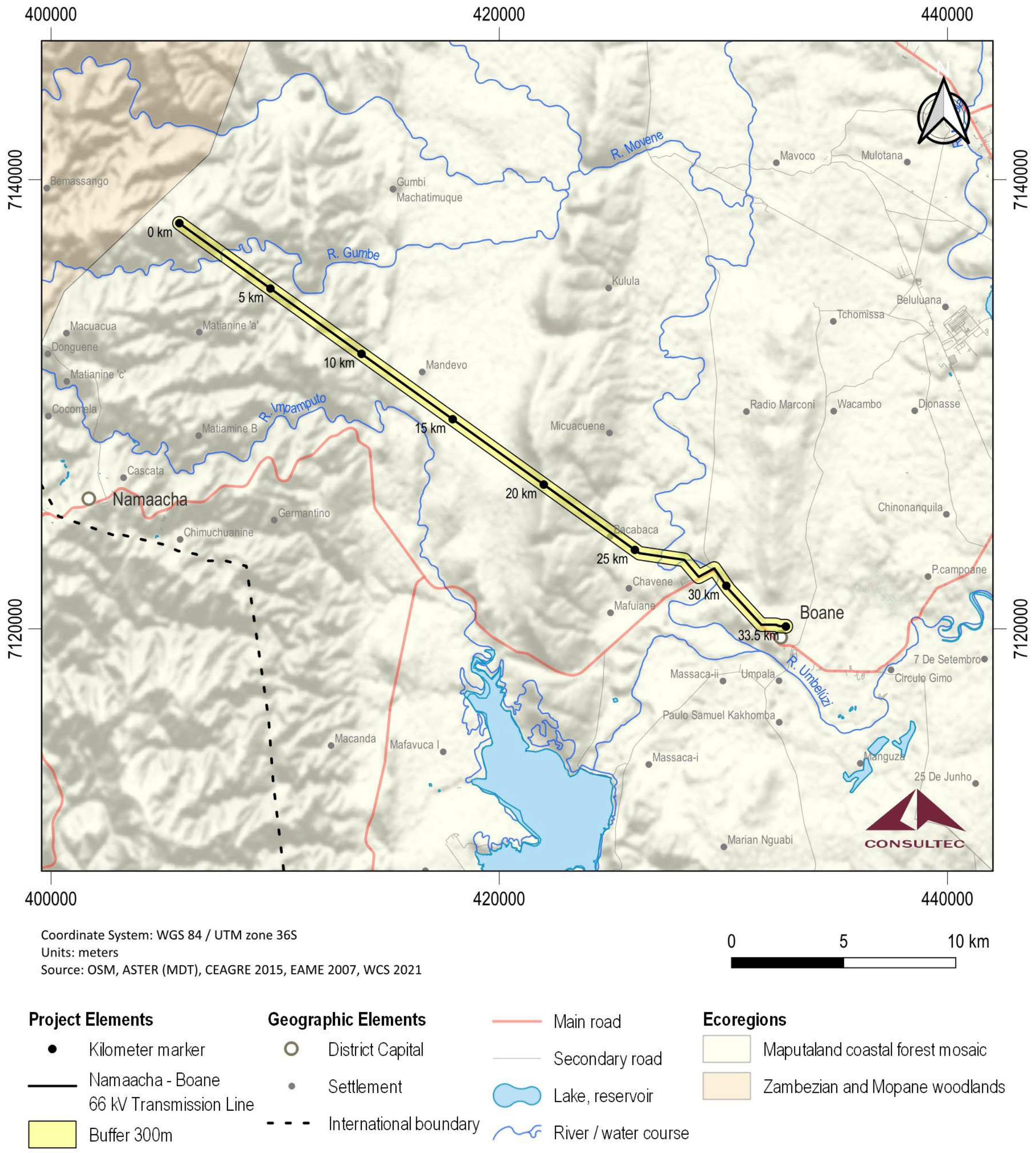
Birds of prey were sought throughout the entire length of the transmission line project. In each observation, the name of the species and the geographical position it occupies was recorded with the aid of GPS. This information was used to map each species observed throughout the range affected by the project. Some species of birds were not recorded during this survey, but they were considered in others studies all that were carried out in the same region.

6.2.2 Flora and Vegetation

6.2.2.1 Regional context

The flora and vegetation in the study area falls within the phytogeographic unit designated as Maputaland Coastal Forest (RESOLVE, 2017), dominated by herbaceous and shrub formations with patches of undifferentiated open forest in the higher regions (Figure 6-49) (Diniz *et al*., 2012). The Ecoregion presents a high diversity of flora and fauna, in fauna standing out the African elephant (*Loxodonta africana*) and the remaining population of Leopards (*Panthera pardus*) in the Southern African region.

The coastal plains of Maputaland are covered with non-fertile soils distributed by the wind and forming a series of north-south aligned dunes parallel to the coastline. The climate is subtropical humid along the coast, with an annual rainfall of over 1000 mm, whereas in the more inland areas the climate is of the subtropical dry type with less than 600 mm of rainfall per year. The rainy season occurs from September/October to April, the summer is hot and humid and winter is cold and dry. The average annual temperature ranges from 21ºC to 23ºC (RESOLVE, 2017).



Source: RESOLVE (2017)

Figure 6-49 – Ecoregions in Maputo province

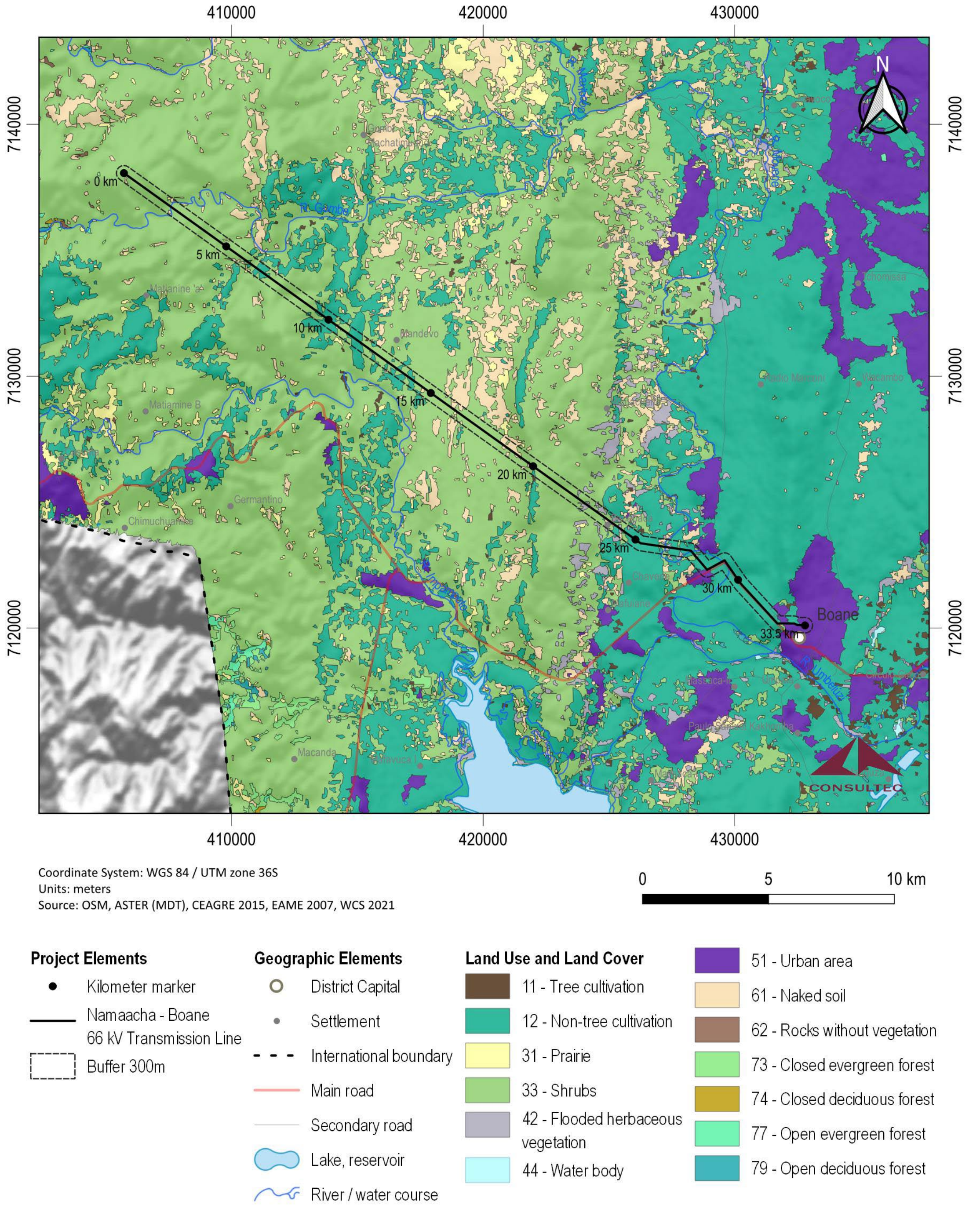
6.2.2.2 Flora and habitats

For the purpose of the habitat mapping exercise, the project corridor was defined as a 300 m corridor centred in the proposed pipeline alignment. The vegetation units and habitats existing in that project corridor were initially mapped in a GIS environment, using the aerial photographic covers available (Google Earth) and Magalhães (2018) Land Cover Map.

The analysis focused on macro-habitats (geographic areas occupied by the same vegetation unit) created by the interaction of the original natural vegetation and human activities, mainly urban development, which significantly influence the vegetation's structure and composition.

In what regards the ecological framework of the project's footprint area, the flora and vegetation present are subject to a high degree of disturbance.

Figure 6-50 illustrates the vegetation types/land uses across the Project´s area.



Source: Magalhães (2018).

Figure 6-50 – Map of Land Use and Cover, Maputo province

Natural vegetation can be observed in the area, although with some signs of anthropization. A total of seven habitats were identified in the project corridor. These habitats are illustrated in Figure 6-50 and the areas covered by each are shown in Figure 6-51.

The main types of vegetation occurring in the Project's areas of influence are:

- Shrub vegetation (48% of the line's extension);
- Non-tree cultivation (28% of the line's extension);
- Naked soil (11% of the line's extension);
- Flooded herbaceous vegetation (7% of the line's extension);
- Urban area (4% of the line's extension).
- Prairie/Grasslands (2% of the line's extension);
- Tree cultivation (<1% of the line's extension).

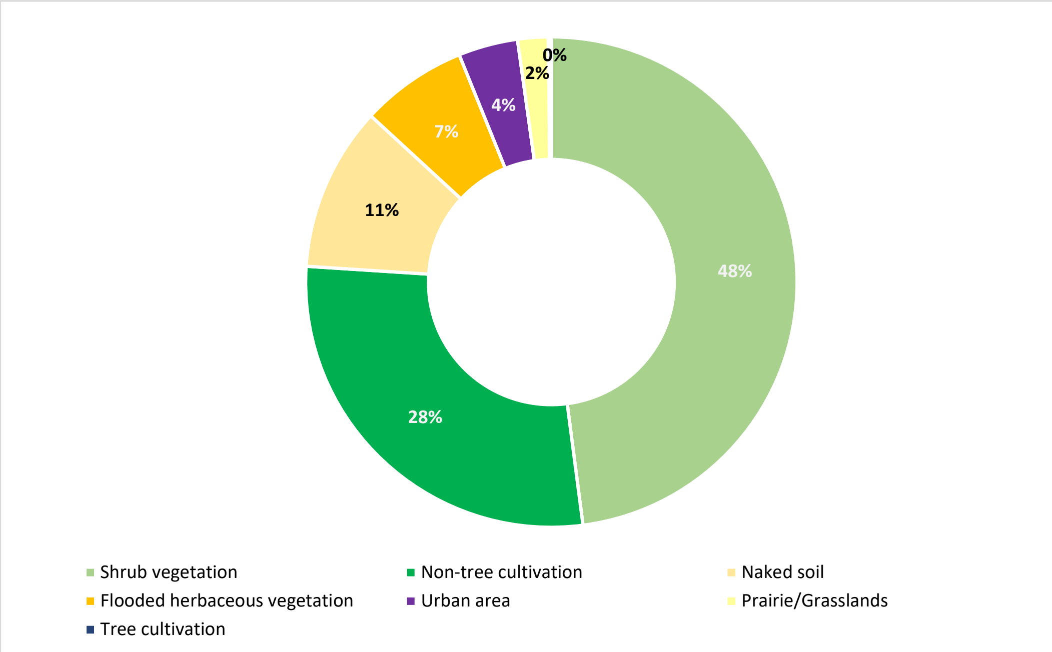


Figure 6-51 – Land cover distribution diagram of habitat units in project area

Main vegetation types identified is described in more detail below:

Shrub vegetation is the most representative in the project ADI (48% of the line's extension) and can be characterised as undifferentiated woodlands and acacia woodlands.

These tree or shrub formations are characterised by a mixture of species where lacks the predominance of floristic elements typical of the Mopane and Miombo woodlands (Magalhães, 2018). This type of vegetation forms open woodlands, sometimes moderately dense, with a dominance of deciduous tree species, and are mostly formed by two to three strata, with the lower stratum composed of a mixture of shrubs and trees in regeneration. The trees with high canopies do not touch each other, the shrub layer is well developed, and areas of open vegetation can be found, with herbaceous vegetation alternated with shrub species.

The main species identified in the tree stratum are: *Dalbergia melanoxylon, Swartzia madagascariensis, Erythrophloeum africanum*, and in the shrub layer *Vachellia nigrescens,* Cagôlo *(Combretum paniculatum* and *Combretum sp.*) and climbers such as *Eureiandra eburnea* while in the herbaceous layer can be found *Aloe spp., Sansevieria sp.* and *Vernonia colorata*, among others. In anthropized areas the canopy cover is generally low, less than 50%, with a low species diversity due to the destruction of vegetation to open up agricultural fields and the extraction of commercially valuable trees for the production of timber, firewood and charcoal. The shrub vegetation covers most of the project area.

Undifferentiated woodlands are defined by the absence of dominant miombo or mopane species. Small trees and shrubs are common but not abundant. Typical species include *Grewia bicolor, Dichrostachys cinerea, Vachellia nilotica, Combretum apiculatum, Dalbergia sp., Combretum spp., Commiphora mossambicensis, Commiphora africana,* Canho *(Sclerocarya birrea) and* Blackwood *(Dalbergia melanoxilon*). The undifferentiated forest vegetation unit occurs throughout the study area and is the most represented.

In the undifferentiated woodlands, the species that presented the highest importance index value are: Canho (*Sclerocarya birrea*) (IVI=102.3%), Incaia (*Acacia welwitschii*) (IVI=28.8%) and *Grewia flavescens* (IVI=12. 2%) (Figure 6-52).

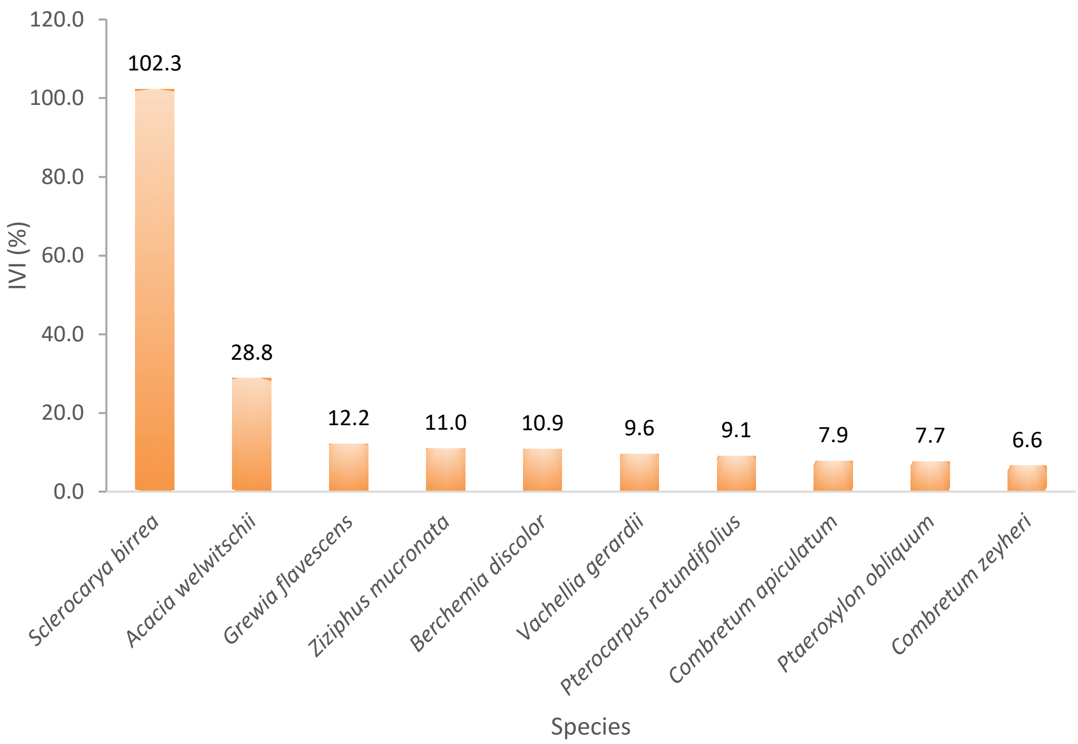


Figure 6-52 – Importance Value Index (IVI%) of the 10 most important species in the Undifferentiated woodlands

Figure 6-53 – Undifferentiated woodlands in project area

Acacia woodlands are formed mainly by grasses, trees and small shrubs, there are long stretches without trees, only grasses. The soils are generally poor in nutrients, and may be sandy, preventing the development of large vegetation, but some soils may be relatively fertile, where grasses settle.

The species with the highest importance value in the acacia forest are namely: *Vachellia davyi* (IVI=73.6%), Canho (*Sclerocarya birrea*) (IVI=72.1%), Caia (*Vachellia nigrescens*) (IVI=54.4 %) and *Vachellia gerrardii* (IVI=41.7%). The graph in Figure 6-54 represents the 10 most important species in the acacia forest.

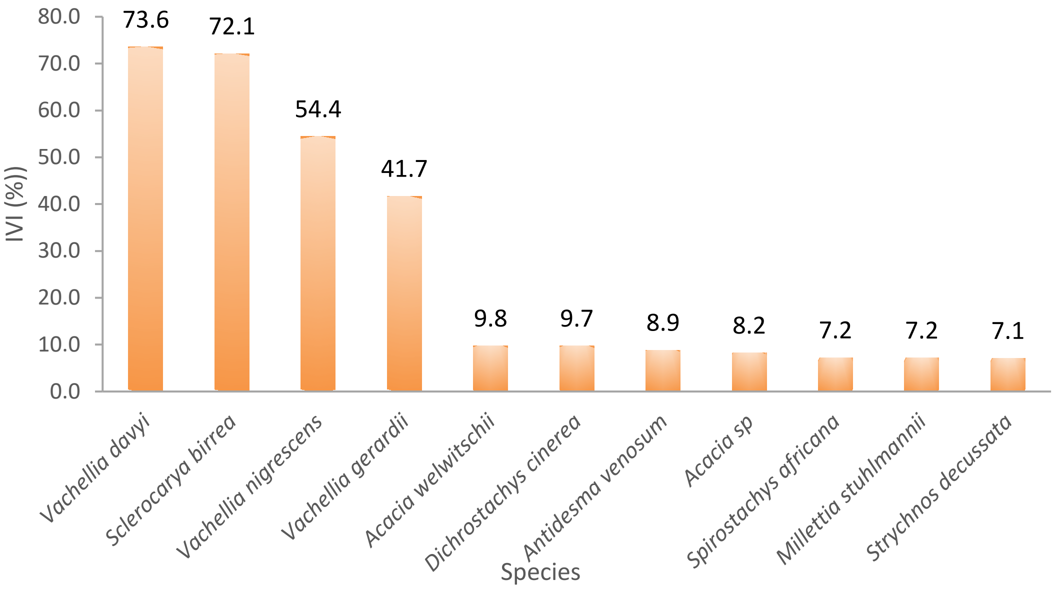


Figure 6-54 – Importance Value Index (IVI%) of the 10 most important species in the Acacia woodlands

Figure 6-55 – Acacia woodland in project area

Non-tree cultivation is the second most representative land use in the area (28% of the line's extension) represent the agricultural areas, mostly of subsistence and also itinerant, which consists of cutting and burning of the forest, these are small areas between 0.5 to 1 hectare. This type of subsistence agriculture is usually done for a 1 to 2 year period and then the area is abandoned allowing natural regeneration to occur. These areas are present in the study area and represent a large extension of the Project area, as the districts of Boane and Namaacha have a great agricultural potential, and where there are several farms and associations for agricultural production. Orchards of various fruit trees (such as banana plantation) are distributed throughout Boane and Namaacha districts that have a great potential for tree cultivation, in addition to fruit farming. Local communities have the habit of having fruit trees in their backyards.

The **flooded herbaceous areas** area (7% of the line's extension) are ecosystems that have plants adapted to soils that are periodically or permanently flooded, occurring in soils that undergo anaerobic processes, mainly plants with roots adapted to withstand flooding. These areas must be protected as they perform important ecological functions.

As an integrating element, water bodies include all rivers, tributaries and seasonally flooded areas found along the study area. The main river basin in the study area is the Umbeluzi River, with the crossing its tributaries Movene and the Impamputo rivers (see Figure 6-36). The banks of the Umbeluzi River and tributaries are mainly occupied by human settlements and agricultural activities. In those places where riparian vegetation occurs, it generally consists of large trees with a dense layer of shrubs, sometimes forming a small forest. Characteristic species are *Cordyla africana, Acacia spp.* and *Kirkia acuminata*. On other patches of natural vegetation, species such as *Phragmites mauritianus, Ficus sycomorus* and *Typha capensis* are also present.

The aquatic, semi-aquatic and terrestrial vegetation on the banks of rivers, swamps and freshwater lagoons is made up of numerous species, of which the most characteristic are Xinghavé (*Vachellia nilotica* subsp. *kraussiana*), *Cyperus papyrus*, Inkuyo (*Ficus sycomorus*), *Fuirena umbellata*, *Mimosa pigra*, Mkindo (*Phoenix reclinata*), Reed (*Phragmites australis*), *Pycreus macranthus*, Secassica (*Sesbania sesban*) and *Typha domingensis*.

The species with the highest importance value (IVI) identified in riparian vegetation within the Project study area are: *Ficus ingens* (IVI=45.8%), *Cola dorrii* (IVI=38.7%), Chanfuta (*Afzelia quanzensis*) (IVI=38.2%) and Ncuacua (*Strychnos madagascariensis*) (IVI=29.8%) (see Figure 6-56).

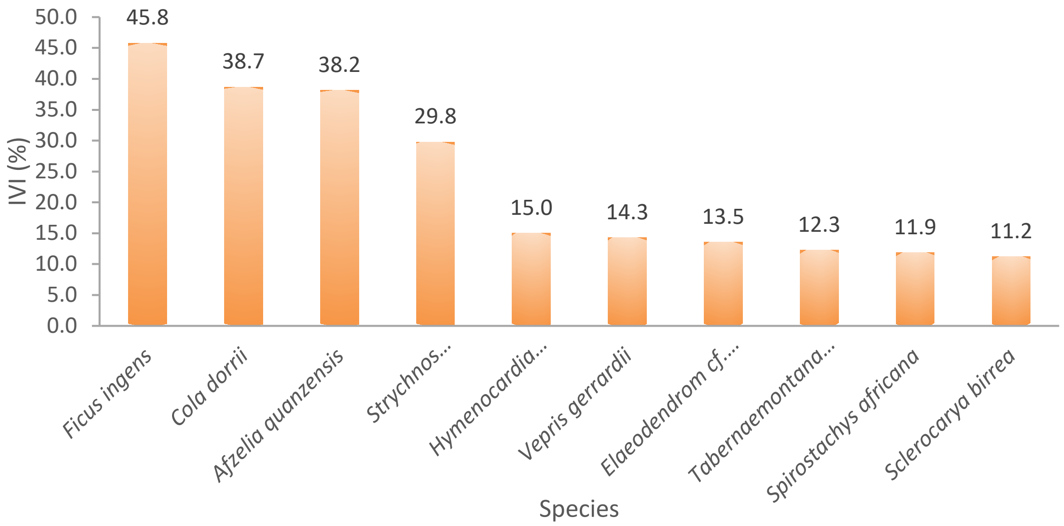


Figure 6-56 – Importance Value Index (IVI%) of the 10 most important species in riparian vegetation

The following figures illustrate the riparian vegetation identified within the study area.

Figure 6-57 – Riparian vegetation in project area

Prairie/Grasslands consist of semi-deciduous vegetation, constituted by a disperse arboreal component, with canopy cover of less than 2% of the area, and an herbaceous component which forms extensive grassy areas. In this physiognomy the tree crowns hardly touch each other, tree species such as: Bastard marula (*Lannea schweinfuthi*), Apple leaf (*Lonchocarpus capassa*), Marula tree *(Sclerocarya birrea*), African blackwood (*Dalbergia melanoxylon*), Bird plum (*Berchemia discolor*), Garcke (*Sterculia quiqueloba*) and Baobab (*Adansonia digitata*), among others, can be found. In the herbaceous stratum are found species such as: *Dactyloctenium aegyptium, Digitaria eriantha, Echinochloa colona, Eragrostis capensis, Heteropogon contortus, Panicum maximum, Sporobolus festivus, Sporobolus pyramidalis, Urelytrum argopyroides, Urochloa mosambicensis,* and *Heteropogon contortus*. The grassland areas develop mainly on shallow, poor soils, sometimes in areas with rocky outcrops.

Figure 6-58 – Grassland in the project area

6.2.2.3 Species diversity

A total of 543 individuals representing 50 tree species were identified and distributed in 22 botanical families. The following graph represents the distribution of individuals within the families identified during the fieldwork. It also shows that the Fabaceae and Anacardicaceae botanical families stood out in terms of number of trees, with 70.5 trees/hectare and 21.5 trees/hectare respectively.

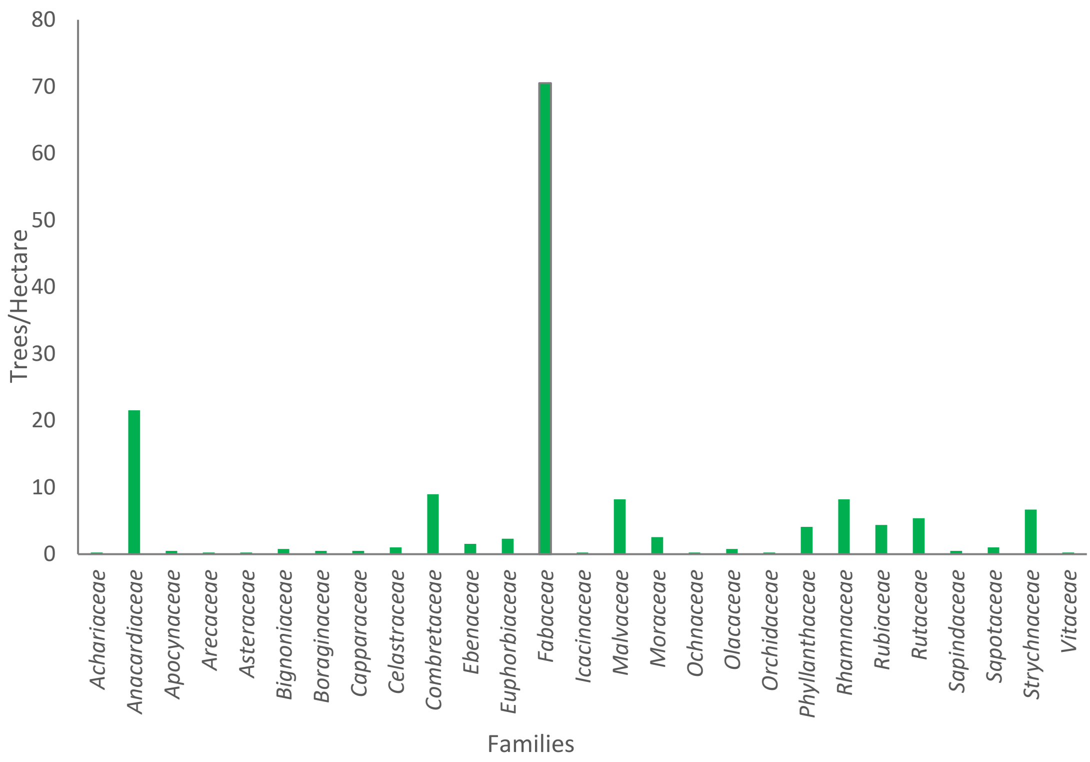


Figure 6-59 – Distribution of botanical families throughout the project area.

Taking into account the species richness within the project area, aside from the Fabaceae family with the highest species richness (12 species), the Combretaceae (4 species) and Anacardiaceae, Malvaceae, Phyllantaceae, Rutaceae, Strychnaceae and Rubiaceae families with 3 species each, followed Euphorbiceae and Rhamnaceae 2 species each per family, and 1 species was identified for each of the remaining families. The following table illustrates the diversity in each of the identified types of woodlands during the field survey.

Table 6-21 – Floristic composition of the types of woodlands identified in the project area

Category	Density (Ni/ha)	Richness	Family	Sampled plots
Acacia woodlands	4	126,6	1,09	11
Undifferentiated woodlands	7	149	3,91	38
Riparian vegetation	2	130	0.79	18
Total (sample)	**13**	**405,6**	**5,8**	**50***

The undifferentiated woodlands have the highest species richness (38 species) followed by riparian vegetation (18 species) and acacia woodlands.

The floristic survey conducted within the study area showed that the maximum diameter measured was 78.5 cm recorded in the species *Scleorocarya birrea* (Canho). Regarding the diametric distribution of species identified in the project area, the patterns verified for the species accumulation curve are similar to those of a natural forest. One of these patterns showed the vast majority of individuals are inserted within the first diametric classes (5-10 and 10-15), representing 89.68% of sampled individuals.

The other pattern is the reverse J-shaped diametric distribution, that is, there is a greater number of individuals in the smaller diameter class and, in the following classes there are fewer individuals. The distribution pattern of the reverse J is an indicator of ecological stability of the population and of a species, and therefore an indicator of ecological sustainability in the management of this species.

This type of distribution in a natural environment is typical of forests with regeneration from seeds (Lambrecht, 1990; Coraiola, 1997; Ribeiro et al., 2002). The lower number of individuals in the larger classes may be associated with the characteristics of the species found within the project area. It may also be associated with logging or implication of the practice of agriculture within this area.

This reversed J distribution behaviour was observed in all habitats (Figure 6-61) identified during the field survey in the project area, namely undifferentiated woodlands, acacia woodland and riparian vegetation.

According to Lamprech (1990) it can be considered that the natural support capacity is assured. The undifferentiated woodlands were the only physiognomy that presented individuals in the DBH≥40 cm class, representing only 1.2% of the individuals sampled, thus suggesting that the absence of trees with larger diameters may be associated with anthropic degradation caused by human action, such as the practice of agriculture and/or logging.

In the acacia woodlands, 94% of the individuals sampled are in classes between 5-15 cm DBH. In riparian vegetation approximately 95% of the individuals sampled are in the 5-20 cm DHB classes.

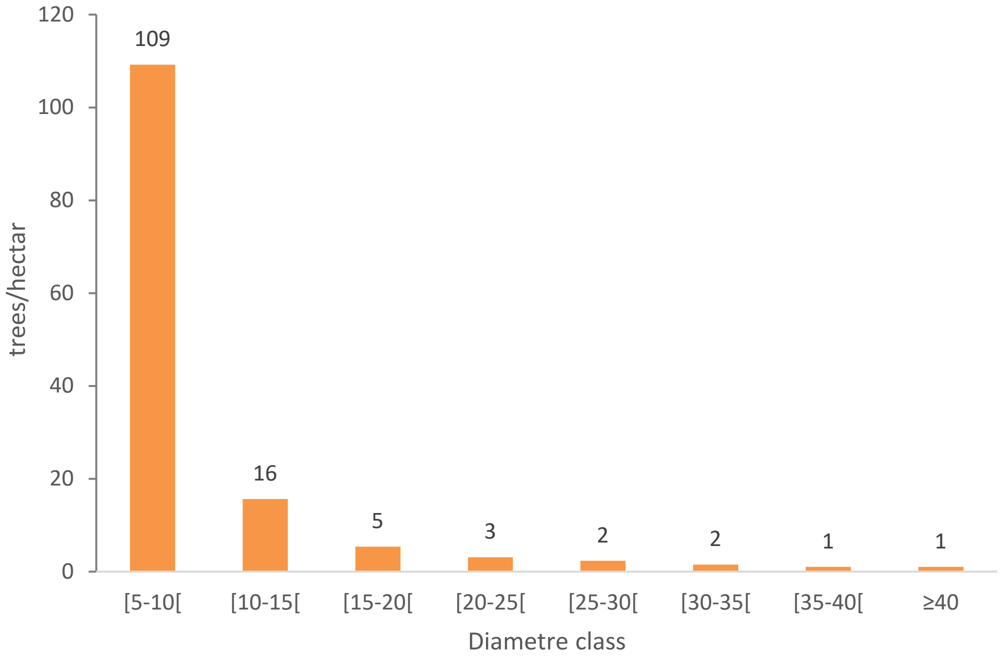


Figure 6-60 – Diametric distribution of the project area

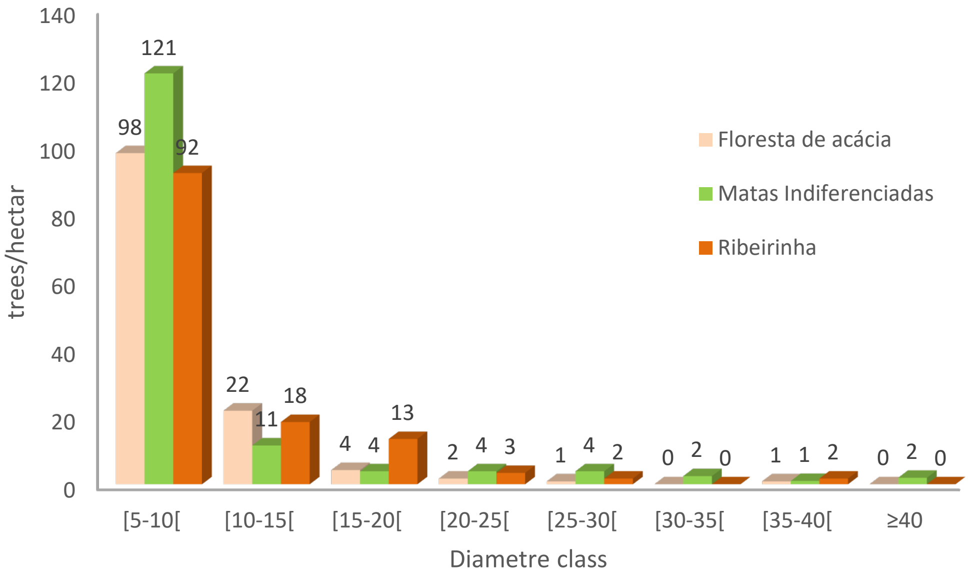


Figure 6-61 – Diametric distribution for Undifferentiated Woodlands, Acacia Woodlands and Riparian Vegetation.

6.2.2.4 Plants of special interest

In Mozambique, according to the Red List of Plants for Mozambique (Bandeira & Izidine, 2002 in Southern African Plant Red Data Book (Golding, 2002)), there are about 300 species classified as critically endangered, endemic and vulnerable, a classification based on the categorization criteria of the IUCN (2020). According to this list and the IUCN Red List of Southern African plants, one shrubby tree species of conservation interest was found in the sampled areas, namely *Lannea schweinfurthii*, classified as vulnerable (VU) (IUCN 2022).

6.2.2.5 Uses of Flora Species

The native species in the study area are used by local communities for various purposes, including food, timber, cultural and medicinal use. These plants were identified through flora manuals and with the help of the field botanist. The main uses of the native plants are as follows:

Construction – The wood from various tree species is used locally in the construction of precarious houses, improvements, and animal fences. The main wood species used in the area are Chanfuta (*Afzelia quanzensis*), Copo-copo (*Milletia sthulmannii*), Pau-rosa (*Berchemia discolor*).

Food – Refers to native and introduced species whose leaves, roots, or fruits are used as food. Most of the agricultural crops on the farms have food use, some for personal consumption or for trade, especially sorghum, tomato, sesame, corn, and cassava, among others. Among the native and naturalized fruit trees are Canho (*Sclerocarya birrea*), Massala (*Strychnos spinosa*), Macuacua (*Strychnos madagascariensis*), and others.

Fuel – Fuel is produced in the form of charcoal and firewood, using native plants such as Tatalatani (*Hymenocardia ulmoides*), *Cola dorrii*, Shikukutse (*Combretum molle*), among other species.

Medicinal use – Among the native and introduced species in the region with medicinal use is the *Olax dissitiflora*, a plant with medicinal roots and leaves used as cosmetics to treat the skin. *Lípia javanica* leaves are used to treat influenza.

The list of some of the botanical species, trees and shrubs identified in the study area and that are used by local people for various purposes is presented in the table below.

Table 6-22 – Botanical species used by local people

Family	Scientific Name	Comon name	Main Uses
Fabaceae	*Afzelia quanzensis*	Nlhanfuta/Chanfuta	Timber
Rhamnaceae	*Berchemia discolor*	Pau-rosa	Timber
Malvaceae	*Cola dorrii*		Production of charcoal
Combretaceae	*Combretum molle*	*Shikukutse*	Production of charcoal/ Timber
Euphorbiaceae	*Croton pseudopulchellus*	Dilhambo	Medicinal
Fabaceae	*Dichrostachys cinerea*	Tsenga	Medicinal
Boraginaceae	*Ehretia amoena*		Medicinal
Ebenaceae	*Euclea undulata*	Mulala	Roots used to hygiene of the mouth
Celastraceae	*Gymnosporia heteropylla*	Chichango	Medicinal
Bignoniaceae	*Kigelia africana*	Mpfungula	Medicinal
Fabaceae	*Milletia sthulmannii*	Copo-copo/Panga-panga	Timber
Olacaceae	*Olax dissitiflora*	Mussiro	Medicinal/Cosmetics
Arecaceae	*Phoenix reclinata*	Kindo	Edible fruits

Family	Scientific Name	Comon name	Main Uses
Rutaceae	*Ptaeroxylon Obliquum*	Timbila	Production of traditional instruments (e.g. Timbila)
Anacardiaceae	*Sclerocarya birrea*	Ncanho	Food (the fruits are used to produce traditional drink) and medicinal
Fabaceae	*Spirostachys africana*	Sandalo	Handicraft/medicinal
Strychnaceae	*Strychnos madagascariensis*	Ncuacua	Edible fruits
Strychnaceae	*Strychnos spinosa*	Nsala	Edible fruits
Apocynaceae	*Tabernaemontana elegans*	Cachuane	Medicinal/Edible fruits
Combretaceae	*Terminalia sericea*	*Conola*	Medicinal/Rope production
Rubiaceae	*Vangueria randii*	maffilwa	Edible fruits
Rhamnaceae	*Ziziphus mucronata*	Massanica	Edible fruits
Herbaceous and Gramineae			
Orchidaceae	*Encyclia baculus*		Ornamental
Poaceae	*Hyperthelia dissoluta*		Used as rooftop
Hypoxidaceae	*Hypoxis hemerocallidea*	African potato	Medicinal
Verbenaceae	*Lippia javanica*		Medicinal
Poaceae	Panicum maximum	Chihundze	Used for pasture
Poaceae	*Phragmites australis*	hlanga	Used for building houses
Vitaceae	*Rhoicissus revoilii*	chilucalhelo	Used in the production of sieves and mats
Solanaceae	*Solanum panduriforme*	Ruluana-tsongo	Medicinal

During the field visit it was possible to observe some evidence of degradation, and in addition to the practice of agriculture, there is also livestock production within the project area. Charcoal production has also been a practice within the project area, and several points with charcoal kilns were found. Below are illustrations of some of the uses and evidence of degradation.

Crop preparation

Charcoal production

Figure 6-62 – Uses of natural resources and forms of forest degradation

6.2.3 Fauna

Power lines can have negative impacts on biodiversity, particularly for flying species such as birds and bats, where the risk of collision is a serious concern. Therefore, these two groups have been given particular attention during the project's planning phase, as well as in the ESIA.

6.2.3.1 Avifauna

According to secondary data collected through a comprehensive literature review on birds within the project area, 240 bird species of potential occurrence have been identified in the project area. This number excludes species of birds from the families of the Passeriformes Order which, due to their size and behaviour, are not at risk from this type of projects.

The 240 potentially occurring species in the study area belong to 17 orders and 51 families.

Of the species of potential occurrence, about 31 are migratory birds, with the remaining birds being resident. About 43 species are birds of prey, including species of hawks and vultures.

In terms of birds of potential occurrence in the area, species typically associated with forest and wetlands species have a higher representation.

The project area has a moderate to high diversity of avifauna, particularly of smaller terrestrial species which are less likely to suffer collision impacts.

Field survey (dry and wet season)

Bird surveys were performed in the dry season (early November 2022) and in the wet season (late March 2023). Details on methodology are presented in section 6.2.1.3.

89 bird species were observed, of which 39 were recorded in both seasons of the year. In the second campaign, 32 new species were observed, which had not been registered in the previous campaign. While 18 species recorded in the first campaign were not observed in the second. This indicates the dynamics in terms of species variation at this location throughout the year, i.e., there are many local movements between species areas, including some migrations. About 16% of the observed bird species are considered migratory in the study area, of which 7% are palearctic migrants and 9% are intra-African migrants (Figure 6.63*)*. The other species are considered common residents in the region, that is, they are present all year round. This finding emphasizes the importance of this area for migratory birds in addition to resident birds.

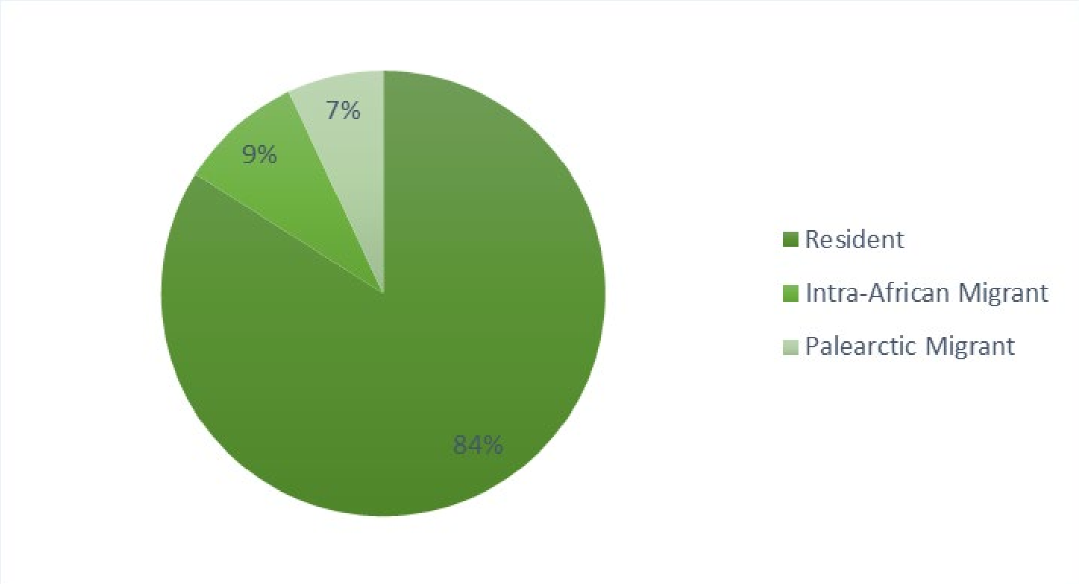


Figure 6.63 – Percentage of common resident, African migratory, and palearctic migratory bird species observed in the study area during the two sampling seasons

All of the observed species have a Least Concern (LC) conservation status according to the IUCN red list (IUCN, 2023).

