ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

VOLUME II

SONGO CONVERTER SUBSTATION REHABILITATION PROJECT

FINAL REPORT

Prepared for:

HIDROELÉCTRICA DE CAHORA BASSA

Hidroeléctrica de Cahora Bassa, S.A.

Prepared by:

CONSULTEC Consultores Associados, Lda

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Consultec – Consultores Associados, Lda.

July 2022

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT

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FINAL REPORT

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INDEX

FIGURES LIST

TABLES LIST

LIST OF ACRONYMS AND ABBREVIATIONS

AI	Area of Influence
AfDB	African Development Bank
ARA	Regional Water Administration
WB	World Bank
CO	Carbon Monoxide
ºC	Degrees centigrade
AD	Agricultural Directorate
BLS	Basic life support
dB(A)	Decibel
EIS	Environmental Impact Study
EN	National Highway
EPA	Environmental Protection Agency
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESS	Environmental and Social Safeguards
EU	European Union
FAO	Food and Agriculture Organization
HC	Hydrocarbons
HCB	Hydroelectrical of Cahora Bassa
h	Hour
I&AP	Interested and affected parties
IFC	International Finance Corporation
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for the Conservation of Nature
km/h	Kilometres
LAeq	Equivalent continuous sound level
m	Metres
m2 m3	square meter cubic meter
mm	Millimetre
µg/m3	Micrograms per cubic meter
MT	Mozambique Television
MTA	Land and Environment Ministry
MITADER	Land, Environment and Rural Development Ministry
Mtpa	Millions of tons per year
NO	Nitrogen oxide
NO2	Nitrogen dioxide
NOx	Nitrogen oxides
OS	Operational Safeguard
PAH	Polycyclic Aromatic Hydrocarbons
PM10	Particulate material less than 10 micrometres in diameter
SS	Substation
SO2	Sulphur Dioxide
SOx	Sulphur Oxides
TSP	Total Suspended Particles
WB	World Bank
WHO	World Health Organization

1 Introduction

1.1 General Considerations

Hidroeléctrica de Cahora Bassa, SA ("HCB" or "Proponent"), a public limited company incorporated under Mozambican law, operates under a concession, the Cahora Bassa hydroelectric plant with the main purpose of producing, transporting, and marketing electricity.

HCB's mission is to operate the Cahora Bassa project with efficiency, to contribute to expanding use of the country's energy potential, competing in the domestic and regional markets, in a sustainable and socially responsible way, and its vision is to be an international reference company, providing a decisive impetus to development of the national and regional energy matrix.

HCB is headquartered in Songo village, where it has vast resources, consisting not only of energy production and transport infrastructure, but also of other movable and immovable assets.

The Songo Converter Substation (SS) was built between the end of the 60s and the beginning of the 70s and is a world pioneer in HVDC technology based on thyristors. The HVDC transmission system consists of two converter stations located in Songo (Republic of Mozambique) and Apollo (Republic of South Africa).

Songo's converter SS comprises two main subsystems:

- An alternating current station, which supplies loads with alternating current (EDM Centre/North – 220 kV and ZESA/SAPP – 400 kV);
- A direct current station, where the conversion from alternating current to direct current occurs, and through which energy is transported in a bipolar network ± 533 kV (Eskom).

Energy is supplied from Songo to customers through the following infrastructures:

- Two alternating current transmission lines (HVAC), 220kV from the Songo converter SS to the Matambo SS;
- An alternating current 420kV (330) kV transmission line (HVAC) from Songo to Bindura (Zimbabwe) which, in addition to supplying Zimbabwe, facilitates transactions in the *Southern African Power Pool* (SAPP);
- Two direct current transmission lines (HVDC), bipole ±533kV that supply South Africa (Apollo).

However, most of the equipment at the Songo converter SS was installed around 40 years ago and is already at the limit of its useful life, without spare parts or technology available on the market, which reduces its reliability and availability. It is in this situation that the Proponent intends to restore and modernize the Songo Converter Substation, as well as replacing the earth electrodes located in Chitima.

To comply with the legislation, HCB intends to obtain an environmental license to restore and modernize Songo Converter SS at the same time ensuring that it is correctly operated.

To obtain the Environmental License for the Songo Converter SS Restoration Project (hereafter referred to as the "Project"), required under the terms of the Environmental Law (Law No. 20/97, of 1 October) and the Regulation on the Environmental Impact Assessment Process, approved by Decree No. 54/2015, of 31 December, the Proponent must submit the Project to an Environmental Impact Assessment Process (EIA).

In November 2020, HCB requested, together with the Provincial Environmental Services (Tete SPA), the Process Instruction (PI) for the Songo Converter SS Restoration Project. In February 2021, a written recommendation from the National Environment Directorate (NED) was received for preparation of an Environmental Management Plan with a view to ensuring safe, sustainable and rational environmental management of the infrastructure, as a condition for obtaining an environmental license (Annex I – Communication on the Process Instruction Decision for the Songo Converter SS Restoration Project (Ref. No. MTA/218/DINAB/GDN/252/2021)).

Consultec - Consultores Associados, Lda. (Consultec), an MTA registered EIA consultant (Annex II), has been appointed to manage the ESIA process on behalf of the Proponent.

1.2 Project Proponent

The Project Proponent (entity that proposes to implement the project) is Hidroeléctrica de Cahora Bassa, SA Its contact details are provided at Error! Reference source not found. below.

Table 1-1 - Proponent's Contacts

HIDROELÉCTRICA DE CAHORA BASSA	**Proponent**	Hidroeléctrica de Cahora Bassa
	Address:	Tete – Songo, Caixa Postal 263 - Moçambique
	Contact person:	Edite César
	E-mail:	edite.cesar@hcb.co.mz
	Telephone:	+258 82 336 7840/ +258 84 686 9152

1.3 Environmental Consultant

The ESIA was prepared by Consultec - Consultores Associados, Lda. (Consultec), a Mozambican consultancy company, based in Maputo and registered as an Environmental Consultant (Annex I) and Environmental Auditor with the MTA. Consultec's contact details are provided at Error! Reference source not found..

Table 1-2 -– Consultec's Contacts

	Project Environmental Consultant:	Consultec - Consultores Associados, Lda.
	Contact person:	Marta Henriques Project Coordinator

CONSULTEC Consultores Associados, Lda	**Contact number:**	+ 258 21 491 555
	E-mail	mhenriques@consultec.co.mz

1.4 ESIA team

The authors of the ESIA report are listed in the Error! Reference source not found. below.

Table 1-3- ESIA Technical Team

Nome	Role
Vera Ribeiro	Project Director
Marta Henriques	Project Coordinator
Miguel Barra	Specialist in Air Quality and Noise
Susana Paisana	Specialist in Geology, Soils and Hydrology
Natacha Ribeiro	Flora and Habitat Specialist
Valério Macandza	Specialist in Fauna and Biodiversity
Julieta Jetimane	Biodiversity Characterization
Rafael Noronha	Specialist in Socioeconomics
Samira Victor	Socioeconomic Characterization
Bram Naidoo	Specialist in Gender and Gender-Based Violence
Ricardo Teixeira Duarte	Archeology Specialist
Mafalda Santos	Specialist in Health and Safety at Work
Iussufo Adade	Specialist in Geographic Information Systems

1.5 Scope and Objectives

The ESIA is a documented commitment by the Bidder to interested and affected parties (I&APs), defining good practices, quality standards and the environmental measures and care that will be observed for environmentally responsible and sustainable management practices. The purpose of the ESIA is ensure compliance with all applicable environmental requirements and standards established in the legislation in force in the Republic of Mozambique, in particular the Regulation on the Environmental Impact Assessment Process, approved by Decree No. 54/2015, of 13 December. If there are no relevant standards and procedures in national legislation, the ESIA specifies best international practices.

It is intended that the actions/measures presented in this ESIA are practical, simple to implement and adequate for the type of activities required to restore the SS and replace the earth electrode in Chitima. The aim of these measures is to avoid or minimize and mitigate negative impacts arising from the activity and to optimize positive impacts.

The main objective of this ESIA is to define the environmental actions to be implemented for environmentally responsible and sustainable management of the restoration and operation of the SS and earth electrode.

In pursuit of this main objective, this report has been prepared to fulfil the following secondary objectives:

- To interpret and describe the engineering solutions of the restoration project;
- To identify and assess the impacts of activities planned within the scope of the restoration and operation of the SS and earth electrode;
- To ensure compliance with AfDB integrated safeguards system requirements;
- To develop the different environmental management programmes to be implemented.

This ESIA includes, in addition to the activity framework, a description of the activities to be implemented, characterization of the reference situation and an assessment of potential environmental impacts. Based on this information, the actions/measures considered appropriate are described together with strategies for their implementation. These were structured in the following thematic programmes:

- Waste Management Plan;
- Communication Programme;
- Grievance Response Mechanism;
- Unexpected Heritage Findings Procedure;
- Environment, Health and Safety Training Programme;
- Emergency Response Programme.

This ESIA was defined based on the experience that the Technical Team has accumulated during similar work and the knowledge that its members have of the country and region.

It should be noted that, as part of preparation of this ESIA, there was a technical visit to the area under study from 2 to 5 September 2021 to survey the Archaeological and Cultural Heritage, and from 14 to 17 September 2021 to survey socio-economic, biodiversity and noise components. The main objective of this survey was to validate the bibliographic information collected, as well as to obtain more detailed information about the place with a view to maximising the appropriateness of the measures to be proposed in the ESIA.

1.6 Report Structure

This ESIA is structured as in **Error! Reference source not found.** below.

Table 1-4 - ESIA Report Structure

Chapter	Description
Chapter 1	**Introduction** Presents the ESIA scope and objectives and describes its context and structure.

Chapter	Description
Chapter 2	**Legal and Administrative Framework** Lists and briefly describes the applicability of the requirements of relevant national legislation, international agreements and conventions, as well as international guidelines and policies.
Chapter 3	**Project Description** Presents the main elements of the Project, the justification and framework for the construction and operation phases, its location and main activities.
Chapter 4	**Definition of the Project's Areas of Influence** Defines the Project's areas of direct and indirect influence.
Chapter 5	**Characterization of the Reference Situation** Characterizes the reference situation as a basis for assessing impacts, and for future monitoring actions.
Chapter 6	**Identification and Evaluation of Environmental Impacts** Identifies, describes and assesses the main potential environmental impacts, based on the experience of the technical team involved in preparing ESIAs, in a description of the reference environmental situation in the area and the activities to be performed.
Chapter 7	**Risk analysis** Focuses on the potential risks of activities foreseen and accidents that may occur during construction and operation phase of the Songo Converter SS. The intent of this assessment is preventive in nature and is intended to provide key information for proactive planning to ensure responsible and controllable operations
Chapter 8	**Environmental and Social Management Plan** Presents minimization or enhancement measures resulting from the impact analysis carried out, the proposed environmental management programmes, both by updating the plans forming part of the SS's general ESMP, and by proposing new, additional programmes.
Chapter 9	**Public Participation Process** Presents the main outcome of the consultation process which aim to inform all I&APs of the proposed activities and their potential impacts, allowing them an opportunity to present their views, concerns and expectations regarding the project.
Chapter 10	**Conclusions and Recommendations** Presents the main conclusions because of the study
Chapter 11	**Bibliographic References** Lists the bibliographic references used in preparing the ESIA

2 Legal and Administrative Framework

This chapter presents a survey and synthesis of current environmental legislation applicable to the activity to be performed.

It emphasizes the conditions for the activity in the legal requirements relating to the environmental licensing process, environmental protection, environmental quality standards and pollution control, protection of biodiversity and natural, historical and cultural heritage, as well as other requirements, which must be taken into account by HCB in order to ensure adequate environmental management of the activities to be performed.

2.1 Environmental Authorities

The **Land and Environment Ministry (MTA)** directs, plans and coordinates, controls and ensures the implementation of policies in the areas of administration and management of Land and Geomatics, Forests and Wildlife, Environment, Climate Change and Conservation Areas. About environmental management specifically, the MTA reviews environmental and social impact assessments, issues environmental licenses for project implementation, promotes public awareness of environmental issues and implements the territorial planning process. This ministry is also responsible for issuing land titles and managing the land registry, licensing forest concessions and managing conservation areas.

There are several directorates and departments in the MTA organizational structure. Regarding regulation of energy sector issues, the main relevant institutions are:

- **National Environment Directorate (DINAB)** which deals with development of environmental policies, reviews documents associated with the ESIA process, and issues environmental licenses, etc;
- **Land and Environment Inspection (ITA)** which is responsible for inspections in accordance with MTA procedures;
- **National Agency for Environmental Quality Control (AQUA)** which carries out audits and monitoring, both at central and provincial levels, and is responsible for reviewing and approving independent audit reports prepared by proponents;
- **National Administration of Conservation Areas (ANAC)** which is administratively and financially autonomous and is responsible for the management and administration of protected areas (reserves and national parks). ANAC also oversees the conservation of biological biodiversity, landscapes and associated heritage within protected areas, through the national system for conservation areas.[1];
- The **National Council for Sustainable Development (CONDES)** was founded by Law No. 20/97, of 7 October, as a consultative body of the Council of Ministers, with the task of

[1] Regarding biodiversity issues in conservation areas, DINAB is responsible for coordinating the National Biodiversity Action Plan and Strategy.

advising on matters related to the coordination and integration of environmental management principles in the Mozambican development process.

The MTA also has as subordinate institutions the National Centre for Cartography and Remote Sensing (CENACARTA), the Land and Environmental Sciences Polytechnic Institute (PPCTA) and the Physical Planning and Environment Middle-Level Institute (IMPFA).

At provincial level, the **Provincial Territorial Development and Environment Directorate (DPDTA)** incorporates the Provincial Executive Council and performs functions related to the environment, forests and wildlife, in the context of land (such as participation in or issuing opinions on DUAT requests) and within the scope of territorial planning. About the State Representation Bodies in the Province, there is the **State Representation Provincial Services Council,** which incorporates the **Provincial Environmental Services (SPA)**. The most practical land administration functions are carried by SPA. Registry maps and DUAT records are for example, managed and maintained at the provincial level. Provincial technicians are also called upon to comment on EISs for large-scale mining projects. The SPA is also the entity at the provincial level that categorizes Category B and C projects and reviews the respective reports.

Ministries also have representation at the district level, where technicians from different areas participate in monitoring and controlling projects, and they report to the District Administration. At district level, the MTA is represented by the **District Planning and Infrastructure Services (SDPI)**.

2.2 Legislative framework

The Constitution of the Republic of Mozambique establishes that every citizen has the right to live in a balanced environment and has a duty to defend it (Article 90). In addition, the State must ensure: (i) the promotion of initiatives that ensure ecological balance and environmental conservation and (ii) implementation of pollution prevention and control policies, and integration of environmental issues in all sectoral policies, to guarantee citizens the right to live in a balanced environment supported by sustainable development (Article 117).

The proposed Project must comply with the legal requirements for environmental licensing, considering not only the specific regulations of the EIA process, but also all applicable environmental regulations (biophysical and social) that may be relevant to the Project throughout its life cycle (build, operate and decommission). The environmental statutes and regulations most relevant to the proposed Project's EIA process include:

- National Environmental Policy, Resolution No. 5/1995, of 3 August;
- Environmental Law No. 20/1997, of 1 October.
- Regulation on the Environmental Impact Assessment Process, approved by Decree No. 54/2015, of 31 December;
- Regulation on the Environmental Audit Process, approved by Decree No. 25/2011, of 15 June.
- Regulation on Environmental Inspection, approved by Decree No. 11/2006, of 15 June;

- General Directive for Preparation of Environmental Impact Studies, approved by Ministerial Diploma No. 129/2006, of 19 July;
- General Directive for the Public Participation Process (PPP) in the Environmental Impact Assessment Process, approved by Ministerial Diploma No. 130/2006, of 19 July.
- Environmental Law No. 16/1991, of 3 August.
- Regulation on Environmental Quality and Effluent Emission Standards, approved by Decree no. 18/2004, of 2 June, with amendments to Decree No. 67/2010, of 31 December;
- Regulation on the Management of Solid Urban Waste, approved by Decree no. 94/2014, of 31 December, and Regulation on the Management of Hazardous Waste, approved by Decree No. 83/2014 of 31 December;
- National Land Policy and respective Implementation Strategies, approved by Resolution No. 10/95, of 17 October;
- Land Law (Law No. 19/97, of 1 October) and respective Regulation, approved by Decree No. 66/98, of 8 December, with amendments to Decree No. 50/2007, of 16 of October, and Decree No. 43/2010, of 20 October;
- Land Use Planning Law (Law No. 19/2007, of 18 July) and respective Regulation, approved by Decree No. 23/2008, of 1 July;
- Directive on the Expropriation Process for Territorial Planning, approved by Ministerial Diploma No. 181/2010, of 3 November;
- Law on the Protection of Cultural Heritage (Law No. 10/88, of 22 December) and the Regulation for the Protection of Archaeological Heritage, approved by Decree No. 27/94, of 20 July;
- Labour Law (Law No. 23/2007, of 1 August), as well as the associated occupational health and safety regulations;
- Forest and Wildlife Law (Law No. 10/99, of 7 July) and respective Regulation, approved by Decree No. 12/2002, of 6 July;
- Law on the Protection, Conservation and Sustainable Use of Biological Diversity (Law No. 16/2014, of 20 June, amended and republished by Law No. 5/2017, of 11 May) –, and respective Regulation, approved by Decree No. 89/2017, of 29 December.
- Regulation on the Protection, Conservation and Sustainable Use of Avifauna, approved by Decree No. 51/2021, of 19 June.

The relevance and applicability of these legal diplomas to the Project are briefly outlined in Error! Reference source not found.. Note that a given legal diploma may be relevant to different matters (e.g., the Environment Law must be considered in different aspects, such as biodiversity conservation and waste management, as well as other aspects).

Table 2-1- Main Environmental legislation

Relevant Legislation	Description	Relevance
ENVIRONMENTAL ASSESSMENT		
National Environmental Policy,Resolution n.º 5/95 of August 1st.	Lays the foundation for all environmental legislation. According to Article 2.1, the main objective of this policy is to ensure sustainable development to maintain an acceptable balance between socio-economic development and environmental protection. To achieve this objective, the requirements of the policy must ensure include incorporation of environmental considerations in socio-economic planning, management of the country's natural resources and protection of ecosystems and essential ecological processes.	The Project will achieve the policy objectives by incorporating environmental considerations in the engineering design to minimize impacts on natural resources and ecosystems.
Environmental Law No. 16 /1991of October 1st	Defines the legal basis for sound use and management of the environment for the country's sustainable development. Environmental Law applies to all public and private activities that directly or indirectly affect the environment.	The Project will consider the principle of sustainable development defined by Environmental Law throughout its entire lifecycle.
Environmental Inspection Regulation, Decree No. 11/ 2006 of June 15th	Regulates the supervision, control and verification of project compliance with national environmental protection standards.	During Project construction and operational phases, the MTA may carry out inspections to verify compliance with environmental legislation and the Environmental and Social Management Plan (ESMP). The Proponent must collaborate with and facilitate these inspections.
General Directive for Preparation of Environmental Impact Studies, Diploma Nº129/2006, of July 19th	Provides details on procedures for obtaining an environmental permit, as well as the format, general structure and content of the EIA report. It aims to standardize the procedures followed by various key participants in the AIA process.	The ESIA report was prepared in accordance with the specifications described in this Ministerial Diploma.
General Directive for the EIA PPP, Diploma Nº 130/2006 of July19th	Defines the basic principles, methodologies and procedures for the EIA PPP. It considers public participation to be an interactive process that begins at the design stage and continues throughout the life of the project.	The PPP report was prepared in accordance with the specifications described in this Ministerial Diploma.
Environmental Audit Process Regulation, Decree n.º 25/2011 of June 15th	Defines the environmental audit as an objective and documented instrument for management and systematic evaluation of the management and documentation system implemented to ensure protection of the environment. Its objective is to assess compliance of the operational and work processes with the environmental management plan, including the legal environmental requirements in force, approved for any given project.	During the Project lifetime, the Proponent will conduct independent annual environmental audits, without prejudice to any public environmental audits that may be requested under this decree.
Environmental Impact Assessment Process Regulation Decree Nº 54 /2015 of December 31ST	Establishes the EIA process as one of the fundamental instruments for environmental management, aimed at mitigating negative impacts of public and private sector projects on the natural and socioeconomic environment, by means of environmental studies before project start. Defines the EIA process, necessary environmental studies, PPP, study review process, decision process on environmental feasibility and environmental license issue. It applies to all public and private activities with a direct or indirect influence on the environment.	This document was complied for the ESIA process in accordance with this regulation. An environmental license will be obtained from MTA, and issue of this license precedes any other license or authorization required for the Project.

Relevant Legislation	Description	Relevance
ATMOSPHERIC EMISSIONS AND AIR QUALITY		
Environmental Law Nº 20/97 of October 1st	Article 9 prohibits the discharge of any toxic substances into the atmosphere above legal limits. Emission standards are defined by the Environmental Quality and Effluent Emission Standards Regulation, approved by Decree No. 18/2004, of 2 June (see below).	The Project will comply with ambient air quality and atmospheric pollutant emission standards, so as not to cause damage to the environment.
Environmental and Effluent Emission Quality Standards Regulation, Decree No. 18/2004, of June 2nd	Establishes parameters for maintaining air quality parameters (Article 7), gaseous pollutant emission standards by industry type (Article 8), and gaseous pollutant emission standards from mobile sources (Article 9), including light and heavy vehicles.	
WATER RESOURCES AND WATER QUALITY		
Water Law, Law Nº 18/91 of August 3rd	This law is based on the principle of public water usage, water management based on river basins and the user-pays and polluter-pays principle. It seeks to ensure ecological and environmental balance. The use of water requires either a concession (permanent or long-term uses) or a license (short-term uses). Licenses are valid for renewable periods of 5 years, whilst concessions are valid for renewable periods of 50 years. Article 54 specifies that any activity with the potential to contaminate or degrade public waters, in particular the discharge of effluents, is subject to a special authorization to be issued by the Regional Water Administration and payment of a fee.	If a project needs to capture water from natural water bodies (e.g., to produce concrete), it is necessary to obtain a license from the competent authority (Regional Water Administration). If a project needs to release effluents into water bodies (such as in encampments), a license must be obtained for this purpose.
Environmental and Effluent Emission Quality Standards Regulation, Decree No. 18/2004, of June 2nd	Determines that, when industrial effluents are discharged into the environment, the final discharged effluents must comply with the rules for discharges as established in Annex III of the Decree. Domestic effluent discharges must comply with the discharge regulations as set out in Annex IV.	The Project will respect the effluent emission limits established in this regulation, so as not to harm the environment.
POLLUTION AND WASTE MANAGEMENT		
Environmental Law, Nº 20/97 of October 1st	Prohibits the production and disposing of any toxic or pollutant substances in soil, subsoil, water or atmosphere, as well as prohibiting any activities that may accelerate erosion, desertification, deforestation or any other form of environmental degradation, in excess of the limits established by law (Article 9).	The Project includes measures to avoid pollution throughout its lifecycle. All projects comply with the requirements described in this regulation.
Urban Solid Waste Management Regulation, Nº94/2014 of December 31st	Establishes the legal framework for solid urban waste management. The fundamental objective is to establish rules for the production, collection and disposal of urban solid waste to minimize its negative impacts on health and the environment. Urban solid waste under the terms of this Decree is classified in accordance with the Mozambican Standard NM339 – Solid Waste – Classification. Waste management obligations are assigned to Municipal Councils and District Governments, in their respective areas of jurisdiction.	The project will implement adequate waste management practices throughout their lifecycles. The Project will comply with the requirements described in this regulation.
Hazardous Waste Management Regulation, Decree Nº83/2014 of December 31st	Establishes the legal framework for hazardous waste management. The fundamental objective is to establish rules for the production, collection and disposal of hazardous waste to minimize its negative impacts on health and the environment. Annex IX of this Decree presents waste classifications. The MTA is given powers to manage hazardous waste, through the licensing of management units. Only registered and licensed entities can collect and transport waste outside installation boundaries.	

Relevant Legislation	Description	Relevance
LAND USE AND RESETTLEMENT RIGHTS		
National Land Policy. Resolution Nº10/95 of October 17th	Establishes that the State must provide land for each family to build or own their home and is responsible for planning the use and physical occupation of land, although the private sector can participate in preparing plans.	The Project will comply with the principles of the policy, in accordance with the regulations defined in the laws they implement.
Land Law, Law Nº19/97 of October 1st	Defines land use rights, including details on customary rights and procedures for the acquisition and utilization of land use rights (DUATs) by communities and individuals. This law recognizes and protects 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 Proponent owns the DUAT for the Project area. The DUAT acquisition process comply with Land Law requirements, considering pre-existing land rights of the community.
Land Law Regulation Decree Nº66/98 of December 8th	Defines separate total protection zones for nature conservation and State protection, as well as partial protection zones where land use and benefit rights cannot be issued and where activities cannot be implemented without a license. Partial protection zones include a 50 m strip along lakes and rivers, a 100 m strip along the coastline and estuaries, 50 m along overhead, surface or underground ducts / cables for electricity, telecommunications, oil, gas and water, 30 m corridor surrounding primary roads and 15 m surrounding secondary and tertiary roads.	This regulation defines total and partial protection zones where land use is restricted. The Project does not interfere with these buffer zones.
Regulation of the Resettlement Process resulting from Economic Activities. Decree Nº31/2012 of August 8th	Defines guidance rules and principles to be followed in resettlement processes resulting from implementation of public and private economic activities. Article 15 states that the Resettlement Plan is part of the EIA process and specifies that it must be approved prior to the issue of an environmental license.	The Project does not result in physical or economic resettlement, so there's no need to develop a Resettlement Plan.
Territory Planning Regulation. Decree 23/2008 of July 1st	Defines the general bases for national territory planning to ensure rational and sustainable use of natural resources, regional potential, urban centres and infrastructure, and to promote national cohesion and the safety of the population. Articles 68 to 71 describe procedures for the expropriation of private property for reasons of national public interest. Article 70 states that expropriation must be preceded by fair compensation.	No land expropriation or land rights are necessary for Project implementation.
Directive on the Expropriation Process for Land Use Planning. Diploma Nº181/2010 November 3rd	Sets out expropriation process procedures for land use planning purposes, including procedures for issuing a declaration of public interest, compensation for expropriation (including calculation methods), and for the expropriation process itself.	No expropriation of land or land use rights in the Project area is required.
Gender Policy and its Strategy for Implementation of August, 2018	It is based on the analysis of the current situation in Mozambique and aligns with the contents and structure of the SADC Protocol on Gender and Development. Define the vision, mission and general principles, the objective of the strategic objectives in the various axes to achieve gender equality, as well as measures to be taken to improve the overall efficiency of the instruments for its implementation. This SADC protocol addresses the need for financial and operations management, organization and predictable resources for dissemination, coordination, training and guidance of the sectors, which are offered for its fulfillment.	The Project will comply with the principles of the policy.
CULTURAL HERITAGE		
Cultural Heritage Law. Law Nº/88 of December 22nd	The objective is to protect material or non-material cultural heritage. Cultural heritage is defined in this law as the "set of material and intangible assets created or integrated by the Mozambican people throughout history, with relevance to definition of the Mozambican cultural identity."	The potential presence of cultural heritage in the Project area was assessed in the ESIA. Archaeological objects may also

Relevant Legislation	Description	Relevance
	Material cultural goods include monuments, groups of buildings with historical, artistic or scientific relevance, places or sites (with archaeological, historical, aesthetic, ethnological or anthropological interest) and natural elements (physical and biological formations of special interest from an aesthetic or scientific viewpoint).	be found during construction of the Project. If this happens, the Proponent must stop work and immediately report the finding to the relevant cultural heritage institution.
BIODIVERSITY		
Environmental Law Nº 20/97 of October 1st	Articles 12 and 13 define that the planning, implementation and operation of projects must ensure the protection of biological resources, in particular species of flora and fauna threatened with extinction or that require special care, due to their genetic, ecological, cultural or scientific value. This aspect extends to their habitats, especially any present in environmental protection areas.	The Project considers the protection of biodiversity. The potential presence of relevant biodiversity values in the Project area was assessed in the ESIA.
Forest and Wildlife Law Nº 10/99 of July 7th	Establishes basic rules and principles for the protection, conservation and sustainable use of forest and wildlife resources. Article 10 defines protection zones, as demarcated areas of the territory, representative of the national natural heritage, included due to their biodiversity, fragile ecosystems or the conservation of animal and plant species.	No protection areas, as defined by this Law, are affected by the Project.
Forest and Wildlife Law Regulation. Decree Nº89/2017 of December 29th	Applies to the protection, conservation, use, exploitation and production activities involving flora and fauna resources. It includes the trade, transport, storage and primary artisanal and industrial transformation of these resources. It includes a list of protected species of fauna in Appendix II, and which prohibits hunting.	The Proponent would notify the MTA if a species listed in this regulation is captured or disturbed.
Law on the Protection, Conservation and Sustainable Use of Biological Diversity, and respective Regulation. Law Nº16/2014 of June 20th	This law establishes the basic principles and standards for the protection, conservation, restoration and sustainable use for biological diversity use in the national territory, in particular in conservation areas. Article 11 of the Regulation establishes that cultural and natural monuments must be preserved. These include areas with one or more unique aesthetic, geological, religious, historical or cultural values which given their rarity, should be preserved. Natural monuments can include trees of ecological, aesthetic, historical and cultural value. Article 16 specifies that all activities that may result in alterations to the vegetation cover, or which may degrade the flora, fauna or ecological processes to the point of compromising their maintenance, are prohibited within natural parks, unless necessary for scientific or management reasons.	No conservation areas, as defined by this Law, are affected by the Project.
Regulation for the Protection, Conservation and Sustainable Use of Avifauna. Decree51/2021 of June 19th	This Decree regulates the protection, conservation and sustainable use of avifauna, including their natural, continental, marine, lake and river habitats. Art 5 defines “Key Biodiversity Areas”, and “Important Bird Zones” as avifauna protection zones ” and Art. 4 prohibits the exercise of any activity or construction of infrastructure capable of disturbing avifauna or its habitat in the protection areas, and any economic or social infrastructure to be built in sensitive areas for birds must respect international good practice standards, ensuring the placement of signalling devices that prevent bird collisions or any other damage that could affect the avifauna. Appendices A and D define the protected species that may not be exploited, and Appendix B defines the species of avifauna in Mozambique included in CITES.	The Project considers the protection of avifauna as well as their habitats. There is no presence of relevant potential avifauna values in the Project area, namely “Key Biodiversity Areas”, and “Important Bird Zones”.
WORK AND SAFETY		
Labour Law Nº23/2007 of August 1st	This law applies to legal subordinate work relationships established between national and foreign employers and workers, across all industries, operating in the country. Chapter VI provides the safety, hygiene and health principles.	The Proponent will provide its workers with good physical, environmental and moral work conditions, inform them about the risks of their work and

Relevant Legislation	Description	Relevance
		instruct them on correct compliance with health and safety standards at work.
Regulation on General Labour Inspection. Decree Nº45/2009 of August 14th	This regulation establishes the rules regarding inspection activities, within the scope of work legality control. Section 2 of Article 4 outlines the employer's responsibilities in terms of preventing occupational health and safety risks for employees.	The Proponent will comply with the requirements. In the case of an inspection, the Proponent must provide all necessary information to the inspectors.
Legal Regime on Workplace Accidents and Occupational Illnesses. Decree Nº 62/2013 of December 4th	Revokes Legislative Diploma No. 1706, of 19 October 1957 and does not apply to employees and agents of the State and Local Authorities. Specifies that the employer is responsible for adopting the measures prescribed in the laws and regulations relating to the prevention of accidents at work and occupational illnesses.	The Proponent will comply with the requirements. In the case of an inspection, the Proponent must help to provide all necessary information to the inspectors.
Law for the Protection of Individuals, Workers and Job Seekers with HIV/AIDS. Decree Nº19/2014 of August 27th	This law establishes general principles that aim to ensure that no employees or job seekers are discriminated against in the workplace or when applying for jobs, because they are suspected of having or have HIV/AIDS. Article 47 states that workers and job seekers shall not be discriminated against in their rights to work, training, promotion, and career advancement, on account of being HIV positive. Article 52 prohibits the requirement for HIV testing when applying for jobs, maintaining employment, accessing training or for qualification, promotion, or any other employment activity.	HIV/AIDS testing of job seekers is prohibited. Testing workers without the worker's consent is also prohibited. The Proponent will train and reorient all HIV positive workers who are able to perform their duties at work with activities compatible with their abilities.

2.3 International Guidelines and Policies

This ESIA was prepared in accordance with national legislation and in-line with international best practices, including African Development Bank (AfDB) Integrated Safeguards System (ISS) Policy and its Operational Safeguard Requirements for environmental and social assessment and public participation, and World Bank (WB) environmental and social standards and environmental, health and safety guidelines.

The main international standards and guidelines applicable to this Project are described below in **Error! Reference source not found.**.

Table 2-2- International EIA Best Practice Policies and Guidelines

International Guideline / Standard	Description	Requirement in terms of National Legislation
Project Categorization		
African Development Bank (AfDB) Integrated Safeguards System (ISS) (2013)	AfDB ISS require a project categorization. Projects financed directly by the AfDB are classified into three categories, depending on the expected impact of the potential benefits and adverse impacts of the project: – Category 1 projects require a complete ESIA, including preparation of an ESMP. These projects will likely result in major adverse environmental and/or social impacts that are irreversible, or will significantly affect environmental or social elements judged sensitive by the Bank or the client country; – Category 2 projects require the development of an ESMP. These projects are likely to have detrimental and site-specific environmental and/or social impacts that are less adverse than those of Category 1 projects, and that could be minimized by applying mitigation measures or incorporating internationally recognized design criteria and standards; – Category 3 projects do not require an impact assessment. These projects do not involve any adverse physical intervention in the environment and do not induce any adverse environmental or social impacts. This project is categorized as category 1 according to the AfDB environmental categorization (OS 1) because is likely to cause significant environmental and social impacts. Category 1 project require Full ESIA.	Regulation on the Environmental Impact Assessment Process, approved by Decree No. 54/2015, of 31 December, defines projects in four categories: A+, A, B and C. An ESMP is required for category C projects. The national process for categorization generally complies with international best practices.
World Bank (WB) Environmental and Social Framework (ESF) (2017)	The objective of the WB ESF is to ensure that projects financed by the WB are environmentally and socially sustainable, and that the decision-making process is improved through appropriate to assessment and management of the environmental and social risks. The policy is triggered if a project is likely to result in potential (negative) environmental and social risks and impacts in its area of influence. WB will classify all projects (including projects involving Financial Intermediaries (FIs)) into one of four classifications: High Risk, Substantial Risk, Moderate Risk or Low Risk. In determining the appropriate risk classification, the Bank will consider relevant issues, such as the type, location, sensitivity, and scale of the project; the nature and magnitude of the potential environmental and social risks and impacts; and the capacity and commitment of the Borrower (including any other entity responsible for the implementation of the project) to manage the environmental and social risks and impacts in a manner consistent with the Environmental and Social Safeguards (ESS).	
Assessment and Environmental and Social Management		
AfDB Operational safeguard OS 1 – Environmental and social assessment	OS1 emphasizes the importance of managing the environmental and social performance of a project throughout its lifecycle. OS1 1 requires the client to carry out an environmental and social assessment process and to establish and maintain an Environmental and Social Management System (E&SMS), appropriate to the nature and scale of the project and commensurate with the level of environmental and social risks and impacts.	Regulation on the Environmental Impact Assessment Process, approved by Decree No. 54/2015, of 31 December, states that an environmental and social assessment process is

International Guideline / Standard	Description	Requirement in terms of National Legislation
World Bank (WB) Environmental and Social Safeguard ESS1 Assessment and Management of Environmental and Social Risks and Impacts	ESS1 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 a project. The objectives are to: - To identify and evaluate environmental and social risks and impacts of the Project; - To adopt a mitigation hierarchy to anticipate and avoid, or where avoidance is not possible, minimize, and, where residual impacts remain, compensate/ offset for risks and impacts to workers, affected communities, and the environment; - To promote improved environmental and social performance through the effective use of management systems; - To ensure that grievances from affected communities and external communications from other stakeholders are responded to and managed appropriately; and - To promote and provide means for adequate engagement with affected communities throughout the Project cycle on issues that could potentially affect them and to ensure that relevant environmental and social information is disclosed and disseminated.	necessary for each Project with potential to generate environmental and social impacts. This evaluation results in an ESMP, which the Proponent can develop in a ESMS. National regulations are therefore in-line with international best practices.
Public Participation		
AfDB - Stakeholder Consultation and Participation Guidelines	For Category 1 projects, the AfDB guidelines will require significant consultation during the EIA. Significant consultations are required with relevant stakeholders, including potential beneficiaries, affected groups, civil society organizations and local authorities, to discuss the environmental and social aspects of the project, as well as to incorporate public perspectives into the analysis. The guidelines state that these consultations must be carried out in compliance with national legal requirements, providing they meet AfDB 's minimum requirements for public consultation, summarized below: - Consultation must be carried out as early as possible; - Information about the Project and the EIA must be disseminated in a timely manner and in a form and language accessible to the groups being consulted; - Relevant stakeholders should be consulted during the scoping phase and the EIS phase; - Stakeholder input should be incorporated with the EIS report and reflected in the proposed mitigation, if applicable; - Stakeholder consultation should be continued during the construction and operational phases.	The Environmental Impact Assessment Process Regulation, approved by Decree No. 54/2015, of 31 December, and the General Guidelines for the Process of Public Participation in the Environmental Impact Assessment Process, approved by Ministerial Diploma No. 130/2006, of 19 July, fully comply with the requirements of these international guidelines and policies regarding stakeholder consultation. The process includes consultation with local communities, companies and a range of government sector entities (state companies, national, provincial and local departments). The stakeholder consultation process will solicit participation from potential stakeholders through newspaper advertisements and public meetings.
World Bank (WB) Environmental and Social Standard 10. Stakeholder Engagement and Information Disclosure .	ESS10 recognizes the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice. Effective stakeholder engagement can improve the environmental and social sustainability of projects, enhance project acceptance, and make a significant contribution to successful project design and implementation. The objectives are to: - To establish a systematic approach to stakeholder engagement that will help Borrowers identify stakeholders and build and maintain a constructive relationship with them, project-affected parties.	

International Guideline / Standard	Description	Requirement in terms of National Legislation
	- To assess the level of stakeholder interest and support for the project and to enable stakeholders' views to be considered in project design and environmental and social performance. - To promote and provide means for effective and inclusive engagement with project-affected parties throughout the project life cycle on issues that could potentially affect them. - To ensure that appropriate project information on environmental and social risks and impacts is disclosed to stakeholders in a timely, understandable, accessible, and appropriate manner and format. - To provide project-affected parties with accessible and inclusive means to raise issues and grievances, and allow Borrowers to respond to and manage such grievances.	
Resettlement		
AfDB Involuntary Resettlement Policy	BAD's Involuntary Resettlement Policy covers the involuntary displacement and resettlement of people caused by a AfDB financed project and applies when a project results in the displacement or loss of housing, loss of property, or income for residents in the project. The overall aim of the policy is to ensure that people who must be displaced are treated equitably, and that they share in the benefits of the project causing their resettlement. The policy has the following key objectives: - To avoid involuntary resettlement wherever possible, or to minimize resettlement impacts when population displacement is unavoidable, by exploring all viable project engineering concepts. Particular attention should be paid to sociocultural considerations, such as land of cultural or religious significance, the vulnerability of the affected population, and the availability of in-kind replacement assets, especially when they have important intangible implications. When large numbers of people or a significant portion of the affected population may be subjected to displacement or impacts that are difficult to quantify and compensate for, serious consideration should be given to the alternative of not going ahead with the project; - To ensure that displaced persons receive resettlement assistance, preferably under the project, in such a way that their living standards, income earning capacity and production levels are improved; - To provide explicit guidance to AfDB staff and clients about the conditions necessary to address involuntary resettlement issues in AfDB operations, to mitigate the negative impacts of displacement and resettlement, and to establish a sustainable economy and society; - To establish a mechanism to monitor the performance of involuntary resettlement programmes in AfDB operations and remediate problems as they arise to guard against poorly prepared and implemented resettlement plans.	National resettlement requirements are defined in the Regulation on the Resettlement Process resulting from Economic Activities, approved by Decree No. 31/2012, of 8 August, which defines the basic rules and principles for resettlement processes resulting from implementation of public or private economic activities. Resettlement will not be required for the Project under review.
AfDB OS 2: Involuntary Resettlement: Land Acquisition, Population	OS2 aims to facilitate the operationalisation of the AfDB's Involuntary Resettlement Policy in the context of the requirements of OS1 and thereby mainstream resettlement considerations into Bank operations. The term resettlement refers to both physical and economic displacement. Resettlement is considered involuntary when the project-affected people are not able to refuse the activities that result in their physical or economic displacement. This occurs	

International Guideline / Standard	Description	Requirement in terms of National Legislation
Displacement and Compensation	in cases of lawful expropriation or temporary or permanent restrictions on land use, and in negotiated settlements in which the buyer can resort to expropriation or impose legal restrictions on land use if negotiations with the seller fail	
World Bank (WB) Environmental and Social Safeguard 5 Land Acquisition and Involuntary Resettlement	ESS5 recognizes that project-related land acquisition and restrictions on land use can have adverse impacts on communities and persons that use this land. The objectives are to: - To avoid, and when avoidance is not possible, minimize displacement by exploring alternative project designs. - To avoid forced eviction. - To anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use by (i) providing compensation for loss of assets at replacement cost and (ii) ensuring that resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected. - To improve, or restore, the livelihoods and standards of living of displaced persons. - To improve living conditions among physically displaced persons through the provision of adequate housing with security of tenure at resettlement sites.	National resettlement requirements are defined in the Regulation on the Resettlement Process resulting from Economic Activities, approved by Decree No. 31/2012, of 8 August, which defines the basic rules and principles for the resettlement processes resulting from implementation of public or private economic activities. The national resettlement regulation is in-line with international best practice, with the goals of minimizing resettlement where possible and to restore and enhance living standards for resettled people when resettlement is unavoidable.
Pollution Prevention		
AfDB OS 4: Pollution Prevention and Control, Greenhouse Gases, Hazardous Materials and Resource Efficiency	OS4 recognizes that increasing economic activity and urbanization often produce increasing levels of pollution to air, water and land, and consume finite resources in ways that can threaten people and the environment at local, regional and global levels. OS4 aims to: avoid or minimize adverse impacts on human health and the environment, by avoiding or minimizing pollution from project activities; promoting more sustainable use of resources, including energy and water; and reducing project-related emissions that contribute to climate change.	The Environmental Law (Law No. 20/97, of 1 October) includes provisions for controlling pollution, and the Regulation on Environmental Quality and Effluent Emission Standards, approved by Decree No. 18/2004 of 2 June, defines environmental quality standards (for air and water) as well as effluent emission limits. Environmental quality issues will be addressed in the ESMP. Where national standards do not exist (such as for noise), international guidelines will be adopted as Project standards.
World Bank (WB) Environmental and Social Standard 3. Resource Efficiency and Pollution Prevention and Management	ESS3 recognises 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. The objectives are to: - To avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities; - To promote more sustainable use of resources, including energy and water; and - To reduce Project-related GHG emissions.	
Biodiversity		
AfDB OS 3: Biodiversity and Ecosystem Services	OS 3 recognizes that the protection and conservation of biodiversity, maintenance of ecosystem services and sustainable management of living natural resources are fundamental to sustainable development. Its objectives are to protect and conserve biodiversity; maintain the benefits of ecosystem services; promote the sustainable management and use of natural resources through practices that integrate conservation and development.	The protection of biodiversity in Mozambique is defined in the Law on the Protection, Conservation and Sustainable Use of Biodiversity (Law No. 16/2014, of 20 June,

International Guideline / Standard	Description	Requirement in terms of National Legislation
World Bank (WB) Environmental and Social Standard 6. Biodiversity Conservation and Sustainable Management of Living Natural Resources	ESS6 recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and sustainably managing living natural resources are fundamental to sustainable development. The objectives are to: - To protect and conserve biodiversity; - To maintain the benefits from ecosystem services; and - To promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.	amended and republished by Law No. 5/2017, of 11 May). This law establishes the basic principles and standards for the protection, conservation, restoration and sustainable use of biological diversity in the national territory, in particular in conservation areas.
Socio-economics		
AfDB OS 5: Labour Conditions, Health and Safety	OS5 recognizes that the pursuit of economic growth through job creation and income generation must be accompanied by the protection of workers' fundamental rights and recognizes that project activities, equipment and infrastructure can increase the community's exposure to risks and impacts OS5 aims to: establish, maintain and improve the worker-administration relationship; promote equal opportunities for work and compliance with national labour and employment laws; protect the workforce by banning child and forced labour; protect vulnerable workers; and promote safe and healthy working conditions and the health of workers and aims to anticipate and avoid adverse impacts on the health and safety of the affected community during the project lifecycle, and to ensure that personnel and property safety measures prevent or minimize risks to the safety and protection of the community.	The protection of workers' fundamental rights is fully covered by Mozambican law, through the Labour Law (Law No. 23/2007, of 1 August) and auxiliary legislation (see analysis of the legal framework in section 2.2 for more information). Community health and safety is not specifically defined in national law as an independent concept. However, the requirement to protect community health and to ensure community safety can be derived from the overall national legal framework
World Bank (WB) Environmental and Social Standard 2. Labour and Working Conditions	ESS2 recognises that the pursuit of economic growth through employment creation and income generation should be balanced with protection for the basic rights of workers. The objectives are to: - To promote fair treatment, non-discrimination and equal opportunity of workers, and compliance with national labour and employment laws; - To establish, maintain and improve the worker management relationship; - To promote compliance with national employment and labour laws; - To protect the workforce by addressing child labour and forced labour; and - To promote safe and healthy working conditions, and to protect and promote the health of workers.	
World Bank (WB) Environmental and Social Standard 4. Community Health and Safety	ESS4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. The objectives are to: - To anticipate and avoid adverse impacts on the health and safety of the affected community during the Project from both routine and non-routine circumstances; and - To ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the affected communities.	

International Guideline / Standard	Description	Requirement in terms of National Legislation
World Bank (WB) Environmental and Social Standard 8. Cultural Heritage	ESS8 recognizes the importance of cultural heritage for current and future generations. The objectives are to: - To protect cultural heritage from the adverse impacts of project activities and support its preservation; and - To promote the equitable sharing of benefits from the use of cultural heritage.	Under the Law for the Protection of Cultural Heritage (Law No. 10/88, of 22 December), protected cultural heritage includes material goods: monuments, groups of buildings with historical, artistic or scientific importance, places (with archaeological interest, historical, aesthetic, ethnological or anthropological) and natural elements (physical and biological formations with aesthetic or scientific interest).

2.4 Relevant International Conventions

International conventions relevant to the Project under evaluation are listed in Error! Reference source not found.. Where relevant, these will be addressed in detail in the relevant chapters.

Table 2-3 - Relevant international conventions

Convention	Description
BIODIVERSITY	
African Convention on the Conservation of Nature and Natural Resources, 1968	The fundamental principle of this Convention is commitment by the states involved to adopt measures to ensure the preservation, use and development of soil, water, flora and fauna resources, in accordance with scientific principles and with due respect for the best interests of individuals. Pursuant to Resolution No. 18/81, of 30 December, the Republic of Mozambique acceded to the African Convention on the Conservation of Nature and Natural Resources.
United Nations Convention on Biological Diversity, 1993	This convention is a legally binding international treaty with three main objectives: conservation of biodiversity, sustainable use of biodiversity and fair and equitable sharing of benefits arising from the use of genetic resources. Its general objective is to encourage activities that lead to a sustainable future. Mozambique ratified this convention in 1994, through Resolution No. 2/94.
Convention on International Trade in Endangered Species of Wildlife and Flora (CITES), 1973	Ensures that the international trade in specimens of wild animals and plants does not pose a threat to their survival. It grants varying levels of protection to over 33,000 species of animals and plants. This Convention was ratified by Mozambique through Resolution No. 20/1981.
Convention on the Conservation of Migratory Species Belonging to Wild Fauna (Bonn Convention, CMS), 1979	Aims to promote measures to protect migratory wildlife species throughout their natural area of distribution, as part of a strategy for the conservation of wildlife and habitats on a global scale. Ratified by Mozambique in 2008.
SADC Protocol on Wildlife Conservation and Law Enforcement, 1999	Ensures the conservation and sustainable use of wildlife resources. Ratified by Mozambique in 2002.
WASTE/HAZARDOUS WASTE	
Basel Convention on the Control of Transboundary Movements of Hazardous Waste and its Disposal, 1989	This Convention regulates the import, export and transborder movement of hazardous waste. The Basel Convention has been replaced by the Bamako Convention (see below). The Republic of Mozambique ratified the Basel Convention on the Control of Transborder Movements of Hazardous Wastes and its Removal, through Resolution No. 18/96, of 26 November.
Convention on the Prohibition of Imports into Africa and the Control of Transborder Movements and Management of Hazardous Wastes in Africa, Bamako, 1991	During negotiation of the Basel Convention, African states, represented by the Organization of African Unity, adopted the Bamako Convention, believing that the Basel Convention was not rigorous enough. The Bamako Convention completely prohibits the import of hazardous waste into Africa. This Convention entered into force on 22 April 1998. The Republic of Mozambique ratified the Bamako Convention through Resolution No. 19/96, of 26 November.
AIR QUALITY / CLIMATE CHANGE	
United Nations Framework Convention on Climate Change (UNFCCC) and Kyoto Protocol, 1992 and 1997	UNFCCC is an international environmental treaty, produced with the aim of achieving stabilization of greenhouse gas concentrations in the atmosphere at levels low enough to prevent dangerous anthropogenic interference with the climate system. The Kyoto Protocol to the UNFCCC, adopted in December 1997 by most industrialized nations and some economies in Central Europe in transition, establishes a legal agreement on the reduction of greenhouse gas emissions, between 6% and 8% below 1990 levels on average, to be implemented between 2008 and 2012, defined as the first budget deadline for emissions. The UNFCCC was ratified through Resolution no. 2/94, of 24 August, and the Republic of Mozambique acceded to the Kyoto Protocol through Resolution no. 10/2004, of 28 July.
Vienna Convention for the Protection of the Ozone Layer,	Pursuant to Article 2.1 of this Convention, the Signatory Parties have assumed the obligation to take appropriate measures to protect human health and the environment against adverse

Convention	Description
1985, London 1990, Copenhagen 1992	effects resulting from or likely to result from human activities that alter or are likely to alter the ozone layer. Pursuant to Resolution No. 8/93, of 8 December, the Republic of Mozambique acceded to the Vienna Convention for the Protection of the Ozone Layer as well as the 1990 and 1992 Amendments.
Montreal Protocol on Substances that Deplete the Ozone Layer (UNEP), 1987	Defined to control the production of ozone depleting substances to reduce their abundance in the atmosphere and so protect the Earth's fragile ozone layer. The use of chlorofluorocarbons (CFCs) is prohibited. Ratified by Mozambique through Resolution No. 9/2009.
POLUTION PREVENTION	
Stockholm Convention on Persistent Organic Pollutants (POP), 2001.	Worldwide action and control of chemicals that persist in the environment, bioaccumulate 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 on Protection of the World Cultural and Natural Heritage	Developed to assist identification and protection of cultural (monuments, architectural assemblies and sites) and natural (natural forms, geological and physiographic formations and natural sites) heritage. Mozambique ratified this convention in 1982.
Convention for Safeguarding Intangible Cultural Heritage (UNESCO), 2003	Safeguards intangible cultural heritage and ensures respect for intangible cultural heritage of communities, groups and individuals. Ratified by Mozambique in 2007.
Convention on the Protection and Promotion of the Diversity of Cultural Expressions (UNESCO), 2005	Protects and promotes the diversity of cultural expressions, encourages dialogue between cultures and promotes respect for cultural diversity. Ratified by Mozambique in 2007.
HUMAN RIGHTS	
International Labour Organization conventions and national labour-related legislation	• Convention on Forced Labour, ratified in June 2003: Convention on Forced or Compulsory Labour; • Freedom of Association and Protection of the Right to Organize (December 1996): Convention on Freedom of Association and protection of the Right to Organise; • Right to Organize and Collective Bargaining (December 1996): Convention on the Right to Organise and Collective Bargaining; • Equal Remuneration Convention (June 1977): Convention on equal pay for male and female workers for work of equal value, and reference to established pay rates without discrimination based on gender; • Convention on the Abolition of Forced Labour (June 1977); • Discrimination (Employment and Profession) Convention (June 1977): Convention on Discrimination in Matters of Employment and Occupation; • The minimum age specified: 15 years (June 2003): Convention on Minimum Age for Employment; • Convention on the Worst Forms of Child Labour (June 2003); Convention on the Prohibition and Immediate Action for Elimination of the Worst Forms of Child Labour.
International Covenant on the Elimination of Racial Discrimination	Stated Parties "commit themselves 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 (CEDAW)	The Stated Parties have an obligation to guarantee equal rights for men and women to enjoy all economic, social, cultural, civil and political rights. Ratified in 2007.
International Convention on the Rights of Migrant Workers	Its main objective is to protect migrant workers and their families, a particularly vulnerable population, from exploitation and human rights violations. Signed in 2012 and ratified in 2013.
International Convention on the Rights of Persons with Disabilities	Stated Parties have an obligation to protect the rights and dignity of persons with disabilities. Signed in 2007.