Three of this species are protected by Mozambique's Forest and Wildlife Regulations (Decree No. 12/2002)

Table 6.23 – Observed bird species

ORDER	FAMILY	SPECIES	NAME	STATUS	ENDEMISM	LAW	SEASON
APODIFORMES	APODIDAE	*Apus affinis*	Little Swift	Common Resident			Wet/Dry
CHARADRIIFORMES	GLAREOLIDAE	*Glareola pratincola*	Collared Pratincole	Common Resident			Wet/Dry
CICONIIFORMES	PLATALEIDAE	*Bostrychia hagedash*	Hadada Ibis	Common Resident			Wet/Dry
COLIIFORMES	COLIIDAE	*Colius striatus*	Speckled Mousebird	Common Resident			Wet/Dry
COLIIFORMES	COLIIDAE	*Urocolius indicus*	Red-faced Mousebird	Common Resident			Wet/Dry
COLUMBIFORMES	COLUMBIDAE	*Streptopelia capicola*	Cape Turtle Dove	Common Resident		X	Wet/Dry
COLUMBIFORMES	COLUMBIDAE	*Streptopelia decipiens*	Mourning Collared Dove	Common Resident			Wet/Dry
COLUMBIFORMES	COLUMBIDAE	*Streptopelia semitorquata*	Red-eyed Dove	Common Resident			Wet/Dry
COLUMBIFORMES	COLUMBIDAE	*Treron calva*	African Green Pigeon	Common Resident			Wet
COLUMBIFORMES	COLUMBIDAE	*Turtur chalcospilos*	Emerald-spotted Wood Dove	Common Resident		x	Wet/Dry
CORACIIFORMES	ALCEDINIDAE	*Halcyon albiventris*	Brown-hooded Kingfisher	Common Resident			Wet/Dry
CORACIIFORMES	BUCEROTIDAE	*Lophoceros alboterminatus*	Crowned Hornbill	Common Resident			Wet/Dry

Order	Family	Species	Name	Status	Endemism	Law	Season
CORACIIFORMES	BUCEROTIDAE	*Tockus leucomelas*	Southern Yellow-billed Hornbill	Common Resident			Wet/Dry
CORACIIFORMES	CORACIIDAE	*Coracias caudata*	Lilac-breasted Roller	Common Resident			Wet
CORACIIFORMES	MEROPIDAE	*Merops persicus*	Blue-cheeked Bee-eater	Palearctic migratory			Wet/Dry
CORACIIFORMES	MEROPIDAE	*Merops pusillus*	Little Bee-eater	Common Resident			Wet/Dry
CUCULIFORMES	CUCULIDAE	*Centropus burchellii*	Burchell's Coucal	African migratory			Wet/Dry
CUCULIFORMES	CUCULIDAE	*Chrysococcyx klaas*	Klaas's Cuckoo	African Migratory			Wet/Dry
CUCULIFORMES	CUCULIDAE	*Clamator jacobinus*	Jacobin Cuckoo	African Migratory			Wet/Dry
CUCULIFORMES	CUCULIDAE	*Cuculus clamosus*	Black Cuckoo	African Migratory			Wet/Dry
CUCULIFORMES	CUCULIDAE	*Cuculus solitarius*	Red-chested Cuckoo	African Migratory			Wet/Dry
CUCULIFORMES	MUSOPHAGIDAE	*Corythaixoides concolor*	Grey Go-away-bird	Common Resident			Wet/Dry
CUCULIFORMES	MUSOPHAGIDAE	*Crinifer concolor*	Grey Go-away-bird	Common Resident			Wet
CUCULIFORMES	MUSOPHAGIDAE	*Tauraco livingstonii*	Livingstone's Turaco	Uncommon Resident			Wet/Dry
FALCONIFORMES	ACCIPITRIDAE	*Circaetus pectoralis*	Black-chested Snake Eagle	Uncommon resident			Wet/Dry
FALCONIFORMES	ACCIPITRIDAE	*Polyboroides typus*	African Harrier-Hawk	Common Resident			Wet/Dry
GALIFORMES	NUMIDIDAE	*Numida meleagris*	Helmeted Guineafowl	Common Resident		x	Wet/Dry
GALIFORMES	PHASIANIDAE	*Coturnix coturnix*	Common Quail	Palearctic Migratory			Wet
GALIFORMES	PHASIANIDAE	*Pternistis afer*	Red-necked Spurfowl	Common Resident			Wet/Dry
PASSERIFORMES	ALAUDIDAE	*Mirafra rufocinnamomea*	Flappet Lark	Common Resident			Wet/Dry
PASSERIFORMES	DICRURIDAE	*Dicrurus adsimilis*	Fork-tailed Drongo	Common Resident			Wet/Dry
PASSERIFORMES	DICRURIDAE	*Dicrurus ludwigii*	Common Square-tailed Drongo	Common Resident			Wet/Dry
PASSERIFORMES	ESTRILDIDAE	*Estrilda astrild*	Common Waxbill	Common Resident			Wet/Dry
PASSERIFORMES	ESTRILDIDAE	*Lagonosticta rubricata*	African Firefinch	Uncommon Resident			Wet/Dry
PASSERIFORMES	ESTRILDIDAE	*Lonchura cucullata*	Bronze Mannikin	Common Resident			Wet/Dry
PASSERIFORMES	ESTRILDIDAE	*Lonchura cucullata*	Bronze Mannikin	Common Resident			Wet
PASSERIFORMES	ESTRILDIDAE	*Uraeginthus angolensis*	Blue Waxbill	Common Resident			Wet/Dry
PASSERIFORMES	FRINGILLIDAE	*Crithagra mozambica*	Yellow-fronted Canary	Common Resident			Wet/Dry

ORDER	FAMILY	SPECIES	NAME	STATUS	ENDEMISM	LAW	SEASON
PASSERIFORMES	FRINGILLIDAE	*Crithagra sulphurata*	Brimstone Canary	Common Resident			Wet
PASSERIFORMES	FRINGILLIDAE	*Emberiza tahapisi*	Cinnamon-breasted Bunting	Common Resident			Wet/Dry
PASSERIFORMES	HIRUNDINIDAE	*Cecropis abyssinica*	Lesser Striped Swallow	African Migratory			Wet/Dry
PASSERIFORMES	HIRUNDINIDAE	*Hirundo rustica*	Barn Swallow	Palearctic Migratory			Wet/Dry
PASSERIFORMES	HIRUNDINIDAE	*Hirundo spilodera*	South African Cliff Swallow	African Migratory			Wet/Dry
PASSERIFORMES	HIRUNDINIDAE	*Riparia riparia*	Sand Martin	Palearctic Migratory			Wet/Dry
PASSERIFORMES	MALACONOTIDAE	*Chlorophoneus sulfureopectus*	Orange-breasted Bushshrike	Common Resident			Wet/Dry
PASSERIFORMES	MALACONOTIDAE	*Dryoscopus cubla*	Black-backed Puffback	Common Resident			Wet/Dry
PASSERIFORMES	MALACONOTIDAE	*Laniarius ferrugineus*	Southern Boubou	Common Resident			Wet/Dry
PASSERIFORMES	MALACONOTIDAE	*Tchagra australis*	Brown-crowned Tchagra	Common Resident			Wet/Dry
PASSERIFORMES	MALACONOTIDAE	*Tchagra tchagra*	Southern Tchagra	Uncommon Resident			Wet/Dry
PASSERIFORMES	MALACONOTIDAE	*Telophorus viridis*	Gorgeous Bushshrike	Uncommon Resident			Wet/Dry
PASSERIFORMES	MUSCICAPIDAE	*Batis fratrum*	Woodward's Batis	Common Resident	end.		Wet
PASSERIFORMES	MUSCICAPIDAE	*Batis molitor*	Chinspot Batis	Common Resident			Wet/Dry
PASSERIFORMES	MUSCICAPIDAE	*Batis soror*	Mozambique Batis	Common Resident	end.		Wet
PASSERIFORMES	MUSCICAPIDAE	*Terpsiphone viridis*	African Paradise Flycatcher	Common Resident			Wet/Dry
PASSERIFORMES	NECTARINIIDAE	*Chalcomitra amethystina*	Amethyst Sunbird	Common Resident			Wet
PASSERIFORMES	NECTARINIIDAE	*Chalcomitra senegalensis*	Scarlet-chested Sunbird	Common Resident			Wet/Dry
PASSERIFORMES	NECTARINIIDAE	*Cinnyris bifasciatus*	Purple-banded Sunbird	Common Resident			Wet
PASSERIFORMES	NECTARINIIDAE	*Cinnyris mariquensis*	Marico Sunbird	Common Resident			Wet/Dry
PASSERIFORMES	NECTARINIIDAE	*Cinnyris talatala*	White-bellied Sunbird	Common Resident			Wet
PASSERIFORMES	NECTARINIIDAE	*Cinnyris venustus*	Variable Sunbird	Uncommon Resident			Wet/Dry
PASSERIFORMES	NECTARINIIDAE	*Hedidypna collaris*	Collared Sunbird	Common Resident			Wet
PASSERIFORMES	PLOCEIDAE	*Euplectes ardens*	Red-collared Widowbird	Common Resident			Wet/Dry
PASSERIFORMES	PLOCEIDAE	*Euplectes capensis*	Yellow Bishop	Common Resident			Wet
PASSERIFORMES	PLOCEIDAE	*Passer griseus*	Northern Grey-headed Sparrow	Common Resident			Wet

ORDER	FAMILY	SPECIES	NAME	STATUS	ENDEMISM	LAW	SEASON
PASSERIFORMES	PLOCEIDAE	*Ploceus ocularis*	Spectacled Weaver	Common Resident			Wet/Dry
PASSERIFORMES	PLOCEIDAE	*Ploceus velatus*	Southern Masked Weaver	Common Resident			Wet/Dry
PASSERIFORMES	PYCNONOTIDAE	*Andropadus importunus*	Sombre Greenbul	Common Resident			Wet/Dry
PASSERIFORMES	PYCNONOTIDAE	*Chlorocichla flaviventris*	Yellow-bellied Greenbul	Common Resident			Wet/Dry
PASSERIFORMES	PYCNONOTIDAE	*Nicator gularis*	Eastern Nicator	Common Resident			Wet/Dry
PASSERIFORMES	PYCNONOTIDAE	*Phyllastrephus terrestris*	Terrestrial Brownbul	Common Resident			Wet/Dry
PASSERIFORMES	PYCNONOTIDAE	*Pycnonotus tricolor*	Dark-capped Bulbul	Common Resident			Wet/Dry
PASSERIFORMES	STURNIDAE	*Lamprotornis corruscus*	Black-bellied Starling	Uncommon Resident			Wet/Dry
PASSERIFORMES	SYLVIIDAE	*Apalis flavida*	Yellow-breasted Apalis	Common Resident			Wet/Dry
PASSERIFORMES	SYLVIIDAE	*Camaroptera brachyura*	Green-backed Camaroptera	Common Resident			Wet
PASSERIFORMES	SYLVIIDAE	*Cisticola chiniana*	Rattling Cisticola	Common Resident			Wet/Dry
PASSERIFORMES	SYLVIIDAE	*Cisticola galactotes*	Rufous-winged Cisticola	Common Resident			Wet/Dry
PASSERIFORMES	SYLVIIDAE	*Prinia subflava*	Tawny-flanked Prinia	Common Resident			Wet/Dry
PASSERIFORMES	SYLVIIDAE	*Sylvietta whytii*	Red-faced Crombec	Common Resident			Wet/Dry
PASSERIFORMES	TIMALIIDAE	*Turdoides jardineii*	Arrow-marked Babbler	Common Resident			Wet/Dry
PASSERIFORMES	TURDIDAE	*Cercotrichas leucophrys*	White-browed Scrub Robin	Common Resident			Wet/Dry
PASSERIFORMES	TURDIDAE	*Cossypha heuglini*	White-browed Robin-Chat	Common Resident			Wet
PASSERIFORMES	TURDIDAE	*Cossypha natalensis*	Red-capped Robin-Chat	Common Resident			Wet
PASSERIFORMES	TURDIDAE	*Saxicola torquata*	African Stonechat	Palearctic Migratory			Wet
PASSERIFORMES	VIDUIDAE	*Vidua macroura*	Pin-tailed Whydah	Common Resident			Wet
PASSERIFORMES	ZOSTEROPIDAE	*Zosterops anderssoni*	Southern Yellow White-eye	Uncommon Resident			Wet/Dry
PASSERIFORMES	ZOSTEROPIDAE	*Zosterops pallidus*	Cape White-eye	Common Resident	almost		Dry
PICIFORMES	LYBIIDAE	*Lybius torquatus*	Black-collared Barbet	Common Resident			Wet/Dry
PICIFORMES	LYBIIDAE	*Pogoniulus bilineatus*	Yellow-rumped Tinkerbird	Common Resident			Wet/Dry
PICIFORMES	LYBIIDAE	*Trachyphonus vaillantii*	Crested Barbet	Common Resident			Wet/Dry
PICIFORMES	PICIDAE	*Dendropicos fuscescens*	Cardinal Woodpecker	Common Resident			Wet

ORDER	FAMILY	SPECIES	NAME	STATUS	ENDEMISM	LAW	SEASON
STRIGIFORMES	STRIGIDAE	*Glaucidium capense*	African Barred Owlet	Uncommon Resident			Wet/Dry

Species Density

During the first campaign, the species that had the highest density were the following: *Merops persicus, Cisticola chiniana, Turtur chalcospilos, Prinia subflava, Andropadus importunes, Pycnonotus tricolor, Crithagra mozambica, Laniarius ferrugineus*, and so on. In general, during the second campaign, the dominant species were almost the same, changing only the hierarchical order between them.

Table 6.24 – Observed bird species density

Scientific Name	Common Name	Density (dry)	Density (wet)	Status
Merops persicus	Blue-cheeked Bee-eater	0,001165	0,000121	Palearctic Migratory
Cisticola chiniana	Rattling Cisticola	0,000892	0,000276	Common Resident
Turtur chalcospilos	Emerald-spotted Wood Dove	0,000821	0,000044	Common Resident
Prinia subflava	Tawny-flanked Prinia	0,000754	0,000242	Common Resident
Andropadus importunus	Sombre Greenbul	0,000453	0,000691	Common Resident
Pycnonotus tricolor	Dark-capped Bulbul	0,000446	0,000297	Common Resident
Crithagra mozambica	Yellow-fronted Canary	0,000434	0,000257	Common Resident
Laniarius ferrugineus	Southern Boubou	0,000423	0,000129	Common Resident
Sylvietta whytii	Red-faced Crombec	0,000344	0,000100	Common Resident
Cinnyris venustus	Variable Sunbird	0,000324	0,000269	Common Resident
Uraeginthus angolensis	Blue Waxbill	0,000302	0,000388	Common Resident
Tchagra australis	Brown-crowned Tchagra	0,000293	0,000079	Common Resident
Dryoscopus cubla	Black-backed Puffback	0,000259	0,000049	Common Resident
Euplectes ardens	Red-collared Widowbird	0,000259	0,000010	Common Resident
Lagonosticta rubricata	African Firefinch	0,000219	0,000200	Common Resident
Tauraco livingstonii	Livingstone's Turaco	0,000196	0,000024	Common Resident
Hirundo rustica	Barn Swallow	0,000178		Palearctic Migratory

Scientific Name	Common Name	Density (dry)	Density (wet)	Status
Urocolius indicus	Red-faced Mousebird	0,000173	0,000146	Common Resident
Chlorophoneus sulfureopectus	Orange-breasted Bushshrike	0,000173	0,000049	Common Resident
Ploceus ocularis	Spectacled Weaver	0,000159	0,000010	Common Resident
Mirafra rufocinnamomea	Flappet Lark	0,000151	0,000010	Common Resident
Chalcomitra senegalensis	Scarlet-chested Sunbird	0,000134	0,000079	Common Resident
Lamprotornis corruscus	Black-bellied Starling	0,000129		Uncommon Resident
Bostrychia hagedash	Hadada Ibis	0,000110		Common Resident
Nicator gularis	Eastern Nicator	0,000110		Common Resident
Apalis flavida	Yellow-breasted Apalis	0,000089	0,000041	Common Resident
Centropus burchellii	Burchell's Coucal	0,000089	0,000010	Common Resident
Cuculus solitarius	Red-chested Cuckoo	0,000089		African Migratory
Dicrurus ludwigii	Common Square-tailed Drongo	0,000089		Common Resident
Ploceus velatus	Southern Masked Weaver	0,000086	0,000079	Common Resident
Lonchura cucullata	Bronze Mannikin	0,000084		Common Resident
Phyllastrephus terrestris	Terrestrial Brownbul	0,000065	0,000074	Common Resident
Cercotrichas leucophrys	White-browed Scrub Robin	0,000065	0,000041	Common Resident
Chrysococcyx klaas	Klaas's Cuckoo	0,000065	0,000034	African Migratory
Merops pusillus	Little Bee-eater	0,000065	0,000020	Common Resident
Batis molitor	Chinspot Batis	0,000053	0,000034	Common Resident
Cecropis abyssinica	Lesser Striped Swallow	0,000053		African Migratory
Lybius torquatus	Black-collared Barbet	0,000048	0,000024	Common Resident
Cisticola galactotes	Rufous-winged Cisticola	0,000045	0,000058	Common Resident
Pogoniulus bilineatus	Yellow-rumped Tinkerbird	0,000045	0,000010	Common Resident
Turdoides jardineii	Arrow-marked Babbler	0,000045	0,000010	Common Resident

Scientific Name	Common Name	Density (dry)	Density (wet)	Status
Colius striatus	Speckled Mousebird	0,000045		Common Resident
Dicrurus adsimilis	Fork-tailed Drongo	0,000045		Common Resident
Pternistis afer	Red-necked Spurfowl	0,000045		Common Resident
Streptopelia capicola	Ring-necked Dove	0,000045		Common Resident
Streptopelia decipiens	Mourning Collared Dove	0,000045		Common Resident
Telophorus viridis	Gorgeous Bushshrike	0,000045		Common Resident
Terpsiphone viridis	African Paradise Flycatcher	0,000045		African Migratory
Estrilda astrild	Common Waxbill	0,000043		Common Resident
Lophoceros alboterminatus	Crowned Hornbill	0,000027	0,000059	Common Resident
Chlorocichla flaviventris	Yellow-bellied Greenbul	0,000027		Common Resident
Tchagra tchagra	Southern Tchagra	0,000027		Common Resident
Tockus leucomelas	Southern Yellow-billed Hornbill	0,000027		Common Resident
Circaetus pectoralis	Black-chested Snake Eagle	0,000011	0,000010	African Migratory
Crinifer concolor	Grey Go-away-bird	0,000011	0,000010	Common Resident
Emberiza tahapisi	Cinnamon-breasted Bunting	0,000011	0,000010	Common Resident
Polyboroides typus	African Harrier-Hawk	0,000011	0,000010	Common Resident
Zosterops anderssoni	Southern Yellow White-eye	0,000011	0,000010	Common Resident
Apus affinis	Little Swift	0,000011		Common Resident
Chalcomitra amethystina	Amethyst Sunbird	0,000011		Common Resident
Cinnyris mariquensis	Marico Sunbird	0,000011		Common Resident
Clamator jacobinus	Jacobin Cuckoo	0,000011		African Migratory
Cuculus clamosus	Black Cuckoo	0,000011		African Migratory
Glareola pratincola	Collared Pratincole	0,000011		Palearctic Migratory
Glaucidium capense	African Barred Owlet	0,000011		Common Resident

Scientific Name	Common Name	Density (dry)	Density (wet)	Status
Halcyon albiventris	Brown-hooded Kingfisher	0,000011		Common Resident
Numida meleagris	Helmeted Guineafowl	0,000011		Common Resident
Petrochelidon spilodera	South African Cliff Swallow	0,000011		African Migratory
Riparia riparia	Sand Martin	0,000011		Palearctic Migratory
Streptopelia semitorquata	Red-eyed Dove	0,000011		Common Resident
Trachyphonus vaillantii	Crested Barbet	0,000011		Common Resident
Treron calvus	African Green Pigeon		0,000100	Common Resident
Vidua macroura	Pin-tailed Whydah		0,000073	Common Resident
Camaroptera brachyura	Green-backed Camaroptera		0,000059	Common Resident
Cinnyris bifasciatus	Purple-banded Sunbird		0,000049	Common Resident
Cossypha heuglini	White-browed Robin-Chat		0,000024	Common Resident
Saxicola torquatus	African Stonechat		0,000024	Palearctic Migratory
Lonchura cucullata	Bronze Mannikin		0,000020	Common Resident
Batis soror	Pale Batis		0,000010	Common Resident
Cinnyris talatala	White-bellied Sunbird		0,000010	Common Resident
Coracias caudatus	Lilac-breasted Roller		0,000010	Common Resident
Cossypha natalensis	Red-capped Robin-Chat		0,000010	Common Resident
Coturnix coturnix	Common Quail		0,000010	Palearctic Migratory
Crithagra sulphurata	Brimstone Canary		0,000010	Common Resident
Dendropicos fuscescens	Cardinal Woodpecker		0,000010	Common Resident
Euplectes capensis	Yellow Bishop		0,000010	Common Resident
Hedydipna collaris	Collared Sunbird		0,000010	Common Resident
Passer griseus	Northern Grey-headed Sparrow		0,000010	Common Resident
Batis fratrum	Woodward's Batis		0,000009	Common Resident

Species richness index

Comparing the richness between the two campaigns, it was higher in the rainy season compared to the dry season (Table 6.24). This difference is indicative that the study area is visited by different species throughout the year whose numbers of the respective populations vary. This difference is indicative that the study area is visited by different species throughout the year whose numbers of the respective populations vary.

Table 6.25 – Comparing the richness between the two avifauna sampling seasons

SEASON	DRY	WET
R^2	2.49	2.89

Birds of Prey

Birds of prey were observed several times in both sampling campaigns. Observations were obtained during the points count and also from free observations throughout the study area. The highlight goes to the following species: *Elanus caeruleus, Milvus aegyptius, Circaetus pectoralis, Polyboroides typus, Aquila wahlbergi* and *Buteo rufofuscus*.

Important Bird and Biodiversity Areas (IBA)

Important Bird and Biodiversity Areas (IBA) have been identified and are illustrated in Figure 6-64.

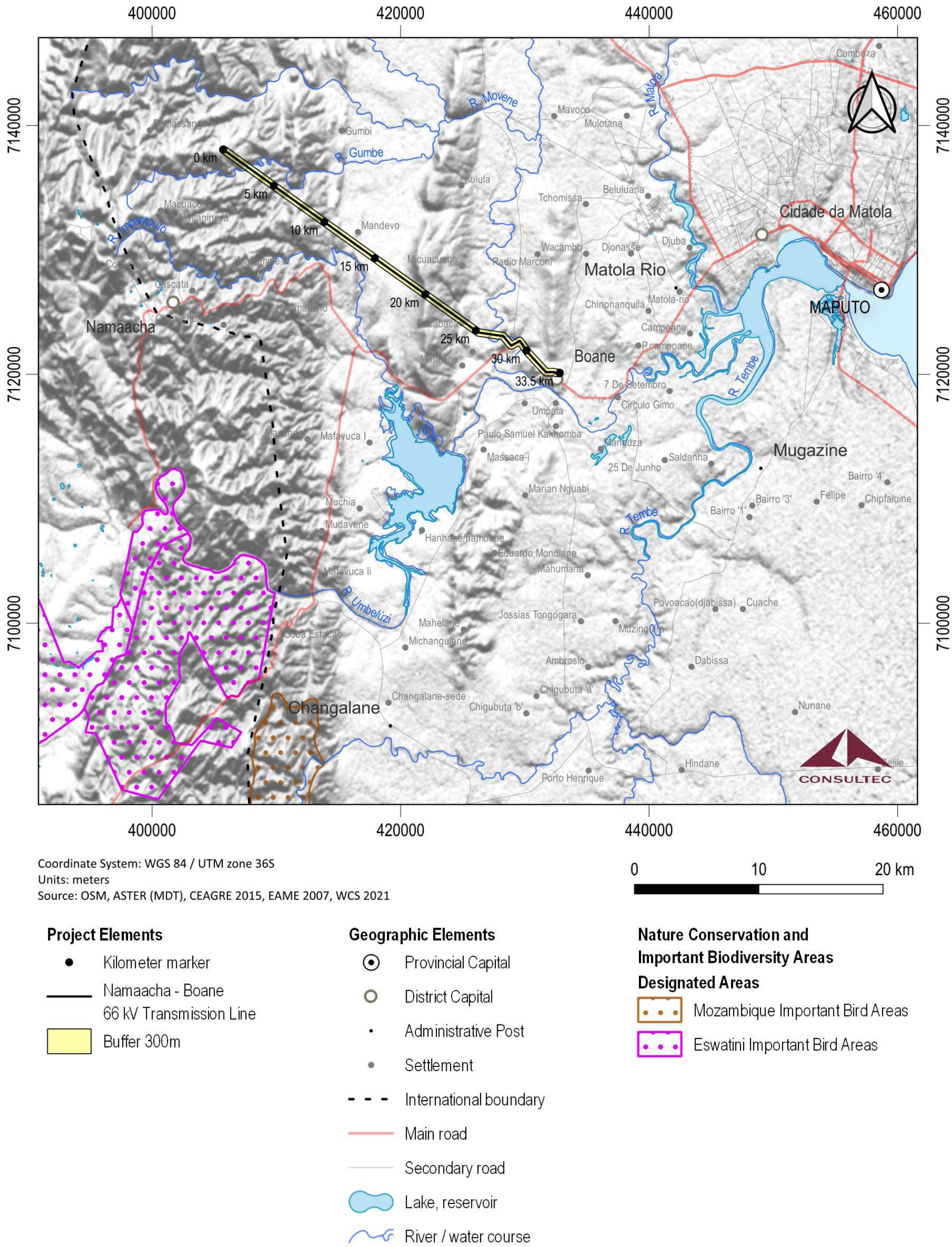


Figure 6-64 – Important Bird Areas in the project region

An Important Bird Area (IBA) is a globally important site for the conservation of bird species. These areas are needed to ensure the survival of viable populations of most of the world's bird species. IBAs are considered Key Biodiversity Areas by IFC (2012) Critical Habitat criteria. These areas are small enough to be entirely conserved and differ in their character, habitat or ornithological importance from the surrounding habitat. No IBAs are crossed by the Project.

6.2.3.2 Bats and other mammals

At least 38 species of mammals from 16 families occurred in the project area in the 1970's (Smithers and Tello, 1976). However, during this study, only 21 species from 16 families were identified (Table 6-25 and Figure 6-65), which suggests that most species that formerly occurred in the area might have gone locally extinct, mainly due to anthropogenic activities such as hunting and habitat destruction for agriculture, cutting for trees for charcoal production and firewood, and development of social and economic infrastructures. Five species were found in the dense thickets that cover ravines and the remaining species were recorded in upland grasslands. Seven mammal species are protected by Law in Mozambique (Decree nº 12/2002 of June 6^{th}).

Six species of bats were documented using a combination of methods (observation and interviews). Two species of bats were confirmed by direct observation, namely Wahlberg's Epauletted Fruit-bat (dry and wet season) and Yellow house bats (wet season) (Table 6-25). All are of least conservation concern at global level and are not protected by law in Mozambique.

Only one species, the African elephant, is of global conservation concern, classified as Endangered by IUCN (2022), which suggests a declining abundance or shrinking distribution of this species. The remaining species are of least conservation concern worldwide (Table 6-25), which suggests that the populations of these species are widely distributed and abundant. However, all these species (endangered and least conservation concern) due to their importance in the food chain and ecosystem functioning, should benefit from conservation initiatives aimed at protecting them from any cause of mortality and maintaining the integrity of their habitats.

Source: Consultant

Figure 6-65 – From left to right: feeding signs of vervet monkey, droppings of common duiker, scrub hare, red veld rat captured by local people's mouse trap, porcupine quill and chacma baboon skull and droppings of bushpig

Table 6-26 – Checklist and conservation status of bats and other mammal species recorded in the study area

Family	Scientific Name	Common name	Methods of observation	Season of the record	Habitat type	Conservation Status (IUCN Red List, 2021)	Legal protection (Decree no 12/2002 of 6 June)
Bathyergidae	*Cryptomys hottentotus*	Common molerat	Interview (captured by local people)	Wet season	Upland grasslands	Least concern, stable population	
Bovidae	*Sylvicapra grimmia*	Common duiker	Direct observation ofanimals, droppings, footprints	Dry season	Upland grasslands	Least concern, decreasing population	
Cercopithecidae	Papio ursinus	Savanna baboon	Food remains, vocalization, animal remains (skull)	Dry season	Dense thickets in the ravines Upland grasslands	Least concern, decreasing population	
Cercopithecidae	*Chlorocebus aethiops*	Vervet monkey	Food remains Footprints	Dry season	Dense thickets in the ravines Upland grasslands	Least concern, decreasing population	
Elephantidae	*Loxodonta africana*	African elephant	Footprints Interview	Dry season Wet season	Dense thickets in the ravines Upland grasslands	Endagered, decreasing population	
Felidae	*Felis silvestris lybica*	African wild cat	Interview	Dry season	Dense thickets in the ravines Upland grasslands	Least concern, unknown population trend	Protected
Hystricidae	*Hystrix africaeaustralis*	Porcupine	Diggings porcupine spines	Dry season	Dense thickets in the ravines	Least concern, stable population	
Leporidae	*Lepus saxatilis*	Scrub hare	Direct observation of animals Droppings	Wet season	Upland grasslands	Least concern, decreasing population	
Lorisidae	*Galago crassicaudatus*	Thick-tailed bushbaby	Interview	Dry season	Dense thickets in the ravines	Least concern, stable population	Protected
Muridae	*Aethomys chrysophilus*	Red veld rat	Captured using mouse trap by local people	Dry season	Upland grasslands	Least concern, unknown population trend	
Muridae	*Mastomys natalensis*	Multimamilate rat	Captured using mouse trap by local people	Dry season	Upland grasslands	Least concern, stable population	

Family	Scientific Name	Common name	Methods of observation	Season of the record	Habitat type	Conservation Status (IUCN Red List, 2021)	Legal protection (Decree no 12/2002 of 6 June)
Muridae	*Saccostomus campestris*	Pouched mouse	Diggings Interview	Dry season	Upland grasslands	Least concern, stable population	
Mustelidae	*Ictonyx striatus*	Striped polecat	Diggings	Dry season	Upland grasslands	Least concern, stable population	Protected
Emballonuridae	Taphozous mauritianus	Mauritian Tomb Bat	Interview	Dry season	Walls of houses	Least concern, stable population	
Vespertilionidae	Pipistrellus nanus	Banana bat	Interview	Dry season	Banana plantations	Least concern, stable population	
Vespertilionidae	Scotophilus dinganii	Yellow house bats	Direct observation of animals, Interviews	Wet season	Dense evergreen trees	Least concern, Unknown population trend	
Vespertilionidae	Nycticeinops schlieffeni	Schlieffen's bat	Interviews	Wet season		Least concern, Unknown population trend	
Vespertilionidae	Eptesicus capensis	Cape serotine bat	Interviews	Wet season		Least concern, stable population	
Pteropodidae	Epomophorus wahlbergi	Wahlberg's Epauletted Fruit-bat	Direct observation of animals	Dry season Wet season	Palm trees in wetlands	Least concern, stable population	
Scuridae	*Paraxerus cepapi*	Tree squirrel	Direct observation of animals	Dry season	Dense thickets in the ravines	Least concern, stable population	
Suidae	*Potamochoerus larvatus*	Bushpig	Footprints, Droppings	Dry season	Dense thickets in the ravines	Least concern, stable population	
Thryonomyidae	*Thryonomys swinderianus*	Greater Cane Rat	Droppings Food remains	Dry season	Upland grasslands	Least concern, unknown population trend	
Viverridae/ Herpestidae	*Galerella sanguinea*	Slender mangoose	Direct observation of animals	Dry season	Upland grasslands	Least concern, stable population	Protected
Viverridae/ Herpestidae	*Mungos mungo*	Banded Mangoose	Direct observation of animals	Dry season	Upland grasslands	Least concern, stable population	Protected
Viverridae/ Herpestidae	*Halogale parvula*	Dwarf mangoose	Interview	Dry season	Upland grasslands	Least concern, stable population	Protected

6.2.3.3 Reptiles

At least 27 species of reptiles potentially occur in the project area (Branch, 1998). During the dry season field data collection 14 species from nine families were recorded (Table 6-26). Only one reptile species is protected by Law in Mozambique (Decree nº 12/2002, of June 6th). The findings suggest that these species are widely distributed and abundant.

Table 6-27 – Checklist and conservation status of reptiles recorded in the study area

Family	Scientific Name	Common Name	Habitat type	Conservation Status at global level (IUCN Red List, 2021)	Legal protection in Mozambique (Dec no 12/2002, June 6th)
Agamidae	Agama armata	Peter's Ground Agama	Upland grasslands	Least concern	
Agamidae	Acanthocercus atricollis	Southern Tree Agama	Dense thicket in the ravines and upland grasslands	Least concern	
Boidae	Python natalensis	Southern African Python	Upland grasslands	Least concern	Protected
Chamaeleonidae	Chamaeleo dilepis	Flap-necked Chameleon	Upland grasslands	Least concern	
Colubridae	Psammophis mossambicus	Olive Grass Snake	Upland grasslands	Least concern	
Colubridae	Thelotornis capensis		Dense thicket in the ravines	Least concern	
Elapidae	Dendroaspis polylepis	Black mamba	Upland grasslands	Least concern	
Elapidae	Naja mossambica	Cobra-cuspideira-moçambicana	Upland grasslands	Least concern	
Gekkonidae	Lygodactylus capensis	Common dwarf gecko	Dense thicket in the ravines and upland grasslands	Least concern	
Scincidae	Trachylepis depressa	Eastern Coastal Skink	Upland grasslands	Least concern	
Scincidae	Trachylepis varia	Variable Skink	Upland grasslands	Least concern	
Scincidae	Trachylepis quinquetaeniata	Rainbow Skink	Upland grasslands	Least concern	
Viperidae	Bitis arietans	Puff adder	Upland grasslands	Least concern	

6.2.3.4 Amphibians

According to Carruthers (2001) at least 20 species of amphibians occur in the project area. During field data collection seven species were recorded from six families (Table 6-27). The five species are widely distributed in Mozambique and in Southern Africa (Carruthers, 2001). There is no information on the conservation status of amphibian species in Mozambique due to lack of data on species occurrence, distribution and abundance. Globally, the recorded species are of least conservation concern and have stable or increasing populations (IUCN 2021).

Table 6-28 - Checklist and conservation status of amphibians recorded in the study area

Family	Scientific Name	Common Name	Habitat type	Conservation Status at global level (IUCN Red List, 2021)	Legal protection in Mozambique (Decree no 12/2002, of June 6th)
Bufonidae	*Bufo gutturalis*	Guttural Toad	Upland grassland	Least concern, population increasing	
Bufonidae	*Schismaderma carens*	Red toad	Upland grassland	Least concern, population trend unknown	
Hyperoliidae	*Hyperolius marmoratus*	Painted Reed Frog	Marsh	Least concern, population increasing	
Microhylidae	*Phrynomantis bifasciatus*	Banded Rubber Frog	Upland grassland	Least concern, stable population	
Pipidae	*Xenopus* sp.		Marsh	Least concern, stable population	
Ranidae	*Ptychadena mossambica*	Broad-banded Grass Frog	Upland grassland	Least concern, stable population	
Rhacophoridae	*Chiromantis xerampelina*	Foam Nest Frog	Dense thickets in the ravines	Least concern, stable population	

6.2.4 Conservation Areas

The Conservation Law (Decree 16/2014 of 20 June) defines protected areas with the objective of conserving biological diversity, fragile ecosystems or animal and plant species. Protected areas can be areas of total conservation or conservation areas for sustainable use. Total conservation areas are intended for the preservation of ecosystems and species, and the extraction of resources is prohibited. Conservation areas for sustainable use are also intended for conservation, however extraction of resources is allowed if they are in compliance with the protected area's management plans.

As shown in the figure below, the Project does not cross nor is it in close proximity to any conservation area.

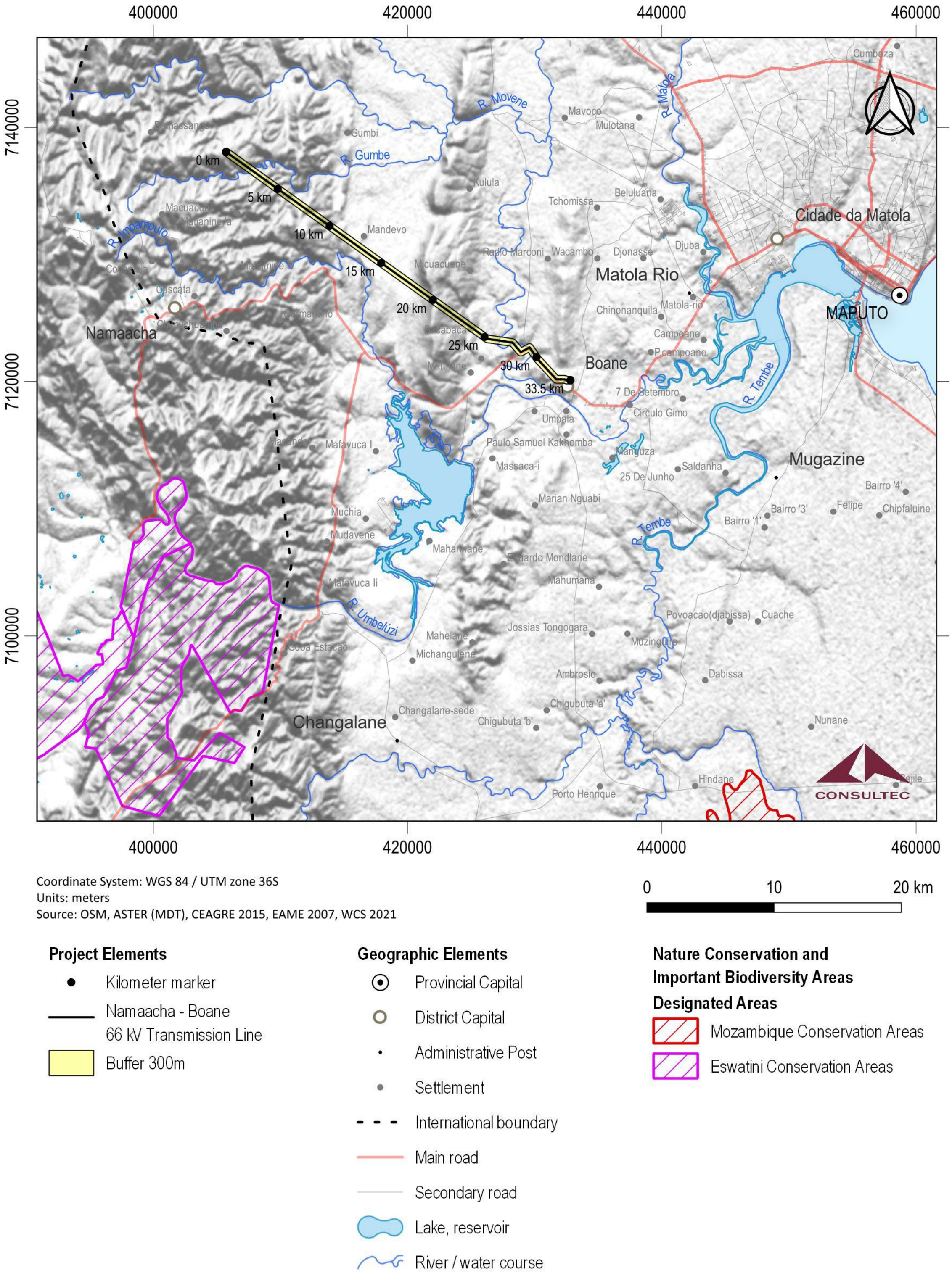


Figure 6-66 – Conservation areas in the region

The conservation areas closest to the project area in Mozambique are the Malhazine National Reserve, the Licuáti Forest Reserve and the Maputo Special Reserve (CEAGRN, 2015), the latter being associated with the Futi cross-border corridor linking with the Tembe Reserve in South Africa.

West of the project in the Eswatini Kingdom there are tree Conservation Areas (WDPA, 2017): two National Parks, namely the Hlane Royal National Park and the Mlawula Nature Reserve, and the Mbuluzi Game Reserve. North of the project is the Kruger National Park, in South Africa (WDPA, 2017).

6.2.5 Key Biodiversity Areas

Key Biodiversity Areas are sites that contribute significantly to the overall existence of biodiversity, both in terrestrial, freshwater, marine and groundwater systems. These areas are identified based on internationally accepted scientific criteria.

In 2021 the Ministry of Land and Environment (MTA), through the National Directorate of Environment (DINAB), in partnership with the Wildlife Conservation Society (WCS) and with funding from USAID through the SPEED+ program, presented the project "Red List of Threatened Species, Ecosystems, Identification and Mapping of Key Biodiversity Areas (KBAs) in Mozambique", where the Key Areas in Mozambique were identified (WCS, 2021).

The Figure 6-67 identifies the KBAs in the project implementation area, and as can be seen, the closest KBA is located about 30 km southeast of the Project area.

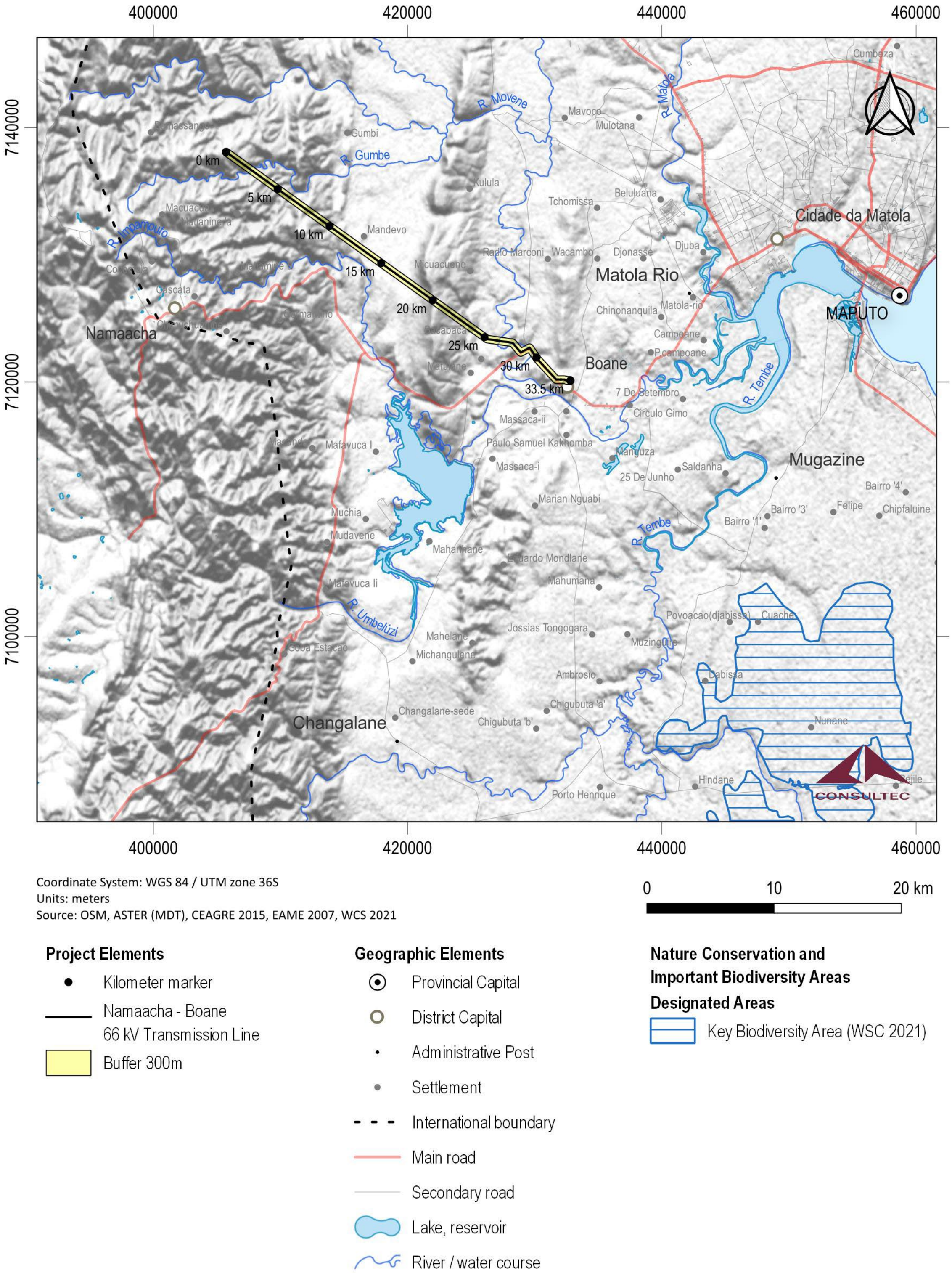


Figure 6-67 – Key Biodiversity Areas identified in the project region

6.2.6 Natural, Modified and Critical Habitat Assessment

6.2.6.1 Methodology for habitat assessment

Habitats in the study area were classified according to the guidelines of IFC PS6 (IFC, 2019), as modified, natural, or critical as described below:

- **Modified habitats:** areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition.
- **Natural habitats:** 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.
- **Critical habitats** are areas with high biodiversity value. These are natural or modified habitats that meet at least 1 of the following criteria:
    1. Habitat of significant importance to CR (Critically endangered) or EN (endangered) species;
    2. Habitat of significant importance to endemic or restricted-range species;
    3. Habitat supporting globally significant concentrations of migratory species or congregatory species;
    4. Highly threatened or unique ecosystems; and
    5. Areas associated with key evolutionary processes.

The evaluation of the first 4 critical habitat criteria is guided by numerical thresholds (Table 6-28) published in the IUCN's *A Global Standard for the Identification of Key Biodiversity Areas and Red List Categories and Criteria*, and the IFC's *Guidance Note 6* with a habitat being defined as critical if the threshold is met. For Criterion 5, there are no numerical thresholds and the evaluation of the "criticality" of a habitat should be based on best available scientific information and expert opinion.

Table 6-29 – Description of the IFC PS 6 Thresholds for Each Criteria (IFC, 2019)

Criteria	Thresholds
1. Critically Endangered / Endangered Species	- Areas that support globally important concentrations of an IUCN Red-listed EN or CR species (≥0.5% of the global population AND ≥ 5 reproductive units of a CR or EN species); - Areas that support globally important concentrations of an IUCN Red-listed VU species, the loss of which would result in the change of the IUCN Red List status to EN or CR and meet the thresholds mentioned above; - As appropriate, areas containing nationally / regionally important concentrations of an EN, CR or equivalent national / regional listing.
2. Endemic / Restricted Range Species	- Areas that regularly hold ≥10% of the global population size AND ≥10 reproductive units of a species;
3. Migratory/ Congregatory Species	- Areas known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle; - Areas that predictably support ≥10 percent of the global population of a species during periods of environmental stress.;
4. Highly threatened or unique ecosystems	- Areas representing ≥5% of the global extent of an ecosystem type meeting the criteria for IUCN status of CR or EN; - Other areas, not yet assessed by IUCN, but determined to be of high priority for conservation by regional or national systematic conservation planning

Data on the ecology of species to evaluate criterions and tiers was consulted mostly from IUCN (2022). More updated data on bats was also obtained from ACR (2020).

6.2.6.2 Natural and modified habitat determination

CEAGRE (2015) produced a habitat classification for Mozambique that also defines a Mixed Habitat category, which lies between Natural and Modified habitats:

- **Mixed Habitat**: consists of a mosaic composed of natural areas, small cultivated areas and isolated villages / houses.

In general, Modified Habitats are considered less sensitive to additional disturbance given that they have already lost their natural structure and integrity, thus containing lower biodiversity and conservation values. By contrast, Natural Habitats are considered highly sensitive to habitat loss and degradation, given that their structure and biodiversity remain largely intact in terms of the representation of natural species (albeit with a reduction in the abundance of large mammals), thus being vulnerable to construction activities and increased human disturbance.

CEAGRE's (2015) habitat classification of the project area is illustrated in Figure 6-68. As shown in this figure, the project area falls mostly within Natural Habitats.

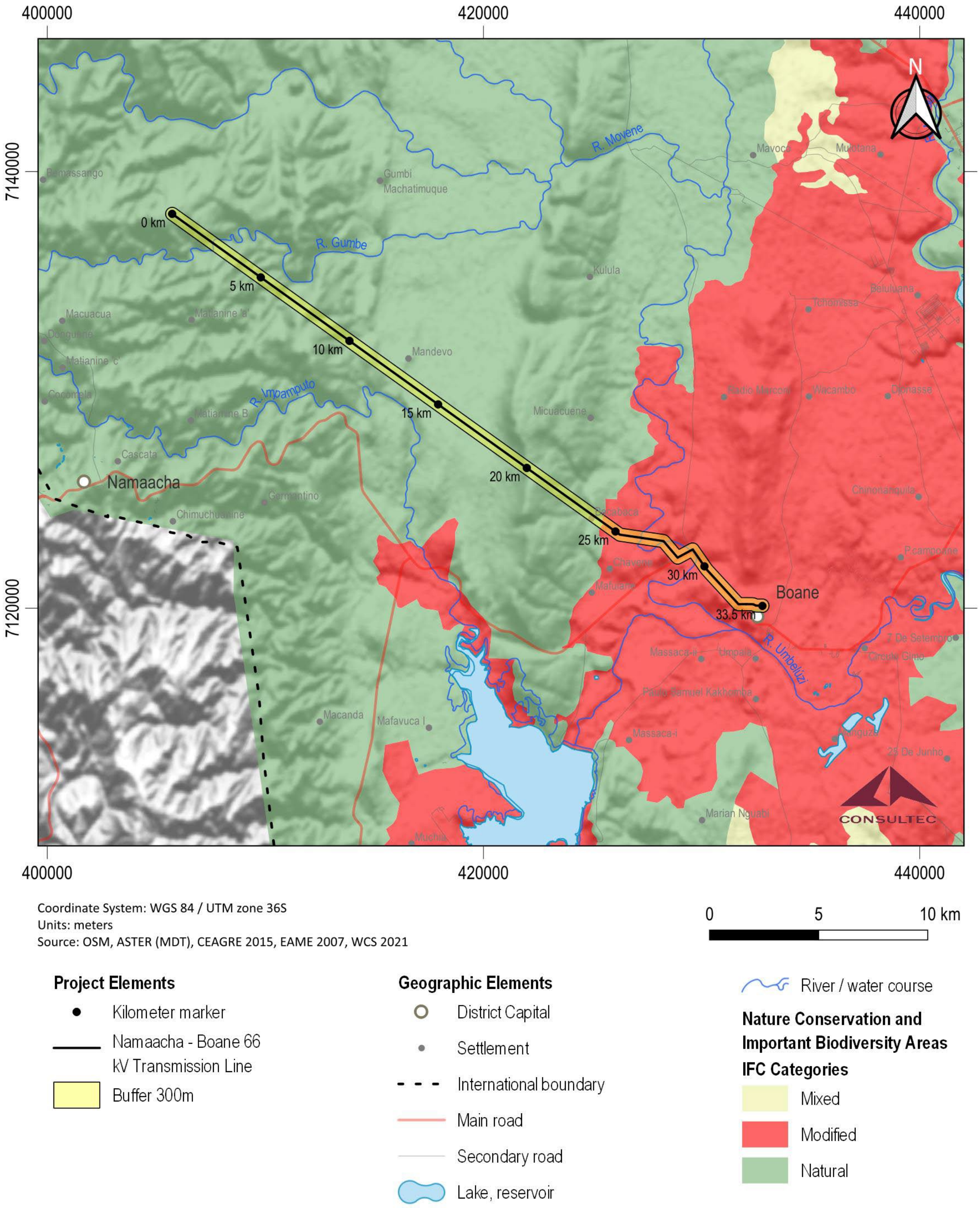


Figure 6-68 – IFC habitat categories (natural, modified and mixed) in Namaacha – Boane area

Although CEAGRE (2015) classifies the study area as a Natural Habitat[7], field surveys concluded that the area has an anthropogenic change of more than 50%, which results in a Mixed Habitat classification.

Table 6-29 describes habitat types and status in the potential development areas of the Powerline project, as per observations during field work.

Table 6-30 – Habitat description and status

HABITAT STRUCTURE	HABITAT SPECIES COMPOSITION	HABITAT STATUS ACCORDING TO IFC PS6
Shrub vegetation and non-tree crops with shrubs and short trees. Denser woody vegetation only in the valleys	Woody species: *Combretum sp., Pterocarpus rotundifolius, Strichnos spinosa, Trichilia emetica* Grass species: *Themeda triandra, Diheteropogon amplectans, Cymbopogon sp.*	< 25% modified

In the study area, the main human activities responsible for habitat modification include human settlements in the form of isolated houses built predominantly with local materials (poles, rocks/stones and thatching grass), cultivated areas for subsistence farming covering areas <0.5 hectares and livestock grazing. Charcoal production has been, in the last two decades, a widespread activity in the area, except along the valleys. Areas formerly used for charcoal production are covered by secondary vegetation, consisting of shrubs with less than 3 m in height, however species composition remains natural.

6.2.6.3 Critical habitat determination

Overall, a total of 3 observed species (1 mammals, 1 reptile and 1 plant) have a concerning conservation status. However, none of these are critically endangered and therefore none meet at least one of the IFC PS6 1-3 criteria. Accordingly, none of the habitats in the study area were considered in the thresholds required to have a critical habitat classification.

Regarding the other criteria, the area occupied by the Lebombo mountains was classified as Critical Habitat. This is supported by a previous Critical Assessment performed at the national level that the classified this area under the criterions 2 (Endemic species habitat) and 5 (Key evolutionary processes), attributed to areas where biogeographical processes in place leaded in an increased number of species in a region (CEAGRE, 2015).

However, the critical habitat determination is not necessarily limited to these criteria. Other recognised high biodiversity values might also support a critical habitat designation, and the appropriateness of these should be evaluated on a case-by-case basis.

[7] It is worthwhile mentioning that CEAGRE's study was carried out at the national level, meaning that it is likely to result in inaccuracies at the local level.

The Critical Habitat mapping developed by CEAGRE (2015) was based on pre-existing land use and habitat maps (at scales 1:250,000, 1:1,000,000 and 1:2,500,000) and remote sensing techniques using satellite imagery. In other words, this mapping has a very low level of resolution (stated scale of 1:250,000, although the base maps were of lower resolution) and was not subjected to ground-truthing. As such, the field surveys were used to verify the presence of any critical habitat.

Following the results of the two field surveys, it is Consultec's professional opinion that none of the AoI would be considered as critical habitat under PS6.

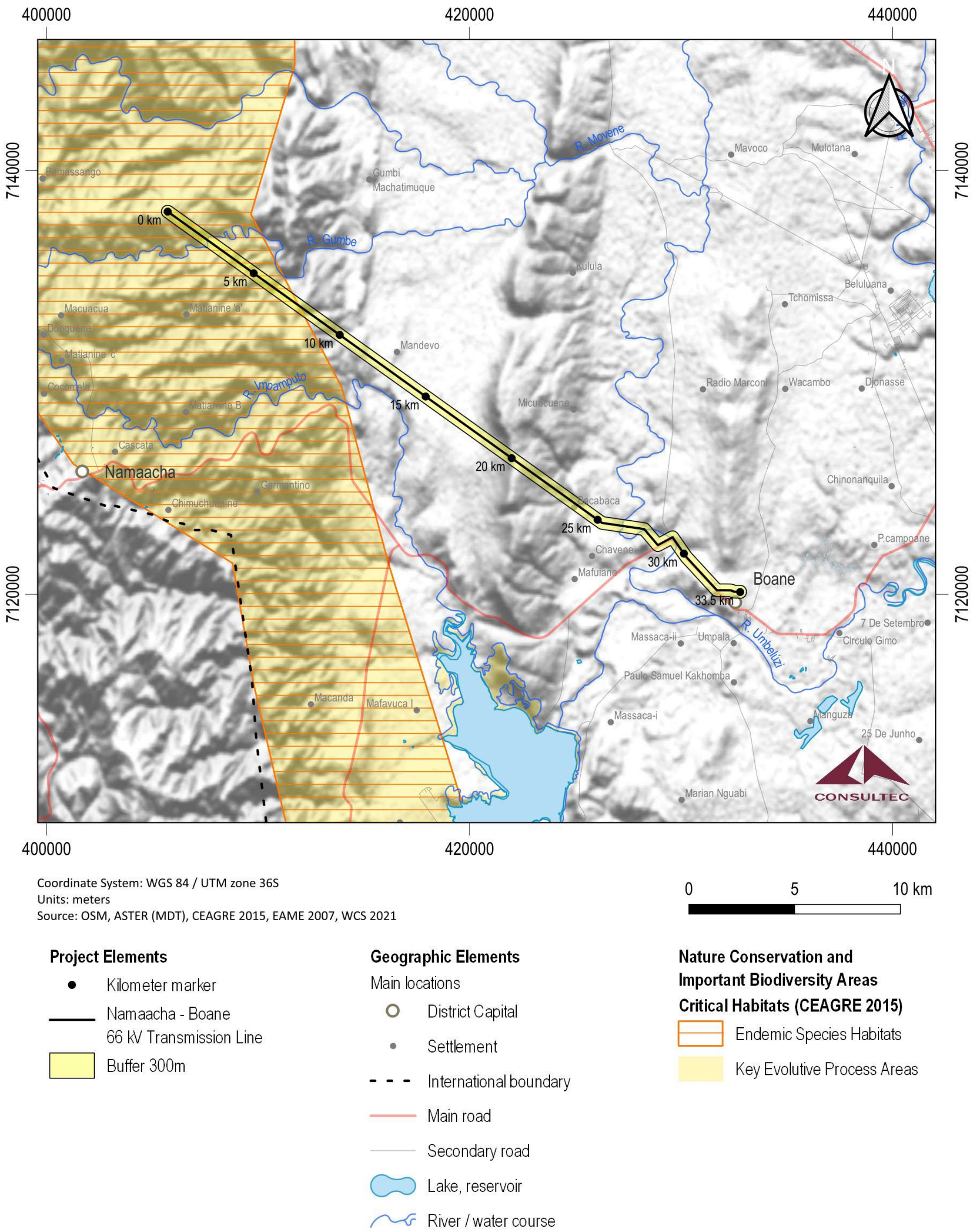


Figure 6-69 – Critical habitat mapping (CEAGRE, 2015)

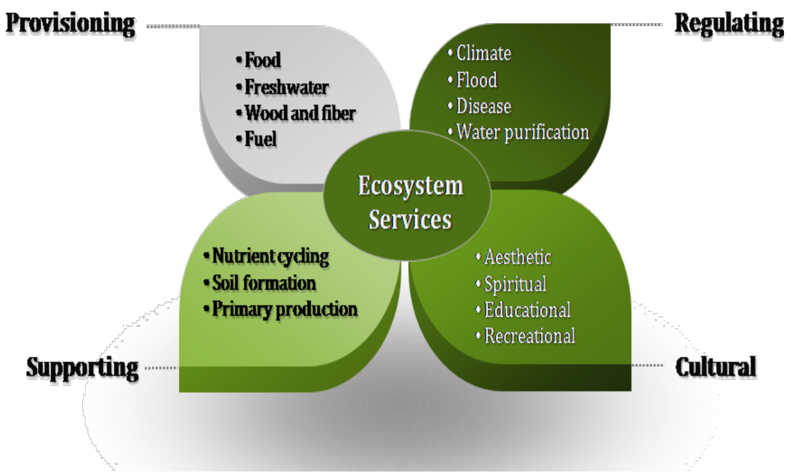
6.2.7 Ecosystem Services

6.2.7.1 Identification of ecosystem services

An ecosystem is defined as a dynamic complex of plants, animals, micro-organisms and non-living components interacting as a functional unit. Human communities are an integral part of ecosystems and are beneficiaries of many goods and services they provide. These benefits are recognised as Ecosystem Services (ES). The benefits that local communities obtain from local natural and modified habitats are crucial for their well-being. ES provided by the project- potentially impacted habitats or ecologically associated with these habitats, have been assessed at a high-level.

ES are grouped into four categories:

- **Supply services**: which refer to products people obtain directly from ecosystems (e.g. agricultural products, plants to eat, game, medicinal plants, fresh water, biofuel, timber, etc.). Inside the project area, the forest mosaics and aquatic habitats provide natural resources that are used by local communities. The main supply services are agricultural production, livestock and forage resources, foods, traditional medicine, fuelwood and fisheries;
- **Regulating services**: which are the benefit local communities obtain from the regulation of ecosystem processes (e.g. climate regulation, waste decomposition, purification of water and air, etc.);
- **Cultural services**: which refer to the non-material benefits people obtain from ecosystems (e.g. sacred and spiritual sites, ecotourism, education, etc.). It may be materialised by the presence of sacred sites or sacred species protected by communities. The social baseline assessment conducted during the EIS will provide more information on the presence of these elements within the Namaacha project site;
- **Supporting services**: which are the natural processes that maintain the other services (e.g. nutrient cycling, genetic production and genetic exchange channels, etc.).



Source: adapted from MEA (2005)

Figure 6-70 – A conceptual model of connection types regarding ecosystem structure, processes, services and benefits

6.2.7.2 Supporting ecosystem services

Supporting ecosystem services are the ones necessary to produce all other ecosystem services, including soil formation, photosynthesis, primary production, nutrient cycling, and water cycling. All other ecosystem services (ES) depend on, and develop on, supporting ES. All habitats except the urban areas (these areas cannot be considered relevant sinks of ES) are related to these services, as presented in Table 6-30. The relative importance of each habitat for the ES is ranked as H - High importance; M - Medium importance; L - Low importance; and NA – Non Applicable.

Table 6-31 – General appraisal on the relative importance of each supporting service at the vegetation unit level

Supporting ecosystem services	Primary production and photosynthesis	Soil Formation	Nutrient and water cycling
Acacia woodlands	H	H	H
Undifferentiated woodland	M	M	M
Riparian Vegetation	H	H	H
Farmed areas	H	L	H
Urban areas	NA	NA	NA

6.2.7.3 Provisioning ecosystem services

Provisioning services include the products that are obtained from ecosystems, such as food, fibre, fuel, genetic resources, biochemicals, natural medicines, pharmaceuticals, ornamental resources, and fresh water. The most relevant habitats for these services are: Acacia woodland, undifferentiated woodland, and farmed areas (Table 6-31). The relative importance is ranked as H - High importance; M - Medium importance; L - Low importance; and NA – Non-Applicable.

Table 6-32 – General appraisal on the relative importance of each provisioning service at the vegetation unit level

Provisioning ecosystem services		Acacia woodlands	Undifferentiated woodland	Riparian Vegetation	Farmed areas	Urban areas
Food Production	Hunting	H	L	L	M	NA
	Natural food foraging	M	L	L	M	NA
	Fishing	NA	NA	H	NA	NA
	Livestock and husbandry	M	L	NA	H	M
	Agriculture	NA	NA	M	H	M
	Honey production	H	H	L	M	M
Endogenous Natural Resources	Freshwater	L	L	H	M	L

Provisioning ecosystem services		Acacia woodlands	Undifferentiated woodland	Riparian Vegetation	Farmed areas	Urban areas
Endogenous Forest Products	Wood	H	H	NA	H	NA
	Other Forest non-woody materials	M	H	NA	M	NA
	Resins	M	H	NA	M	NA
Plant and Animal Resources	Genetic Resources	M	M	M	L	L
	Medicinal and well-being	M	M	M	H	L

Food Production

Hunting is a common practice in rural areas, with people hunting antelopes in general, monkeys, warthogs/bush pigs, and hares. Mostly people hunt for food, although it is normal to sell the surpluses. At local markets only meat from domestic animals was for sale, and from interviews to local populations, wild animals' stock for food seems to be not very abundant in the region.

Most people eat wild fruits in villages, but only a restricted number of them, such as masala (*Strychnos spinosa*), malambe (*Adansonia digitata*) and tamarind (*Tamarindus indica*). In villages, the sale of mango (*Mangifera indica*) is common.

In the study area, all villages have livestock, mostly goats, pigs, and chicken, normally in small numbers. More rarely, cows and ducks are also kept.

The dominant agricultural crop in the study area (in "*machambas*") is maize; other frequently produced products are cassava, rice, tomato, "nhemba" beans, lettuce, onion, and cabbages. Other products found mostly in villages or nearby are mango, papaya and banana.

Besides food sources, ecosystems provide also drinks and beverages, such as the beverage produced form malambe.

Natural Resources

The main freshwater sources are wells and pumps.

Forest Products

Charcoal is an important resource for local people since for many in the only energy source available and it is also sold very frequently along N2 road and in the villages.

Other forest non-woody materials are used, such as palm tree fronds, grass, and sisal. Tendrils from grasses and palm trees can be found in the villages; these are sometimes use for roof covering, doors, and windows.

6.2.7.4 Regulating ecosystem services

Regulating services correspond to the benefits obtained from the regulation of ecosystem processes, including air quality regulation, climate regulation, water regulation, erosion regulation, water purification, disease regulation, pest regulation, pollination, and natural hazard regulation. The most relevant habitats for these services are Riparian Vegetation, and Acacia woodland (Table 6-32). The relative importance is ranked as H - High importance; M - Medium importance; L - Low importance; and NA – Non Applicable.

Table 6-33 – General appraisal on the relative importance of each regulating services at the vegetation unit level

Regulating ecosystem services		Acacia woodlands	Undifferentiated woodland	Riparian Vegetation	Farmed areas	Urban areas
Cycles (processes)	Soil protection and formation	H	M	H	H	NA
	Water Regulation	M	L	H	M	L
	Nutrient Regulation	M	L	H	H	L
	Pollination	H	M	L	H	L
	Local climate regulation	H	L	H	M	NA
Depuration	Soil bioremediation	M	L	H	M	L
	Pollution and contaminant treatment	M	L	H	M	L
	Water Purification	M	L	H	M	L
	Air quality	H	M	H	M	L
Prevention	Flood prevention/ control	M	M	H	M	L
	Wildfire prevention/ control	L	L	H	M	H
	Pest and disease prevention/ control	M	L	M	L	L
	Invasive species control	L	L	M	H	L
Habitats	Habitats Maintenance	M	M	H	L	L
	High Conservation Value Areas	M	L	H	L	NA

6.2.7.5 Cultural ecosystem services

Cultural services refer to the non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences – thereby taking account of landscape values (MEA, 2005). The most relevant habitats for these services are the Riparian Vegetation, followed by Acacia woodland (Table 6-33). The relative importance is ranked as H - High importance; M - Medium importance; L - Low importance; and NA – Non-Applicable.

Table 6-34 – General appraisal on the relative importance of each cultural service at the vegetation unit level

Cultural ecosystem services	Human Well-Being		Educational	
	Recreation Activities	Tourism	Education	Scientific Research
Acacia woodlands	M	M	M	H
Undifferentiated woodland	L	L	M	L
Riparian Vegetation	H	H	H	M
Farmed areas	M	L	M	L
Urban areas	L	L	L	L

6.3 Socioeconomic Environment

6.3.1 Introduction

This section presents the socioeconomic baseline characterization of the Project area, at Maputo Province and Boane and Namaacha Districts level and a characterization of the households (HH) and Infrastructures (IF) potentially affected by the transmission line`s protection zone. The socio-economic baseline provides a broad overview of the project's areas of influence, allowing the subsequent impact assessment.

6.3.2 Methodology

The socioeconomic baseline assessment utilized secondary data which was then complemented by primary data collected during the field surveys conducted between March and May 2023. The secondary data included data from the IV General Census of Population and Housing (RGPH) of 2017 from the National Statistics Institute (INE), several documents on Maputo Province and Namaacha and Boane District, the provincial and district level Economic and Social Plan and Budget, and other relevant studies for the study area.

The secondary data information was complemented by primary qualitative data collected through interviews with locality chiefs and community leaders of all the communities crossed by the transmission line route, as well as interviews with local education and health professionals. In addition, information was also collected through first-hand observations made of the general socioeconomic conditions during the fieldwork mentioned above. During the same period, primary quantitative data was collected through the household and crop fields (*machambas*) surveys that will potentially be affected by this project in the area covered by the 66 kv transmission line. The data collected on these surveys was subsequently analyzed using the SPSS statistical software.

The census data is presented and discussed in detail in the Physical and Socioeconomic Survey Report (PSESR) provided in **Volume V** of this EIS.

6.3.3 Administrative Division and Governance

6.3.3.1 Maputo Province

Administratively, Mozambique is divided into 11 provinces, among which, the capital of the country, Maputo City, which has the status of a province. Each province is subdivided into a variable number of districts, which in turn are subdivided into administrative posts, and these are further subdivided into localities. The proposed Project is located in Maputo Province and in the Districts of Boane and Namaacha.

Maputo Province is situated in the extreme south of Mozambique and has an area of approximately 22,693 km² (2.8% of the country´s total surface). It is limited to the South by the Republic of South Africa (Kwazulu-Natal Province), to the West by the Republic of South Africa (Mpumalanga Province) and Eswatini, to the North by Gaza Province and to the East by Maputo City and the Indian Ocean. The province´s capital is Matola City, located 10 km west of the country's capital, Maputo City. Maputo Province is divided into eight districts (Matola City, Boane, Magude, Manhiça, Marracuene, Matutuíne, Moamba and Namaacha), four municipalities (Matola City, Boane Village, Manhiça Village and Namaacha Village), 29 administrative posts and about 111 localities and neighbourhoods.

In administrative terms, to perform its administrative and territorial development function, the governmental structure is ensured at local level (provinces, districts, administrative posts, localities, communities, and villages), through the so-called Local Organs of the State (OLE). Law No. 8/2003 of 5 May, commonly known as the Law on Local Organs of the State (LOLE), establishes principles and norms for the organisation and functioning of local organs of the State at the Province, District, Administrative Post and Locality levels. At the District level, it is composed of Administrative Posts and Localities. Administrative Posts are the basic territorial units of the State's local administration organization. Localities, on the other hand, comprise communities and other population settlements within their territory.

Maputo Province, just as all other provinces in the country, has a provincial government divided into 2 bodies: (1) The Provincial Council of State Representation headed by the Secretary of State, representing the Central Government at the Provincial level, and appointed by the President of the Republic; and (2) the Provincial Executive Council headed by the Governor, who acts as a political figure elected by popular vote.

The Governor and the Governor's Office are supported and assisted by the Head of the Governor's Office and the Provincial Directors of Agriculture and Fisheries, Transport and Communication, Industry and Commerce, Health, Education, Labor, Culture and Tourism, Territorial and Environmental Development, and Infrastructure. The Secretary of State is assisted by the Head of Office the Provincial Secretary of State`s office, and by the Provincial Services Directors. The latter oversee areas such as Economy and Finance, Economic Activities, Social Affairs, Infrastructure, Justice and Environment. These all represent the national level ministries.

In addition to the departments in line ministries, the province also has a Prosecutor General and a Provincial Police Commander. There are also other relevant public institutions at the provincial level, such as the Institute for Social Action (INAS) and the Provincial AIDS Council - *National Council for the Fight against HIV/AIDS* (CNCS).

As previously mentioned, the province is administratively subdivided, mainly into districts and municipalities. The municipal councils are run by the municipal president and the municipal assembly, which is an elected body. As for districts, they are governed by district administrators who are supported by district services and by the heads of the various administrative posts and localities.

Table 6-34 shows the basic administrative structure of the provinces, districts, and municipalities.

Table 6-35– Basic administrative structure of the provinces, districts and municipalities

Province	- Secretary of State for the Province (assisted by the respective Head of Office); - Governor of the Province (assisted by the respective Head of Office); - Provincial Services of State Representation; - Provincial Directorates.		
Districts	- District Administrator - Permanent Secretary - Head of Administrative Post - Head of Locality - Traditional or local leadership: o Highest rank - 1st *Level* (traditional leaders); o 2nd rank - 2nd *level* (village secretary); o 3rd rank - 3rd level (block secretary).	**Municipalities**	- Municipal President - Councillors - Traditional Leaders - Suburban or Neighbourhood Secretaries - Unit Secretaries - Block Chiefs

Figure 6-71 illustrates the administrative division of Maputo Province.

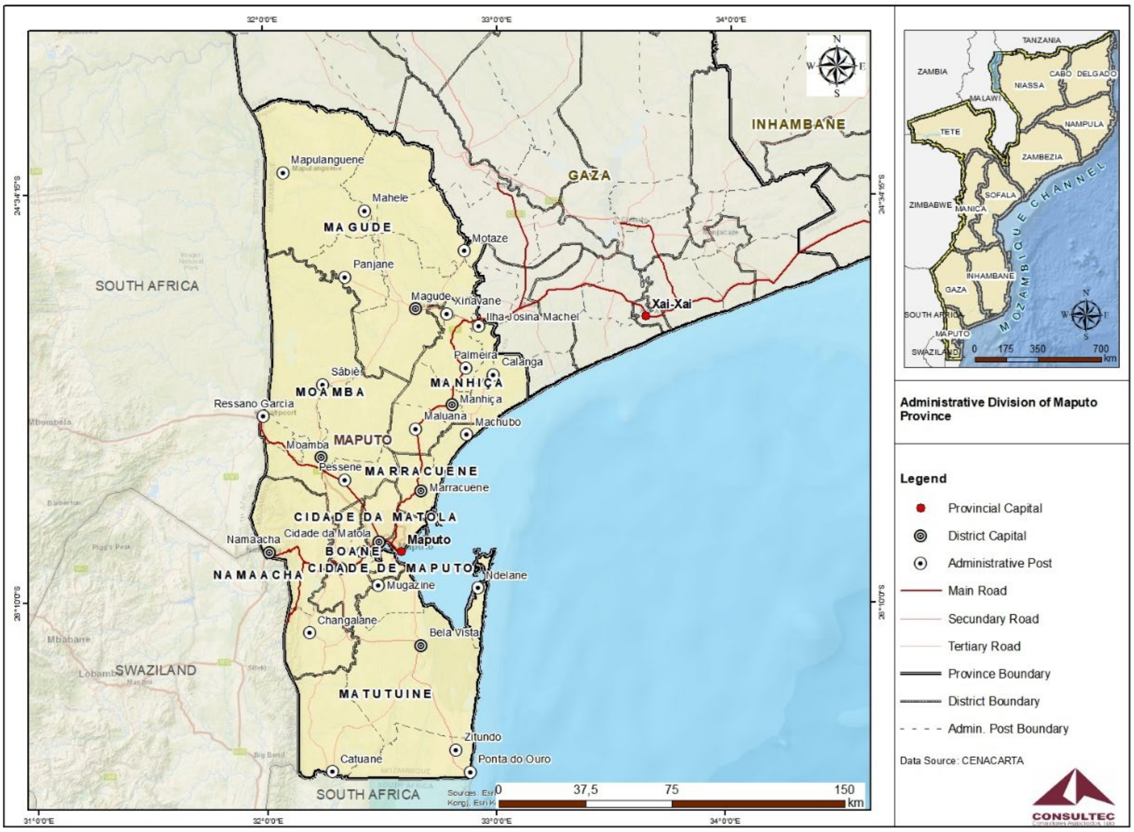


Figure 6-71 – Administrative Division of Maputo Province

District Government

The districts are managed by a District Administrator who is appointed by, and reports to, the Provincial Governor. The administrator is supported by the Permanent Secretary and a number of district services, including Economic Activities; Planning and Infrastructure; Education, Youth and Technology; Health, Women and Social Welfare; the District Directorate of the National Institute for Social Welfare; the Civil Registry and Notary Services; and the District Command of the Police of the Republic of Mozambique. In addition to these institutions, the State Information Services, the Public Telecommunications Company, the Court, and the Administration of State Assets, are all subordinate to the district government. Figure 6-72 illustrates the basic structure of the district administration.

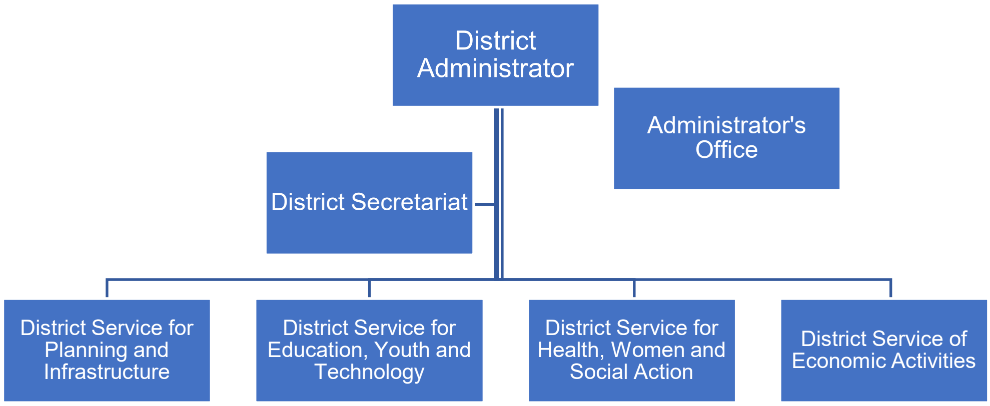


Figure 6-72 – Basic structure of the district administration

In terms of governance structure, the relevant formal district leadership includes the heads of the lower-level administrative units - Administrative Post and Locality, as well as local community leaders/authorities and traditional authorities who manage community participation in local government at the local level.

A locality is made up of communities and villages. The term "community" is used to define a village, or sometimes groups of villages. At the community level, authority is exercised by various "community" authorities such as the neighborhood secretaries, unit chiefs or block chiefs, who in peri-urban neighborhoods are also assisted by community leaders. There are other structures that support the secretaries and traditional leaders in running the neighborhoods and these include the community police, traditional doctors, community judges, production chiefs, and community advisors who help the village leader resolve any conflicts that arise within the community. In rural areas, these structures report directly to the village secretary.

Traditional authority and associated structures are recognized by law through Decree No.15/2000, of June 20th, and Decree No.11/2005, of June 10th. These decrees recognize the role of community leaders as legitimate authorities in their respective communities. As such, villages/communities and localities generally have a bifurcated governance structure, where local leaders are appointed by the state, and traditional leaders, "Elders and Queens" and the "Chief / Community Leader" inherit their positions or are directly chosen by community members.

In terms of hierarchy within the districts, the community chief reports to the community secretary, who in turn reports to the chief / community leader, who reports to the Locality Chief, who reports to the Head of the Administrative Post, who finally reports to the District Administrator– see Figure 6-73.

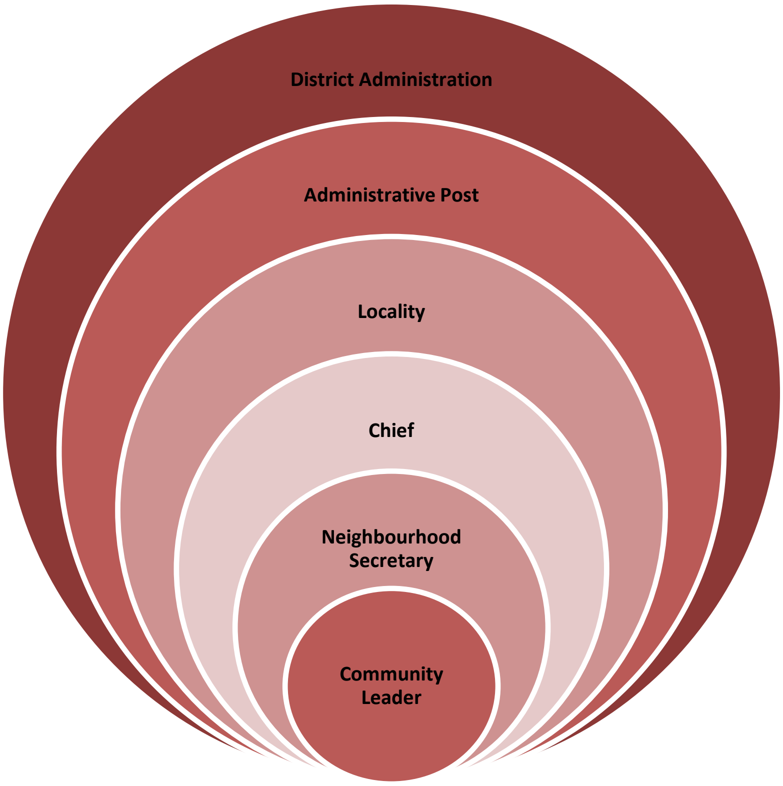


Figure 6-73 – District authority hierarchy

While local authorities play an important role in mobilizing people in relation to district planning sessions and communication with the state, etc., their primary role is to maintain a form of social order and to resolve individual or social conflicts at the community level, prior to any potential escalation to the formal court system. Community leaders play an additional and extremely important role in the allocation and management of land used by community members and new individuals and families seeking land for subsistence. This role is based on the national land policy (Resolution No. 10/95, October 17th) which aims to guarantee access to land for all communities, families and individuals. Additionally, the Land Law (Law no. 19/1997) recognizes customary rights to land without a formal land title (DUAT). Community leaders are also responsible for disseminating information to community members, informing the higher-level government authority of community decisions, any conflicts or issues in the community that cannot be resolved at the local level, and assisting in the implementation of any government-supported project.

This seemingly simple governance structure is in reality very complex due to several different intersecting and often overlapping power foundations. First, the district directorates (health, education, youth and technology, etc.) are formally linked and accountable to the various ministries of their respective sectors at the provincial and central levels of government, while also being administratively accountable to the district administrator. There is a public sector reform process regarding decentralization, but the de facto dependency between the central, provincial and district levels of government vary considerably between the different directorates and their departments.

District planning follows a hierarchical process in which economic and social development plans and activities are developed based on policies and guidelines provided from the central (PES - economic and social plan) and provincial (PESOP) levels. Emanating from these policies, the districts produce their own economic and social plan (PESOD), which are then reported back to the provincial economic and social plan, which in turn is reported to the annual national plan. This process, and the community participation that is an integral part of it, is facilitated by the current governance structure that includes community and traditional leadership. Furthermore, advisory councils have been established at the administrative post and locality levels to enhance and strengthen participation within these planning processes.

Municipal Council

As previously mentioned, in municipalities, administrative bodies are elected within the provinces and are administered by an elected municipal president who is accountable to the Municipal Assembly, which is also composed of elected municipal advisors. Municipal councils are responsible for services in a similar way to districts, and as such, they are responsible for the following:

- Housing and Urban Planning;
- Roads and Urban Transportation;
- Education and Culture;
- Economic Activities and Services;
- Youth and Sports;
- Social Welfare and Civil Society;
- Markets and Fairs;
- Public Works;
- Administration and Municipal Revenues; and
- Waste, Environment, Parks and Municipal Gardens Management.

As with the districts, the municipal governance structure is complex and the management and delivery of services such as health, education, criminal justice, social welfare, etc. are officially the responsibility of the various line ministries at the provincial and central levels of government. Municipalities currently have limited direct revenues and are primarily responsible for the management of waste, water and sanitation, municipal roads, housing and urban planning.

6.3.3.2 Namaacha District

Namaacha District is located on the western border of Maputo Province, with an area of 2,156km² (representing 9.5% of the province´s surface). The district is limited to the North by Moamba District, to the South by Matutuine District, to the West by the eSwatini Kingdom, the Republic of South Africa, and to the East by Boane District. The district with its headquarters in Namaacha Town, is divided into two administrative posts (AP) and eight localities.

The district headquarters of Namaacha is a Municipal Town and its Municipal Council assume the territorial management covered by the Town.

The following Table 6-35 presents the administrative division of Namaacha District.

Table 6-36 – Administrative division of Namaacha District

Administrative Post	Localities
Namaacha Sede	Namaacha Town, Kala-Kala, Impaputo, Mafuiane e Matsecanha
Changalane	Changalane, Goba, Mahelane e Michangulene

6.3.3.3 Boane District

Boane District is located in the southeast of Maputo Province and covers an area of 820 km^2 (representing 3.5% of the province's surface). The district is limited to the north by Moamba District, to the south and east by Namaacha District and to the west by Matola Municipality of and Matutuine District. The district has its headquarters in Boane Town. The District of Boane is divided into two Administrative Posts (PA) and five Localities. Boane district headquarters is a Municipal Town with the Municipal Council assuming the territorial management covered the Town.

Table 6-36 below shows the administrative division of Boane District in terms of administrative posts and localities.

Table 6-37 – Administrative division of Boane District

Administrative Post	Localities
Boane Sede	Boane Sede, Eduardo Mondlane e Gueguegue
Matola Rio	Matola Rio e Mulotane

Figure 6-74 illustrated the regional context of the Project with the 66 kV transmission line crossing the Namaacha Sede and Boane Sede administrative posts in Namaacha and Boane Districts respectively.

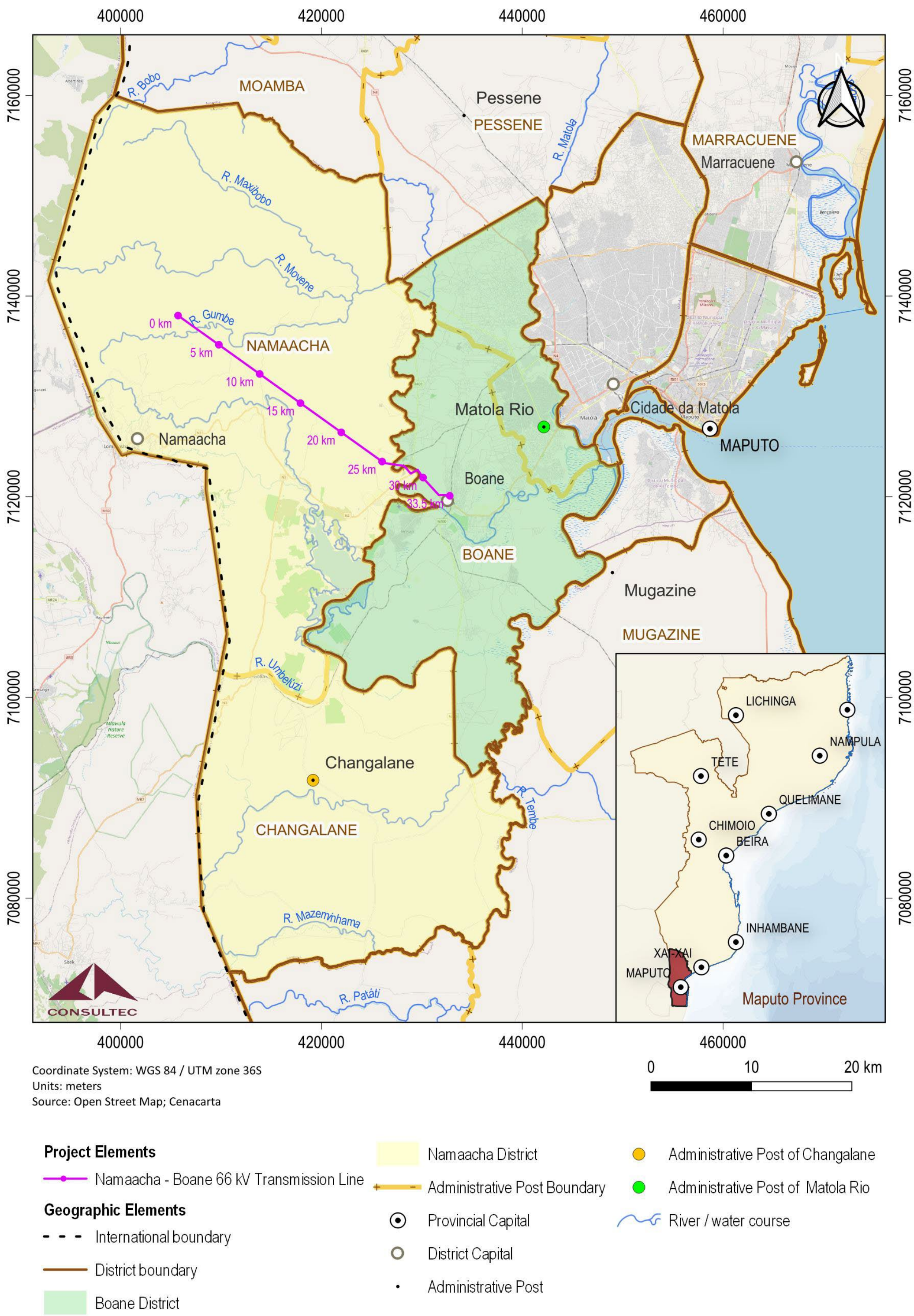


Figure 6-74 – Regional context of the 66 kV transmission line

6.3.3.4 Communities on the vicinity of the route

The social and economic infrastructure used by these communities is mainly distributed through most localities of Namaacha and Boane administrative posts. Particular emphasis is given to the communities closest to the project area.

Communities in Namaacha District

As previously mentioned, the communities found on the project´s right-of-way and surrounding areas are located in Namaacha Administrative Post. The following Table 6-37 presents the administrative division of the communities found on the project´s surroundings:

Table 6-38 – Communities on the project´s surroundings - Namaacha District

District	Administrative Post	Localities	Communities
Namaacha	Namaacha Sede	Kalakala	Livevene and Mangava
		Impaputo	Gumbe
		Mafuiane	Baca Baca and Micacuene

Communities in Boane District

The communities found on the project´s right-of-way and surrounding areas are located in Boane Administrative Post. The following Table 6-38 presents the administrative division of the communities found on the project´s surroundings:

Table 6-39 – Communities on the project´s surroundings - Boane District

District	Administrative Post	Localities	Communities
Boane	Boane Sede	Gueguegue	Mabanja, Bairro 1 and Bairro 6

Figure 6-75 below illustrates the Namaacha Government headquarters (left) and the jurisdiction boundary of Boane Town Municipality (right).

Governo do Distirto da Namaacha

Boane Municipal Town

Figure 6-75 – District government entities

6.3.4 Population and Demographics

6.3.4.1 Maputo Province

According to the results of the IV General Census of Population and Housing (RGPH) released by the National Statistics Institute (INE) in 2017, the population of Mozambique was 26,899,105 inhabitants and of Maputo Province 1,908,078 inhabitants (INE, 2018).

The same source indicates the existence of 452,051 households in Maputo province with an average household size of 4.2 members per household. Unlike most provinces in Mozambique, a large part of the population of this province has urban characteristics, i.e., about 71% of its population.

In 2021, the population growth in Maputo Province (Table 6-40) was higher than at the national level and the illiteracy rate in the province was considerably lower than in Mozambique, where 39% of country´s population over five years old cannot read or write.

The demographic indicators of Maputo Province are better placed than at the national level, having, for example, a higher coverage on the education and health sectors. Both global and infant mortality rates, as well as the birth rate in Maputo Province are lower than at the national level.

Fertility is one of the main factors in the natural growth of the population. The global fertility rate was lower in Maputo province than at the national level, being at 3.4 children per woman. Life expectancy at birth was higher in Maputo province (62.7 years) than in Mozambique, which was placed at 55.3 years in the same period. Table 6-40 presents the main demographic indicators in Mozambique and Maputo Province in the year 2021.

Table 6-40 – Demographic Indicators (2021)

Description	Province	National
Population Growth Rate (%)	3.8	2.5
Illiteracy rate (%)	13.3	39
Child Mortality Rate (per thousand live births)	46.6	66.2
Mortality Rate (per 1000)	8.8	12.1
Birth Rate (births/1000 inhabit)	29.2	37.2
Global Fertility Rate (children/woman)	3.4	4.7
Life Expectancy at Birth (years)	62.7	55.3

Source: INE, (2022d, 2022e)

6.3.4.2 Districts covered by the project

Boane District is one of the most populous districts in Maputo Province. In the last general population census conducted in 2017, it had a population of 210,367 inhabitants corresponding to 11% of the province's total population. In the same period, it had the third highest population density after Matola City and Marracuene Districts, being higher than the population density at provincial and national level. On the other hand, Namaacha District had in the same period 47,129 inhabitants, being the district with the lowest number of inhabitants in the province representing about 2% of the province´s total population.