Convention	Description
Protocols related to the African Union	Various protocols and charters for the promotion and protection of human rights and fundamental freedoms, the rights of children and others on the African continent.

3 Project Description

3.1 Location

The SS is in Tete Province, Cahora Bassa District, Songo Village (Figure 3-1) and has been operating since 1979. Cahora Bassa District is in the Centre-North of Tete Province, bordered to the North by Marávia and Chiúta Districts, to the East by Changara District, to the South by the Republic of Zimbabwe and to the West by Mágoe District.

Songo converter substation (Figure 3-1) lies west of Songo town centre, about 3 km south of the Zambezi River.

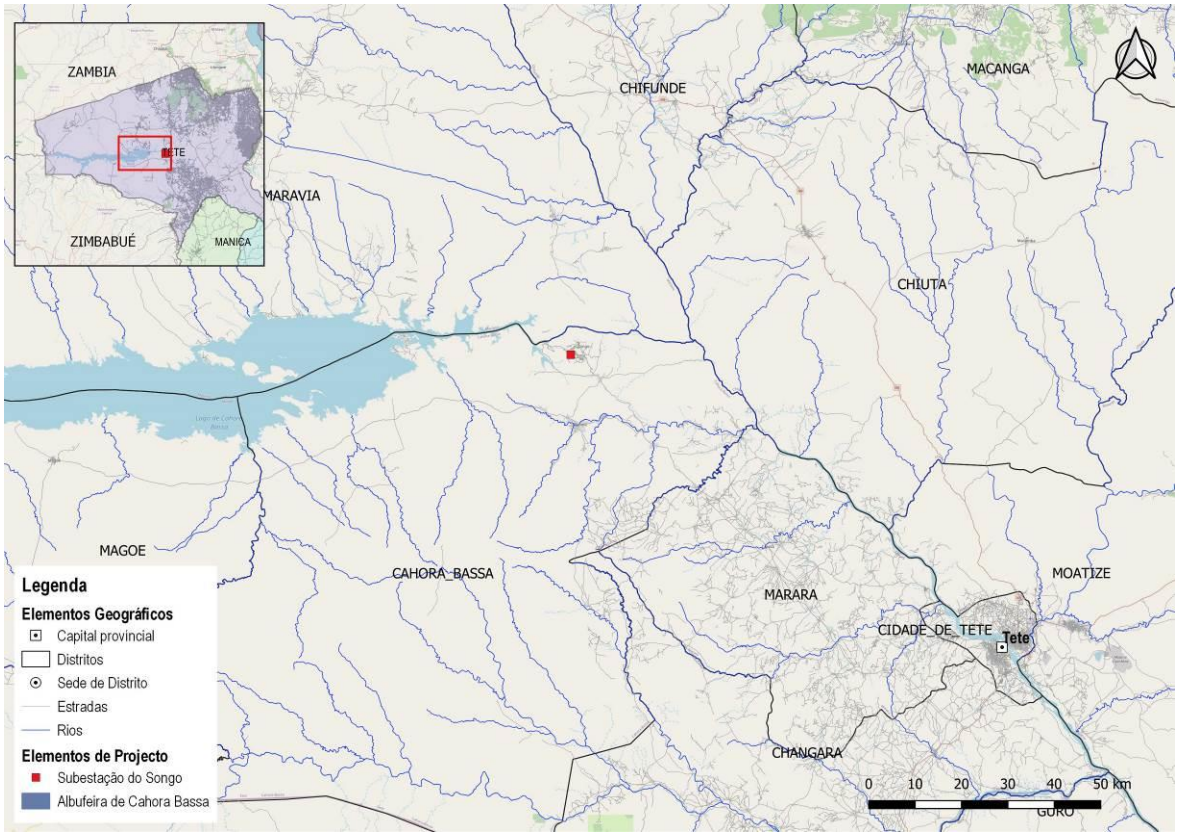


Figure 3-1- Songo converter SS in Tete Province

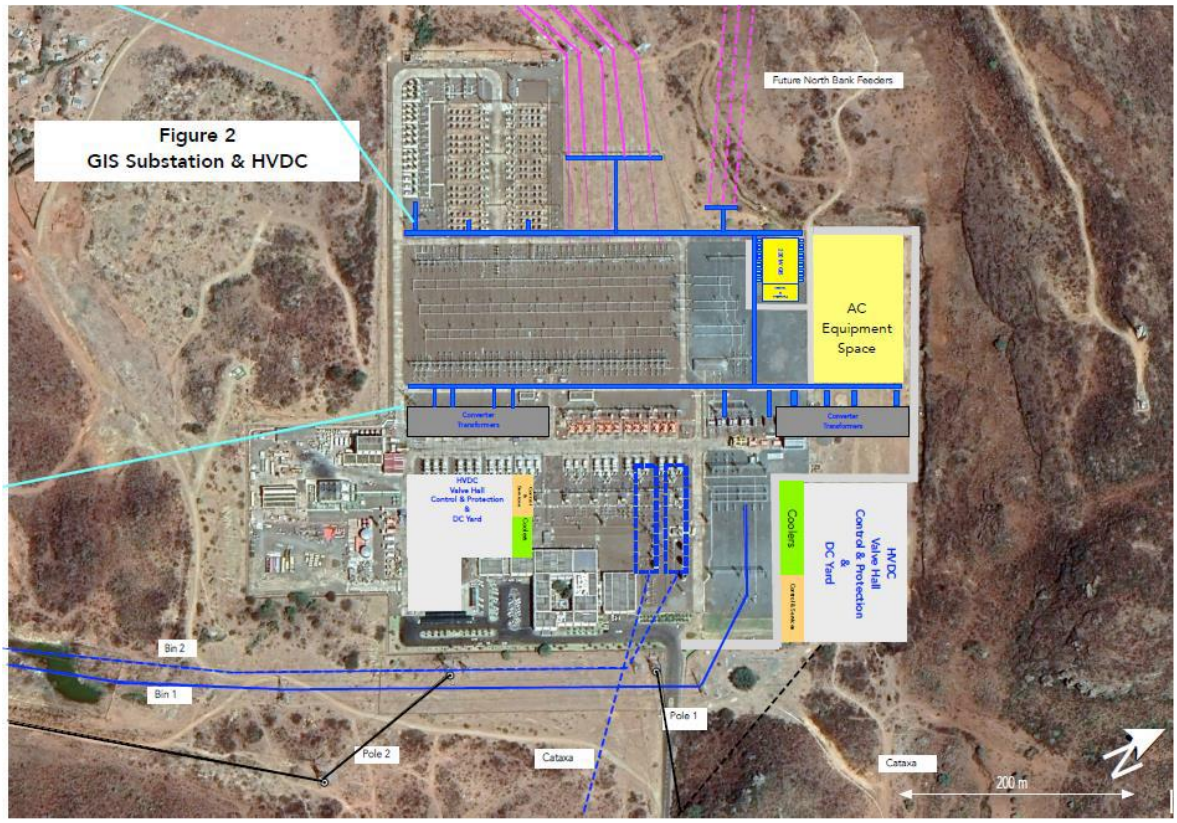


Figure 3-2 – Location of the proposed project implementation area.

3.2 Project Justification

The project to refurbish and modernize Songo converter substation, which the proponent intends to implement, consists as stated above, of replacing and refurbishing equipment and systems installed around 40 years ago, with a view to increasing the reliability, availability and sustainability of the equipment and extending the operational life of the converter SS.

However, to ensure continuity of electricity supply to customers during the refurbishment project execution period, a hybrid system must be implemented using the existing converter transformers as main units, a new pole and a new isolated 220kV SS constructed in the "North extension area", an area previously reserved for expansion of the SS.

The main objective of the SS refurbishment is to improve performance of the converter station in the medium and long-term to improving its reliability, availability and to ensure its useful life is extended to more than 40 years.

3.3 Project Alternatives

3.3.1 No action

In case of “No action” alternative, the availability of the existing scheme, without any further investments in the HVDC electric power transmission system, will steadily decline until the system becomes inoperable in year 2037. Beyond that date, only the parallel AC system will be available to deliver power from Songo to South Africa.

For HVDC system, the “Do Nothing” option would not reduce the following availability risk factors:

1. Obsolescence of HVDC conversion equipment.
2. Unavailability of spare parts and technical support for Valves, AC and DC switchyard equipment and Protection & Control systems.
3. Reduced operational expertise in HVDC conversion equipment repair and restoration.
4. Increased risk of inadvertent equipment damage during continued repair and life extension refurbishment work.

3.3.2 Brownfield Refurbishment: Replace One Pole at a time

The alternative “Replacing one Pole at a time” includes the following high level scope of work:

1. Refurbishment of existing Converter Transformers with bushings, barrier systems, coolers, tap changer, oil processing, protection upgrade and monitoring equipment to meet availability targets.
2. Replacement of Outdoor Converter Valves with a modern indoor valve in a valve hall, Valve Cooling, HVDC control and protection, measurement equipment and switching devices.
3. Evaluation and possible replacement of valve and transformer auxiliary services and communications
4. Evaluation and likely replacement of DC and AC yard equipment.

This type of option of replacement would require the HVDC system to be run in a monopolar operation and outage times for each Pole is estimated at 18 months.

Advantages:

1. CAPEX reduction by life extension of converter transformers (core, coils, tank) and possibly valve support towers.
2. Reduced interface and availability risk when compared with the two bridge replacement option since the complete work area will be de-energized.
3. Offers more valve design flexibility for suppliers.
4. Less complex interfacing as only interfacing between one old pole and one new pole will be required.

Disadvantages:

1. Transformer Unavailability risk is not completely mitigated and maintaining the larger inventory of units does not reduce the number of possible failure modes.

2. Converter Transformer CAPEX savings are not 100% since refurbishment costs may be 20% to 40% of new unit costs. Additionally, the existing two bridge 12 pulse “group pair” consists of six units and a corresponding new valve “group pair” would potentially consist of only three single phase three winding units. Therefore, achieved CAPEX savings may only range from 20% to 40% of new transformer costs.
3. Project execution risk from a construction safety, environmental, interfacing and availability risk is high with this option as the contractor has more scope in the energized and in service portion of the converter station.

Outage costs and additional line loss are highest in this option. This represents a one-time two year annual unavailability of 100% and 50% respectively. Significant time running in monopolar operation with the ground electrode is required. Overall, the only difference between this option and the two bridges per pole is the duration of outage time, proximity to energized areas and the associated cost/risk of these. Based on this, this option is not the most economically viable in the BCA.

3.3.3 Brownfield Refurbishment: Replace Two Bridges at a Time

The alternative “Replacing Two Bridges at a Time” includes the following high level scope of work:

1. Refurbishment of existing Converter Transformers with NCI bushings, barrier systems, coolers, tap changer, oil processing, protection upgrade and monitoring equipment to meet availability targets.
2. Replacement of Outdoor Converter Valves, Valve Cooling, HVDC control and protection, measurement equipment and switching devices.
3. Replacement of standoff insulating platforms and valve handling equipment.
4. Replacement of valve and transformer auxiliary services and communications.
5. Replacement of DC and AC yard equipment.

Outage times for each converter pair is assumed at 4 months in the BCA, and an additional Pole Outage for each converter pair replacement of 2 to 4 weeks for interface testing. Additionally, common Pole equipment such as Pole switches and Protection & Control would require an additional 3 months for installation and commissioning.

Advantages:

1. CAPEX reduction by life extension of converter transformers (core, coils, tank) and possibly valve support towers.
2. CAPEX savings in reduced new civil infrastructure requirements including concrete replacements.

Disadvantages:

1. Transformer Unavailability risk is not completely mitigated and maintaining the larger inventory of units does not reduce the number of possible failure modes.
2. Converter Transformer CAPEX savings are not 100% since refurbishment costs may be 20% to 40% of new unit costs. Additionally, the existing two bridge 12 pulse “group pair” consists of six units and a corresponding new valve “group pair” would potentially consist of only 3.

Therefore, achieved CAPEX savings may only range from 20% to 40% of new transformer costs.

3. HVDC suppliers will have to custom design a valve to operate outdoors on the existing platforms which may be perceived as a technical risk for suppliers that have not done this (Siemens/GE) or be perceived as a reason to “no Bid” if it is perceived by these suppliers that suppliers with existing experience (ABB) will have an unfair competitive advantage.
4. Outdoor valves may have a “unique” set of future operational considerations that cannot be compared with other industry user data.
5. Project execution risk from a safety, environmental, interfacing and availability risk is high with this option as the contractor has more scope in the energized and in service portion of the converter station.
6. More complex interim interfacing issues with running two new technology bridges with two existing technology bridges in a pole until the second pair of bridges in a pole is replaced.
7. Outage costs and additional line loss are high in this option. This represents a one-time annual unavailability of between 40% and 80%.
8. Operational constraints due to two bridges being out of service during the refurbishment, which will lead to a 6-bridge operation (12p). Referring to Error! Reference source not found., a fault on one of the remaining two bridges of the refurbished pole, would require a complete trip of that pole to maintain the 4-bridge operation. A trip on a group on the in service pole will take the system into a 7-bridge operation (12p + 1x6p) which requires two filters to be in service which may be hard considering the loss of generation due to the upgrades and the reactive power requirements.

Furthermore, the requirement to operate “new” and “old” equipment in parallel introduces a risk for both the new equipment and the old equipment and may lead to a decreased performance.

3.3.4 Greenfield/Hybrid (New Transformers)

Building one new pole in the open area to the north of the existing substation/converter station, then taking one old pole out of service and replacing that pole with a new one includes the following high level and detailed scope of work:

1. Construction of one new pole with a modern indoor valve hall and new DC switchyard.
2. Replacement of Existing Converter Transformers for the first new Pole installation.
3. Replacement of Outdoor Converter Valves, Valve Cooling, HVDC control and protection, measurement equipment and switching devices.
4. Cutover of the new Pole into the existing Bipole system.
5. Salvage of the one of the existing Pole areas for installation and cutover of the second Pole.

This type of option of replacement would allow the HVDC system to be kept in operation during construction and the cutover outage times for each new Pole would range from 2 to 4 weeks.

Additionally, this option of replacement could allow the HVDC system to be run in continuous 2x12 pulse operation. If the AC feeders are combined to feed both star and delta transformers. This would reduce the required AC apparatus per bridge by one half and provide some benefits for an enhanced

AC switchyard configuration. (Upon loss of one 12 pulse group, block two groups in Apollo. Upon loss of one group in Apollo, run in a reduced voltage mode).

Advantages:

1. OPEX reduction by reduction in the number of converter transformers and converter components.
2. Lowest outage requirements (7.7% to 15.4%).
3. Significantly reduced interface and availability risk when compared with the other replacement options since the complete work area will be de-energized.
4. Offers the most converter design flexibility and optimization for suppliers.
5. Lowest project execution, availability and interfacing risk.
6. Highest probability of maintaining 97% availability industry target.
7. Longest expected serviceable lifecycle.
8. Option for overload capability.

Disadvantages:

1. Higher initial CAPEX.
2. Utilization of the vacant area to the north of the existing substation may constrain possible future expansion activities.
3. Requires 12 pulse to six pulse coordination with Apollo.

3.3.5 Greenfield/Hybrid (Use of Existing Transformers)

Building one new pole in the open area to the north of the existing substation/converter station, then moving one pole of existing transformers for use in the new Pole. Subsequently, the second pole would be taken out of service and a new pole would be constructed in that area using the existing transformers.

The main factors influencing the NPV are:

1. Transformer project CAPEX of $90M to $100M are removed from this option (increase in NPV)
2. Sustainment Capital (future replacement of transformers) still required
3. Transformer related outage costs still applicable as per Brownfield options
4. Additional Transformer maintenance costs still applicable as per Brownfield options

Advantages:

1. Reduced initial CAPEX with some of the same advantages of the Greenfield/Hybrid Option
2. Transformers can be spaced with adequate fire separation to mitigate this risk

Disadvantages:

1. Construction outage times would be longer since transformers would have to be moved from one of the running poles
2. Additional risk of transformer damage during movement

3. Same NPV impact of transformer failure lost revenue and sustainment capital which reduces the NPV of this option.

This solution (Green field /Hybrid Existing Transformers) is the preferred alternative, however the bidder is proposing other solution, still under discussion with HCB and Owner´s engineer (Hacth).

3.3.6 Greenfield Hybrid Variant (New Transformers on new Greenfield Pole only)

Building one new pole (positive pole) in the open area to the north of the existing substation/converter station with new transformers. The main factors influencing the NPV are:

1. Transformer project CAPEX reduction (increase to NPV)
2. Sustainment Capital for Converter Transformers significantly reduced (increase in NPV)
3. Transformer related outage costs applicable as per Brownfield options reduced by one half
4. Transformer maintenance costs still applicable as per Brownfield options reduced by one half

Advantages:

1. Reduced initial CAPEX with most of the same advantages of the Greenfield/Hybrid Option
2. Transformers can be spaced with adequate fire separation to mitigate this risk
3. Complete rebuild of the Negative Pole valves could be deferred using parts from the Positive Pole.

Disadvantages:

1. Construction outage times would be longer since transformers would have to be moved from one of the running poles
2. Additional risk of transformer damage during movement for 4 units
3. Additional Transformer Transportation risk (owned by EPC contractor)
4. Requires 12 pulse to six pulse coordination with Apollo on one pole

3.3.7 Greenfield

Building one new Bipole in the open area to the north of the existing substation/converter station, then taking both old poles out of service and salvaging the area as required includes the following high level and detailed scope of work:

1. Construction of a new Bipole with a modern indoor valve hall and new DC switchyard.
2. Two valve groups per Pole is assumed (three single phase 3 winding transformers per pole only), with a 75% reduced voltage operation capability to cover for a single bridge loss at Apollo. The outage rate at Apollo should be evaluated against the incremental cost of two valve groups per pole.

3. Complete DC Yard replacement and valve halls would be 12 pulse and require only one Bypass switch per valve group. Suppliers would evaluate whether outdoor or indoor valve equipment is most economical.
4. New valve and transformer auxiliary services and communications:
5. Decommissioning of the existing Bipole system could be in scope or a separate contract:

For a new Bipole, required changes to the existing AC bus protection scheme and routing of additional controls for filter switching and coordination with the existing Pole may be simplified. There should be ample flexibility for the HVDC and electrode line connection routing. This type of option of replacement would allow the HVDC system to be kept in operation during construction and the cutover outage times for each new Pole would be minimal with the existing Poles available immediately for contingency.

Advantages:

1. OPEX reduction by reduction in the number of converter transformers and converter components.
2. Lowest outage requirements (Less than 5%) with old Poles available for contingency.
3. Significantly reduced interface and availability risk when compared with the other replacement options since the complete work area will be de-energized.
4. Offers the most converter design flexibility and optimization for suppliers.
5. Lowest project execution, availability and interfacing risk.
6. Highest probability of maintaining 97% availability industry target.
7. Longest expected serviceable lifecycle.
8. Option for overload capability.
9. Option to split old Bipole decommissioning contract from scope or defer.
10. Potential simplified locational interaction with a new GIS 220 kV substation.

Disadvantages:

1. Higher initial CAPEX.
2. Utilization of the vacant area to the north of the existing substation may constrain possible future expansion activities.
3. Less geographical Pole spacing for the Bipole than the Greenfield Hybrid Option (fire resilience).
4. Requires 12 pulse to 6 pulse coordination with Apollo.

The preferred alternative is **Green field /Hybrid Existing Transformers(3.3.5)**. However, the bidder is proposing other solution, still under discussion with HCB and Owner´s engineer (Hatch).

3.4 Activities to be undertaken

The work to be carried out as part of this project include the design, manufacture, and testing of equipment in the factory, transport, installation of HVDC poles and a Gas Insulated Substation (GIS), as well as the removal of old equipment.

The project involves construction of a new pole and a new 220kV SS in the "Northern extension area" and another pole in the area where one of the existing poles is currently located.

- Implementation of two complete HVDC poles with all the systems and equipment necessary for a fully functional bipolar HVDC system;
- Replacement of valves, valve cooling system and respective control system;
- Replacement of the grid power and stability control system (Grid Master Power Controller - GMPC) and the teletransmission systems;
- Replacement of 220 kV AC equipment control and protection systems;
- Replacement of auxiliary service transformers 2 x 220kV / 20kV, 20 MVA;
- Reconfiguration of the 220kV AC bus providing greater flexibility for O&M;
- Replacement of all circuit breakers and isolators in the SS park;
- Replacement of a 3.6 MVA emergency Diesel generator set;
- Replacement of AC 1 and 2 Filter Banks containing PCBs;
- Replacement of the HVDC earth line electrodes.

3.5 Construction Phase

The construction phase includes the following generic work:

- Preliminary work to prepare the work site;
- Civil construction work;
- Supply and installation of equipment and accessories;
- Replacement of earth electrodes;
- Commissioning.

Preliminary work

- Excavations, dismantling, removal and elimination of all existing equipment, structures, foundations and any other existing redundant installations that obstruct the works and cannot be reused or modified;
- Deforestation (if necessary) and removal of topsoil from the substation extension area;
- Establishing the work site;
- If necessary, relocating any buried accessories/equipment or other buried facilities to accommodate the new equipment;
- If necessary, relocating any primary equipment and structures to a suitable location within the SS perimeter to accommodate the new equipment;
- Fencing to isolate work areas from the installations in operation.

Civil Construction Work

- Landfill, excavation and area compaction to establish the platform in the work site;
- Landfill and excavations to establish implantation quotas for buried infrastructure (foundations, cables, etc.);
- Execution of reinforced concrete elements such as foundation slabs, concrete cable trenches and any other civil or structural works necessary for equipment installation;
- Fence installation in the new area;
- Spreading gravel on the surface affected by the works.

Supply and Installation of Equipment

- Supply and installation of equipment;
- Installation of all earth connections for the new system;
- Installation of protection and control cables and interface cables with the existing building.

Replacement of the Chitima earth electrode

In bipolar direct current electrical energy transmission systems (HVDC systems), the earth electrode is used as the voltage reference on the direct current side. It also forms the neutral between the two poles. The earth electrode can also be used to enable the current to return if one of the poles is unavailable.

- Investigation of soils in Chitima, to obtain their physical properties (electrical, geotechnical, magneto telluric, thermal properties, etc.). This investigation will be used to size and install and the new earth electrodes.

The quantity and type of electrodes to be installed will be defined after soil investigation and contracting the work to install the new earth electrodes. The activities involved in installing the new electrodes will be presented after contracting the work.

- Replacement of existing electrodes with completely new electrodes. It is planned to install new electrodes in the same location, i.e. inside the existing fence.

Commissioning

Initial start-up to ensure that the systems and installed components are assembled, tested and operating in accordance with operating requirements.

3.6 Operational Phase

Activities during the operational phase will be those currently carried out in the SS, namely, operation, maintenance (preventive and corrective) activities including:

- **General maintenance**: equipment functionality, condition of oils and lubricants below those produced, performance of transformers, quality and quantity of gas insolation, etc.;

- **Replacement of oils and lubricants**: during SS operation and maintenance it is expected that limited quantities of oils and lubricants will be generated, and that the oils can be filtered and reused;
- **Replacement of transformers**: due to increased electricity demand it may be necessary to change the transformer. The existing transformer can be reused in another SS with lower demand for electricity;
- **Waste production**: includes generated and rejected domestic waste (rejected cables and spare parts).

3.7 Work Force

The following table presents the labour contracting needs for the project:

Table 3-1- Approximate amount of labour required

LABOUR (WORKERS)			
PROJECT PHASE	TOTAL	LOCAL	EXPATRIATES
Rehabilitation	570	365	205

3.8 Investment

The investment value is estimated to be about 300 000 000 Euros.

3.9 Schedule

The construction and commissioning phase is expected to last 3 years (2023, 2024 and 2025), with a further 2 years of technical support (2026 and 2027).

This project is expected to increase the useful life of the Songo converter substation by another 40 years, operating with minimal maintenance.

4 Definition of Areas of Influence

The EIA Regulation defines an Area of Influence (AI) as the area and geographic space directly or indirectly affected by the environmental impacts of an activity.

The EIA process requires an Area of Direct Influence (DIA) and an Area of Indirect Influence (IIA) to be defined for any project/activity.

The DIA is defined as the area affected by the direct impacts of the SS, i.e. the area where the infrastructure will be deployed (the area of direct impact of the SS) plus the areas where the direct impacts arising from the construction and operation of the SS are felt (e.g. the area affected by gaseous or liquid emissions from the SS).

The IIA is defined as the area that will be indirectly affected by the project, i.e. the area where indirect impacts resulting from direct impacts are felt (e.g. installation of a project may attract other economic activities into the project. area, which is an indirect socio-economic impact).

The following subchapters define the HCB SS AIs considering the aspects described above.

4.1 Direct Influence Area (DIA)

The DIA corresponds to the zone where the activities associated with the project will have a direct impact on the physical and social environment, including the following physical occupation areas:

- Area allocated on land for expansion of the SS;
- Accesses.

Table 4-1 - Area of Direct Influence by descriptor

Descriptor	Criterion
Air quality	The DIA considered is the area up to 500 m surrounding the SS expansion area, as it is unlikely that there will be direct impacts beyond this direct environment.
Noise Environment	The DIA considered is the area up to 500 m surrounding the SS expansion area, as it is unlikely that there will be direct impacts beyond this direct environment.
Geology	The DIA considered is the area up to 300 m surrounding the area intended for the expansion area and the earth electrode zone, as it is unlikely that there will be direct impacts beyond this direct environment.
Soils	The DIA considered is the area up to 300 2m surrounding the area intended for the expansion area and the earth electrode zone, as it is unlikely that there will be direct impacts beyond this direct environment.
Surface Hydrology	The DIA considered is the water hydrographic basin area where the project is implanted (or higher order), as it is unlikely that there will be direct impacts beyond this direct environment.
Fauna, Flora and Habitats	The DIA corresponds to the infrastructure expansion zone. For this area, the expected direct impacts on existing habitats and impacts on fauna and communities dependent on these habitats are considered.
Socio-economics	From a socio-economic viewpoint, the Area of Direct Influence (DIA) is defined by the areas occupied by the communities or resource points affected (used by the communities). This fact

Descriptor	Criterion
	implies direct and long-term impacts (positive or negative) suffered by the communities resulting from SS activities. Consequently, the DIA considered for this project includes: ▪ All areas, communities and/or resources physically disturbed by the proposed activities – e.g. the area occupied by all components of the SS, such as residential units, facilities and services, accesses and internal roads, car parks, etc. – All components of the SS. ▪ All areas, communities and/or resources where access has been directly restricted by SS activities (without the need for physical disturbance as such); and all communities directly affected by the presence of the SS from an aesthetic and/or noise viewpoint. These include all locations within a radius of 500 meters of the SS area. ▪ All areas, communities and/or resulting resources that benefit in the long-term from the SS activities. This area will include communities that benefit from long-term employment or that have greater access to employment due to the expansion and/or refurbishment of public services and infrastructure.

4.2 Indirect Influence Area (IIA)

The IIA relates to the larger project area where the indirect impacts of the SS can be felt. For the purposes of this study, the Songo village must be incorporated into the IIA.

Table 4-2 – Area of Indirect Influence by descriptor

Descriptor	Criterion
Air quality	The IIA considered is the area up to 1500 m surrounding the SS expansion area, as it is unlikely that there will be direct impacts beyond this direct environment.
Noise Environment	The IIA considered is a 1,500 m band surrounding the SS expansion area, as it is unlikely that there will be indirect impacts on the noise environment beyond this direct environment.
Geology	IIA has a subjective definition based on the occurrence and heterogeneities of geological resources. To assess the impacts of the planned work in the SS and earth electrode zone on a given formation, layer, or bed, it is necessary to frame and positioning it stratigraphically to ascertain its uniqueness. Accordingly, an DIA is considered where the occurrence of formations and their framing were perceptible, measurable and comparable.
Soils	The IIA considered is the area up to 500m surrounding the area intended for the SS expansion area and the earth electrode zone, as it is unlikely that there will be indirect impacts on the soils beyond this direct environment.
Surface Hydric Resources.	The IIA is defined according to the hydrographic basin of the water line intercepted by the project up to the point of confluence of the perennial water line, with higher hierarchy.
Hydric Resources.	The IIA has a subjective definition, in accordance with the occurrence and heterogeneities of hydraulically distinct geological resources. Accordingly, an DIA is considered where the occurrence of formations and their framing are perceptible, measurable and comparable.
Fauna, Flora and Habitats	This item considers indirect impacts on habitats around the SS expansion site. These impacts are related to the disturbance of fauna, increased human presence, increased noise, lighting, etc. A buffer zone of 500 m around the DIA was adopted in consideration that indirect impacts should not be experienced beyond this area.
Socio-economics	The IIA in socio-economic terms is considered as the area where indirect socio-economic impacts as well as direct short-term impacts will occur. As a result, from a socio-economic viewpoint, the IIA can be defined as areas that are indirectly impacted by the SS expansion (one example is the potential migratory flow of people seeking work).

5 Characterization of the Reference Situation

As part of the ESIA, Consultec presents a brief characterization of the reference situation in the implementation area of the Songo Converter SS Refurbishment Project. The description of the reference situation is considered essential for assessing the project's environmental impacts and determining measures to mitigate them (in the case of negative impacts) or enhance them (in the case of positive impacts). Therefore, several sub-chapters have been prepared (corresponding to technical descriptors identified based on our experience and legislation) that group different categories: the natural environment, which encompasses physical-chemical and biological factors, and the anthropogenic, which encompasses cultural resources and socioeconomic issues.

Next, geoenvironmental factors are listed summarising available technical information, augmented and fine-tuned using data from field-visits by the technical team. This is presented in the form of text, maps, graphs, figures, illustrated with photographs (whenever possible) to:

- Summarize existing environmental data;
- Communicate and provide information on the quality of the affected environment;
- Assess the vulnerability and susceptibility of a given environmental variable to contamination;
- Select and focus impact assessment on key environmental factors.

As a result, the description of the reference situation facilitates an overall and integrated view of the various environmental variables, and the balance of their relative weights based on the characteristics of the Project.

5.1 Climate and Meteorology

The climatic characterization presented is the result of querying meteorological data obtained by consulting climatological conditions for the Tete region during the period 1991-2020. Historical meteorological data from a minimum series of 30 years was used, as required by the World Meteorological Institute (IMM). The data presented were produced by the *Climate Research Unit* (CRU) at the University of East Anglia through the World Bank Portal https://climateknowledgeportal.worldbank.org/ (Accessed September 2021).

At a regional level, data from the Chicoa meteorological station that provides climate data regarding temperature and precipitation (HCB, 2020) were used.

Data referring to wind speed and direction come from the Tete Meteorological Station via information provided by *Iowa State University*. https://mesonet.agron.iastate.edu (accessed September 2021).

At a regional level, data are used from the HCB meteorological station alongside the Songo SS regarding temperature and precipitation.

5.1.1 National Framework

In national terms, Mozambique has a tropical to sub-tropical climate. The distribution of precipitation in Mozambique follows a North-South gradient, with higher levels of precipitation occurring along the coast, where the annual average varies between 800 mm and 1 200 mm. The high-altitude inland areas where Songo is located receive approximately 600 mm of rainfall annually. Temperatures are warmer along the coast and cooler in the higher parts of the interior of the country.

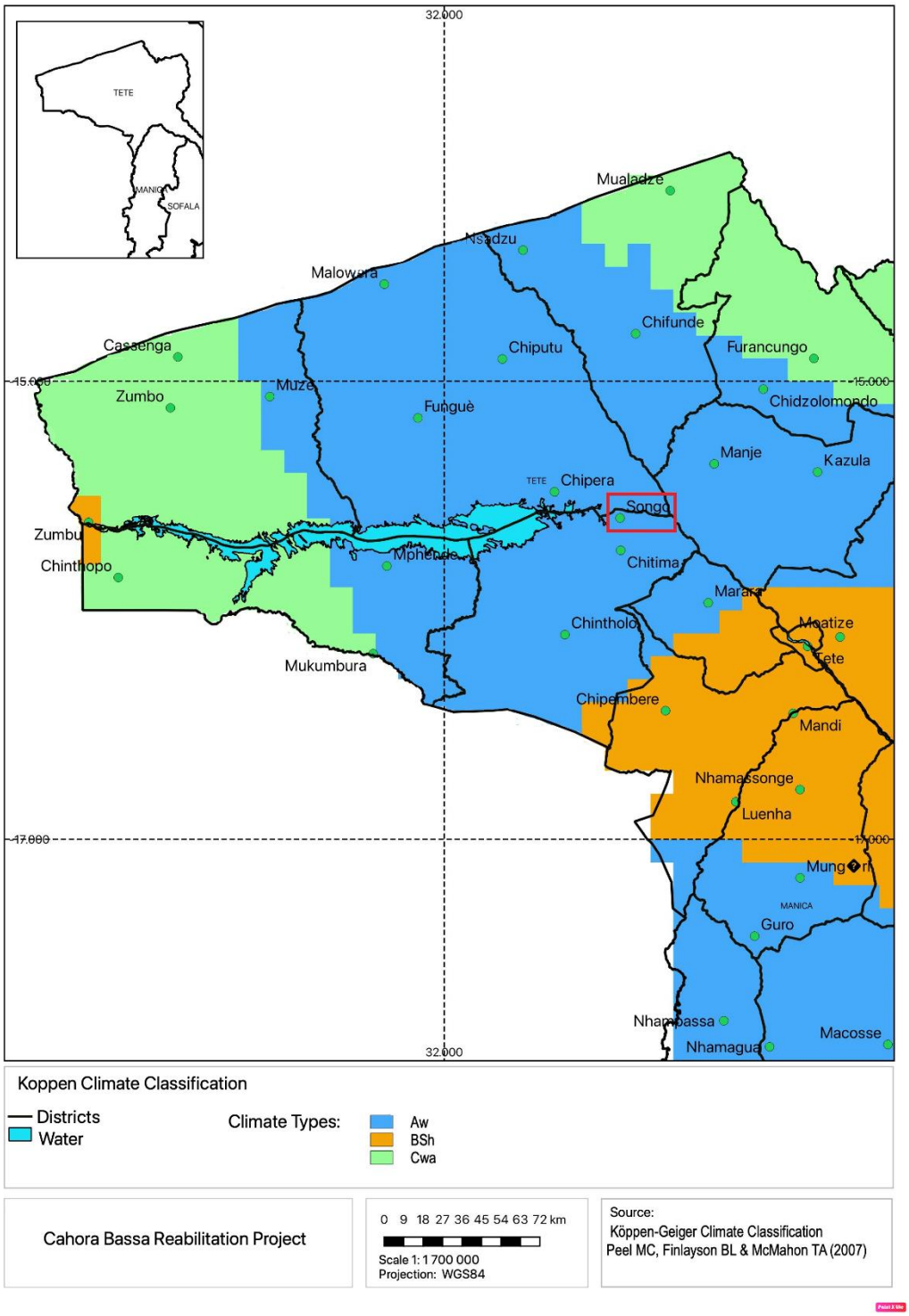
Since 1960, average temperatures across the country have increased by an average of 0.9 °C (0.15-0.16 °C per decade), especially during the rainy season. The number of warm days has increased by 25 over the past 40 years, and much of this increase has occurred during the southern hemisphere autumn (HCB, 2020).

In terms of precipitation, since 1960 precipitation has decreased by an average of 2.5 mm per month (3.1%) per decade. However, spatial manifestations are varied, with increased precipitation in the northern regions, highly variable conditions in the central regions, and persistent drought periods associated with episodic flooding in the south of the country. The proportion of days with heavy rainfall increased by 2.6% per decade at an estimated 25 days per year.

5.1.2 Regional framework

On a regional scale, the climate of the Songo region is predominantly the “Tropical Dry with Dry Winter” type, locally modified by altitude. According to the Koppen-Geiger classification, the climate of this region is classified as being type Aw, characterized by the occurrence of two distinct seasons: a warm, rainy season running from October to March and another cooler, drier season from April to September. Maximum temperatures occur between October and January.

The greatest rainfall is mainly during the period between November and April, producing significant variations in quantity and distribution, however. The figure below presents the climatic classification of Northern Tete province according to the Koppen classification.



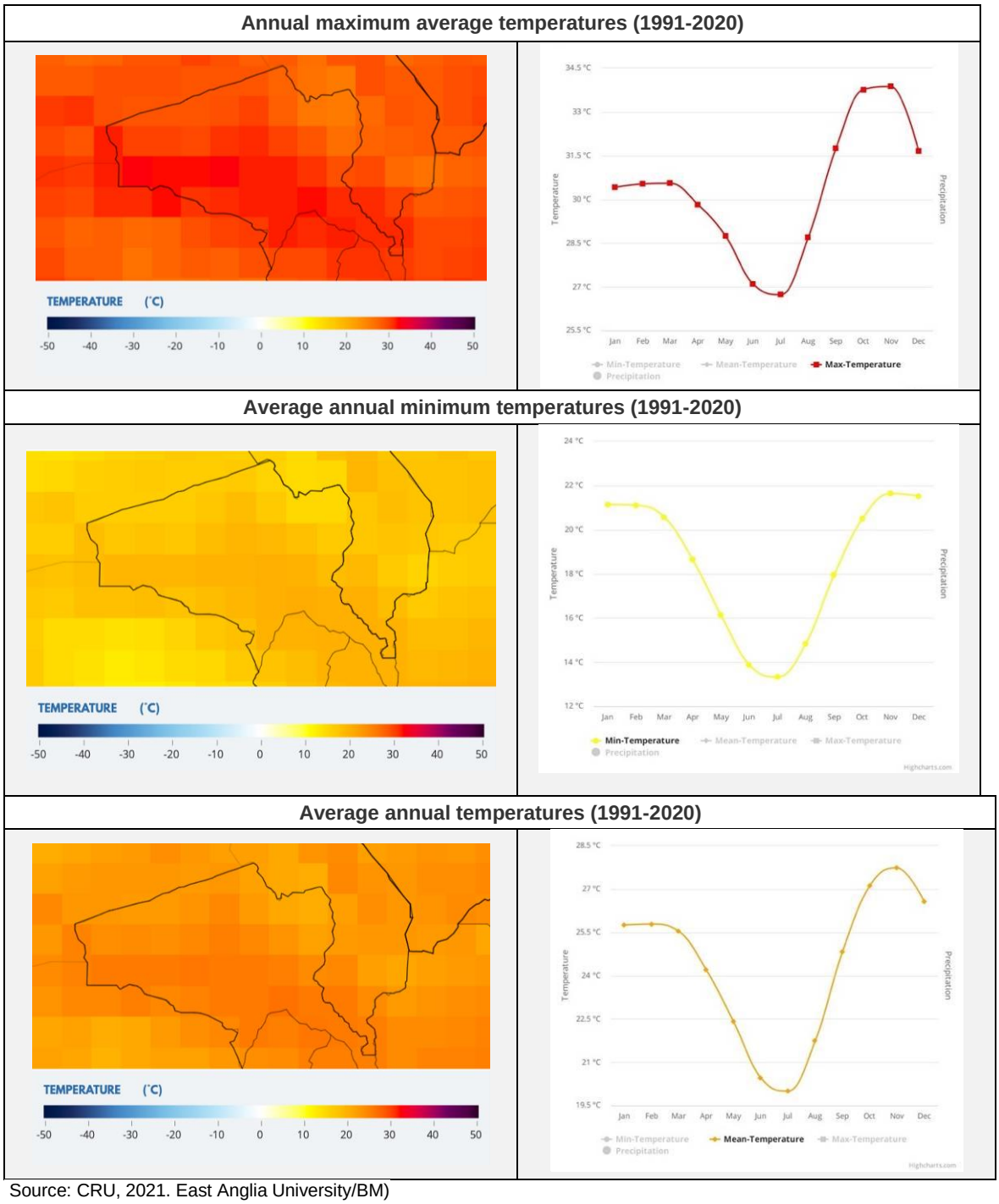
Source: Peel et al, 2007

Figure 5-1 - Climatic characterization according to the Kõppen classification

5.1.3 Temperature

Analysis of the figures and graphs below confirms that in the Tete region, the maximum and minimum annual average temperatures vary in a consistent manner, a typical phenomenon of the tropical

climate, where the lowest temperatures occur from June to August during the dry season with average minimum temperatures below 16 ºC. The hottest months of the year occur between October and December, with average monthly maximum temperatures exceeding 33 ºC.



Source: CRU, 2021. East Anglia University/BM)

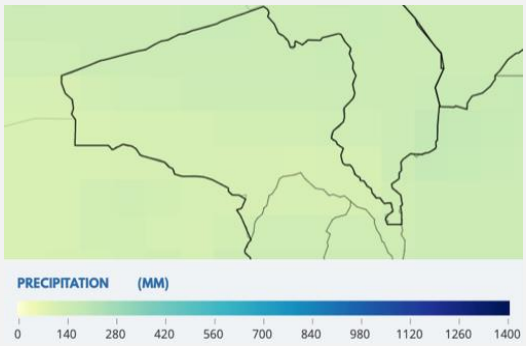
Figure 5-2 – Graphs of Temperature in the Tete region

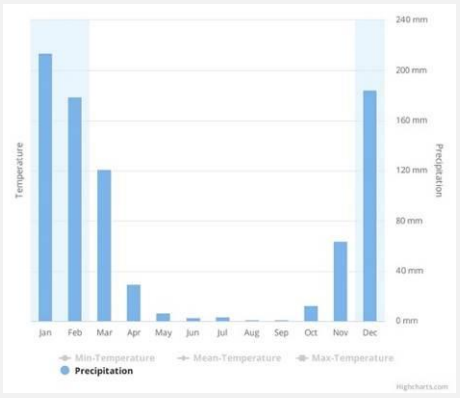
5.1.4 Precipitation

Regarding rainfall in the Tete region, the seasonal distribution of rainfall is very accentuated, mainly concentrated in the wet season. When they occur, precipitation episodes can be quite intense. This rainfall pattern creates an uneven rainfall distribution throughout the wet season. The most intense precipitation occurs from December to February, with January the wettest month and the maximum rainfall exceeding 200 mm. Most of annual precipitation values occur during May to October with monthly averages below 6 mm. August and September are the driest months, with rainfall reaching minimal or virtually non-existent values. The average annual rainfall recorded at the Chicoa station in the Songo region is around 635 mm.

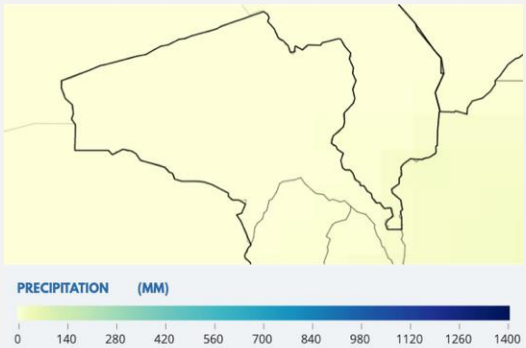
The images and graphs below illustrate average annual precipitation levels in the period between 1991 and 2020. They also highlight the December-February quarter of the Wet Season and the June-August quarter of the Dry Season. The data presented are produced from information provided for the Tete region via the World Bank portal https://climateknowledgeportal.worldbank.org/.

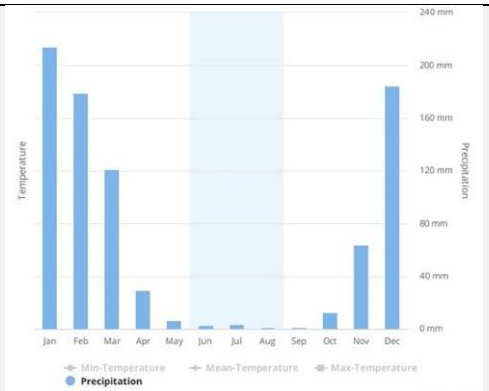
Average annual precipitation – Wet Season (1991-2020)



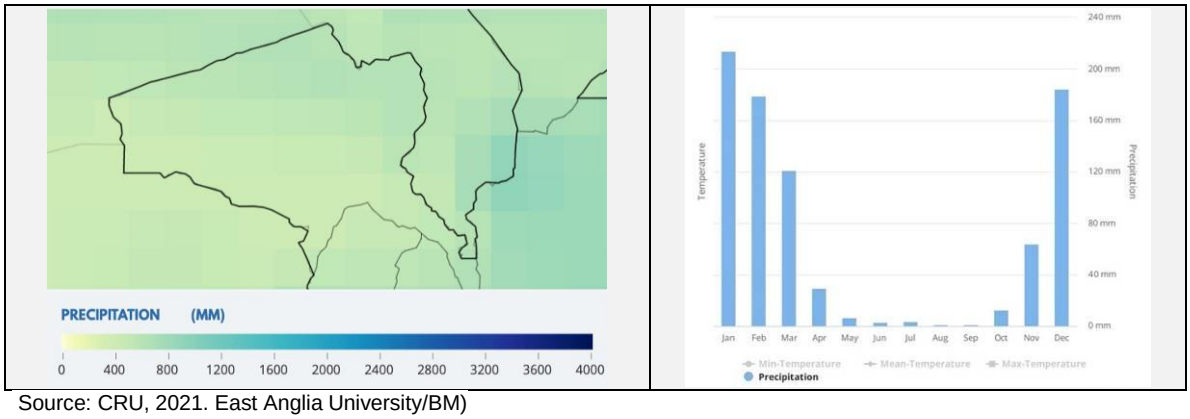


Average annual precipitation – Dry Season (1991-2020)





Average annual precipitation (1991-2020)



Source: CRU, 2021. East Anglia University/BM)

Figure 5-3 – Graphs of Precipitation in the Tete region

5.1.4.1 Local framing

Figure 5-4below illustrates the thermopluviometric chart for the HCB meteorological station located next to Songo Substation. According to meteorological observations recorded between 1990 and 2020, the monthly average temperature varied between a minimum of 18.6 ºC (July) and a maximum of 25.1 ºC (December). The maximum monthly average rainfall occurs in January, the month in which 235 mm was recorded. The rainfall reaches its minimum of 2.6 mm in August and September.

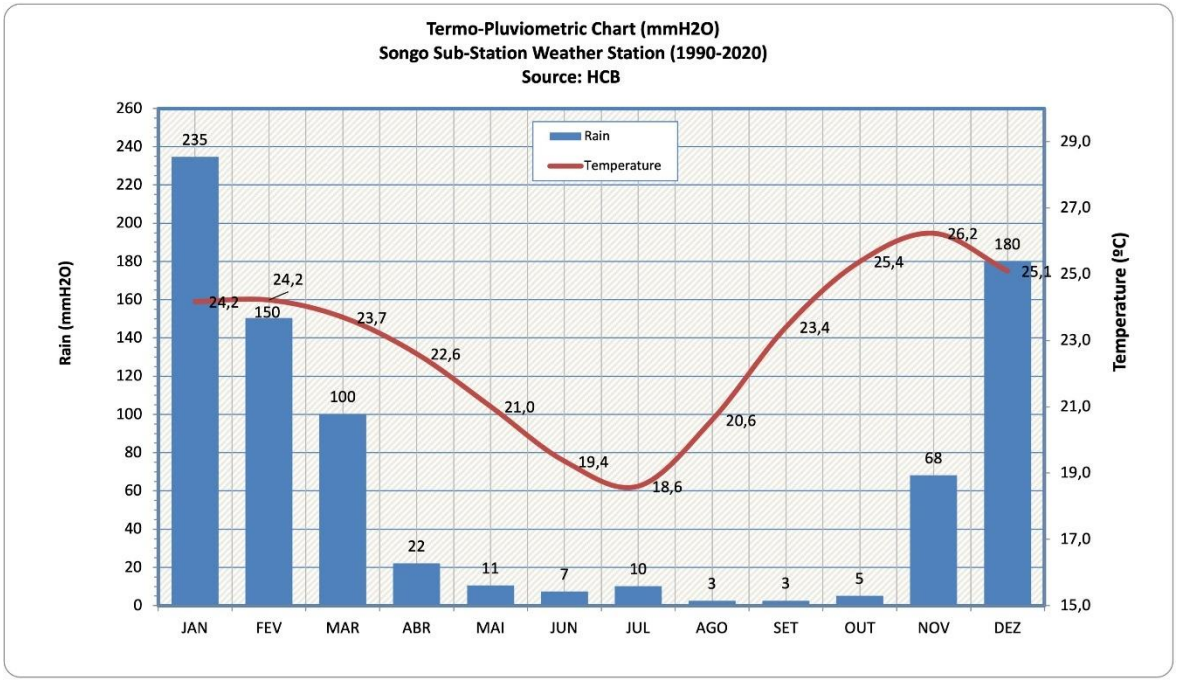


Figure 5-4 – Songo Station Thermopluviometric Chart

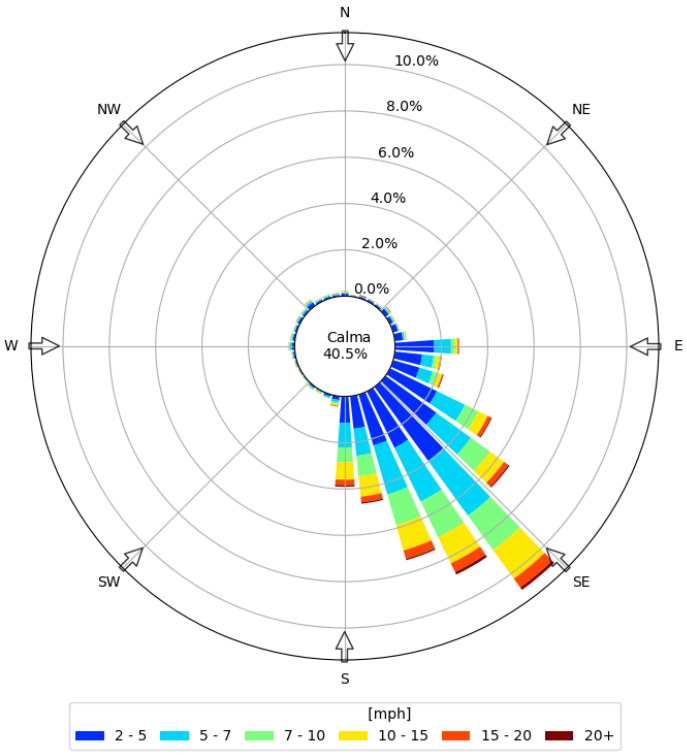
5.1.5 Wind Regime

The wind field in the Tete region is determined by prevailing winds from the east-southeast and southeast quadrants. The average annual wind speed is of the order of 6.9 km/h. Winds with lower

speeds occur mainly during the wet season, with calm conditions, i.e. wind speeds below 0.5 m/s with a frequency of the order of 40.5%.

Cyclones do not directly affect the region under analysis, but their occurrence can possibly influence the isobar configurations (lines with the same atmospheric pressure), which in turn are susceptible to affecting the weather and/or wind direction.

The graph in the figure below illustrates the monthly distribution of average values of wind direction and speed based on data acquired and recorded between 1973 and 2020 at the Tete Meteorological Station.



Source: IEM 2021

Figure 5-5 – Monthly Average Wind Speed Record

5.1.5.1 Local framing

According to data from the HCB meteorological station located next to the Songo Substation, monthly average wind speed varies between a minimum of 10.2 km/h in January and a maximum of 17.1 km/h in October. The predominant wind direction comes from the East-Southeast and Southeast quadrant. Figure 5-6 below illustrates the monthly distribution of wind intensity between 1990 and 2020.

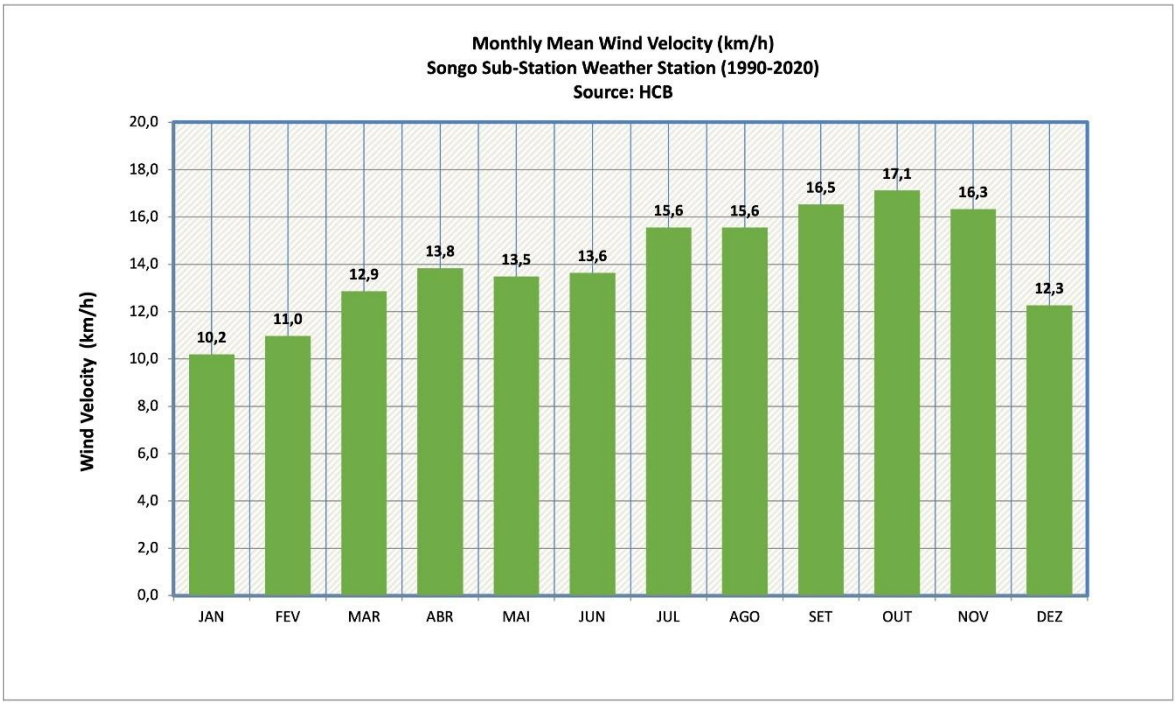


Figure 5-6 – Monthly Average Wind Speed Record

5.2 Air quality

5.2.1 Atmospheric Emissions and Air Quality – Legislative framework

The Environmental Law prohibits the release of any toxic and polluting substances into the atmosphere outside legally established limits. Regulation on Environmental Quality and Effluent Emission Standards, approved by Decree No. 18/2004, of 2 June, defines pollutant emission standards for fixed and mobile sources. This regulation establishes the basic parameters that characterize air quality. These national air quality standards are determined to protect the health of the human population and ensure protection of the ecosystems. In terms of pollution, the Environmental Law restricts "the production and deposition in the ground water and underground water, and release to the atmosphere of toxic substances and/or pollution, as well as activities that accelerate erosion, desertification, deforestation and others forms of environmental degradation" to limits established by this law (Article 9).

This law also provides for the creation of environmental norms on quality standards, through a specific regulation (Article 10). This culminated in the Regulation on Environmental Quality and Effluent Emission Standards, approved by Decree No. 18/2004, of 2 June, with amendments to Decree No. 67/2010, of 31 December; The standards applied regarding air quality are summarized in Error! Reference source not found..

Table 5-1- National Air Quality Standards

POLLUTANT	UNIT	Limit value	Notes
TSP	µg/m³	150	Maximum value of daily average
		60	Annual average
NO_2	µg/m³	190	Maximum of hourly average
		--	Maximum value of daily average
		10	Annual average
SO_2	µg/m³	500	Instant Value - 10 minute average
		800	Maximum hourly value
		100	Maximum daily value
		40	Annual average
CO	µg/m³	30,000	Maximum hourly value
		10,000	Maximum of 8 hours
		60,000	Maximum of 30 minutes
		100,000	Maximum of 15 minutes
O_3	µg/m³	160	Maximum hourly value
		120	Maximum of 8 hours
		50	Annual average
		70	Annual average

Source: Decree no. 67/2010

According to the Regulation on Environmental Quality and Effluent Emission Standards, approved by Decree No. 18/2004, of 2 June, with amendments to Decree No. 67/2010, of 31 December; the maximum daily emission (24h) of Total Particles in Suspension is 150 µg/m³. As there is no national legislation establishing PM10 limit values, the limit values established by the World Health Organization (WHO) shall be adopted for this project. These allow a maximum concentration of 50 µg/m³ for a period of 24h.

The following table summarizes other air quality standards established by WHO, the European Union (EU) and South Africa.

Table 5-2 - Air Quality Standards

Parameters	Period	Mozambique (µg/m³)	OMS (µg/m³)	European Union (µg/m³)	South Africa (µg/m³)
PM_{10}	24 hours	--	50	50	--
	MAA(*)	--	20	40	--
Sulphur Dioxide (SO_2)	Instantaneous	--	500	--	500
	1 hour	800	--	350	--

Parameters	Period	Mozambique (µg/m³)	OMS (µg/m³)	European Union (µg/m³)	South Africa (µg/m³)
	24 hours	100	--	125	125
	MAA(*)	40	50	20	50
Carbon monoxide (CO)	1 hour	30 000	--	--	--
	8 hours	10 000	10,000	10,000	--
Nitrogen Dioxide (NO_2)	1 hour	190	200	200	376
	24 hours	--	--	--	188
	AAA(*)	10	40	40	94

(*) Annual Arithmetic Average

In relation to the Particle Deposition Rate expressed in mg/m²/day in South Africa, dust deposition is assessed according to criteria published by the South African Department of Environmental Affairs and Tourism (DEAT). Under these criteria, dust deposition levels are classified as follows:

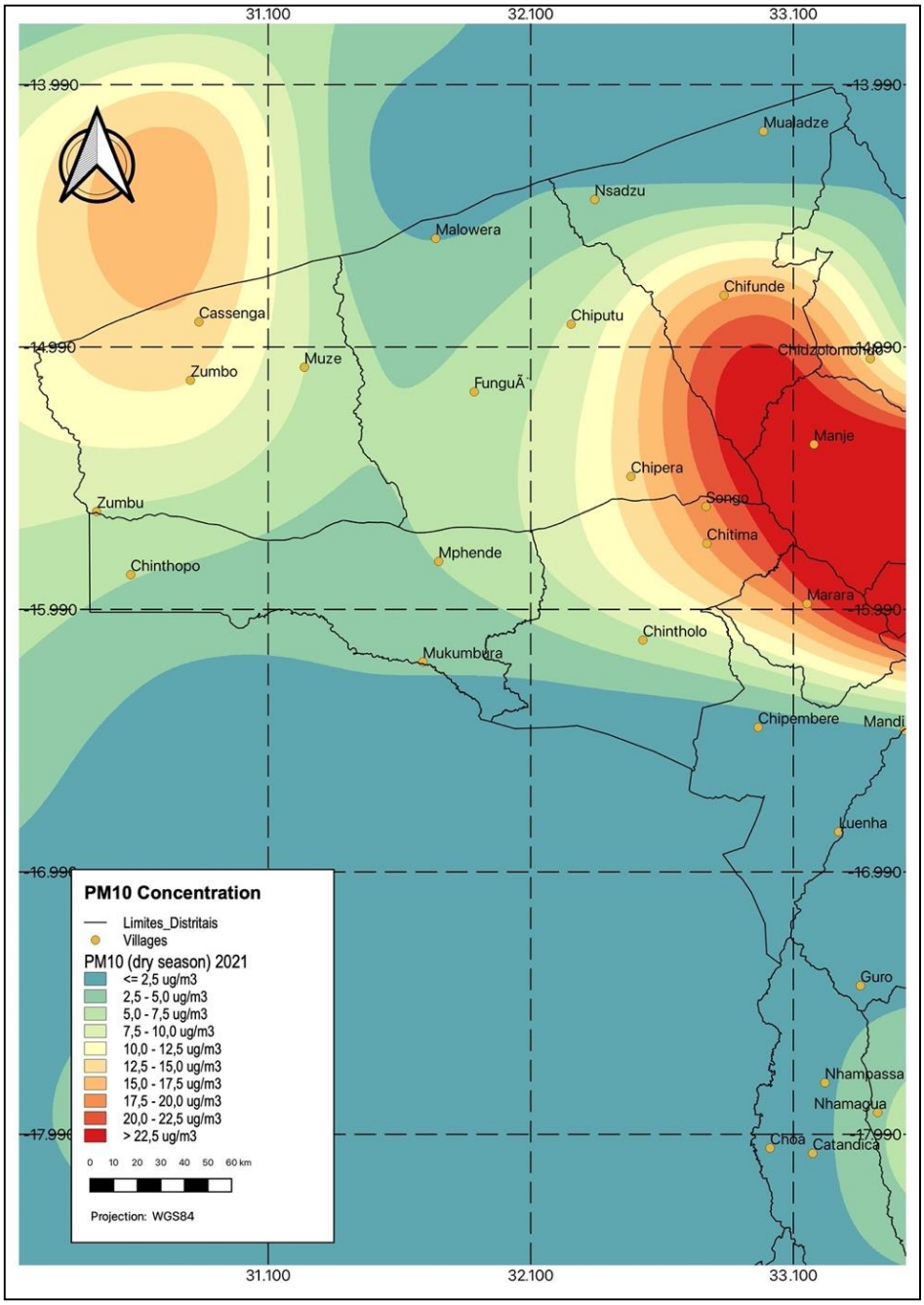
- LIGHT - less than 250 mg/m²/day;
- MODERATE - 250 to 500 mg/m²/day;
- HEAVY - 500 to 1,200 mg/m²/day;
- VERY HEAVY - over 1,200 mg/m²/day.

5.2.2 Air Quality Baseline Assessment

No air quality data is available from air quality monitoring stations in Mozambique. As such, a qualitative assessment of the existing air quality is presented based on the data available from the Copernicus Atmosphere Monitoring Service (CAMS) reanalysis which is the latest global reanalysis data set of atmospheric composition produced by the Copernicus Atmosphere Monitoring Service, consisting of 3-dimensional time-consistent fields, including aerosols and reactive chemical species. The retrieved data refers to the 2021 Dry Season (June 2021, latest available data in the database). The georeferenced data pollution grids were imported to GIS software (QGIS version 3.18) and post-treated for concentration contours and zoomed to the project region.

5.2.2.1 Particulate Matter (PM10)

Figure 5.1 represents the Global modelled annual mean of PM10 (particulate matter with a diameter of less than 10 µm), in the northern Mozambique according with the Copernicus Atmosphere Monitoring Service (CAMS) database for the 2021 dry season period.



Source: Adapted from CAMS,*2022)*. https://ads.atmosphere.copernicus.eu/cdsapp#!/dataset/cams-global-reanalysis-eac4

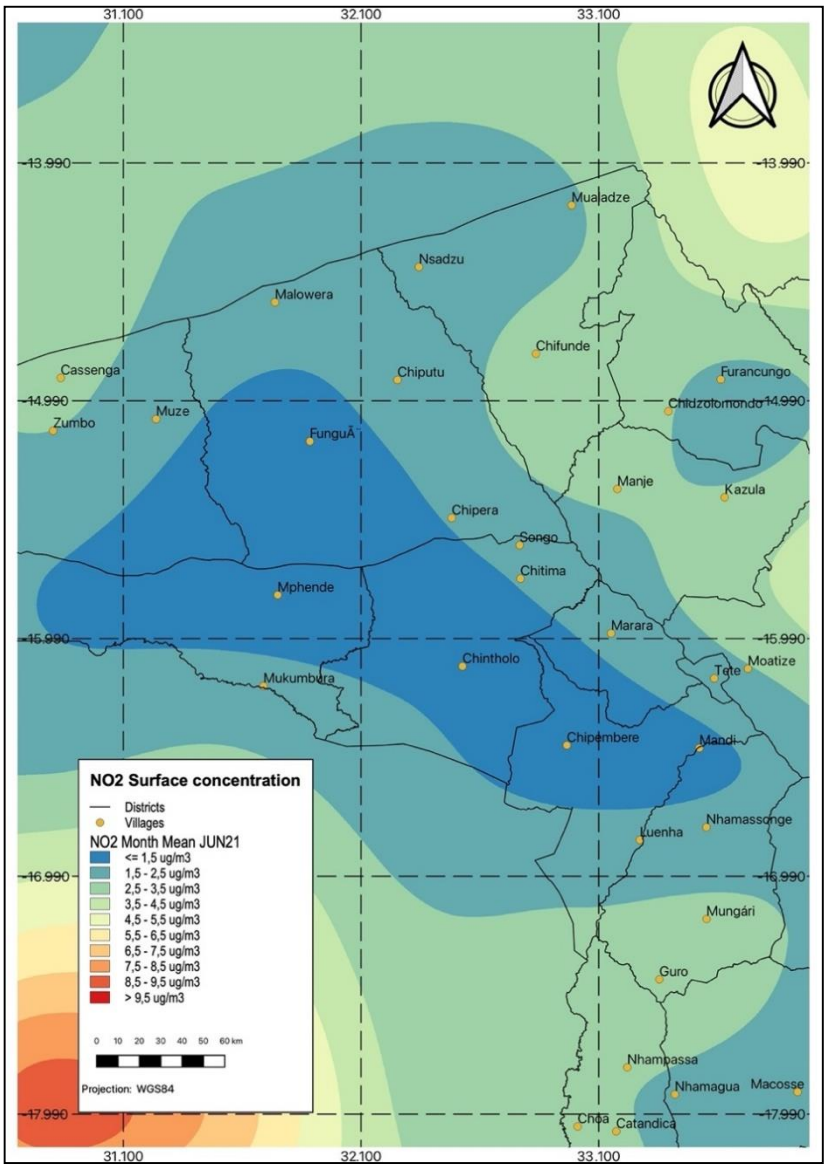
Figure 5.1 – PM10 Concentration distribution (µg/m^3)

Based on the above, it can be concluded that the surface concentration of Particulate Matter (PM10) in the Songo region during the dry season ranges from 20 µg/m^3 to 22,5 µg/m^3. This particulate matter concentration does not exceed the daily guideline value for PM10 set as 45 µg/m^3 as proposed by the WHO Air quality Guidelines (WHO, 2021) which offer global guidance on thresholds and limits for key air pollutants that pose health risks.

5.2.2.2 Nitrogen dioxide

Figure 5.2 illustrates the background surface concentration of Nitrogen Dioxide during the dry season (monthly mean of June 2021 within the project area. Data was derived from the EAC4 (ECMWF Atmospheric Composition Reanalysis 4) which is the fourth generation ECMWF global reanalysis of atmospheric composition in this case for the NO_2. ground level as monthly mean.

In the project region, NO_2 concentration in the Songo region during the dry season ranges from 1,5 ug/m^3 to 2,5 ug/m^3 (as monthly mean average) thus, well below the National standard set as 10 ug/m^3 as annual arithmetic mean (Decree nº 67/2010), revealing a mainly rural and natural character are use with scarce anthropogenic emitting pollutant sources. Vehicular traffic and biomass burning are key sources of NO_2 emissions that are present in the project region.

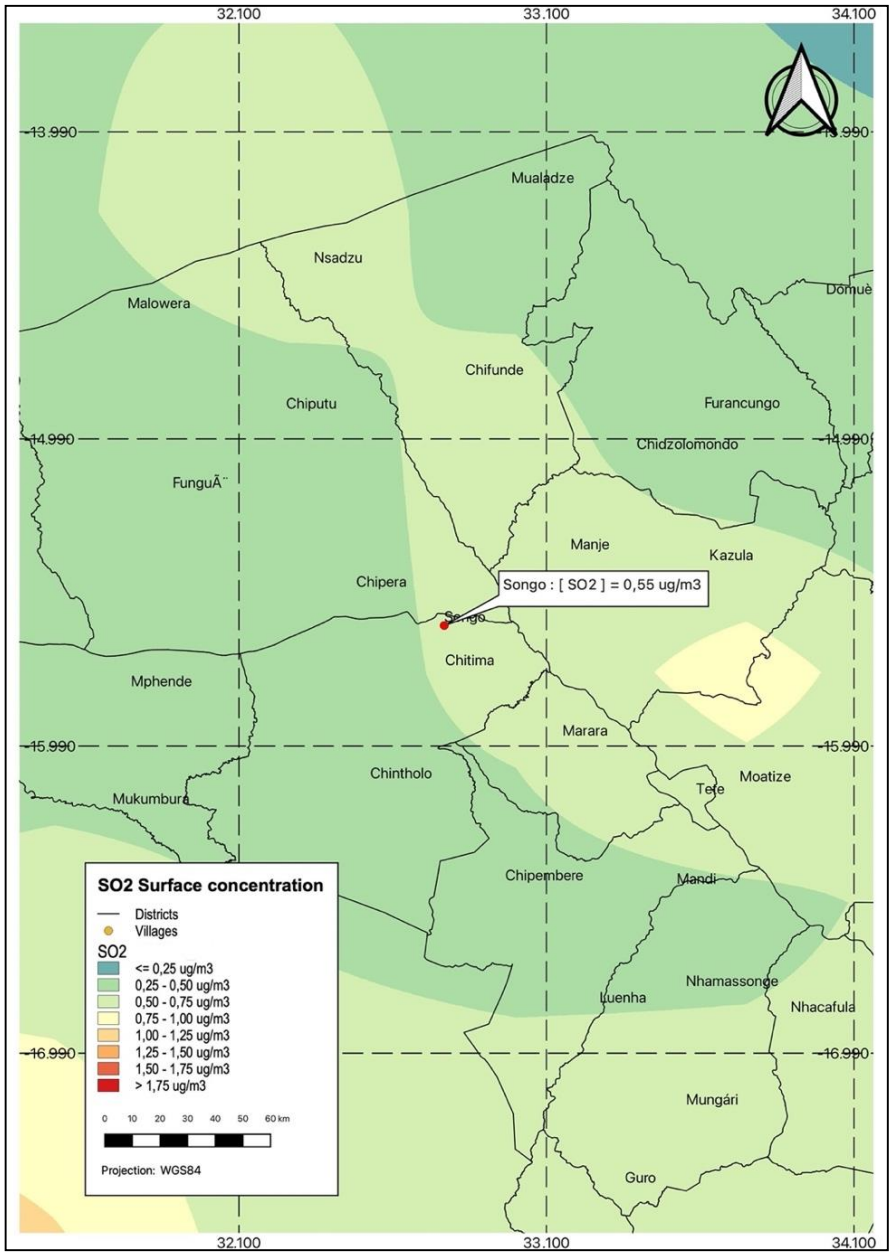


Source: CAMS global reanalysis (EAC4), Nitrogen dioxide Monthly Mean.

Figure 5.2 - NO_2 surface concentration

5.2.2.3 Sulphur dioxide

Figure 5.3 illustrates the background surface concentration of Sulphur Dioxide during the dry season within the project area. Data was derived from the EAC4 (ECMWF Atmospheric Composition Reanalysis 4) global reanalysis of atmospheric composition which represent ground level of SO_2. In the project region, SO_2 concentration in the Songo region during the dry season ranges less than 1,0 ug/m^3 (1-hour average) thus well below the National standard set as 800 ug/m^3 for 1-hour time average, revealing a mainly rural and natural character of this region with scarce anthropogenic pollutant sources within the Songo region. Biomass burning is a key source of SO_2 emission present in the project region.



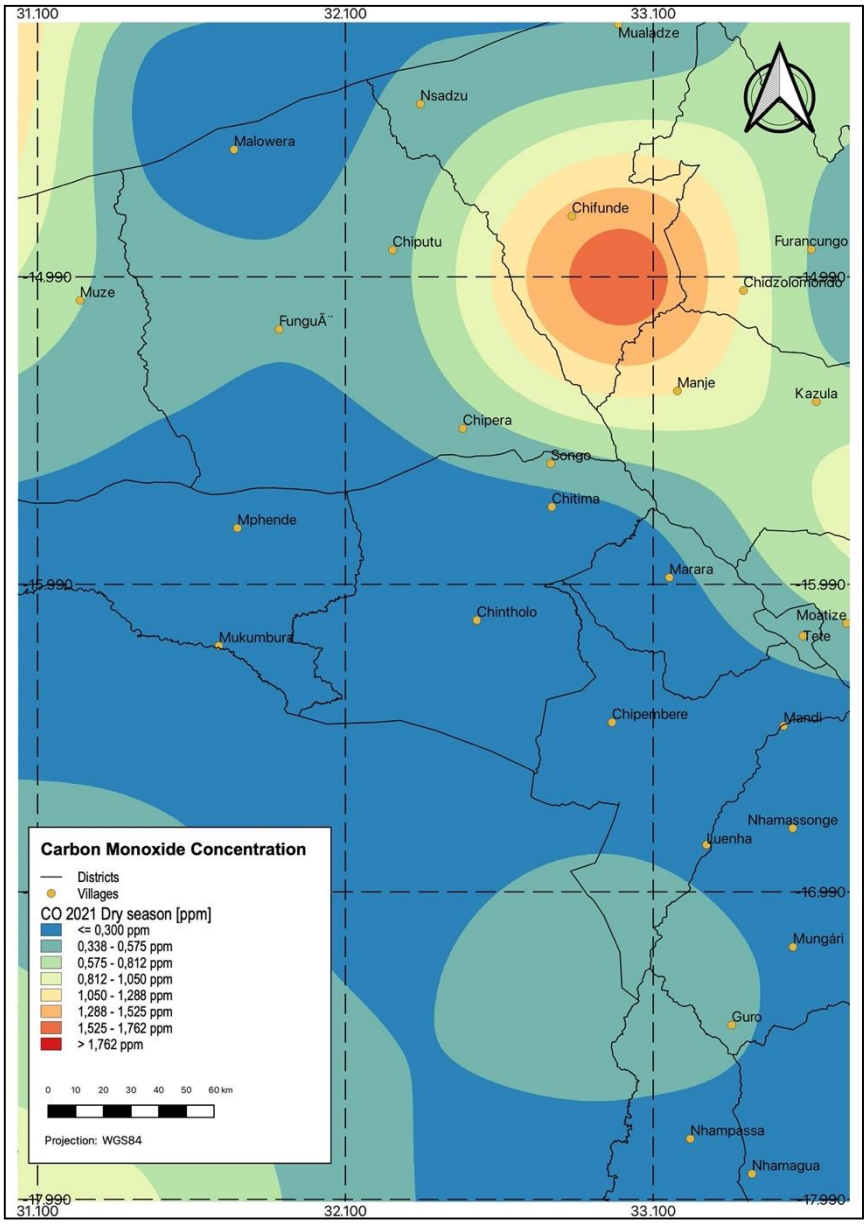
Source: CAMS global reanalysis (EAC4), Sulphur dioxide

Figure 5.3 - SO_2 surface concentration

5.2.2.4 Carbon monoxide

Figure 5.4 represents the time averaged map of Carbon Monoxide, during July 2021 (dry season period), at surface level in the Tete Province. Data grids were retrieved from the derived from the EAC4 (ECMWF Atmospheric Composition Reanalysis 4), accessed in May 2022 from the Copernicus digital database platform.

From the figure below it can be concluded that within the project region carbon monoxide ranges between a concentration of 0,300 to 0,575 ppm at 1 atm, 25ºC. Songo region reaches a carbon monoxide concentration of 0,328 ppm or 0,377 mg/m3 a background value that is considered as of low significance or negligible.



Source: CAMS global reanalysis (EAC4), Carbon monoxide

Figure 5.4– Carbon Monoxide concentration

5.2.2.5 Songo Air Quality Monitoring Campaign

During the month of December 2015, the concentrations of air pollutants in the vicinity of the project's area were characterized for HCB in a dedicated monitoring campaign held by Consultec. The characterization of air quality had as main objective to infer about the existing air quality levels of a set of different pollutants within the Songo village. The gathered results were further interpreted based on the limit values defined by current Mozambican legislation and by comparison with internationally recognized reference values such as those published by the World Health Organization (WHO).

The characterization of the air quality was materialized through an *in situ* measurement campaign. The fieldwork involved a preliminary analysis of the sites with sensitivity to air pollution, and the performance of a set of measurements of air pollutants including Nitrogen Dioxide (NO_2), Sulphur Dioxide (SO_2), Volatile Organic Compounds (BTEX) and Particulate Matter in three selected sites within Songo village boundaries. A total of 3 points were selected for Air Quality characterization as detailed in the following table and figures.

Table 5-3- Air Quality Sampling Points

Monitoring Point	Coordinates	Parameters	Equipment	Duration Test
QA1	15°35'40.22 "S 32°44'53.51 "E	NO_2, SO_2 and BTEX	Radiello and Gastec Pipes	7days exposure
QA2	15°35'41.45 "S 32°44'50.00 "E	NO_2, SO_2 and BTEX	Radiello and Gastec Pipes	7days exposure
QA3	15°36'07.50 "S 32°44'16.10 "E	NO_2, SO_2 and BTEX	Radiello and Gastec Pipes	7days exposure

Figures below illustrate the installation of equipment at the different Air Quality monitoring points. The characterized areas present several typologies of soil use, namely non-covered soil, natural green areas, areas occupied by residences and other services inherent to human habitation.

Figure 5.5 - Monitoring point QA01

Figure 5.6 - Monitoring point QA2

Figure 5.7 - Monitoring point QA 03

Figure 5.8 - Monitoring point QA 03

5.2.3 Air quality monitoring campaign Results

Error! Reference source not found. summarizes the concentrations of Nitrogen Dioxide (NO_2), Sulphur Dioxide (SO_2) and Particulate Matter obtained at the monitoring points where the above-mentioned air quality measurements were taken.

Table 5-4- Characterization of NO2 and SO2 concentrations of Particulate Matter.

Measuring Location	Coordinates	Pollutant Concentrations			
		NO_2 (ug/m^3) (7-days average)	SO_2 (ug/m^3) (7-days average)	PTS (ug/m^3) (24-haverage)	PM10 (ug/m^3) (24-h average)
QA1	(15°35'40.22 "S) (32°44'53.51 "E)	2.38	0.34	70.6	38.8
QA 02	(15°35'41.45 "S) (32°44'50.00 "E)	1.76	<0.29	50.6	27.8
QA 03	(15°35'41.45 "S) (32°44'50.00 "E)	2.47	1.30	17.6	32.0

The analysis of the results shown in the table above allows us to conclude that the requirements defined in relation to the maximum admissible values for atmospheric pollutants as stipulated in Decree no. 18/2004 of 2 June (Regulation on Environmental Quality Standards and Emissions of Effluents) and amended by Decree no. 67/2010 have been fully complied with.

The results obtained demonstrate the presence of Nitrogen Oxides and Sulphur Oxides in the lower atmosphere, although in very low concentrations. Since these gases are associated with combustion processes, their origin may be associated, above all, with sporadic emissions of exhaust gases from automobile circulation and, eventually, with domestic fuel burning processes.

5.2.3.1 Organic Compounds assessment

Error! Reference source not found. summarizes the concentrations of BTEX obtained at the three selected air quality monitoring points.

Table 5-5 - BTEX concentrations at the monitoring points.

MEASUREMENT POINT	RESULTS OBTAINED - CHARACTERISATION OF EXISTING AIR QUALITY				
	Coordinates Sampling location	Concentrations obtained (ug/m³)			
		Benzene	Toluene	Ethyl benzene	Xylenes (m,p)
QA 01	(15°35'40.22 "S) (32°44'53.51 "E)	0,17	<0,27	<0,29	0,14
QA 02	(15°35'41.45 "S) (32°44'50.00")	0,14	<0,27	<0,29	<0,14
QA 03	(15°36'07.50 "S) (32°44'16.10 "E)	0,34	<0,27	<0.29	<0,14

The maximum BTEX concentrations (expressed as Benzene) in the analysed points did not exceed the value of 0.34 ug/m^3, concentration that can be considered as being only trace. The concentrations of Toluene and Ethylbenzene were, in both sampling points, below the quantification limit of the analytical methods, i.e., 0.27 ug/m^3 and 0.29 ug/m^3 respectively. In fact, and for comparison, the World Health Organization states that concentrations in the range of ± 1.0 ug/m^3 of Benzene are typical for rural areas (WHO, 2000). European Union and South African legislation stipulate maximum Benzene annual guideline of 5.0 ug/m^3.

The results obtained for these organic compounds demonstrate then the reduced influence of the existing emission sources responsible for the release of this typology of compounds. These compounds have as main origin the combustion of liquid fuels such as petrol or diesel which are emitted mainly by road vehicles, i.e., it can be stated that this typology of atmospheric pollutants is associated mainly to online sources such as roadways.

5.2.4 Sensitive air quality receivers

From analysis of the surroundings of the Songo converter substation, the project's implantation area is in an area with urban and peri-urban characteristics. Near the Songo converter substation there are some receivers sensitive to air quality, essentially residential areas. Figure 5-7 indicates in green, areas where predominantly residential use was identified in the surroundings of the Songo converter substation.

Figure 5-7 - Residential Areas identified (Adapted Google Earth, 2021)

From fieldwork and analysis of the figure above, the surroundings of the project's implantation area have different types of land occupation in which uncovered soils, some green areas and consolidated residential areas can be seen. In the main, it will be inhabited areas closer to the project area and located downstream of the wind direction that could potentially experience influence from emissions of atmospheric pollutants generated during the refurbishment phase of the Songo converter SS.

5.2.5 Existing sources of air pollutant emissions

The Air quality baseline assessment also considered the major pollution emission sources that may be expected to be present in the study area. As per Cumbane (2004), 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.

Cumbane (2004) and Schwela (2007) point to the uncontrolled burnings in rural zones especially in the North and Central regions of the country 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 are some activities in the project region that contribute to the anthropomorphic alteration of air quality. At the local level, atmospheric emissions generated are essentially related to road traffic, and

there are other possible sources of atmospheric emissions associated with agricultural practices, such as burning firewood and charcoal and the dispersion of dust due to wind erosion phenomena on bare soils.

Fieldwork verified the existence of some online sources associated with road traffic, with automobile circulation responsible for the emission of gaseous atmospheric pollutants as well as particulate material. The atmospheric pollutants emitted by road vehicle internal combustion engines include combustion gases such as Carbon Monoxide (CO), Hydrocarbons (HC), Sulphur Dioxide (SO^2), Nitrogen Oxides (NO_x) and Particles (PTS).

On a local scale, other possible sources of atmospheric emissions could result from the dispersion of particles through wind erosion phenomena. This phenomenon occurs mainly during the dry season in soils without vegetation or with low vegetation cover. The amount of dust dispersed through this natural phenomenon can be significant, especially during periods of strong wind and low soil humidity, causing particulate matter plumes in the atmosphere and their consequent dispersion downwind. Burning firewood and charcoal for domestic purposes such as cooking food, also causes the release and emission of polluting gases and fine particles such as PM10 and PM2.5.

5.3 Noise Environment

5.3.1 General considerations

Noise is a very sensitive component of the environment, which at excessive levels can negatively affect the well-being of populations. Noise is one of the environmental degradation factors that most directly affect the quality of life of the population and their daily life.

In general terms, the main sources that contribute most to noise pollution are transport systems (road and rail), civil construction work in which noisy equipment is used, and commercial and industrial activities. The objective of controlling ambient noise is to protect the population from intrusive noises that disturb their daily activities, as well as to prevent the increasing trend in noise levels that could result in degradation of the quality of life.

5.3.2 Noise Pollution - Legislative Framework

In Mozambique, in June 2004, the Regulation on Environmental Quality and Effluent Emission Standards, approved by Decree No. 18/2004, of June 2 was published. The Regulation sets standards for environmental quality and effluent emissions, with a view to controlling and maintaining acceptable pollutant concentration levels in the environment. This Decree also stipulates that noise limits will be established by the Ministry of Land and Environment (MTA). However, to date there are no standards or guidelines on noise in Mozambique regarding the monitoring and assessment of nuisance caused by noise.

It is proposed therefore that the standards defined for this project are based on a synthesis of World Health Organization (WHO) and World Bank guidelines. WHO recommends certain default and/or guide values for various potential adverse health effects depending on specific environments (land uses). In determining standard levels, WHO considers residential, school and hospital areas to be sensitive uses/receivers. Potential adverse health effects of noise include social or psychological effects such as (Berglund *et al.*, 1999):

- Annoyance;
- Language intelligibility and interference with communication;
- Sleep disturbance;
- Reduced hearing.

Error! Reference source not found. presents the default values recommended by the WHO based on a specific environment or land use.

Table 5-6- Standard noise values recommended by WHO.

Specific environment/Land uses	Default values recommended by WHO (L_{Aeq} in dB (A)	Reference time (hours)	Health effect
Exterior of residential areas (day)	55 dBA	15 hours (07h00 – 22h00)	Serious annoyance
Exterior of residential areas (night)	45 dBA	9 hours (22h00 – 07h00)	Sleep disturbance

Source: BERGLUND *et al.*, 1999

In 1998 the World Bank (GBM, 1998) developed a pollution management programme to ensure that the projects it finances in developing countries are environmentally sound. Noise is one of the aspects covered by this programme which determines that noise levels measured in sensitive receivers located outside the project property boundary should not exceed 3 dB (A) in relation to background noise levels or exceed the maximum noise levels defined in the following table.

Table 5-7- Maximum levels of environmental noise defined by the World Bank.

Receiver type	Maximum allowable levels of environmental noise[Laeq (dBA)]	
	Daytime	Night time
	7 a.m. to 10 p.m.	10 p.m. to 7 a.m.
Residential, institutional, educational	55	45
Industrial, commercial	70	70

Source: BM/IFC

The criteria defined by WHO for residential outdoor areas during the day and night periods coincide with the criteria defined by the World Bank for residential, institutional and educational receivers during the same periods.

As the project's intervention area is close to a residential area, the maximum levels of environmental noise defined by the World Bank are adopted as quality standards for Residential, Institutional and Educational type receivers, which are equal to the standard values recommended by the WHO.

5.3.3 Existing Emission Sources

Given the different uses of land in the surroundings of the project area, the main sources of noise that determine the sound environment in its surroundings are as follows:

- Natural noises – noise generated by wind, water, animals and insects;
- Human residential areas – noise generated by people talking, children playing, music, etc.;
- Road traffic – noise generated by light and heavy motor vehicles on the roads in the vicinity of the project. Noise levels generated are generally low as traffic intensity in the area surrounding the project is low overall.

5.3.4 Sensitive Receptors

As part of the identification of areas sensitive to noise, sensitive receivers in the project's surroundings were surveyed. From observations at the site the existence of some noise-sensitive receivers was noted. The noise-sensitive receivers closest to the SS are located between 140 and 340 meters from the SS boundary. The table below summarizes the location of the population residential areas closest to the surroundings of the study area. These could potentially be affected by noise emissions that might be generated during the restoration phase of the project.

Table 5-8- Population residential areas in the surroundings of the Project

Monitoring point	Coordinates
R #01	15°36'51.47"S
	32°44'45.11"E
R #02	15°36'43.62"S
	32°44'42.60"E
R #03	15°36'32.23"S
	32°44'40.33"E
R #04	15°36'41.81"S
	32°45'26.80"E

Figure 5-8 graphically represents the location of the identified residential areas in the vicinity of the Project. It also highlights the selected noise measurement points used to characterize the reference acoustic environment.

Figure 5-8 – Noise sensitive receivers in the project environment.

It can be seen from analysis of the previous figure that in the area surrounding the Songo converter substation, noise-sensitive receivers include population residential areas are in its vicinity, but no social infrastructure associated with these residential areas was identified, such as schools, health-centres and places of worship such as churches or mosques.

From the above, it can be concluded that the study area presents a fundamentally peri-urban character with some level of acoustic disturbance generated by communities that inhabit the residential areas as well as by traffic that circulates along the roads.

5.3.5 Characterization of Existing Noise Levels

The existing sound environment in the project area was characterized by measuring sound levels in the surroundings close to the project area, particularly near sensitive receivers (housing) which could possibly be affected by noise originated by the project, enabling qualitative identification of the main sound sources in the surroundings of the Songo Converter SS.

For this purpose, an acoustic measurement programme was run in 4 previously selected, different locations, between 14 and 17 September 2021, during the daytime (06:00-22:00h) and during the night period (22:00-06:00h).

The results obtained constitute the existing sound levels for the Project, enabling acoustic characterization of the existing Songo converter substation operation project area surroundings.

5.3.5.1 Methodology

The sampling methodology adopted the requirements stipulated in recommendations and international standards, namely *NP ISO EN 1996-1 (2016) "Acoustics. Measurement and evaluation of ambient noise. Part 1: Fundamental Quantities and Evaluation Methods*." and *NP ISO EN 1996-2 (2018) " Acoustics. Measurement and evaluation of ambient noise. Part 2:* Determining ambient noise sound pressure." The requirements stipulated in the 01dB Solo Black Edition sound level meter manual were also followed. The acoustic data collection procedure adopted the following general principles:

1) Recognition of the area where the project is located, assessment of its suitability for the operation in question, and identification of the main existing noise sources and closest sensitive receivers potentially affected by the noise generated by the Project;
2) Selection of Acoustic Measurement Sites;
3) Acoustic data collection *in-situ* relating to external ambient noise in the area in question and the respective photographic record;
4) The outdoor ambient noise indicator selected was in accordance with the acoustic classification criteria established and assumed in this analysis - the long-term sound level, L_{Aeq}, expressed in dBA;
5) The measurement time interval was chosen to cover all significant variations in noise emission and propagation. For each record, the possible existence of extemporaneous noises, not representative of the location under analysis was considered, and these were eliminated so as not to distort the results obtained;
6) During the daytime, 3 measurements of 15 minutes were performed on 3 different days, and during the night period, 2 measurements of 15 minutes were performed on 2 separate days.

The aim of sound level characterization is to verify the acoustic exposure level of sensitive receivers closest to the project area in the existing situation.

5.3.5.2 Acoustic measurement sites

Four (4) Measurement Sites representative of the area under analysis were selected, based on the following assumptions:

1) Representativeness of existing sound levels in different areas of interest;
2) Accessibility under existing conditions;
3) Existence of safe conditions for taking day and night measurements.

Based on the above, locations were chosen situated in the surroundings of the intervention area. The following figures illustrate the sensitive receivers located in the project's area of influence and which were subject to sound characterization, as identified in the **Figure 5-9** to **Figure 5-12**.

Figure 5-9 – Point R01

Figure 5-10 – Point R02

Figure 5-11 – Point R03

Figure 5-12 – Point R04

5.3.5.3 Measuring equipment

Acoustic tests were performed using a 01dB Solo Black Edition Type 1. This sound level meter is equipped with a high-sensitivity electronic microphone and analysis filters, enabling statistical evaluation by octave and 1/3 octave frequency band. The microphone was equipped with a wind shield to prevent undue low-frequency signals. It should be noted that any residual energy is irrelevant as all measurements were taken with an A-weighted mesh. The sound level meter was

previously checked and calibrated in an accredited laboratory and calibrated before and after each measurement.

5.3.5.4 Reference values

As stated in the chapter on legislation, there are no standards or guidelines on noise in Mozambique regarding the monitoring and assessment of nuisance caused by noise. It is proposed therefore that the standards defined for this project are based on a synthesis of World Health Organization (WHO) and International Finance Corporation (IFC) guidelines. Both guidelines propose a maximum value in residential use areas of 55 dBA for daytime and 45 dBA for night-time.

5.3.5.5 Observed noise levels

Error! Reference source not found. summarises the sound levels recorded during the day at the previously identified monitoring points. The results presented correspond to the average of the different records taken in each sampled location.

Table 5-9- Acoustic results obtained in the daytime (06-22h)

Monitoring point	Location	LAeq dBA	L_{10} dBA	L_{50} dBA	L_{90} dBA	L_{min} dBA	L_{max} dBA
R01	15°36'51.47"S 32°44'45.11"E	42.5	4.7	39.5	36.5	33.9	59.4
R02	15°36'43.62"S 32°44'42.60"E	52.5	54.2	50.3	47.2	43.3	68.3
R03	15°36'32.23"S 32°44'40.33"E	42.7	44.6	36.6	33.1	34.3	60.9
R04	15°36'41.81"S 32°45'26.80"E	40.8	43.6	37.8	35.1	32.8	55.0

Error! Reference source not found. summarises the sound levels recorded during the night at the previously identified monitoring points.

Table 5-10- Acoustic results obtained during the nigh time (22-06h)

Monitoring point	Location	LAeq dBA	L10 dBA	L50 dBA	L90 dBA	L_{min} dBA	L_{max} dBA
R01	15°36'51.47"S 32°44'45.11"E	41.6	42.6	40.8	39.2	37.5	57.8
R02	15°36'43.62"S 32°44'42.60"E	49.0	50.7	48.3	46.1	43.3	62.0
R03	15°36'32.23"S 32°44'40.33"E	37.9	39.7	35.4	33.6	31.8	52.7
R04	15°36'41.81"S 32°45'26.80"E	35.8	37.7	38.0	31.5	29.5	49.8

The values presented above are representative of the conditions of the local acoustic environment and can therefore be considered as average values of existing sound levels, both during the day and at night.

Analysis of **Error! Reference source not found.** and **Error! Reference source not found.** shows that there are very few disturbances to the existing acoustic environment in the intervention area and its surroundings as a consequence of current land use that characterizes the Project area, and due to the non-existence of significant noise sources.

From analysis of the results obtained, it can be confirmed that the sound levels recorded for the daytime period are lower than the maximum exposure values recommended by either the WHO or the World Bank/IFC (defined as 55.0 dBA in the daytime period). The observed and recorded sound levels over 3 days of measurements varied between 40.8 (R04) and 52.5 dBA (R02).

In relation to the night period, the sound levels recorded were below the maximum values recommended by the WHO and IFC at all monitored points, except for site R02, which exceeded the guideline value of 45.0 dBA. During the night period, sound levels varied between 35.8 dBA (R04) and 49.0 dBA (R02). The excess noise verified at point R02 is also be associated with the noise generated by human activities that occur near this monitoring site, as verified by the field team during two (2) different night periods.

It was found that the weather conditions observed did not negatively influence the recorded acoustic levels as measurements were made in the absence of rain, strong wind (> 5 m/s) or low clouds that could influence / exacerbate the acoustic levels recorded.

In conclusion, the results observed in the project implementation area verified that both during the day and at night the existing sound levels are, in general terms, within the 55.0 dBA and 45.0 dBA limits recommended by both IFC and WHO criteria established for residential use zones. It can also be concluded that in the existing situation, the operations associated with the Songo converter substation operation do not negatively and significantly influence the local acoustic environment.

5.4 Geology

5.4.1 Geomorphology

The study area's geomorphology is strongly conditioned by the rift structures that affect the African East and penetrate the Mozambique Sedimentary Basin, in which the Zambezi graben, that affects the implantation and flow direction of the Zambezi River, stands out.

The Cahora Bassa Dam reservoir is a fundamental element in the region and is located west of the study area.

At the local level, the geomorphology, beyond the tectonic control in the macrostructures, also presents evidence of lithological control, quite clear on the ground by the presence of the typical granite inselbergs that stand out in the landscape.

Source: Consultec

Figure 5-13 – Dome-shaped granite relief in the Songo region

The whole region is quite fractured controlling the axis of the main water lines, conferring them, in many sections, a perfectly rectilinear character. The elevation that can be seen in Figure 5-14 corresponds to the Songo area, which forms a rounded relief with a bottom at an altitude of about 500 m, reaching at the top, in some sections, over 1000 m. The Zambezi River flows in the north section of the elevation at elevations of around 300 m.

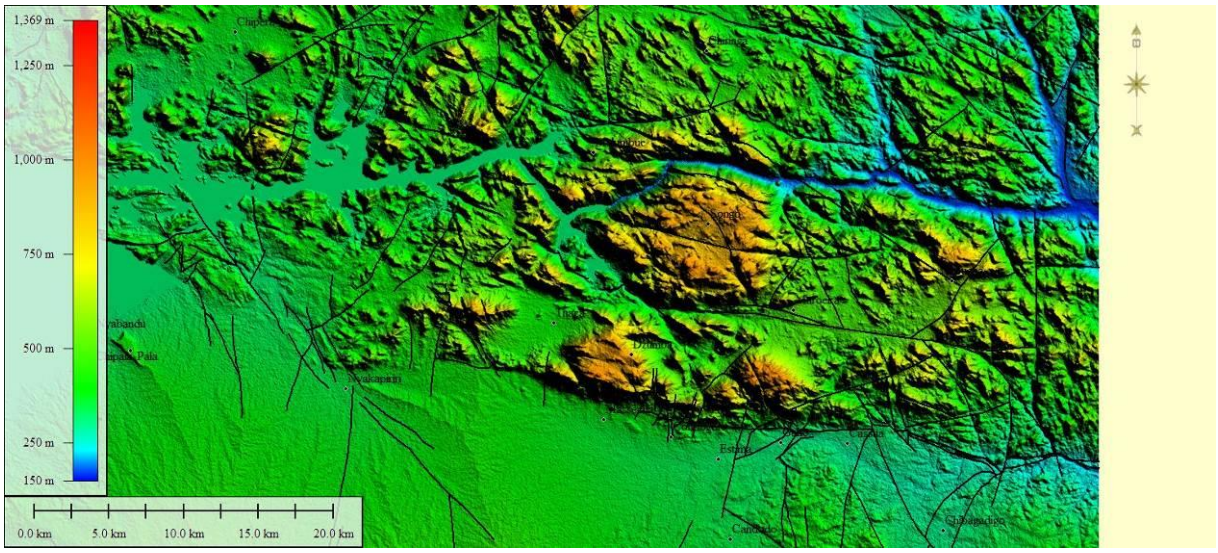


Figure 5-14 – Surrounding relief of the study area

5.4.2 Geological Context

The litho-stratigraphic units constituting the Mozambican territory can be divided between a crystalline basement of Archaean-Cambrian age (2/3 of the country) and a rock cover of Phanerozoic age that occurs mainly in the centre-south of the country and in the NE coastal strip.

The Mozambican Northwest, Tete Province, presents an extraordinarily complex geology, which results from the presence of terranes from Gondwana West, Gondwana East and Gondwana South. These terranes were lithospheric plates that collided and amalgamated thus subsequently forming the Gondwana supercontinent in the Pan-African orogenic cycle. However, before these collisions

occurred, each one of these terranes had its own features resulting from its geodynamic evolution. The intrusive complexes and supra-crustal groups from the Mesoproterozoic to Ordovician in the north sector of Tete Province have a fundamental role in understanding the crustal evolution of this sector.

The crystalline basement of the Tete-Chipata Belt in the north sector of Tete Province consists of metamorphosed supra-crustal plutonic rocks. Most part of the granitoids in this region have ages of between 1,2 and 1,0 billion years, related with the Grenvillian orogenic cycle which culminated with the formation of the Rodínia supercontinent (it's the break-up of this supercontinent into several lithospheric plates which then collide and form another supercontinent – Gondwana). The more recent granites, with 470 to 500 million years, are of post-Pan-African magmatism.

5.4.3 Local Geology

Granitic rocks are interpreted and grouped according to its age and the role they played during the geodynamic evolution of the region. In Songo and, by consequence, in the area where the Project's infrastructures are located, in geological and petrographic terms there is the so called Brown Granite (P_2CT) in the SS expansion area and the lower Karoo Matinde Formation (PeT) in the electrode area (**Figure 5-15**).

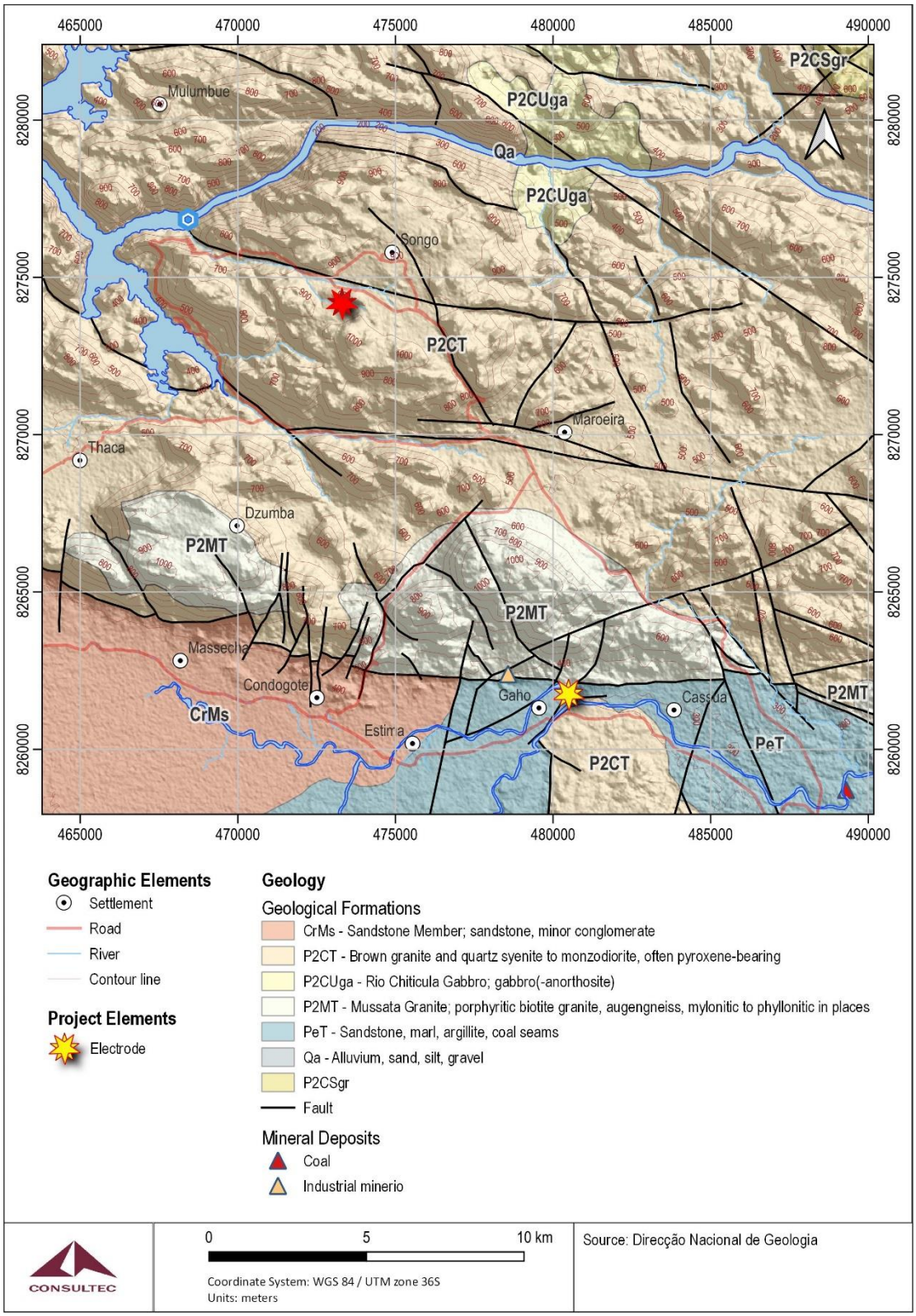


Figure 5-15 Geological Context (detailed key in the table below)

Table 5-11- Geological formations intercepted by the Project

SYMBOL	Group/FORMATION	LITHOLOGY	ERA | AGE
CrMs	Stonesand of Mágoè	Terrigenous feldspathic stoneware	Cretaceous
P2Ct	Irumide Intrusive Suite	Brown Granite	Mesoproterozoic
P2Cuga	Irumide Intrusive Suite	Gabbros and Anorthosites of the Chiticul River	Mesoproterozoic
P2MT	Irumide Intrusive Suite	Mussata Granite	Mesoproterozoic
PeT	F. Matinde	Sandstone, marls, clays, layers of coal	Paleozoic | Permian-Triassic
Qa	-	Alluvium deposits, sand, silt, gravel	Cenozoic | Quaternary
P2CSgr	Pan African Intrusive Rocks	Serra Chiúta granite	Mesoproterozoic

Brown Granite (P2CT) typically shows up in solid bodies that usually present a porphyroblastic texture. The sound rock colours vary from dark brown to dark grey and may, in some places, such as to the SW of Songo, have a dark green colour. The alteration area also has a variety of colours, usually from brown to grey, but it may also present light grey to whitish tones, which contrasts with the rock tones in its sound state.