Boane District presents a considerably high population density, which is in line with the high levels of urbanization and with the population growth observed in recent years, with 256.5 inhabitants/km^2, which constitutes a population density seven, three and eleven times higher than that of Mozambique, Maputo province and Namaacha District, respectively. In turn, the population density of Namaacha district is about 21.9 inhabitants/km^2, which is lower than the population density of Mozambique, Maputo province and Boane district.

To note that Boane´s population is mostly urban with an urbanization rate of 60% while in Namaacha District it is mainly rural (30%). Both districts have an urbanization rate lower than the province´s (71%). The total population and population density of Mozambique, Maputo Province and Namaacha and Boane Districts is shown in Table 6-41 below.

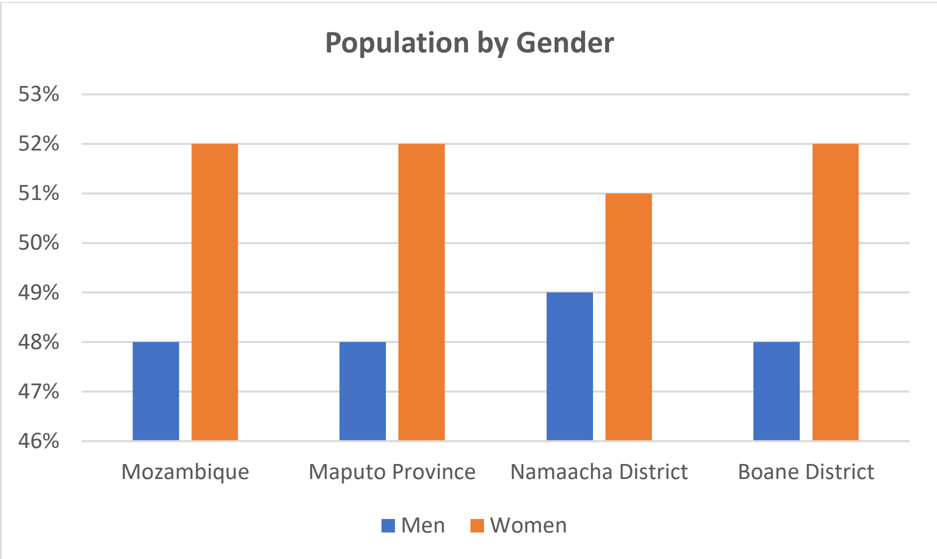
Table 6-41 – Population density of the Country, Province, and districts, 2017

Location	Total Area (km²)	Total Population	Population Density (inhabit/km²)
Mozambique	799,380	26,899,105	33.6
Maputo Province	26,058	1,908,078	73.2
Namaacha District	2,156	47,126	21.9
Boane District	820	210,367	256.5

Source: INE (2018)

In terms of gender balance / distribution, Maputo Province has a gender balance in line with the rest of the country, with 995,143 (52%) women and 912,935 (48%) men. Both Boane and Namaacha Districts show a similar gender balance trend to the country and to the province itself, that is, with a slightly higher number of women. Namaacha District has the most equitable gender balance, with 49% men and 51% women.

Figure 6-76 illustrates the population by gender in Mozambique, Maputo Province and in Namaacha and Boane Districts.



Source: INE (2018)

Figure 6-76 – Population by gender (2017)

The age distribution in the province and covered districts is typical of developing communities, where there are a large majority of young people and fewer elderly. This is partly due to the existing low life expectancy rate as well as a high birth rate. Almost half of the population of Mozambique, Maputo Province and Namaacha and Boane districts, is under 15 years of age at all administrative levels, being about 46% at national level, 38% at provincial level and 39% in both districts. On the other hand, the percentage of working age population (15 to 64 years of age) corresponds to half of the population of Mozambique and to more than half in the province and districts under analysis.

The dependency ratio measures the potentially inactive population contingent, which must be supported by the potentially productive portion of the population. A high dependency ratio represents a very high demographic dependency burden.

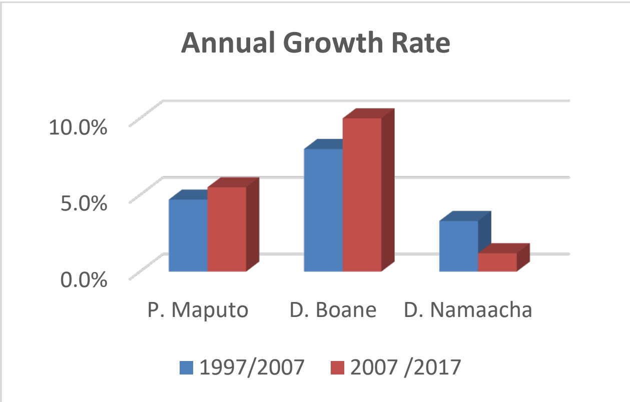
Maputo Province has a dependency ratio (70%) lower than that of Mozambique (100%), Namaacha District (77%) and Boane (72%) District. These figures reflect a considerable proportion of working aged people in the province and districts. Table 6-42 shows the distribution of the population by age groups.

Table 6-42 – Population by age groups (2017)

Location	Age Groups (%)			
	0-4 years	5-14 years	15-64 years	≥ 65 years
Mozambique	17	29	50	3
Maputo Province	12	26	59	3
Namaacha District	12	27	57	5
Boane District	13	26	58	3

Source: INE (2018)

The data presented in Figure 6-77 indicates that there was a considerable increase in the annual growth rate for both Maputo Province and Boane District in the periods between 1997/2007 and 2007/2017. Boane district's annual growth rate was higher than that of the province in both the 1997/2007 decade and the 2007/2017 decade. Namaacha district showed an opposite trend with a decrease in the annual growth rate in the last decade, being in both decades under study lower than the province and Boane district.



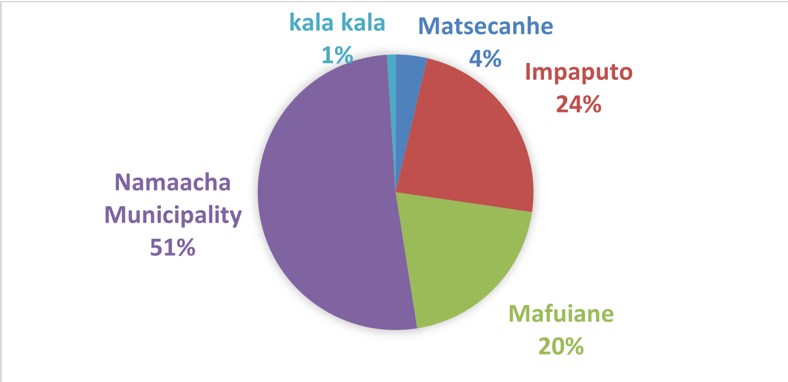
Source: II, III and IV RGPH

Figure 6-77 – Annual growth rate in the province and covered districts

6.3.4.3 Communities in the vicinity of the route

Namaacha Administrative Post has 31.279 inhabitants which corresponds to 66,4% of the total district´s population and Boane Administrative Post has 105.879 inhabitants corresponding to about half (50,3%) the population living in Boane district (INE, 2018).

As shown on the following Figure 6-78, the population living in the different localities of Namaacha Administrative Post are unevenly distributed, with Namaacha town municipality having about half the total population (51%) and both Kala-kala and Matsecanhe localities having only 5% of its inhabitants.



Source: INE (2018)

Figure 6-78 – Population in the localities of Namaacha Administrative Post

The transmission line route in Namaacha District crosses the Namaacha Sede Administrative, Kalakala, Impaputo and Mafuiane Localities, and the communities of Bacabaca, Micacuene, Livevene, Mangava and Gumbe. As seen in Figure 6-78 above the three localities crossed by the project have 45% of the Namaacha administrative post´s population. To note that the locality of Kalakala has much less inhabitants corresponding to 1% of this administrative post.

According to information given by local authorities and presented in Figure 6-79 below, the communities in Mafuiane locality are more populated with Bacabaca having 735 inhabitants and Macacuene 406 inhabitants. Livevene in Kalakala is the least populated with only 58 inhabitants. To emphasize that there are no inhabitants in Mangava having though a considerable number of coal pits and pastures for the animals belonging to Gumbe and Livevene households.

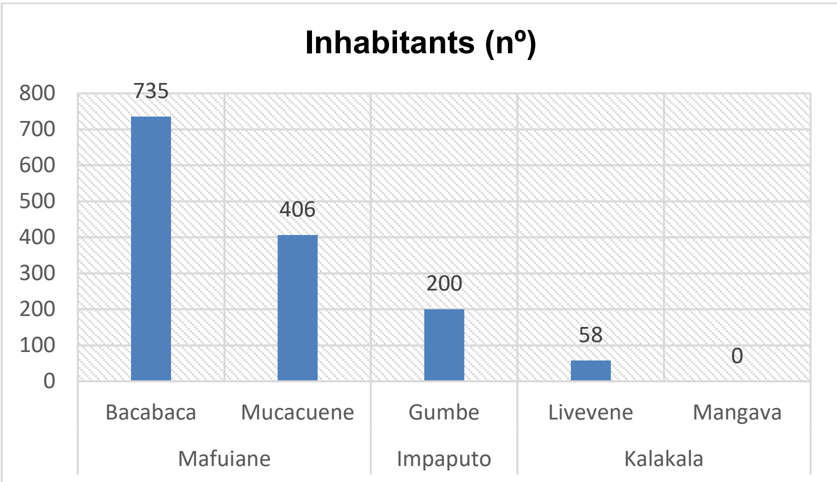
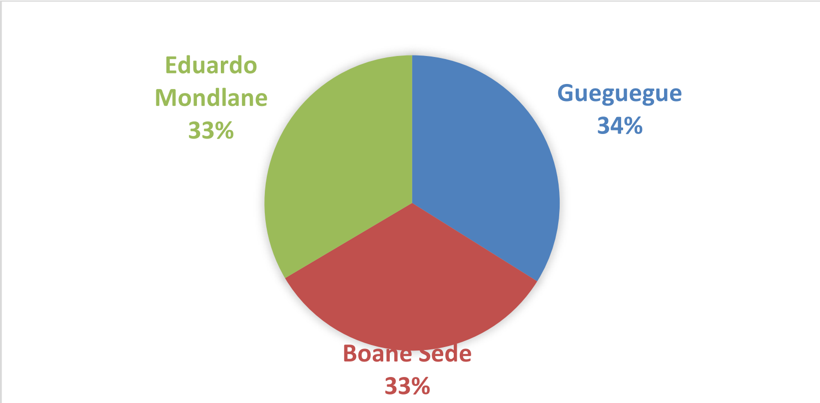


Figure 6-79 – People living in communities crossed by the line in Namaacha (2023)

According to information collected locally by the field team there are presently 60, 45 and 31 houses in Macacuene, Gumbe and Livevene respectively.

Differently from the previous scenario, the population living in Boane Sede Administrative Post are evenly distributed by its three localities, namely Gueguegue, Eduardo Mondlane and Boane Municipality as shown in Figure 6-80 below.



Source: INE (2018)

Figure 6-80 – Population in the localities of Boane Administrative Post

In what concerns the covered communities in Gueguegue Locality (Figure 6-81) Bairro 1 has the highest number of inhabitants and Mabanga the lowest. When comparing with the number of inhabitants in the communities in Namaacha district (Figure 6-79) stands out that the communities in Boane have a much higher number of inhabitants being in line with the typical urban context in which these are set in.

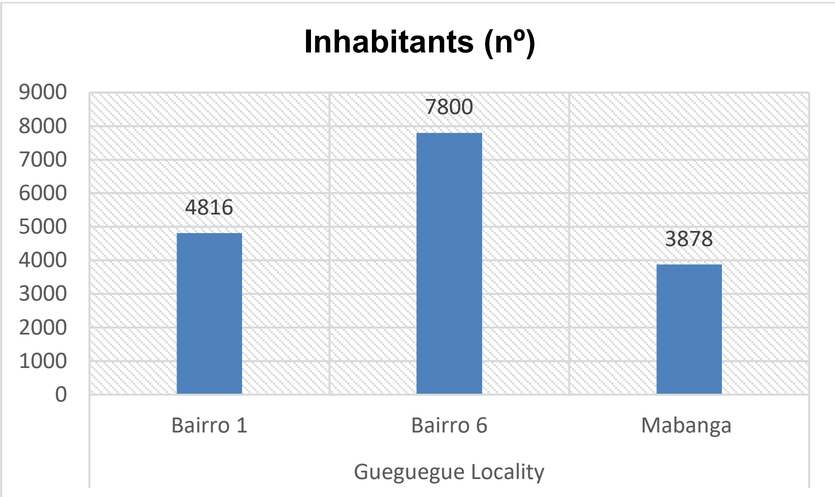
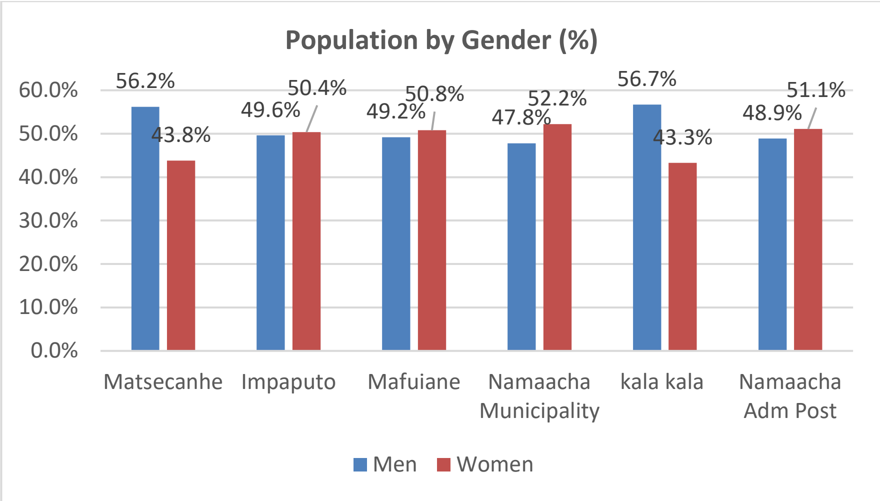


Figure 6-81 – People living in communities crossed by the line in Boane, 2017

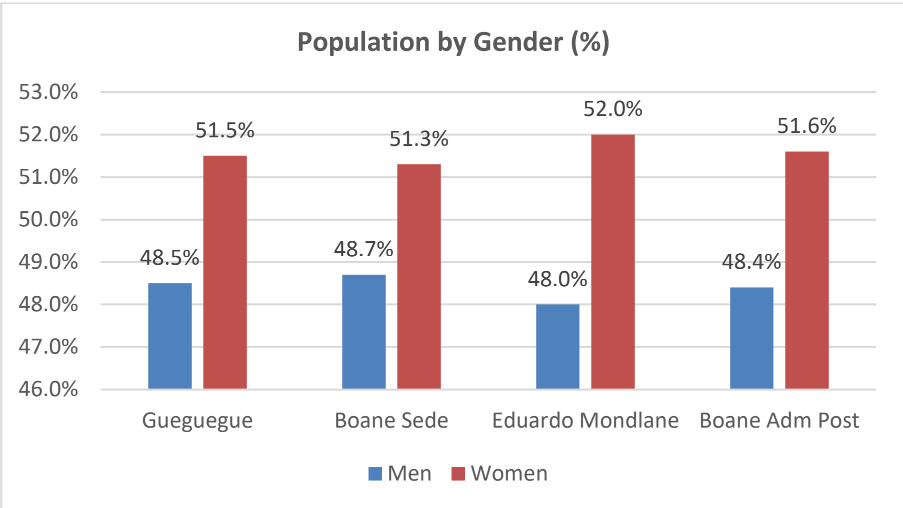
Gender distribution in the localities included in the Namaacha administrative post, can be observed in Figure 6-82 below. The localities of Impaputo, Mafuiane and Namaacha Municipality follow the same trend of the administrative post with a gender balance of slightly more women than man, whereas Matsecanhe and Kala Kala localities have more male inhabitants with 56,2% and 56,7% respectively.



Source: INE (2018)

Figure 6-82 – Gender distribution in Namaacha Administrative Post

As shown in Figure 6-83 below the population living in the localities of Boane Administrative Post are composed by more women than men, varying from 51,3% in Boane Sede to 52% in Eduardo Mondlane locality.



Source: INE (2018)

Figure 6-83 – Gender distribution in Boane Administrative Post

The survey results concerning the numbers of members per household (Figure 6-84) stands out that those who run small to medium enterprises have smaller households with more than half (51,4%) with 1 to 4 members and not having households (HH) with 13 or more members which might well be related to a slighter higher living condition.

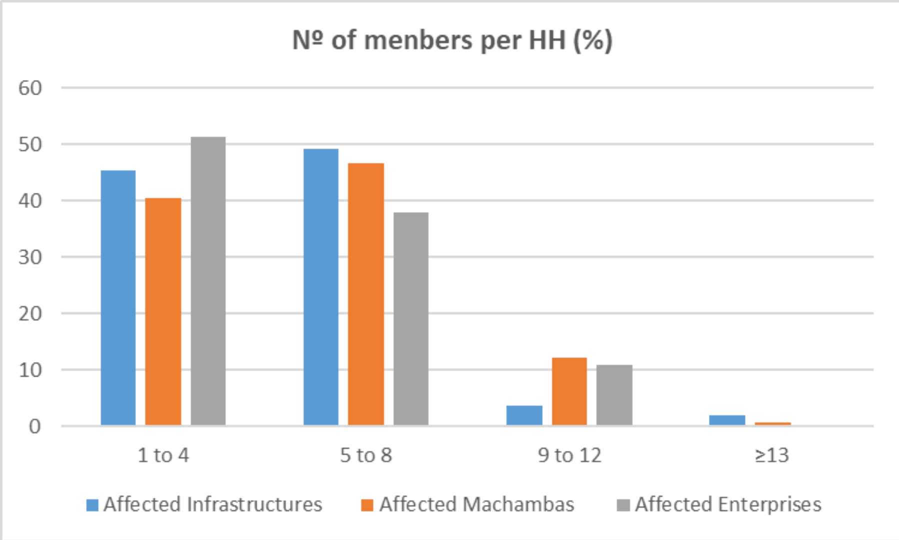


Figure 6-84 – Number of HH members per survey

Regarding the gender of the Head of the Household (HHH) and as shown on Figure 6-85, most HHH in the surveyed affected infrastructures are men (62,3%) while the HHH of the surveyed machambas and enterprises are mostly women. In the specific case of business owners, this data is in line with the growing female entrepreneurship that has been observed in other similar realities in the country.

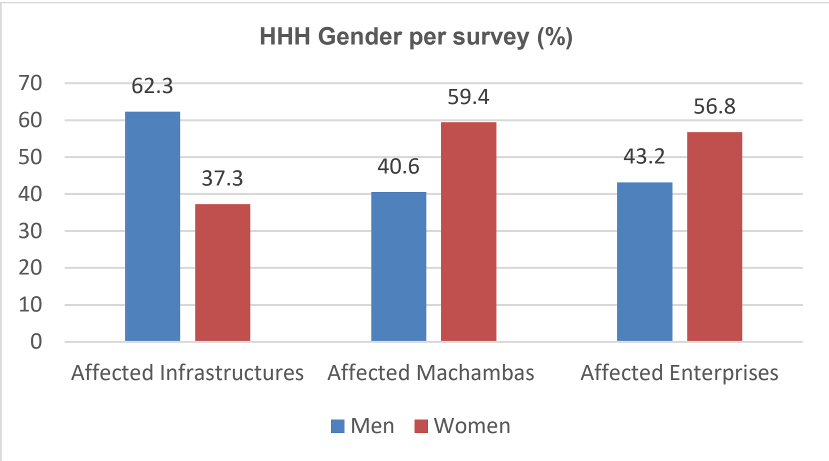


Figure 6-85 – HHH gender per survey

As for the age of HHH, Figure 6-86 below shows that in all the surveys the majority of HHH were between 36 and 56 years old and about 14% were young. Only in the farm surveys there were HHH over 78 years old corresponding to 2.9%.

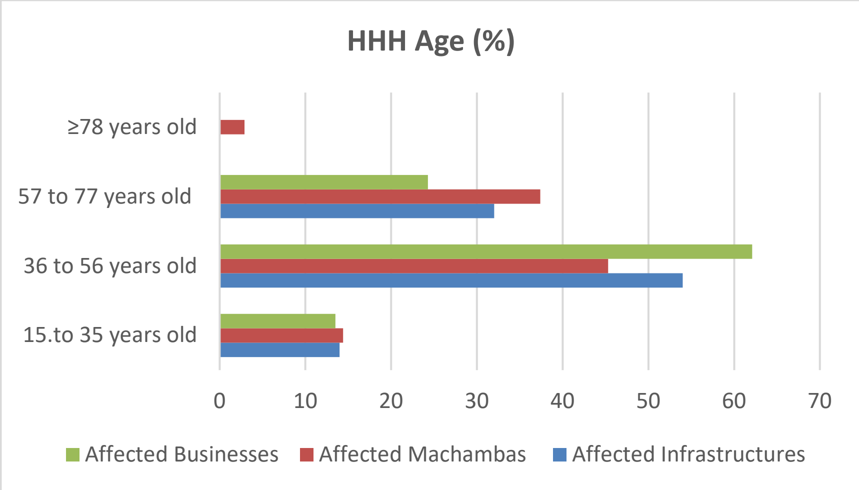


Figure 6-86 – Age intervals of HHH

6.3.5 Culture and Cultural Heritage

According to Willis (2014), cultural heritage is the legacy of physical artifacts and intangible attributes of society inherited from past generations. Physical artifacts include works of art, literature, music, archaeological and historical artifacts, as well as buildings, monuments, and historic places, whilst intangible attributes comprise social customs, traditions, and practices often grounded in aesthetic and spiritual beliefs and oral traditions. Intangible attributes along with physical artifacts characterize and identify the distinctiveness of a society.

The definition of Cultural Heritage is that expressed in Law No. 10/88 of December 22, which determines the legal protection of tangible and intangible assets of Mozambican Cultural Heritage. According to this Law, Cultural Heritage: "is the set of tangible and intangible goods created or integrated by the Mozambican people throughout history, with relevance for the definition of Mozambican cultural identity."

6.3.5.1 Maputo Province

As a product of the different facts and elements of its history, Maputo Province has produced a memory that is made up of a diversity of tangible and intangible cultural assets, mixing elements of exogenous and endogenous origin.

The tangible cultural heritage of Maputo Province consists of historical sites, monuments, and an interpretation centre. There are the Cathedral of Our Lady of Fatima in Namaacha, the Cave of Daimane in Namaacha, the Goba Monument (Namaacha), the Gwaza Muthine Monument (Marracuene), the Cultural Center of Matalane, the sacred marula tree of the Maguiguanas N´ kanyine, the Mawandla Cave (in Magude), the Mapulanguwene Monument with the remains of Maguiguane and the Mouzinho de Albuquerque monument where there was a battle between the resistance forces and the colonial army (Magude) and the Lusaka agreements Monument at Machava (Muocha, 2020).

According to the inventory of the Provincial Directorate of Culture and Tourism (INE, 2022c), there are 24 cultural monuments in Maputo province, of which 29.2% were in Manhiça and 16.7% in Moamba. The districts covered have 16,6% of the province´s monuments, that is, 8.3% (two) each.

Regarding cultural expressions, in 2021 there were 82 cultural groups registered in Maputo province, of which 59.8.% were of traditional dance, 22% traditional music and 18.3% comprised by theatre groups. According to the same source Boane and Namaacha districts had 9,8% and 15,9% of the province´s cultural groups respectively.

Figure 6-87 illustrates examples of the rich intangible cultural heritage of southern Mozambique, xigombela dancers (left) and the opening of the canhu season in Marracuene (right).

Xigombela - traditional dance

Opening of the Canhu season – Gwaza Muthini

Figure 6-87 –Examples of Intangible cultural heritage of Maputo Province

Movable tangible cultural heritage, in accordance with Law nº 10/88 of December 22nd on the protection of cultural heritage, includes, among various elements, rare and unique specimens of different origins, archaeological, philatelic, heraldic elements, ancient manuscripts , rare editions, historical objects and documents, ethnographic objects, utensils, tools, instruments, works of plastic art, objects of popular art, decorative art, applied art or crafts, films and sound recordings, oral history reports, descriptions of traditions , folklore, documents and objects related to personalities of the national liberation movement.

The intangible cultural heritage of Maputo province is constituted by local foundational narratives, local traditions, tales. The foundational narratives are associated with the M'Pfumu, Tembe, Mazwaya, Xirindra, Manyissa genealogies, with their derivations for the small communities that, administratively, are constituted in districts, administrative posts and localities. And at the level of these administrative divisions, respect for these narratives prevails since the places preserve the names of oral tradition. Associated with foundational narratives, communities have several traditions that they carry out throughout their lives, some of which are related to myths about evoking rain, celebrating harvests or having children (Muocha, 2020).

6.3.5.2 Districts covered by the project

Namaacha District

The name Namaacha comes from Lomahacha, the name of an ancient sovereign (régulo) who ruled the region of Pequenos Libombos before the settlers arrived. Fearless and brave, Lomahacha conquered the neighbouring territories by taking over the cattle, which were taken to the pastures of the royal family near Lagoa Makonko in Mozambique, which he often visited, having some calves slaughtered on these occasions to grace the local shepherds and guards. To gain more respect, he rarely appeared in public, except for the great feasts at the end of the harvest, which were called "Liphusibele". The most practised traditional dances in this region are Ngalanga, Xingomana, Mutimba and Xigubo.

The Namaacha cave, given the similarities with Cova da Iria in Portugal, was considered the Fátima of the Catholic community in Mozambique, and the waters from the fountains of the cascades were considered miraculous for those who drank them. Currently, this area continues to be the stage of the annual pilgrimage on May the 13th, for Our Lady of Fátima (MAE, 2012a).

The main recognized Cultural heritage sites in Namaacha district are:

- Mount Mponduine (708 meters) where ceremonies related to traditional cults are carried out and are performed by the local ruler /*Régulo:* Filimone Mahlalela);
- Sanctuary of Our Lady of Fátima, where Catholic pilgrims make an annual pilgrimage on every 13th May; and
- Daimani Cave in Changalane, where slaves were hidden, and many died there.
- Monument of those killed for the fatherland in Goba.

The *Regulado*[8] includes the three bordering countries in this region, South Africa, Swathini and Mozambique. The area covered by each country is governed by a local Régulo, the South African territory is governed by the *Régulo* with the highest traditional rank, and the remaining two countries are governed by two of his closest relatives. The *Régulo* Filimone Mahlalela of the Mozambican territory is a nephew of the South African ruler.

According to the SDEJT Namaacha (2022) The main cultural expressions in the district are:

- Ngalanga - dance of a social nature with a focus on tribal unity and to claim the common loyalty of its members to their respective chief;
- Xigubu – is a cultural and traditional practice that symbolizes colonial resistance in the country, especially in the southern region of Mozambique;
- Xingomana - traditionally a dance of joy danced by girls and young women when agricultural crops are good;

[8] The area covered by the traditional local governance of a Regulo, the local traditional ruler.

- Makwayela – it is a dance of struggle, of longing, and also of joy and festivity when returning home,
- Muthimba (dance practiced at traditional weddings),
- Muthini (dance practiced at traditional weddings),
- Marrabenta – urban dance resulting from the fusion of traditional dances Magika, Xingombela and Zukuta and western influence rhythms;
- Religious and community choral groups,
- Theatre groups, and
- Musical groups

According to the same source there are approximately 15 Cultural groups of traditional music and dance registered in Boane district distributed by the following cultural expressions: Makwaela tradicional (3), Xigubo (4), Ngalanga (2), Xingomane (3), Muthini (1), Muthimba (1) and Marrabenta Band (1). There is also an Art and Culture Makers Association (ADFAC) in which man many of the cultural groups and individual artists are associated.

Boane District

The traditional authority in the entire District of Boane belongs to the Matsolos (expansion of the family Hanhane-Matsolo), with some villages where the Matsolos conferred the power of heads of land or village to other people close to them, as is the case of the Cuambes in some villages of Matola-Rio Administrative Post. In Boane, as in other parts of the country, cultural manifestations that occur refer to the daily life events of the families, such as: births, deaths, puberty phase, initiation rites, food, religion, languages spoken and others. The populations and traditional authorities of this area preserve the traditional ceremonies of the opening and closing periods of the canhu season (February-March), a traditional drink much appreciated in the south of the country.

The most practiced traditional dances in this district are Chigubo, Chingomana, Makuaela and Muthimba. The most common traditional dishes are the Tihovhe, Xiguinha, Uswa, Cacana, among others, being the peanut a very important condiment in the local cuisine (MAE, 2012b).

The main recognized Cultural heritage sites, including monuments and sanctuaries in Boane District (SDEJT Boane, 2022) are as follows:

- Hindu temple in Mazambanine;
- Post office building, Mozambican railway station, 1916 Mozambican railway house, Beata Anuarite Church and bell iron of Boane primary school;
- Fiche family cemetery, and
- Site for Canhú[9] inauguration ceremonies in Mulotana.

The main cultural expressions in the district are:

[9] The canhu season occurs in the end of January each year where people get together to celebrate and drink canhu. Canhu is a traditional drink made of fruit from the Marula Tree (*Sclerocarya birrea*).

- Choral singing
- Traditional dances - Xingomana, Xikwakwakwa, Mutimba, Makwaela, Xigubo, Mapiko, Nyau, Ngalanga, Nonje, libomdo, Ziquire and Libomdo;
- *Capoeira;*
- Musical bands including marrabenta;
- Poetry and theatre; and
- Fine arts, ceramic and handicraft.

There are 43 cultural groups registered in the district comprising: coral singing (8), capoeira (1), Xingomana (2), muthimba (1), xikwakwakwa (1), music bands (23), makweala (1), xigubo (1), mapiko (1), libomdo (1) and Nyau (1). There are also the Umbeluzi cultural association (nagalanga and marrabenta), and Armed Forces Seargent School group that practice choral singing and a series of traditional dances (Xigubo, Ziquire, Limbondo, Mapiko, Nonje, Nyau, Makwaela, Ngalanga).

In what regards artistic expressions, there are two theatre groups, two poets, five plastic artists, one ceramist and nine registered handicraftsmen.

6.3.5.3 Communities in the vicinity of the route

According to information collected locally in the communities crossed by the line's route in Namaacha, all the communities are inhabited since the eighties, and the people living in these communities are a mix of natives from Namaacha and people from former Swaziland and other provinces such as Gaza, Inhambane or Zambézia.

Gumbe has two community cemeteries and the communities of Livevene and Macacuene have one community cemetery each and in these two communities there are some households with graves on their backyards. In Bacabaca there is a community cemetery whose people buried on its graves are unknown and there are four households with graves on their backyards.

None of the communities have sacred sites. Although in Livevene, for instance, have been mentioned that the traditional ceremonies are held by the region`s Traditional Ruler ("*Régulo*") called Filimonde Malhalele. Have also been mentioned the celebrations held on the opening the canhu season comprising among other rituals the performance of local dances.

Leaders of the affected communities in Boane District have mentioned that these settlements exist for quite some time, specifying that Bairro 6 was created 40 years ago and Mabanja about 60 years ago. People from Bairro 6 and Mabanja are mostly native to the area while those who have settled in Bairro 1 come mainly from Maputo city and Gaza Province.

There are no cemeteries in these communities. Communities from Bairro 1 and 6 use the municipal cemetery located at about 4 km, and those living in Mabanja (Zona A) use the cemetery located in Zona D also at about 4 km. In Bairro 1 there are two households with graves on their backyards and in Mabanja there are graves on the backyard of four households.

In Figure 6-88 below shows the tree on the local traditional ruler (*Regulo*) house in Mabnaja where the opening of the canhu season takes place (right) and graves on the backyard of a house (right).

Figure 6-88 – Local ruler house and graves on a backyard in Mabanja

In these communities there are no sacred places and their inhabitants do not perform ceremonies to their ancestors. Funeral ceremonies follow the most common custom followed by urban or semiurban populations with urban characteristics, carrying out the wake at home or in the church and burial in the cemetery.

As far as local festivities and dances are concerned, the only ceremony mentioned was the annual canhu festival where people dance and drink the traditional canhu beverage.

From the conducted infrastructure survey resulted that there are some graves and churches inside the buffer area as shown on the following Figure 6-89.

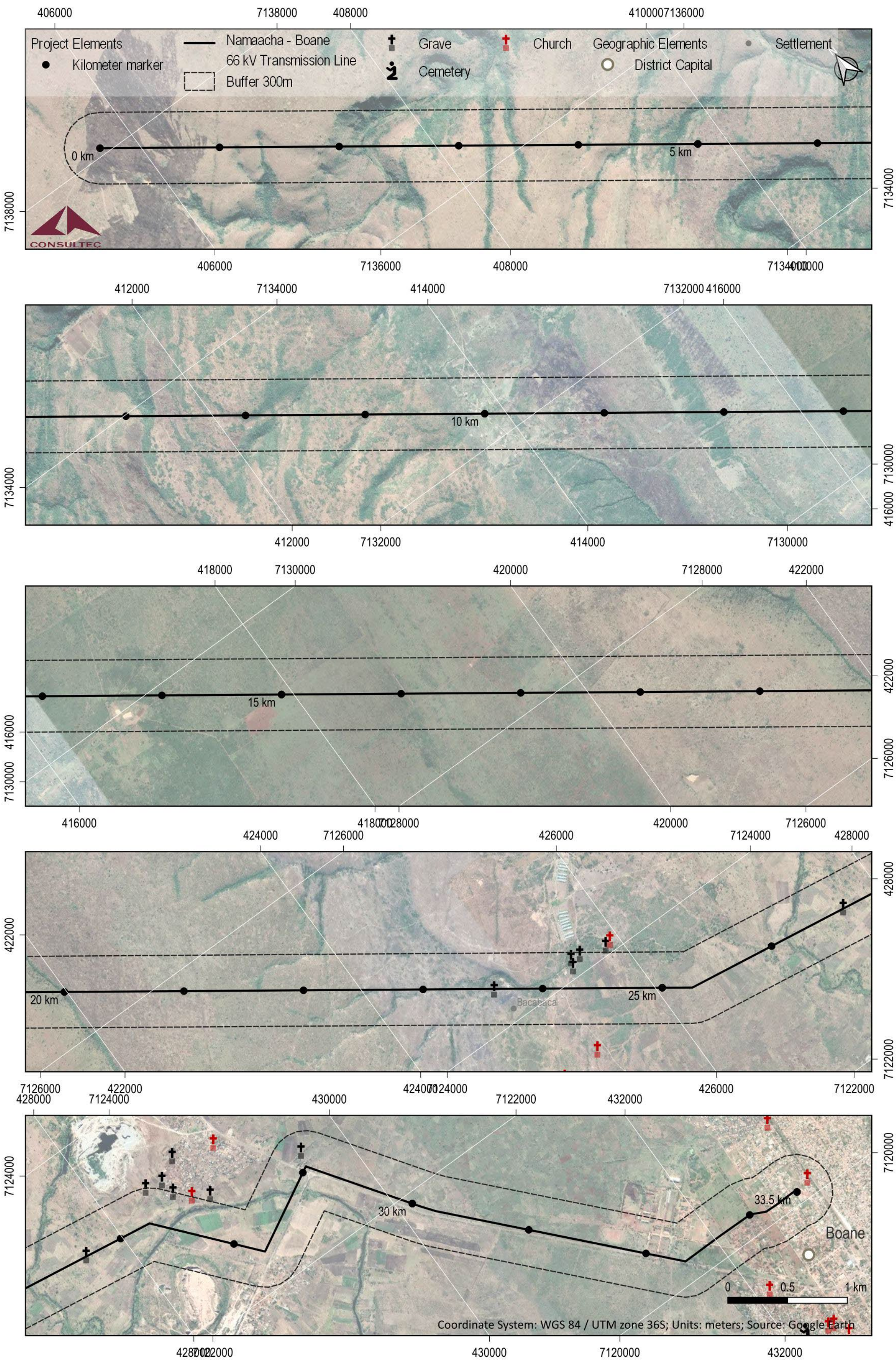


Figure 6-89 – Graves and churches inside and on the vicinity of the 66 kV route

A degraded church and four graves inside the buffer in Mabanja are shown in Figure 6-90. In addition, there is a grave in the same community whose members mentioned to be there since about 1940.


Figure 6-90 – Religious temple and four graves inside the line buffer in Mabanja

6.3.6 Ethnicity, Language and Religion

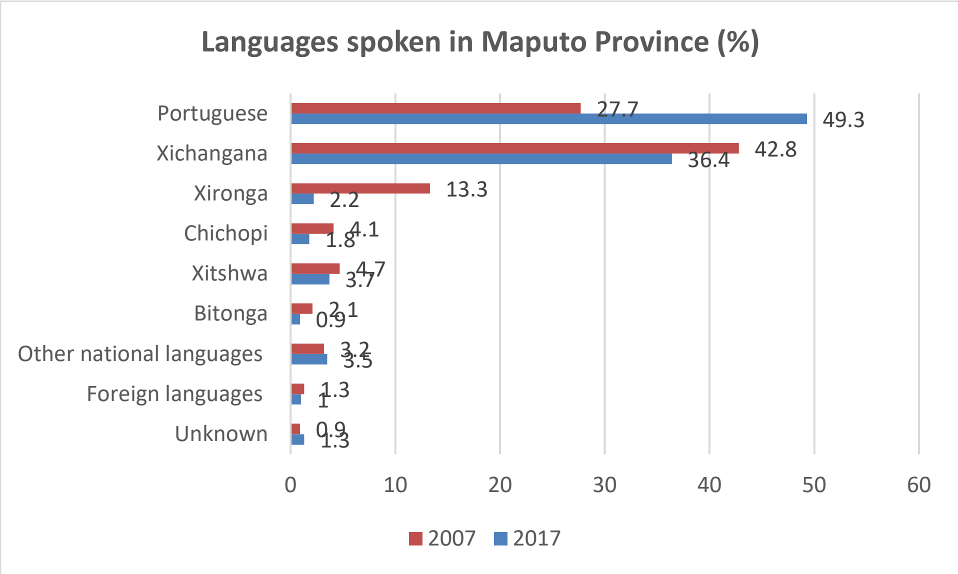
6.3.6.1 Ethnicity and Language

Linguistic diversity is one of the main cultural characteristics of Mozambique, with Portuguese being the official language. Emakhuwa is the most spoken mother tongue in the country, according to the results of the last population censuses. In 1997, Xichangana was the second most spoken language, and in the two following censuses it was replaced by Portuguese, with an increasing trend, rising from 10.7% in 2007 to 16.6% in 2017 (INE 2019a).

Maputo Province

The main ethnic group in Maputo Province, including Boane District is the Tsonga, from the Shangana-Matswa-Ronga clan. This group follows a patriarchal lineage system. However, due to the location of Maputo and Matola in relation to South Africa, and due to the continuous industrial and service growth that has taken place over the last few years, both cities have become centres of attraction for people looking for jobs and better opportunities. As a result, there are a considerable number of other ethnic groups and nationalities, such as the Chopes, Bitongas, Portuguese and South Africans, among others. The main language spoken is Tsonga, although Portuguese is widely spoken in urban and semi-urban areas. Other languages spoken are Chope, Bitonga and Xitswa, reflecting the multi-ethnic character of the area.

Figure 6-91 below shows the distribution of Maputo Province´s most spoken languages where stands out that the number of Portuguese speakers have increased considerably between 2007 and 2017. During the same period there has been a decrease of the tsonga languages spoken in southern Mozambique with particular emphasis to Xironga, a language traditionally spoken in southern Maputo Province.



Source: III and IV RGPH

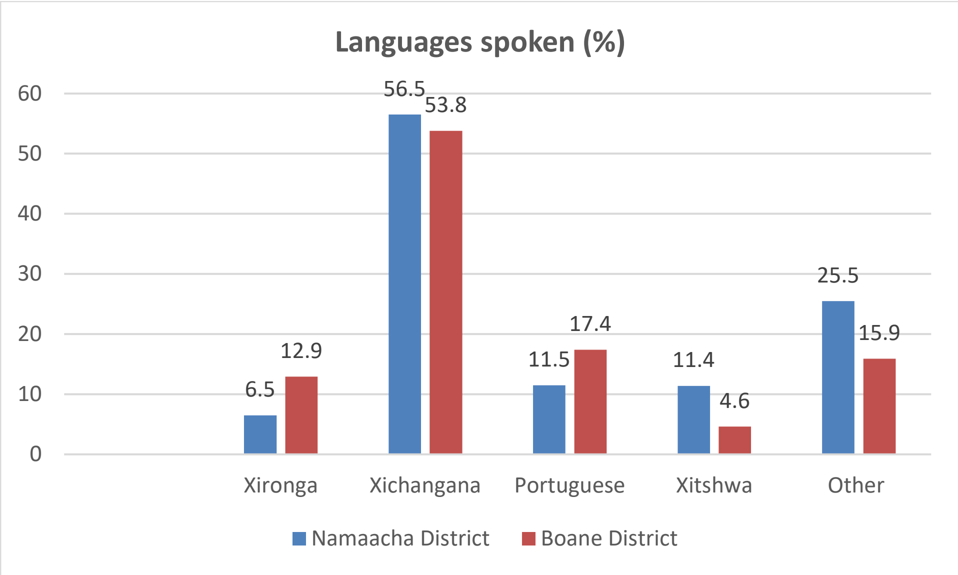
Figure 6-91 – Languages spoken in Maputo Province

Districts covered by the project

The languages most spoken by the population in Namaacha District region were mainly Swazi and Xironga. Currently, with the settlement of the population coming from other regions, it has changed a multilingual population pattern.

In what concerns the ethnolinguistic division of Boane District, the population of this district belongs mainly to the Changana ethnic group, which is part of the Tsonga population group. Besides the Changana, other ethnic groups live in the district, namely, the Ngunis, historically linked to the Zulus of the Kwazulu/Natal region; the Matswas, from the centre-north of Inhambane province; and the Rongas, from the southern part of Maputo province.

The language spoken by the vast majority of both Namaacha and Boane districts is Xichangana being spoken by 56,5% and 53,8% of its inhabitants respectively (Figure 6-92). Followed by Portuguese, Xironga and Matshwa in both districts. Other Mozambican and foreign languages are also spoken by a considerable number of people in both districts, especially in Namaacha (25,5%) which is an expected figure as it borders two neighbouring countries.



Source: III RGPH

Figure 6-92 – Languages spoken on covered districts

Communities in the vicinity of the route

The communities in Mafuiane locality speak mostly Portuguese, Changane and Swazi, and the majority living in Gumbe and Livevene speak Changane, Matswa and Swazi.

Regarding the languages most spoken by the communities in Boane District have been stated by Bairro 1 and 6 leaders that they mostly speak Portuguese and Changana and that those living in Mabanja speak mostly Ronga, Portuguese and Changana.

The results of the survey conducted to the head of households of the affected infrastructures (Figure 6-93) indicate that slightly more than half (51%) speak Changana and the remaining speak mostly Portuguese.

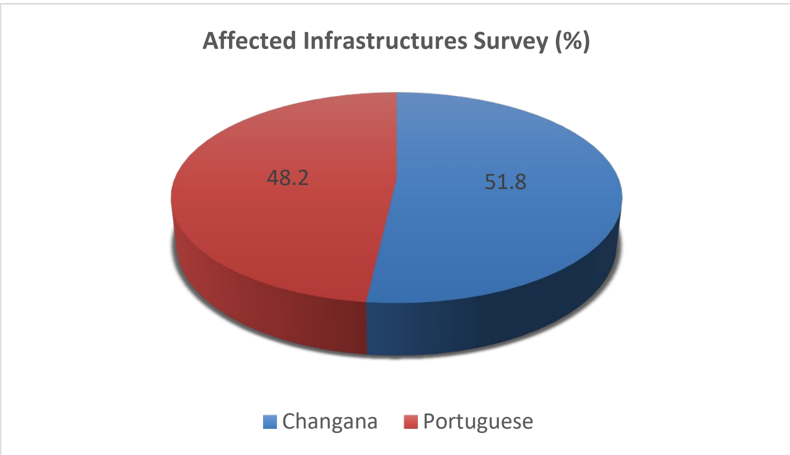


Figure 6-93 – Languages spoken by the affected IF surveyed HH

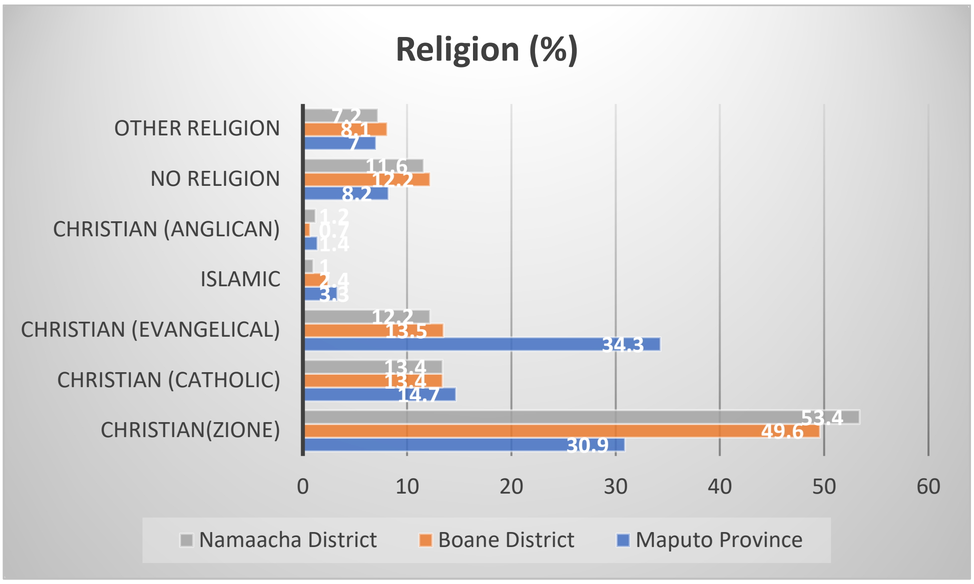
6.3.6.2 Religion

Mozambique has a great cultural diversity, with different beliefs and taboos throughout the country, and it is necessary to strengthen the promotion of national unity and valorisation of the cultural mosaic for a successful integration of new practices. About a third of the Mozambican population is Christian (mainly Roman Catholic), a fourth is Muslim (mainly in the North) and about half practise's animism (often associated with Christianity).