Figure 5-16 Brown granite blocks west of the SS

Brown Granite is composed of varying amounts of quartz, alkali feldspar, plagioclase, orthopyroxene, augite, biotite and hornblende with opaque minerals, giving it a composition ranging from pure granite and quartz syenites to granodiorites and from quartz monzonites to quartz monzodiorites.

Near the Cahora Bassa Dam there are dark green granites composed almost entirely of quartz, feldspar and opaque minerals.

The **Matinde Formation** (PeT) is the youngest of the Karoo Supergroup in the Moatize coal deposits and consists of sandstones with cross stratification and conglomerated locally (lenses of coal and carbonaceous shale develop in some places, but with small thickness).

5.5 Surface Hydrology

5.5.1 Characterisation of the Surrounding Hydrographic System

In terms of regional context, the study area is part of the Zambezi River drainage basin, as shown in **Figure 5-17**. The Zambezi River drainage basin is the fourth largest drainage basin in Africa, after the drainage basins of the Congo, Nile and Niger rivers.

The Zambezi River starts in the northwest of Zambia, in mount Kalene, runs over a length of approximately 2 800 km and flows into the Indian Ocean. It presents several major waterfalls along its course, the more noteworthy ones being Victoria Falls with 1 708 metres in length and falls of up to 100 metres.

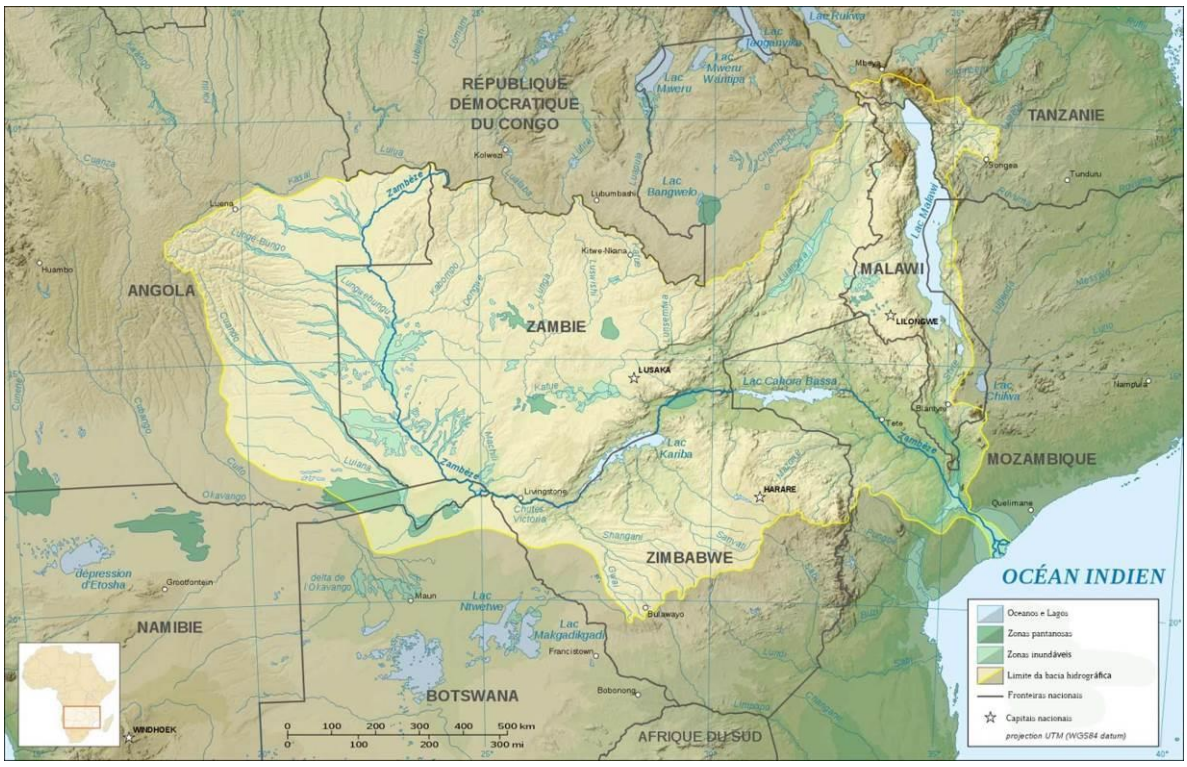


Figure 5-17 – Zambezi River drainage basin

The Zambezi River crosses the border into Mozambique next to the locality of Zumbo and flows to the Cahora Bassa Dam. At the location of the dam, the gorge has very high banks, about 600 m high. Past the dam, the river continues in this gorge for another 30 km before entering the peneplains. In Lupata, the course of the river has only smooth meanders, running through a well-defined channel

of about 800 to 100 m wide. The last 350 km, from Lupata to the Indian Ocean, are characterised by a course about 3-5 km wide, strongly braided and poorly defined riverbanks. It can be considered that the delta starts in Mopeia, 150 km from the ocean, with the tide influence being clear in the last 80 km.

The Zambezi River delta extends for 100 km along the Mozambican coast and covers an area of about 15 000 km². In the south bank, the Marromeu complex is formed, a 5 000 km² wetland close to the coastal region, protected internationally by the Ramsar Convention (2000).

5.5.2 Local Hydrology

The drainage basins where the Project's infrastructures are included are indicated in **Figure 5-18**.

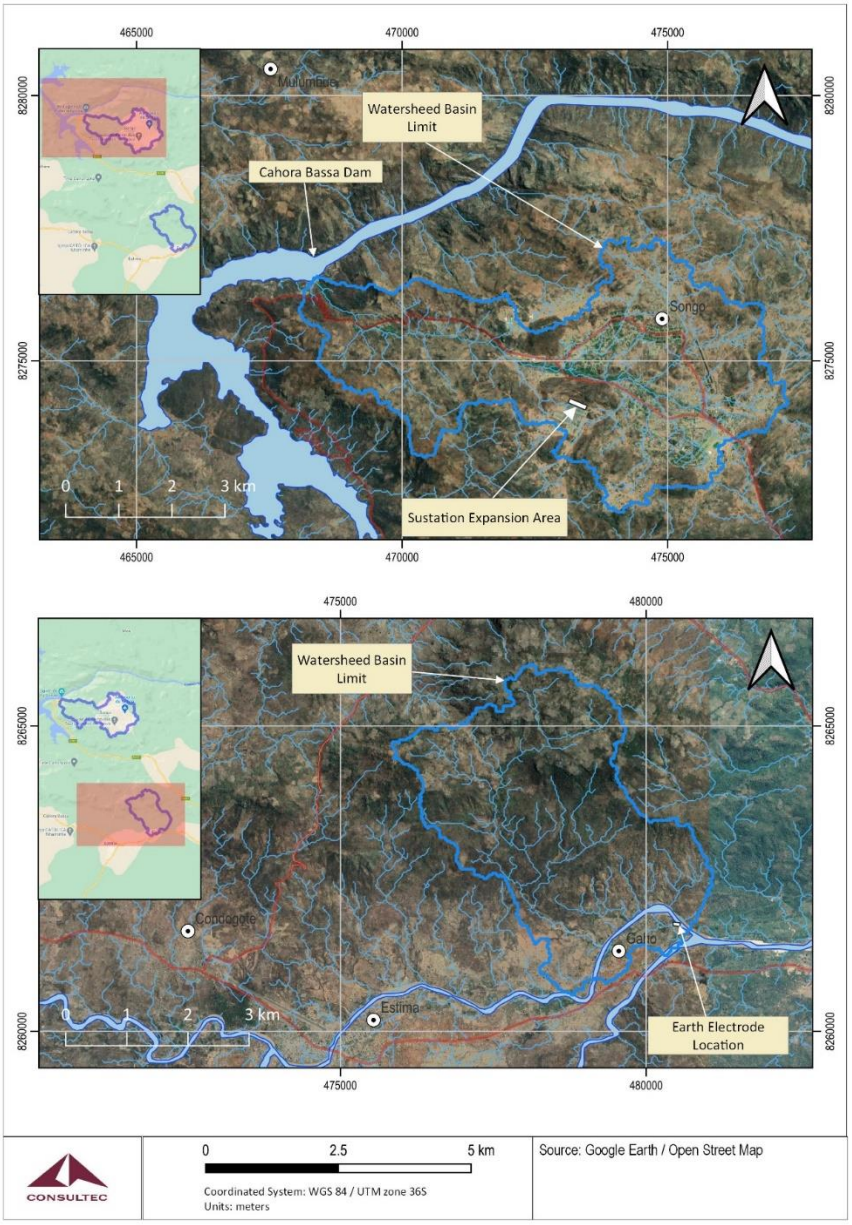


Figure 5-18 - Local hydrology

The **drainage basin of the SS expansion area** has a general direction WNW-ESSE, which encompasses the town of Songo, where the main water line presents a flow in the same direction up to the Zambezi River, north of the dam. The basin has an elongated shape, thin in the central section, and drains an area of 24,5 km^2. The main water line has a channel of about 8 km.

The **drainage basin of the electrode area** has a general direction NW-SE, where the main water line displays an arched flow direction, incurved to the NE, with the project area near its course. The basin presents a rounded shape and drains an area of 14,7 km^2. The main water line has a channel of about 7 km. The drainage pattern is asymmetrical, with most of the tributaries on the left bank of the main water line.

Substation Drainage Basin *Electrode Drainage Basin*

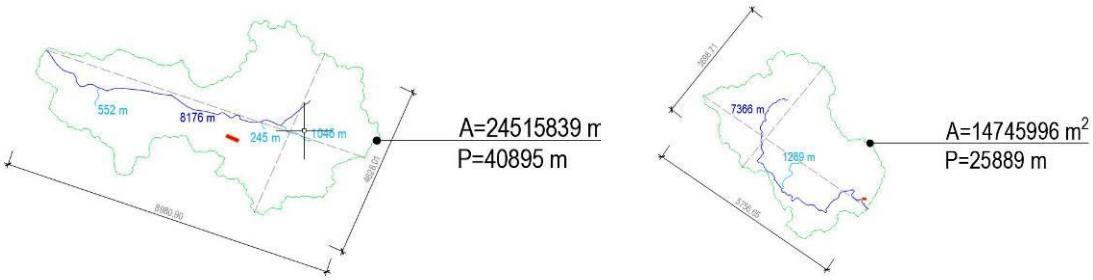


Figure 5-19 Geometrical features of the Project's sub-basins

In terms of tributaries, the water lines are poorly developed, with tributaries mainly of the 1st order and concentrated, mostly, in the upstream section of the basin. The water lines are, in general, ephemeral, only carry water during and immediately after the rainfall periods, but present well-defined riverbeds, with evidence of erosive capacity/sediment transport, probably taking advantage of the fracture plane for its implementation.

In general, the drainage system presents signs of torrential character, with well inserted water lines, gullied riverbanks and, in many cases, steep slopes.

5.6 Underground Hydrology

This work has been conducted based on the field observations and the consultation of the existing bibliography on the region. No tests to assess and quantify the fundamental hydrological parameters (porosity, permeability, hydraulic conductivity, transmissibility, storage coefficient, among others) that ensure or allow acquiring the necessary information to obtain some knowledge on the hydrological conditions in the area have been carried out.

Considering what was mentioned and given the nature of the geological formations present, as described in the Geology section, it is expected that the area doesn't have significant underground water resources, as is shown by the Mozambique Hydrogeological Chart, where the Songo area is over a mountainous area, with no significant alteration mantle and practically devoid of groundwater (usually with a flow <1m^3/h). The appearance of water is related, in general, with springs. Fault zones and slope cones may correspond to exception zones usually more productive, and are classified as class C3 areas (Figure 5-20).

Considering the granitic, solid character of the existing rocks in the study area it is to be expected that the system is fissured, where the weakness zones such as fractures, faults, lithological contact areas, veins, are more susceptible to be altered by weathering and may allow for the development of aquifers.

It is important to note that in fissured, fractured systems, highly fractured zones coexist laterally and in depth with weakly fractured zones, where the alteration acts as a buffer to the flow. The existence of heterogeneous zones necessarily induces sudden changes in terms of hydrodynamics. These changes, even within the same mapped system, are the result of the changes and transitions

between the possible different systems, which are somehow spatially interconnected, which justifies the range of productivity values expected in this type of formations/aquifers.

Productivity class / Type of aquifer	1. High productivity	2. Moderate productivity	3. Productivity generally low (but locally moderate)	4. Productivity generally low
A – Intergranular unconsolidated aquifers	A1	A2	A3	x
B – Fissured aquifers	B1	B2	B3	x

Figure 5-20 – Excerpt of the Mozambique Hydrogeological chart at the original scale of 1:1 000 000 (DNA, 1987)

5.7 Soils

The Soil Charts for Tete Province (INIA, 1994), at a 1: 1 000 000 scale, were used to characterise the soils of the study area within the scope of this project. These charts allow identifying the different pedological units which occur in the study area.

The dominant soils in the Songo region, where the project's infrastructures are identified, are delimited in **Figure 5-21** and **Figure 5-22**, with the brown grey clay soils in the SS area, identified with the acronym KG, and the deep soils derived from limestone rocks in the electrode area, identified with the acronym WK, standing out.

The **brown grey clay soils** (**KG**) are equivalent to the ferric Lixisols of the FAO classification system and account for 6% of the occurring soils in the Zambezi Basin. These soils are derived from acidic, pre-Cambrian rocks, usually granites and gneisses, and generally occupy interfluve areas of

undulating relief. Drainage is moderate, and the soils are marginally suitable for agriculture. Soil depth, sodicity and sometimes salinity are the main limitations for agriculture.

The **deep soils derived from limestone rocks** (**WK**) are equivalent to the limestone Cambisols of the FAO classification system and account for 3% of the occurring soils in the Zambezi Basin. These soils are derived from the Karoo rocks, usually occupying hill areas of undulating relief. Drainage is imperfect to good, with a good to moderate suitability for agriculture. The germination conditions and the erosion risk are the main limitations for agriculture.

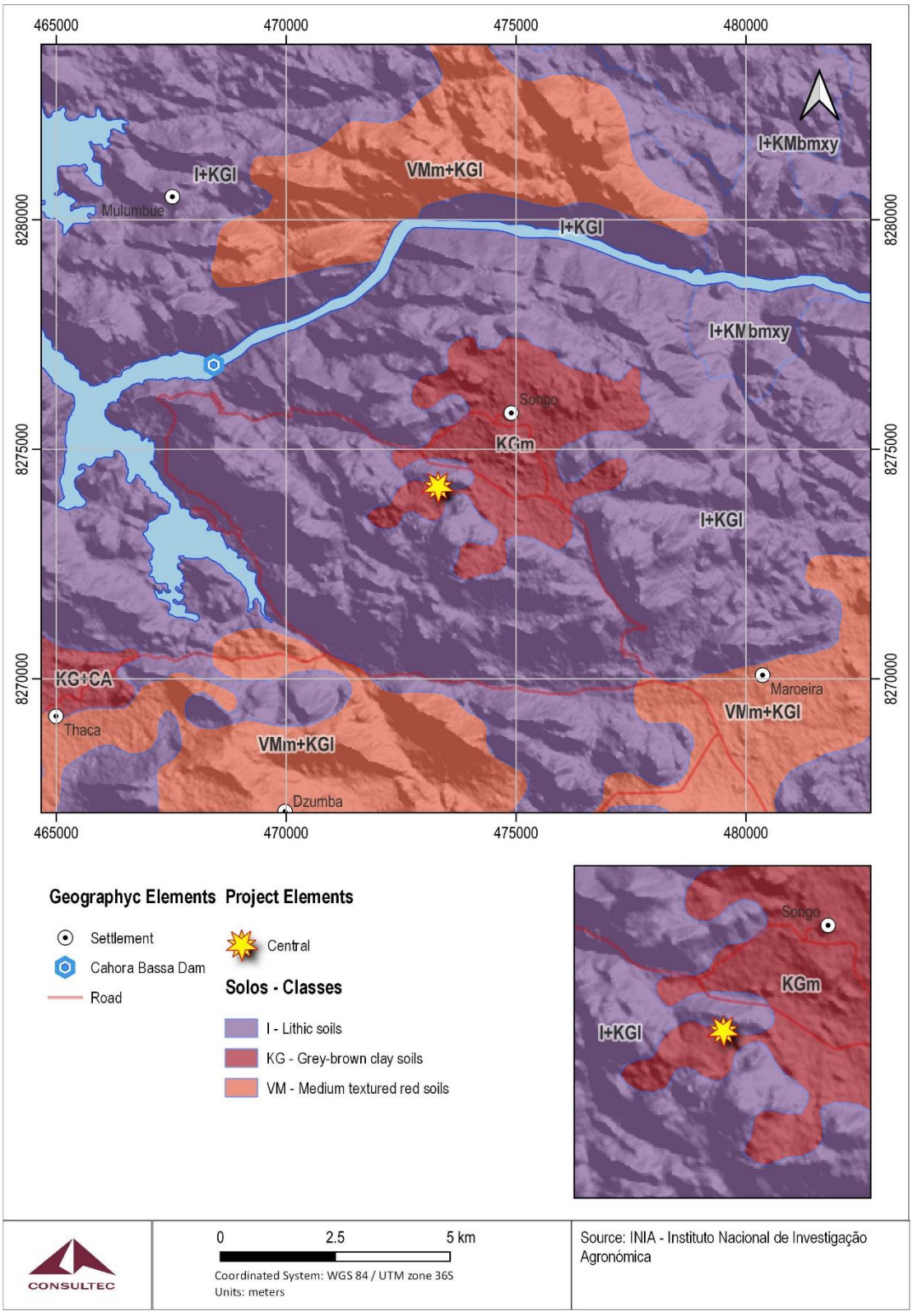


Figure 5-21 – Existing soil groups in the SS expansion area

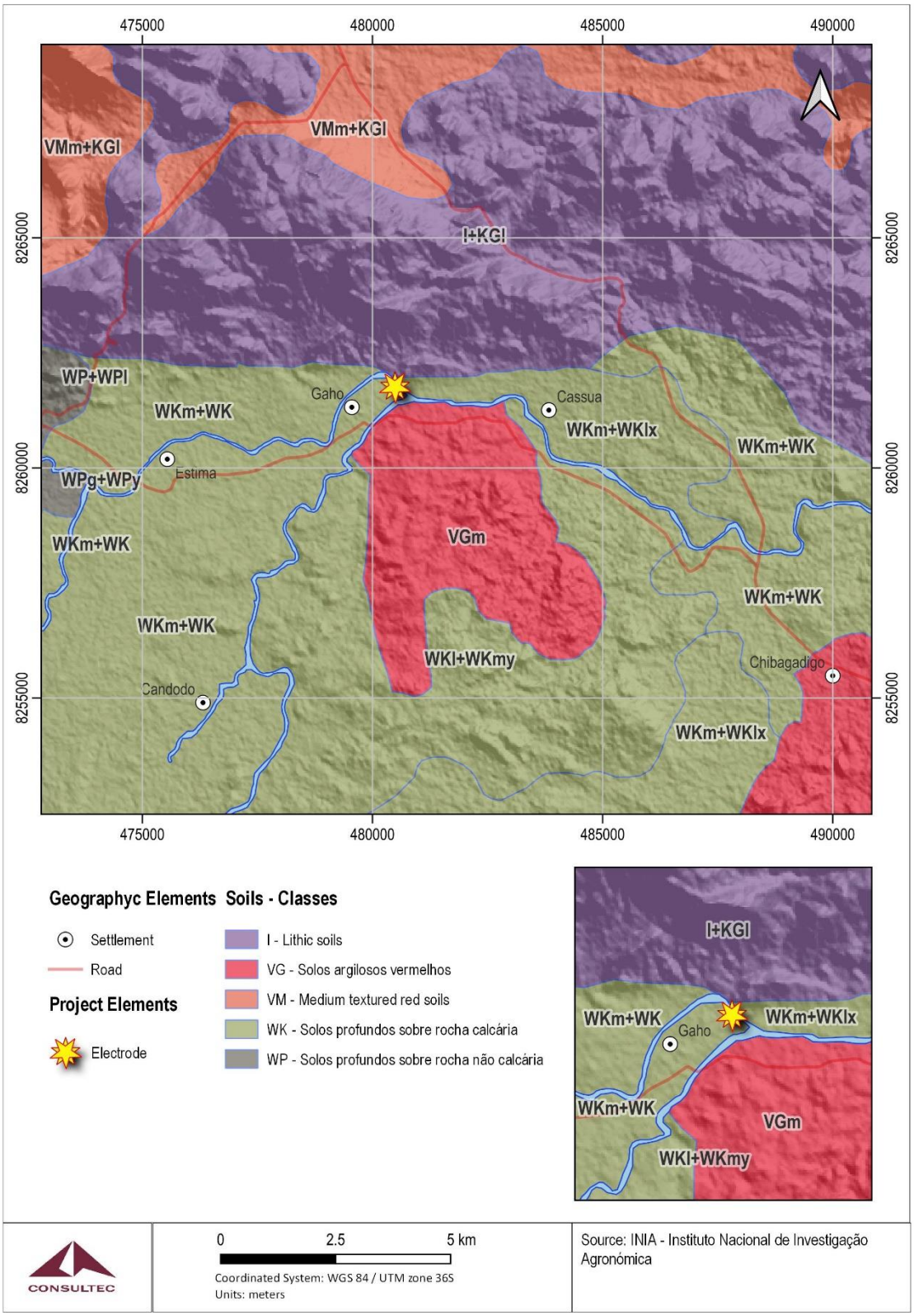
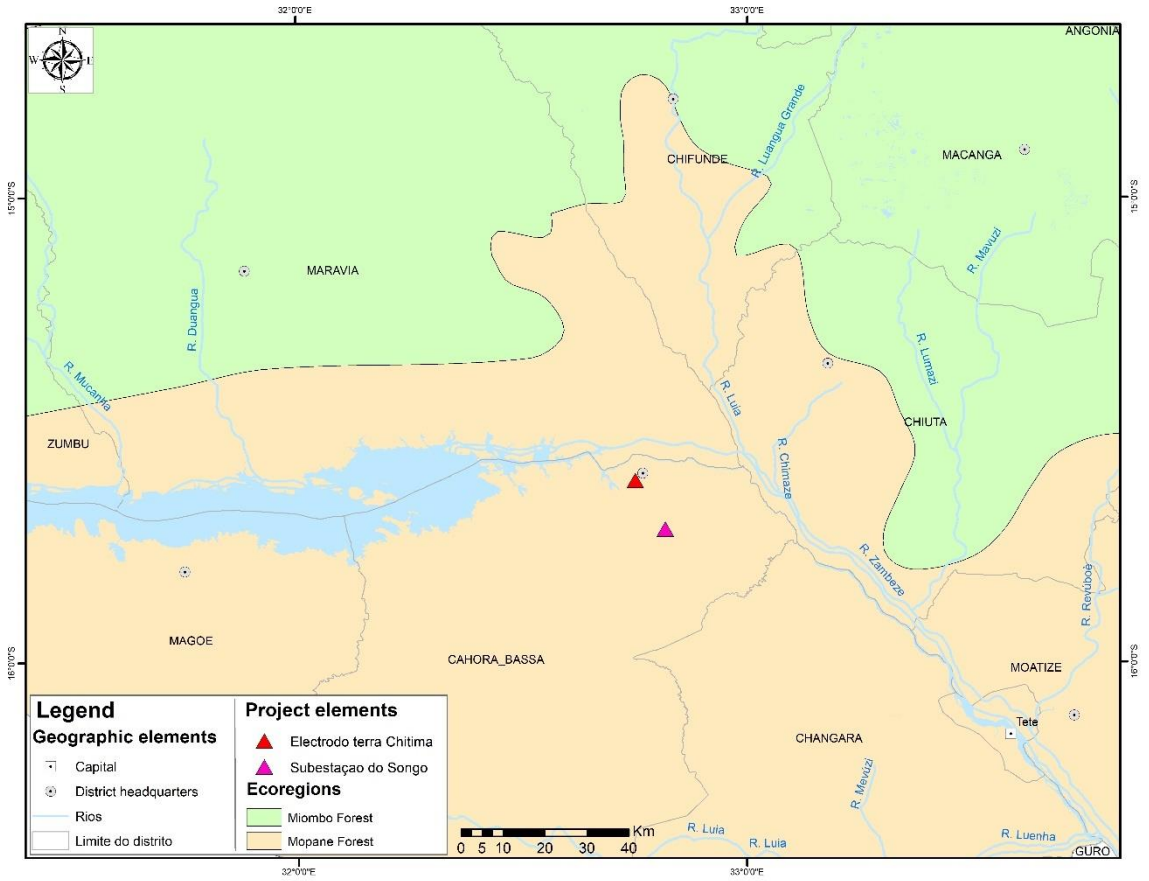


Figure 5-22 – Existing soil groups in the electrode

5.8 Biotic Environment

5.8.1 Regional Context

The regional context (Tete Province) is part of the Zambezian Endemism Ecoregion, dominated by miombo and mopane woodlands (**Figure 5-23**). This ecoregion is found across the area of the Zambezi River drainage basin and the endemism is quite low for the plant and mammal species (RESOLVE, 2017).



Source: RESOLVE, 2017

Figure 5-23 – Map of Tete Province's ecoregions

In the Tete region, miombo woodlands usually correspond to the dry semi-deciduous miombo, of moderate to low arboreal density (< 40% of cover), and tree height not above 10 m. Miombo is characterised by the abundant presence of the genera *Brachystegia* and *Julbernardia* (Compbell *et al*., 2007), with other dominating species in this physiognomy being: *Uapaca kirkiana, Brachystegia boehmii, Combretum molle, Pterocarpus angolensis* and *Millettia stuhlmannii*.

Mopane woodlands, which occupy a narrow strip north and south of the Zambezi River (MITADER, 2011), are characterised by the dominance of the *Colophospermum mopane* species; they may also be associated to species such as *Sclerocarya birrea, Combretum sp., Terminalia sericea, Strychnos sp.*, and others. These communities present a considerable variation in height and density. The trees

of dense forest or of more open savanna woodland may reach a height of between 10 to 15 m and occur in deep alluvial soils, while in impermeable alkali soils mopane trees tend to be smaller with shrub size and heights of between 1 and 3 m (RESOLVE, 2017).

Tete is one of the provinces with a larger contribution of forest area in the country, according to the latest National Forest Inventory (Magalhães, 2018), accounting for 12% of the national forest cover (3,3 million hectares). Despite the province's forest potential, factors such as deforestation and forest conversion are still present. According to the World Bank (2018), forest conversion, to give way to subsistence farming activities, accounts for 68% of forest reduction, resulting in the loss of important goods and services for the livelihood of the local communities.

Vegetation in the area under analysis is quite anthropized due to farming activities, woodcutting for fuel production and grazing.

In the past, the fauna in Tete Province was abundant and diversified, with the presence of large-sized mammals such as lions, giraffes, rhinos, hippos, leopards and elephants (Timberlake, 2000). Small and medium-sized mammals such as antelopes, monkeys, bats and rodents are frequent, while the large-sized ones are mostly observed in the south part of the province bordering Zimbabwe (AGRECO, 2010).

Avifauna is abundant and about 260 bird species have probable occurrence in the Tete region (MacLean, 1993).

Herpetofauna is well represented in the province with about 46 species. Amphibians are associated with the existence of favourable water habitats and reptiles such as crocodiles, snakes (pythons, mambas) and lizards can be found (Consultec, 2010).

5.8.2 Flora and Habitats

Considering the ecological context of the project implementation area, the flora and habitats present are subject to a high degree of disruption. The vegetation characterisation was conducted through the photographic mapping of the different existing plant communities and consultation of the existing bibliography.

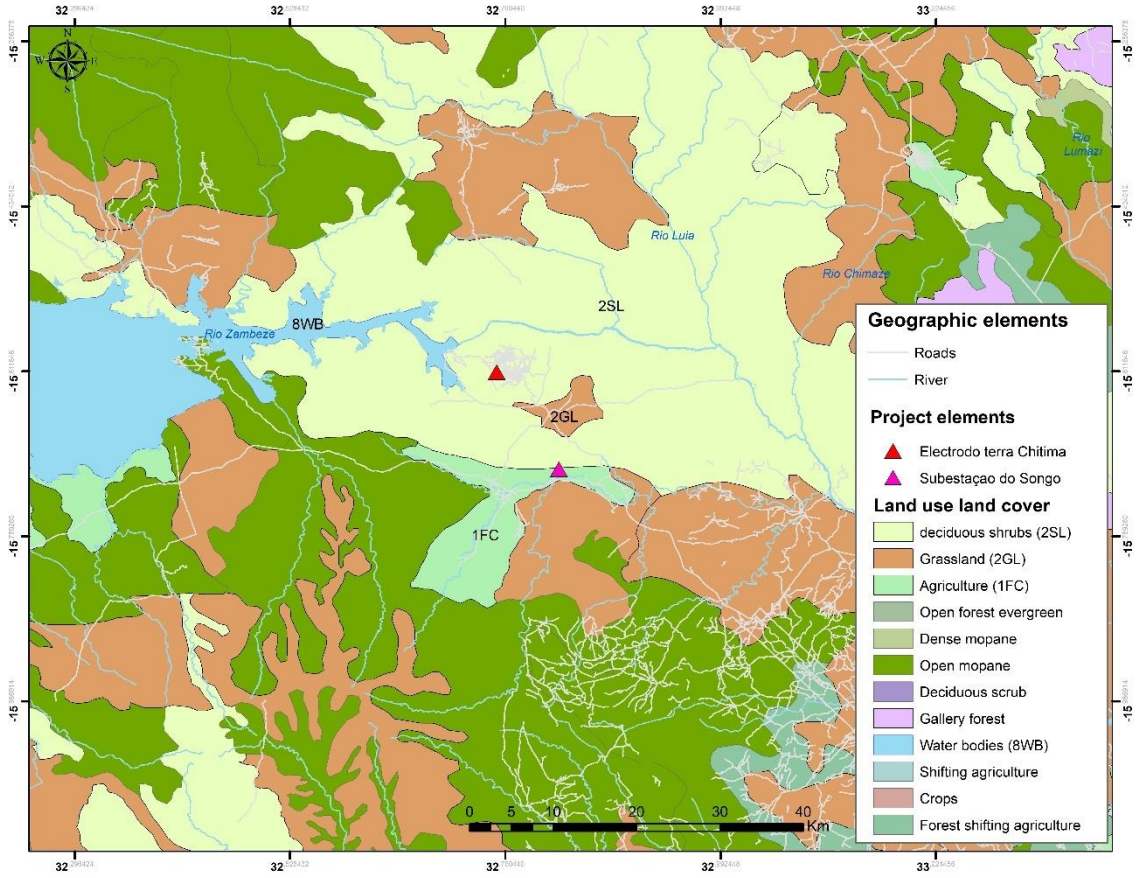
A semi-structured interview with the nearest community's authorities was also conducted to find out what are the main uses for the natural resources in this region.

5.8.2.1 Vegetation Units and brief description

The land use units are shown in **Figure 5-24**. The analysis of the vegetation within the project area identified 4 uses, namely:

- Deciduous bushes;
- Grasslands;
- Agriculture;

- Natural water bodies.



Source: Marzoli, 2007.

Figure 5-24 – Map of land use units in the project area

In terms of natural vegetation, the surroundings of the project implementation area are covered with **deciduous bushes** that represent the mopane woodland mosaic, undifferentiated scrubland and ruderal vegetation. The **grasslands** represent scattered areas with vegetation with the presence of a dominant grass stratum. The **farming areas** represent the rain-fed and irrigated agriculture that is practised on the banks of the Zambezi and Sanangue rivers (the latter being closer to the earthing electrode facilities). The natural **water bodies** represent the Zambezi and Sanangue rivers, along whose banks, besides the farming activity, there is riparian vegetation. **Riparian vegetation** represents the vegetation that occurs along the water lines crossing the project area. However, most of the area shows anthropized vegetation in different degrees, and the spontaneous vegetation occupies scattered fragments, with the more significant vegetation formations being situated in the mountainous areas.

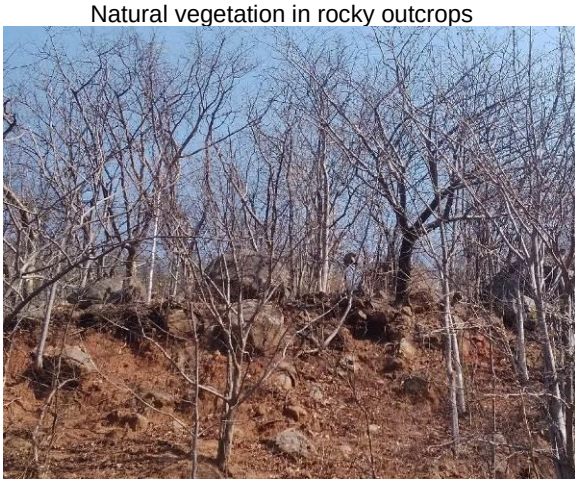
Below is a description of the vegetation types found in the project area.

- Deciduous bushes

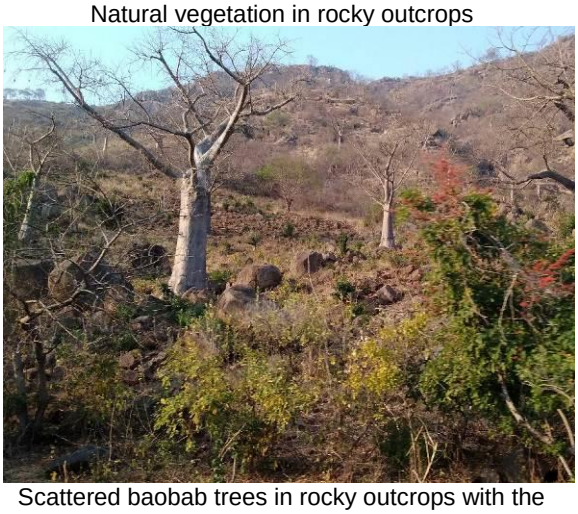
The deciduous vegetation is distributed throughout almost the entire project area surface and is characterised for presenting caducifoliate or deciduous species. The term deciduous is used to indicate species that lose their leaves at a certain time of the year; usually most deciduous species produce new leaves before the rainy season, thus marking the beginning of growth that can last between 2 to 3 months (Lamprecht, 1990). In this physiognomy, miombo (wet and dry) and mopane (open and closed) dominate. The prevailing species in the project area are: mopane (*Colophospernum mopane*), baobab (*Adansonia digitata*), pod mahogany (Chanfuta) (*Afzelia quanzensis*), among others.

Natural vegetation in rocky outcrops

Natural vegetation in rocky outcrops



Medium-sized deciduous trees



Scattered baobab trees in rocky outcrops with the presence of a grass stratum

Figure 5-25 – Deciduous shrub vegetation in the project area

- Riparian Vegetation

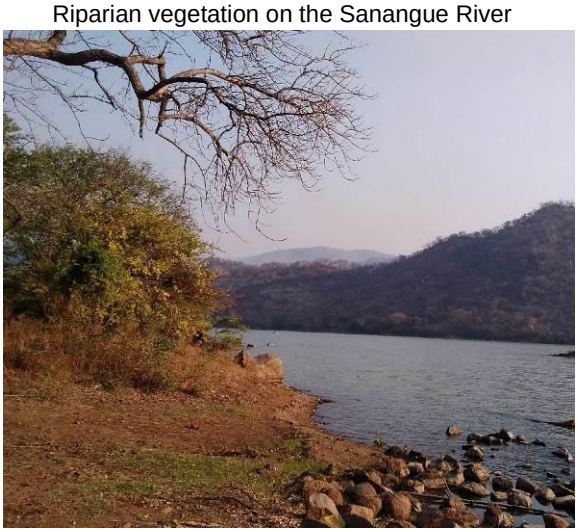
Riparian vegetation develops on riverbanks or flooded areas, temporarily or permanently (Marzoli, 2009), and consists of not very leafy trees, with an average height of 7 m and a treetop cover of about 40%. It is a type of evergreen vegetation that may form an arboreal phytophysiognomy or be limited to the shrub and herbaceous stratum. This type of vegetation develops in areas of high water

availability and is subject to a high level of anthropic pressure for the establishment of farming areas on the riverbanks. Thus, most of the riparian vegetation in the study area is much degraded. These woodlands play an important role in protecting watercourses from sediment deposits and maintain the ecological balance of water systems. They are also important repositories of animal and plant biodiversity, hosting bird species and other animals.

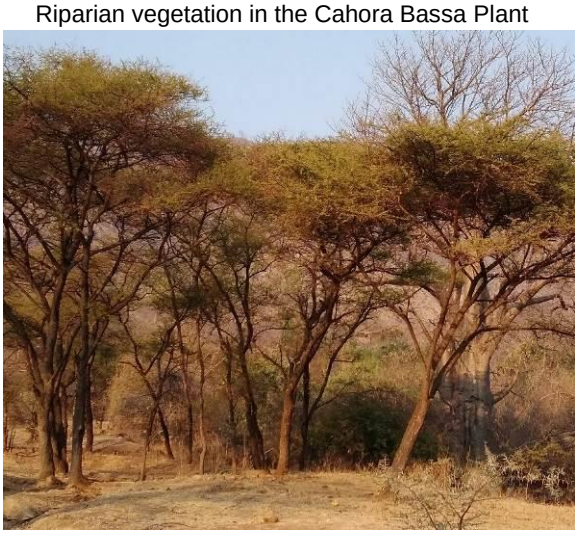
In the project area this vegetation type occurs next to the Cahora Bassa reservoir (Zambezi River) and in the earthing electrode area (Sanangue River). The dominant species in this vegetation are *Combretum imberbe* and other ligneous species; in the grassy component the dominant species are reed (*Phragmites australis*) and papyrus (*Cyperus papyrus*).

Riparian vegetation on the Sanangue River

Riparian vegetation in the Cahora Bassa Plant



Riparian vegetation on the bank of the Zambezi River



Riparian vegetation on the bank of the Zambezi River

Figure 5-26 – Riparian vegetation in the Project area

- Grasslands

Grasslands are a vegetation formation whose main feature is the dominance of the grass stratum and the presence of herbaceous plants. In addition to the strata mentioned, in this formation the tree stratum may occur in a scattered and very open form, or in mosaic form. Grasslands can

also be wooded and non-wooded (MRV, 2019). Wooded grasslands are characterised by the presence of grasses with scattered trees corresponding to about 20% tree and/or shrub cover. In many areas, wooded grasslands are associated with the species *Anacardium occidentale* (cashew tree), and occurs in areas of small-scale family farming and grazing areas. The non-wooded grassland is a vegetation formation dominated by the herbaceous-grass stratum, and trees and/or shrubs may be found scattered throughout the grassland. In this physiognomy the treetops hardly touch. In the project area the occurrence of grasslands with rocky soils and presence of some scattered trees was identified.

Figure 5-27 – Example of a grassland identified within the project area

- Farming Areas

The agriculture class corresponds to all the areas occupied by farming or cattle breeding activities. Some of these classes correspond to low scrubland and wooded grasslands (MRV, 2016). This is the class that, within the project area, occupies the greater surface – family farming (subsistence farming), rain-fed and irrigated, largely located on the riverbanks (Sanangue and Zambezi rivers). The farming production areas are duly identified in the project area, and in some slopes there are signs prohibiting farming to allow natural vegetation to grow and to keep the slopes and the rocky crops protected.

Vegetables on the banks of the Sanangue river

Rain-fed crops in the Matumbuliro community

Figure 5-28 – Farming areas on the Sanangue river, vegetable farming

- Natural Water Bodies

This category includes the rivers, tributaries and flooded areas found in the study area and intercepted by the project's infrastructures. The main river in the study area is the Zambezi, where the Cahora Bassa Hydroelectric is installed. The Sanangue River is the one closer to the project area. Currently, the banks of the Zambezi River and of other tributaries are occupied mostly by human settlements and farming activities.

Sanangue River (with no water)

Zambezi River

Figure 5-29 – Natural water bodies in the Project area

5.8.3 Plant Species with conservation interest

In Mozambique, according to the Red List of Plants of Mozambique (Bandeira & Izidine, 2002 *in* Southern African Plant Red Data Book (Golding, 2002)), there are about 300 classified species listed as critically endangered, endemic and vulnerable, a classification based on the categorisation criteria

of the IUCN (2020). According to this list and to the Red List of Southern African Plants by the IUCN, the *Dalbergia melanoxylon* (Blackwood) species, which is included in Annexure II of the CITES Convention and is considered nearly threatened (NT) according to the red list of the IUCN (2020), was identified in Tete Province. The main species with conservation status occurring in Tete Province and potentially in the project implementation area (Cahora Bassa District, HCB) are listed in the table below. It's not expected, however, that these species will occur in the project area, given the anthropized character of the same.

Table 5-12- Plant species with conservation status with potential occurrence in Tete Province

Scientific name	Vernacular or Local Names	Status (IUCN)
Celosia pandurata	-	Vulnerable (VU)
Lannea stuhlmannii	Mesasoto (Nh)	Vulnerable I (VU2)
Maytenus mossambicensis	-	Vulnerable (VU)
*Hibiscus torrei**	-	Vulnerable (VU)
Sporobolus molleri	Metil (Nh)	Insufficient Data (DD)
Sterculia appendiculata	-	Vulnerable (VU1)
*Grewia hornbyi**	-	Insufficient Data (DD)
Spirostachys africana	Sândalo (Pt) (Sandalwood)	-
Afzelia quanzensis	Chanfuta (Pt)	Low Risk (LR)
Khaya anthotheca	-	-
Raphia farinifera	-	Endangered (PE)

* endemic species

5.8.4 Use of Flora species

The plant species in the Project area are used for various purposes by the communities. These uses were ascertained through the consultation of flora manuals (Koning, 1993), through the knowledge and experience from other projects, in similar areas, and during the semi-structured interview conducted in the nearest community (Matumbuliro). The main uses of native plants are as follows:

Construction – The wood from various tree species is used in the local construction of precarious houses, improvements and animal enclosures. The main timber species used in the area are *Diospyros usambarensis*, mopane (*Colophospermum mopane*), *Pterocarpus rotundifolius* and blackwood (*Dalbergia melanoxylon*).

Food use – The use for food focuses on native and introduced species whose leaves, roots or fruits are used as food. Most farming crops in the farming plots ("machambas") have food use, some for own consumption or for marketing, especially sorghum, tomato, sesame, maize, cassava, among others. About fruit trees, the following should be mentioned: marula (nfula), (*Sclerocarya birrea*), *Diospyros quiloensis*, *Colophospermum mopane* and *Berchemia discolor*.

Fuel – Fuel is produced in the form of charcoal and firewood and to this end native plants such as mopane (*Colophospermum mopane*) and apple leaf tree (*Lonchocarpus capassa*) are used. It is estimated that in Tete Province mopane accounts for 90% of the charcoal production.

Medicinal use – From the species with medicinal use, the following are noteworthy: small-fruited olax (mussiro) (*Olax dissitiflora*), a plant used for skin treatment, its roots and leaves are medicinal; neem (margosa) (*Azadirachta indica*), used to treat stomach diseases; *Commiphora africana*, used to cure various diseases; and the leaves of *Combretum sp*., used in malaria treatment.

The main ligneous species occurring in Tete Province and potentially in the Project implementation area with value for commercial exploitation and referred to in the Regulation of the Forests and Wildlife Law, approved by Decree No. 12/2002, of 6 June, are listed in **Error! Reference source not found.**.

Table 5-13- Listing of the uses for the species identified and potentially occurring in the study area

Scientific name	Vernacular name	Main Uses
Sclerocarya birrea	Nfula	Food and Medicine
Commiphora africana	-	Medicine
Commiphora neglecta	-	Construction stakes
Diospyros quiloensis	-	Stem used in crafts, fruits are edible
Diospyros usambarensis	-	Construction stakes
Albizia obovata	-	Craftwork
Colophospermum mopane	Mopane	Forage, food, construction, firewood and charcoal
Dalbergia melanoxylon	Pau-preto	Craftwork /Sculptures
Dichrostachys cinerea	-	Construction stakes /Firewood and medicine
Olax dissitiflora	Mussiro	Cosmetics/Medicine
Philenoptera violacea	-	Cultural Use
Pterocarpus rotundifolius	-	Construction
Grewia bicolor	-	Construction/Medicine
Azadirachta indica	Margosa	Medicine/Construction
Berchemia discolor	-	Edible fruit

Besides the uses identified above, a large part of the *Poaceae* (*Gramineae*) and the *Boerhavia* spp. (*Nyctaginaceae*) are used as fodder for farm animals. The grasses *Urochloa mosambicensis* and *Panicum* spp., which occur naturally as weeds, have edible ears, while *Pennisectum* spp. is used for roofing houses and farming improvements (Consultec, 2006).

Among the species with multiple practical uses, cultural and medicinal interest it is worth noting the baobab (*Adansonia digitata*), used by local populations for the medicinal properties of the leaves, bark and wood. Baobabs serve to store water, house insect species that produce melliferous substances and produce edible fruits.

5.8.5 Fauna

In the past, the region's fauna was abundant, particularly in terms of large-sized mammals such as elephants, lions, leopards and hyenas (Timberlake, 2000). However, the faunal variety was reduced due to hunting by humans during the civil war and to burnings and the opening of farming areas as a response to the increase of the human population.

However, there are still large-sized animals such as the hippopotamus (*Hippopotamus amphibius*) and the Nile crocodile (*Crocodylus niloticus*) that are at the root of many of the conflicts between man and wildlife in this province (*Dunham et al*., 2010).

Large-sized wildlife is virtually inexistent in the implementation area; the potentially occurring species in the region include the yellow baboon (*Papio cynocephalus)*, grey duiker (*Sylvicapra grimmia*), suni (*Neotragus moschatus*), klipspringer (*Oreotragus oreotragus*), bushpig (*Potamochoerus porcus*), spotted hyena (*Crocuta crocuta*), small herbivores, such as the steenbok (*Raphicerus campestris*), and small rodents.

Avifauna is the group presenting greater diversity, especially in the wetlands and in the Zambezi riverbanks. The avifauna associated to wetlands includes species such as the black-headed heron (*Ardea melanocephala*), dwarf bittern (*Ixobrychus sturmii*), African darters (*Anhinga rufa*), spur-winged geese (*Plectropterus gambensis*), marabou storks (*Leptoptilus crumeniferus*), oriental darter (*Anhinga melanogaster*), giant heron (*Ardea goliath*) and African fish eagle (*Haliaeetus vocifer*) (Bento and Beilfuss, 2003). Besides these, the occurrence of *Podiceps* genera species is very common, with the main ones being the great crested grebe (*Podiceps cristatus infuscatus*), black-necked grebe (*Podiceps nigricollis*), reed cormorant (*Phalacrocorax africanus*), great cormorant (*Phalacrocorax carbo*), and speckled pigeon (*Columba guinea*).

The reptile fauna in Tete Province presents a richness of species reflecting the diversity of existing microhabitats related to the watercourses of the Zambezi River that maintain ideal conditions for the occurrence of various species, such as the Nile crocodile (*Crocodylus niloticus*), Nile monitor (*Varanus niloticus*) and Southern African python (*Python sebae natalensis*). Potentially occurring species in the region also include the black mamba (*Dendroaspis polylepis*), Mozambique spitting cobra (*Naja mossambica*), horned adder (*Bitis caudalis*) and puff adder (*Batis arietans*).

From the amphibian species existing in the region it is worth mentioning the toads (*Bufo gutturallis* and *Bufo maculatus*), knocking sand frog (*Tomopterna krugerensis*) and sharp-nosed ridged frog (*Ptychadena oxyrhynchus*). Regarding invertebrates, to entomofauna, there are no specific studies for the Tete region, but in Mozambique approximately 3,000 species of insects are recorded, although this group hasn't been studied much in the province (Consultec, 2005).

Given the features of the vegetation and soil and the weather conditions, the local fauna is also characterised by small-sized animals. Rabbits, antelopes, wild boars, monkeys, Guinea-fowls and various birds have been identified in the area. It should be mentioned that no occurrence of conservation status species is expected in this area given that the zone is quite anthropized.

During the field visit no traces of large-sized fauna were observed. In the Songo region fauna is not abundant, as hunting and the practice of burnings to clear new areas for farming have been factors

for the reduction of the faunal biodiversity. However, along the rocky outcrops it was possible to observe some grey monkeys and a few small rodents' burrows on the ground.

5.8.6 Sensitive Areas

Sensitive areas are areas with ecological importance and that play unique roles in the ecosystem. Its preservation implies the continued functioning of habitats. No zones considered to be ecologically sensitive were identified in the study area.

5.9 Socio-economic environment

5.9.1 Introduction

This subchapter will present a general description of the socio-economic environment in the project's area of influence. This report's socio-economic data is provided mainly at two levels: at a regional level, presenting pertinent information on the Tete Province; and at a local level, in which the information is centred on the Cahora Bassa District.

5.9.2 Methodology

To collect information at the local level, a semi-structured interview of the Songo town administration was carried out, with the purpose of collecting general socio-economic data on the project's implementation area.

Semi-structured meetings with the chiefs of the project area's surrounding neighbourhoods were also held, with the purpose of collecting socio-economic data specific to each neighbourhood.

An interview with the IIP was also carried out with the aim of exploring which fish species are of greater interest and the importance of that economic activity to the population's livelihood.

Similarly, a survey of geo-referenced coordinates for points of interest, such as schools, hospitals, markets, among others, was carried out.

5.9.3 Location, boundaries and demographics

The project is in Cahora Bassa District, Songo Administrative Post, Songo locality and Matumbuliro community (**Figure 5-30**).

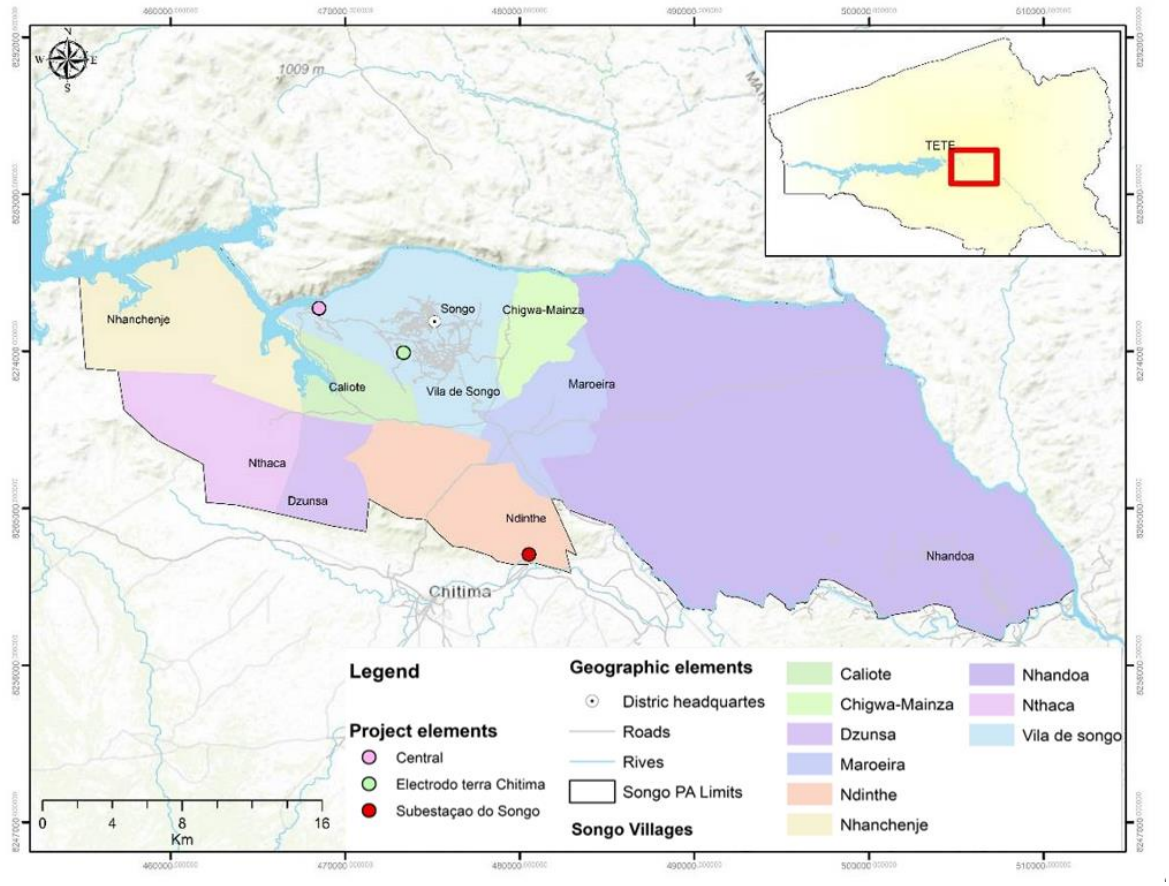


Figure 5-30– Settlements of the Songo Administrative Post – Location of the project

Cahora Bassa District is in the centre-north part of Tete Province and is bordered to the north by Marávia District, by Magoé District to the west, by Zimbabwe to the south, by the Changara District to the east and by the Chiuta District to the northeast.

It is divided into three administrative posts, namely Chitholo, Chitima and Songo, subdivided into 9 localities, as is shown in the table below. The project is in the Songo Administrative Post.

Table 5-14- Administrative Division

District	Administrative posts	Localities
Cahora Bassa	Chitholo	Chitholo
		Mulinje
	Chitima	Chabagadigo
		Chicoa Nova
		Nhabando
		Nhacapirire
	Songo	Songo village
		Dzunga
		Songo

Fonte: INE, 2013.

The Songo Administrative Post is in the northeast of Cahora Bassa District, 149 km from the city of Tete. It is bordered by the Marávia District to the north, through Zambezi River, by the Chiuta District to the east and by the Chitima Administrative Post to the west and south. The administrative post has two localities (Songo and Dzunza), and a total of 13 settlements and the town of Songo.

5.9.4 Government and Political-Administrative Division

5.9.4.1 Tete Province

According to Decree No. 63/2020, of 7 August, that regulates Law No. 7/2019, of 31 May, which establishes the legal framework for the organisation and operation of the Organs of State Representation in the Province, the Government of Tete Province is structured in the following way:

State Representation Organs in the Province

- State Secretary in the Province;
- Governor of the Province;
- State Representation Provincial Services Council.

Provincial Services:

Economy and Finance, Economic Activities, Social Affairs, Infrastructure, Justice and Labour, Environment, Veterans, Health.

There are also, at the provincial level, the Provincial Attorney, the Provincial Commander of the Mozambique Republic Police (PRM), the Disaster Management Provincial Delegate, of Fight against AIDS, Social Security, among other provincial representatives.

The city of Tete is composed of the Municipal Council, governed by the President, the members of the Municipal Assembly and eight Councillors. However, in certain areas of the city the power of the traditional structures is present, through the Traditional and Community Authorities who work in close partnership with the government structures and take in part in social, economic, political and cultural dynamics.

5.9.4.2 Cahora Bassa District

The District Government, run by the District Administrator, is structured in the following areas of management and coordination:

- Office of the Administrator, Administrator and Secretariat;
- Economic Activities;
- Planning and Infrastructure;
- Education, Youth and Technology;
- District Health, Woman and Social Welfare Service;
- National Social Security Institute District Department;

- Civil Registry and Notary Office;
- District Command of the PRM.

Besides these institutions, also the Police, the State Information Services, the Public Telecommunications Company, the Civil Registry, the Courthouse, the Post Office and the Administration of the State's Housing Stock are attached to the district government.

In turn, the Administrator is accountable to the Provincial and Central Government for the various sectors and activities of the district (district services).

At the district level the administrative authorities are represented in hierarchical order, namely:

1. District Administrator;
2. Administrative Post Chief;
3. Locality Chief.

The Traditional or Community Authorities are represented by:

1. 1st level Leader (Régulos);
2. 2nd level Leader (Settlement Secretary);
3. 3rd level Leader (Block Secretary).

At the local level the administrative organisation and organisational structure is mostly represented by the traditional power, which means that at the level of the settlements located in the DIA and the AII the Community or Traditional Authorities, legally recognised by Decree no. 15/2000, of 20 June, oversee the organisation. **Figure 5-31** below shows the typical organisational structure at the local level.

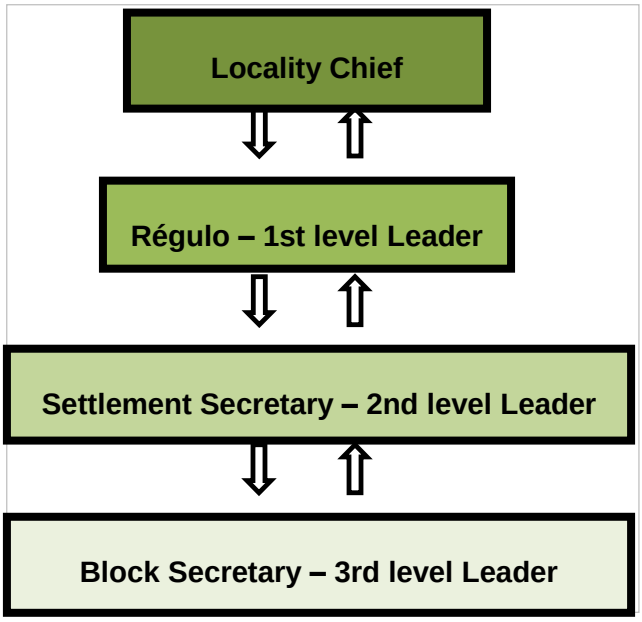


Figure 5-31 – Organisational structure at the local level

5.9.5 Demographics

Area of Indirect Influence

According to the results from the Census of 2007 and 2017, the population of Tete Province increased from 1 807 485 inhabitants in 2007 to 2 551 826 in 2017. In one decade (2007-2017) the province had an average annual growth rate of 5,2% against 2.7% recorded nationwide. This growth corresponded to an increase of 744 341 inhabitants (INE, 2018). At the district scale, Cahora Bassa District had a population increase of 42 127 inhabitants (INE, 2018), corresponding to an average annual growth rate of 4,9%. The city of Tete had an average annual growth rate of 3,3%.

In general, women have a greater representation at all levels of the population (Mozambique, Tete Province and Cahora Bassa District), as can be seen in the following table.

Table 5-15- Country, Province and District Population (INE, 2018)

COUNTRY, PROVINCE AND DISTRICT	POPULATION				POPULATION DENSITY (INHAB/KM²)
	TOTAL	% MEN	% WOMEN	% OF THE PROVINCE	
MOZAMBIQUE	**27 122 222**	**47,8%**	**52,2%**	**-**	**36**
Tete Province	2 551 826	48,8%	51,2%	-	25
Cahora Bassa District	128 768	49,5%	50,5%	4,8%	15

Source: INE, 2018

The distribution of the population across the districts of Tete Province is uneven. The most populated districts are Angónia (18,5%), Tete City (12,0%) and Moatize (10,2%). The least populated districts are Marara (2,9%), Zumbo (3,3%) and Doa (3,4%).

The population in Tete Province is mostly young. The percentage of active population (15 to 64 years old) is like the percentage of young people, which means that the dependency ratio is balanced.

Table 5-16- Population per Age Groups, Country, Province and District (INE, 2018)

COUNTRY, PROVINCE AND DISTRICT	AGE GROUPS							
	BETWEEN 0-4 YEARS		BETWEEN 5-14 YEARS		BETWEEN 15-64 YEARS		65 YEARS OR MORE	
	No.	%	No.	%	No.	%	No.	%
MOZAMBIQUE	4 680 738	17%	7 966 634	30%	13 592 464	50%	882 386	3%
Tete Province	454 491	17%	765 044	29%	1 252 625	49%	79 666	3%
Cahora Bassa District	21 253	17%	37 819	29%	65 726	51%	3 970	3%

Area of Direct Influence

The Songo Administrative Post has a total of 48 910 inhabitants, of which 24 809 are women and 24 101 are men.

Matumbuliro settlement has a total of 2 562 inhabitants divided into four units, and a total of 380 housing infrastructures. These inhabitants will be indirectly affected by the project during the operation phase at the SS.

5.9.6 Education

Area of Indirect Influence

According to the Ministry of Education, the education system in the country is divided into three subsystems:

- Pre-School Education – kindergarten (creches);
- School Education – divided into primary, secondary, technical-professional education and higher education;
- Extra-School Education – this is the teaching of basic literacy and education of people outside the school system.

According to INE (2017), Tete Province had, in the year of 2017, a total of 1 220 primary schools, 84 secondary schools, 7 technical-professional schools (PTS), 9 universities and 1 centre of distance learning resources. The figure below shows the types and number of teaching institutions in Tete Province.

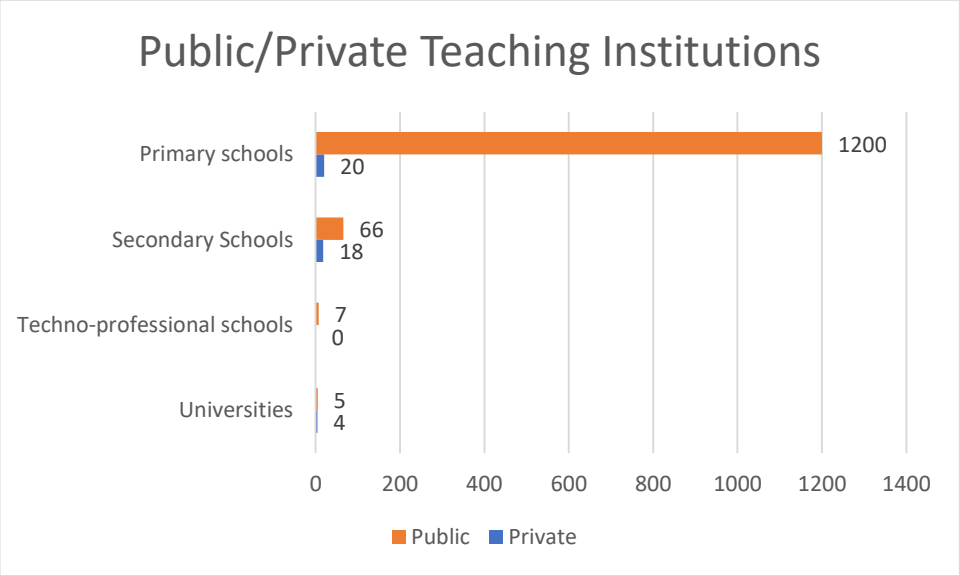


Figure 5-32 Teaching institutions distribution in Tete Province

Regarding the illiteracy rate, according to INE (2018), as in the rest of the country, in Tete Province women have a higher rate (69%) when compared to men (37,9%).

However, women net schooling rate has increased significantly from 2017 to 2018, from 81,2% in 2017 to 83,8% in 2018. According to INE (2018), the women dropout rate in 2017 was 8.6%.

According to the Cahora Bassa District's Government, 57% of the population is literate, with a predominance of the male gender (65,1%).

According to the district's Administration and Tete's Provincial Education Department, in 2011 Cahora Bassa District had 28 education establishments and 25 770 students, which were distributed in the manner shown in the following table:

Table 5-17- Teaching establishments and no. of students in Cahora Bassa District in 2011

EDUCATION LEVELS	No. OF SCHOOLS	No OF STUDENTS	
		Women	Men
District total	58	12 657	13 113
EP1 (Primary – 1st level)	38	9 570	9 404
EPC (Primary – 2nd level)	15	1 816	2 056
ESG 1 e 2 (Secondary)	2	1 154	1 310
IFP (Professional)	1	67	91
EP (Professional)	1	35	138
ISPS (University)	1	15	114

Source: Provincial Directorate of Education 2012, adapted by Consultec, 2020

Analysing the data above it can be concluded that, just like at the provincial level, in Cahora Bassa District about 91,4% of the teaching establishments teach the 1st and 2nd levels of primary education, approximately 2,5% are dedicated to the first level of secondary education, with the second level of secondary education and the professional education having less than 1% of allocation of facilities each.

This statistical tendency reveals, once again, a clear reduction in educational infrastructures as the educational level advances, with this aspect being a limitation to the education progress of the student-age population.

The district shows the same educational dynamic of the province, with a larger number of education establishments and students in level 1 of primary education, with a greater female concentration in this level, and a reduction in the number of students as the education level advances. It is commendable that there are nocturnal school schedules for full primary education (EPC), and both levels of secondary education (SE1 & SE2), as well as the fact that the female population enrolled in all education levels offered in the district accounts for 49.1% of the total student population. In professional education, out of the 158 enrolled students only 67 are women.

In the city of Tete there is a greater training offering, including at college level. The National Training and Employment Institute have been organising professional training courses in partnership with the coal exploitation companies, namely Vale Moçambique.

Area of Direct Influence

There are about 22 teaching establishments in Songo Administrative Post, with 5 level 1 primary schools (grades 1 to 5), 13 full primary schools (grades 1 to 7), 1 secondary school, 1 technical school, 1 higher institute and 1 private school property of HCB.

It should be mentioned that for the current school year 15 437 students were enrolled in all teaching establishments, of which 7 612 are girls. Regarding the teaching staff, the post has a total of 608, of which 307 are women. Part of these schools has been facing some constraints regarding IT and laboratory equipment, energy and water supply.

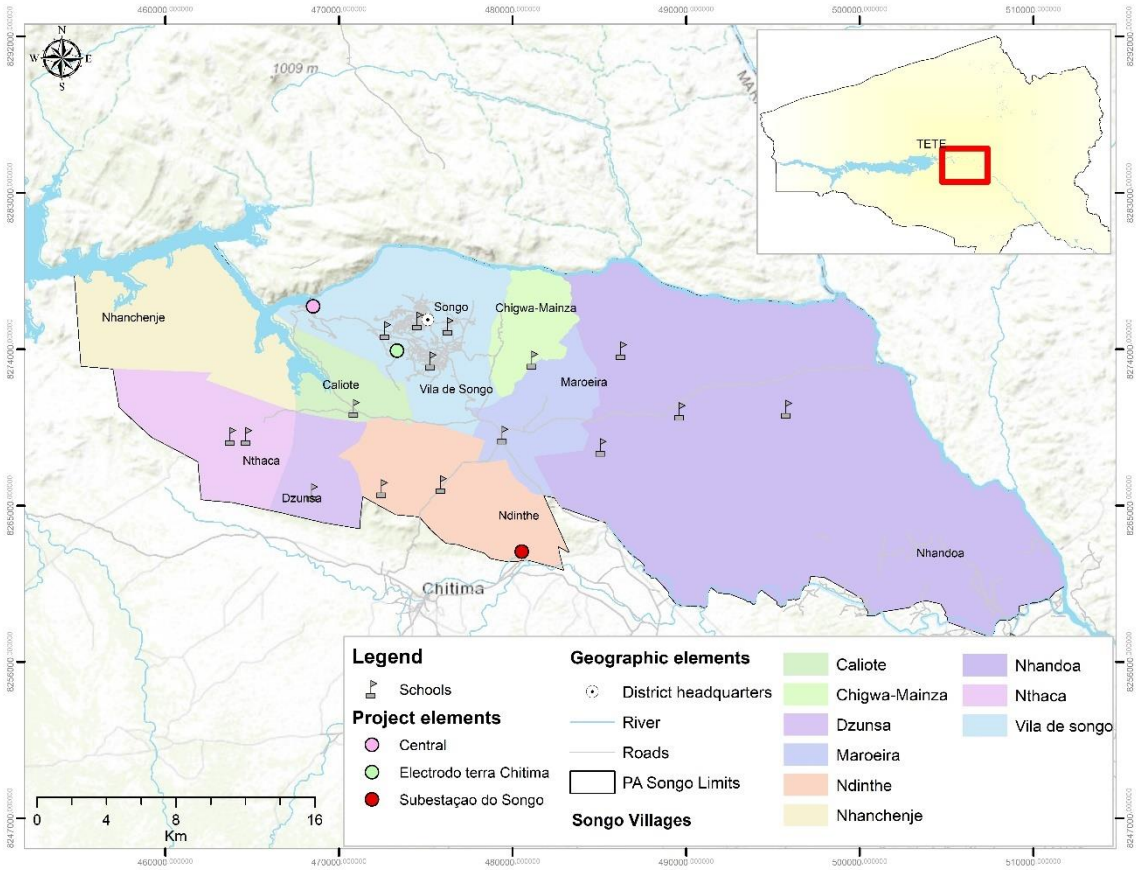


Figure 5-33 – Distribution of teaching establishments in Songo

Below are some pictures of the schools identified in the town of Songo.

Full Primary School at Unidade Neighbourhood

Full Primary School (EPC) of Liberdade

HCB Private School

Classroom blocks, EPC of Liberdade

Matumbuliro Primary School

Figure 5-34 – Teaching establishments in Songo

At the level of the Matumbuliro community, where the SS is located, there is a full primary school with 469 students, of which 256 are girls. Regarding the teaching staff, there are a total of 21, of which 3 are women; of these 21 staff, 3 teachers have basic education, 7 have a college degree and 11 have middle-level school education.

5.9.7 Health

Area of Indirect Influence

In Mozambique, the health sector focuses mainly on primary health services. These services consist of various types of healthcare units, each providing specific health services. The table below provides a brief description of the various types of healthcare units in the country and the respective services provided. It is important to note that some facilities may be better equipped than others, depending on their location, capacity and number of people making use of that facility.

Table 5-18- Description of healthcare facilities

Type of health service	Type of health unit	Type of service offered
Community services	Community	Traditional midwife Elementary Polyvalent Agent: member of the community, formed by an NGO or by the National Health Service (SNS) to provide basic, preventive and promotional care to the same community.
	Health Posts (provide primary health care)	Elementary Polyvalent Agent Elementary midwife Elementary nurse
Minimum Health Services	Rural Health Centre - Type II Provide primary health care	Elementary midwife Elementary nurse Nutrition Agent
Extensive Health Services	Rural Health Centre - Type II The Type II health unit is more modest in its infrastructure and personnel, not having a doctor on duty and only having a medical technician or assistant, but with the capacity to carry out consultations and deliveries. These services provide primary health care.	Medical technician or assistant Basic midwife Basic nurse Nurse or basic agent
	Rural Health Centre - Type I In a rural environment, Type I units are considered the most equipped. They usually have a medical staff with a trained doctor and all basic care infrastructure, plus surgery with operating rooms.	Doctor, technician or medical agent Basic midwife Preventive medicine agent Basic nurse
	Urban Health Centre - Type C	Basic midwife Preventive medicine agent Basic nurse
	Urban Health Centre - Type II	Doctor, technician or medical agent Basic midwife Preventive medicine agent Basic nurse
	Urban Health Centre - Type A	Doctor, technician or medical agent Basic midwife Preventive medicine agent Basic nurse
	District Hospital	Doctor, technician or medical agent Basic midwife

Type of health service	Type of health unit	Type of service offered
		Preventive medicine agent Basic nurse
Specialized health services	District Hospital	Doctor Medical Technician Obstetric Surgery Technician Obstetric Nurse Laboratory Technician or Agent Basic or Medium Maternal and Child Care (MCC) Nurse Basic or medium nurse
	Rural Hospital	Doctor Medical Technician Obstetric Surgery Technician Obstetric Nurse Laboratory Technician or Agent Basic or medium MCC nurse Basic or medium nurse
	General Hospital	Doctor Medical Technician Obstetric Surgery Technician Obstetric Nurse Laboratory Technician or Agent Basic or medium MCC nurse Basic or medium nurse
	Provincial Hospital	All health personnel
	Central Hospital	All health personnel

Source: Global Health Initiative - Strategy for Mozambique, 2011 to 2015

According to MISAU (2014), Tete Province has a total of 116 healthcare units, distributed as per the figure below.

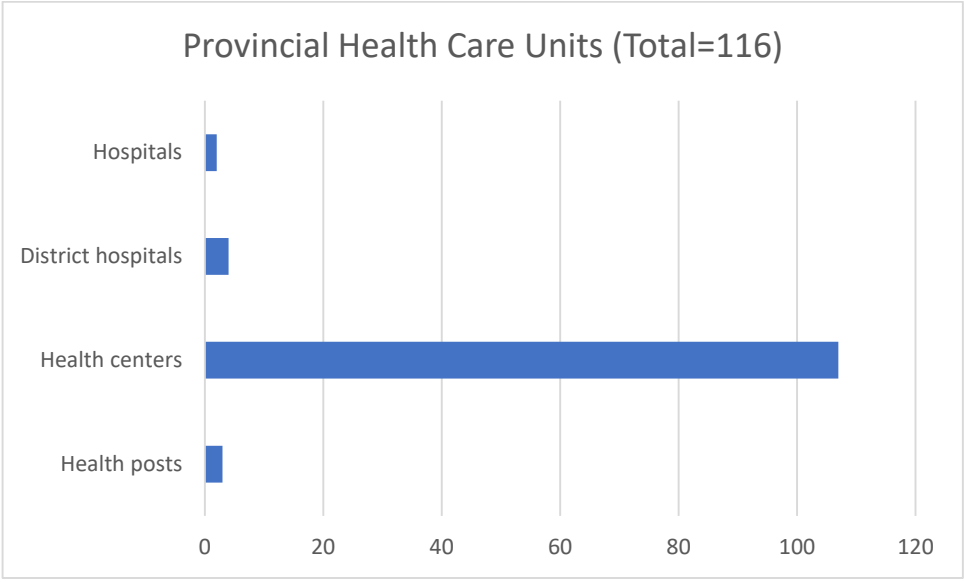


Figure 5-35 Distribution of the healthcare units in Tete Province

The health profile of Tete Province is like the rest of the country's, as it presents high rates of transmissible diseases, such as malaria, HIV/AIDS, diarrhoeal diseases and respiratory diseases, besides malnutrition. The high hospitalisation and mortality rates are linked to the poverty situation, illiteracy rates, lack of infrastructure and human resources at all levels of care, lack of basic sanitation, natural disasters and food crisis.

The semi-formal and informal system complements the coverage of the health system and serves as an alternative in several communities in Tete Province, and especially in those where the access to the units is difficult. The traditional medicine, or informal health system, consists of traditional doctors or healers.

The district has 1 rural hospital in Songo and 8 health centres, of which 1 is Urban Type B (in Songo), 1 is Rural Type I (in Chitima) and 6 are Rural Type II (5 in Chitima and 1 in Songo). In 2012, the district had a total of 188 general beds and 48 maternity beds. The district has the support of 104 health technicians and 15 multifaceted health agents: 8 in Chitima, 3 in Chintholo and 4 in Songo (TPF *et al.*, 2014).

As for the epidemiological profile, Cahora Bassa District is characterised by a strong incidence of malaria and HIV/AIDS. There's also a record of diarrhoeal diseases and dysentery. The increase in the recorded cases of rabies should be mentioned (TPF *et al.*, 2014).

STDs represent a major risk factor in HIV/AIDS transmission. The last National Survey on Prevalence, Behavioural Risks and Information on HIV and AIDS in Mozambique (INSIDA) of 2009 shows that the individuals who contracted an STD in the last 12 months had nearly twice the HIV prevalence (24%) when compared to those who hadn't had an STD (13%) (TPF *et al.*, 2014).

Area of Direct Influence

The Songo Administrative Post has 3 healthcare units, namely 1 health centre, 1 rural hospital and 1 private health centre property of HCB. A ratio of 12 227 inhabitants per healthcare unit has been estimated (**Figure 5-35**).

Below are some pictures of the healthcare units identified in the town of Songo.

HCB health centre

Songo rural hospital

Figure 5-36 – Healthcare units in the town of Songo

In the Matumbuliro community there is no healthcare unit. To access healthcare the population must travel to the town of Songo, most times on foot, which takes about 1 hour. The main diseases affecting the community are malaria, diarrhoea, coughing, flu and high blood pressure.

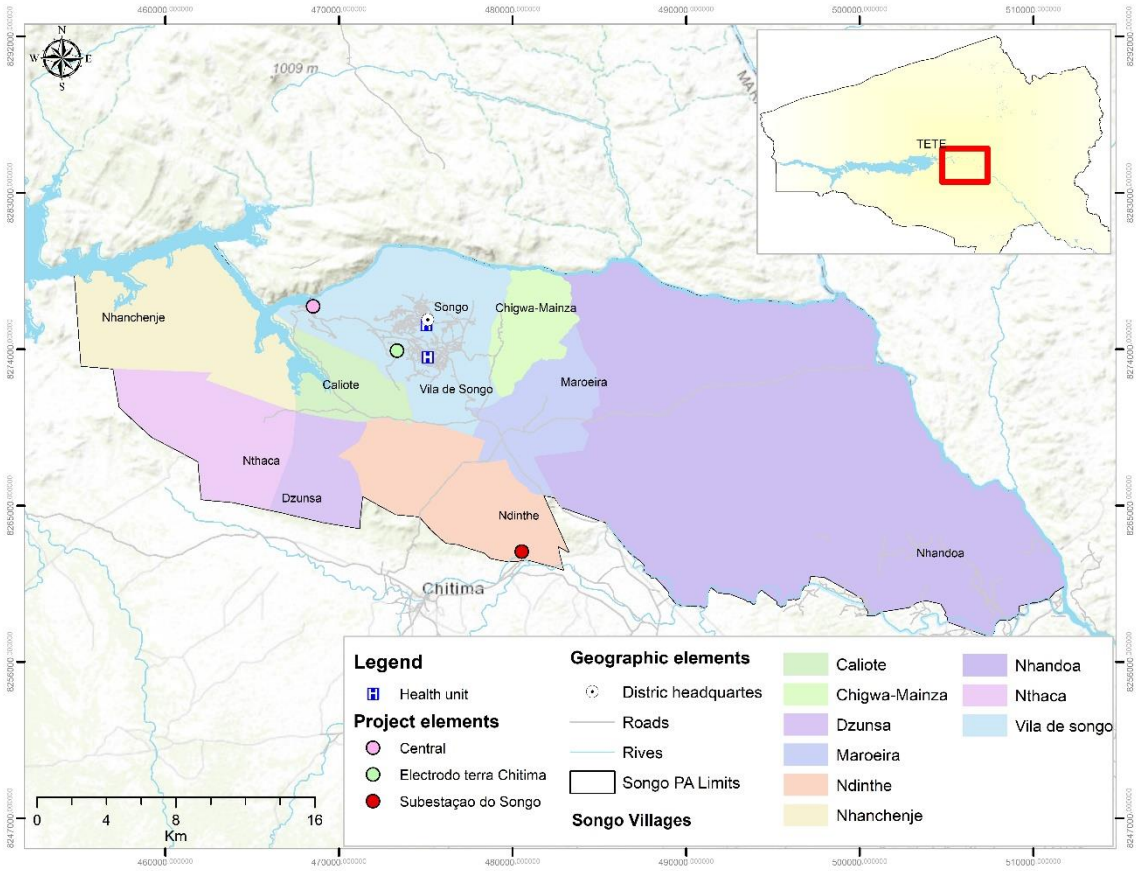


Figure 5-37 – Distribution of the healthcare units in the town of Songo

5.9.8 Housing and living conditions

Area of Indirect Influence

The population's way of life is rural, with the issue of conserving the traditional good habits and customs very present, especially in the localities further away from the seats and from the Cahora Bassa District's seat.

Regarding the housing conditions, the table below shows the types of housing according to the building material.

Table 5-19- Housing types according to building material

TYPE OF CONSTRUCTION MATERIAL	%
Wattle and daub	50,4
Adobe	49,6

Source: INE, 2017

The situation tends to improve as one gets closer to the localities' and administrative posts' seats, where the housing construction type evolves, using improved and conventional building materials such as burnt or raw adobe bricks and zinc or canvas (Ministry of State Administration, 2012).

The district's nutritional situation is reasonable. The population's diet is based on the consumption of maize and sorghum flour accompanied by various vegetables such as cowpea leaves, pumpkin and okra and, on a smaller scale, of cow and lamb meat. An interesting aspect is that, although the district has a large cattle herd it isn't part of the population's diet, the meat being primarily destined for sale and only consumed in festive occasions (Ministry of State Administration, 2012).

The prevailing economic activity in the district is agriculture, with small family units, that produce the minimum for their own subsistence. The agricultural production also includes cattle breeding, with the breeding of small species. Other noteworthy economic activities are artisanal fishing and informal trading, which involve a significant number of households.

Men are responsible for chores like house building, preparing the fields for farming, the development of family economic activities such as fishing, hunting and cattle breeding, and they are the ones who decide how much and where to sell, how much to keep and how much to be consumed. In the instances where the woman takes up the role of head of the household, she is the one who takes these decisions.

The underage is involved in the daily chores from a very young age, with the roles being divided by gender. Thus, while farming is carried out by children of both genders, domestic responsibilities such as carrying water and taking care of younger siblings fall on the girls and the sale of surpluses falls on the boys.

Area of Direct Influence

Regarding housing, in the Matumbuliro community we can mostly find houses built with mixed materials, i.e., walls made from raw brick, roofing with metal sheets and dirt floors. It should be mentioned that there are some constructions built with conventional material. **Figure 5-38** below shows some houses in the Matumbuliro community.

Houses built with mixed material

Houses built with conventional material

Figure 5-38 – Housing types in the Matumbuliro community

5.9.9 Basic Services and Infrastructures

5.9.9.1 Water supply and sanitation

Area of Indirect Influence

Water supply to the cities of Tete and Moatize is done through abstractions in 5 borehole fields, located in the Nhartanda River valley (13 boreholes), in Canongola (4 boreholes), Revúboè (13 boreholes), Degue (1 borehole) and Chithatha-Moatize (9 boreholes), totalling 40 boreholes currently in operation.

Access to improved water sources is still a problem and the communities supply themselves with water from rivers, lakes, wells and some boreholes (from 12 to 100 m groundwater level; low quality of the abstracted water) (TPF *et al.*, 2014).

Although there are two small water supply systems (PSAA) operating in the district, in the town of Songo and in Chitima Administrative Post's seat, the water supply grid in the district still consists mostly of wells and boreholes (electrical and manual pumps operating in the community boreholes) (TPF *et al.*, 2014).

The most critical areas in the district in terms of access to water are the settlements of Tsatsabango, Calonda and Mereque in the Chintholo Administrative Post; however, according to the local administrative authorities, this situation has been improving with the increase in the number of water sources (TPF *et al.*, 2014).

Area of Direct Influence

The Songo Administrative Post has household connections and besides that there are a total of 31 water supply pumps. According to the local authorities the number of supply pumps is insufficient to address the needs of the population.

As for the Matumbuliro community, it has 4 supply sources distributed across the 4 units that it is composed of.

Water Fountain in Cantchenga

Water Fountain in Matumbuliro

Figure 5-39 – Water fountains in the communities covered by the project

5.9.9.2 Energy

Area of Indirect Influence

The electrical power system in Tete Province is characterised by the production and distribution by Electricidade de Moçambique (EDM). The supply of electrical power in the province is done by EDM, over the line that comes from Cahora Bassa, through the Matambo SS.

The Cahora Bassa Hydropower Dam, built over the Zambezi River, is 164 metres high, consisting of 5 generator sets for a total power of 2 075 MW. This dam is one of the largest economic developments in Mozambique and Southern Africa and is in operation since 1975. Its construction created a huge artificial lake, the Cahora Bassa reservoir, with a length of 270 km and a maximum width of 30 km.

Currently, the hydropower plant supplies electrical power to dwellings, commercial establishments and social institutions (health centres, schools and informal hospitality industry) in the town of Songo, in the suburban neighbourhood of Maroeira and in the seat of the Chitima Administrative Post.

The power grid is expanding into the settlements of Dithi and Cahó, in the administrative posts of Songo and Chitima, respectively.

The burn of hydrocarbons oil/paraffin/kerosene is the main energy source for most families in the district. Firewood and charcoal continue to be some of the main household fuels, especially in the more rural areas.

Area of Direct Influence

Regarding electrical power, not all the Matumbuliro community is connected to the grid, only a small part has electrical power connections in their houses. The remaining households await the expansion of the service so that they may also make their connections.

5.9.9.3 Transport structures

Area of Indirect Influence

The region is served by the N7 road, called the "Cuchamano/Tete/Zóbuè Corridor", which is one of the main roads in Tete Province, connecting to neighbouring countries, namely to the Republics of Zimbabwe and Malawi. There are private transport companies in the district, transporting people and goods from the district to the provincial capital and vice versa, as well as between some points within the district along the main access roads such as the N7.

Noteworthy is the project for the highway that will connect Tete, Moatize, Chiuta and Chifunda – this road connection has a relevant role in the international connection with the neighbouring countries and the port of Beira.

The Sena railroad connects the town of Moatize to the port of Beira, in Sofala Province, going through the Kambulatsitsi administrative post up to the border with Mutarara District, in the Mecombedzi settlement, over a length of 108 km.

The road network of Cahora Bassa District comprises secondary and tertiary roads, partially classified, in a total length of about 550 km (TPF *et al.*, 2014). It includes the following main infrastructures:

- EN 301 – goes from the town of Songo to the settlement of Chirodzi Ponte, over a length of about 50 km, paved;
- ER 601 – goes from the intersection with the EN 301 (next to Cabvulatsie) up to Macacate over a dirt track with a length of 90 km;
- ER 613 – goes from the R601 in the Chitima area to serve the southern part of the district.

Road rehabilitation has had a significant impact in the development of the district, allowing for the transport of food aid, the access to new lands for agriculture and community participation in the reconstruction of destroyed infrastructures. The transport of people and goods is done through road and river transportation (TPF *et al.*, 2014).

Area of Direct Influence

Most people don't own any means of transportation, travelling mainly on foot, or using public transportation (moto-taxi) when they want to travel long distances.

5.9.9.4 Telecommunications

Area of Indirect Influence

Tete Province has made significant progress regarding telecommunication networks. The telecommunications system infrastructure has benefited from substantial improvements to the satellite and UHF radio connections. The province is covered by the mobile telephony network from the three main service providers in the country, namely TMcel, Movitel and Vodacom. Although these

cover all the district seats in the province, there are still difficulties in the access to the mobile network in rural and more remote areas, and only Movitel covers rural areas on a larger scale.

Regarding the postal services, the postal network is not very significant and there are few postal stations.

The province has access to the national television networks and has transmitting infrastructure, such as the Television Retransmitting Centre of Mozambique.

In the Cahora Bassa District seat there is mobile network infrastructure of the three service providers currently operating in the country, TMcel, Vodacom and Movitel.

Cahora Bassa has access to the broadcasts of Rádio Moçambique (Mozambique Radio) and of foreign radio stations from neighbouring countries, such as Malawi, Zimbabwe, Zambia and Tanzania.

The TVM signal has a radius of about 10 km, in the district seat, with some deficiencies due to the location of the transmitter.

Postal and courier services are present in the district seat and in the town of Songo. Information and communication technologies are still well below expectations at the household level, namely in terms of computer and internet use and mobile phone ownership.

Area of Direct Influence

During field work it was found that the affected communities are served by the signal of two mobile networks operating in Mozambique, namely Vodacom and Movitel. When the households were inquired on what was the main channel used to receive and send information, most replied to the local leader and mobile phones.

5.9.9.5 Municipal solid waste

Area of Indirect Influence

In Chitima Administrative Post the waste and rain water drainage and waste collection and treatment systems are virtually inexistent. Only the town of Songo has a garbage collection and deposition system, its own landfill and a waste water treatment plant (under HCB management).

Area of Direct Influence

Matumbuliro neighbourhood is included in the partial protection zone of the Songo SS, and as this area should not be occupied by permanent infrastructure no services or social infrastructure are made available, to discourage the occupation of the area. Therefore, the surveyed communities do not benefit of any formal garbage collection system.

5.9.10 Religion

Area of Indirect Influence

Tete Province, like other provinces in the centre and south of the country, is predominantly inhabited by Protestants and Catholics and the Muslim community represents only a minority. According to the Cahora Bassa district profile (Ministry of State Administration, 2012) the prevailing religion is Catholic, practiced by most of the district's population. There are other religious creeds in the district, and it's a current practice for the representatives of the religious hierarchies to be involved, in coordination with the district authorities, in various activities of a social nature.

The table below shows the population distribution in the province according to religion.

Table 5-20- Population distribution in Tete Province according to religion

Total	Catholic	Anglican	Islamic	Zion/Sion	Evangelic	Without religion	Other	Unknown
Abs	515 230	72 318	24 921	468 774	482 716	811 631	111 408	64 828
%	20%	3%	1%	18%	19%	32%	4.3%	2.5%

Source: INE, 2017

Area of Direct Influence

Religion and Religious Temples

The Matulumbiro community has no religious infrastructure, they're all located in the seat town of Songo. The religions professed are Catholic and Evangelic.

Mount of Olives International God Assembly Church

Seventh-day Methodist Church

Catholic Church of São José Operário Parish

Universal Church

Massjid Al Asqsa- Mosque of Songo

Figure 5-40 – Religious temples in the town of Songo

Sacred places

A cemetery at approximately 2,2 km from the SS was identified. **Figure 5-41** below shows the location of the Matumbuliro community cemetery. Besides this one, there are 2 more cemeteries in the town of Songo, in Seretse Kama and Casserebede neighbourhoods.

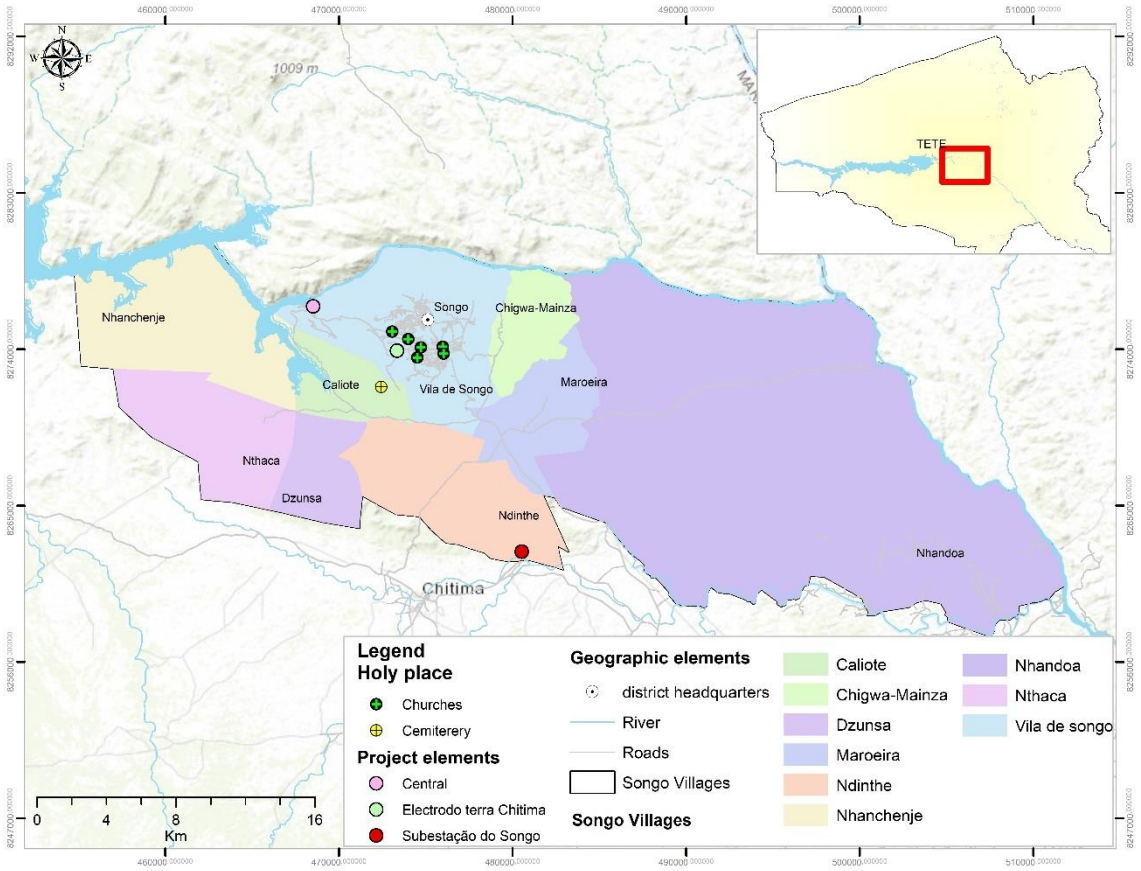


Figure 5-41 – Matumbuliro cemetery

5.9.11 Culture and Heritage

Area of Indirect Influence

Tete Province is composed of various ethnic and cultural characteristics, among which its typical dances, Nhau and Kadaba, who depict the begging to the spirits of former traditional warriors. In 2007 Nhau has been recognised by the UN as World Cultural Heritage (Tete Province Government, 2017).


Figure 5-42 - Nhau dancer (Tete Province)

The population of the province also practices Mafuwe, Nhanga, Tchintali, Tchiwere, N'handa, N'goma and N'cansuere, dances which are common in reception ceremonies for important people, in requests to the spirits (rain) and others.

The mark of cultural diversity can also be found in the context of the everyday linguistic diversity of Tete Province.

In Tete Province the most spoken mother tongue is Cinyanja, followed by Cinyungwe and Cisena. Cinyungwe is the mother tongue adopted by about 30% of Tete's population, especially in the Cahora Bassa, Changara, Moatize and Magoe districts. About 57,2% of the urban population has Cinyungwe as mother tongue, which is related to the fact that it's the most spoken language in the city of Tete.

African religions have a greater expression outside the city, and the ceremonies listed in the table below are noteworthy.

Table 5-21- Cultural/religious ceremonies in Tete Province

Cerimony	Function
Malombo	Ceremony that involves leaders and community to evoke a common good.
Bhona	Mass dedicated to the faithful who died six months or a year ago.
Mpemba	Ceremony characterized by clapping, appealing to the spirits to help fight diseases and the death of animals.
Kathsisse	Ceremony performed in the family to solve the problems of the household.

The prevailing mother tongue in Cahora Bassa District is Cinyungwe.

About 70% of the population with 5 years or older doesn't speak Portuguese, with the command of the Portuguese language being predominant in men, given its greater inclusion in school life and in the labour market (Tete Province Government, 2017).

Cemeteries are considered sacred places in the district, as well as in much of the rest of the province. It is believed that from those places the spirits of the dead continue to watch and protect their descendents. To go into those places one needs an authorisation and ceremonies must be performed by the spiritual leaders of the locality.

The areas where the population performs the ceremonies are considered sacred places or home to spirits. In general, these places are associated to nature and can be mountains, rivers and lagoons, surrounded by sacred trees (such as the baobab and the marula, the latter known locally as *mfula*). It is in these places that, during the ceremonies, the community places their offerings (*nzingo*) to the spirits, and then waits for the reply to the requests made to their ancestors.

In the traditional ceremonies to the spirits it is also common to ask for rain so that agriculture, the main livelihood activity, may be successful. People also ask for help in times of draught, so that the cattle don't perish, wisdom in the preparation of medicines to heal the sick and in conflict resolution on the communities, as well as requests for good luck and money to buy food.

During the ceremonies offerings are made to the spirits, such as sorghum, pearl millet, beans, roasted and pounded maize, peanuts, watermelon seeds, tobacco, wine, beer and *pombe*, a traditional drink made from the fruits of the Indian jujube tree and baobab.

5.9.12 Archaeology

5.9.12.1 Legal framework

Law No. 10/88, of 22 of December (**Law on the Protection of Cultural Heritage)**, which establishes and integrates the constitutional principles of promoting and developing the national culture and personality. The object of this legislative document is the legal protection of the material and immaterial assets of the Mozambican cultural heritage, as well as of all the cultural assets that may come to be found in the Mozambican territory, namely in its soil, subsoil, inland water beds and continental platform. It should be mentioned that the cultural heritage includes monuments, groups of buildings of historical value, artistic or scientific relevance, places (with archaeological, historical, aesthetical, ethnological or anthropological value), mining centres, as well as the natural elements (physical and biological formations with particular interest from an aesthetic or scientific point of view), movable cultural assets, etc., and therefore this law creates the necessary legal and institutional framework to effectively safeguard and protect Mozambique's cultural heritage.

Regulation for the Protection of Archaeological Heritage, approved by Decree No. 27/94, of 20 July, which establishes the legal regime, the way of obtaining licenses for archaeological works, fortuitous findings and safeguard archaeology, the preservation and control of the archaeological heritage, the classified assets of cultural heritage resulting from archaeological works, responsibility of the custodians of archaeological elements, etc. This regulation creates a legal framework to ensure the protection and conservation of the tangible and intangible assets.

The Regulation for the Protection of Archaeological Heritage, approved by Decree No. 27/94, of 20 July, also establishes that all projects involving works of land excavation, removal or widening, or the removal of submerged or buried objects, must include conducting preliminary archaeological prospection and safeguard archaeology in the area covered by the works.

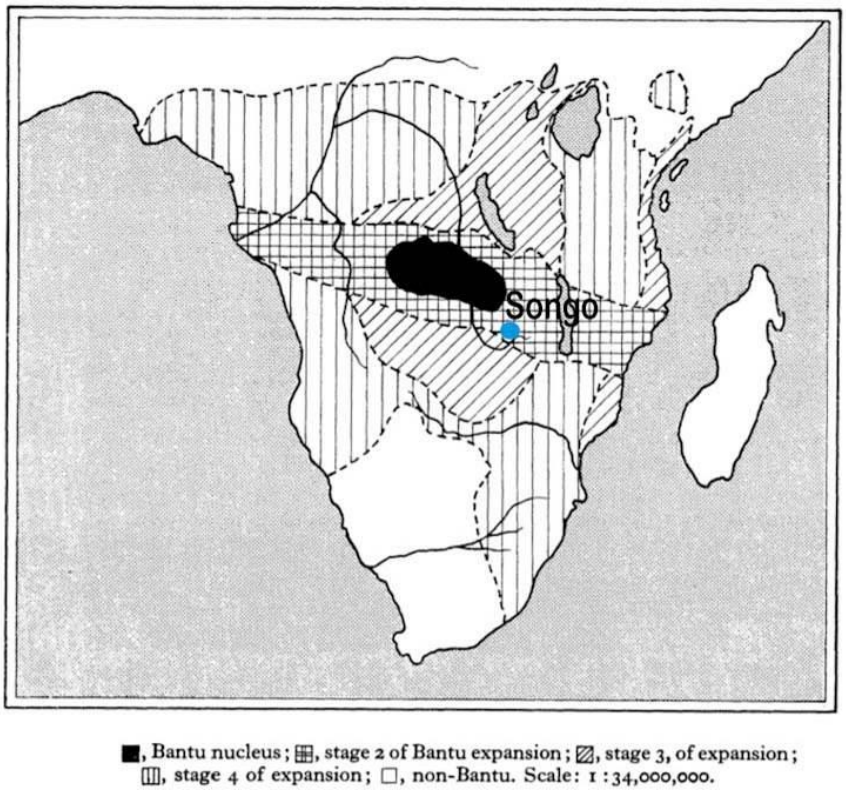
5.9.12.2 Historical and Heritage Context

Stone Age

The town of Songo is in the continuity of the Rift Valley and thus it is a point of interest for the studies related to the origin of man during the Cenozoic period, namely the Pleistocene and the Holocene. In this context, the remains of old hominids (genus *Australopithecus* and genus *Homo*) found in Olduvai Gorge and other locations further north in the Rift Valley, in Kenya and Ethiopia, are well known. Although no evidence of old hominids has yet been found in Songo, everywhere in the region Stone Age remains are found, especially lithic instruments which, in the past, during thousands of years, were manufactured by man for his activities. The oldest remains from this period of human history are known as Acheulean industry, based on a tradition of producing typical stone axes named "Acheulean hand axes" (Meneses, 2004). In this region Stone Age lasted until the last centuries BC and remains of the so called Upper Stone Age have reached us, including small instruments such as scrapers, arrowheads and other utensils mostly manufactured in quartz, that are still found often today. During the archaeological research conducted in the 1970s by the archaeologist Miguel Ramos, Upper Stone Age instruments were found in Songo (Ramos, 1980).

Iron Age

Iron Age developed in this region from the first centuries AD and is linked to the beginnings of sedentary life, agriculture and the development of artisanal industry and, especially, due to its importance (archaeologically speaking), of pottery production. Although the utensils made of clay brake easily, pottery fragments are archaeological elements that last for centuries. In most Iron Age archaeological stations in Africa, 70 to 80% of the remains are pottery fragments. It also happens that the pottery's features, especially when it comes to decoration, allow us to identify different traditions that archaeologists have linked to different settlement groups (see **Figure 5-43**). In this region these settlements are distributed along the first centuries AD, 0 – 150 demonstrated by the Urewe and Kwale Matola traditions and about 200 to 500 AD by other traditions (Nkope, Gokomere and Lydemburg) (Duarte, 1976, Morais, 1988). The map in **Figure 5-44** shows the distribution of these Lower Iron Age traditions in relation to Songo. The link between these settlements from the first half of the first millennium to the Bantu expansion, which gave origin to most of the peoples that inhabit this region today, is clear.



■, Bantu nucleus; ▦, stage 2 of Bantu expansion; ▨, stage 3, of expansion; ▥, stage 4 of expansion; □, non-Bantu. Scale: 1 : 34,000,000.