Maputo Province and covered districts

The province multiethnicity is expressed in the great diversity of religions professed both in Maputo Province and in Namaacha and Boane Districts. The most professed religions by the inhabitants of Maputo Province and Namaacha and Boane districts are Sion/Zione, Evangelical and Catholic (Figure 6-94). To note that Sion/Zione is the predominant religion professed by 30.9%, 53.4% and 49.6% of the population in Maputo Province and Namaacha and Boane Districts respectively.

In Figure 6-94 is shown the distribution of households according to the religion professed, in Maputo Province (2017) and in Namaacha and Boane District (2007[10]).



Source: INE (2010 e 2018)

Figure 6-94 – Distribution of households by religion

A Catholic church and a Zion church in the covered districts are shown in Figure 6-95.

[10] The national statistics institute (INE) has not released data from the last census for the districts.

Catholic Church, Namaacha

Zion Church, Boane

Figure 6-95 – Places of worship in the covered districts

Communities in the vicinity of the route

The main religions practiced in the affected communities in Namaacha district are Christian beliefs, such as Protestant, Ten Apostles, Zione, Old Apostles, Anglican, Assembly of God, and United Naftal of Mozambique. In these communities there are twelve religious temples including six zione churches, three apostolic, one Assembly of God, one Anglican and one from United Naftal of Mozambique Church.

During the interviews held with Bairro 1, Bairro 6 and Mbanja communities in Boane, have been mentioned Cristian beliefs including Old Apostles and the Ebenezer Baptist Church. There are eleven religious temples in these communities, four in Bairro 1 and Bairro 6 and three in Mbanja.

In the following Figure 6-96 are shown a Zione Church in Gumbe in Namaacha District (Left) and a God Assembly Church in Bacabaca community in Boane District (Right).

Figure 6-96 – Religious temples in Bacabaca (Boane) and Gumbe (Namaacha)

As shown on Figure 6-97 from the survey conducted to the households with affected infrastructures located on the buffer resulted that the majority of those who mentioned the religion they follow are from the Catholic belief (28,2%) followed by Zion with 20% of the respondents. Animists count with 1,8%, although some of those who have not specified their religion might fall under this category.

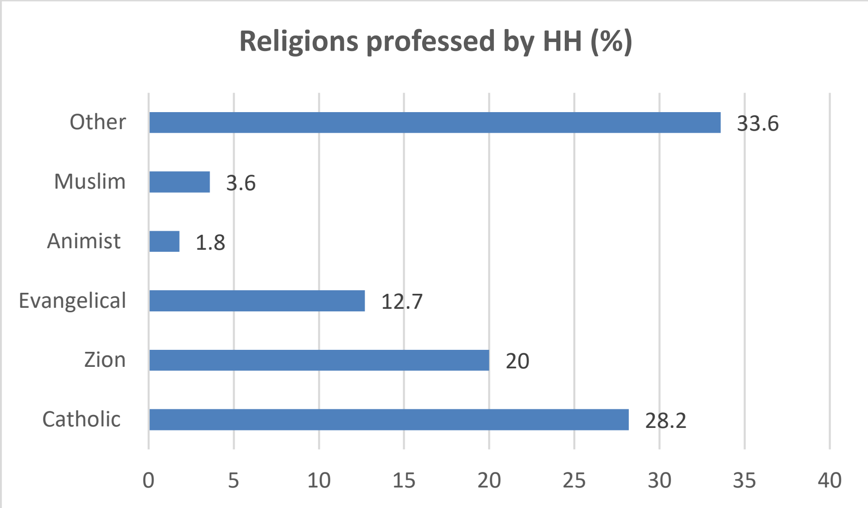


Figure 6-97 – Religions professed by surveyed households

All the religious temples inside the power line buffer or located on its immediate vicinity are illustrated on the map shown on Figure 6-89 above.

6.3.7 Education

Education is considered a priority sector for the government at both national and provincial levels in Mozambique. Over the past decade, Mozambique has made significant progress in increasing the number of children attending school. Much of this progress is due to the abolition of school fees in 2004, educational reforms, and major investments in the construction of schools and recruitment of teachers.

According to the Mozambican Education Ministry, the education system in the country is divided into three subsystems:

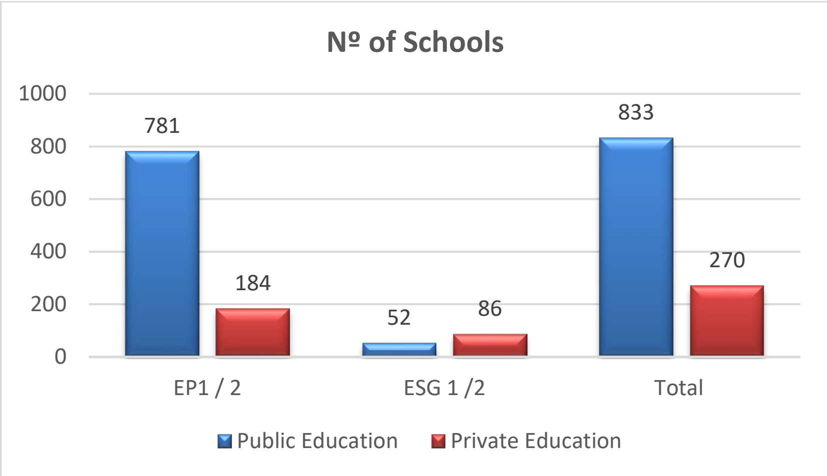
- Pre-School Education – kindergarten (*creches*);
- School Education – That is divided into:
  - 1st Level Primary School (EP 1) – 1st to 4th Grade;
  - 2nd Level Primary School (EP 2) – 5th to 7th Grade;
  - 1st Level Secondary School (ESG 1) – 8th to 10th Grade;
  - 2nd Level Secondary School (ESG 2) – 11th to 12th Grade;
  - Technical and Professional Education - this is taught in technical schools and institutes, offering courses that cover three major areas (industrial, commercial and agricultural) at elementary, basic and medium level; and
  - Higher Education - University and higher education institutes.

- Extra School Education – This is the literacy and education of people outside the school system.

The education system in Maputo Province and Namaacha and Boane districts follow the same trend as the rest of the country, with a focus on Primary Education, as illustrated by the significantly higher number of primary schools than secondary schools, vocational technical education, teacher training schools or higher education institutions.

6.3.7.1 Maputo Province

As shown in Figure 6-98, the province of Maputo had in 2021 a public-school network of 833 educational establishments of which 781 were 1st and 2nd grade primary schools and 52 were 1st and 2nd cycle secondary schools. In the same period, the province had a private school network of 270 educational establishments, of which 184 were 1st and 2nd grade primary schools and 86 were 1st and 2nd cycle secondary schools. To note that the difference on the number of primary and secondary schools is much accentuated on the public education system.



Source: INE (2022d, 2022e)

Figure 6-98 – Number of schools per type and level (2021)

The province also has 14 professional and technical schools and eight higher education institutions.

The illiteracy rate represents the percentage of the population over 15 years of age who can neither read nor write. The results presented in Table 6-43 show that the percentage of people who can neither read nor write in Mozambique and Maputo Province has been decreasing over time, from 44.9% in 2014/5 to 39.9% and 13.3% in 2019/20 in Mozambique, and from 19.3% in 2014/5 to 13.3% in 2019/20 in Maputo Province.

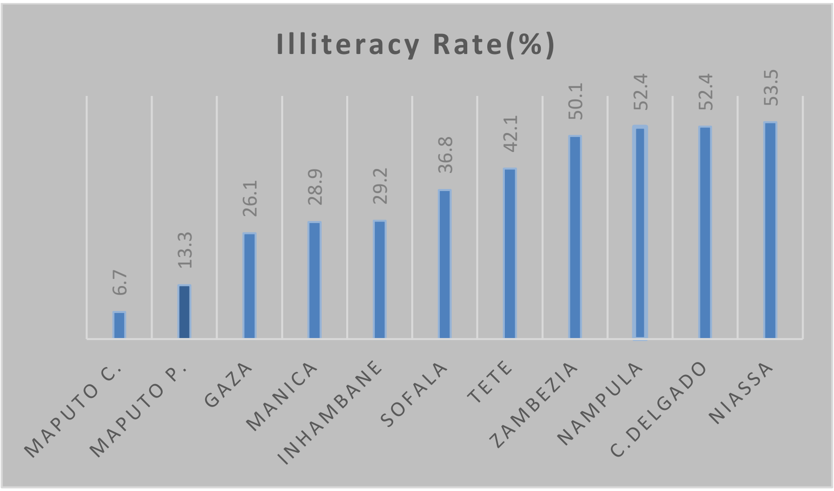
Although there has been a reduction in the illiteracy rate for both genders in the period under review, this was more accentuated among women in Maputo Province (8.8 percentage points) than among men (2.6 percentage points). Nevertheless, the percentage of women who can neither read nor write remains high (17.8%) when compared to men (7.9%).

Table 6-43 – Illiteracy rate in Mozambique and Maputo Province, 2014/5 and 2019/20

Level	2014/15			2019/20		
	Total	Men	Women	Total	Men	Women
Mozambique	**44.9**	30.1	57.8	**39.9**	27.4	51.0
Maputo Province	**19.3**	10.5	26.6	**13.3**	7.9	17.8

Source: INE (2021c).

The level of schooling and literacy remains extremely low in Mozambique, although illiteracy rates have been declining in recent years. When compared to the other provinces of Mozambique, Maputo Province currently has the second lowest illiteracy rate in the country, (13.3%) after Maputo City Province (6.7%), as illustrated in the following Figure 6-99**.**



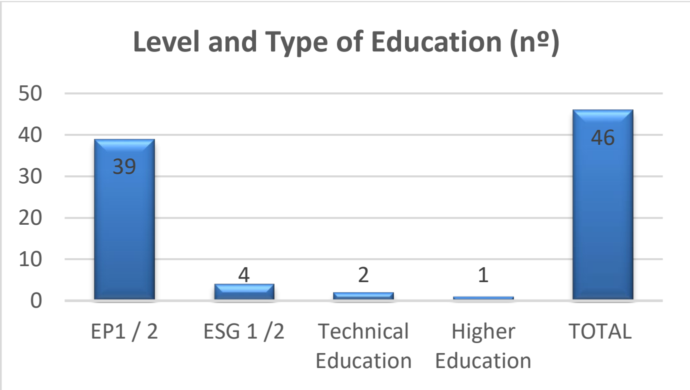
Source: INE (2021b)

Figure 6-99 – Illiteracy rates by province

6.3.7.2 Districts covered by the project

Namaacha District

The Educational establishments in Namaacha District follow the same trend, that is, there are considerably more primary education establishments than secondary education establishments. The district has currently 46 general education establishments and three public and private vocational training institutions, namely, Teachers Training Institute (IFP), Namaacha Agricultural Institute (IAN) and the Higher Institute of Education and Technology (ISETT). Figure 6-100 shows the number of educational establishments currently existing in Namaacha District by level and type.



Source: GDN (2022)

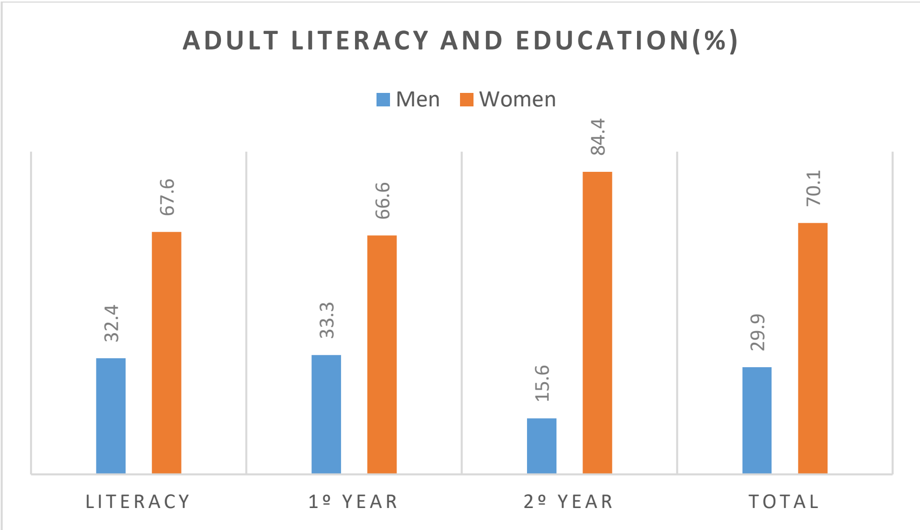
Figure 6-100 – Education establishments in Namaacha District (2022)

Figure 6-101 shows a primary school built of conventional materials located in Namaacha Town, the Namaacha District´s headquarters.

Source: Consultant

Figure 6-101 – Primary School in Namaacha District

Regarding the Youth and Adult Literacy and Education (AEJA) and as illustrated in Figure 6-102 below, 495 adults were enrolled in the regular programme of which 347 (70.1%) are women, subdivided by level of education. This significantly higher number of women enrolled in AEJA, and similarly to other districts in the country, is mainly motivated by the need of these women to become literate and educated in adulthood, being a direct consequence of lack of opportunities at schooling age.



Source: GDN (2022)

Figure 6-102 – Number of Adults in AEJA by level and gender

According to data made available by the education sector and presented in Table 6-44, the total number of students enrolled in general education increased from 2020 to 2021. As for technical-vocational education there was a slight reduction of enrolments and in the same period there was a slight improvement in the education indicators regarding students per teacher and students per class ratios.

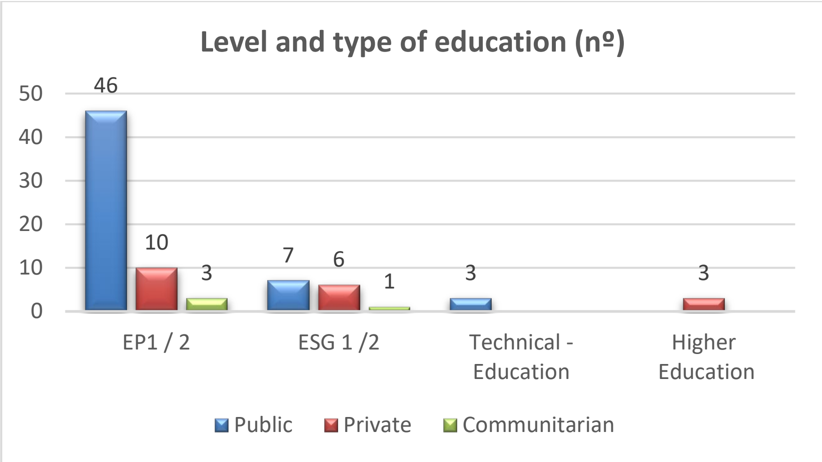
Table 6-44 – Education sector indicators, 2020-2021

Designation	2020	2021
General Education (nº)	15.731	16.239
Technical-Vocational Education	366	359
Student/Teacher Ratio	29	28
Student/Class Ratio	36	35

Source: INE (2022)

Boane District

In Boane District there are 59 primary schools, 46 of which are public, three communitarian and 10 private schools. There are 14 secondary schools of which seven are public, six private and one run by the community. The district also has three private institutions of higher education and three technical public institutions (SDEJT Boane, 2022). Figure 6-103 shows the existing educational establishments in Boane District by level and type of education.



Source: SDEJT Boane, 2022

Figure 6-103 – Education establishments in Boane District (2022)

As shown in Figure 6-104, and similar to what was observed in Namaacha District (Figure 6-102), there was a significant predominance of women attending adult education and literacy centres in Boane District, having increased from 67% to 83% between 2020 and 2021.

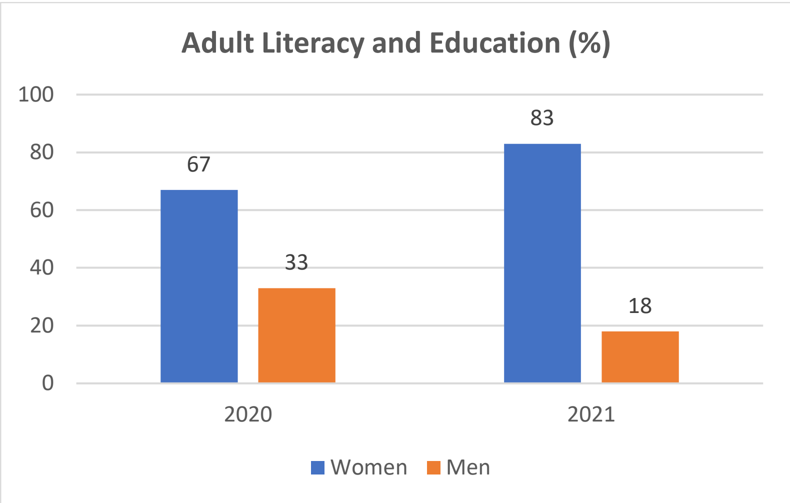


Figure 6-104 – Adult literacy and education by gender (2020 – 2021)

In global terms (Table 6-45) the number of students per class and per teacher in Boane District is high, these indicators are much higher in the public sector than in the private sector. Of the total number of students in Boane District, 93.2% and 6.8% attend the public and private education respectively. As for the proportion of girls, they constitute 51.2% of the total number of students, representing in turn, 51.3% and 49.9% of the total school population in the public and private education respectively.

Table 6-45 – Education sector indicators (2022)

Indicator	Public	Private	Global
Number of students / classes	54.9	17.4	47.9
Number of students /teachers	55.2	13.9	46
Number of girls (%)	51.3	49.9	51.2
Total number (%)	93.2	6.8	100

Source: GDB (2022)

6.3.7.3 Communities in the vicinity of the route

According to SDEJT Namaacha (2022) in Namaacha Administrative Post there are a total of 24 schools corresponding to 57% of the existing schools in the district. As shown in Figure 6-105 below Kala kala has 11 schools (45,8%), Impaputo six (25%), Mafuiane four (16,7%), and the locality of Matsecanhe with three schools corresponding to 12,5%.

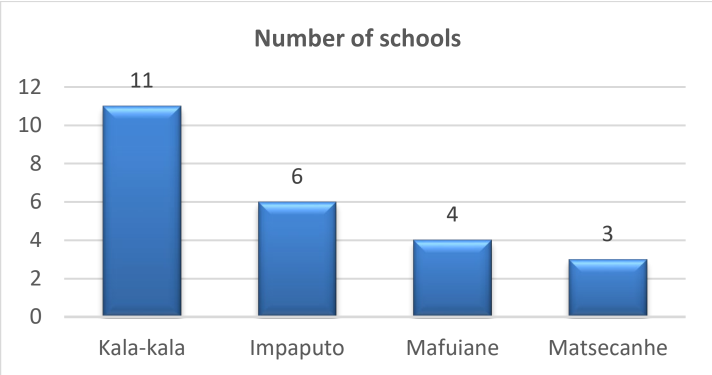


Figure 6-105 – Number of schools per locality in Namaacha AP

Concerning access to education in the communities covered by the project in Namaacha (Table 6-46) Mucacuene and Livevene have no primary school but while children from Mucacuene can go to neighbouring Bacabaca primary school children from Livevene do not have any in the vicinity either. The education sector professional from Bacabaca who has been interviewed reported that a considerable number of students go to EPC Mafuiane as well, also because EPC Bacabaca lectures only to the 6th grade. In fact, the later has a much higher number of students.

Table 6-46 – Schools attended by covered communities in Namaacha

Locality	Community	School in the Community	Number of students	Number of Teachers	School in the Vicinity	Number of students	Number of Teachers
Mafuiane	Bacabaca	EPC Bacabaca	74	5	EPC Mafuiane	864	28
	Mucacuene	No school			EPC Bacabaca	74	5
Impaputo	Gumbe	EPC Gumbe	40	3	EP1 7 de Abril	No data	No data
Kalakala	Livevene	No school			No school		

Schools located in the localities within Boane Sede Administrative Post comprise 64% of the total number of Boane district´s schools as illustrate in the following Figure 6-106.

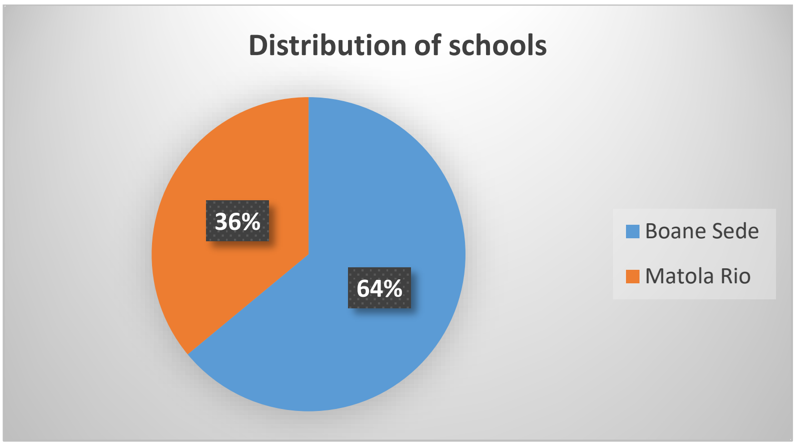


Figure 6-106 – Schools per administrative post

All the communities covered by the project in Boane (Table 6-47) have a primary school. EPC Boane Sede in Bairro 1 has the highest number of students and teachers. When compared with the rural context of the communities in Namaacha the schools in these urban communities have considerably more students and teachers.

Table 6-47 – Schools attended by covered communities in Boane

Locality	Community	School in the Community	Number of Students	Number of Teachers
Gueguegue	Bairro 1	EPC Boane Sede	1290	34
	Bairro 6	EP1 José Macamo	822	17
	Mabanja	EPC Mabanja	616	21

Figure 6-107 shows the EPC Gumbe with the roof destroyed and children having classes outside under a tree.

Figure 6-107 – Gumbe Primary School in Impaputo Locality

Table 6-48 presents the last or higher level of education concluded by the surveyed heads of households which indicates that most of the respondents had the primary school level. More than half of machambas HHH have primary education (56,1%) and 45,9 % of the business owners. 21,8% and 16,2% of surveyed HHH of affected infrastructures and businesses respectively have a university level education. To note that 18.3% of surveyed machambas HHH do not have any concluded schooling level.

Table 6-48 – Higher level of education of surveyed HHH

Level of education	Affected Infrastructures	Affected Machambas	Affected Businesses
Primary school	33,6	56,1	45,9
Secundary School	28,2	21,1	21,6
Tecnnical -professional education	2,7	2,2	5,4
University	21,8	2,2	16,2
None	10	18,3	8,1
Other	3,6		2,7

The number of heads of households who attend school is low, having been 4,5% for the affected infrastructures survey and 4,4% for the machambas survey. In addition, the respondents have mentioned that members from their households usually walk or take a minivan (Xapa) to go and return from school.

On Figure 6-108 below is shown some schools attended by covered communities.

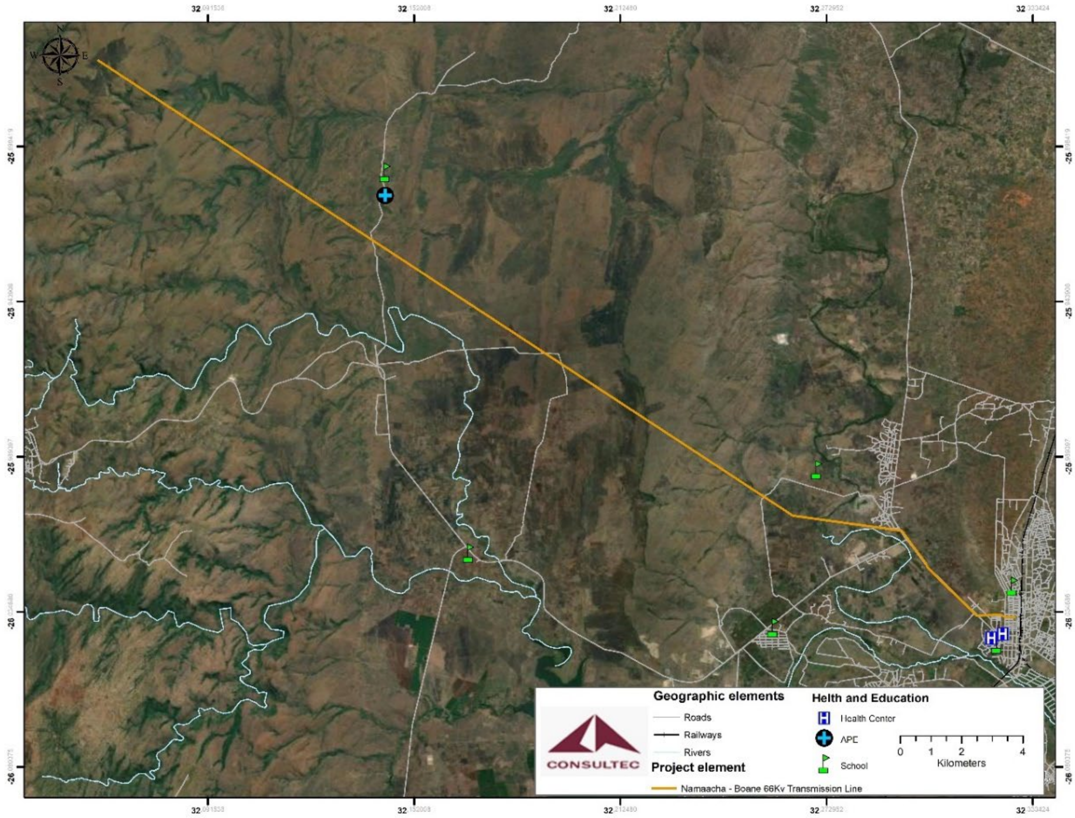


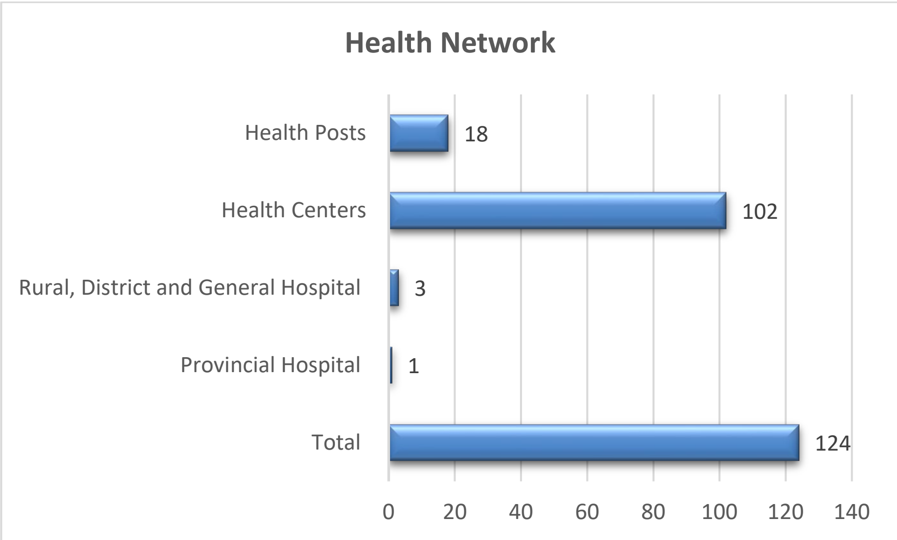
Figure 6-108 – Social infrastructures along the project route

6.3.8 Health

The National Health System (SNS) in Mozambique focuses mainly on primary health care services. However, there are several types of health facilities, each providing a specific type of service. These include health posts, health centres (urban and rural), and hospitals (district, rural, provincial, and central). Important to note that some facilities are better equipped than others, depending on their location and on the number of users.

6.3.8.1 Maputo Province

In 2021 the health network of the province was composed of 124 health units (Figure 6-109), of which 120 are of the primary level (102 health centres and 18 health posts), three of the secondary level (one rural, one district and one general hospital), and one is of the tertiary level (a provincial hospital). Of the 103 existing health centres, 12 are urban health centres and 90 are rural health centres.



Source: MISAU (2022)

Figure 6-109 – Health network in Maputo Province, 2021

Despite the increase in the number of health units in recent years, there has been an increase in the ratio of inhabitants per health unit both at national and provincial level between 2020 and 2021 (Table 6-49) which falls short of the international recommendation (10,000 inhabit./HU). The number of beds per thousand inhabitants in the Mozambican territory has remained stable during this period while there was a slight reduction of this ratio for Maputo province.

The average distance that inhabitants living further away must travel to access a Health Unit reduced from 12.1 km in 2020 to 12.0 km in 2022 at national level, on the other hand, this ratio has slightly increased in the province. During this period, there was a positive evolution on ratio of inhabitants per health technician both at national and at the Maputo Province level.

Table 6-49 – National and provincial level NHS indicators (2020 – 2021)

Indicator	Year	National	Provincial
Inhabitants / Health Unit	2020	17.219	17.875
	2021	17.419	18.572
Beds /1000 inhabitants	2020	0,72	0,78
	2021	0,72	0,76
Theoretical Range of Action	2020	12,1	8,18

Indicator	Year	National	Provincial
	2021	12,0	8,2
Inhabitants / Health Technicians	2020	909	1.055
	2021	902	808

Source: MISAU (2022)

Regarding the epidemiological profile in Maputo Province, malaria and diarrhoeal diseases continue to be the main causes of demand for health services, with a downward trend in the number of deaths in recent years. Preventive actions, with particular emphasis on intra-household spraying, distribution of mosquito nets and intermittent presumptive treatment for pregnant women, are activities that will continue to merit the attention of the health units. Another public health problem in the province is tuberculosis. The national strategy is centred on the control of the disease and the intention is to concentrate efforts on improving the screening rate of the disease. There is also a need to strengthen integration between the Tuberculosis and HIV/AIDS Programmes, considering the data collected that indicates that about half of all TB patients are HIV positive.

6.3.8.2 Districts covered by the project

Namaacha District

Namaacha District has 11 health units (Table 6-50) classified as Type I and II Health Centres, for the provision of basic services and primary and curative care. Of the total number of health units, six are in Namaacha Administrative Post and five in Changalane Administrative Post. The ratio of inhabitants per health unit is 4,284 inhabitants per health unit, within the parameter recommended by WHO (10,000 inhabitants/HU), and therefore better than the national and provincial levels.

Table 6-50 – Health units in Namaacha District

Health Unit	Type	Administrative Post	Locality
Namaacha Health Centre	I	Namaacha Sede	Namaacha Sede
Mundavene Health Centre	II		Impaputo
Odete Mechisso Health Centre	II		Impaputo
Mafuiane Health Centre	II		Mafuiane
Kuluka Health Centre	II		Mafuiane
Matsequenha Health Centre	II		Matsequenha
Changalane Health Centre	II	Changalane	Changalane sede
Ndinviduane Health Centre	II		Changalane sede
Warmongo Health Centre	II		Mahelane
Mahelane Health Centre	II		Mahelane
Goba Health Centre	II		Goba

Source: SDSMAS Namaacha (2022)

Primary health care focuses on preventive medicine and includes the following programmes: National Malaria Control Programme, Vaccination Expanded Programme (PAV); Mental Health Programme, Epidemiological Surveillance Programme, Nutrition Programme, Mother and Child Health Programme (SMI), National Programme for the Fight Against Tuberculosis; and the National

Programme for the Control of Sexually Transmitted Infections (STI) and HIV/AIDS. In Figure 6-110 below is illustrated the Namaacha Type I Health Centre located in Namaacha Town.

Source: Consultant

Figure 6-110 – Type I Health Centre in Namaacha Town

According to the Namaacha District Health Service, the coverage of institutional deliveries is encouraging, showing a positive evolution. Namaacha district had 63% of institutional deliveries in 2021. Both the number of children and adults starting Antiretroviral Treatment (ART) has reduced in the period under review which may indicate a downward trend in the incidence of new cases of HIV/AIDS. The health professional per inhabitant ratio remained stable and the ratio of doctors per inhabitant increased during this period.

The main health indicators in Namaacha District are presented in Table 6-51 below.

Table 6-51 – Health indicators (2020-2021)

Indicator	2020	2021
Number of institutional deliveries	1426	1477
Number of children starting ART	40	32
Number of adults starting ART	677	595
Health professional per inhabitant ratio	296	296
Doctor per inhabitant ratio	16.887	18.963

Source: GDN (2022b)

The epidemiological profile of the district, between 2019 and 2021 (Table 6-52), was mainly dominated by diarrhoea, dysentery, and malaria, which together represent almost all the cases of notifiable diseases. During this period, a considerable number of cases of canine bite were reported. There were no confirmed cases of Acute Flaccid Palsy, as well as no cases of cholera, meningitis, whooping cough and tetanus in new-borns in the last 5 years. According to information obtained from the Health, Women and Social Affairs District Service (SDSMAS), arterial hypertension has been a disease of greatest concern at the district level, followed by acute respiratory diseases and HIV/AIDS.

Table 6-52 – Epidemiological profile in Namaacha District (2019 – 2021)

Disease	Number of cases

	2019	2020	2021
Measles	53	44	31
Malaria	2009	1772	1777
Febrile Syndrome	1298	1406	1497
Diarrheal Diseases	2323	1870	1610
Canine bite	141	114	92
Dysentery	151	27	21

Source: (SDSMAS Namaacha, 2022).

Boane District

Boane District has 16 health facilities (Table 6-53), of which one is classified as Type I Health Centre, nine as Type II and six of Type III, for the provision of basic services and primary and curative care. Of the total number of health units, 12 are in Boane Sede Administrative Post and four in Matola Rio Administrative Post. In addition to these health infrastructures, there are three private clinics, two pregnant women waiting houses and five health committees. Of all the health units in the district, 12 have maternity and 14 have antiretroviral treatment (ART) services. The health units more distant from the district headquarters are Josina Machel Health Centre and Mulotane Health Centre.

Table 6-53 – Health units in Boane District

Health Unit	Type	Administrative Post	Distance from headquarters
Boane -Sede Health Centre	I	Boane Sede	0 km
Mahubo Health Centre	II	Boane Sede	14 km
Massaca Health Centre	II	Boane Sede	8 km
Picoco Health Centre	II	Boane Sede	6 km
Casa do Gaiato Health Post	III	Boane Sede	11 Km
Mabanja Health Centre	II	Boane Sede	7 km
Tchonissa Health Centre	III	Boane Sede	11 km
Águas de Moç. Health Post	III	Boane Sede	5 km
Josina Machel Health Centre	II	Boane Sede	60 km
Militar Health Post	III	Boane Sede	1 km
Libombos Health Post	III	Boane Sede	14 km
Mahanhane Health Centre	II	Boane Sede	16 km
Baleluane Health Centre	II	Matola-Rio	30 km
Campoane Health Centre	II	Matola-Rio	13 km
Mulotana Health Centre	II	Matola-Rio	50 km
Matola-Rio Health Centre	III	Matola-Rio	22 km

Source: SDSMAS (2022a)

The ratio of inhabitants per health unit in Boane District is 15,274 inhabitants per health unit, which falls short of the WHO ´s recommendation (10,000 inhabitants/US), being however, closer to the recommended value than at national and provincial levels.

According to Boane´s SDSMAS, the main health programmes developed in the district are; namely, Mother and Child Health Programme (SMI), Nutrition, Expanded Vaccination Programme (PAV), Community Involvement, Preventive Medicine, Environmental Health, Oral Health, HIV/AIDS, Tuberculosis, Malaria, Nursing, School Health, Mental Health, Traditional Medicine, Social Action, Epidemiological Surveillance, and the Gender Based Violence Programme (GBV).

The images in Figure 6-111 are allusive to child vaccinated the polio vaccination campaign within the Expanded Programme on Immunization (PAV) and outpatient waiting area in Boane Health Centre.

Source: Consultant

Figure 6-111 – Child vaccinated and outpatient yard

As presented in Table 6-54 and as mentioned above the ratio of inhabitants per health unit is fall short the recommended ratio. Similarly, the ratios of inhabitants per doctor and per nurse are also above the WHO recommendation, i.e., one doctor per 10,000 inhabitants and one nurse per 3,000 inhabitants.

Table 6-54 – Main heath indicators in Boane District

Indicator	2020
Ratio Inhabitant per health unit	15.274
Ratio inhabitant per doctor	32.947
Ratio inhabitant per nurse	8.237
Ratio inhabitants per hospital bed	2.777

Source: SDSMAS Boane (2022a) and INE (2021c)

Boane district´s epidemiological profile (Table 6-55) has been dominated mainly by diarrheal diseases, dysentery, and malaria, which together represent almost all reported cases of compulsorily notifiable diseases.

Table 6-55 – Boane District Epidemiological profile (2019 – 2021)

Disease	Number of cases		
	2019	2020	2021
Measles	51	62	51
Malaria	6348	5353	4138
Febrile Syndrome	7928	4535	3881
Diarrheal Diseases	5086	3034	1843
Canine bite	315	212	114
Dysentery	666	525	352
Acute Flaccid Paralysis (AFP)	7	3	3

Source: SDSMAS Boane (2022a)

6.3.8.3 Communities in the vicinity of the route

In Table 6-56 can be observed the health units most used by the covered communities located inside or in its vicinity. None of the communities located in Namaacha have a health unit and Type II Mafuiane Health Center and Type I Namaacha Health Center are those used by these communities. Specially those living in Mucacuene and Livevene communities must walk long distances to reach the nearest health unit.

Regarding the covered communities in Boane, both Bairro 1 and Mabanja have a health unit and the people living in Bairro 6 go either to Type I Boane Health Center or Type III Military Health Post. Although there is a health unit in Mabanja which is in Bairro B, the communities interviewed and therefore directly impacted by the line´s right-of- way, live or have their impacted assets in Bairro A which is about one hour walk to the health centre.

Table 6-56 – Health units used by affected communities

District	Locality	Comunity	Health Unit	Nearest Health Unit	Distance walking
Namaacha	Mafuiane	Bacabaca	no	Mafuiane Health Center	30 minutes
		Mucacuene	no	Mafuiane Health Center	2 hours 30m
	Impaputo	Gumbe	no	Mafuiane Health Center Namaacha Helath Center	
	Kalakala	Livevene	no	Namaacha Health Center	2 hours
Boane	Gueguegue	Bairro 1	Boane Health Center		10 minutes
		Bairro 6	no	Boane Health Center Military Health Post	30 minutes
		Mabanja	Mabanja HealthCenter		1 hour

According to information provided by local health professionals the communities using Boane Type I Health Center have access to a greater range of services and primary health care programmes such as outpatient consultation, maternity, vaccination expanded programme, mother and child health; HIV/AIDS services, ophthalmology, laboratory, minor surgery, physiotherapy and stomatology, while those that mostly use Mabanja Health Center have access to services or programmes such as, Outpatient consultation, maternity, expanded vaccination program, mother and child health and HIV/AIDS services.

With regard to Namaacha District, the services offered at Mafuiane Health Center are: maternity, outpatient consultations, paediatric and psychiatry internment, laboratory, adolescent and youth-friendly services and programs such as an extended vaccination program and maternal and child health. In more remote communities such as Gumbe and Livevene in the locality of Kalakala, or Mucacuene in the locality of Mafuiane in the district of Namaacha, there are elementary multipurpose agents who serve as a link between health units and communities to support them in minor first aid and in disseminating information and education on primary health care.

In Figure 6-112 below is shown the working place of the Elementary Multipurpose Agent (APE) in Gumbe community where he gives support in the treatment of minor injuries, emergency deliveries or distribution of prescribed drugs for malaria for example.

Figure 6-112 – Workplace of the Elementary Multipurpose Agent (APE) in Gumbe

In general, the most common illnesses reported by health professionals and local leaders were malaria, respiratory infections, diarrheal diseases, HIV/AIDS, scabies, joint diseases, among others. While the main cause of death reported in children were malaria, respiratory infections and diarrheal diseases, the main causes of mortality in adults were mentioned to be malaria, hypertension, and HIV/AIDS related diseases.

On the map in Figure 6-108 above are shown some of the health units used by the covered communities and Figure 6-113 below indicates the HU used by the survey respondents, Boane Health Centre was mentioned by almost 70% followed by Mabanja health centre (50,4%) and Military health post (21,8%). Maputo Central Hospital or Maputo Military Hospital are also used by 3,6% a 0,9% of the surveyed respectively. To note that 3,6% search for medical care in private clinics.

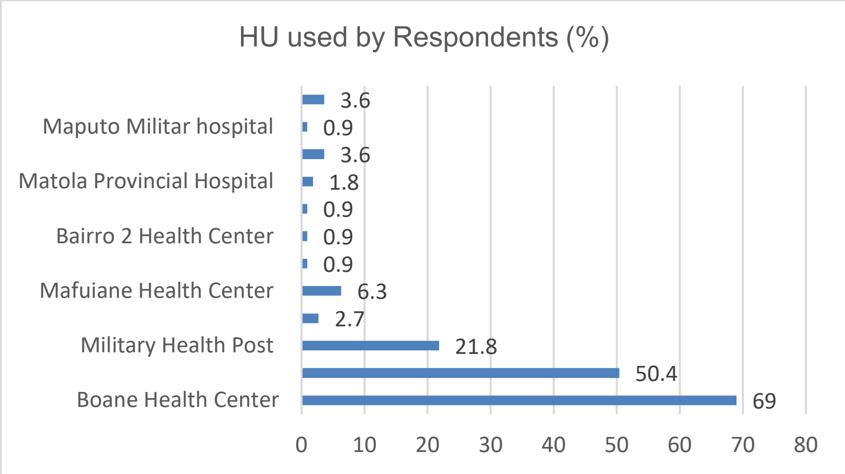


Figure 6-113 – Health units used by the infrastructures survey HHH

When asked if there was anyone in the HH with a chronic illness, 43.6% said yes and the remaining responded negatively. Reported chronic diseases were hypertension, HIV/AIDS, diabetes, asthma, sinusitis, cancer, epilepsy, hepatitis among others.

Figure 6-114 below shows the illnesses reported by the HHH has having occurred on the households. Malaria and respiratory diseases were the most frequent having been mentioned by 44,5 % and 31,8% of those surveyed. Tuberculosis (1,8%) and diarrheal diseases (0,9%) were reported by much less respondents.

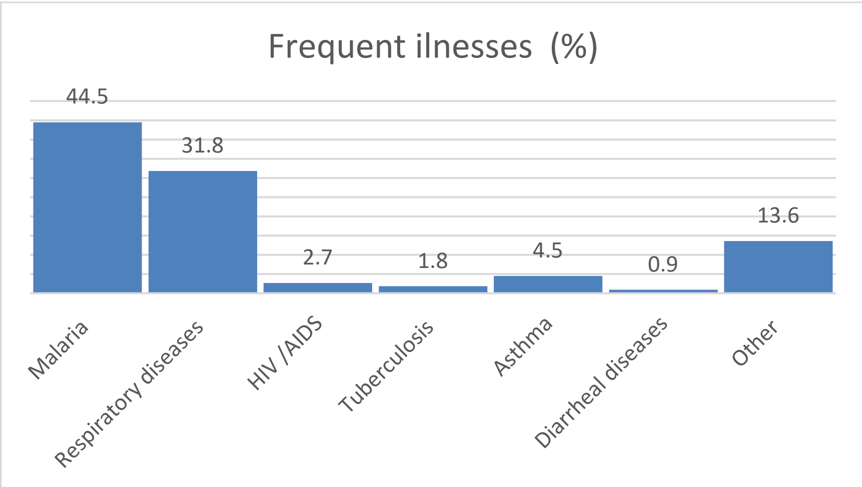


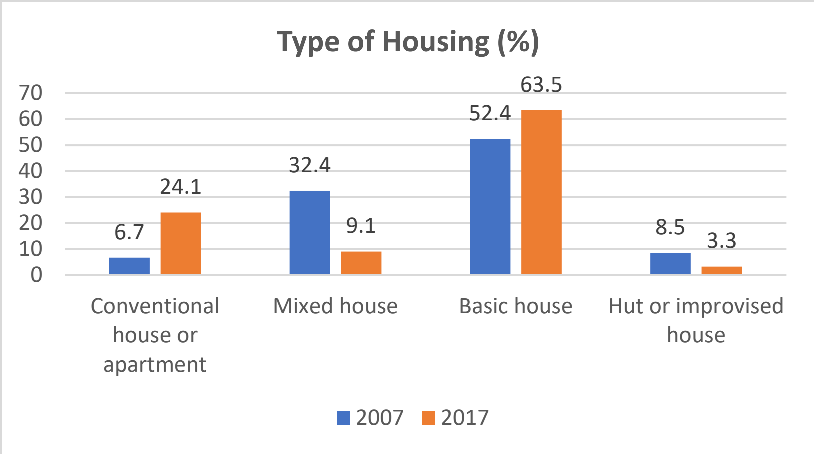
Figure 6-114 – Illnesses suffered by the surveyed HH in the last year

6.3.9 Housing and Living Conditions

6.3.9.1 Maputo Province

The physical characteristics of housing, especially the material used in its construction and access to basic water, sanitation, and energy services, are important indicators of the standard of living of households. The characteristics of the housing stock of a society are a very relevant indicator of the level of socio-economic development.