Figure 5-43 – Adaptation of the McBeeby Bantu expansion model by Ricardo Duarte, 2018, based in Oliver, 1966

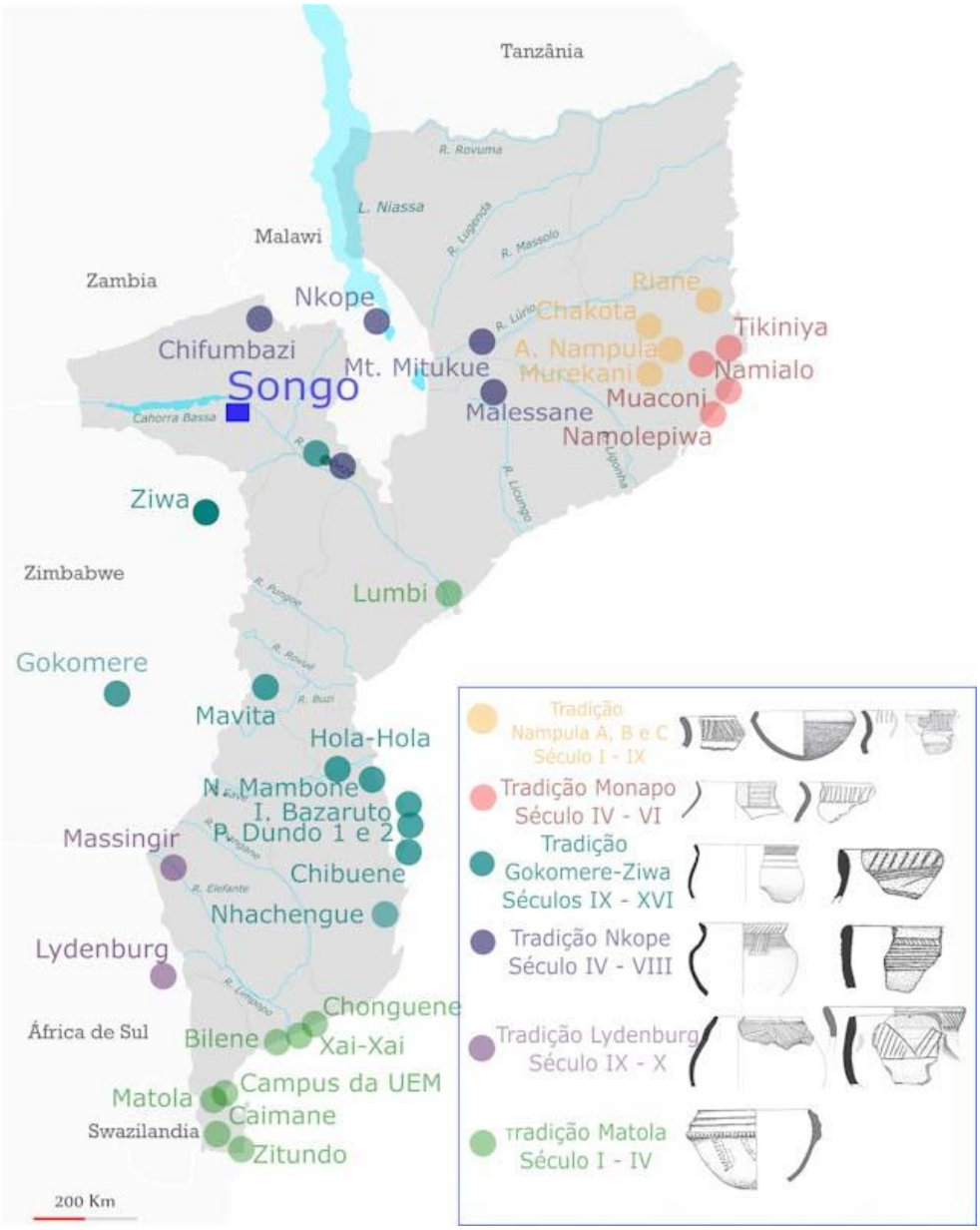


Figure 5-44 – Region where Songo is located and the pottery traditions in the early Lower Iron Age – Bantu expansion

Medieval Period

From mid-first millennium AD more centralised political structures began organising in this region, establishing states inland and along the coast, and the first urban centres began developing. Northward from the region where the town of Songo is today the Marave State was developed in connection to the Chewa ethnic group, and southward the Zimbabwe State, from the 11th century. This State's walled cities were known as Zimbabwes, which means "stone constructions", and were spread across the territories of present-day Zimbabwe and Mozambique. The ruins of this State's capital, called Great Zimbabwe, are still preserved today. These impressive ruins are evidence of the magnificence of this city and are classified as World Heritage by UNESCO.

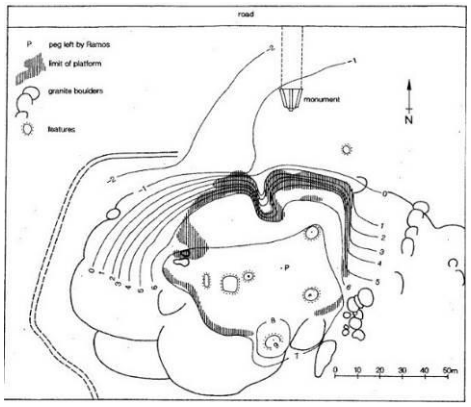
From the 14th century on, Zimbabwe State fragmented into several political units, including the Monomotapa State, also known as the Empire of the Monomotapa, with its northern border in the Zambezi River. It is believed that one of the last capitals of Monomotapa (called Zimbabwe "Mbire Nhantekwe") was located near Chicoa, today covered by the waters of the Cahora Bassa reservoir.

In the town of Songo there are ruins of one of the walled enclosures of the Monomotapa State, called Songo's Zimbabwe. This walled platform, consisting of remains of the collapsed stone wall, is locally known as "Katuta Mabwe", which in the local language means "carrying stone".

Even today, there are still stories in the local oral tradition related to the construction of this walled enclosure (Duarte and Macamo, 1996).

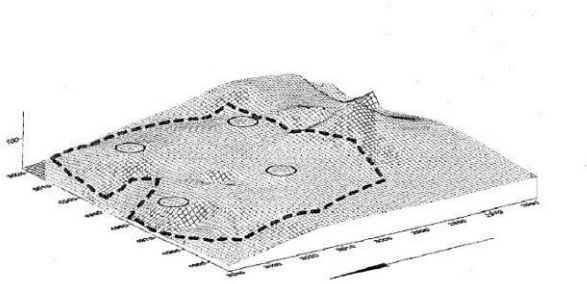
Songo's walled enclosure was first studied in 1937 by the archaeologist Santos Junior (1941); the study was continued in 1972/73 by Miguel Ramos (1979; 1980). Ricardo Duarte visited and documented these ruins in 1976 and Solange Macano conducted archaeological works between 1995 and 2001, having carried out archaeological excavations in cooperation with G. Lisegang and A. Ekblom.

As a result of these works, it was established that this walled enclosure is part of the Zimbabwe-Monomotapa culture. This archaeological station consists of a platform with about 50 m by 60 m supported by granite blocks. At the time of the excavation works, traces of construction in daga/dhaka were found and an array of pottery fragments, some with decorations, was collected, as well as iron slag and charcoal samples for carbon-14 dating, the result of which indicated that the early occupation dates to the early 16th century (1522). Together with the archaeological excavations a topographical survey of this location was carried out by Joaquim Miguel.



Source: Macamo (2006)

Figure 5-45 Plant of the Songo walled enclosure, by Joaquim Miguel



Source: Macamo (2006)

Figure 5-46 Digital topographical plant of the Songo walled enclosure done by Joaquim Miguel

The town of Songo and the surrounding areas are therefore part of a region of great historical importance, largely also because of its location in the Zambezi River valley, a major communication route between inland and the coast. Archaeological reearch recently carried out within the scope of the safeguard archaeology works conducted in Moatize by Ricardo and Yolanda Teixeira Duarte

revealed evidence of the penetration inland of the coastal peoples between the 11th and the 14th centuries.

This great African river has been navigated since remote times, even before the arrival of the Europeans to this region. The place named as Cahora Bassa rapids was the terminal navigability point for the vessels coming from the coast.

Besides the dugout canoes, which have been used for millennia, both in this and in all other African rivers, one other vessel, already vanished, called Luzio, was typical of the Zambezi River (Duarte 2012). It should be mentioned that in the Portuguese military expedition of 1570 to conquer the Monomotapa twenty Luzios were used to carry all the equipment up river. According to the descriptions from the time, the Luzio was a vessel powered by sail and oars, with a cargo hold and a cabin for passengers (Duarte, 2012). The Luzios transported different types of cargo to the coast, especially ivory and slaves, export products coming from the large land concessions called “prazos da coroa” that characterised this region between the 17th and the 19th centuries.

Industrial Archaeology

The Cahora Bassa Dam is a relevant engineering work, not only nationally, but even at an international level, whose construction started 52 years ago (in 1969). The Cahora Bassa reservoir has a maximum length of 270 km, extending from the wall until Zumbo, at the Mozambican border with Zimbabwe and Zambia. The construction of the underground power plant on the south bank and the double curvature arch dam wall in conventional concrete, which includes 8 flood gates half way down the dam wall and 1 surface spillway located in middle of the crest dedicated to the removal of debris from the reservoir, makes this structure a privileged centre for traces of industrial archaeology consisting of materials linked to its construction, such as buildings, machinery, infrastructures, documents, photographs, etc., that must be preserved for future memory, historical testimony and musealisation.

The record of the techniques and equipment/industrial machinery used since the beginning of the dam’s construction, such as the old concrete plant, which is preserved on the slope above the wall, is an example of the industrial archaeological heritage that needs to be studied and preserved. In 1876, the Portuguese Francisco de Sousa Viterbo, journalist, historian and archaeologist, was the precursor of industrial archaeology when he alerted for the need to study arts and industries. However, it was Michael Rix who, in 1955, introduced the concept of Industrial Archaeology into the scientific world. Since 1973 the international scientific community has been developing actions and creating institutions/organisations to raise awareness and promote the preservation of the industrial heritage.

The awareness and importance of the systematic study of industrial archaeology beyond academic acceptance has been confirmed by UNESCO, when it integrates this relevant heritage in the world heritage list, as was the case with the “European industrial heritage route”. Although Mozambique doesn’t have a tradition of protecting the industrial legacy, due to its recent nature, the national scientific community has been interceding for the protection of the tangible and intangible

Mozambican industrial heritage, whether by stimulating scientific studies or by encouraging the musealisation of traces associated with the mining industry, of activities articulated with the production or distribution of electrical power, of transport, port or commercial infrastructures, of workers dwellings, etc. The importance of the creation of the Railroad Museum of Mozambique should be reminded, as this marked the beginnings of the national musealisation of industrial heritage and the recognition of the industrial heritage as an integral part of the cultural heritage. This recognition has been moving toward the enhancement and preservation of the material industrial heritage "*in situ*" or the musealisation in case of impending destruction due to weathering or other anthropogenic factors such as modernisation, conversion, etc.

There is awareness that the industrial heritage is easily fragmented, vandalised, sold as scrap metal or even abandoned inside industrial buildings, etc., and the loss of this information, besides being irreversible, prevents the functional reading of the facilities and is a factor of loss of identity and memory for the communities that emerged around it. In Mozambique, recent scrap metal marketing activities have been responsible for the destruction of important heritage. Therefore, it is crucial to safeguard and record the material and immaterial industrial heritage associated with the construction and the history of the Cahora Bassa development.

To this end, the collection of oral testimonies on the construction and history of this dam in its labour context can also be conducted. With this infrastructure being the development factor of Songo, it makes perfect sense to link the social aspect to the national education process, whether through the local musealisation in Songo or through the creation of touring exhibitions in the country, or even by creating/fostering cultural tourism, enabling the access to everyone from the scientific and technical fields.

Figure 5-47 - HCB- traces of infrastructures from the time of the construction of the dam

Figure 5-48 – Old concrete plant and quarry

5.9.12.3 Archaeological Research

Archaeological Definitions

The definitions to be applied in this report are:

Safeguard Archeology	-	These are all archaeological works intended for the immediate study and protection of elements, archaeological sites and monuments threatened with destruction.
Industrial Archeology	-	Science that studies and preserves material and immaterial traces related to the various industrial sectors.
CAIRIM	-	Centre for Archeology Research and Resources Ilha de Moçambique
Archaeological complex	-	Set of archaeological sites in the same place or from the same period.
Archaeological station	-	Place where there are evident traces of ancient human activities. These can be on the surface, generally stations located in the open (outdoors), in caves or rock shelters or even in the waters of seas, lakes, etc. These are characterized by the superficial distribution of the material or with stratigraphy (disposition of the material by different archaeological horizons).
Stone Age	-	Stage of the human development process, in which the main raw material used for the manufacture of artefacts is stone.
Iron Age	-	Stage of human development characterized by the intensive use of iron for the manufacture of utensils.
Archaeological heritage	-	It is the set of movable and immovable assets of archaeological, paleontological, anthropological or geological value, related to the ancient generations, found through fortuitous discoveries, prospecting or archaeological excavations, as well as those that are yet to be discovered or excavated. The archaeological heritage also includes studies, records and results of laboratory tests or others from archaeological prospecting and excavations.
Cultural heritage	-	It is the set of material (movable and immovable) and immaterial cultural goods created or integrated in Mozambique throughout its history, with relevance to the definition of the national cultural identity.
Industrial Heritage	-	It refers to the physical traces and memories of the history of technology and industry.

Archaeological prospection	-	It refers to any research and investigation work carried out, on the surface, in the bed of inland waters or on the continental shelf, with the aim of discovering, exploring or recording archaeological elements, stations or monuments.
Archaeological works	-	These are activities aimed at the investigation and protection of the archaeological heritage, namely the archaeological prospection and excavation, the preservation, conservation and enhancement of archaeological elements and sites and their study.

Methodology

During the period when the archaeological prospection work was conducted, the following methodological procedures were adhered to:

- Bibliography and documentary analysis, to produce a brief desk study outlining the general archaeological characterisation of the region where the area of direct influence of the Cahora Bassa Bam is located;
- The methodology applied in this stage was initially supported by a review of the existing relevant bibliographical material. Based on the knowledge of the regional context regarding the area where the archaeological work was conducted, second stage was proceeded to, consisting of an inspection of the area to determine the features and working conditions and to conduct a prior safeguard archaeological survey.
- The archaeological prospection ensued, with the consequent systematic search which is based on the practice of direct observation to locate and identify archaeological stations and objects from traces indicating them[2].

It should be reminded that the archaeological stations and objects may be visible on the surface or be completely buried. It is thus sometimes necessary to resort to test excavations and probing. No test excavations were conducted in this archaeological campaign.

In this specific case, the prospection conducted was the traditional or conventional one (Fernández, 1993), based on the search of surface indicators, and thus consisted of: the careful observation of the area, looking to identify traces of possible structures on the surface; the observation of the visible stratigraphic sections that would allow indicating what could be buried; as well as the identification of materials susceptible of being classified as cultural and chronological indicators.

During the visual research, the goal was to visualise and write down everything around it, to establish/look for the favourable locations for houses, as well as the adverse ones, the reason for the anomalies in the relief, the composition of the plant elements (flora), the presence of human activity, etc.

Mapping is a method that allows for the easy location of archaeological sites, resorting to the global positioning system (GPS). It is a valuable auxiliary since it allows understanding the extent or the boundaries of an archaeological station and integrating it on a vaster cartographical context.

[2] It should be mentioned that the surface findings are the first indication on the probable existence of an archaeological site.

History of Research in the Region

Archaeological research conducted in Mozambique for the Tete and Zambezi River valley region can be divided into two periods: the colonial period and the post-independence period. The colonial period is characterised by few excavations and more descriptive work which started particularly with the Anthropological Mission of Mozambique in the 1930s, directed by Santos Júnior (Santos Júnior, 1940). Excavations were done merely to collect the artefacts without the careful description and analysis of the stratigraphy.

The progress of archaeology in Mozambique has a research precedent in the neighbouring countries: Zambia, South Africa, Malawi and Eastern Africa (Clark, 1942, 1950b; Clark and Van Noten, 1974; Phillipson, 1968, 1976a, 1977a; Chittick, 1975; Ehret and Posnanski, 1982; Ehret, 2002; Mitchell, 2002).

Before the Anthropological Mission of Mozambique reached the Zambezi Valley, an excavation had been made there, in the Chifumbazi cave in Tete. This was the first archaeological excavation conducted in Mozambique (1907), by the German archaeologist Carl Wiese, from where he collected pottery fragments that would later be known as the Chifumbazi Complex[3] (Philipson, 1977).

In 1936, Santos Júnior started working on the Pre-History of Mozambique, which culminated with the location of different rock art stations and others from the Stone Age in the centre of the then Portuguese colony (Santos Júnior, 1947).

During 1937, Santos Júnior used oral tradition to describe the Songo's Zimbabwe walled enclosure, in Tete Province. His study reached important information on this Zimbabwe, because he made the description and the first drawings. Santos Júnior (1947) also did studies on the rock paintings of Mwalaulembwe (Mulembué) and other stations of the lithic industry in Tete, from where he collected several artefacts. In 1941, Santos Júnior excavated the Marissa station, also in the Tete Province. These investigations allowed him to develop the first draft of the Mozambican Pre-History map.

One other important work developed in the colonial period was conducted during the construction of the Cahora Bassa Dam between 1972 and 1973, with the geologist Miguel Ramos excavating the Songo walled enclosure as part of the safeguard archaeology initiative. In this excavation he found lithic artefacts, pottery with geometrical decorations and iron slag (Ramos, 1980). Moreover, in the 1970s Rosa de Oliveira (1973, 1975) continued the study of the walled enclosures and of the rock art in Tete, culminating with the collection of several lithic instruments and pottery of the Zimbabwe culture. Archaeological research post-independence began with Ramos and Rodrigues, who, in 1978, worked in the Portuguese settlement of Zumbo and Cachomba, in the Lower Zambezi.

In the second half of the 1990s, Solange Macamo (Duarte and Macamo 1996, Macamo 2006) continued the research and excavations in the Zambezi Valley after a long period of pause. Several stations were excavated in the Tete and Manica provinces, among them the Songo walled enclosure and the settlement of Degue-Mufa (Macamo, 2006: 161), with the latter providing interesting material

[3] Pottery style of the first farming communities with a vast spatial distribution first excavated in Southern Africa in 1907 by Carl Wiese, in Chifumbazi cave in Tete Province, Mozambique.

on long-distance commerce in the Zambezi Valley during the Portuguese occupation. A considerable amount of pottery fragments manufactured locally, glazed beads, Chinese porcelain and other glossy material was collected in these excavations.

Another important research in Tete, in 2000, was authored by Tore Saetersdal (2004), a Norwegian archaeologist who studied in greater detail the rock art and the traditional custody (custódia). He excavated several archaeological stations with rock paintings from where he collected different types of data, mainly lithic artefacts, pottery and charcoal samples for carbon-14 dating (C_{14}).

Research made recently in Sena, in the Lower Zambezi, by Hilário Madiquida (Macamo e Madiquida, 2004), have identified various evidence of the long-distance commerce, which places the whole Zambezi Valley as one of the more active areas in this process.

In 2013, Ricardo and Yolanda Duarte identified an old, fortified field (aringa), Tundo, next to Moatize. It's one of the fortified settlements that developed in Zambezi Valley – Mozambique during the 18th and 19th centuries, related to the slave trade. The site, located near the present-day village of Moatize, in Tete Province, is located on the banks of the small river with the same name, which is part of the Zambezi River drainage basin.

The archaeological station extends over 2000 m^2. The boundaries and plant are still clear trough the alignment of big "mitumbwe" trees, which grew from the old palisade posts that flourished.

An old map from 1861 mentions the Tundo land concession ("prazo") in this place and a manuscript from 1803 (AHU - CU – 64, cx 97 doc 63) attributes its ownership to Mrs Francisca Josefa de Moura e Meneses, a powerful woman and slave owner, wife to João Moreira Pereira. There is a significant reference to the shipwreck of a slave ship, the "Ana Joaquina", in which the original land ownership document to this estate was lost when on its way to Rio de Janeiro (Brazil) to be signed off by the King.

A 1 x 1 m drain was excavated with evidence of one single occupation. A significant collection of pottery was assembled in the excavation and on the surface. The evidence of what seems to be different pottery traditions in this collection show an atypical situation regarding the archaeological characteristics of the primitive agricultural and medieval sites in the region. In this context, the specific characteristics of the main aringa settlers, the Achicunda, a social group with a non-traditional ethnic affiliation composed mainly of slaves (Capela, 2006), should be noted. The Achicunda are composed of populations from the region, coming from different ethnic groups (Maravi, Shona, Nhungwe, Sena, Nyanja, Angoni and others) enslaved or recruited as soldiers for the huge armies organised by local traditional leaders, such as the kingdom of Barué (Isaccmann, 1979), owners of "prazos", and even the African component of the colonial expedition corps (Botelho, 1934).

In 2021, Yolanda and Ricardo Duarte, within the scope of a safeguard archaeology work, referenced the archaeological station named 1633Bb-M4 with pottery from the Lower Iron Age, corresponding to the first communities of iron producers that inhabited the Moatize region (gokomere/ziwa and nkope), 1st millennium AC, and pottery from the Lumbo tradition, 11th to 14th centuries, characterised by decoration with stamped motives, arranged in bands, triangles, polygons and other geometrical figures usually delimited by strokes or cuts. This pottery tradition has been considered as an

expression of a coastal settlement by farming peoples, linked to commerce, navigation and of urban origins between the 11th and 14th centuries (Duarte 1995). The occurrence of traces of this tradition hitherto unknown, at such great distance from the coast, in Tete Province, Moatize District, raises the possibility of a penetration inland along the Zambezi by this coastal society.

Field archaeological work

The field archaeological work was preceded by an initial meeting conducted on 2 September with Nico Savaio, in which the cultural heritage survey and prospection activities to be carried out on 3 and 4 September 2021, as well as all the procedures regarding health and safety as required by HCB, were organised.

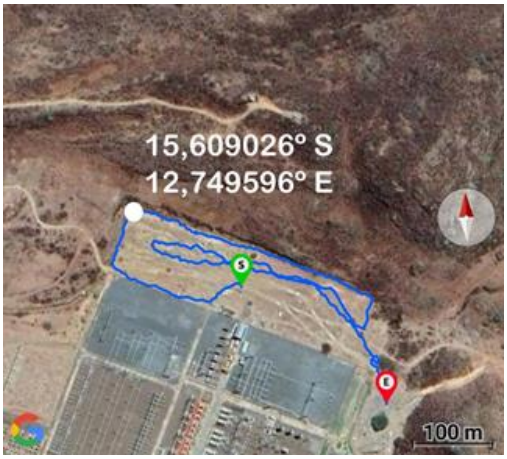
3 September 2021

The activities began with health and safety actions, which included:

- Health induction, information and inquiry on Covid-19;
- Safety induction on IPS and HCB safety rules, especially the ones related to entering the area of the plant;
- Start of the safeguard archaeology work, through visual prospection on foot, in the areas of the Songo convertor SS and the Earthing Electrode (Chitima). This was accompanied by the following officials from HCB: Nico Savaio, Leonel Fanequiço and Albino Ubisse;
- Observation of the site where the renovation of the plant will be carried out (REABSUL2), accompanied by HCB technicians António Carlos and Nico Savaio;
- Meeting with Pedro Conhaque to prepare the work regarding the ethnographic and traditional history inquiries.

Archaeological prospection circuits in the earth electrode area.

Visual research on foot in Chitima, earth electrode area.



Prospection circuit in the Songo convertor SS expansion area.

Archaeological prospection conducted in the Songo convertor SS expansion area.

Figure 5-49 – Circuit and visual prospection conducted in the Songo convertor SS expansion area and Earth Electrode.

No archaeological remains were detected on the inspected sites.

4 September 2021

This day was dedicated to conducting ethnographic and traditional history inquiries and visiting the Songo walled enclosure for monitoring.

The interviews were conducted with important members of the Songo community, namely:

- Mrs Joana – queen of Songo, with the interview focusing on rituals, ways and customs, sacred places, etc.;
- Mr Ferane – queen's relative / cousin and competitor for the throne, performs Nhau religious ceremonies and rituals, is a community leader and traditional religious leader. Following this interview a sacred place was checked having Mr Ferane as a guide.

Note that this sacred place is far from the project area, thus will not be affected.

A B

Figure 5-50 - Consultec's team, Dr Pedro Conhaque of HCB and Joana, Queen of Songo and a neighbour, group photo after the interview (A) and interview with Mr Ferane, community leader (B)

A sacred place was located at the coordinates: 15.593897ºS, 32.724259E.

Figure 5-51 – Sacred place (15.593897ºS, 32.724259E)

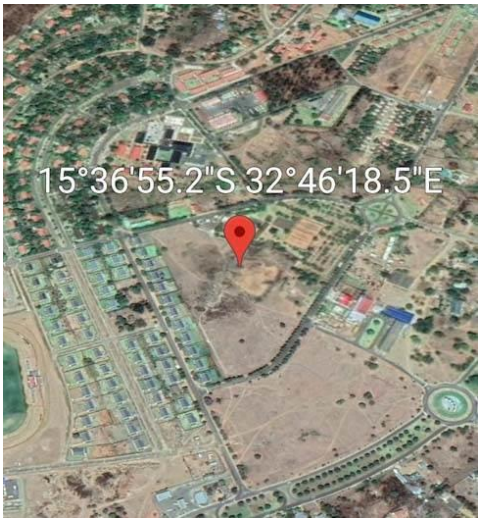
This brief approach allowed confirming the need to create a systematic data collection of the oral tradition as well as of the associated objects, for example, daily life objects, musical and worship instruments, masks and other objects related to the Nyau dance rituals with duly established rules that regulate the entry of the interested and penalties for those who break their laws, etc., aimed at the preservation of this cultural heritage and its future musealisation and national and international promotion. This activity must include the local community as the holder of information and objects, but also as an active member in the recording, awareness, conservation and enhancement of this important cultural heritage.

It is also indispensable to conduct an update and inventory of the historical and cultural monuments and places of this region, especially regarding sacred places, iron casting furnaces, etc.

Visit to the Songo walled enclosure

As a result of the monitoring visit, it was found that the most part of the walls are currently collapsed, although the platform where the old houses/buildings stood is in a good condition; however, it is possible to reconstitute its original configuration, which can be done in 3D and/or with a scale model.

In this archaeological station there is no informative signage, nor were there conducted any protection and conservation works of this important monument. Considering its location in the centre of the town of Songo, its historical and archaeological context, configuration, etc., this site has the potential for musealisation which could be integrated in a future Interpretation Centre to be created in Songo.



Location of the Songo walled enclosure/Zimbabwe (picture from Google Earth)

Songo walled enclosure/Zimbabwe – remains of the walls

Figure 5-52 – Songo walled enclosure/Zimbabwe

5.9.13 Economic activities

5.9.13.1 Agriculture

Area of Indirect Influence

Agriculture is the main economic activity in Tete Province. There are, however, some exceptions, in places where precipitation is low and erratic with frequent draughts, resulting in usually low crop productivity.

In Cahora Bassa District agriculture is the main activity, considered to be the basic production unit, in which the family has a fundamental role in the practice of rain-fed and irrigated agriculture (small low-cost irrigation systems) for own consumption and sale of surpluses. In general, each family has two farming plots (“machambas”), one for household consumption only and another to complement the family consumption in years of crisis and for sale in the years with surpluses. In this type of

agriculture the growing of cereal (maize, sorghum and pearl millet) and other crops such as peanuts, watermelon, boer beans, cowpeas and vegetables prevails.

Out of the 888 thousand hectares of Cahora Bassa District's area it is estimated that the potential arable land of the district is 400 thousand hectares. No significant conflicts regarding land ownership were mentioned nor other conflicts related to grazing land and water (Ministry of State Administration, 2012).

In general, agriculture in the district is practiced in a mixed crop system based on local varieties and, in some regions, with the use of animal traction and tractors.

Agriculture, predominantly rain-fed, is practiced in small family plots in one single season only, beginning between October and December, depending on the first rainfalls. In specific areas it is possible to practice a second season from the month of April, harnessing the humidity of the existing low temperatures, especially on the banks of the reservoir using irrigation systems (weirs) (TPF *et al.*, 2014).

The main food crops practiced are maize, pearl millet, sorghum, peanuts, cowpeas, jugo beans and sweet potato; watermelon and pupkin are also grown. In the areas where a second season is practiced, different vegetables are grown (cabbage, onions, round cabbage, tomato, etc.), beans and other crops also practiced in the first season, except sorghum and pearl millet (TPF *et al.*, 2014).

The cotton crop (the main cash crop), whose price is regulated, is absorbed by OLAM (agri-business multinational operating in Mozambique). The cotton production in the district is practiced by the family sector in the settlements/localities of Chitholo, Mulinje, Massecha, Matungulo, Chinhanda, Thaca, Candodo, Nhabando, Macacate, Bungue, Nhacapiri and Chinthando (TPF *et al.*, 2014).

To strengthen the bonds between the small and medium producers in the region, Vale Moçambique has created synergies between the producers and the major consumption centres. To that end community fairs have been promoted, which have created business opportunities for small local producers (Ministry of Economy and Finance, 2015). Fairs promote the exchange of knowledge on new agricultural production technologies and on the local culture and gastronomy.

The marketing of maize, peanuts and cowpeas is done by itinerant traders and small groups of buyers, financed under micro-financing, and in some cases by the Mozambican Cereal Institute, which has been buying part of the agricultural surpluses for storage and future sale in times of food crisis. Part of the production is marketed, as well, in the neighbouring Republic of Malawi, due to the ease of circulation and sale (Ministry of Economy and Finance, 2015).

5.9.13.2 Cattle breeding

Area of Indirect Influence

Animal rearing plays a preponderant role in the socio-economic life of the population in Tete Province, where the cattle breeding tradition together with favourable weather conditions (the low precipitation contributing to a low disease incidence and the development of good nutritional grass) favours a good performance of that activity. The main animal species bred include goats, cattle, poultry, pigs, sheep and some donkeys.

Most animal rearing is done by small breeders of the family sector, although there are breeders with herds over 100 heads. For small breeders, the animals are an important source of wealth and food security. Animals and their products contribute – directly or indirectly – to food safety through meat, milk and eggs. Moreover, the animals are used to increase agricultural productivity (through animal traction and the use of excrements as organic fertilizer), for transport and as a source of direct income through the sale of milk and/or animals. Families that don't own "machambas" resort to the sale of animals and/or of their products for the acquisition or barter trade of farming products. The sale and handling of poultry are the responsibility of women, while men decide on the sale of goats and sheep.

The sale of animals is usually done between farmers. However, there are many cases of sales to other places in the region, the province and the country. In these instances, sales are done through intermediaries that come to the villages to negotiate with the breeder.

Figure 5-53- Cattle breeding in Tete Province

The cattle breeding activity in the district is practiced, essentially, by the family sector, and is intended for own consumption and local sale.

Similarly to agriculture, cattle breeding in Cahora Bassa District is developed in a rudimentary way, with the animals usually in enclosures or grazing in the vicinity of the houses. The existing infrastructures for this activity are barns, coops and rudimentary pens made with local materials.

In Cahora Bassa District the livestock farming development has been weak, despite its good conditions, especially in terms of good grazing areas.

The members of the household, specifically women and children, take part in poultry breeding based on ancestral knowledge and practices.

The sanitary assistance to the animals in the district is not regular, with a recurring use of alternative means for treatment.

The most frequent diseases include hematic and symptomatic anthrax, nodular dermatosis, and in pigs the outbreaks of swine fever.

Currently, vaccination against the Newcastle disease in poultry is done routinely after an outbreak of the disease occurred.

The greater constraints to the development of cattle breeding are diseases, the lack of financial resources and the insufficiency of extension services (Ministry of Economy and Finance, 2015).

5.9.13.3 Industry

Area of Indirect Influence

Until 2010 Tete Province was characterised by tobacco industry (the largest processing plant in the country is in the city of Tete), processing of chilli pepper, production of beverages, production of metal structures, furniture, small industrial units focussed on grain milling, metal works, bakeries, ceramics, as well as by the informal industry sector which was dedicated to the production of construction materials (bricks and stone).

The beginning of coal exploitation in recent years attracted many multinational companies to this sector and contributed to a significant migratory flow with a strong incidence in the city of Tete and the town of Moatize.

All these projects are of open-pit mining. It should be noted that there are several other coal projects under development in Tete Province (currently, 9 concessions have been allocated, of which only 4 are in operation) (TPF *et al.*, 2014).

5.9.13.4 Tourism

Area of Indirect Influence

Despite its rich fauna, flora and thermal water areas, tourism in Tete Province is still poorly developed and is mainly associated to hunting.

As previously mentioned, the province has a community management system, the Tchuma-Tchato Project, which promotes ecotourism and trophy hunting activities managed by the community itself. In terms of areas of historical and cultural interest, the province has several sites that reveal its strategic importance over time, since the Monomotapa Empire.

In Cahora Bassa, the touristic potential includes the use of the Cahora Bassa reservoir, which offers conditions for the development of the tourism associated to water sports.

5.9.13.5 Livelihood Activities and Income

Area of Direct Influence

The income generating activities in Songo Administrative Post are commerce (formal and informal), subsistence farming, small and large-scale cattle breeding, formal employment in various areas of HCB, seasonal employment (casual workers), domestic work in the houses of the company's employees and tourism.

5.9.13.6 Fishing

Area of Indirect Influence

Fishing is an important activity in Tete Province. It's practiced along the Zambezi River, mainly in the Cahora Bassa Dam. There are several foreign fishing companies operating in the eponymous district, involved mostly in the capture of kapenta. After having been dried and salted, this fish is exported to Zimbabwe, Zambia, DRC, Malawi and South Africa, and is also transported to the provinces of Manica, Sofala and Niassa for domestic consumption. This semi-industrial activity contributes to the province's economic growth, through the imposition of an annual levy and the provisioning of export services.

Fishing is also practiced at a family level, as a livelihood, especially for the population living near the Zambezi, Revúboè and Ncondezi rivers. Fishing is focused on the species banded tilapia (*Tilapia sparmanii*) *pende* or Mozambique tilapia (*Oreochromis mossambicus*), chicoa or bull shark (*Carcharhiunus leucas*), conger (*Labeo congoro*) and tigerfish (*Hydrocynus vittatus*).

The family sector practices a traditional type of fishing, using hooks, nets and canoes. Fishing is viewed as a complementary activity to farming. However, there are a small number of families that live exclusively off this activity. Family sector fishing is mainly for own consumption. However, in times of low farming income fishing becomes the basis of the household income and fish is sold fresh or salted.

Area of Direct Influence

Fishing is an activity that has been developed mostly along the reservoir in an artisanal and semi-industrial manner.

Artisanal fishing

For artisanal fishing, fishermen use mostly two fishing gears, trawl and gillnet. They use dugout canoes to make their way through the river. There are also fishermen that use cages made from papyrus and reed to catch the fish. It should be noted that sometimes fishermen leave the cages assembled in the water, where they deposit the fish, they gather until they have a larger catch.

There is a total of 9 Community Centres for Fishing that work in partnership with the Fishing Research Institute (IIP, Instituto de Investigação Pesqueira). These centres have autonomy for licensing and conduct inspections of the fishing activity. It should be mentioned that these centres only deal with the fishing of larger fish.

Artisanal fishing is carried out every day during daytime. The fresh catch is marketed in the internal market, the dried one is exported to the Democratic Republic of the Congo and a part goes to Angola and Tanzania; the smoked fish is marketed in Zambia.

The following pictures show some types of vessels used in artisanal fishing and some of the fish conservation methods.

Artisanal fishing vessels, of the dugout canoe type.

Fish salting drying technique.

Example of a drying rack for fish

Application of conservation technique through the smoking of the fish

Figure 5-54 – Artisanal fishing vessels and fish conservation techniques

Semi-industrial fishing

Semi-industrial fishing is done using vessels appropriate for such practice (with approximately 7 to 19,9 metres). Along the reservoir vessels of 7 to 9 metres are used for the practice of semi-industrial fishing. These vessels are open, with a small cover, internal engine and a crew of four members, who cast the net into the water and then use light to draw the fish.

There are two associations practicing semi-industrial fishing, with exclusive licenses for the capture of kapenta (which is done at depths above 20 metres and more than 500 metres away from the

coast); should they be found to be fishing species other than kapenta they will be penalised. Semi-industrial fishing is done during night time, almost every day, except for full moon nights, when the moonlight interferes with the light used for fishing.

The captured kapenta is intended for export to Zimbabwe, Zambia and the Democratic Republic of the Congo.

Figure 5-55 – Semi-industrial fishing vessel

Sport fishing

This type of fishing is practiced once a year, in tournaments where the winner is selected in the end. The fish caught by the entrants is returned to the water. Usually tigerfish is the most popular, but the entrants also catch *pende*.

Industrial fishing

There is no industrial fishing due to the reservoir's own features and the type of vessels used by the industry.

5.9.14 Aspects relating to Gender and Vulnerable Groups

Area of Indirect Influence

Extreme poverty and the HIV/AIDS epidemic are problems that affect mostly women and girls in the country, thus contributing for them having the same precarious living conditions, both emotionally and financially (USAID, 2013). Although access to social services has increased, gender and

geographical inequalities persist in Tete Province. The northern and central provinces have less access to education, health services, water, sanitation and social protection. These provincial disparities are reinforced by the reduction of the budget allocation *per capita*.

The poorer families have less probability of accessing services; for example, the pre-natal care coverage varies between 58% and almost 100% from the lowest income levels to the highest. There is a direct correlation between a high level of education, wealth and a greater exposure to media. The situation worsens in rural areas, where less than 4% of women know what the Internet is. Another challenge for the socio-economic development of the country is related to the high illiteracy rate, which for various reasons (especially cultural) affects more women (especially in the rural areas) than men (58% and 30%, respectively). In general terms, women in Mozambique are disadvantaged sociocultural, politically and economically. This is strongly due to the current gender relations in the country, which are highly patriarchal (WLSA, 2017). From the gender inequality perspective, women are highly susceptible to domestic violence and to sexual abuse, two factors that contribute to the increase of poverty, especially among women-led households (TVEDTEN, 2009).

In Cahora Bassa District about 20% of single parent households are headed by women (usually widows or single women over 50 years old), and therefore more socially vulnerable (TPF *et al.*, 2014).

An indicator which is inextricably related to gender issues and women well-being is the illiteracy rate. The illiteracy rate in the district is higher in the female than in the male population. There is a lot of pressure for girls to drop out of school and dedicate themselves to the “machamba” or other domestic chores (TPF *et al.*, 2014).

Area of Direct Influence

There are some other vulnerable groups, namely elderly, women head of households, orphans and disabled people. Part of them receives support from the National Social Welfare Institute (INAS, Instituto Nacional de Acção Social).

6 Identification and Assessment of Impacts

The environmental impacts of an activity result from the effect (consequences) that the specific actions conducted within the scope of that activity (tasks) induce on the environment in which they take place. In fact, different actions conducted in the same place, or the same action carried out in places with distinctive characteristics, necessarily lead to different impacts.

Thus, following the analysis of the detailed description of the activities that make up the project (presented in chapter 3), the identification and evaluation of the main environmental aspects of the activity was conducted. The relationship of these aspects with the specific characteristics of the region where such activities will be developed (characterised in chapter 5) enabled the prediction of the main potential environmental impacts of the SS.

6.1 Methodology

The assessment of the impacts of activities related to the rehabilitation/expansion and operation of HCB's SS was based on the impact assessment methodology detailed below.

This methodology enables the analysis of impacts in a systematic way, resulting in the classification of their significance (from insignificant to very significant). The significance of a given impact is defined as a combination of the consequence of the impact occurring and the likelihood of the impact occurring. The criteria used in determining the consequence of the impact include comprehensiveness, intensity and duration, considered the cumulative impact, as the construction will take at the location while the substation will be in operation. The criteria is shown on the Error! Reference source not found. below.

Table 6-1- Criteria used in determining the impact consequence

Classification	Classification definition	Punctuation
A. Coverage – the area in which the impact will be experienced		
Local	Limited to the SS or study area, or a part of it (e.g. the location)	1
Regional	The region, which can be defined in various ways, e.g. e.g., administrative, watershed, topographic	2
(Inter)national	Nationally or beyond	3
B. Intensity – the magnitude or size of the impact		
Low	The more extensive and site-specific and natural and/or social functions and processes are negligibly altered	1
Medium	The more extensive and site-specific natural and/or social functions and processes continue, albeit in a modified form.	2
High	The more extensive and site-specific and natural and/or social functions and processes are severely altered	3
C. Duration – the time frame during which the impact will be experienced		
Short-term	For full-time SS rehabilitation/expansion activities/up to two years	1
Medium-term	Two to 15 years	2
Long-term	More than 15 years	3

The combined score of these three criteria corresponds to a consequence score, as set out in the Error! Reference source not found. below. (note that the lowest possible consequence score is 3).

Table 6-2-- Method used to determine the consequence score

Combined score (A+B+C)	3 – 4	5	6	7	8 – 9
Consequence classification	Very reduced	Reduced	Medium	High	Very high

Once the consequence has been determined, we consider the likelihood of the impact occurring, using the probability classifications presented in the following Error! Reference source not found..

Table 6-3-- Classification of likelihood

Probability of impact - how likely is the impact to occur	
Unlikely	< 40% probability of occurrence
Possible	40% to 70% probability of occurrence
Likely	> 70% until 90% probability of occurrence
Definitive	> 90% probability of occurrence

The overall significance of impacts is ascertained by consideration of consequence and likelihood, making use of the ranking system recommended in the following Error! Reference source not found..

Table 6-4- Classifications of impact significance

		Probability			
		Unlikely	**Possible**	**Likely**	**Definitive**
Consequence	**Very reduced**	INSIGNIFICANT	INSIGNIFICANT	VERY REDUCED	VERY REDUCED
	Reduced	VERY REDUCED	VERY REDUCED	REDUCED	REDUCED
	Average	REDUCED	REDUCED	MEDIUM	MEDIUM
	High	MEDIUM	MEDIUM	HIGH	HIGH
	Very high	HIGH	HIGH	VERY HIGH	VERY HIGH

Lastly, impacts are considered in terms of their status (positive or negative) and we indicate the confidence in the assigned rating of impact significance. The criteria for ranking the status of impacts and the confidence in the assessment, are indicated in Error! Reference source not found..

Table 6-5- Impact status and confidence rating

Impact status	
Indication of whether the impact is adverse (negative) or beneficial (positive).	+ vo (positive – a "benefit")
	– vo (negative – a "cost")
	Neutral
Confidence of the assessment	
	Low
	Average

The degree of confidence in the forecasts, based on available information, the consultant's judgment and/or their expert knowledge.	High

Distinct types of impacts have also been considered in the impact ratings, as outlined in the **Error! Reference source not found.**.

Table 6-6- Types of impact

Direct – impacts that result from the direct interaction between a given project activity and the receiving environment (e.g. dust generation that affects air quality).

Indirect – impacts that result from other activities (other than the project) but which are facilitated because of the project (e.g. immigration of job seekers, which places additional demands on natural resources) or, impacts that occur because of the subsequent interaction of the project's direct impacts within the environment (e.g., a reduced water supply that affects crop production and then impacts livelihoods based on livelihoods).

Cumulative – impacts that act in concert with potential current or future impacts from other existing or proposed activities in the area/region that affect the same resources and/or receptors (e.g. the combined effects of wastewater discharges from more than a project for the same water resource, which may eventually be acceptable in isolation, but which cumulatively results in reduced water quality and fisheries productivity).

6.2 Identified Potential Impacts

6.2.1 Climate

Considering the project and the activities involved, as well as the type of gases emitted, no impacts are expected on the climatological component of the DIA, or even locally (IIA).

6.2.2 Air Quality

6.2.2.1 Construction/rehabilitation phase

Impact AQ1: Increased concentration of particulate matter and flue gas

The main negative impact on air quality resulting from the planned rehabilitation activities will be mainly due to earth-moving operations (e.g., to lay the foundations of the new buildings) to be conducted during the project's construction phase. These activities, particularly those involving earthmoving, are likely to release dust and are therefore likely to generate negative environmental impacts associated with a potential increase, albeit temporary, in concentrations of particulate matter. The inhabited areas that are in the vicinity of the intervention sites, especially those located downwind of the prevailing winds, may be affected mainly on dry days and wind favourable to the transport of dust in the direction of these houses.

It will also be possible that a slight increase in the concentration of flue gases may be generated due to the use of machinery equipped with combustion engines, and to the temporary increase in the traffic of heavy and light vehicles on the access roads to the construction site due to the transport of new equipment and construction materials. The circulation of transport vehicles inevitably generates emissions of combustion gases such as carbon monoxide (CO), carbon dioxide (CO_2), nitrogen oxides (NOx) and sulphur oxides (SOx), as well as the resuspension of dust when these vehicles circulate on unpaved roads.

The **Error! Reference source not found.** below summarises the atmospheric pollutant emission factors, expressed in g/h, of some construction equipment that may be used in the planned construction activities:

Table 6-7-– Average factors of emission of atmospheric pollutants

Construction Equipment	Hydrocarbons (HC)	Carbon Monoxide (CO)	Nitrogen Oxides (NOx)	Sulphur Oxides (SOx)	Particles (PTS)
	g HC/ h	g CO/ h	g NOx /h	g SOx /h	g PTS/ h
Dumper Track	135,46	532,92	1 154,48	1,11	48,26
Crawler Rotary Excavator	55,32	242,15	411,45	0,60	21,80
Water Tanker Truck	94,22	346,97	773,91	0,76	37,12
Articulated Lorry/Trailer Lorry	97,11	288,52	841,10	1,21	29,22

Source: *AQMD,1993, Off Road Mobile Source Emission Factors (scenario years 2007-2025)*

However, we estimate that the local increase in emissions of these air pollutants caused by the operation of equipment used in the construction process and by the circulation of heavy vehicles may be considered residual, since it is expected that a small number of vehicles will operate simultaneously during the construction process. The increase in traffic during the construction phase is not expected to reach such densities as to warrant special emphasis on the negative effects on air quality.

Based on the above, the main impacts on air quality that could arise during construction activities are:

- Possible visualisation of dust plumes generated, for example, when a heavy multi-wheeled vehicle passes on an unpaved road;
- Increased concentrations of Total Suspended Particulates and fine particles (PM10), because of the handling of granular materials at construction sites (e.g., earth moving during excavation and landfill operations);
- A negligible increase in concentrations of flue gases such as carbon monoxide, nitrogen dioxide and sulphur oxides due to exhaust emissions from diesel vehicles and equipment used in the construction area.

During commissioning and testing of the equipment, it must be ensured that there will be no leakage of Sulphur Hexafluoride (SF_6) into the atmosphere as this gas has a very high greenhouse effect potential, of around 23 500 compared to carbon dioxide as stated in the IPCC's 5th report (AR5), and if released into the atmosphere, it has a high potential for contributing to climate change.

The induced impact on air quality due to a possible increase in the concentration of particulate matter and increase of combustion gases potentially emitted during the rehabilitation activities of the Songo converter SS is classified as having a negative nature, local scope, probable, short term and with a very low significance after the implementation of the mitigation measures suggested, as shown below.

Impact QA1: Production of Particulate Matter							
No mitigation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Negative	Location	Low	Short-term	Very reduced	Likely	**Very reduced**
Mitigation Measures: • Restrict earthworks and land movements to what is strictly necessary as defined in the project; • Careful choice of itineraries for the vehicles assigned to the work, to minimize, whenever possible, circulation along or through inhabited areas. • Determine a maximum speed of 30 km/h for the circulation of vehicles in critical stretches, such as close to inhabited areas, considering that dust emissions increase linearly with speed; • To efficiently reduce the emission of particulate matter, emitted by machines and vehicle wheelsets, the implementation of a regular system for wetting intervention areas where there are soils exposed to wind action should be considered. • All equipment equipped with combustion engines must undergo regular inspection to verify their operating conditions (periodical maintenance); It is intended in this way to minimize the emissions of combustion gases resulting from its operation. • Equipment which generates excessive black should not be used at site. • Providing appropriate PPE to workers which will be exposed to a risk of dust and combustion gases.							
With mitigation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Negative	Location	Low	Short-term	Very reduced	Possible	**Insignificant**

6.2.2.2 Operation Phase

Given the nature and intrinsic characteristics of the project, it is not at all expected that negative impacts on air quality may occur in the project's operation phase.

6.2.3 Climate Change

In what concerns climate change, the implementation of this project will allow the continued availability of electricity generated by non-polluting sources, which contributes to reducing the use of conventional fossil energy sources for electricity production such as coal, natural gas or oil. Maintaining this energy availability will contribute, on a national scale, to the reduction of pollutant gases emissions from fossil fuels.

Based on data from the IPCC, 2014 (Intergovernmental Panel on Climate Change - 5th report) the intensity of greenhouse gas emissions associated with hydroelectric systems is around 24g CO_2/kWh carbon dioxide equivalent.

Considering that the CO_2 emissions generated by the burning of natural gas for electricity generation range between 272 g CO_2/kWh and 908 g CO_2/kWh and the burning of coal gives rise to greenhouse gas emissions ranging between 635 g CO_2/kWh and 1634 g CO_2/kWh (IPCC, 2011), it can be concluded that the Songo converter SS rehabilitation project contributes to the national effort to reduce greenhouse gas emissions in itself, which in turn is considered an impact of a positive nature and high significance on a national scale.

6.2.4 Noise and Vibration Environment

6.2.4.1 Construction Phase

The main activities associated with the Songo converter SS rehabilitation project that could give rise to environmental impacts on the Noise and Vibration environment are:

- Installation of a construction site and equipment yard;
- Movement of machinery and vehicles;
- Earth moving;
- Erection of metallic structures;
- General construction work.

It is expected that the building sites will include office areas, storage areas for tools and materials and other construction support areas.

The type of machinery and vehicles normally used on construction sites will be vehicles for transporting equipment, materials and personnel, and will therefore generate noise that could potentially affect nearby residential areas.

Impact SE1: Local increase of noise and vibration levels in the immediate surroundings of populated areas

During the rehabilitation phase of the Songo converter SS, some operations likely to cause a temporary increase in noise and vibration levels in the areas surrounding the worksites are likely to occur. These activities are mainly associated with those carried out on the construction site, with the use of machinery and equipment involved in earth moving, the assembly of metallic structures as well as the circulation of heavy vehicles used to transport materials and equipment to the construction site combined with the noise and vibration from the normal operation.

The impact generated on the sound environment will depend on the distance of the noise sources to the sensitive receptors in the project's area of influence. However, given that the construction operations are of short duration and given the distance between the project's implantation area and the existing residential areas, between 140 and 340 metres, and considering that no associated social infrastructure such as schools, health care centres and places of worship, such as churches or mosques, has been identified, we estimate that the impacts will be temporary and, in general, not very significant.

The potential impacts are characterised by their limitation, both in terms of period of occurrence (only during the rehabilitation phase of the SS), and in terms of space, as they will mainly affect the areas immediately surrounding the work within a maximum radius estimated at 200-300 metres, so it is not expected that the sensitive receptors identified in the surroundings of the project area are significantly affected by the noise levels produced during the rehabilitation works.

In what regards vibration, early phases of construction projects often generate vibrations in the near-surface soils. These construction activities can include soil excavation, site clearing, truck traffic, or compaction with vibratory equipment.

In industrial construction, most of the construction-related vibration typically occurs during the early phases of construction. Three primary activities related to most, if not all, of the vibration-related damage claims in construction, include: Site clearing and removal; Site grading and soil compaction and installation of deep foundations.

Site clearing includes the removal of existing vegetation, buildings, and pavement. This process is often performed with vibration-inducing equipment such as excavators, dozers, loaders, and large trucks.

However, as far as 100 meters from the vibration source, the vibration levels induced by trucks, crane idling, small and even large dozers are expected to be below the threshold of the perception set as a peak particle velocity of 0,5 mm/s (Wiss, 19981). Therefore, and considering the existing distances between the construction site and the nearest sensitive receptors and their housing, the vibration impact can be classifies as being non-existent.

In the light of the above, the impact on the noise climate induced by the rehabilitation activities of the Songo converter SS is classified as having a negative nature, local scope, probable, short term and with an extremely low significance after the implementation of the mitigation measures suggested, as shown below.

Impact SE1: Local increase of noise and vibration levels in the immediate surroundings of populated areas							
No mitigation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Negative	Local	Average	Short-term	reduced	Likely	**Reduced**

Mitigation Measures:

- The location of the contractor's camp site should be selected so that it is located as far as possible from areas of sensitive use (housing).
- Carry out a careful choice of itineraries for the vehicles assigned to the work, to minimize their circulation near or through inhabited areas.
- Construction activities, especially the noisiest ones, should whenever possible be limited to daytime hours (6:00-22.00).
- The Contractor shall instruct its drivers on techniques to minimize vehicle noise, such as when braking or accelerating near inhabited areas.
- The Contractor shall, whenever possible, avoid parking fixed equipment (e.g., cranes or compressors or other noisy equipment) in the vicinity of areas of sensitive use.
- Select and use low noise machinery/equipment.
- The contractor should ensure that equipment and vehicles are well maintained and properly fitted with exhaust mufflers.
- Workers exposed to excessive noise should use protective equipment.

With mitigation	Nature	Scope	Intensity	Duration	Consequence	Likelihood	Significance
	Negative	Local	Low	Short-term	Very reduced	Likely	**Very reduced**

6.2.4.2 Operation Phase

In the project's operation phase, no increase in noise or vibration levels in relation to those already existing and determined in the current situation is expected to occur. Considering the surrounding topography, which is morphologically rugged, and considering the location of existing dwellings in relation to the new construction area, and given the results obtained during the noise monitoring campaign, one can consider that the impacts arising from the operation phase of this project will be negligible or even non-existent.

Considering that the HVDC ground electrode is in an area without sensitive use (houses), in a radius greater than 600 metres, the noise impact resulting from its operation is null, since all the noise produced by this equipment will be attenuated by the distance. The dilution of the energy of the sound waves caused by the distance from the source is about - 6 dB with double the distance to which is added the sound absorption of the propagation medium (air), the acoustic attenuation caused by the type of terrain (in this case morphologically rugged) and the additional attenuation exerted by the existing vegetation between the emitting source and the receiving points, which acts as a natural and effective barrier to sound propagation.

6.2.5 Geology

The impacts on the geological component are null to insignificant, since during the construction phase, the main activity likely to induce impacts on this environment are the earth movements required to extend the platform of the SS and the reprofiling of accesses. As the Songo converter SS is an already active SS, where the area has already been prepared and the accesses have been built, the earth moving activities are not significant, and will only be of a minor levelling detail.

In the operation phase, considering that the maintenance of the SS and the activities in the electrode zone will not require intervention in the geological substratum, the impacts are non-existent.

6.2.6 Hydrology

6.2.6.1 Construction and Operation Phase

The main activities that may generate impacts in the construction phase are:

- Site preparation;
- Construction activities;
- Management of waste and hazardous materials;
- Transport and circulation.

The main activities that may generate impacts in the operation phase are:

- Maintenance and Repairs;
- Management of waste and hazardous materials;
- Transport and circulation.

The potential impacts that may occur because of the possible actions identified above are described in the following paragraphs.

Impact H1: Changes in the quality of surface and underground water with the risk of contamination due to leaks/spills of pollutants and suspended solids in the water

The project activities do not involve the crossing or diversion of water lines. The topographic location of the SS in an area outside the paths of run-off lines prevents the design of additional precautionary measures relating to surface water resources, other than those provided for in the stormwater drainage project already in place at the Songo conversion SS. The planned and existing SS is expanded to the new area.

The potential impacts that could occur result from potential oil spills caused by equipment breakdowns, regular maintenance (including oil replacement) at the SS site, as well as resulting from the replacement of the AC 1 and 2 filter banks containing Polychlorinated Biphenyls (PCB), substances classified as Persistent Organic Pollutants (POP); which could lead to groundwater and surface water contamination in proportion to the magnitude of such accidental events. Furthermore, special attention must be given to a proper management of waste and hazardous products from the SS equipment, such as transformers and capacitors containing PCB.

HCB will use the SAPP PCB handling procedure to ensure the safe removal and disposal of the equipment containing PCB.

Pollutants may seep either through soils or geological substrate and reach surface water and/or groundwater levels. The environmental damage depends on the volumes involved, their hazardousness and toxicity and the containment measures implemented.

However, the application of general mitigation measures and the waste management plan will help to reduce this risk significantly. The semi-permeable nature of the geological formations is of note, which allows for some infiltration, although hardly any, and may cause contamination of this resource if it exists.

Impact H1: Changes in the quality of surface and underground water with the risk of contamination due to leaks/spills of pollutants and suspended solids in the water

	Nature	Scope	Intensity	Duration	Consequence	Likelihood	Significance
No mitigation	Negative	Local	Low	Short-term	Very reduced	Likely	**Very Reduced**

Mitigation Measures:

- Implement the Waste Management Procedure based on the existent, which include measures for management of generated waste both general waste and hazardous waste;
- Implement SAPP PCB Management Guidelines;
- Implement a Chemical Product Management Procedure;
- Implement a Spill Emergency Response Plan (work instructions for Oil and Acid Spills);

Impact H1: Changes in the quality of surface and underground water with the risk of contamination due to leaks/spills of pollutants and suspended solids in the water							
No mitigation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Negative	Local	Low	Short-term	Very reduced	Likely	**Very Reduced**
• Keep equipment and machinery in good working order, including clean brakes and catalysts (high pressure washed), transformers, without leaks, excess oil and/or grease; • All flammable, reactive, corrosive and toxic materials must be stored in clearly labelled containers; • Install of oil/water separator for the drain from contractor's garage/service bay; • Construct bund with concrete pad for spillage containment at the contractor's filling stations/service bay/garage; • Regularly inspect all equipment in the SE that may contain contaminants such as transformers.							
With mitigation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Negative	Local	Low	Short-term	Very reduced	Possible	**Insignificant**

6.2.7 Soils

6.2.7.1 Construction and Operation Phase

The main activities that may generate impacts in soils during the construction phase are:

- Preparing the work area;
- Construction activities;
- Management of waste and hazardous materials;
- Transport and circulation;
- Presence of workers.

The main activities that may generate impacts in the operation phase are:

- Maintenance and Repairs;
- Management of waste and hazardous materials;
- Transport and circulation.

The potential impacts that may occur because of the possible actions identified above are described in the following paragraphs.

Impact S1: Changes in soil chemical properties and risk of soil contamination

The project activities will have a gentle impact on soils as the work takes place within the existing SS site, which is already in operation. There is also no need to open access roads.

The potential impacts that may occur are from unforeseen events such as spills of hydrocarbons resulting from equipment malfunctions or inappropriate storage/handling of waste from dismantled equipment, which may lead to contamination of soils in proportion to the magnitude of these unexpected events. Furthermore, special attention must be given to a proper management of waste and hazardous products from the SS equipment, such as transformers.

Polluting substances may seep through soils; the environmental damage depends on the volumes involved, their hazardousness and toxicity and the containment measures implemented.

However, the application of general mitigation measures and the waste management plan will help to reduce this risk significantly.

Impact S1: Changes in soil chemical properties and risk of soil contamination							
No mitigation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Negative	Local	Low	Short-term	Very reduced	Likely	**Very Reduced**
Mitigation Measures: • Implement the Waste Management Procedure, including measures for management of generated waste both general waste and hazardous waste ; • Consider to create additional waste storage areas for hazardous and non-hazardous material; • Implement a Chemical Product Management Procedure; • Implement a Spill Emergency Response Plan (work instructions for Oil and Acid Spills); • Keep equipment and machinery in good working order, including clean brakes and catalysts (high pressure washed), transformers without leaks, excess oil and/or grease; • Install of oil/water separator for the drain from contractor's garage/service bay; • Construct bund with concrete pad for spillage containment at the contractor's filling stations/service bay/garage; • Regularly inspect all equipment in the SS that may contain contaminants such as transformers.							
With mitigation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Negative	Local	Low	Short-term	Very reduced	Possible	**Insignificant**

6.2.8 Biotic Environment

6.2.8.1 Construction Phase

The construction phase of this project will include all works necessary for the expansion and rehabilitation of the SS and all associated infrastructure, thus covering a diverse range of construction activities. The main activities that may generate impacts on the habitats during the operation phase are:

- Preparing the work area;
- Construction activities;
- Management of waste and hazardous materials;
- Transport and circulation;
- Presence of workers.

In the operation phase, considering that the maintenance of the SS will not require intervention outside the area of direct influence, the impacts are non-existent.

The potential impacts that may occur because of the possible actions identified above are summarised in the following paragraphs.

Impact BE1: Disturbance and loss of habitats and members of the local fauna (mortality)

Land-clearing activities and the movement of machinery and vehicles belonging to the project may affect or even cause the death of animals that are difficult or slow to move (such as reptiles, amphibians or insects).

The cutting of vegetation during the land-clearing stage, as well as the use of heavy machinery for this purpose, could increase local noise levels and adversely affect the animals that are most demanding in terms of habitat quality. This disturbance could lead to the migration of animals to less disturbed areas.

However, the project's implantation area is an area with a lot of anthropization, so the occurrence of plants and animals that are very demanding in terms of habitat quality and not very tolerant to disturbances will be very infrequent.

Biodiversity is therefore of reduced importance in the study area, so this impact can be assessed as *local* in scope (limited to the project's implantation area), of *low* intensity (given the reduced importance of biodiversity in the project's implantation area), of *short* duration (since the disturbance will be linked to the construction phase) and *likely*, resulting in an impact of *very reduced* significance.

Impact BE1: Disturbance and loss of habitats and members of the local fauna (mortality)							
No mitigation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Negative	Local	Low	Short-term	Very reduced	Likely	**Very reduced**
Mitigation Measures: • Implement an environmental awareness program for workers. • Implement a Waste Management Plan for the construction phase. • Implement a wildlife flight/rescue program. • Signalling and delimiting large trees that do not need to be felled, so that they are not affected by the movement of machines. • Avoid, whenever possible, felling trees. Timber with commercial value and of interest to local communities must be felled with a chainsaw. These woods should be arranged in piles with a height of not more than 5 m, in places that do not interfere with the activities. • Request prior authorization from the HCB for felling trees; • Avoid leaving garbage unattended, so as not to attract nocturnal carnivores; • Promote the selection of areas with bare soil and less need to cut vegetation for temporary work and storage areas; • Keep equipment and machinery in good working order, including brakes, silencers, catalytic converters clean (jet wash), without leaks and excess oil and/or grease • Construction works during the night time should be avoided.							
With mitigation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Negative	Location	Low	Short-term	Very reduced	Possible	**Insignificant**

Impact BE2: Increased pressure on wildlife resources and surrounding vegetation due to mobilisation of construction workers

The presence of workers in the project implementation area and surrounding areas may increase pressure on the remaining vegetation. This pressure results from various activities such as potentially increased exploitation of plant resources (firewood, charcoal, construction materials, tools, etc.), increased occurrence of forest fires and poaching. This pressure will affect the conservation status of the remaining ecosystems. As mentioned above, due to the degree of anthropic pressure that the area already suffers, since the SS already exists and because it is located near an urbanised area, as well as the reduced conservation interest of the vegetation in the area, this impact has a *local*

scope, *low* intensity and magnitude, *long duration* and *reduced* significance. The summary of the impact is presented in the table below.

Impact BE2: Increased pressure on wildlife resources and surrounding vegetation due to mobilisation of construction workers							
No mitigation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Negative	Local	Low	Short-term	Very reduced	Likely	**Very reduced**
Mitigation Measures: • Implement an environmental awareness program. • Implement a Waste Management Plan for the construction phase. • Prohibit all workers from purchasing charcoal or firewood or any other product that may be offered for sale in and around the project area, to avoid promoting the use of forest resources and hunting.							
With mitigation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Negative	Local	Low	Short-term	Very reduced	Likely	**Insignificant**

Impact BE3: Loss of Ecosystem Services

The vegetation in the project area provides ecosystem services to local communities such as energy, food, medicine and water flow control. Construction of infrastructure, access roads, etc., will mean the loss of ecosystem services provided to local communities. Some of the services that will be lost are food, energy, medicine, water and cultural aspects.

The loss of ecosystem services is an impact of *local* extent, *likely*, *short-term* and of *very low* intensity and magnitude, as it is in the vicinity of an anthropized area reduces the dependence of communities on ecosystem services. The summary of the impact is presented in the table below.

Impact BE3: Loss of Ecosystem Services							
No mitigation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Negative	Local	Low	Short-term	Very reduced	Likely	Very reduced
Mitigation Measures: • Implement an environmental awareness program. • Donating the biomass that results from the deforestation activity to local communities.							
With mitigation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Negative	Local	Low	Short-term	Very reduced	Possible	**Insignificant**

6.2.8.2 Operation Phase

In the operation phase, considering that the maintenance of the SS will not require intervention outside the area of direct influence, the impacts are non-existent.

6.2.9 Socio-economic Environment

6.2.9.1 Construction Phase

The construction phase of the Project will include all works necessary for the expansion and rehabilitation of the SS, covering a wide variety of construction activities, including clearing of land, earth moving, construction of temporary access roads and installation of temporary construction camps, operation of construction machinery and movement of heavy vehicles, among other activities.

The construction phase will include several activities with various potential social impacts, among which the most relevant are the following:

- Labour Mobilisation - the hiring and mobilisation of labour for construction will result in direct positive impacts due to job creation, and indirect negative impacts related to the potential influx of migrants and other pressures associated with the social fabric;
- Earth moving, and movement and operation of vehicles and machinery - construction works will generate noise, light and air emissions, which will result in nuisance effects on local populations.

Impact SE1: Creation of job opportunities, working conditions and labour

The construction phase will create direct employment opportunities, mostly for unskilled workers. It should be noted that HCB will not hire these workers directly. The proponent will hire a construction contractor, who will mobilise the necessary labour. Most of this labour is likely to be recruited locally, i.e. at a provincial level, with a small proportion of skilled workers likely to be recruited from other provinces or abroad.

Currently, employment opportunities for communities in the Project area are very scarce. Therefore, the jobs created by the Project, both direct and indirect, will lead to increased household income for locally hired workers and improved welfare for their families. It should be noted, however, that these jobs are temporary in nature (limited to the construction phase).

This is a positive impact, *local* in scope, and of *low* intensity (given the relatively small number of workers) and *short-term* duration (restricted to the construction phase), resulting in *very low* significance.

Impact SE1: Creation of job opportunities, working conditions and labour							
No mitigation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Positive	Local	Low	Short-term	Very reduced	Likely	**Very reduced**
Maximisation Measures: • During the process of hiring workers, priority should be given to the local population, if the candidates have the necessary qualifications for the job opportunity created;							

• Employment opportunities should be adequately publicized so as not to limit application opportunities including the inclusion of genders and vulnerable groups; and • The process of hiring personnel must be transparent and follow pre-established and accepted criteria.							
With mitigation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Positive	Local	Low	Short-term	Very reduced	Likely	**Very reduced**

Impact SE 2: Local and regional economic boost due to the purchase of construction goods and materials and increased labour income

The construction of the Project will create direct and indirect opportunities for the stimulation of the local economy linked to:

- The purchase of services, goods and materials required for the construction works. Although some specialist services will need to be procured nationally or internationally (as they are not available locally), many goods and services will be procured locally, notably those related to accommodation, catering, etc.;
- Increased income from hired labour will lead to increased levels of consumption due to the concentration of workers and the influx of people from other areas looking for work.

This will lead to an increase in demand for consumer products, goods and services. Greater demand for products will develop local markets, especially in the food sector, which will benefit local, district and provincial economies, stimulating the creation of companies and jobs. Informal commercial activities can also be expected to develop, benefiting some residents with increased household income.

This is a positive impact, which we have assessed as *indirect*, of *short term* duration (the stimulus will only occur during the construction phase), of *local* scope and *low* intensity, resulting in a *very low* significance.

Impact SE3: Local and regional economic boost due to the purchase of construction goods and materials and increased labour income							
No mitigation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Positive	Local	Low	Short-term	Very reduced	Likely	**Very reduced**
Maximisation Measures: • The procurement of goods and services by the construction contractor shall prioritise sourcing from local and provincial markets whenever possible.							
With mitigation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Positive	Local	Low	Short-term	Very reduced	Likely	**Very reduced**

Impact SE3: Potential impacts on workers' health and safety during the construction phase

As previously stated, the Project's construction phase will likely require the mobilization of roughly 565 workers. Impacts on worker's health and safety could manifest because of inadequate implementation of existing labour standards by the Contractor or from work related injury or health effects. Work accidents could occur during several of the planned construction activities, such as site preparation, excavations, vegetation clearance, waste and hazardous materials management, transportation and circulation or worksite restoration.

All workers could be exposed to accidents at the worksite. However, implementation of suitable health and safety procedures should help preventing or reducing the probability of accidents from occurring.

Child labour is also a risk during construction work that should be avoided at all costs. Child labour is described as having workers below 18 years of age. Therefore, child labour shall be strictly prohibited and any case thereof should be reported to HCB by the individuals responsible for surveillance. The ultimate responsibility for preventing child labour lies with the Contractor.

This potential impact on workers' health and safety is assessed as *negative*, *direct*, of *short-term* duration, of *local* extent (only the workers at the construction sites are potentially impacted) but of *high* intensity (as work accidents could result in serious injuries or even fatalities), resulting in a *reduced significance* prior to mitigation.

I Impact SE3: Potential impacts on workers' health and safety during the construction phase							
No mitigation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Negative	Local	High	Short-term	Reduced	Likely	**Reduced**

Mitigation Measures:

- The Contractor will develop and implement an Emergency Response Plan;
- The Contractor will develop and implement a Health and Safety Management Plan to protect every worker involved in construction activities, even temporary workers. This plan will comply with national legislation, AfDB OS 5: Labour Conditions, Health and Safety, WB General EHS Guidelines and WB Industry Sector Guideline for Electric Power Transmission.
- Sub-contractors will be contractually required to comply with labour and health and safety legislation. Specific provisions must be included for:
    - Supply drinking water and maintain its quality and ensure sanitation at the construction sites;
    - Provision of sanitation at camps and work areas;
    - Provision of separate accommodation and sanitation facilities in worker camps, to satisfy both gender needs;
    - Declaration of accidents through an accident reporting mechanism;
    - Handling domestic and specialized waste, as well as dangerous goods;
    - Procedures in case of injuries and accidents;
    - Secure equipment and demarcate any excavation work areas;
    - Sign and fence construction areas, where necessary;
    - Maintain construction camps in a clean and healthy condition as prescribed by international worker health standards.
    - Implement a long-term training program throughout the construction phase to ensure adequate training and qualification of all staff employed for the project.
    - Provide medical facilities throughout the construction phase for the use of workers where required;

- Ensure reasonable working hours, wages and other benefits;
- Provide suitable and safe accommodation and sanitation facilities, including available drinking water and improved latrines;
- Provide and ensure the use of personal protective equipment (PPE);
- Establish a 'grievance mechanism' for workers.

With mitigation	Nature	Scope	Intensity	Duration	Consequence	Likelihood	Significance
	Negative	Local	Low	Short-term	Very reduced	Possible	**Insignificant**

Impact SE4: Disruption to community health and safety due to the construction nuisance factor (noise, light and dust emissions, transportation of equipment/machinery, parts and materials to installation and traffic interference)

In addition to direct impacts, construction activities will generate various environmental disturbances that will result in a nuisance effect on the communities surrounding the construction site area. These include increased light, noise and dust emissions, as well transportation of equipment/machinery, parts and materials to installation and traffic interference caused by the Project's construction.

Impact assessments for noise and air quality are provided in the respective sub-chapters. These assessments are not repeated in this section, which focuses on the nuisance effects of these environmental disturbances on the health and safety of local communities. However, a summary of these assessments' main conclusions is presented below for reference:

- Regarding noise emissions, the impact during the construction phase was of very low significance, after mitigation. The noise emitted by construction machinery will be typical of heavy equipment noise, like noise levels already recorded in areas near roads and will be of short term duration;
- Atmospheric emissions in the construction phase will be mainly from dust caused by earth moving. This impact has been assessed as having very low significance following mitigation.

As these specific assessments have not identified significant impacts on noise or air quality, no public health problems are expected to result from these environmental disturbances. However, the combined effects of these low significance environmental disturbances will still result in a nuisance factor for local communities.

This nuisance effect is, however, minimised by the relatively small scale of the construction activities to be undertaken.

Because of this, the impact is classified as *negative*, of *local* scale, *medium* intensity and *short term* duration, resulting in a *very low* significance.

Impact SE4: Disruption to community health and safety due to the construction nuisance factor (noise, light and dust emissions, transportation of equipment/machinery, parts and materials to installation and traffic interference)							
No mitigation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Negative	Local	Medium	Short-term	Very reduced	Likely	**Very reduced**
Mitigation Measures:							

- Construction activities should be limited to the daytime period of weekdays, whenever possible;
- Speed limits for heavy vehicles involved in construction must not exceed 30 km/h in critical segments, such as near residential areas;
- All unpaved surfaces must be kept moist, especially during dry and windy conditions;
- Inhabitants of local communities near construction sites should be informed in advance about future construction activities.

With mitigation	Nature	Scope	Intensity	Duration	Consequence	Likelihood	Significance
	Negative	Local	Low	Short-term	Very reduced	Possible	**Insignificant**

Impact SE5: Increased risk of disease transmission (STD and COVID-19) due to labour mobilization

The implementation of the Project will concentrate a relevant number of workers. This influx of workers, most likely men, can stimulate an increase in risky social behaviour in local communities (such as unsafe sex between workers and local people). Therefore, there may be an increase in the rates of HIV/AIDS and other sexually transmitted diseases (STDs) in Project workers and in local communities, as well as the possibility of outbreaks of COVID-19 occurring among workers or in the community due to the presence workers and non-compliance with the necessary minimization measures, such as social distancing or wearing a mask.

This potential impact of increased risk of transmission of diseases such as STD or COVID-19 is assessed as *negative*, *indirect, short-term* (increased risk is limited to the construction phase), *regional* in scope (since disease transmission can occur at the provincial level, although the risk is greater in communities located close to the Project, especially in more urban areas) and of *medium* intensity (due to the number of people that may be affected), resulting in reduced pre-mitigation significance.

SE5 Impact: Increased risk of disease transmission (STD and COVID-19) due to labour mobilization

No mitigation	Nature	Scope	Intensity	Duration	Consequence	Likelihood	Significance
	Negative	Regional	Medium	Short-term	Reduced	Likely	**Reduced**

Maximisation Measures:

- Implementation of self-protection measures for COVID-19: social distance, respiratory etiquette, mask use, frequent disinfection of hands and work surfaces;
- The Contractor shall develop a management plan for the prevention of HIV/AIDS and STD and a contingency plan for COVID-19 and implement awareness campaigns for counselling, testing, care, treatment and prevention among the workforce;
- Conducting awareness campaigns on various aspects of health for workers and the community in general through community radio.

With mitigation	Nature	Scope	Intensity	Duration	Consequence	Likelihood	Significance
	Negative	Location	Low	Short-term	Very reduced	Likely	**Very Reduced**

Impact SE6: Temporary socio-economic changes and gender and vulnerable groups

As noted above in the impact related to temporary employment and localised economic generation, the construction phase will require an influx of workers in order to rehabilitated the Sonfo SE. Whilst every effort should be made to draw on the local labour pool and women, given the condition of generalised poverty and the extremely low level of education, it is reasonable to assume – as with most other projects – that the bulk of the labour force for the construction phase will be formed by migrant workers and who will be predominantly male. Having relatively large groups of male migrant

workers living in temporary accommodation, away from their families and normal life, is internationally associated with the rise in demand for nightclubs, bars, eateries and an increase in prostitution. In the Mozambican context and in areas such as Tete, these associated demands are compounded by the context of generalised poverty and the extreme power disparities between those who have a higher standard of living, have more money are better travelled, on the one hand and households and families who have low levels of education and survive primarily off subsistence farming. Such power disparities are likewise often associated with ability to take advantage of those who are significantly less 'powerful', susceptible and more vulnerable.

The increase in prostitution services may result in the localised increase of HIV and other STD's. It is not easy for vulnerable partners and sex workers to insist on forms of protection because of the significant power disparities (including gender disparities). The young (youth) are increasingly likely to temporarily or permanently drop-out of school in search of opportunities where they can generate additional income for themselves and/or their families. This may increase the number of teenage and/or unwanted pregnancies, higher morbidity because of both STD's and unregulated termination procedures. In addition, such negative consequences, may be compounded as a result the stigma and discrimination associated with prostitution, HIV, termination, etc, resulting in the possible alienation and marginalisation from families and/or communities.

These conditions may also heighten the risk of a rise in violence and abuse, both sexual and otherwise. Sexual abuse of women, girls and minors may also increase. Such circumstances are once again compounded by power disparities, where the vulnerable (in such cases women and children) are both unaware of their rights and may find it difficult, if not impossible to access justice and recourse. Stigma and shame around such events must also be taken into consideration.

Considering the above, this impact is assessed as *negative*, *local*, *of short-term duration* resulting in a *very reduced* impact.

As it is crucial to the construction of the Project that it possesses the necessary workforce to execute its objective, the increase in migrant workers is directly attributed to the Project itself, however, given that the impact associated with this section do not arise directly from Project specific activities, these impacts are *indirect*. They are deemed to be *negative* and given their nature considered *avoidable*.

Impact SE6: Temporary socio-economic changes and gender and vulnerable groups							
No mitigation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Negative	Local	Medium	Short-term	Very Reduced	Likely	**Very Reduced**

Minimization Measures:

- Gender should be mainstreamed in all project phases and activities;
- Prepare and develop a course and/or information package on local context and vulnerability to be provided to all staff. Aspects of appropriate and expected behaviour by contractor staff must be adhered to. It is the responsibility of the contractor to ensure appropriate behaviour and conduct of all staff (code of conduct).
- Ensure that entire labour force is dually informed and educated of above impacts and informed on the legislation, responsibility and accountability. The repercussions and legal ramifications of any violation should be made explicit.
- Ensure appropriate procedures and policies are in place to address any violation of the law and/or rights of individuals and/or communities.

- Should a sexual abuse and/or underage sex complaint or other violation of rights be brought to the grievance committee (which may involve one or more workers) and where the accusation(s) found to be justified, the contractor shall enact the following actions:
  - The contractor, through the grievance mechanism should immediately inform the local authorities and ensure a case is opened. The case and its progress should be monitored,
  - The staff member or members should be suspended from duty pending the outcome of the case.
  - The contractor is obliged to ensure that necessary steps regarding rehabilitation, support and compensation for the victim and/or victims are applied and followed through.
  - Ensure that there is a well-functioning accessible mechanism for redress (part of the grievance mechanism). This mechanism should consider the stigma and shame associated, particularly with sexual violence and abuse of minors and must be constructed and operate in a way that enables/encourages, rather than dissuades victims from coming forward.
- Organise education and information campaigns for both workers and the local communities, on rights, responsibilities and obligations concerning the above impacts. Local communities should be informed on the available redress mechanisms and the requisite procedures.
- Prepare and implement an STD and HIV and Aids prevention programme for all staff.

With mitigation	Nature	Scope	Intensity	Duration	Consequence	Likelihood	Significance
	Negative	Local	Low	Short-term	Very reduced	Possible	**Insignificant**

Impact SE7: Loss of cultural heritage sites

Although no archaeological remains or cultural heritage sites have been identified in the project implementation area, the existence of underground archaeological elements cannot be ruled out. The Contractor shall implement a Procedure for Archaeological Incidental Finds during construction activities that involve earth movement or deforestation. Although no archaeological sites have been identified within the Reserve Strip, the implementation of a Procedure for Archaeological Incidental Finds will enable the safeguarding of any archaeological site or element that may be encountered during construction.

Impact SE7: Loss of cultural heritage sites

No mitigation	Nature	Scope	Intensity	Duration	Consequence	Likelihood	Significance
	Negative	Local	Low	Short-term	Very reduced	Likely	**Very Reduced**

Minimization Measures:

- The Contractor will implement a Random Archaeological Finds Procedure to safeguard any archaeological elements that are found during construction.

With mitigation	Nature	Scope	Intensity	Duration	Consequence	Likelihood	Significance
	Negative	Local	Low	Short-term	Very reduced	Possible	**Insignificant**

6.2.9.2 Operational Phase

The operational phase will have few activities with potential impact on the socio-economic environment. The main positive impact will be the increase in energy supply in Tete Province, which will help to stimulate other industries in the region.

Impact SE8: Creating job opportunities

The number of direct employment opportunities created by the Project during the operational phase will be very low. The operation will be mainly carried out by HCB personnel currently existing in the SS. Additionally, local teams can be employed to carry out maintenance.

Although *positive*, this impact will be local in scope and of *low intensity*, albeit of *long-term* duration. The significance resulting from the direct application of the standardized impact assessment methodology is small. However, given the very small number of jobs created, this impact is of *very low* significance.

Impact SE8: Creating job opportunities							
No mitigation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Positive	Local	Low	Long-term	Reduced	Possible	**Very reduced**
Maximisation Measures: • Give priority to hiring local workers, if candidates have the necessary qualifications for the job opportunity created; • Employment opportunities must be properly publicized in order not to limit application opportunities; • The process of hiring personnel must be transparent and follow pre-established and accepted criteria.							
With mitigation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Positive	Local	Low	Long-term	Reduced	Possible	**Very reduced**

Impact SE9: Regional economic stimulus, due to increased energy availability

This increase in power availability created by the Project will have a positive impact on the regional economy. The expansion and rehabilitation of the Songo converter SS will allow for an increase in power supply in Tete Province and will allow for improved power distribution in the future, from which distribution projects may be developed later.

The development of the Project may also create business opportunities in the industrial sector. Knowing that the Project will simultaneously increase the quantity and robustness of power supply, allowing the viability of a greater number of industrial projects, will give greater confidence to industrial entrepreneurs. All these vectors of economic stimulation will result in the creation of jobs.

This is therefore an *indirect positive* economic impact, of *long term* duration, *regional* in scope and of *medium* intensity, resulting in *medium* significance.

Impact SE9: Regional economic stimulus, due to increased energy availability							
No mitigation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Positive	Regional	Medium	Long-term	High	Possible	**Medium**
Maximisation Measures: • HCB should ensure the standard maintenance programme for the Songo converter SS.							
With maximisation	**Nature**	**Scope**	**Intensity**	**Duration**	**Consequence**	**Likelihood**	**Significance**
	Positive	Regional	Medium	Long-term	Medium	Possible	**Medium**

7 Risk Analysis

7.1 Introduction

Whenever, in a certain project, there are activities that are considered likely to cause harm to the people involved in that project, it is necessary to conduct a work risk assessment.

In this sense, it is essential to determine whether the existing control measures are sufficient, or whether additional actions are necessary to minimise or eliminate the level of risk identified, with the maximum objective of preventing illnesses, accidents and more drastic situations.

The potential risks identified for the project activities were generally considered moderate to low and, with the implementation of the proposed mitigation measures, can be considered controlled.

In the case of accidental scenarios at HCB, and with respect to the analysis of the consequences, the effects should be contained at the Songo Converter SS, with no impact on users in the vicinity of this infrastructure.

The identified risks, however, are adequately controlled by the maintenance and inspection procedures in place at HCB, and by the mitigation measures proposed in this document. The Risk Management Programme and the Emergency Response Programme, developed and implemented as part of the HCB Environmental and Social Management System, should integrate these mitigation measures regarding the SS rehabilitation and expansion works.

7.2 Methodology

7.2.1 Hazard Analysis

It is important to understand the difference between hazard and risk.

A hazard is anything that has the potential to cause harm to life, property, and environment. Furthermore, it is a constant parameter (such as petrol, chlorine, ammonia, etc.) that poses the same hazard wherever they are present.

Risk, on the other hand, is the probability that a hazard will cause damage, and how severe that damage will be. Risk is therefore the probability that a hazard will manifest itself. For instance, the risk of a chemical accident/spill depends upon the amount present, the process it's used in, the design and safety features of its container, the exposures, and the prevailing environmental and weather conditions and so on.

Risk analysis thus comprises a judgement of probability based on local atmospheric conditions and generic failure rates, and the severity of consequences based on the best available technological information.

7.2.1.1 Identify Project Activities

The first step is to determine:

- The activities during construction/operation phases;
- Physical location of activities; and
- Operating facilities and infrastructure.

As the project is in a single geographic area, the various operating facilities and infrastructure were analysed for the project construction and operation.

7.2.1.2 Identification of Hazards

There are many causes for hazards, but they can broadly be classified as follows:

- **Natural hazards** include anything that is caused by a natural process, and can include obvious hazards such as flooding, earthquakes to smaller scale hazards such as loose rocks on a hillside.
- **Man-made hazards** are created by humans, whether long-term (such as global warming) or immediate (like the hazards present at a construction site or operating plant). These include:
    - Human related hazards;
    - Machinery/Equipment; and
    - Environmental.
- **Deadly force or retribution** is that hazard involving any protective and responsive-ready threat of harm or punishment that becomes active in the event of a breach of security, or violation of a boundary or barrier such as wars or conflicts. Hazards involving deadly force have been excluded from this study.

7.2.1.3 Hazard Analysis and Management

The hazard analysis describes the cause, consequence and safeguard or mitigation for each hazard identified.

The cause of the hazard is normally due to a natural event, failure of a component or human error e.g., the cause of a dam failure could be a poor design (human error), earthquake (natural event) or concrete failure (component failure)

Consequences are measurable and can extend from societal risks, worker risks, environmental impacts as well as business losses and reputational consequences e.g. single or multiple fatalities, financial losses, loss of permit to operate, etc. The Hazard Analysis then describes the potential consequence for each cause. It should be noted that there may be more than one consequence e.g., fatality, plus financial loss, plus environmental damage, etc.

The safeguards or mitigation are engineering or organizational controls that are in place to reduce or remove the cause or consequence of a hazard. The frequency of an event occurring is reduced for every new and independent safeguard introduced.

7.2.2 Determining and Evaluating Risk

With the definition of risk as the combination of the two parameters – possible consequences of an incident and the frequency of the corresponding scenario - it makes sense to use a matrix of categories for consequences and frequencies (risk matrix) to categorize the risk.

The significance of potential risks that may result from the proposed project was determined to assist decision-makers. The significance of a risk is defined as a combination of the consequence of the risk occurring and the probability that the risk will occur.

The criteria used to determine risk consequence are presented in the table below.

Table 7-1 – Likelihood of incident happening

Score	Rating	Frequency (n.º/year)	Description
4	Definitely	1 < F ≤ 10	Almost certain to occur many times during the life of the project. Hypothesis of up to 10 events per year.
3	Quite Possible	0,01 < F ≤ 1	Expected to occur several times during the life of the project. Hypothesis of up to one occurrence per year.
2	Maybe if not careful	0,001 < F ≤ 0,01	Expected to occur at least once during the life of the project. Hypothesis 1 / 100 to have one occurrence per year.
1	Highly Unlikely	0,0001 < F ≤ 0,001	Unlikely to occur during the life of the project. (Hypothesis 1/1.000 to have one occurrence per year)

Table 7-2- Possible levels of severity of an incident or impact

Score	Rating	Description / Features
1	Minor	Minor injuries; localised short term environmental effect, minor downtime, no equipment damage, financial loss due to production loss of less than USD 1000,00.
2	Serious	Disabling injury or occupational illness, environment damage requiring clean-up or rehabilitation, shutdown of 24 hours, production loss, financial loss due to production loss of less than USD 10.000,00.
3	Very Serious	Permanent disability, serious environmental damage, long shutdown, serious effect on company performance and product quality, financial loss due to production loss of less than USD 100.000,00.
4	Catastrophic	Fatality, long term irreversible damage to the environment, long term shutdown, large scale repairs, financial loss due to production loss in the region of USD 1.000.000,00. Note that all environmental legal non-compliances could have catastrophic consequences.

The overall significance of risks was determined by considering consequence and probability using the rating system prescribed in the table below.

Table 7-3 - Risk Matrix

		Likelihood of incident happening			
		Highly Unlikely (1)	Maybe if not careful (2)	Quite Possible (3)	Definitely (4)
Consequences of hazard	Minor (1)	1	2	3	4
	Serious (2)	2	4	6	8
	Very Serious (3)	3	6	9	12
	Catastrophic (4)	4	8	12	16

The risk rating will be considered in the decision-making process based on the implications of ratings ascribed below:

- **LOW (1-3)**: the potential risk is very small and should not have any meaningful influence on the decision regarding the proposed activity;
- **MODERATE (4-6)**: the potential risk may not have any meaningful influence on the decision regarding the proposed activity, this is the ALARP (as low as reasonably possible) level ;
- **HIGH (8-10)**: the potential risk should influence the decision regarding the proposed activity;
- **VERY HIGH (12-16)**: the potential risk **will** affect the decision regarding the proposed activity.

Whenever required, practicable mitigation and optimisation measures are recommended and risks were then rated in the prescribed way above, assuming effective implementation of mitigation and optimisation measures. Mitigation and optimisation measures are not mandatory but must be shown to have been considered and sound reasons provided by the proponent if not implemented. Once a recommendation has been implemented, it becomes a safeguard reducing the respective risk to acceptable levels.

7.3 Project Risk Assessment

7.3.1 Key Project Activities

7.3.2 Construction Phase

Based on the characteristics of the Project and the information provided by HCB, the main activities and processes of the construction phase that may generate some types of risk are the following:

- Preliminary works:
  - Removal of vegetation and clearing of the site for the construction site and for the foundations to extend the SS;
  - Ground preparation work for the execution of the foundations and for the temporary storage of new and old equipment;
- Construction works:
  - Excavation and earthworks

- Building the foundations;
- Fence assembly;

- Supply and installation of equipment:
  - Erection and installation of the new equipment.

7.3.3 Operation Phase

Regarding the Project's operation phase, and according to the data provided by HCB and the project description provided in this document, the main activities of the Songo Converter SS Rehabilitation project are:

- General maintenance;
- Replacement of oils and lubricants;
- Replacement of equipment;

Production of waste.

7.3.4 Risk Assessment

7.3.4.1 Construction Activities

Activity: 1. Removal of vegetation and clearing of the site and ground preparation

HAZARDS/SOURCE	CAUSES	CONSEQUENCES	SAFEGUARDS	LIKELIHOOD	SEVERITY	RISK	RECOMMENDATIONS	RISK AFTER RECOMMENDATIONS
Human	Movement of people in the vicinity of the areas to be worked on (falls, being run over, etc.)	– Injuries/ fatalities	– Training on safety procedures regarding the operation and maintenance of machinery/equipment. – Signalling of the area in accordance with security planning (speed, directions, prohibitions, etc.). – Promote the proper use of Personal Protective Equipment (PPE) according to each task. – Establishment and implementation of collective protections. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts. – Signal and limit work areas.	3	2	6	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE.	3
	Falls due to uneven ground	– Injuries/ fatalities	– Promote the proper use of Personal Protective Equipment (PPE) according to each task. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts. – Establishment and implementation of collective protections. – Signal and limit work areas.	4	1	4	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE.	2
	Cuts and bruises resulting from the inappropriate use of tools	– Injuries/ fatalities	– Training on safety procedures regarding the operation and maintenance of machinery/equipment. – Promote the proper use of Personal Protective Equipment (PPE) according to each task. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts. – Respect the instructions manual.	4	1	4	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE.	2
Human	Road accidents	– Injuries/ fatalities – Spillages – Damage to equipment	– Training on safety procedures regarding the operation and maintenance of machinery/equipment.	3	2	6	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required	4

Hazards/Source	Causes	Consequences	Safeguards	Likelihood	Severity	Risk	Recommendations	Risk After Recommendations
			– Carry out periodic maintenance and inspection (comply with maintenance and inspection plans). – Use of seat belts / defensive driving training for drivers / operators of vehicles and machines. – Signalling of the area in accordance with security planning (speed, directions, prohibitions, etc.). – Promote the proper use of Personal Protective Equipment (PPE) according to each task. – Establishment and implementation of collective protections. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts. – Signal and limit work areas.				[including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines/equipment, including PPE. 4. Ensure all process areas are fully contained to prevent spillages. 5. Procedures for Oil Spill Response (part of the ERP) and response equipment will be prepared. 6. Spill kits for response chemical spills will be made available as part of the emergency response equipment.	
Natural	Exposure to excessive heat or other extreme weather scenarios originating from rain and wind (adverse weather conditions)	– Injuries/ fatalities	– Promote the proper use of Personal Protective Equipment (PPE) according to each task, including hats and t-shirts with long leaves. – Work must be organized to prevent workers from being exposed to extreme weather situations. – In cases of extreme heat, there must be enough drinking water for workers to hydrate.	2	1	**2**	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency.	**1**

Activity: 2. Excavation and earthworks

Hazards/Source	Causes	Consequences	Safeguards	Probability	Severity	Risk	Recommendations	Risk After Recommendations
Human	Falls from a height of people	– Injuries/ fatalities	– Promote the proper use of PPE according to each task. – Placement of adequate barriers and protections along the top of the excavation slopes. – Planning and availability of medical support. – Establishment and implementation of collective protections. – Signal and limit work areas.	3	2	**6**	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency.	**4**

Human	Burial of people	– Injuries/ fatalities	– Promote the proper use of PPE according to each task. – Placement of adequate barriers and protections along the top of the excavation slopes. – Planning and availability of medical support. – Establishment and implementation of collective protections. – Signal and limit work areas.	3	2	**6**	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency.	**4**
	Cuts and bruises resulting from the inappropriate use of tools	– Injuries/ fatalities	– Training on safety procedures regarding the operation and maintenance of machinery/equipment. – Promote the proper use of Personal Protective Equipment (PPE) according to each task. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts. – Respect the instructions manual.	4	1	**4**	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE.	**2**
	Exposure to noise and vibrations	– Injuries/ fatalities	– Promote the proper use of Personal Protective Equipment (PPE) according to each task. – Identify the location of noisy environments/equipment. Suggest engineering or organizational controls to prevent prolonged exposure of people to excessively noisy environments to prevent chronic injuries.	2	1	**2**	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency.	**1**
Machinery / Equipment	Collision, shock and fall during the movement of heavy equipment such as crawler tractors, "scraper" graders, hydraulic excavators, dumpers, rollers (sheep's feet and smooth), among others	– Injuries/ fatalities – Spillages – Damage to equipment – Loss of production	– Promote the proper use of PPE according to each task. – Use of seat belts / defensive driving training for drivers / operators of vehicles and machines. – Signalling of the area in accordance with security planning (speed, directions, prohibitions, etc.). – Planning and availability of medical support. – Signal and limit work areas. – Establishment and implementation of collective protections. – Respect safety distances. – Schedule periodic inspections of equipment and material handling devices (machines, cables, etc.).	3	2	**6**	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE. 4. Ensure all process areas are fully contained to prevent spillages. 5. Procedures for Oil Spill Response (part of the ERP) and response equipment will be prepared. 6. Spill kits for response chemical spills will be made available as part of the emergency response equipment.	**4**

	Falls from a height of equipment, when operating close to the excavation slopes	– Damage to equipment – Loss of production – Spillages	– Promote the proper use of PPE according to each task. – Placement of adequate barriers and protections along the top of the excavation slopes. – Availability of fire extinguishers on the work fronts. – Establishment and implementation of collective protections. – Planning and availability of medical support. – Signal and limit work areas.	3	2	**6**	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE. 4. Ensure all process areas are fully contained to prevent spillages. 5. Procedures for Oil Spill Response (part of the ERP) and response equipment will be prepared. 6. Spill kits for response chemical spills will be made available as part of the emergency response equipment.	**4**
	Burial of equipment	– Damage to equipment – Loss of production – Spillages	– Promote the proper use of PPE according to each task. – Placement of adequate barriers and protections along the top of the excavation slopes. – Establishment and implementation of collective protections. – Planning and availability of medical support. – Signal and limit work areas.	3	2	**6**	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE. 4. Ensure all process areas are fully contained to prevent spillages. 5. Procedures for Oil Spill Response (part of the ERP) and response equipment will be prepared. 6. Spill kits for response chemical spills will be made available as part of the emergency response equipment.	**4**
Natural	Sliding and/or breaking of landfills and ditches	– Injuries/ fatalities – Damage to equipment – Loss of production	– Promote the proper use of Personal Protective Equipment (PPE) according to each task. – Establishment and implementation of collective protections.	2	1	**2**	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency.	**4**
	Exposure to adverse weather conditions during outdoor activities	– Injuries/ fatalities	– Promote the proper use of Personal Protective Equipment (PPE) according to each task, including hats and t-shirts with long leaves. – Work must be organized to prevent workers from being exposed to extreme weather situations. – In cases of extreme heat, there must be enough drinking water for workers to hydrate.	2	1	**2**	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency.	**1**

Activity: 3. Building the bases of the foundations

HAZARDS/SOURCE	CAUSES	CONSEQUENCES	SAFEGUARDS	PROBABILITY	CONSEQUENCE	RISK	RECOMMENDATIONS	RISK AFTER RECOMMENDATIONS
Human	Crush and impact	– Injuries/ fatalities	– Promote the proper use of PPE according to each task. – Establishment and implementation of collective protections. – Planning and availability of medical support. – Signal and limit work areas.	3	2	**6**	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency.	**4**
	Cuts and bruises in the handling of tools, equipment and construction materials	– Injuries/ fatalities	– Training on safety procedures regarding the operation and maintenance of machinery/equipment. – Carry out periodic maintenance and inspection (comply with maintenance and inspection plans). – Promote the proper use of Personal Protective Equipment (PPE) according to each task. – Respect the instructions manual. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts.	4	1	**4**	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE.	**2**
	Accidents resulting from improper contact or inhalation / ingestion of chemicals (paints, solvents, etc.)	– Injuries/ fatalities	– Promote the proper use of Personal Protective Equipment (PPE) according to each task.	2	1	**2**	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency.	**1**

HAZARDS/SOURCE	CAUSES	CONSEQUENCES	SAFEGUARDS	PROBABILITY	CONSEQUENCE	RISK	RECOMMENDATIONS	RISK AFTER RECOMMENDATIONS
	Electrical Incidents	– Injuries/ fatalities – Damage to equipment	– Training on safety procedures regarding the operation and maintenance activities and electrical risks. – Promote the proper use of Personal Protective Equipment (PPE) according to each task. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts. – Signal and limit work areas. – Availability of fire extinguishers on the work fronts. – Check the existence of an earth connection, that the electrical wires are properly insulated, that there is protection against contacts with live parts, that the safety distances are adhered to, etc. – Respect safety distances. – Planning training for the correct handling and use of available resources to fight fires. – Respect the instructions manual. – Schedule periodic inspections of equipment and material handling devices (machines, cables, etc.).	3	2	**6**	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE.	**4**

HAZARDS/SOURCE	CAUSES	CONSEQUENCES	SAFEGUARDS	PROBABILITY	CONSEQUENCE	RISK	RECOMMENDATIONS	RISK AFTER RECOMMENDATIONS

Machinery / Equipment	Collision, knock and fall during cargo handling	– Injuries/ fatalities
		– Damage to equipment
		– Spillages
			– Promote the proper use of PPE according to each task.
			– Use of seat belts / defensive driving training for drivers / operators of vehicles and machines.
			– Signalling of the area in accordance with security planning (speed, directions, prohibitions, etc.).
			– Planning and availability of medical support.
			– Respect safety distances.
			– Establishment and implementation of collective protections.
			– Schedule periodic inspections of equipment and material handling devices (machines, cables, etc.).
			– When lifting the metallic support, comply with the stipulated safety rules.
			– Fulfil assembly plans.
			– All materials and tools necessary for the task must be properly packed.
			– During the assembly phase, the following must be considered:
			  – The positioning of the lifting equipment and its capacity;
			  – The positioning of the workers present;
			  – That there are no obstacles in the vicinity, likely to be reached.
				3	2	**6**	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)].
							2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency.
							3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE.
							4. Ensure all process areas are fully contained to prevent spillages.
							5. Procedures for Oil Spill Response (part of the ERP) and response equipment will be prepared.
							6. Spill kits for response chemical spills will be made available as part of the emergency response equipment.
								4

	Fire	– Injuries/ fatalities – Damage to equipment – Loss of production	– Training on safety procedures regarding the operation and maintenance activities and regarding to fire and explosion. – Existence of fire-fighting first intervention equipment. – Availability of fire extinguishers on the work fronts. – Planning training for the correct handling and use of available resources to fight fires. – Promote the proper use of Personal Protective Equipment (PPE) according to each task. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts.	2	4	**8**	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency.	**4**

Hazards/Source	Causes	Consequences	Safeguards	Probability	Consequence	Risk	Recommendations	Risk After Recommendations
Environment	Leakage of flammable fuels and lubricating oils used in the supply of transport equipment	– Spillages with pollution of water and soils	– Training on safety procedures regarding the operation and maintenance activities and handling chemical products. – Promote the proper use of Personal Protective Equipment (PPE) according to each task. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts. – Signal and limit work areas. – Planning training for the correct handling and use of available resources to spilled products.	2	3	6	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE. 4. Ensure all process areas are fully contained to prevent spillages. 5. Procedures for Oil Spill Response (part of the ERP) and response equipment will be prepared. 6. Spill kits for response chemical spills will be made available as part of the emergency response equipment.	3
Natural	Landslides	– Injuries/ fatalities – Loss of production – Damage to equipment	– Training on safety procedures regarding to earthquakes and land movements. – Planning and availability of medical support. – Signal and limit work areas.	1	4	4	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency.	4

Activity: 4. Assembly of metallic structures

Hazards/Source	Causes	Consequences	Safeguards	Probability	Severity	Risk	Recommendations	Risk After Recommendations
Human	Clash with objects	– Injuries/ fatalities	– Promote the proper use of PPE according to each task. – Planning and availability of medical support. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts. – Establishment and implementation of collective protections. – Signal and limit work areas.	3	2	6	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency.	4

HAZARDS/SOURCE	CAUSES	CONSEQUENCES	SAFEGUARDS	PROBABILITY	SEVERITY	RISK	RECOMMENDATIONS	RISK AFTER RECOMMENDATIONS
	Entangling and crushing	– Injuries/ fatalities	– Promote the proper use of PPE according to each task. – Planning and availability of medical support. Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts. – Signal and limit work areas.	3	2	6	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE.	4
	Blows, perforations and/or cuts	– Injuries/ fatalities	– Training on safety procedures regarding the operation and maintenance of machinery/equipment. – Carry out periodic maintenance and inspection (comply with maintenance and inspection plans). – Planning and availability of medical support. – Promote the proper use of Personal Protective Equipment (PPE) according to each task. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts.	4	1	4	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE.	2
	Fall on the same level and from a height	– Injuries/ fatalities	– Promote the proper use of PPE according to each task. – Establishment and implementation of collective protections. – Planning and availability of medical support. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts. – Signal and limit work areas.	3	2	6	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency.	4
	Over-exertion	– Injuries/ fatalities	– Promote the proper use of PPE according to each task. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts. – Planning and availability of medical support.	3	2	6	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines/equipment's, including PPE.	4

HAZARDS/SOURCE	CAUSES	CONSEQUENCES	SAFEGUARDS	PROBABILITY	SEVERITY	RISK	RECOMMENDATIONS	RISK AFTER RECOMMENDATIONS
Machinery / Equipment	Projection and/or falling objects	– Injuries/ fatalities	– Training on safety procedures regarding the operation and maintenance activities and electrical risks. – Promote the proper use of Personal Protective Equipment (PPE) according to each task. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts. – Signal and limit work areas. – Respect the instructions manual. – Schedule periodic inspections of equipment and material handling devices (machines, cables, etc.).	3	2	6	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE.	4
Natural	Exposure to adverse weather conditions	– Injuries/ fatalities	– Promote the proper use of Personal Protective Equipment (PPE) according to each task, including hats and t-shirts with long leaves. – Promote the use of insect repellent. – Work must be organized to prevent workers from being exposed to extreme weather situations. – In cases of extreme heat, there must be enough drinking water for workers to hydrate.	2	1	2	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency.	1

Activity: 5. Assembly and installation of new electrical or electromechanical equipment

HAZARDS/SOURCE	CAUSES	CONSEQUENCES	SAFEGUARDS	PROBABILITY	SEVERITY	RISK	RECOMMENDATIONS	RISK AFTER RECOMMENDATIONS
Human	Clash with objects	– Injuries/ fatalities	– Promote the proper use of PPE according to each task. – Planning and availability of medical support. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts. – Establishment and implementation of collective protections. – Signal and limit work areas.	3	2	6	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency.	4

HAZARDS/SOURCE	CAUSES	CONSEQUENCES	SAFEGUARDS	PROBABILITY	SEVERITY	RISK	RECOMMENDATIONS	RISK AFTER RECOMMENDATIONS
	Entangling and crushing	– Injuries/ fatalities	– Promote the proper use of PPE according to each task. – Planning and availability of medical support. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts. – Signal and limit work areas.	3	2	6	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE.	4
	Blows, perforations and/or cuts	– Injuries/ fatalities	– Training on safety procedures regarding the operation and maintenance of machinery/equipment. – Carry out periodic maintenance and inspection (comply with maintenance and inspection plans). – Promote the proper use of Personal Protective Equipment (PPE) according to each task. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts.	4	1	4	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE.	2
	Fall on the same level and from a height	– Injuries/ fatalities	– Promote the proper use of PPE according to each task. – Planning and availability of medical support. – Establishment and implementation of collective protections. – Signal and limit work areas.	3	2	6	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency.	4
	Electrical Incidents	– Injuries/ fatalities – Damage to equipment	– Training on safety procedures regarding the operation and maintenance activities and electrical risks. – Promote the proper use of Personal Protective Equipment (PPE) according to each task. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts. – Signal and limit work areas. – Check the existence of an earth connection, that the electrical wires are properly insulated, that there is protection against contacts with live parts, that the safety distances are adhered to, etc. – Respect safety distances. – Respect the instructions manual. – Schedule periodic inspections of equipment and material handling devices (machines, cables, etc.).	3	2	6	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE.	4

HAZARDS/SOURCE	CAUSES	CONSEQUENCES	SAFEGUARDS	PROBABILITY	SEVERITY	RISK	RECOMMENDATIONS	RISK AFTER RECOMMENDATIONS
	Over-exertion	– Injuries/ fatalities	– Promote the proper use of PPE according to each task. – Planning and availability of medical support. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts.	3	2	6	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines/equipment's, including PPE.	4
Machinery / Equipment	Falls and falling materials during installation of two HVDC poles	– Injuries/ fatalities – Damage to equipment – Loss of production	– Promote the proper use of PPE according to each task. – Use of seat belts / defensive driving training for drivers / operators of vehicles and machines. – Signalling of the area in accordance with security planning (speed, directions, prohibitions, etc.). – Planning and availability of medical support. – Signal and limit work areas. – Establishment and implementation of collective protections. – Respect safety distances. – Schedule periodic inspections of equipment and material handling devices (machines, cables, etc.).	3	2	6	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE.	4
Natural	Exposure to adverse weather conditions	– Injuries/ fatalities	– Promote the proper use of Personal Protective Equipment (PPE) according to each task, including hats and t-shirts with long leaves. – Work must be organized to prevent workers from being exposed to extreme weather situations. – In cases of extreme heat, there must be enough drinking water for workers to hydrate. – Planning and availability of medical support.	2	1	2	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency.	1

7.3.4.2 Operation Activities

Activity: 1. General maintenance; Replacement of oils and lubricants; Replacement of equipment; Production of waste

Hazards/ Source	Causes	Consequences	Safeguards	Probability	Severity	Risk	Recommendations	Risk After Recommendations
Human	Not respecting the safety procedures of the machines/equipment	– Injuries/ fatalities	– Training on safety procedures regarding the operation and maintenance of machinery/equipment. – Promote the proper use of Personal Protective Equipment (PPE) according to each task. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts. – Respect the instructions manual.	4	1	**4**	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE.	**2**
	Movement of people in the vicinity of the areas to be worked on	– Injuries/ fatalities	– Training on safety procedures regarding the operation and maintenance of machinery/equipment. – Signalling of the area in accordance with security planning (speed, directions, prohibitions, etc.). – Promote the proper use of Personal Protective Equipment (PPE) according to each task. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts. – Establishment and implementation of collective protections. – Signal and limit work areas.	3	2	**6**	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE.	**3**
	Falls due to uneven ground	– Injuries/ fatalities	– Promote the proper use of Personal Protective Equipment (PPE) according to each task. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts. – Establishment and implementation of collective protections. – Signal and limit work areas.	4	1	**4**	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE.	**2**
	Exposure to noise, vibrations, gases	– Injuries/ fatalities	– Promote the proper use of Personal Protective Equipment (PPE) according to each task. – Identify the location of noisy environments/equipment. Suggest engineering or organizational controls to prevent prolonged exposure of people to excessively noisy environments to prevent chronic injuries.	2	1	**2**	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency.	**1**

HAZARDS/ SOURCE	CAUSES	CONSEQUENCES	SAFEGUARDS	PROBABILITY	SEVERITY	RISK	RECOMMENDATIONS	RISK AFTER RECOMMENDATIONS
	Cuts and bruises resulting from the inappropriate use of tools	– Injuries/ fatalities	– Training on safety procedures regarding the operation and maintenance of machinery/equipment. – Promote the proper use of Personal Protective Equipment (PPE) according to each task. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts. – Respect the instructions manual.	4	1	**4**	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE.	**2**
	Social threat (theft, robbery, sabotage disturbances, etc.)	– Damage to equipment – Loss of production	– Training on safety procedures regarding the operation and maintenance of machinery/equipment.	2	2	**4**	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency.	**2**
	Electrical Incidents	– Injuries/ fatalities – Damage to equipment	– Training on safety procedures regarding the operation and maintenance activities and electrical risks. – Promote the proper use of Personal Protective Equipment (PPE) according to each task. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts. – Signal and limit work areas. – Availability of fire extinguishers on the work fronts. – Check the existence of an earth connection, that the electrical wires are properly insulated, that there is protection against contacts with live parts, that the safety distances are adhered to, etc. – Respect safety distances. – Planning training for the correct handling and use of available resources to fight fires. – Respect the instructions manual. – Schedule periodic inspections of equipment and material handling devices (machines, cables, etc.).	3	2	**6**	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE.	**2**
Machinery / Equipment	Fire/explosion due to inadequate maintenance	– Injuries/ fatalities – Damage to equipment – Loss of production	– Training on safety procedures regarding the operation and maintenance activities and regarding to fire and explosion. – Existence of fire-fighting first intervention equipment. – Availability of fire extinguishers on the work fronts. – Planning training for the correct handling and use of available resources to fight fires.	2	4	**8**	2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency.	**3**

Hazards/ Source	Causes	Consequences	Safeguards	Probability	Severity	Risk	Recommendations	Risk After Recommendations
			– Promote the proper use of Personal Protective Equipment (PPE) according to each task. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts.					
Environmental	Oil spills or other chemical contaminants and gas leakage	– Spillages with pollution of water and soils	– Training on safety procedures regarding the operation and maintenance activities and handling chemical products. – Promote the proper use of Personal Protective Equipment (PPE) according to each task. – Have medical supplies readily available and train people to properly treat minor injuries such as bruises and cuts. – Signal and limit work areas. – Planning training for the correct handling and use of available resources to spilled products.	2	3	**6**	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE. 4. Ensure all process areas are fully contained to prevent spillages. 5. Procedures for Oil Spill Response (part of the ERP) and response equipment will be prepared. 6. Spill kits for response chemical spills will be made available as part of the emergency response equipment.	**3**
Natural	Earthquakes	– Injuries/ fatalities – Loss of production – Damage to equipment	– Training on safety procedures regarding to earthquakes and land movements. – Planning and availability of medical support.	1	4	**4**	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE.	**2**

7.4 Mitigation Measures from Hazard Identification and Risk Assessment

A summary of the mitigation measures proposed to reduce the identified risks' significance is provided in the follow tables.