As presented in Figure 6-115, between 2007 and 2017 there was an increase of about 17.4% of households living in conventional houses in Maputo Province, indicating some improvement in the living conditions of this portion of the province´s inhabitants. There was also an increase in basic houses and a noteworthy reduction in the number of households living in mixed houses and huts or improvised houses.



Source: III and IVRGPH

Figure 6-115 – Type of housing in Maputo Province (2007-2017)

6.3.9.2 Districts covered by the project

At the time of the III RGPH, most of the population of Maputo Province and covered districts lived in self-owned dwellings. According to the data presented in Table 6-57, the majority of the population of Maputo Province lived in basic houses (52.4%) and mixed houses (32.4%), and the minority in conventional houses or flats (6.7%) or in huts (8.5%). At the district level, about half lived in mixed houses (48%) in Namaacha and in basic houses (50.3%) in Boane. However, families living in huts constitute almost a quarter in Namaacha District (23%) and in Boane District 9.7% of the total housing stock.

Table 6-57 – Type of housing in the province and covered districts

Type of Housing	Maputo Province (%)	Namaacha District (%)	Boane District (%)
Conventional house or apartment	6.7	5	6.8
Mixed house	32.4	48	33.2
Basic house	52.4	24	50.3
Hut, improvised houses and others	8.5	23	9.7

Source: III RGPH

The images in Figure 6-116 show the type of conventional housing (left) and basic housing (right).

Conventional House, Boane

Basic House, Namaacha

Source: Consultant

Figure 6-116 – Types of housing in the covered districts

In the following figures, a comparison was made between the construction material of the walls, roofs and floors of the houses in Namaacha and Boane Districts (INE, 2012)[11] and Maputo Province (INE, 2018). Figure 6-117 shows that the most used type of wall construction material in Boane is cement block (53%) and reed / sticks / bamboo (22.1%), which is in line with the more urban characteristics of Maputo Province, where 82.2% of the house walls are built with cement blocks. The most used material in Namaacha is reed/ sticks or Bamboo (34,2%) followed by cement block (26,7%) and sticks and adobe (26,5%) thus indicating a higher proportion of households living in a more rural environment.

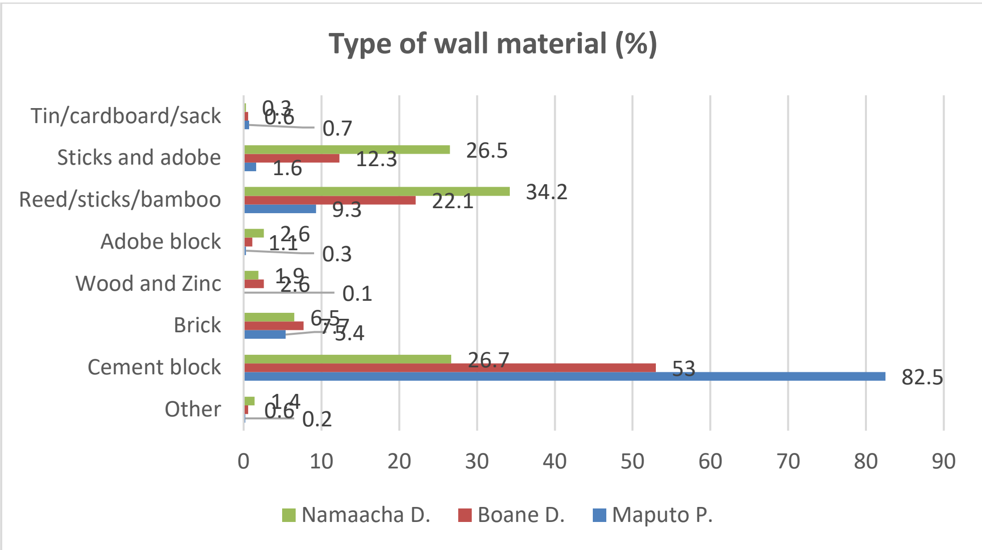


Figure 6-117 –Type of building material used for walls

As for Maputo Province (91%), the predominant type of roofing material in Namaacha (67,5%) and Boane District (83,9%) is zinc sheeting (Figure 6-118). Other commonly used roofing material for houses is straw, thatch or palm leaves comprising 25,3% of Namaacha HH and 8,2% of Boane HH.

[11] INE has not yet released data from the IV RGPH (2017) regarding housing data at the district level.

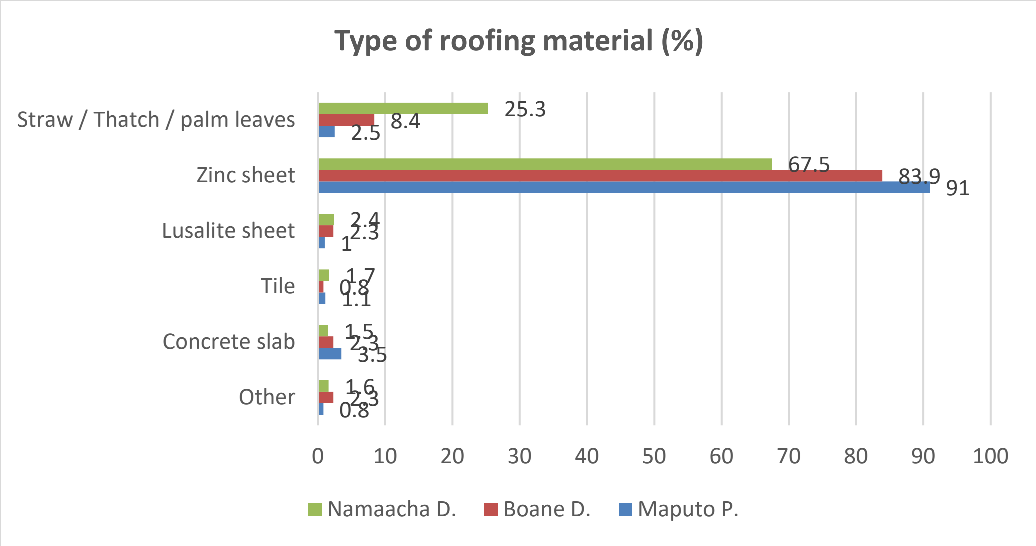


Figure 6-118 –Type of building material used for roofing

In Figure 6-119, it can be observed that the predominant type of flooring material used in Boane District (62.1%) and Namaacha District (44,3%) is cement, which is consistent with the material most used in Maputo Province (80.3%). The second most used flooring material is adobe for Namaacha (32,1%) and Boane (15,4%) while in Maputo Province is Mosaic/Tile (11,3%).

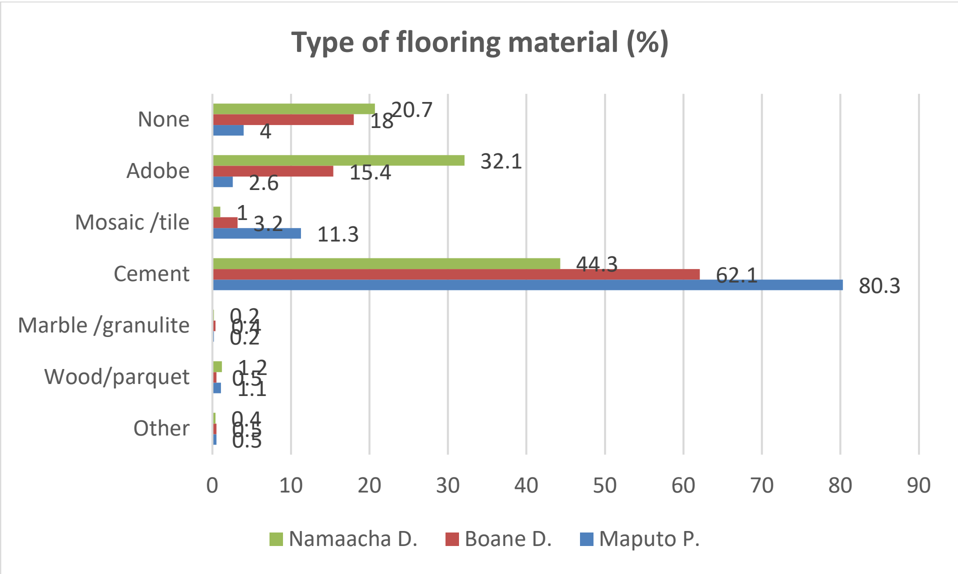


Figure 6-119 – Type of building material used for flooring

6.3.9.3 Communities in the vicinity of the route

According to information collected during the field work, there is a distinct difference on the type of housing found on the communities crossed by the transmission line on both districts. On the one hand, we have communities such as those living in Bairro 1 and Bairro 6 (near the Boane substation) where the houses are all made of conventional masonry materials and mostly have several rooms. On the other hand, we have remote communities such as Mucacuene, Gumbe, or Livevene, where the houses are almost all made of precarious materials. Bacabaca and Mabanja communities have a mix of both conventional and precarious materials used for building their houses.

On Figure 6-120 below are shown an house built of conventional materials in Bairro 6 of Boane District (left) and an house built of precarious materials in Livevene (right) in Namaacha District.

Figure 6-120 – Housing types found on the line´s RoW

The results of the infrastructures survey conducted with the households indicated that the majority of the respondents said that the house where they live is self-owned dwellings (98,2) while 0,9% said to rent the house and the remaining 0,9 % have inherited the house.

From the survey also resulted that the number of building infrastructures found on the household plot ranged from one to 15 structures. As shown on Figure 6-121 below about half the households (50,9%) have one to four built infrastructures on the housing plot, 42,7% have five to eight, 5,5% have nine to 12, and 0,9% have 13 or more built infrastructures on their household.

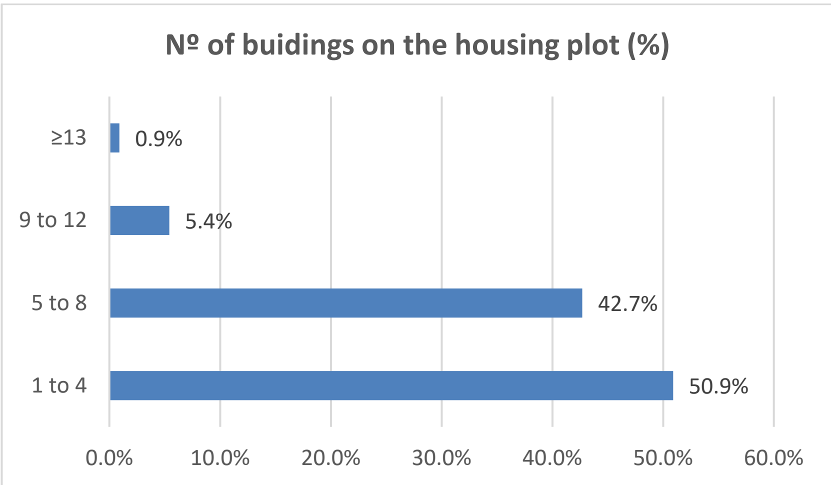


Figure 6-121 – Number of built infrastructures on the housing plot

As illustrated on Figure 6-122 below there are several infrastructures found within the transmission line buffer or within its proximity. On the first map section corresponding to the starting point there is one affected built infrastructures (IF) in Livevene. The second and forth sections correspond to the infrastructures affected in Gumbe and Bacabaca respectively. On the fifth and last section on

Boane district territory is where the majority of infrastructures are found more precisely in Mabanja and Bairro 6 on the finishing point close to Boane substation.

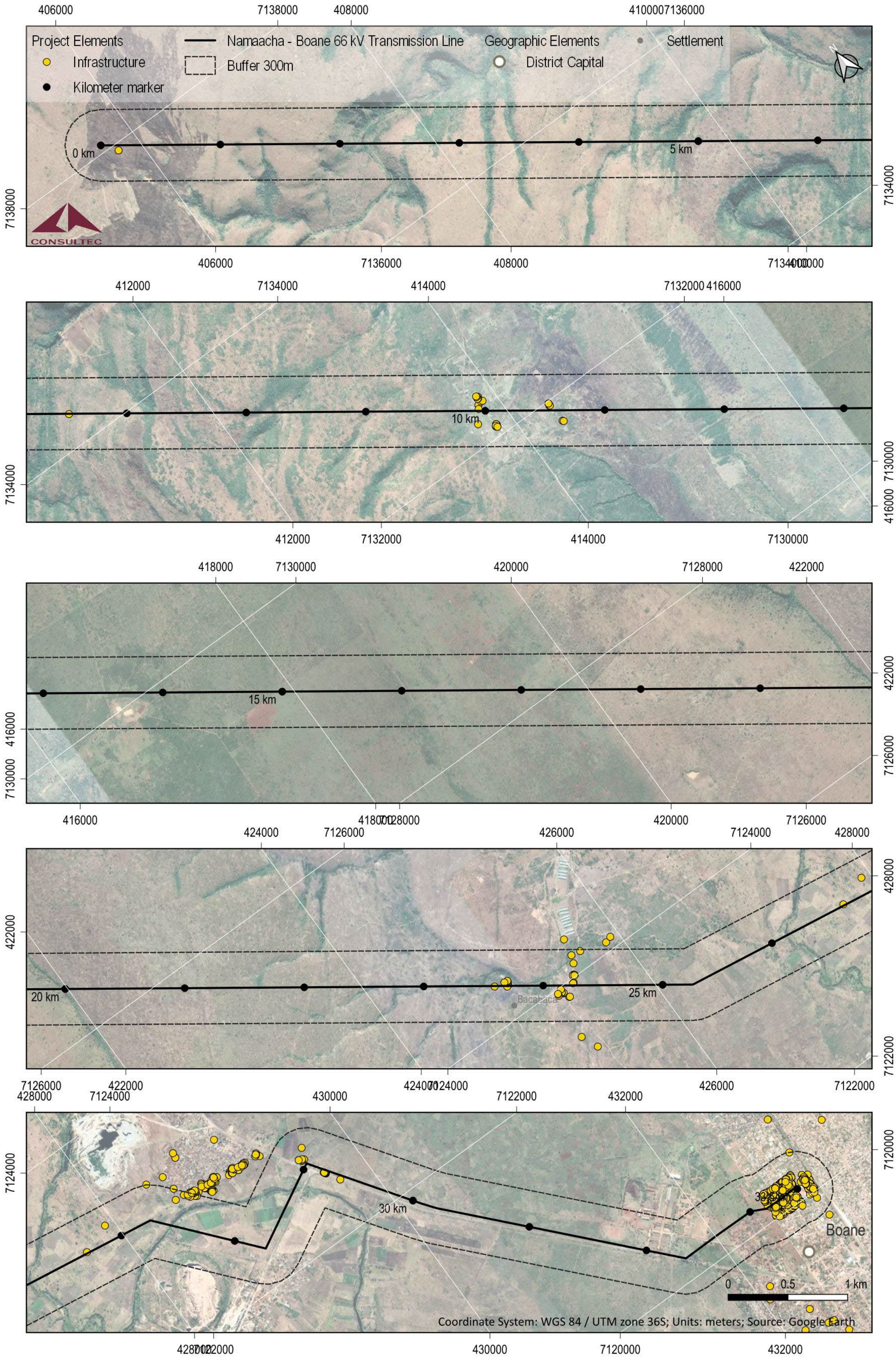


Figure 6-122 – Infrastructures found on the OHL buffer and vicinity

Figure 6-123 below shows that businesses HHH which have been surveyed have indicated that bricks (40,5%), zinc sheets (51,4%) and cement (54,1%) are the most common building materials used. Other materials used for roofing include straw, concrete slabs or even no roof.

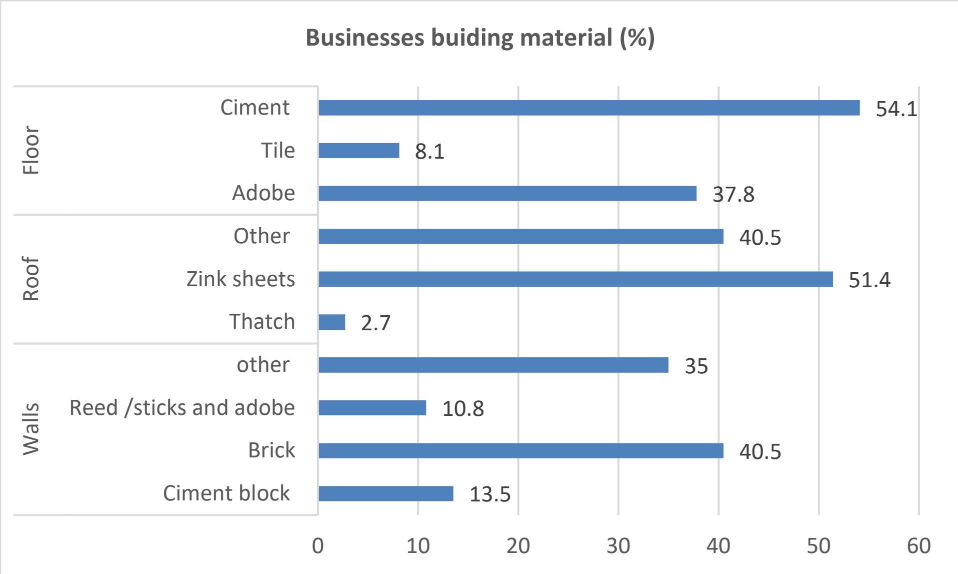


Figure 6-123 – Type of building material of surveyed businesses

6.3.10 Basic Services and Infrastructures

6.3.10.1 Energy, water and sanitation

Energy

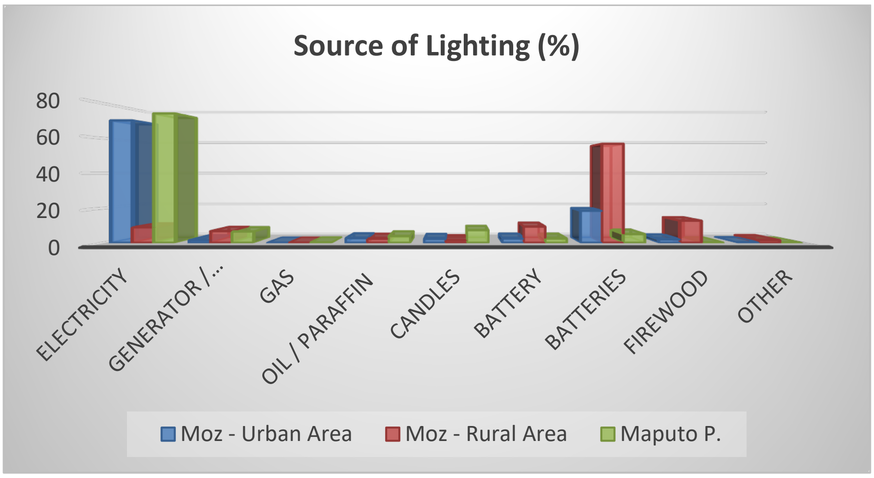
Maputo Province

Mozambique has undertaken significant efforts in recent years to electrify the country. The electrification rate has increased from 5% in 2001, to 24% in 2017 and to 38.1% in 2021. Access to electricity, however, remains low and is mainly concentrated in urban areas. In 2019, 72% of the urban population had access to electricity compared to 5% of the rural population. This imbalance represents a major challenge to achieving the electrification of the country by 2030, considering that the vast majority (63% in 2019) of Mozambique's population lives in rural areas.

According to the Economic Social Plan and Budget for 2020 (GoM, 2021), one of the main objectives regarding the energy sector in Mozambique is to electrify 77 administrative post headquarters through a combination of national grid connection options and autonomous generation and distribution systems.

As illustrated in Figure 6-124**,** the main source of lighting in the rural area continues to be the battery (56.9%) and followed by firewood (12.7%), while in the urban area, the main source of lighting for most households is electricity from the public grid (70.1%) and followed by the battery

(18.4%). In Maputo Province, the main source of power or fuel for lighting is electricity (74.3%) from the public grid, followed by the battery (7.3%) being in line with the urban areas in Mozambique.



Source: INE (2021b)

Figure 6-124 – Main sources of lighting - Maputo Province

As shown in Table 6-58 there has been an increasing trend in the number of electricity consumers in Maputo Province in recent years. When comparing the profile of domestic consumers and the medium and high voltage consumers, there is also an increase in the number of consumers.

Table 6-58 – Electricity consumption in Maputo Province (2020 – 2021)

Description	2020	2021	Var (%)
Domestic consumers (no.)	336,249	372,150	10.6
Medium and high voltage consumers (no.)	1,147	1,188	3.5
Distributed energy (Kwh)	1,194,756	1,225,088	2.5
Domestic tariff (MT / kwh)	3,9	3,9	0
New connections (no.)	38,545	43,441	12.7

Source: INE (2022b)

Districts covered by the project

All administrative posts and localities in Namaacha District have access to electricity except in Matsecanhe locality where there is no electricity connection (SDPI Namaacha, 2022).

In this district 444 new electrical energy connections were made in 2021, against to 327 in 2020 which represents an increase of 35.8% (GDN, 2022b). According to the same source, the Government of Namaacha District plans to continue to privilege partnerships with EDM in order to expand the electricity network to the villages of Matianine A, Mugudo, Livivene, Bemassango in the Locality of Kala Kala; 12 de Outubro, Gumbe, Mutocomelene in Impaputo; Micuacuene, Zone F, Zone G in the Locality of Mafuiane: Bairro Novo in Goba Locality, Gerencia in Michangulene Locality; Cassimate, Munucua, Xigubuta B in Mahelane Locality: Mussuquelane, Mugungulhovo, Mazimunhama and Estatuene in Changalane Sede Locality.

Presently Boane is provided by electricity supplied by EDM, benefiting Matola Rio and Boane Sede Administrative Posts. The district has 1,997 km of electrical grid, of which 519 km of medium voltage and 1,478km of low voltage, with 595 transformer stations (PT's), of which 279 are public and 316 are private. Of the total 8,000 new connections planned for 2022, 3,810 new connections were made in the first half of 2022, totalling 57,071 electricity consumers (SDPI Boane, 2022). According to the same source the district's electricity coverage rate is around 80%.

According to last data released by INE (Table 6-59), the main source of energy was petroleum /paraffin and kerosene, used by 64% and 61,5 % of the households in Boane and Namaacha respectively. Followed by electricity and candles in both districts. Firewood was only mentioned by 1% and 3.4% of Boane and Namaacha households respectively.

Table 6-59 – Main energy source used by HH (2007)

Energy Source	Boane District (%)	Namaacha District (%)
Electricity	24.0	21.0
Generator/Solar Panel	0.4	0.5
Gas	0.1	0
Petroleum / paraffin / kerosene	64.0	61.5
Candles	10.0	12.6
Batteries	0.2	0.1
Firewood	1.0	3.4
Others	0.3	0.7

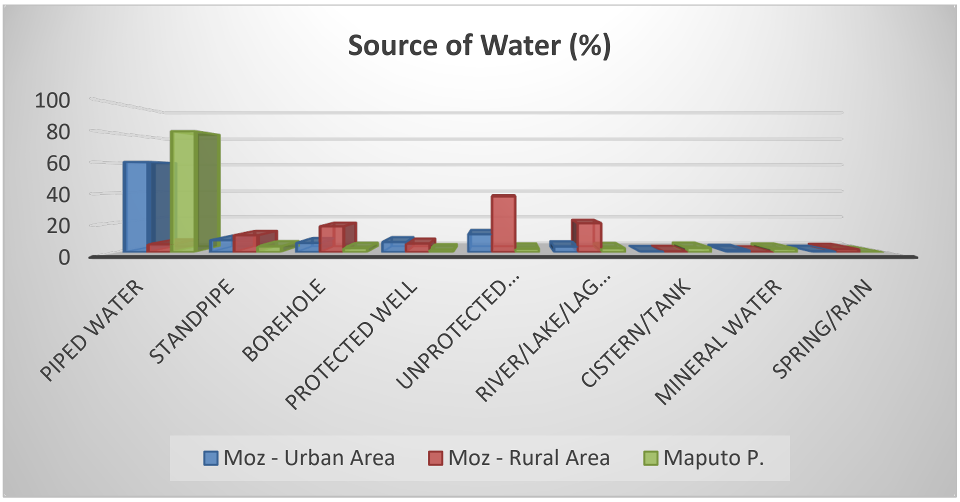
Source: MAE (2012)

Water Supply

Maputo Province

One the objectives of the sustainable development in Mozambique is to ensure the availability and sustainable management of drinking water and sanitation for all, having within its goals, to achieve universal and equitable access to safe drinking water for all by 2030 (INE, 2020c).

According to INE (2021c), 81.4 % of households in Maputo Province had access to piped water inside or outside the home in 2019/20 (Figure 6-125), which is in line with the 60.8% of households living in urban areas in Mozambique that have access to piped water. To note that only 5.3% of households living in rural areas in Mozambique have access to piped water and are therefore in a much more disadvantaged position than those in urban areas. The remaining 18.6% use several main sources of water, standing out those who use mostly water from standpipes (3.9%), from cisterns, mobile water tank or truck (2.9%), and from boreholes (2.8%).



Source: INE (2021c)

Figure 6-125 – Main water sources in Maputo Province

Districts covered by the project

In Namaacha District there are five small water supply systems (Namaacha Town, Mafuiane, Changalane, Goba and Michangalene), and 161 dispersed water sources, of which 85 in Namaacha Sede and 76 in Changalane Administrative Post. The safe water access rate in the district is good covering about 88% of its inhabitants. Table 6-60 presents the water supply sector indicators in Namaacha District.

Table 6-60 – Water sector Indicators – Namaacha District

Indicator	2020	2021
Rate of access to safe water	88	88.7
Number of water sources constructed/rehabilitated	22	18
Number of water sources	-	161
Number of household connections	-	1,558

Source: SDPI Namaacha (2022a), GDN (2022b)

In Namaacha municipality there were in 2019 about 26 water boreholes, of which, 18 manual boreholes, three electro pumps, three pedestal pump boreholes and two hand pump boreholes. The management of these pumps is done by the management committee that charges the users monthly (the fee has been previously agreed upon when the borehole was opened) and the amount collected is used to cover the expenses of the maintenance of the pumps (CMN, 2019). According to the same source there are about 400 household connections that benefit about 1263 people within the municipal area. In the following Figure 6-126 is shown the water tanks of the municipal water supply system in Namaacha town (left) and a borehole in Boane district.

Water tanks, Namaacha

Borehole, Boane

Figure 6-126 – Water supply infrastructures

Boane District is equipped with a public water supply network, provided by *Águas da Região de Maputo* and the Investment Fund for Water Supply (FIPAG). In rural areas, water supply is usually provided from sources connected to the general water supply network, as well as from boreholes, wells and even from direct consumption from rivers and lakes. In Boane District there is also the Pequenos Libombos Dam, a vital infrastructure built with the intention of guaranteeing the provision and supply of water to the region of Maputo and Matola cities. Part of Boane District is supplied by a large water supply system, under management of the company Águas da Região de Maputo, which supplies water to Maputo, Boane and Matola. The vast majority of people in the district have access to drinking water and the water from wells or rivers is mainly used for washing clothes, dishes etc., except in Saldanha community in Eduardo Mondlane Locality which has difficulties to access to drinking water (SDPI Boane, 2022b).

The district´s coverage rate is currently 58% for rural water and 71% for urban water. The dispersed sources are 108 in total, of which 89 are operational and 19 are inoperative. In addition to these infrastructures, there are 18 Small Water Supply Systems (PSAA), 12 elevated tanks and a large water supply system, managed by *Águas da Região de Maputo*, which supplies water to Boane and Matola regions. As shown in Table 6-61, the number of small systems and dispersed water sources has been progressively increasing in recent years. Likewise, there is an increasing trend in urban and rural water coverage rates in the district.

Table 6-61 – Water sector indicators – Boane District

Indicator	2018	2019	2020	2021
No. of Water Sources	53	55	105	108
No. of water supply systems	1	1	1	1
Nº of small water supply systems (PSAA)	13	13	16	18
Urban Coverage Rate	67,8	68,3	68,3De	71
Rural coverage rate	57	57,4	57,4	58

Source: SDPI Boane (2022a), INE (2020a, 2021c)

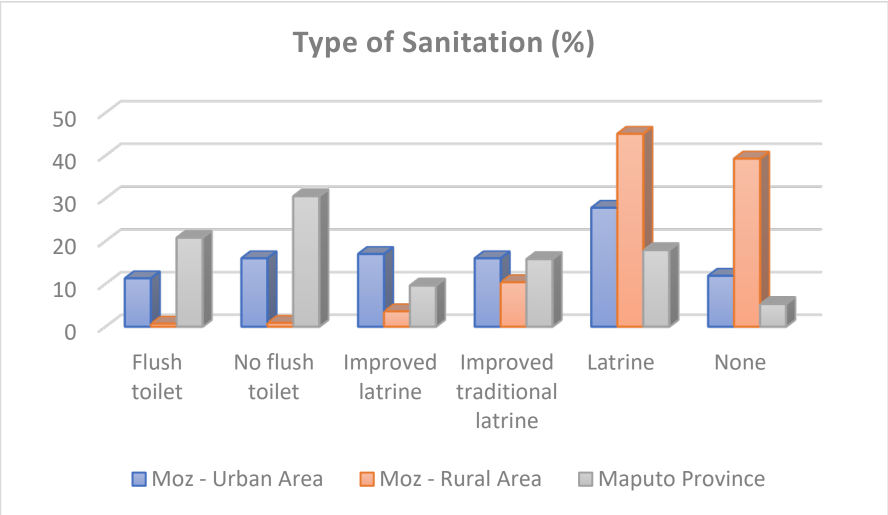
Sanitation, drainage and waste management

Maputo Province

Another goal of the sustainable development objectives in Mozambique is achieving access to adequate and equitable sanitation and hygiene for all, and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations by 2030 (INE, 2020c).

Regarding sanitation in Mozambique (Figure 6-127), in 2019/20 in the rural area, most households in the country used unimproved latrine (45.1%), followed by traditional improved latrine (10.4%). Likewise in the urban area, i.e., most households use unimproved latrine (27.8%), followed by improved latrine (16.0%). Households without toilet/latrine or using the bush in the rural area account for 39.3%, compared to 12.0% in the urban area.

As for Maputo Province, 20.8% of its population used in the same period a flush toilet and 30.5% a non-flush toilet, making up to 51.3% of households with access to toilet sanitation. As with the main source of water, the sanitation characteristics in the province are better than those in urban areas of all country, where the unimproved latrine (27.8%) is the main type of sanitation used, followed by the use of flush and non-flush toilet (27.3%). In relation to the province, note that 9.6%, 15.8% and 17.9% of households use the improved, traditional improved and unimproved latrines respectively.



Source: INE (2021c)

Figure 6-127 – Type of sanitation in the country and Maputo province

Districts covered by the project

As shown in Table 6-62, unimproved latrine is the most common type of sanitation used by 55,3% and 49,6% of households in Boane and Namaacha respectively. followed by those who declared not to use any sanitation system in Namaacha (27,2%) and by those who use improved latrines in Boane District (13,5%). Only a small part of the families in Namaacha (5.7%) and Boane (8,4%) use a toilet connected to a septic tank.

Table 6-62 – Type of sanitation used by households

Sanitation	Boane District (%)	Namaacha District (%)
Toilet connected to septic tank	8.4	5.7
Improved latrine	13.5	9.8
Improved traditional latrine	10.5	7.7
Unimproved latrine	55.3	49.6
Without toilet /latrine	12.3	27.2

Source: MAE (2012)

According to information given by the SDPI from Namaacha, the collection of solid waste is made in the main town and its deposit in a dump at the district headquarters. Regarding the other localities, a site has been requested for the creation of a landfill to deposit the solid waste produced in those localities, but currently in these places the solid waste is still burned or buried.

With regards to sanitation in Boane District, the urban and peri-urban areas have an individual (household) septic tank system. In more rural areas most of the population uses traditional or improved latrines. According to the PESOD Report (GDB, 2020), 4,318 improved latrines were constructed in 2019, with the number of improved latrines in the district increasing from 18,108 in 2018 to 22,426 in 2019 which represents an increase of around 23.8%. There has been an effort by SDPI regarding awareness campaigns in the communities for promoting the construction and use of improved latrines.

Solid waste collection in Boane is done at the level of the most significant settlements and outside the municipality, such as the markets and commercial areas, being then transported to a dumpsite within the municipal area (former borrow pit). There was another dumpsite in Matola, but it was closed down. There are some private companies in the district that collect the waste through the payment of a fee (SDPI, 2022b).

Communities on the vicinity of the route

Energy

Only Bacabaca community have some houses and a factory connected to the national power grid all the other communities found along the project alignment in Namaacha District have no connection to EDM`s electricity grid, using as main solar panels, petroleum, batteries, and candles as the main forms of lighting. To standout that many households in these communities have been adopting alternative energy packages from solar panels offered by a company with growing demand. The solar panels and other equipment provided by the company become the property of the users after the completion of its payment in monthly instalments over a period of five years.

For Boane District, on the other hand, all the covered communities have access to the national electricity network, having also been mentioned the usage of petroleum and candles as sources of lighting.

From the Household survey on impacted infrastructures resulted that 81,8% use electricity as a source for lighting (Figure 6-128) followed by other sources that include solar panels (10%) and lanterns or torches with 4,5% of the respondents. Regarding energy sources used for cooking the most frequently mentioned was gas (36,4%), charcoal (21,8%) and firewood (20,9%).

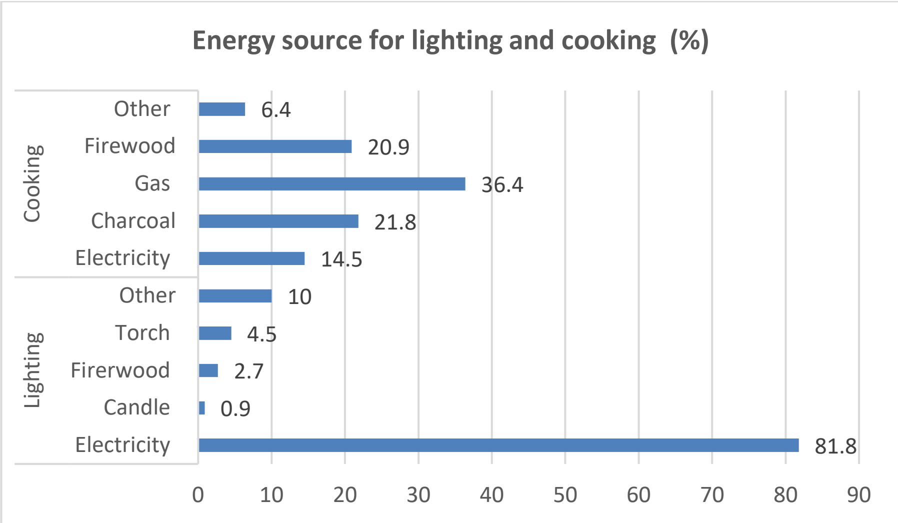


Figure 6-128 –Type of energy source used for lighting and cooking

From the survey conducted on the potentially impacted businesses resulted that 59,5% are connected to the national power grid (Figure 6-129) and 40,5% do not, which is also an indication of the considerable quantity of stalls and small improvised shops built with mixed or precarious materials present on the communities along the power line route.

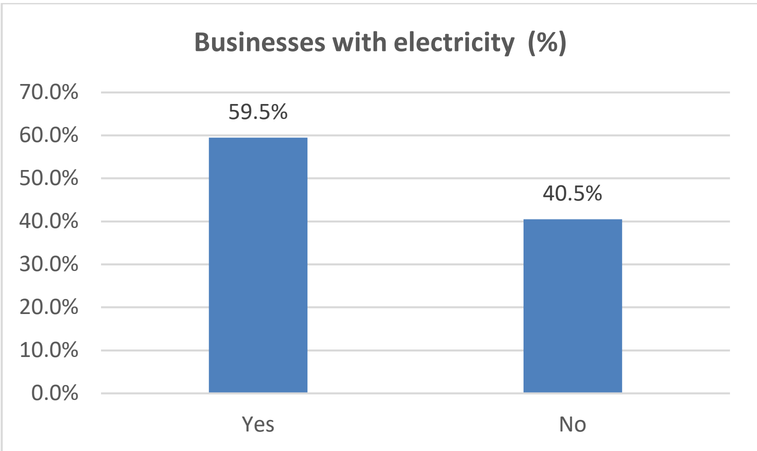


Figure 6-129 – Electricity connection of surveyed businesses

Water Supply

From the information collected through interviews and by direct observation (Table 6-63) regarding water sources on covered communities was found that none of the communities located in Namaacha have access to piped water on their homes and having as main water source water from boreholes. Except for Livevene where people said to have as the only water source water collected from rain puddles. All covered communities located in Boane district instead have piped water as main water source, except for Mabanja community where a considerable part of its inhabitants collect water from boreholes or from the Movene river.

Table 6-63 – Main water sources in crossed communities

District	Community	Main Water Sources	Water Supply Network	Nº of Boreholes
Namaacha	Bacabaca	Boreholes and standpipe on the Huku factory	no	3 operational
	Mucacuene	Borelholes	no	2 operational 1 non operational
	Gumbe	Borelholes and Gumbe river	no	2 operational 1 non operational
	Livevene	Rain puddles	no	None
Boane	Bairro 1	piped water and standpipes	yes	None
	Bairro 6	Pipped water	yes	None
	Mabanja	Pipped water, boreholes and Movene river	yes	2 operational 1 non operational

Figure 6-130 below illustrates a borehole in the mountainous area of Gumbe (left) and in Bacabaca community (right).

Figure 6-130 – Boreholes found in Gumbe and Bacabaca

On Figure 6-131 below are illustrated all the water sources found inside the transmission line buffer zone and on the immediate surroundings. Stands out that most of these water supply sources are found on Bairro 6 just besides Boane substation.

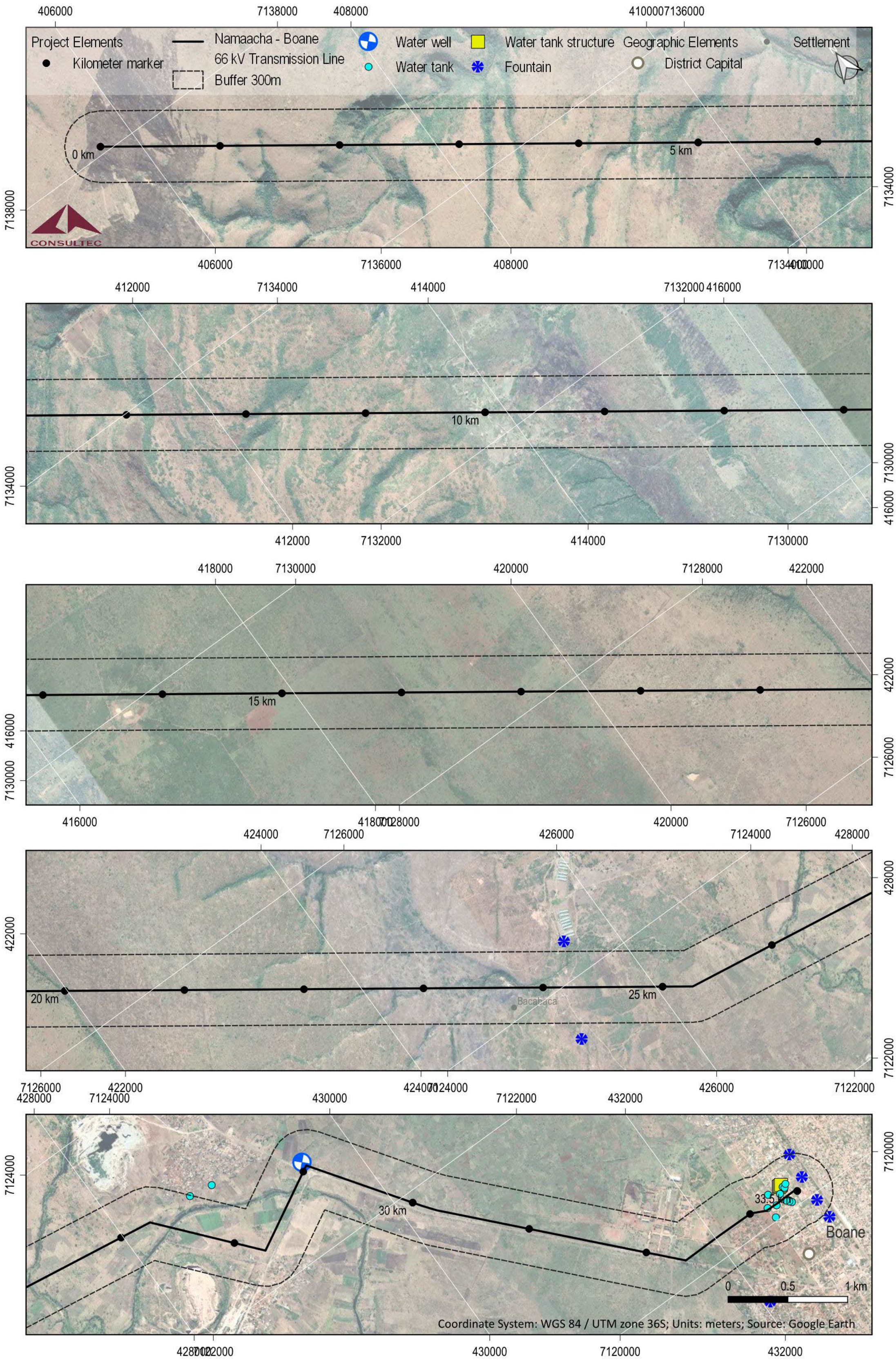
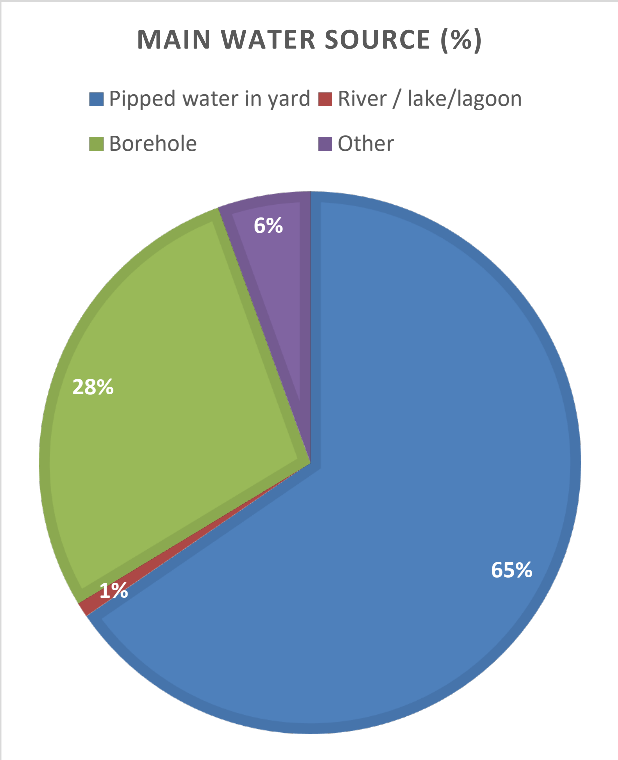


Figure 6-131 – Water sources along the line buffer and vicinity

As presented in Figure 6-132 below the results from the household survey indicate that the main water source is piped water on the backyard (65%) and water from boreholes (28%). Regarding treatment given to water 54% do not treat the water and only 4% and 2% boil or treat with Certeza respectively. Among the 40% who fall into the other group are those who drink bottled mineral water.



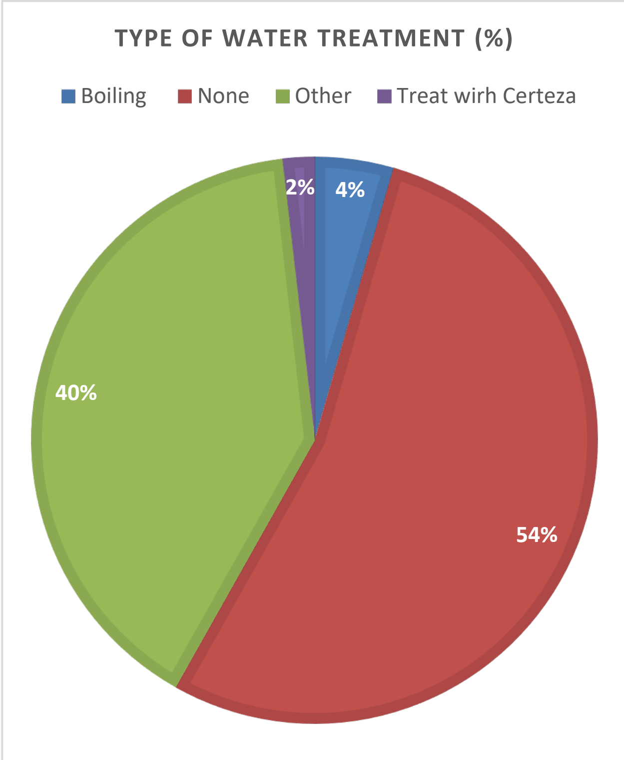


Figure 6-132 – Main water source and water treatment on surveyed household

Contrary to what is presented above in Figure 6-129 where more than half of the business infrastructure are connected to the electricity grid, the business infrastructure connected to the water supply network corresponds to 24,3% (Figure 6-133).

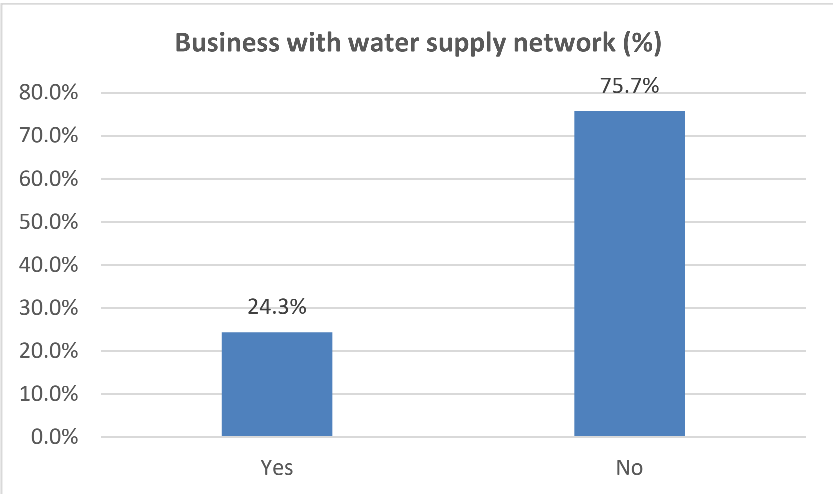


Figure 6-133 – Water supply network connection of surveyed businesses

Sanitation

Regarding sanitation and waste disposal there is also a distinct difference between Boane's semiurban and urban neighbourhoods and the rural communities in Namaacha. According to the information collected on the interviews and presented in Table 6-64, none of the communities in Namaacha district have flushing toilets in their homes being improved and non-improved latrines the most common type of sanitation while in Bairro 1, Bairro 6 and Mabanja have been stated that there is flushing toilets, and improved in its houses. Mabanja´s leadership have also mentioned the use of non-improved latrines by its inhabitants.

The information given regarding waste disposal (Table 6-64) differs as well between different communities, in bairro 1 and 6 in Boane have been mentioned that waste is disposed on the garbage container for further collection by the municipal workers while in Mabanga they just throw it away. All the communities interviewed in Namaacha district have said to burn the waste on the backyards.

Table 6-64 –Type of sanitation and waste disposal on covered communities

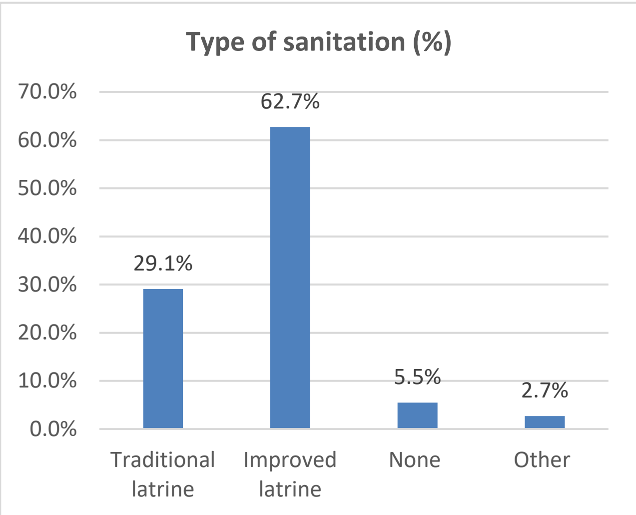
District	Community	Type of sanitation /toilet	Waste disposal
Namaacha	Bacabaca	Improved latrines, unimproved latrines and none (in the bush).	People burn the waste in their backyards
	Mucacuene	Improved latrines, unimproved latrines	People burn the waste in their backyards
	Gumbe	Improved latrines, unimproved latrines and none (in the bush).	People burn the waste in their backyards
	Livevene	Improved latrines and unimproved latrines	People burn the waste in their backyards
Boane	Bairro 1	Flushing toillet and latrines	Solid waste is thrown into the garbage container
	Bairro 6	Flushing toillet and latrines	Solid waste is thrown into the garbage container
	Mabanja	Toilet, improved latrines and non improved latrines	Solid waste is thrown away

Figure 6-134 below illustrates a bathroom (toilet and bath division) built with conventional materials in Bairro 6 (left) and built with precarious material in Gumbe community (right).

Figure 6-134 – Conventional and precarious bathrooms found on covered districts

As shown on Figure 6-135 below the Type of sanitation most used by surveyed households is the improved latrine (62,7%) followed by traditional latrine (29,1%) and those who stated they do not use any type of sanitation (5,5%). Among the remaining 2,7% are included thoso who have flushing or non-flushing toilets in more urban areas such as Bairro 6.

In what concerns waste disposal 50% of the respondents thrown their waste into the trash while 9,1% and 14,5% either bury or burn it in their backyards. 18,2% of the respondents mentioned the waste being collected on their homes which most certainly correspond to the households living in Boane municipality.



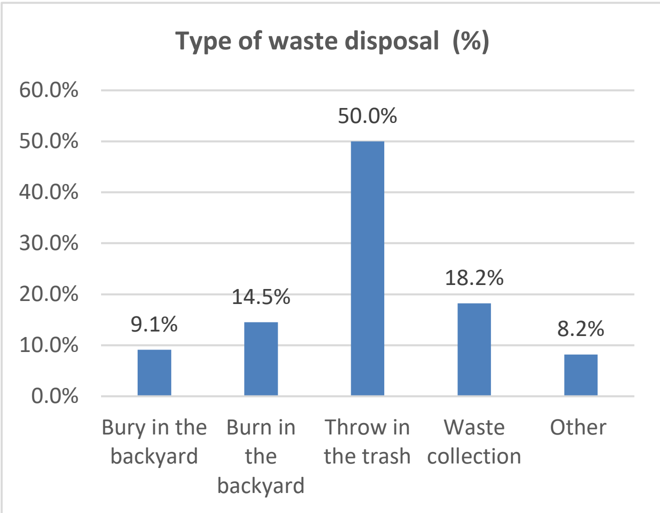


Figure 6-135 –Type of sanitation and waste disposal used by surveyed households

6.3.10.2 Transport, road network and communication

Transport

Maputo Province

The main types of transport systems used in Maputo Province are road, railway, and maritime transport. The most common type of transport in the province is the road transport. The main means of road transport being buses or minibuses (*chapa 100*), which is quite consistent with the means of transport used in the rest of the country. The Maputo Port, also called the Maputo - Matola port complex, is a set of port terminals located in Maputo and Matola cities. It is situated in Maputo Bay, on the north bank of the *Espírito Santo* estuary which is separated from the Mozambique Channel by the Inhaca and Portuguese Islands and by the Machangulo peninsula. It is the largest port complex in the country, ranking as the second largest on the East African coast, in addition to being the main import and export terminal for long-haul cargo in the nation.

In its area of influence can be found the main industries of Mozambique. It is also the busiest Mozambican port, surpassing all other major national ports, namely: Beira (Sofala), Nacala (Nampula), Quelimane (Zambezia) and Pemba (Cabo Delgado). The Port is the terminal for three railway lines: Goba, Limpopo and Ressano Garcia, carrying products from South Africa, Eswatini and Zimbabwe. Another important transport link is the N1 National Road. It is a fundamental part of the logistic complexes of the "Maputo Corridor", "Limpopo Corridor" and "Libombo Corridor".

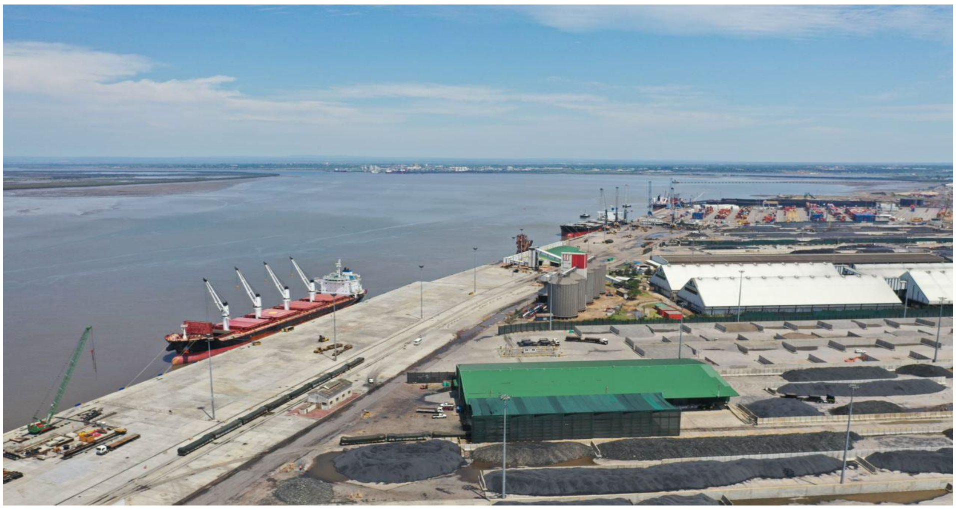
As shown in Table 6-65**,** there was an increase of about 17% on the volume in cargo handled between 2020 and 2021. This growth reflects a post-COVID market recovery but also of the efficient usage of the rehabilitated berths 7, 8 and 9, along with an expanded ferro slab footprint and dedicated rail siding. Similarly, there was an increase of about 3,4% in ship movements during the same period. Regarding railway activity, there has been an increase of 7,7% and 0,5% in passengers carried, and cargo transported respectively.

Table 6-65 – Rail-port activity in Maputo Province (2020 – 2021)

Activity	2020	2021
Port Activity		
Cargo handled (million tons/Year)	18.3	22.2
Ship movement (nº)	743	776
Rail Activity		
Rail network (km)	827	827
Passengers carried (10^3 nº)	2.484	2.293
Cargo transported (10^3 TON)	7.815	7.851

Source: INE (2022d)

The following Figure 6-136 illustrates a berth of Maputo port with the Espírito Santo Estuary in the background.



Source: Portmaputo.com (2022)

Figure 6-136 – Maputo port and the Espírito Santo Estuary

Districts covered by the project

In Namaacha District there is rail and road transport. The railway line that connects downtown Maputo and Goba also transports cargo and passengers, with connections to the Kingdom of eSwatini. The most common type of transport infrastructure in this district is road transport. The district is crossed by the EN2 (main road), which connects to the cities of Maputo and Matola and to Boane town and giving access to the Kingdom of eSwatini.

Public transport is mainly done by minibuses (chapas) and buses (*machibombos*), used by most of the population. There are four public transport buses, three mixed vehicles (*Agência Metropolitana*) and 119 semi-collective vehicles in operation, which run on the routes Namaacha/Baixa, Namaacha/Boane, Boane/Kukuka, Boane/Goba, Boane/Mundavane, Boane/Mafuiane, Municipal Village/Macuacua and Municipal Market/Border (SDPI Namaacha, 2022).

The existing transport systems in Boane District include road and rail transport. The railway line that connects Maputo city and Goba passes through the district, and which has been used to transport passengers and cargo to different places in the district as well as for product export through the port of Maputo. There are 375 public transport vehicles, of which 50 buses distributed on 34 routes, of which 24 in Boane sede administrative post and 10 in Matola Rio administrative post. There are also three licensed taxi operators in the district. (SDPI Boane, 2022). The following Figure 6-137 illustrates some means of transportation in Namaacha and Boane districts.

Inter-district transport , Namaacha

Local Xapa, Boane

Source: Consultant

Figure 6-137 – Public transport in covered districts

Road network

Maputo Province

Mozambique has developed its road network based mainly on arterial roads connecting the main cities of the country. The classified roads consist of national roads (primary and secondary) and regional roads (tertiary and vicinal roads). These roads are managed by the National Road Administration (ANE). Urban roads and unclassified roads are under the jurisdiction of the Municipal Councils and District Administrations respectively.

As presented in Table 6-66, the road network in Maputo Province extends for 1774 km, comprising 1.633 km of classified roads and 141 km of unclassified roads.

Table 6-66 – Road network in Maputo province (2021)

Road network	Extension (km)
Classified roads	1.633
Non classified roads	141
Total	**1.774**

Source: INE (2022d)

As for the road network (Table 6-67), primary, secondary, tertiary and vicinal roads contribute with a share of 26.2%, 8.6%, 32.7% and 32.5% respectively. Most of the road network is made up of unpaved roads (55.2%) and remaining of paved /tarred roads (44.8%).

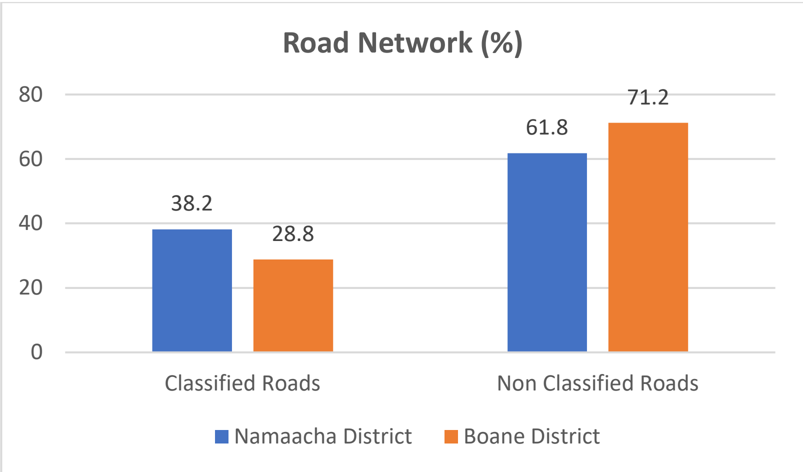
Table 6-67 – Classified Road network and surface type (2021)

Road Network	Length (km)	Contribution (%)
Road Network		
Primary	428	26.2
Secondary	141	8.6
Tertiary	534	32.7
Vicinal	530	32.5
Surface Type		
Paved / Tarred	732	44.8
Unpaved	901	55.2
Total	**1633**	**100**

Source: INE (2022d)

Districts covered by the project

Namaacha District Road network is comprised by 429.2 km, of which 164 km are of classified roads and 265.2 km of unclassified roads. On the other hand, the road network in Boane District consists of 308.9 km, with 89.2 km of classified roads (28.8%), and 219.7 km (71.1%) of unclassified roads. The road network in both districts is mainly made up of unclassified roads (Figure 6-138), covering a greater proportion of the road length in Boane than in Namaacha.



Source: SDPI (2022)

Figure 6-138 – Road network in Namaacha and Boane districts

Examples of classified roads in Namaacha and Boane districts are shown in Figure 6-139.

Primary road, Namaacha

Vicinal road, Boane

Source: Consultec (2022)

Figure 6-139 – Classified roads in the covered districts

In the following Figure 6-140 is shown the regional context of the road and railway network with particular emphasis on Namaacha and Boane districts. On this map can be seen that, except for the line route within Boane District, the line route is far away from any classified road.

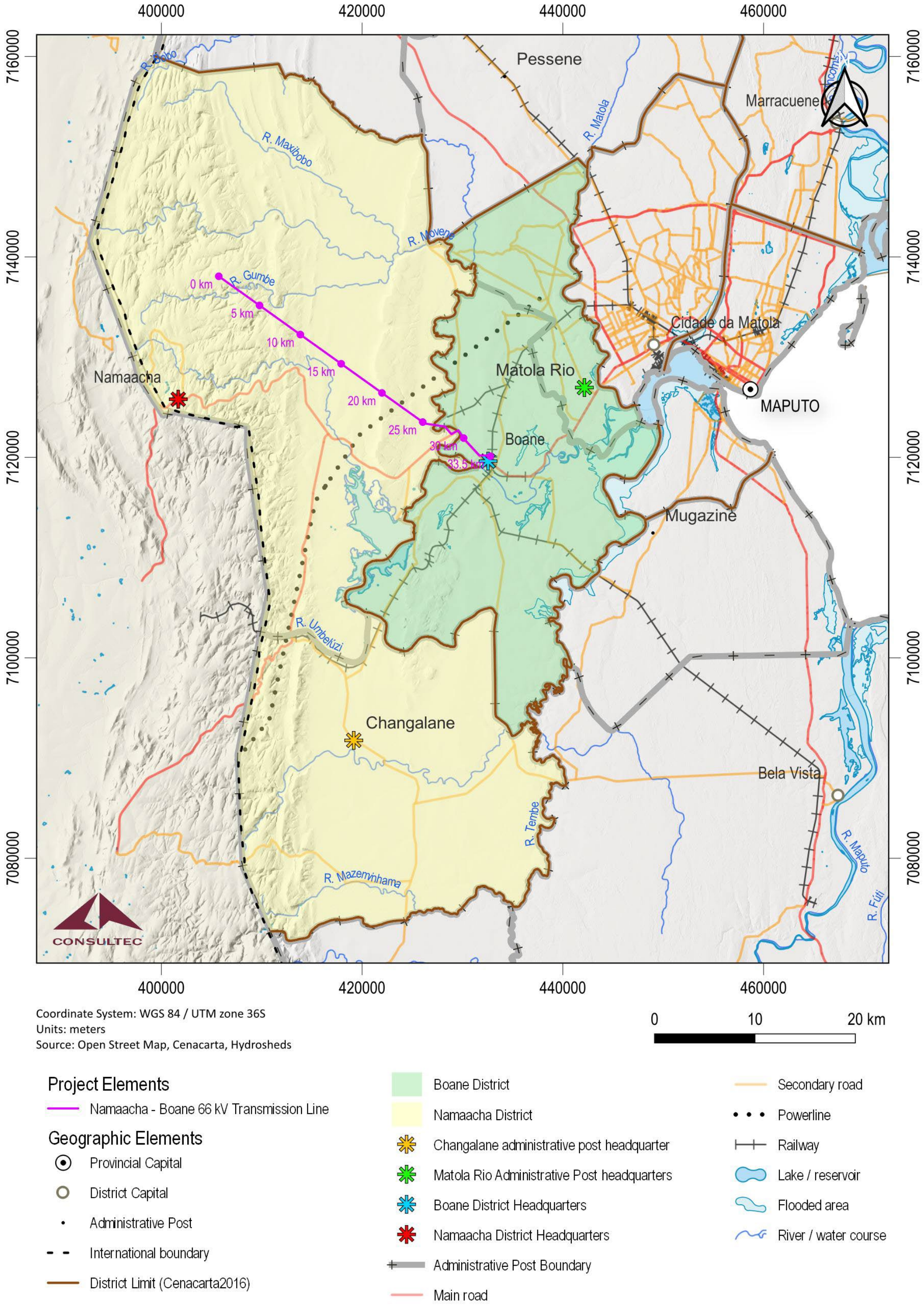


Figure 6-140 – Regional context of the road and railway network

Communication

Maputo Province

The communications sector in the province is divided into mobile communication, fixed-line telecommunication and national post service. Post office and fixed-line telecommunication services in the province are limited to the cities and district capitals and to areas with larger population numbers. On the other hand, mobile communication has experienced exponential growth in the province in recent years and most administrative posts and localities within the province are now covered by one or more of the country's mobile phone operators. Internet services in the province are provided by mobile and fixed-line telephone companies.

According to the National Culture Yearbook (INE, 2022c), most of the radios registered in Maputo Province in the year 2021 were represented by communitarian radios (55,6%) the remaining were comprised by public (11,1%) and private (33,3%) radios.

Districts covered by the project

Like the provincial level, the district communication sector is divided into mobile communication, fixed telephone network and post office services. Fixed-line services and postal services are generally non-existent outside the district headquarters. There is a branch office of the Mozambique Post Office in both district headquarters.

In Namaacha District there is the community radio Cascata, and according to local official sources both Radio Mozambique and community radio are the main source of information. Communication through community leaders is mainly used in more remote areas of the district. Television and radio are the main source of information used by the inhabitants of Boane District.

Regarding the access to durable assets, such as possession of a radio or television (Table 6-68), a considerable part of the households in the districts covered have access to durable assets used by the media for communication and spreading information, however in both districts there are slightly less HH with this type of durable assets than in the province of Maputo.

Table 6-68 – Access to media communication assets (2021)

Administrative division	Radio (%)	TV (%)
Boane District	44,6	57
Namaacha District	41	40.3
Maputo Province	**46,3**	**61**

Source: (INE, 2022c)

Communities on the vicinity of the route

Except for Bacabaca 1 which is located on the edge of the N2 Road and therefore with access to public transport all the other covered communities in Namaacha have no access to public transport (Table 6-69). Nonetheless, Bacabaca 2 in the upper mountain area located on the line route have no access to public transport as well. On these communities very few people have private transport being restricted to some bicycles or motorcycles. Some households on the highlands rely on donkeys for transportation (**Figure** 6-141). Both Bairro 1 and Bairro 6 in Boane have access to different means of transport, from minivans (xapa), buses to train. Mabanja have access to minivans and buses. A considerable number of households have their own means of transport such as cars, motorbikes, or bicycles. In summary, communities in Namaacha lack access to classified roads, while those in Boane have access to various types of roads.

In general terms, regarding communication (Table 6-69), communities in both districts have access to the three national mobile phone networks, as well as national radio and television signals. The exception is the community of Livevene, where only the Movitel signal is available, and it is weak.

Table 6-69 –Transport, roads and communication on covered communities

District	Community	Access to public transport	Access to Road type	Communication
Namaacha	Bacabaca	Bacabaca 1 - xapa and bus Bacabaca 2 - no transport	Bacabaca1 - on the N2 Bacabaca 2- vicinal road	Signal from the three mobile phone networks Access to raidio frequency and TV signal
	Mucacuene	No transport	Vicinal road	Signal from the three mobile phone networks Access to raidio frequency and TV signal
	Gumbe	No transport	Vicinal road	Signal from the three mobile phone networks Access to raidio frequency and TV signal
	Livevene	No transport	Vicinal road	Bad signal of Movitel mobile network Access to radio frequency and TV signal
Boane	Bairro 1	Xapa, bus, and train	Acess to all types of classified roads	Signal from the three mobile phone networks Access to raidio frequency and TV signal
	Bairro 6	Xapa, bus, and train	Acess to all types of classified roads	Signal from the three mobile phone networks Access to raidio frequency and TV signal
	Mabanja	Xapa and bus	Acess to all types of classified roads	Signal from the three mobile phone networks Access to raidio frequency and TV signal

Figure 6-141 shows a donkey used to transport goods and products by people living in Gumbe community on the highlands of Namaacha district.

Figure 6-141 – Donkey used for transport in Gumbe

As previously mentioned, the access routes to the Namaacha `s highland communities are non-classified unpaved dirt roads. As shown on Figure 6-142 below the road access to Gumbe community (left) is particularly difficult and the access to Livevene (right) is characteristic of this mountainous area with a very rocky pavement.

Figure 6-142 – Access roads to Gumbe and Livevene communities

In what regards personal possession of means of transport of surveyed households and presented on Figure 6-143 can be observed that 40% of households have a car, 33,6% possess a bicycle and 7,3% a truck. These data are in line with formal neighbourhoods in urban areas which is the case for instance of Bairro 6 were many households have been surveyed.

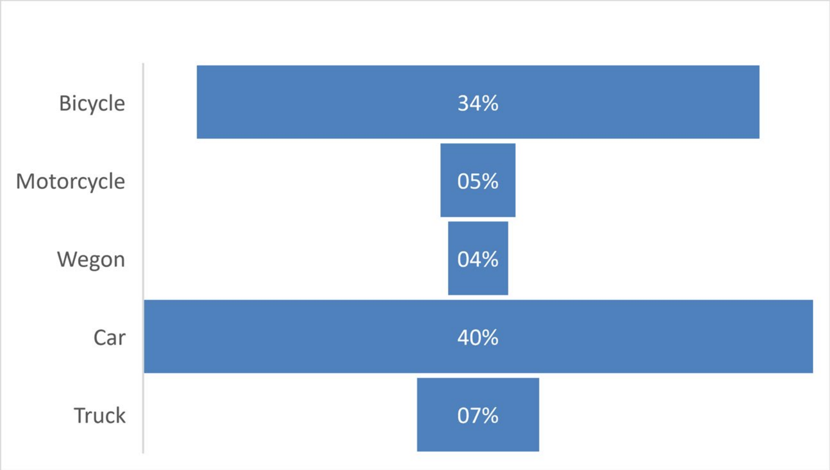


Figure 6-143 – Personal means of transport of surveyed households

In what communication is concerned, the means by which information is received and stated by surveyed households (Figure 6-144) indicates that 45% received information through television, 29% through friends, family or religious leaders and only 1% through administrative or municipal authorities, which is a very different reality than that usually observed in rural areas.

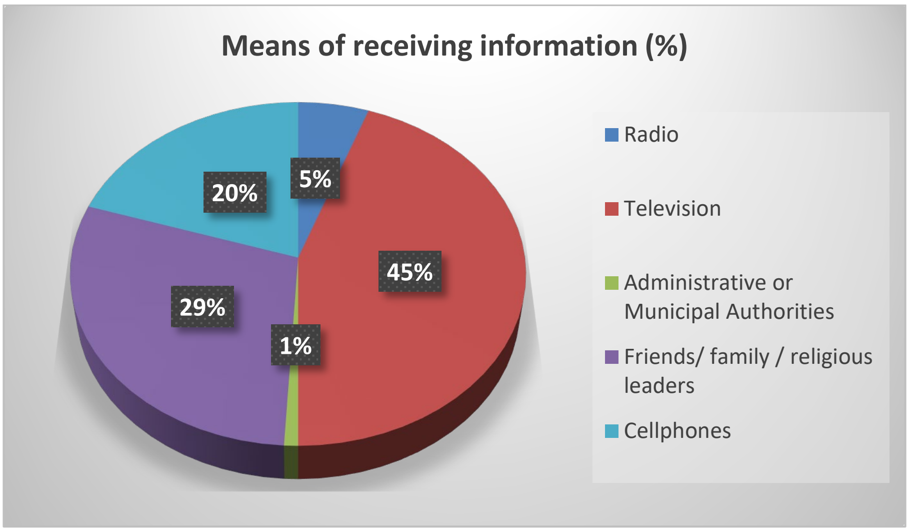


Figure 6-144 – Means by which information is received

6.3.11 Economic Activities

6.3.11.1 Economy and employment

Maputo Province

The Gross Domestic Product (GDP) in Mozambique is composed of the agriculture, livestock, fishing and related activities sectors, which represent the largest portion, at 22.5%; the transport and related activities, storage, and information and communications sectors correspond to 12.2%; trade and maintenance services correspond to 11.3%; the manufacturing industry represents 8.6%; real estate and business services represent 6.7%; the education sector represents 7.5%; and other sectors combined represent 31.3%. The main export products are coal and aluminium. Economic growth has been primarily driven by mega-projects in the energy and natural resources sectors, but this has not generated enough job opportunities for the Mozambican population. Recent discoveries of coal and gas reserves bring the potential for the country to become a relevant global player in the energy sector (OIT, 2019).

The current economic situation points to the need to increase domestic production through the processing of local raw materials and by taking advantage of the comparative advantages that Maputo Province has; improvement of the business environment for the growth of the private sector; promotion of initiatives that generate employment; and strengthening of the state's capacity to provide essential public services (GPM, 2021).

Regarding the macro-economic indicators of Maputo Province, in 2019, it had a Gross Domestic Product (GDP) per capita estimated at 1,272 USD, and in 2020 the GDP per capita was estimated at 1,246 USD, which corresponds to a decrease in the order of about 10%. Although there was also a decrease in the national GDP it was much less accentuated for the same period, being at 1,9%. INE (2019b e 2022b).

According to the 2019/2020 Household Budget Survey (INE, 2021b), the monthly income per capita and per household in Maputo Province was 3,859 MT and 16,717 MT respectively, presenting average monthly incomes higher than the national average of 1,946 MT per capita and 8,916 MT per household.

According to the same source, the employment rate of the population aged 15 or older in Mozambique is 74%, being slightly higher among men (75.5%), than among women (72.8%). Maputo Province has an employment rate of 54.9%, being higher among men (62.8%) than among women (48.3%), and both being lower than the national average.

Also, according to the 2019/20 HBS, more than 65% of the population aged 15 or older is employed in the agriculture, forestry and fisheries sectors (except in Maputo Province and Maputo City, where the majority is employed in the trade, finance, and other services sectors). Only 20.2% of the employed population in Maputo Province is engaged in the agriculture, forestry, and fisheries sector.

It is important to note that those working in the informal sector, who constitute the bulk of the province's working population, are extremely vulnerable to external shocks and have no access to legal protection, social security, and/or pension benefits. Due to the informal nature of their businesses, they also lack access to formal forms of finance, and face great difficulties in recruiting skilled labor. All these factors contribute to limiting their ability to expand their activities, thereby also contributing to poor economic growth, and therefore meaning that their businesses are somewhat precarious.

Districts covered by the project

The economy and livelihoods in Boane District are similar to those in other coastal districts of the province. Although Boane District has a higher population density, and its district headquarters being a municipality with a fast-developing economy, communities in this district are mostly self-employed in informal trade, subsistence agriculture or artisanal fishing. According to the District Secretariat of Boane (GDB, 2020b), the main economic activities in Boane District are commerce, and industrial and agricultural production. Regarding Namaacha District it has in comparison a lower population density and not as fast developing economy. Nonetheless, given its location, the region benefits from good market integration and possibilities of access to non-agricultural income-generating activities, namely the considerable number of emigrants from South Africa and Eswathini, informal and border trade, the soap making and the sale of firewood, charcoal, alcoholic beverages, and pottery products.

As shown in Table 6-70 and in line with the mentioned above, the number of formal jobs created are much higher in Boane than in Namaacha, as well as having also had a much higher growth from 2020 to 2021.

Table 6-70 – Number of jobs created in the Private and Public Sector

District	2020	2021	Growth (%)
Namaacha	592	615	3.9
Boane	5.579	6.773	28.4

Source: GDN (2022b) and GDB (2022b)

Communities on the vicinity of the route

As shown in Table 6-71 agricultural and animal husbandry activities are common to all communities. Fishing was referred by the local leaders of Mucacuene, Gumbe and Mabanja as important for their livelihoods. Charcoal production and sale were referred to in Mucacuene, Gumbe and Livevene. To note that Mangava serves as an important area of charcoal production for the neighbouring communities of Gumbe and Livevene. Commercial activity is more extensive and active in the communities of Boane District and members of households with formal employment were particularly mentioned in Bairro 1 and Bairro 6.

Table 6-71 – Main economic activities on the covered communities

District	Community	Main Economic Activities
Namaacha	Bacabaca	Agriculture and livestock
	Mucacuene	Agriculture, livestock, fishing, and charcoal production and sale
	Gumbe	Agriculture, livestock, fishing, and charcoal production and sale
	Livevene	Agriculture, livestock and charcoal production
Boane	Bairro 1	Agriculture, livestock, commercial activities and formal jobs
	Bairro 6	Agricultural activities, livestock, commercial activities and formal jobs
	Mabanja	Agricultural, livestock, fishing and commercial activities

Regarding the profession or occupation reported by surveyed HHH on the different quantitative surveys, Table 6-72 indicates that from the HH survey resulted that most of the respondents work on the public sector (22,7%) or in commerce (16,4%). More than half of machambas survey HHH have has main occupation to work on the crop fields (57,2%). From surveyed businesses households resulted that 48,6% of HHH have as main occupation commercial activity (48,6%) followed by those employed on the public sector.

Table 6-72 – Professions / occupations reported on quantitative surveys

Profession /occupation	Infrastructures Survey (%)	Machambas Survey (%)	Businesses Survey (%)
Farmer/Silviculture/Fishing	15,5	57,2	2,7
Industry	2,7	0,6	
Construction	2,7	1,7	
Commerce	16,4	2,2	48,6
Services	5,5	2,2	5,4
Charcoal burner	0,9		
Transport		1,7	
Public sector	22,7	5	21,6
Self-employment	10,9	6,7	5,4
Unemployed	5,5	8,3	8,1
Student	1,8	2,8	2,7
Other	14,5	11,7	5,4
NA	0,9		

Other professions or occupations referred to were as follows:

- Household survey – Mechanic, Pastry, mason, mason assistant and locksmith
- Machambas survey – Livestock production
- Businesses survey – mechanic, locksmith, brick production, house renting, selling of charcoal and agricultural products and tailor.

6.3.11.2 Agriculture

Maputo Province

The economy in Mozambique is mainly based on agriculture, which accounts for approximately a quarter of GDP, followed by the manufacturing sector (around 15%) and services (10%). Agriculture also employs most of the labour force (over 75%), with the remainder split between the second and third sectors (UN Habitat, 2018).

Agriculture in Maputo Province is practiced with two main objectives. The first is to produce crops such as maize, cassava, sweet potatoes, cowpeas, rice, and peanuts to ensure household food security and for sale in the cases of surplus of production. The second objective is the production of crops to supply the market in Maputo city, specifically fruits and vegetables such as tomatoes, onions, cabbage, carrots, potatoes, peppers, French beans, cucumbers, eggplant, cabbage, lettuce, and others. Most of the population practices rainfed production, but there is also the irrigation component; although not fully functioning, it does create the conditions for vegetable production.

The crop with the highest agricultural production in Maputo Province in the period under review (Table 6-73) was sugar cane, followed by vegetables and roots and tubers. Exception for cereals, there was an increase in the production of the various crops between 2019 and 2021.

Table 6-73 – Agricultural production by crop in Maputo province, 2019 – 2021

Crop / group of crops	2019	2020	2021
Potato (Ton)	30.902	25.672	30.951
Sugar Cane (Ton)	2.183.441	2.412.135	2.436.036
Cereals (Ton)	316.997	313.375	308.170
Fruits (Ton)	328.791	344.420	399.152
Vegetables (Ton)	688.949	709.987	754.550
Legumes (Ton)	61.790	60.670	62.262
Roots and tubers (Ton)	483.653	485.418	521.573

Source: INE (2022d)

Districts covered by the project

Namaacha District

In general, agriculture in Namaacha District is practised in household crop fields of one hectare in average and in a regime of crop consociation based on local varieties, and in some regions the families use animal traction and tractors to support agriculture.

The main crops cultivated in Namaacha district are maize, cassava, sweet potato, potato, beans and various types of vegetables such as tomato, pepper, green beans and lettuce. As for cash crops, and because they are defined as those produced essentially for sale, in addition to macadamia nuts, fruits, are considered one of the great potentials of the district, with strawberries, lychees, avocados, bananas and some vegetables standing out (SDAE, 2022).

The family sector is dedicated to the cultivation of maize, peanuts, beans, sweet potatoes, bananas, and cassava, with the promotion of sunflower and oil production in Changalane

Administrative Post. In the irrigated area of Mafuiane (Figure 6-145), farmers also grow vegetables, fruit trees (citrus, banana, avocado, strawberry, litchis), beans, peanuts, and maize. Agricultural production and commercialisation are very important as agriculture is the main economic activity of the population.

Figure 6-145 – Banana trees and multi crop production in Mafuiane

As for agricultural production (Table 6-74), 261,668.4 tons of different crops were harvested in the first half of 2022, representing a growth of 8.1% compared to the same period of the 2020/21 Agrarian Campaign (243,031.2ton). During the period in analysis there was an increase in the production of all food and cash crops, with emphasis on the production of vegetables which has had an increase of 44.3%.

Table 6-74 – Agricultural production in Namaacha district (2021-2022)

Crop	1st Semester 2021	Total 2021	1st Semester 2022	Growth (%)
	Prod (ton)	Prod (ton)	Prod (ton)	
Cereals	38748.9	34213.1	42055.1	8.5
Legumes	5700.8	6941.7	6057.7	6.3
Roots and tubers	14,615.70	13,151.73	15,344.90	5.0
Total food crops	59,065.4	54,306.5	63,457.7	7.4
Fruits	165,803.9	221,036.2	173,298.4	4.5
Vegetables	17,162.0	50,308.5	24,760.9	44.3
Total cash crops	182,965.9	275,870.7	198,210.7	8.3
GRAND TOTAL	**242,031.2**	**330,177.2**	**261,668.4**	**8.1**

Source: GDN (2022a)

Boane District

Boane District also has a considerable agricultural activity, and the Umbelúzi Agricultural Station, a branch of the Mozambique Agricultural Research Institute, founded in 1909, is located here. During 2021, there was significant rainfall that contributed to the increase and availability of water in the Pequenos Libombos Dam and main weirs, thus ensuring irrigation in the agricultural production fields and watering of livestock. This period was characterised by good levels of food production (vegetables and tubers), accelerating the economy, which contributed to stabilising food security and the prices of goods, services, and fuel (GDB, 2022b).

The following Table 6-75 shows the agricultural production in Boane district, with an increase of 5.9% of the total production in relation to the same period of the previous year, highlighting the production of cereals and root and tuber crops in food crops and of vegetables in cash crops.

Table 6-75 – Agricultural production in Boane District (2021-2022)

Crops	1st Semester 2021	1st Semester 2022	Growth (%)
	Prod (ton)	Prod (ton)	
Cereals	81,052.2	88,805.4	9.6
Legumes	1,297.5	1,545.9	19.1
Roots and tubers	66,290.8	7,1307.4	7.6
Total food crops	148,640.5	161,658.7	8
Vegetables	59,058.7	60,308.2	2.1
Fruits	45,176.4	45,814.5	1.4
Total cash crops	104,235.1	106,122.7	1.2
GRAND TOTAL	**252,875.6**	**267,781.4**	**5.9**

Source: GDB (2022a)

Communities on the vicinity of the route

According to what has been mentioned by the interviewed local leaders the main crops in the districts are listed in Table 6-76 below. The average size of crop fields varies from 0,5 to 3 hectares and from 1 to 4 hectares in Namaacha and Boane districts respectively. Except for Mabanja, in the communities located in Namaacha, crop fields are predominantly located inside the community while for Boane these are mostly located on other neighbourhoods, such as Bairro Marconi or Bacabaca.

Table 6-76 – Main crops and location and size of crop fields

District	Main crops	Average crop field size	Lcation of crop field
Namaacha	Maize, cassava, okra, pumpkin, peanuts and Nhemba beans	0,5 - 3 hectars	In the community
Boane	Cucumber, maize, tomato, okra and lettuce	1 - 4 hectars	Bairro 1 and Bairro 6 outside the community Mabanja in the community

In Namaacha district people who work on the fields are mostly the owners of the machambas while in Boane district local authorities have stated that machambas can be owned, rented, or borrowed by their users. Those who rent the machambas can pay about 1500MT per hectare monthly.

In what regards tree species on these communities, in Namaacha have been mentioned a series of species including natal mahogany, lychee tree, black plum, lemon tree, orange tree, sugar apple tree, avocado tree, banana tree, mango tree, marula tree and paw-paw tree. In Boane district have been mentioned mango trees, banana trees, paw-paw trees, natal mahogany and marula tree.

Regarding the quantitative data survey conducted to the machambas HHH have been stated that 82,8% have one machamba, 12,2% have two and the remaining 4,6% have from three to 12 parcels of cultivated lands. The number of parcels per HH is shown on Figure 6-146 below.

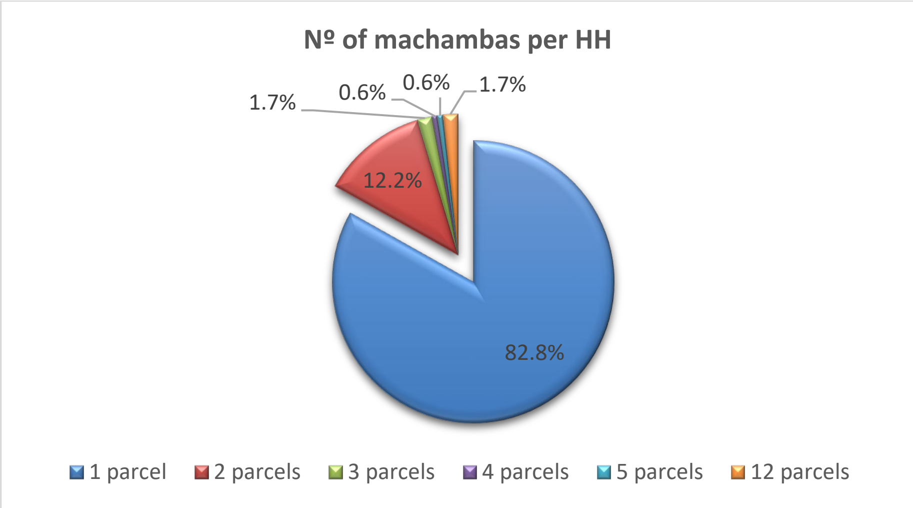
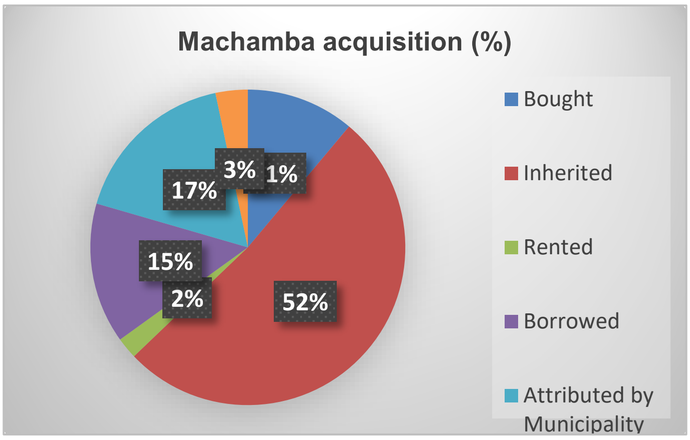


Figure 6-146 – Number of machambas per household

When asked if they had a cultivated parcel on other area rather than on their own community, 40% replied positively and 60% of the respondents said to have their machambas inside their own communities. Furthermore, 5,6% stated to have a land title regarding the right to use and benefit from the land (DUAT)-and a considerable number of respondents (47,8%) said to use agricultural inputs on their crop fields.

In Figure 6-147 below is shown how the machambas HHH have acquired their crop field parcels (left) and the year they have started to work on them. Regarding the type of acquisition, the survey indicates that 52% have inherited the land, 17% have been attributed by the municipality and 15% borrowed it. The remaining whether have bought or tented it.

Considering the year of acquisition, the survey results indicate that approximately half of the machambas have been acquired between 1986 and 2007. Before the year of Mozambique independence were acquired 6,4% and after 2019, 14% of the 182 machambas surveyed.



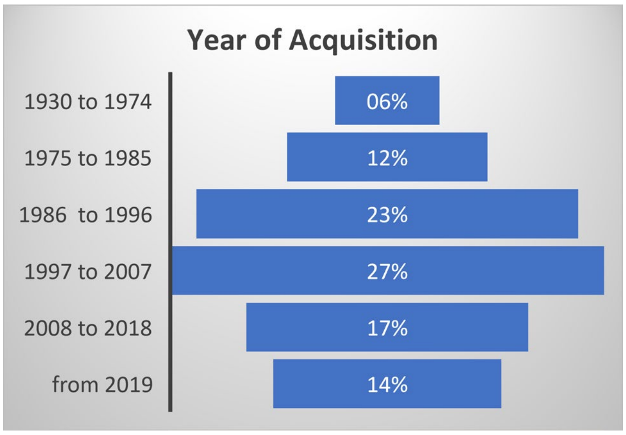


Figure 6-147 – Form and year the surveyed machambas HHH have acquired the machamba

The following map (Figure 6-148) illustrates the location of machambas along the line buffer route showing that these are mostly concentrated in Bacabaca and Mabanja communities. Gumbe and Bairro 1 had in comparison a smaller number of surveyed machambas.

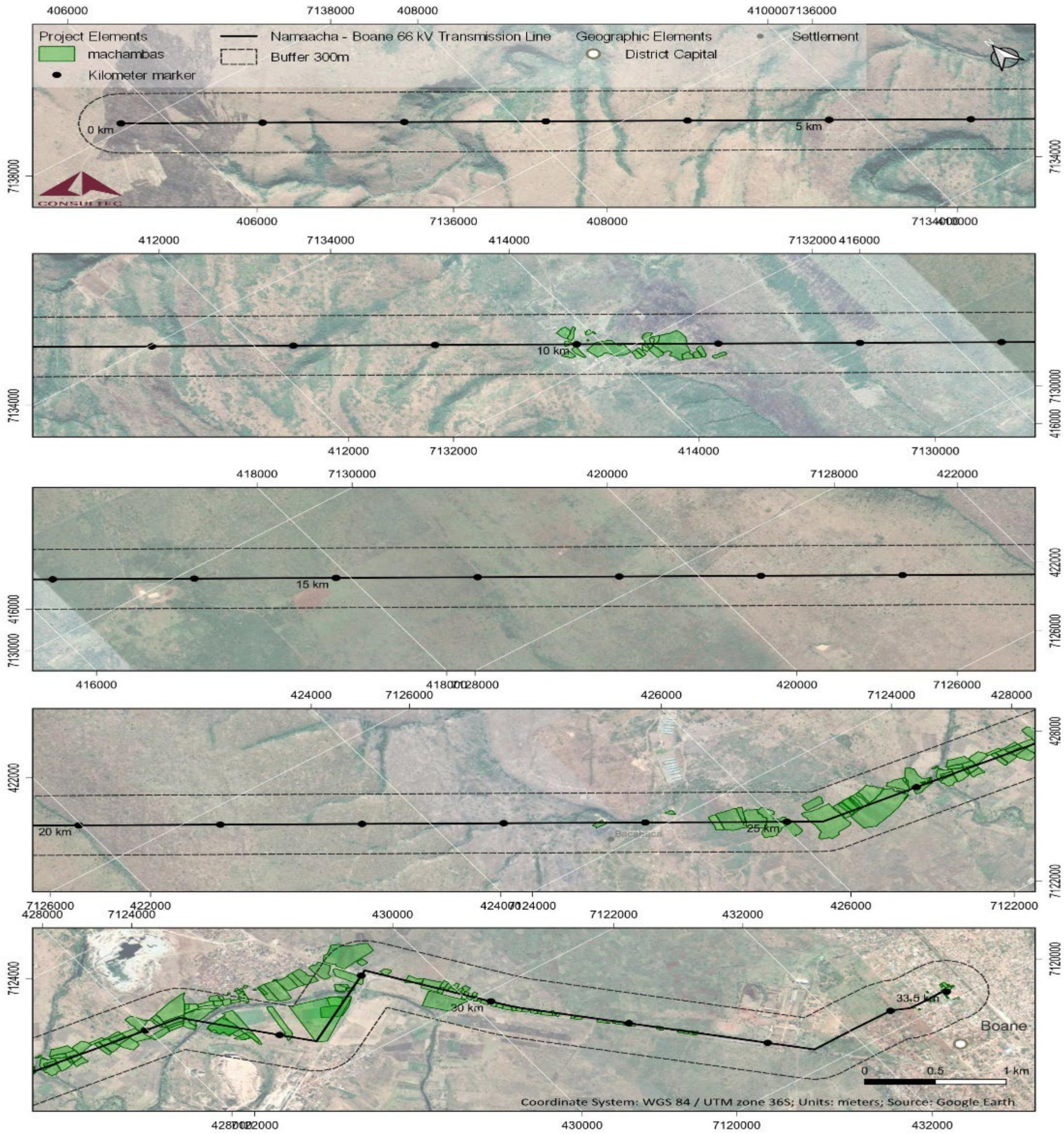


Figure 6-148 – Machambas located along the transmission line buffer

Regarding the surveys conducted to HHH of impacted infrastructures, 51,8% have said to have a machamba and 48,2% to have not.

Survey data results such as the parcel size, crops cultivated or the number of trees on impacted machambas will be analysed on the Physical and Socioeconomic Survey Report.

On Figure 6-149 is shown the distribution of impacted trees along the transmission line buffer zone with a particular concentration in the end of the line in Bairro 6.

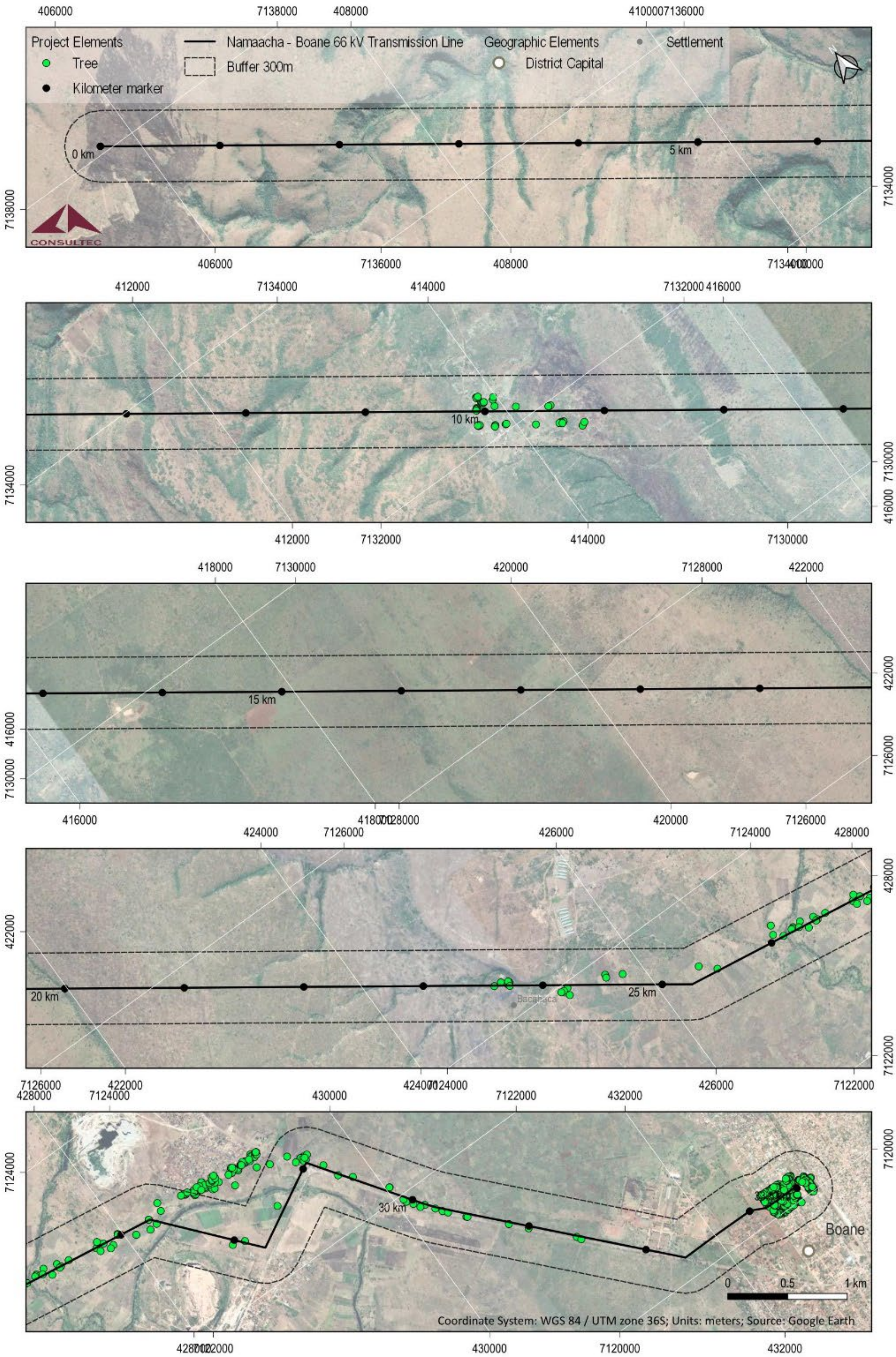


Figure 6-149 –Trees identified along the line route buffer

According to data collected on conducted quantitative surveys (Figure 6-150) less than half (40%) of machambas parcels have trees while most of the parcels (86,4%) with impacted infrastructures have trees.

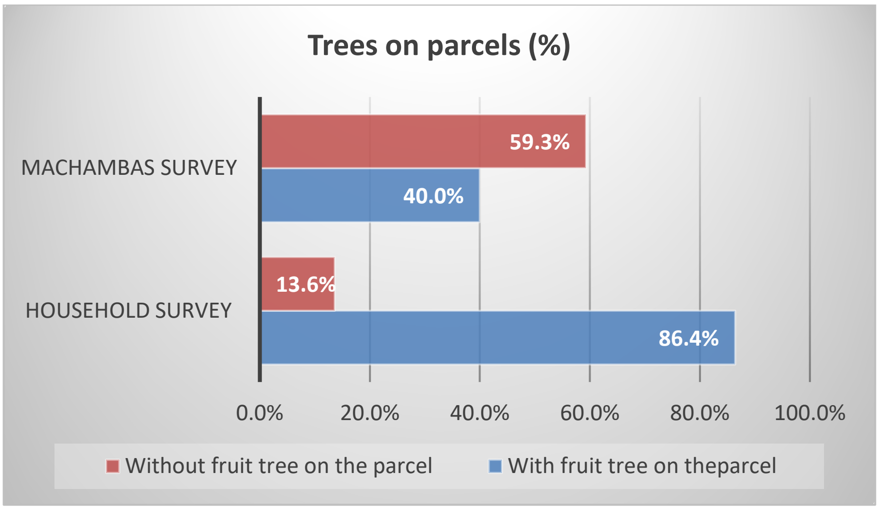


Figure 6-150 –Trees identified on HH parcels and machambas

The most common tree species found on both surveys are mango trees, pawpaw tree, avocado tree, orange tree, lemon tree, sugar cane or banana tree. However, a more detailed study regarding the tree species found and their respective frequencies will be carried out in the RPF/PSESR.

6.3.11.3 Livestock breeding

Maputo Province

In addition to agriculture, in recent years Maputo Province has seen considerable growth in the livestock component, essentially cattle rearing, to such an extent that the province's strategic plan considers livestock as a priority area.

As indicated in Table 6-77, there was an increase in the registered livestock numbers of most livestock species in the period from 2019 to 2021, with the considerable number of cattle in this province standing out. Except for goat rearing that had a decrease of about 6,7% from 2020 to 2021.

Table 6-77 – Livestock numbers in Maputo Province (2019 – 2021)

Species	2019	2020	2021
Poultry	467.223	869.036	990.599
Cattle	367.921	378.710	385.241
Goats	309.300	315.771	294.612
Sheep	58.610	61.638	65.650
Pigs	46.958	47.875	49.295

Source: INE (2022d)

Districts covered by the project

Livestock breeding development in Namaacha district is still insufficient, although this district has a tradition in cattle breeding and in the use of animal traction, particularly in the areas of Mafuiane and Changalane. At the family level, techniques of cheese production from goat cattle have been introduced, although its impact is not yet visible, because these cattle are still in the reproduction phase, and families are asking for more livestock development. The limitations of livestock production identified in the area are animal diseases, insufficient rural extension services and the household´s poor monetary capacity to buy stock.

Despite the mixed context, the population of Boane District has agriculture as its main form of subsistence complemented by cattle, sheep, pig and poultry breeding and trading. In Boane, private commercial agriculture is strongly present, occupying large areas of land and with great impact on the absorption of local labour. Particularly in relation to cattle there has been a reduction tend of its stock in recent years due to the increasing reduction of pasture areas, which makes some breeders opt to transfer their animals to the surrounding districts such as Namaacha, Matutuine and Moamba, but on the other hand, the stock of small species of animals has been growing. Poultry production is significant in the district with more than 400 poultry farmers, about 60% of the total registered poultry farmers are broiler breeders and the rest in the rearing of laying hens for egg production.

Like the province and as presented in Table 6-78, between 2019 and 2021, there has been a growing increase in the registered livestock numbers of the main livestock species reared in Namaacha District. Except for poultry numbers, the numbers of the other livestock species reared in Boane District are considerably inferior to those of Namaacha. Table below also shows that in Boane there was a decrease in all ungulated species in 2020 followed by an increase in 2021.

Table 6-78 – Livestock numbers in covered districts (2019 – 2021)

Species	Namaacha District			Boane District		
	2019	2020	2021	2019	2020	2021
Cattle	60 273	64.872	66.863	9.129	8.716	9.936
Goats	31 505	31.604	21.501	6.917	2.919	3.425
Sheep	17 463	19.012	20.592	2.510	936	1.113
Pigs	8 823	9.817	10.578	3.786	859	1.375
Poultry	62172	67.324	73.805	46.462	209.629	249.471

Source: INE, (2021b, 2022d), GDB (2020), SDAE Namaacha (2022) and SDAE Boane (2022).

Communities on the vicinity of the route

According to information provided by the local leadership of both districts the animal species most found in the covered communities are chicken, ducks and goats. People also mentioned to have sheep, pigs, and cattle. These are all for own consumption or for selling, although pigs, goats and cattle have been more often mentioned to be for sale. The following Figure 6-151 illustrates a chicken and duck coop (left) and a pigpen (right) located in the community of Mabanja.

Figure 6-151 – A henhouse and a pigpen in Mabanja community

From the HH survey resulted that 40% said to raise or sell animals and 60% responded negatively. From those who raise animals and as shown in Figure 6-152 below, 75%, 59% and 40% of HH said to raise chicken, ducks and goats respectively for their own consumption, and only 2,3% have sheep. The only animal species sold by the impacted households are Goats (4,5%) and Chichen (6,8%).

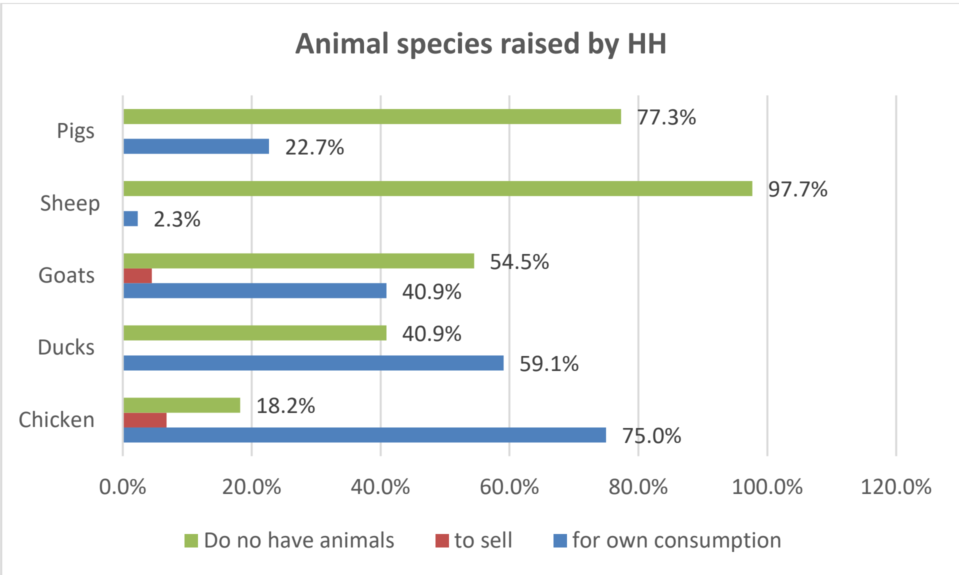


Figure 6-152 –Livestock raised by surveyed HH

13,6% of households have also mentioned to have bovine cattle, donkeys, rabbits or pigeons.

Regarding the location in relation to the household where livestock go feeding on Figure 6-153 is shown that the great majority (86%) feed outside on pastures the community 'grounds, 5% on the community and 9% inside the household parcel.

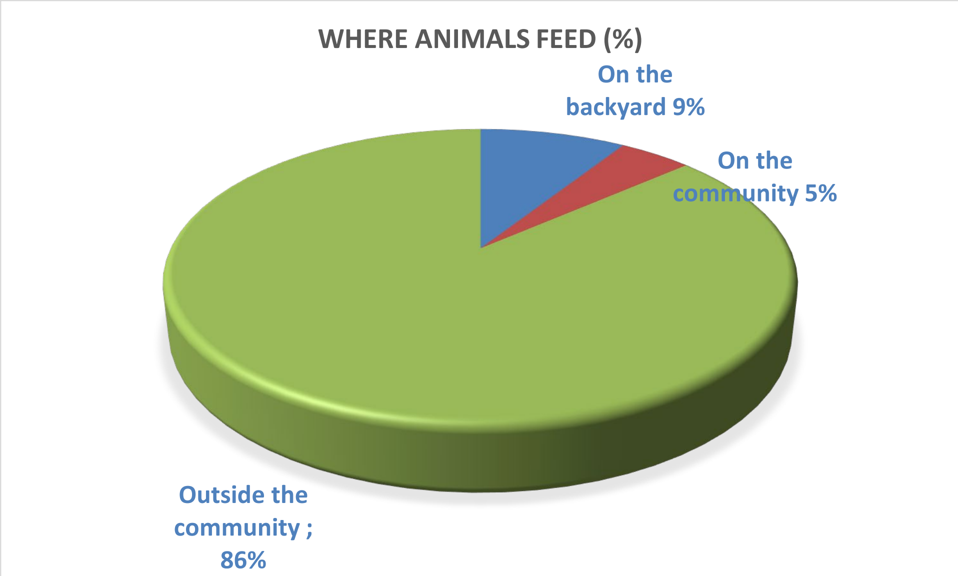


Figure 6-153 – Place where animals feed

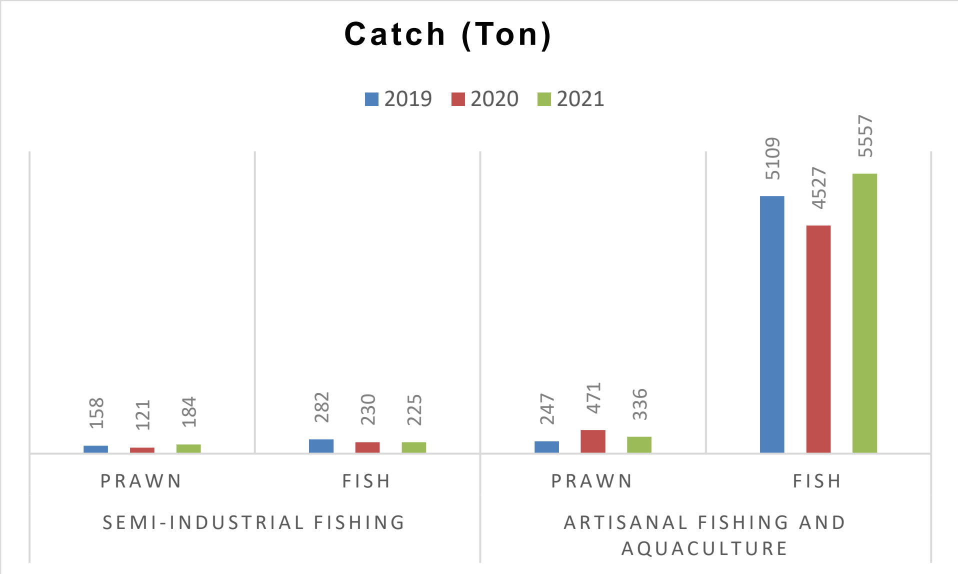
6.3.11.4 Fisheries and aquaculture

Fishing is a crucial sector of the Mozambican economy, being one of the main sources of self-employment and income. The fisheries and aquaculture sector accounts for 1.7% of Mozambique's annual gross domestic product (GDP) (INE, 2021c). Although industrial fishing plays an important role in the Mozambican economy, small-scale coastal fishing composed of the semi-industrial and artisanal sectors contributes significantly to exports and the informal economy, especially at the local level, and is an important source of protein for communities in coastal areas.

Maputo Province

Regarding semi-industrial fishing licensing, the Province of Maputo had in 2019 a total of 34 vessels licensed in Maputo Port which corresponded to 8,8% of the total vessels licensed. As for artisanal fishing and aquaculture the province had 2.475 fishing gear licensed in the same year which corresponded to 13% of all licensed fishing gear. Maputo had the country’s highest number of people licensed in recreational and sport fishing (37,5%) followed closely only by Inhambane with 36,8% (MMAIP, 2020).

The semi-industrial fishing sector in Maputo Province registered lower catches of prawn and fish than the artisanal fisheries (Figure 6-154). The largest catches correspond to artisanal fisheries, with catches exceeding 4,500 tons per year between 2019 and 2021.



Source: INE (2022d)

Figure 6-154 – Fishery production in Maputo Province

Districts covered by the project

Namaacha District

According to IDPPE (2013) the main fishing centres in Namaacha district are Impaputo, Goba Estação and Mahalena which had during the general fishing census 47, 10 and 162 registered fishermen respectively.

Regarding fishery production in Namaacha District, and as presented in Table 6-79, 42.7 tons were caught in 2021 in the Umbeluzi reservoir and river by artisanal fishermen and in fishponds, with an increase of 36.4% compared to the same period of the previous year (31.3 tons). During this period there was a reduction of about 57% in fish farming production.

Table 6-79 – Fishery production in Namaacha District, 2020-2021

Fishery Type	Production (Ton) 2020	Production (Ton) 2021	Evolution (%).
Artisanal Fishing	17.4	36.7	111.2
Fish	12.0	26.8	123.3
Other	5.4	9.9	84.0
Aquaculture	13.9	6.0	-57.0
Fish	13.9	6.0	-57.0
Total	**31.3**	**42.7**	**36.3**

Source: GDN (2022b)

Boane District

Fishing in the District is basically for subsistence and practiced in the two Administrative Posts. The fishermen are organized in 3 fishermen's associations, namely: Fishermen's Association of Km 16, Fishermen's Association of Saldanha and Fishermen's Association of Mahanhane, which carry out their activities on the Matola River, Tembe River and Umbeluzi River (Albufeira dos Pequenos Libombos) respectively (GDB, 2014).

According to SDAE Boane (2022), 114 artisanal fishermen were registered in Boane district, of which 100 in Eduardo Mondlane locality, mostly in Pequenos Libombos reservoir, and 14 in Matola Rio mainly along the Matola River.

A total of 60 aquaculture tanks producing Tilapia were also registered, with the vast majority of these located in Boane Administrative Post. To point out that during the past year the tanks were stocked with 41,000 fingerlings.

From the plan of 106.8 tons of fish estimated for 2021, 110.5 tons of fishery and aquaculture products were caught, of which 101.7 tons in artisanal fisheries and 8.8 tons in aquaculture, against 97.6 tons of the same period of 2020, which corresponds to an achievement of 103.46% and an overall growth of 13.2%. The fishery production in the district is presented in the following Table 6-80.

Table 6-80 – Fishery production in Boane District, 2020-2021

Fishery Type	Production (Ton) 2020	Production (Ton) 2021	Evolution (%).
Artisanal fishing	76.2	101.7	25.1
Aquaculture	21.4	8.8	-58.8
Total	**97.6**	**110.5**	**13.2**

Source: GDB (2021) GDB (2022)

Communities on the vicinity of the route

Fishing has not been reported on conducted interviews as a major livelihood activity on covered communities. As a matter of fact, not all communities mentioned fishing as one of their livelihood activities. The Community of Mabanja in Boane and Bacabaca, Mucacuene and Gumbe in Namaacha have mentioned fishing among the livelihood activities they perform. The information provided on fishing activity is presented on the following Table 6-81.

Table 6-81 – Fishing activity on covered districts

District	Community	Where they fish	Fish species	where they sell
Namaacha	Bacabaca	Movene river	Catfish and tilapia	on the community
	Mucacuene	Movene river	Tilapia	on the community
	Gumbe	Gumbe and Mabanga river	Catfish and tilapia	on the community
Boane	Mabanja	Movene river	Catfish	on the community

The following Figure 6-155 shows the Movene river limiting Bacabaca and Mabanja communities and where these communities conduct their fishing activities.

Figure 6-155 – Movene River between Bacabaca and Mabanja

The household survey results on Figure 6-156 confirms that fishing is not a main resource to sustain the impacted households as it is only practiced by 6,4% of the total surveyed households. Furthermore, when they were questioned on where they go fishing, Movene and Gumbe rivers have been mentioned by the respondents.

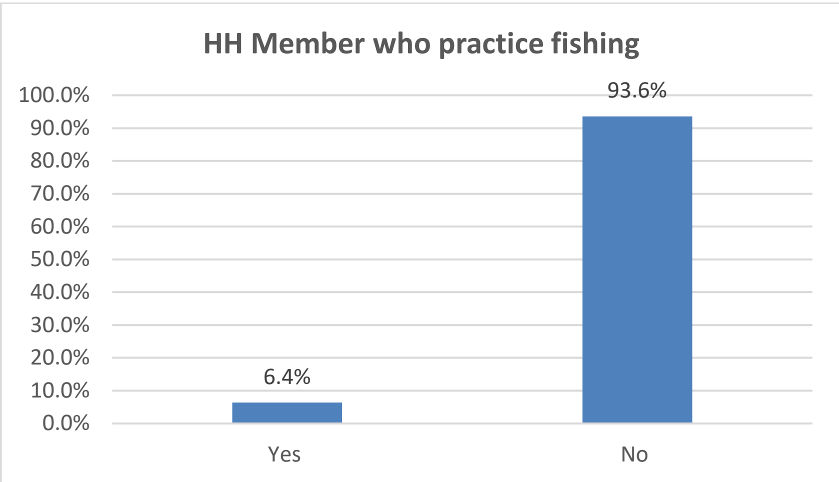


Figure 6-156 – Household practicing fishing

6.3.11.5 Industry

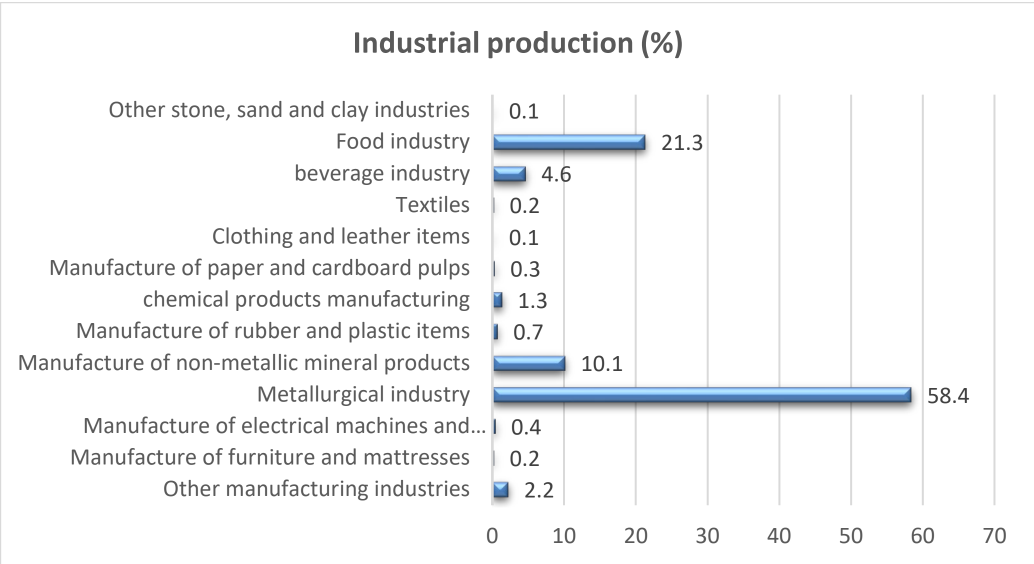
Maputo Province

Mozambique is a country in the process of revitalizing its industry, with considerable industrial production indices. Despite the various conjunctural factors that have not been contributing in a very favourable way to the industrial development, production in the manufacturing industry grew from 70.8 billion Meticais (2014) to 89.4 billion (2018). Industry also grew by 4.7% in 2019. For the recorded growth, the extractive and manufacturing industry sectors accounted for 39.0% and 61.0% of the production value attained in 2019 respectively (INE, 2020b).

In the present Quinquennium, 902 industries were licensed, creating about 16,145 jobs, with an emphasis on cement plants and grain milling, which add value using limestone and domestic cereals.

Maputo Province has about 150 licensed industries, having registered a development and expansion of the industrial sector, highlighting the entry into operation of large and medium size companies such as LIMAK, expansion of the Coca-Cola factory, INALCA (meat processing) and Espiga D'Ouro (Bakery); Beleza (processing of synthetic fiber to obtain artificial hair), Heineken (Beers) and Xinavane Sugar Refinery.

Industrial production in Maputo Province in 2021 (Figure 6-157), was dominated by the metallurgical industry (58.4%), followed by the food industry (21.3%) and the manufacture of non-metallic mineral products (10.1%). It is noteworthy that the province has about thirteen relevant branches of activity.



Source: INE (2021b)

Figure 6-157 – Industrial production in Maputo province by activity sector (2020)

Districts covered by the project

Namaacha District

According to Namaacha SDAE (2022), there are a total of 85 small and micro industries in the district (Table 6-82), 61 of which are in Namaacha Sede and 24 in Changalane Administrative Post. highlighting the manufacture of blocks, quarries and companies producing banana, macadamia, and water bottling.

Table 6-82 – Industry establishments in Namaacha District (2022)

Category	Administrative Post	
	Namaacha Sede	Changalane
Metalworking	1	3
Carpentries	2	4
Block manufacture	20	4
Bakeries	4	2
Mills	8	8
Quarries	10	-
Bitumen production company	1	-
Water bottling company	4	1
Banana production company	9	2
Macadamia production company	2	-
Total	**61**	**24**

Source: SDAE Namaacha (2022)

Boane District

Boane District holds the largest number of industries in the province, boosting the growth of local Small and Medium Enterprises (SMEs) while creating employment opportunities. The Beluluane Industrial Park (PIB) Complex and the Beluzone Free Zone, with 700 hectares, is considered the main industrial zone in the country and aims to become a privileged location in Southern Africa for export-oriented companies. The Beluluane Industrial Park was created by the impact of the implementation of the Aluminium Smelting Industry - Mozal, which in turn generates other national and foreign companies and industries.

The district currently has an accumulated number of 395 industries (mostly small scale) of which 45 are operating in the Beluluane Industrial Park. The Mozal Aluminium Smelter factory is the most prominent in the Industrial Park. However, some autonomous factories have emerged, such as Capital Star Steel, an export-oriented factory of piping for oil and gas pipelines, contributing to improve the competitiveness of Mozambican products in the international market. Other important factories in the BIP are Midal Cables International, Dendustri Mozambique, Godrej Group, Duys Engineering Group, Matola Gas Company, Hytec, Sunshine Nut Company and *Cimento Nacional*. Boane District also has several stone and sand quarries, important sources of resources for the construction sector in Maputo Province and Maputo City.

Figure 6-158 presents examples of the existing industry in the districts covered by the project.

Quarry, Namaacha

Metalworks, Boane

Source : Consultant

Figure 6-158 – Industry in covered districts

Communities in the vicinity of the route

During the qualitative data collection industrial activity has not been referred by local authorities as of relevance for the covered communities. Nonetheless on surveys conducted to the affected infrastructures and machambas resulted that 2,7% and 0,6% respectively work on the industrial sector.

6.3.11.6 Commerce

Maputo Province

Trade plays an important role in the national economy, being one of the main sources of income for rural populations, a mechanism to link production and market between rural and urban areas, and a tool to induce agricultural productivity. In agricultural trade there is an increasing involvement of various agents and players in the process, but there are challenges ahead, such as bringing policies closer to small retailers, higher quality of production and conservation, and controlling the informal sector.

There has been an increase in the number of licensed commercial establishments in Maputo Province in recent years, corresponding to a growth in the order of 26.5% (2018), 5.7% (2019), 6.8% (2020) and 15,1% in 2021 (Table 6-83). 820 agricultural trade fairs were held in the province in the same year, of which 17 were in Boane District and five in Namaacha district.

Districts covered by the project

Commercial activity has been growing at a significant rate in Boane District, in part due to its internal growth, its location, the industrial base, and to some extent, also due to farming activities. The informal and border trade is characteristic of the district and has a significant impact on the population and economy of the district. In the town of Boane, along the main road (EN2), and on the secondary and tertiary accesses, there is a dense occupation of informal commercial premises and considerable movement of people. The arrival of more immigrants making commercial activity more dynamic, and besides being one of the areas that generates most employment at the district level. Commercial activity in the district includes specifically the activities in markets (stalls), grocery stores, supermarkets and warehouses.

Border trade is one of the activities that most moves the inhabitants of Namaacha. Linked by ethnic and linguistic (and often family) ties with the population that lives on the side of Eswathini, the population transits between the two territories to improve their economic situation through trade. The town of Namaacha, due to its location on the border with Eswathini, was the place where a very characteristic border commercial practice emerged along the territorial limits of southern Mozambique (including in relation to South Africa): the so-called “Mukhero”.

Table 6-83 shows the number of licensed commercial establishments in Maputo province and in Boane and Namaacha districts between 2019 and 2021. Boane district is one of the districts with the highest number of annual issued licenses in the province after Matola and Marracuene districts, and on the other hand, Namaacha district is one of the districts with the less licensed establishments.

Table 6-83 – Commercial network (2019-2021)

Location	Commercial Establishments (nº)		
	2019	2020	2021
Maputo Province	2.339	2.510	2.953
Boane District	228	226	180
Namaacha District	31	31	24

Source: INE (2022d)

In Figure 6-159 below are illustrated examples of existing formal and informal commerce in the districts crossed by the project.

Formal Commerce, Boane

Informal Commerce, Boane

Figure 6-159 – Formal and informal commerce in the covered districts

Communities in the vicinity of the route

Both in the interviews carried out and in the surveys on the infrastructures and companies located in the right of way of the line, the difference in terms of commercial activity between the communities located in Namaacha district and those located in Boane was notorious.

In Bairro 1, Bairro 6 and Mabanja in Boane district there is a very active commercial activity, both formal and informal, from stalls to grocery stores. Formal trade is carried out in masonry infrastructures that offer a wide range of services and products sold from materials to food and beverages. On the other hand, in Livevene and Gumbe there isn´t even informal stalls, and in Bacabaca and Mucacuene there are some informal commerce and a few conventional built small groceries as the one shown on the left side of Figure 6-160 below.

Figure 6-160 – Commercial activity in Mucucuene and Bairro 6

As shown in Table 6-84 below most businesses perform commercial related activities (73%) followed by other activities. Other activities which have been mentioned by the respondents include livestock production, house rental, shipyards, hotel businesses and hair salon.

Table 6-84 –- Activity performed by surveyed businesses

Actvity performed	Number of businesses
Commerce	73%
Services	2,7%
Mechanical workshop	2,7%
Metalwork / carpentry	2,7%
Other	18,9%

When asked if they have a property title (DUAT) of their business, 18,9% said they have a DUAT and the remaining 81,1% do not have one.

During the business survey the HHH were asked on how they acquired their business (Figure 6-161) and most, that is 78,4%, responded they have built the business infrastructure themselves, 10,8% have bought the property and the remaining have either inherited or borrowed it.

Regarding the year the business started (Figure 6-161) most have started from 1982 to 2002 (37,8%), 27% between 2003 and 2013, and 35,1% more recently from 2014 to 2022.

Figure 6-161 – Type and year of business acquisition

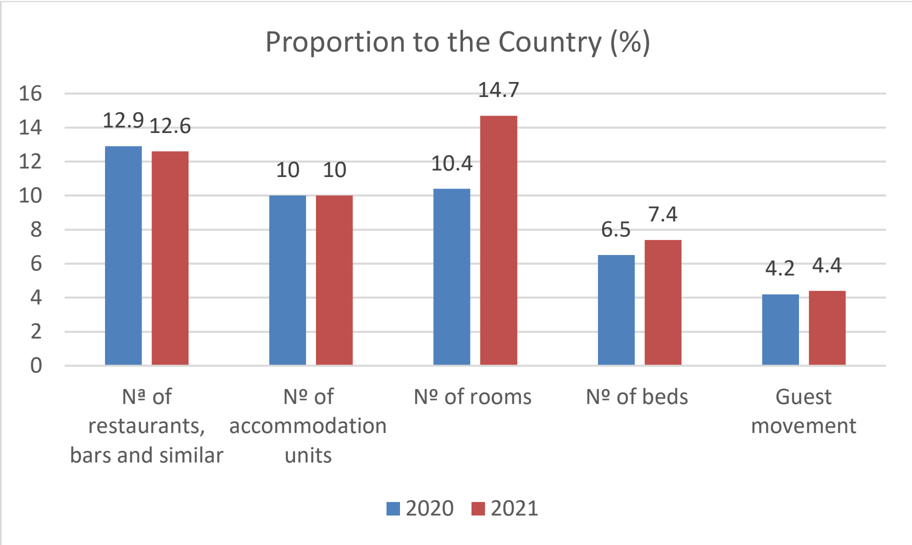
6.3.11.7 Tourism

Maputo Province

Mozambique, a developing country ranked among the poorest countries, has interesting economic potentialities. International tourism, playing the role of a development engine, is of interest for its economic and social contributions, namely the most evident and most direct: job creation, the possibility for inhabitants to increase their income and standard of living, and for the secondary gains over other sectors. It is essentially a tourism of proximity, since the bulk of the influxes come from neighboring countries, such as South Africa, from where, in fact, the bulk of the investments in the sector come from (Silva, 2019).

Tourism by its nature covers all economic and social activities. This sector acts as a catalyst for transport activities, stimulates some activities such as agriculture, fixes investment to the land by catalysing civil construction. It also inspires the evocation of cultural values and art as elements of the tourism product. Maputo Province has a wide range of natural and cultural tourism potentialities, characterized by beautiful beaches, natural reserves, monuments, and historical sites. This gives it a prominent place per excellence, being considered Mozambique´s fifth tourist destination.

Figure 6-162 below shows some of the province´s tourism indicators in relation to all those existing in the Mozambican territory. The number of restaurants, bars and other catering units have slightly decreased, the proportion of accommodation units have remained stable, and the number of rooms and beds have both increased in the same period. In what concerns guest movement Maputo province has had a small proportion of tourists when compared to provinces such as Nampula, Inhambane, Gaza or Maputo City.



Source: INE (2022f)

Figure 6-162 – Maputo Province´s tourism indicators

According to the Provincial Directorate of Culture and Tourism, in 2020 there were in the province 51 hotel and restaurant establishments (Table 6-85) among these 19 hotels, 21 guesthouses, five lodges, and 339 restaurant establishments.

Table 6-85 – Tourism Establishments in Maputo Province (2020)

Type of Establishment	2020
Hotels	19
Guesthouses	27
Lodges	5
Restaurants	339
Others	1,469

Source: INE (2021b)

Districts covered by the project

Namaacha District

Regarding tourism, Namaacha has a well-known natural interest site, the Namaacha Waterfall, as well as benefiting from its proximity with the Kingdom of eSwatini. Other sites of interest are Mount M'Ponduine of cultural interest, the Church of Our Lady of Fatima a place of pilgrimage for Catholic believers, the Damiano cave in Changalane and the war monument in Goba.

According to SDAE Namaacha (2022), there are a total of 43 hotel and restaurant establishments in the district (Table 6-86), of which 34 are restaurant establishments and five are hotel resorts. Of which there are two Hotels, four guesthouses and seven medium-sized restaurant establishments, two wildlife farms (MHMexotic Parque Nature Conservation and AAA Enterprise) and a farm. The rehabilitation of the SunShine Libombos Hotel and Spa is underway and is expected to reopen with 80 workers.

Table 6-86 – Tourism establishments in Namaacha District (2022)

Category	Administrative Post	
	Namaacha Sede	Changalane
Restaurants and bars	29	9
Accommodation	5	-
Total	**34**	**9**

Source: SDAE (2022)

Boane District

As indicated in the following Figure 6-163, there has been a gradual and continuous growth in the number of licensed hotels and restaurants in Boane District in recent years. Between 2014 and 2021 there was an increase of about 40% in the number of tourism establishments, which can easily be associated with the population growth, and the increasing urbanization rate that has characterized this district in recent years.

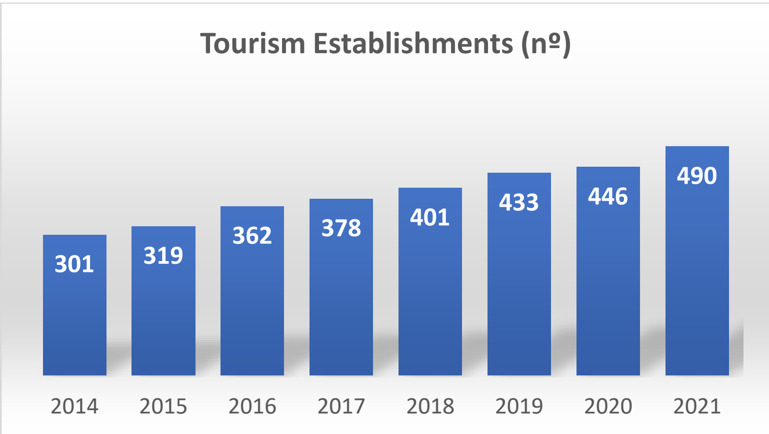


Figure 6-163 – Tourism establishments in Boane District, 2014-2021

In what regards places of touristic interest in Boane District, such as those of Mahanhane and Massaca in Boane Sede Administrative Post, where Pequenos Libombos reservoir is located, have potential for the development of this activity, because it is a place endowed with beautiful landscapes associated with the characteristics of the relief, weather conditions and the existence of rivers. Regarding areas with potential to explore, can be highlighted Ambrosio, Saldanha, Chinonanquila and Matola - Rio.

Communities in the vicinity of the route

Tourism activity was not mentioned in any of the interviews carried out with the leaders of the communities under consideration as being of relevance to the livelihood of their inhabitants, however, when surveying business establishments, four companies linked to the tourism sector were identified, this is three renting room houses and guesthouse all located on the transmission line´s right-of-way in Bairro 6 in Boane. The guesthouse in Bairro 6 in illustrated in Figure 6-164 below.

Figure 6-164 – Pérola guesthouse on the Line´s RoW

Annex I – Proof of Consultec's Registration with MTA

República de Moçambique

MINISTÉRIO DA TERRA E AMBIENTE

CERTIFICADO DE CONSULTOR AMBIENTAL

Nº. 47 / 2022

O Ministério da Terra e Ambiente, ao abrigo do Regulamento sobre o Processo de Avaliação do Impacto Ambiental, aprovado pelo Decreto nº 54/2015, de 31 de Dezembro, certifica que o (a) sr (a) *Consultec – Consultores Associados, Limitada*

está devidamente credenciado (a) a exercer funções de Consultor Ambiental em Moçambique.

CERTIFICADO DE CONSULTOR

Maputo, aos 31 / 08 /2022

Validade até 31 / 08 /2025

Ivete Joaquim Maibaze

A Ministra

Annex II – Correspondence with SPA Maputo

REPÚBLICA DE MOÇAMBIQUE
PROVÍNCIA DE MAPUTO
SERVIÇO PROVINCIAL DO AMBIENTE

Á;

Central Eléctrica da Namaacha, S.A

N/ Refª 601 /SPA/DA/407/220/2022

Matola, 16 de Junho de 2022

Assunto: **Análise e Categorização do Projecto de Construção de uma Linha de Transmissão apartir do Parque Eólico da Namaacha á Subestação de Boane, Localizado no Distrito de Namaacha e Boane, Provincia de Maputo**

Exmos Senhores;

Serve a presente para comunicar à V.Excia que feita a análise dos documentos do projecto em epígrafe, e confrontada a informação através da visita ao local para efeitos de pré-avaliação, concluiu-se que o mesmo é susceptível de causar alguns danos ao ambiente.

A actividade enquadra-se na Categoria "**A**", de acordo com alinea d) do nº 2.6. anexo II do Decreto Nº 54/2015 de 31 de Dezembro Regulamento sobre o Processo de Avaliação do Impacto Ambiental, no entanto, estando sujeito á realização de um **Estudo de Impacto Ambiental** (EIA), o qual deverá ser elaborado por consultores ambientais inscritos no MITA. A anteceder a elaboração do EIA, devem ser submetidos o respectivo Estudo de Pré - Viabilidade e Definição do Âmbito e Termos de Referência (EPDA & TdR's) em doze (12) exemplares em formato físico e um (1) em digital na **DINAB** e dois (2) em formato físico e um (1) (en pen drive e enviar para da.spa.maputo@gmail.com) neste Serviço para análise e devidos efeitos.

Com os melhores cumprimentos;

A Directora do Serviço Provincial

Teresinha Pascoal

(Tecnico Superior N1)

MdGM

SPA – Rua da Radio Moçambique nº 415, Telef +258876290001 – E-mail: spambiente.maputo@gmail.com, Cidade da Matola

REPÚBLICA DE MOÇAMBIQUE
MINISTÉRIO DA TERRA E AMBIENTE
GABINETE DO MINISTRO

À:
Central Eléctrica de Namaacha (CEN)

Maputo

N/Refª N º158/MTA/ 183 /GM/220/23 **Maputo: 28 / 04 /2023**

Assunto: Estudo de Pré-viabilidade Ambiental e Definição do Âmbito (EPDA) e Termos de Referência (TdR) do Projecto de Linha de Transmissão de 66 kV do Parque Eólico da Namaacha à Subestação de Boane, Província de Maputo

Exmos Senhores,

O Ministério da Terra e Ambiente (MTA) recebeu o documento de V.Excias referente ao Projecto em epígrafe, tendo merecido a devida análise técnica.

Após a revisão feita nos termos do Artigo 16, do Regulamento sobre o Processo de Avaliação do Impacto Ambiental, aprovado pelo Decreto nº 54/2015, de 31 de Dezembro, o MTA comunica à V.Excias que o presente documento está aprovado mas, recomenda para o Relatório de Estudo de Impacto Ambiental (REIA), o cumprimento integral do EPDA e TdR e das questões apresentadas no relatório de revisão em anexo.

Informa-se ainda que o REIA deverá ser submetido à DINAB em nove (09) exemplares em formato físico e um (01) em formato electrónico. Três (03) exemplares do mesmo documento em formato físico e um (01) em formato electrónico deverão ser submetidos ao Serviço Provincial de Ambiente de Maputo.

Com os melhores cumprimentos.

A Ministra

Imaibaz

Ivete Joaquim Maibaze

CC: Suas Excelências:
- O Ministro dos Recursos Minerais e Energia
- O Ministro das Obras Públicas, Habitação e Recursos Hídricos
- O Ministro da Indústria e Comércio
- O Ministro da Saúde
- A Secretária de Estado da Província de Maputo

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