Table 7-4- Mitigation Measures for the Construction Phase

Construction Phase	
Activity 1 **Removal of vegetation and clearing of the site and ground preparation**	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE. 4. Ensure all process areas are fully contained to prevent spillages. 5. Procedures for Oil Spill Response (part of the ERP) and response equipment will be prepared. 6. Spill kits for response chemical spills will be made available as part of the emergency response equipment.
Activity 2 **Excavation and earthworks**	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE. 4. Ensure all process areas are fully contained to prevent spillages. 5. Procedures for Oil Spill Response (part of the ERP) and response equipment will be prepared. 6. Spill kits for response chemical spills will be made available as part of the emergency response equipment.
Activity 3 **Building the bases of the foundations**	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE. 4. Ensure all process areas are fully contained to prevent spillages. 5. Procedures for Oil Spill Response (part of the ERP) and response equipment will be prepared. 6. Spill kits for response chemical spills will be made available as part of the emergency response equipment.
Activity 4 **Assembly of metallic structures**	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE.
Activity **Assembly and installation of new electrical or electromechanical equipment**	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE.

Table 7-5- Mitigation Measures for the Operation Phase

Operation Phase	
Activity 1 **General maintenance, Replacement of oils and lubricants, Replacement of**	1. A procedure would be required for the safe use and maintenance instruments and Machinery/equipment, if required [including schedule periodic inspections of equipment and material handling devices (machines, cables, etc.)]. 2. The Emergency Response Plan (ERP) must specify measures to protect people and the environment in the event of an emergency. 3. Preparation of procedures and training for personnel working with safety guidelines for the operation of machines, including PPE.

Operation Phase	
equipment, Production of waste	4. Ensure all process areas are fully contained to prevent spillages. 5. Procedures for Oil Spill Response (part of the ERP) and response equipment will be prepared. 6. Spill kits for response chemical spills will be made available as part of the emergency response equipment.

7.5 Risk Management

Most risks or impacts are of an ongoing or repetitive nature, and should be controlled through effective management. Actions for effective management include implementing procedures, scheduled maintenance, inspections, monitoring, training, etc., and should be part of the Project's action or plan.

Eliminating any recorded risk, controlling risks at source and minimising risk are all strategies that can be considered to manage risks. Where risks remain, even after these management measures have been implemented, Personal Protective Equipment (PPE) should be provided to all workers and a programme should be put in place to monitor the risk to which employees, equipment or the environment may be exposed.

For risk management measures, including those recommended in this risk assessment, we suggest that these be developed and implemented in the SS operation phase, based on HCB's norms and corporate policies, and these internal documents already provide procedures for implementing an effective methodology to reduce environmental risks.

Initial and periodic tests and inspections should be developed, as well as preventive and corrective maintenance programmes, based on the corporate criteria developed by HCB, with the aim of promoting a safer working environment, both for employees and for the environment, thus minimising the consequences and/or frequency of accidents and/or incidents.

If an accident occurs, it shall be registered and investigated, according to the procedures established in the Emergency Response Plan, so that the cause of the fault that gave rise to the occurrence is identified and measures are taken to prevent its recurrence.

A supplier evaluation procedure shall be implemented to ensure that the qualification of the contractors is compatible with the function to be performed. Additionally, evaluations of the performance of service providers shall be conducted.

Responsibilities and prevention measures should be defined for the maintenance services to be conducted, in which only previously qualified people should be allowed to perform services in the facilities.

8 Environmental and Social Management Plan

This ESMP will be implemented during the Project's Construction and Operation Phase. Details of actions required for the implementation of mitigation measures have been developed and tabulated in the form of action plans. The plan indicates the organisation responsible for taking specific action and sets out parameters for monitoring the implementation of such action.

The ESMP should be updated regularly, every 5 years after the start of the operations phase, to reflect any Project change.

8.1 Coordination with Relevant Agencies

HCB will ensure that coordination is maintained with all relevant agencies dealing with environmental and social control throughout the Project.

8.2 Roles and Responsibilities

8.2.1 Main Players

The Project **Proponent** is HCB. HCB will be ultimately responsible for implementing the Project, but will do so through the hiring of one or more construction contractors, who will be responsible for the construction of the Project's infrastructure. Thus, many of the social and environmental mitigation and management requirements set out in this ESMP for the construction phase will be the responsibility of the Contractor, under the supervision of the Proponent.

Regarding the operational phase, HCB will operate and manage the Songo converter SS. Therefore, most of the social and environmental mitigation and management required for the operation phase, in accordance with this ESMP, will be HCB's responsibility.

The mitigation of the impacts caused by the project will require active management in all its phases. Since these phases will be under the responsibility of different stakeholders, it is crucial to clearly define the responsibilities of the main stakeholders throughout the project's life cycle, to ensure that the social and environmental management procedures defined in this ESMP are fully implemented.

The environmental management of the Project will thus depend on the actions of the following key stakeholders:

- **Proponent** - HCB, in the capacity of Project Proponent, will be responsible for ensuring that the Project is designed, constructed and operated in accordance with the requirements set out in this ESMP. This will include the following main tasks:
    - Ensure that the detailed engineering of the Project (the execution design, which will be prepared by the engineering team) complies with the recommendations provided in the ESMP;
    - Update and finalise the ESMP based on the final detailed engineering design and ensure that the measures to be conducted during construction and the environmental technical

specifications are included in the bidding documents and contractual obligations with the winning Proponent for each of the Project's contracted elements;

- Ensure that the Contractor is fully aware of the social and environmental management requirements set out in this ESMP for the construction phase of the different components of the Project by including them in the tender process and subsequent contracts;
- Require all Contractors to submit a Construction ESMP (C-ESMP) for HCB approval in accordance with all requirements included in this ESMP and all related management plans and method statements;
- Oversee the Contractor's environmental performance to ensure that all management requirements in this ESMP are implemented;
- Manage the project during the operational phase in accordance with the environmental management requirements set out in this ESMP;
- Develop and implement a project specific Stakeholder Engagement Plan (SEP) based on the guidelines provided in the Communication Plan and a Grievance Response Mechanism (GRM) in accordance with the guidelines provided in this ESMP.

- **Contractor -** the Contractors, which shall be selected and engaged by HCB, shall be responsible for developing the detailed engineering design of their respective parts of the Project to a level of detail suitable for construction in accordance with the requirements provided in the ESMP for the construction phase.
  - Prior to commencement of work, the Contractor shall prepare and submit to HCB specific C-ESMPs for approval. The C-ESMPs prepared by the Contractor shall comply with the requirements of the African Development Bank Group and the World Bank and may include, but not limited to: Emergency Preparedness and Response Plan, Working Conditions Management Plan, Waste Management Plan, Traffic Management Plan, Construction Camp Management Plan, Biodiversity Management Plan, etc.;
  - When hiring subcontractors, the Contractor shall also ensure that they comply with all the requirements of the ESMP by including the ESMP in the bidding process and in the contracts of its subcontractors.

- **Regulatory Agencies.**

The responsibilities of each of these key stakeholders are described in more detail in the following sub-chapters.

8.2.2 Responsibility of the Proponent

HCB, the **Proponent**, shall appoint an Environmental Control Officer and a Social Control and Communication Officer who shall be responsible for monitoring the Contractor's compliance with the requirements of the ESMP, including conducting social and environmental management compliance audits, namely:

- Ensuring that the Contractor is properly informed of the ESMP and all its environmental management requirements prior to any award of the contract, including the required environmental documents in tenders and expressions of interest;
- Ensure that the Contractor takes ownership of the environmental requirements set out in this ESMP by requesting that the Contractor submits a C-ESMP detailing how they will implement these requirements;
- Review and approve the C-ESMP;
- Inform key personnel on site of their roles and responsibilities in terms of the ESMP through initial environmental awareness training;
- Monitor, review and verify compliance with the ESMP by the Contractor, as well as any subcontractors, if applicable;
- Identify areas of non-compliance and recommend measures to rectify them in consultation with HCB and the Contractor as necessary;
- Ensure that the Contractor corrects environmental problems in a timely manner and to the satisfaction of the HCB and authorities (where necessary);
- Request method statements by the Contractor prior to commencement of relevant activities and approve these (as appropriate) without causing undue delay to the Contractor;
- Ensure that induction material includes environmental issues that are appropriate to the Project;
- Approve environmental training programmes and other awareness raising initiatives;
- Provide feedback for continuous improvement in environmental performance;
- Respond to changes in project implementation or unforeseen site activities that are not addressed in the ESMP and that may have potential environmental impacts, and advise HCB and the Contractor as necessary;
- Review, approve and file the ESMP Performance Reports;
- Assess compliance with construction phase stakeholder engagement in accordance with the Stakeholder Engagement Plan to be developed by HCB, based on the Communication Plan Framework provided in this ESMP;
- Ensure that the GRM is implemented and disseminated to the communities surrounding the construction corridor. The Social, Environmental and Communication Control Officer (SECCO) will be the contact person for forwarding complaints and suggestions arising from the construction phase of the Project.

8.2.3 Responsibility of the Contractor

The **Contractor** shall be responsible and contractually obligated to develop all social and environmental management plans and implement all social and environmental management actions set out in this ESMP for the construction phase (see Chapters 4 and 6) and shall comply with the instructions of the HCB manager regarding the implementation of the ESMP.

The Contractor shall appoint an **Environmental Control Officer** (**ECO**) who shall report to the HCB Officer and ensure that the management actions set out in this ESMP are complied with daily. The ECO shall:

- Develop environmental awareness raising and training for all new staff on work sites (e.g. posters, daily lectures, signage);
- Ensure that all workplace activities are conducted in accordance with the ESMP;
- Carry out visual inspections of the activities of the workers regarding the implementation of the requirements defined in this ESMP;
- Immediately notify the SECCO of any non-compliance with the ESMP, or any other complaints or issues of environmental concern;
- Develop and submit the Construction EMAP to the SECCO for approval;
- Review, and submit to the SECCO for approval, specifications for specific works;
- Maintain documentation related to environmental management at worksites (i.e. permits, ESMP, environmental descriptive memories, Environmental Permit, reports, audits, waste removal receipts, etc.);
- Maintain a regular photographic record of all social and environmental incidents;
- Monitor and record ESMP performance indicators;
- Preserve the records required in the Environmental Management Programmes;
- Compile and submit ESMP performance reports to the SECCO;
- The ECO will also ensure that all stakeholder engagement activities under the responsibility of the contractor are conducted in accordance with the Communication Plan Framework defined in the ESMP.

Additionally, the Contractor has the following general responsibilities:

- Obtain all necessary licenses and permits to perform the activities;
- Obtain all necessary licenses and permits for the discharge of wastewater;
- Obtain all necessary licenses and permits for the handling, treatment, transport and disposal of waste at the final destination;
- To comply with all the requirements included in this ESMP;
- Allocate human and financial resources to implement the ESMP. Ensure that all necessary equipment (e.g., waste containers, safety equipment, fire extinguishers) and materials (e.g., spill kits) are available;
- Provide environmental training to workers;
- Carry out its own inspections to ensure compliance with the ESMP;
- To be open to periodic audits by the Proponent, and by entities assigned by the Proponent, and to provide the necessary information for this purpose;
- Implement a communication channel with local communities in accordance with the Communication Plan Framework;
- Ensure that Subcontractors, if any, comply with the ESMP;
- Implement all necessary corrective measures. Maintain the record of incidents, accidents and complaints by the community;
- Supervise the activities of subcontractors;

- Informing the Proponent of all relevant incidents and accidents.

8.2.4 Responsibility of Regulatory Agencies

Regulatory agencies directly concerned with the project include:

- Ministry of Land and Environment (MTA);
- National Environment Directorate (DINAB); and
- National Agency for the Control of Environmental Quality (AQUA).

The roles and responsibilities of these organisations are as follows:

- MTA is the designated authority responsible for approving the ESMP. MTA has overall responsibility for ensuring that HCB complies with the term and conditions of its environmental licence as well as this ESMP. It is responsible for verifications, inspection, and audit before, during and after project implementation;
- DINAB is the authority designated MTA to monitor ESMP applications at the national level, and will be responsible for review and approval of ESMPs and subsequent revisions;
- AQUA is the designated authority responsible control of environmental quality and is tasked, among other attributions, with the development and implementation of strategies for the integrated control of water, air, and soil pollution.

HCB will be responsible for all relevant clearances, permits, licences and necessary approvals from these bodies prior to commencing the project activities.

8.3 Guidelines for Construction Sites and Access

The following table provides guidelines for the location and management of infrastructure to support the construction phase, namely construction sites and access roads. The Contractor should follow these guidelines to avoid significant environmental or social impacts resulting from the location or management of ancillary construction infrastructure.

Table 8-1 Guidelines for the location and management of construction sites, borrow pits and temporary access roads

Aspect	Guidelines	Avoided and Mitigated Impacts
Construction Sites	- Avoid locating construction sites and borrow pits in natural habitats. - Preferably, only areas that are already highly disturbed should be used for establishing construction sites and/or areas for receiving and temporarily storing materials and equipment. - Construction camps and building sites shall be in areas well away from drainage lines and shall not be located within the 1:100 year flood area or within 100 m (whichever is greater) of a watercourse, drainage line or wetland. - The location and organisation of construction camps should be carefully defined, taking into consideration the location of sensitive receptors, and the noise impacts resulting from road traffic produced and activities to be undertaken. - Minimise lighting in construction camps if they are close to natural habitats	- Noise impacts - Potential surface water pollution - Loss of habitats
	- Do not discharge untreated effluent or wastewater into the ground or natural water bodies. - Adopt good cleaning practices to avoid spills and contamination. - Do not leave litter unattended to avoid disturbing nocturnal animals and attracting nocturnal carnivores and other opportunistic species. - Store oils, fuels and other hazardous and potentially polluting products safely to prevent their spillage on the ground and/or water resources. The storage of these materials must be done in impermeable covered areas equipped with containment basins. - Provide an area for refuelling and maintenance of equipment and vehicles with an impermeable floor and containment basins. Set these facilities away from water courses and residential and community use areas (minimum 100 m). - Install pre-treatment of effluent containing oil and grease (e.g. a grease trap) in vehicle and equipment washing, refuelling and maintenance areas.	- Soil and water contamination - Degradation of habitats. - Exclusion of fauna species due to increased disturbance
Borrow pits	- Suppression of vegetation should be restricted to the borrow area polygon and limited to the minimum necessary. - Planning and defining the site for storage of the woody material produced to favour the use of firewood and timber. - Removal and storage of topsoil that will be used in the recovery of the area after the end of exploration. - The stored topsoil should be spread over the intervention area to cover the deforested areas and facilitate vegetation recovery. - In locations with a substantial risk of erosion or where it is necessary to preserve the topsoil and herbaceous cover, manual deforestation processes should be prioritised. - Delimit the sites chosen for the activity and only operate in the demarcated areas.	- Soil and water contamination - Degradation of habitats - Potential water pollution
Access ways	- Wherever possible, new and temporary accesses should take into account pre-existing accesses. If new accesses need to be opened, efforts should be made to avoid affecting areas of natural habitats as far as possible. - Develop a community awareness program that addresses community risks associated with road traffic and the appropriate preventative behaviours and precautions that should be adopted in the vicinity of Project accesses. - If an existing road or pedestrian access is cut because of Project construction activities, alternative routes shall be provided to restore pedestrian and road accessibility.	- Loss of habitats - Soil erosion and compaction - Increased safety issues due to increased traffic

8.4 General Mitigation/Maximisation Measures

In this section of the ESMP, the environmental management measures to be implemented in the operation of the HCB SS are presented in detail. These management measures include mitigation and maximisation measures defined during the impact assessment.

The table presented was structured to identify the aspect (or impact to be addressed), the environmental management measures to be implemented, including the respective responsible entities, as well as the monitoring and performance evaluation for the implementation of the mitigation measures. Note, however, that the Proponent is ultimately responsible for ensuring the mitigation/maximisation implementation, even when other stakeholders (such as the Contractor) are involved, through supervision and audits.

Table 8-2- Environmental Management Measures for the Construction/Rehabilitation Phase

Appearance	Management Actions	Responsible	Performance Monitoring and Evaluation		
			Monitoring	Performance indicators	Frequency
AIR QUALITY					
Production of Particulate Matter	Restrict earthworks and land movements to what is strictly necessary as defined in the project.	Contractor	• Performance report • Audits	• No. of Non-conformities	• Monthly
	Careful choice of itineraries for the vehicles assigned to the work, to minimize, whenever possible, circulation along or through inhabited areas.	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly
	Determine a maximum speed of 30 km/h for the circulation of vehicles in critical stretches, such as close to inhabited areas, considering that dust emissions increase linearly with speed.	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly
	To efficiently reduce the emission of particulate matter, emitted by machines and vehicle wheelsets, the implementation of a regular system of wetting of the intervention areas where there are soils exposed to wind action should be considered.	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly
	All equipment equipped with combustion engines must be inspected regularly to check their operating conditions (periodical maintenance), the aim is to minimize combustion gas emissions resulting from their operation.	Contractor	• Performance report • Audits	• No. of Non-conformities	• Monthly
	Equipment which generates excessive black should not be used at site.	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly
	Provide appropriate PPE to workers which will be exposed to a risk of dust and combustion gases	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly
NOISE AND VIBRATION ENVIRONMENT					
Local increase of noise and vibration levels in the immediate	The location of the contractor's camp site should be selected to be located as far away as possible from areas of sensitive use (housing).	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly

Appearance	Management Actions	Responsible	Performance Monitoring and Evaluation		
			Monitoring	Performance indicators	Frequency
surroundings of populated areas	Carry out a careful choice of itineraries for the vehicles assigned to the work, to minimize their circulation along or through inhabited areas.	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly
	Construction activities, especially the noisiest ones, should be limited whenever possible to daytime hours (6:00-22:00).	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly
	The Contractor must instruct its drivers on techniques to minimize vehicle noise, such as when braking or accelerating near inhabited areas.	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly
	The Contractor shall, whenever possible, avoid parking fixed equipment (e.g. cranes or compressors or other noisy equipment) in the vicinity of areas of sensitive use.	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly
	Select and use low noise/vibration machinery/equipment.	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly
	The contractor should ensure that equipment and vehicles are well maintained and properly fitted with exhaust mufflers	Contractor	• Performance report • Audits	• No. of Non-conformities	• Monthly
	Workers exposed to excessive noise or vibrations should use protective equipment.	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly
HYDROLOGY/SOILS					
Changes in the quality of surface and underground water with risk of contamination by	Implement the Waste Management Plan. Implement the SAPP PCB Management Guidelines	Contractor	• Performance report • Audits • Waste Inventory • Safe disposal certificates	• No. of Non-conformities •	• Monthly

Appearance	Management Actions	Responsible	Performance Monitoring and Evaluation		
			Monitoring	Performance indicators	Frequency
leakage / spillage of polluting substances and solids suspended in water / Changes in soil chemical properties and risk of soil contamination	Implement an Emergency Response Plan.	Contractor	• Performance report • Audits	• No. of Non-conformities • N.º of Accidents • N.º of emergency drills as indicator	• Monthly
	Keep equipment and machinery in good working order, including clean brakes, catalytic converters and silencers (high pressure washed), transformers, without leaks, excess oil and/or grease.	Contractor	• Performance report • Audits	• No. of Non-conformities • N.º of Accidents	• Monthly
	All flammable, reactive, corrosive and toxic materials will be stored in clearly labelled containers.	Contractor	• Performance report • Audits	• No. of Non-conformities • N.º of Accidents	• Monthly
BIODIVERSITY					
Disturbance and loss of habitats and individuals (mortality) of local fauna	Implement an environmental awareness program.	Contractor	• Performance report • Audits	• Number of trained workers • No. of Awareness Actions	• Monthly
	Implement a Waste Management Plan for the construction phase.	Contractor	• Performance report • Audits	• No. of Non-conformities	• Monthly
	Avoid leaving the garbage unattended, so as not to attract nocturnal carnivorous animals.	Contractor	• Performance report • Audits	• No. of Non-conformities	• Monthly
	Deforestation should be limited to strictly necessary areas.	Contractor	• Performance report • Audits	% of Deforested Area	• Monthly
	Promote the selection of areas with bare soil and less need to cut vegetation for temporary work and storage areas.	Contractor	• Performance report • Audits	• % of Deforested Area	• Monthly
	Restrict the movement of people and equipment during construction activities.	Contractor	• Performance report • Audits	• No. of Non-conformities	• Monthly
	Keep equipment and machinery in good working order, including brakes, silencers, catalytic converters clean (jet wash), without leaks and excess oil and/or grease.	Contractor	• Performance report • Audits	• No. of Non-conformities • N.º of Accidents	• Monthly

Appearance	Management Actions	Responsible	Performance Monitoring and Evaluation		
			Monitoring	Performance indicators	Frequency
	Construction works during the night period should be avoided.	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly
	Implement a faunal scare/rescue program.	Contractor	• Performance report • Audits	• Number of animals run over • Number of animals chased away/rescued	• Monthly
	Signal and delimit large trees that do not need to be felled, so that they are not affected by the movement of machines.	Contractor	• Performance report • Audits	• Number of felled trees • No. of complaints	• Whenever necessary
	Avoid, whenever possible, felling trees. Timber with commercial value and of interest to local communities must be felled with a chainsaw. These woods should be arranged in piles with a height of not more than 5 m, in places that do not interfere with the activities.	Contractor	• Performance report • Audits	• Number of felled trees • No. of complaints	• Whenever necessary
	Request prior authorization from the HCB for the felling of trees.	Contractor	• Performance report • Audits	• Number of felled trees • No. of complaints	• Whenever necessary
Disturbance and loss of habitats and individuals (mortality) of local fauna	Implement an environmental awareness program.	Contractor	• Performance report • Audits	• Number of trained workers • No. of Awareness Actions	• Monthly
	Implement Biodiversity Study Action Plan (if applicable)	HCB	• Performance report	• Numbers of Implemented actions	• Annually
	Implement a Waste Management Plan for the construction phase.	Contractor	• Performance report • Audits	• No. of Non-conformities	• Monthly
	Prohibit all workers from purchasing charcoal or firewood or any other product that may be offered for sale in and around the project area, to avoid promoting the use of forest resources.	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly
Loss of Ecosystem Services	Implement an environmental awareness program.	Contractor	• Performance report • Audits	• Number of trained workers • No. of Awareness Actions	• Monthly

Appearance	Management Actions	Responsible	Performance Monitoring and Evaluation		
			Monitoring	Performance indicators	Frequency
	Donate the biomass that results from the deforestation activity to local communities if applicable.	HCB	• Performance report	• Kg of donated biomass	• Monthly
SOCIO-ECONOMY					
Creation of employment opportunities, working conditions and labour	During the process of hiring workers, priority should be given to the local population, if the candidates have the necessary qualifications for the job opportunity created;	Contractor	• Performance report • Audits	• Number of Local Workers • Number of contracted women	• Monthly
	Employment opportunities should be adequately publicized so as not to limit application opportunities including the inclusion of genders and vulnerable groups	Contractor	• Performance report • Audits	• Number of Local Workers • Number of contracted women	• Monthly
	Ensure that the recruitment process is transparent and open to everyone, regardless of race, political opinion, colour or gender. The recruitment process should consider cultural and social sensitivities, as well as the number of vacancies for women and youth.	Contractor	• Performance report • Audits	• No. of Local Workers • Number of contracted women N • No. of contracted youngers	• Monthly
	The process of hiring personnel must be transparent and follow pre-established and accepted criteria.	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly
	Establish a Human Resources policy in accordance with relevant legislation, including national and central labour laws of the International Labour Organization (ILO) covering: – Forced labour – Freedom of Association and Right to Organize; – Right to Unionize and Collective Bargaining; – Discrimination (Employment and Occupation); – Equal Remuneration; – Minimum age (prohibit the hiring of minors).	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly
Potential impacts on workers' health and	The Contractor will develop and implement an Emergency Response Plan	Contractor	• Performance report • Audits	• No. of Non-conformities	• Monthly

Appearance	Management Actions	Responsible	Performance Monitoring and Evaluation		
			Monitoring	Performance indicators	Frequency
safety during the construction phase	The Contractor will develop and implement a Health and Safety Management Plan to protect every worker involved in construction activities, even temporary workers. This plan will comply with national legislation, AfDB OS 5: Labour Conditions, Health and Safety, WB General EHS Guidelines and WB Industry Sector Guideline for Electric Power Transmission	Contractor	• Performance report • Audits	• No. of Non-conformities	• Monthly
	Sub-contractors will be contractually required to comply with labour and health and safety legislation. Specific provisions must be included for: – Supply drinking water and maintain its quality and ensure sanitation at the construction sites; – Provision of sanitation at camps and work areas; – Provision of separate accommodation and sanitation facilities in worker camps, to satisfy both gender needs; – Declaration of accidents through an accident reporting mechanism; – Handling domestic and specialized waste, as well as dangerous goods; – Procedures in case of injuries and accidents; – Secure equipment and demarcate any excavation work areas; – Sign and fence construction areas, where necessary; – Maintain construction camps in a clean and healthy condition as prescribed by international worker health standards. – Implement a long-term training program throughout the construction phase to ensure adequate training and qualification of all staff employed for the project. – Provide medical facilities throughout the construction phase for the use of workers where required; – Ensure reasonable working hours, wages and other benefits; – Provide suitable and safe accommodation and sanitation facilities, including available drinking water and improved latrines; – Provide and ensure the use of personal protective equipment (PPE); – Establish a 'grievance mechanism' for workers	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly
Local and regional economic stimulus due to the purchase of construction goods and materials and increased labour income	The procurement of goods and services by the construction contractor should prioritize supply from local and provincial markets whenever possible.	Contractor	• Performance report • Audits	• Number of local/provincial acquisitions	• Monthly

Appearance	Management Actions	Responsible	Performance Monitoring and Evaluation		
			Monitoring	Performance indicators	Frequency
Disruption of the daily activities of local communities due to the nuisance factor of construction (noise, light and dust emissions and traffic interference)	Construction activities with potential for noise generation should be limited to the daytime period of weekdays, whenever possible.	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly
	Speed limits in construction with heavy vehicles should not exceed 30 km/h in critical segments such as near residential areas.	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly
	All unpaved surfaces should be kept moist, especially during dry and windy conditions.	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly
	Inhabitants of local communities near construction fronts should be informed in advance about future construction activities.	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly
	Implement GRM procedure.	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly
Increased risk of disease transmission (STD and COVID-19) due to labour mobilization	Implementation of self-protection measures for COVID-19: social distance, respiratory etiquette, mask use, frequent disinfection of hands and work surfaces;	Contractor	• Performance report • Audits	• No. of Non-conformities	• Monthly
	The Contractor shall develop a management plan for the prevention of HIV/AIDS and STD and a contingency plan for COVID-19 and implement awareness campaigns for counselling, testing, care, treatment and prevention among the workforce	Contractor	• Performance report • Audits	• No. of Non-conformities	• Monthly
	Conducting awareness campaigns on various aspects of health for workers and the community in general through community radio	Contractor	• Performance report • Audits	• No. of Non-conformities	• Monthly
Temporary socio-economic changes and gender and vulnerable groups	Gender should be mainstreamed in all project phases and activities;	Contractor	• Performance report • Audits	• No. of Non-conformities	• Monthly
	Prepare and develop a course and/or information package on local context and vulnerability to be provided to all staff. Aspects of appropriate and expected behaviour by contractor staff must be adhered to. It is the responsibility of the contractor to ensure appropriate behaviour and conduct of all staff (code of conduct).	Contractor	• Performance report • Audits	• No. of course and/or information package developed	• Annually

Appearance	Management Actions	Responsible	Performance Monitoring and Evaluation		
			Monitoring	Performance indicators	Frequency
	Ensure that entire labour force is dually informed and educated of above impacts and informed on the legislation, responsibility and accountability. The repercussions and legal ramifications of any violation should be made explicit.	Contractor	• Performance report • Audits	• No. of awarness/training sessions	• Annually
	Ensure appropriate procedures and policies are in place to address any violation of the law and/or rights of individuals and/or communities.	Contractor	• Performance report • Audits	• No. of Non-conformities	• Monthly
	Should a sexual abuse and/or underage sex complaint or other violation of rights be brought to the grievance committee (which may involve one or more workers) and where the accusation(s) found to be justified.	Contractor	• Performance report • Audits	• No. of Non-conformities	• Monthly
	Organise education and information campaigns for both workers and the local communities, on rights, responsibilities and obligations concerning the above impacts. Local communities should be informed on the available redress mechanisms and the requisite procedures.	Contractor	• Performance report • Audits	• No. of campaigns • Nº. of participations	• Annually
	Prepare and implement an STD and HIV and Aids prevention programme for all staff.	Contractor	• Performance report • Audits	• No. of workers involved	• Annually
Loss of cultural heritage sites	The Contractor will implement a Random Archaeological Finds Procedure to safeguard any archaeological elements that are found during construction.	Contractor	• Performance report • Audits	• No. of Non-conformities	• Monthly

Table 8-3- Environmental Management Measures for the Operation Phase

Appearance	Management Actions	Responsible	Performance Monitoring and Evaluation		
			Monitoring	Performance indicators	Frequency
HYDROLOGY/SOILS					
Changes in the quality of surface and underground water with risk of contamination by leakage / spillage of	Implement the Waste Management Procedure based on the existent, which include measures for management of generated waste both general waste and hazardous waste;	HCB	• Performance report • Audits	• No. of Non-conformities	• Monthly
	Implement a Spill Emergency Response Plan (work instructions for Oil and Acid Spills);		• Performance report • Audits	• No. of Non-conformities	•

Appearance	Management Actions	Responsible	Performance Monitoring and Evaluation		
			Monitoring	Performance indicators	Frequency
polluting substances and solids suspended in water / Changes in soil chemical properties and risk of soil contamination	Implement the Chemical Product Management Procedure;		• Performance report • Audits	• No. of Non-conformities	•
	Implement SAPP PCB Management Guidelines;		• Performance report • Audits	•	•
	Implement an Emergency Response Plan.	HCB	• Performance report • Audits	• No. of Non-conformities • No of accidents	• Monthly
	Keep equipment and machinery in good working order, including clean brakes, catalytic converters and silencers (high pressure washed), transformers, without leaks, excess oil and/or grease.	HCB	• Performance report • Audits	• No. of Non-conformities • No of accidents	• Monthly
	All flammable, reactive, corrosive and toxic materials will be stored in clearly labelled containers.	HCB	• Performance report • Audits	• No. of Non-conformities • No of accidents	• Monthly
	Regularly inspect all equipment in the SS that may contain contaminants such as transformers.	HCB	• Performance report • Audits	• No. of Non-conformities • No of accidents	• Monthly
SOCIO-ECONOMY					
Creation of employment opportunities, working conditions and labour	During the process of hiring workers, priority should be given to the local population, if the candidates have the necessary qualifications for the job opportunity created.	HCB	• Performance report • Audits	• Number of Local Workers • Number of contracted women	• Monthly
	Employment opportunities should be adequately publicized so as not to limit application opportunities including the inclusion of genders and vulnerable groups.	HCB	• Performance report • Audits	• Number of Local Workers • Number of contracted women	• Monthly

Appearance	Management Actions	Responsible	Performance Monitoring and Evaluation		
			Monitoring	Performance indicators	Frequency
	Ensure that the recruitment process is transparent and open to everyone, regardless of race, political opinion, colour or gender. The recruitment process should consider cultural and social sensitivities, as well as the number of vacancies for women and youth.	Contractor	• Performance report • Audits	• No. of Local Workers • Number of contracted women N • .No of contracted youngsters	• Monthly
	The process of hiring personnel must be transparent and follow pre-established and accepted criteria.	HCB	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly
	Establish a Human Resources policy in accordance with relevant legislation, including national and central labour laws of the International Labour Organization (ILO) covering: – Forced labour – Freedom of Association and Right to Organize; – Right to Unionize and Collective Bargaining; – Discrimination (Employment and Occupation); – Equal Remuneration; – Minimum age (prohibit the hiring of minors).	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly
Disruption of the daily activities of local communities	Implement GRM procedure.	Contractor	• Performance report • Audits	• No. of Non-conformities • No. of complaints	• Monthly

8.5

8.6 Environmental and Social Management Programs

Following the identification and evaluation of the environmental components on which the main potential environmental impacts resulting from the SS's operation activities may be felt, as well as the identification and analysis of these impacts, we propose that the following Environmental and Social Management Programmes be implemented:

- Waste Management Programme;
- Communication Programme;
- Grievance Response Mechanism;
- Procedure for Heritage Incidental Finds;
- Environment, Health and Safety Training Programme;
- Emergency Response Programme.

These programmes systematise the environmental management actions to be implemented with a view to adequately managing the environmental aspects identified and, thus, safeguarding the potential negative impacts (to avoid or minimise them as far as possible) and enhancing the potential positive impacts of the SS. The performance indicators of the parameters to be monitored are also identified.

8.6.1 Waste Management Programme

8.6.1.1 Scope

The Waste Management Program (WMP) is intended to ensure that waste materials generated from rehabilitation and operation of HCB's Songo SS BGC's project are identified, assessed, and managed in compliance with applicable Mozambique regulation, AfDB Integrated Environmental and Social Assessment Guidelines and WB E&S Guidelines.

Waste management is understood as all procedures to be implemented in a systematic way, with a view to ensuring an environmentally safe, sustainable and rational management of waste. The management covers the entire "life cycle" of waste, including collection, conditioning, temporary storage, internal and external transport, treatment and final disposal.

This WMP covers the management of non-hazardous waste (equivalent to Urban Solid Waste - USW) and hazardous waste.

8.6.1.2 Objectives

The main objective of this WMP is to ensure an appropriate and safe strategy for the management of waste received in the HCB SS. In this context, specific management measures are presented to guarantee that the waste received does not produce negative environmental effects on soils, water

or the atmosphere. Waste management is also important in order not to compromise the public health of local communities and workers, and to avoid the proliferation of pests.

In pursuit of the main objective, this report has been prepared to fulfil the following secondary objectives:

- Propose procedures for collection operations;
- Propose procedures for incineration operations;
- Propose actions for systematic and/or periodic monitoring and/or verification;
- Ensure compliance with the standards defined by current legislation on waste management in Mozambique;
- Define performance indicators to assess WMP performance.

8.6.1.3 Definitions

The following are the main definitions of concepts that must be considered in waste management.

CONDITIONING	Temporary and controlled conditioning of waste.
STORAGE	Temporary and controlled depositing of waste
PRIMARY CONTAINMENT	Container or receptacle where the waste is conditioned
SECONDARY CONTAINMENT	Additional containment to prevent pollution caused by drainage associated with the normal use of stored materials (e.g.: trays to prevent spillage) and the limitation of leaks and spills that result from poor conditioning (e.g.: spill containment trays or basins).
FINAL DEPOSITION	The waste's destination.
WASTE TEAM	All workers involved in the processes inherent to waste management.
CHEMICAL INCOMPATIBILITY OF PRODUCTS OR WASTE	This is characterised by the partial or total transformation of the associated substances, forming secondary compounds with new chemical properties, which when reacting amongst themselves may result in an explosion or produce highly toxic or inflammable gases.
NON-CONFORMITY	Legal or technical deviations from what is established in this WMP.
SELECTIVE COLLECTION	Separate collection of waste according to its characteristics and with the objective of channelling it for recycling, reuse or disposal in an appropriate final destination.
WASTE	Substances or objects that are eliminated, that one intends to eliminate or that are required to be eliminated, also known as rubbish.
MUNICIPAL SOLID WASTE	Non-hazardous solid or semi-solid waste such as paper or cardboard, plastic, glass, metal, debris, organic or similar material, and waste resulting from the cleaning of outdoor spaces such as gardens, car parks or roads.
HAZARDOUS WASTE	Waste with hazardous characteristics because it is flammable, explosive, corrosive, toxic, contagious or radioactive, or waste

	exhibiting any other characteristic that could pose a danger to life or human health, to other living beings or also to environmental quality.
NON-HAZARDOUS WASTE	Waste that does not contain any hazardous characteristics.
INERT NON-HAZARDOUS WASTE	Waste that does not undergo any significant physical, chemical or biological transformations and, as a result, may not be soluble, flammable or otherwise physically or chemically reactive, and may not biodegrade or adversely affect other substances it comes into contact with in a way likely to increase pollution of the environment. At the other hand, those are not harm to human health whose total leach ability, pollutant content and ecotoxicity of the leachate are insignificant and, in particular, do not endanger the quality of surface water and/or groundwater.
BIOMEDICAL WASTE	Waste produced in HCB's medical facilities.
TRANSPORT	The physical transfer of waste

8.6.1.4 Waste Classification

The first step to properly structure a waste management plan corresponds to the identification and classification of hazardous waste, according to the Regulation on the Management of Hazardous Waste, approved by Decree No. 83/2014, of 31 December. The following table summarises waste classification.

Table 8-4- Classification of Hazardous Waste according to the Regulation on Hazardous Waste Management, approved by Decree No. 83/2014, of 31 December

HAZARDOUS WASTE **(According to Annex IX of the Regulation on Hazardous Waste Management, approved by Decree No. 83/2014, of 31 December)**	01 Quarries and Physical and Chemical treatment of extracted materials 02 Waste from Agriculture, Horticulture, Aquaculture, Forestry, Hunting and Fishing, Food preparation and processing 03 Waste from wood processing and the production of panels and furniture, paper pulp, paper and cardboard 04 Waste from the leather and textile industries 05 Waste from crude oil refining, natural gas purification and pyrolytic treatment of coal 06 Waste from Inorganic Chemical processes 07 Waste from Organic Chemical processes 08 Distribution and use (MFSU) of coatings (paints, varnishes and vitreous enamels), adhesives, sealants and printing inks 09 Waste from the photographic industry 10 Thermal process waste 11 Waste from Chemical Surface Treatment and Coating of Metals and other materials; Hydro-metallurgy non-ferrous metals waste 12 Waste from Shaping and Physical and Mechanical surface treatment of Metals and Plastics 13 Used Oils and waste of Liquid Fuels (except edible oils, and those stated in chapters 05, 12 and 19) 14 Waste from Organic Solvents, Refrigerants and Propellants (except 07 and 08)

	15 Waste packaging; Absorbents, wiping cloths, filter materials and protective clothing not otherwise specified 16 Waste not otherwise specified in the list 17 Construction and Demolition Waste (Including Excavated Soils from Contaminated Sites) 18 Waste from Human or Animal Health Care and/or Related Research (except kitchen and restaurant waste not directly arising from health care) 19 Waste from Waste Management Facilities, Wastewater Treatment Plants and the Preparation of Water for Human Consumption and water for Industrial Use 20 Municipal Waste and Similar (household waste, waste from commerce, industry and services), including separately collected fractions

Table 8-5- Classification of Biomedical Waste according to the Regulation on Biomedical Waste Management, approved by Decree no. 8/2003 of 18 February

Classification of Biomedical Waste	**Hazardous** Infectious garbage; Sharp and/or sharp garbage; Anatomical waste; Generic trash; Another type of garbage.
	Non Hazardous Ordinary waste – uncontaminated solid waste, comparable to solid domestic waste.

The **Error! Reference source not found.** shows the type of waste that can be received for disposal in the HCB' SS.

Table 8-6 - Type of waste

Waste Classification	Waste Type
GENERAL WASTE	
Hazardous waste	Packaging of oils and other chemical products
	Waste contaminated with oils, lubricants and fuel
	Contaminated soils, contaminated materials, contaminated cleaning cloths, used spill containment materials
BIOMEDICAL WASTE	
Hazardous waste	Needleless syringes, used gloves, bandages, bandages, cotton, other materials infected with blood or other bodily fluids, disposable tweezers
	Needles, lancets, scalpels, blades
	Biological material (human tissue, teeth, large amounts of blood, etc.)
	Pharmaceutical waste

8.6.1.5 Waste Management

Responsibilities

HCB shall appoint an Environmental Manager as its representative for environmental issues and he/she will have the following responsibilities:

- Development and safekeeping of this WMP:
  - compile and analyse waste management performance data to assess compliance;
  - drive continuous improvements of this WMP;
  - communicate changes to the Mozambican authorities (notably the MLE);
  - inform the MLE immediately in the event of accidental waste spillages.
- Allocate the necessary human and financial resources to implement this WMP;
- Ensure the training of workers on waste management procedures;
- Monitor waste management performance by conducting audits;
- Ensure that all waste infrastructure operates in compliance with the license;
- Establish a communication channel with local communities. Keep a record of any complaint regarding waste management;
- Provide adequate response to community complaints, implementing or reinforcing the control measures outlined;
- Prepare quarterly assessment reports on this WMP performance;
- Prepare biannual monitoring reports on this WMP for submission to the MLE;
- Comply with all the requirements included in this WMP, including waste conditioning, storage, transport and disposal procedures.

Management Procedures

NON-HAZARDOUS WASTE

The following table summarises the non-hazardous waste procedures.

Table 8-7- Non-hazardous waste procedures

Mitigation actions	Description	Implementation Schedule	Responsibility for Implementation
Prepare waste inventory	- Prepare inventory of inert, hazardous and non-hazardous waste, as well as biomedical waste; - Classify the waste according to Decree No. 94/2014, Decree No. 83/2014 and Decree No. 8/2003; - Define sources, volumes, segregation, temporary storage and indicate appropriate final disposal for each type of waste, taking into consideration the specifications of the region in question in what concerns the availability of waste treatment and disposal facilities.	Planning phase	Contractor
Reduce waste production	- Working sites must be kept clean, neat and tidy at all times; Avoid leaving garbage unattended, to avoid attracting pests and nocturnal carnivores; - Implement daily cleaning routines to minimize waste;	During rehabilitation	Contractor

Mitigation actions	Description	Implementation Schedule	Responsibility for Implementation
	- Promote the recycling and recovery of waste in coordination with municipal authorities or private entities; Use materials which can be reused easily; - List and estimate the volume of waste that can be reused, recycled or re-process (example, wood scraps, soils, none used materials); - Ensure that the quantities of construction materials on site are as accurate as possible, to avoid surpluses that could result in construction waste.	During operation	HCB
Non-hazardous waste segregation	- Provide containers of appropriate size (according to the expected type and quantity of waste) for the placement of waste in different working areas. The segregation will be carried out as close as possible to the place of production. These shall ensure adequate hygiene and sealing conditions; - Strictly prohibit littering with plastic or other wastes by all project personnel; - Provide different containers for each type of waste that can be reused, recycled or re-processed. Containers will be clearly identified according to their categorization and classification, allowing to clearly identify its contents; - Waste segregation must be carried out accordingly, ensuring that waste does not exceed the top of containers; - Maintain containers clean and always closed; - All produced waste will be sorted according to its type. Waste segregation will be initially done by workers; - Produced waste will be removed daily and temporary stored in Temporary Store Facilities until transported to final disposal.	During rehabilitation	Contractor
		During operation	HCB
Temporary storage facilities for non-hazardous waste	- Non-hazardous waste must be temporarily stored, prior to transport to final disposal, at only one designated area. This area must be duly delimited and signed ("Waste Storage Area"). The area must be roofed, properly ventilated and have impermeable surface floor. Waste temporary storage areas need to be secured, so that they do not create health and safety hazards to people; - Inert waste may be stored in the open without the need for a waterproofing floor in a designated and delimited area; - Location of waste Temporary Storage Facilities must be away (50 m) from water courses and ground depressions; - Maintain a good organization of space and cleaning of waste storage areas; - Waste materials that can be reused by the community, such as removed soil and stones, cut wood and other building materials could be made available for pick up in an orderly fashion and with proper safety arrangements.	During rehabilitation	Contractor
		During operation	HCB
Non-hazardous waste final disposal		During rehabilitation	Contractor

Mitigation actions	Description	Implementation Schedule	Responsibility for Implementation
	- The transport of waste must be carried out in an appropriate vehicle, capable of containing the waste, and in good operating condition. These vehicles must be easily washable; - Transfer operations of waste containers must be carried out safely: without compromising its segregation, not damaging containers, without causing leaks or spills and originating dust; - The destination and transport of waste are the responsibility of the producing entity; - The transport to final disposal site must be performed by a licensed waste contractor; - Prohibit the burial or dump of any type of waste in soil, water resources (lakes, rivers, etc.) or sea; - Prohibit uncontrolled burning of waste (including vegetation); Waste incineration shall be carried out in a licensed incinerator. - Non-hazardous waste will be removed on a weekly basis; - The Proponent and the Contractor will agree on and document the final disposal site for the waste ensuring that it meets national and IFC requirements and will keep records of the delivery of the waste at such facilities. - As no adequate non-hazardous waste disposal facilities, contractor shall install waste staging facility and incineration facility.	During operation	HCB
Worker's training	- Workers must be briefed on the need to reduce the production of waste as much as possible. The use of disposable products (such as plates or plastic or paper cups, products with excessive packaging) will be limited as much as possible, and the use of reusable products will be promoted; - Workers must be trained on the classification, correct sorting and handling of waste; - Workers responsible for hazardous waste handling must be trained on the classification, correct sorting, handling and transport of hazardous waste. Workers must be briefed on the use of individual protection equipment.	During rehabilitation	Contractor
		During operation	HCB

Waste generated during all works, including rehabilitation and operation phases, shall be clearly identified and quantified to allow their adequate collection, segregation, temporary storage for reuse, recycling, treatment, or disposal at licensed facilities. Waste inspection/ audit will be arranged prior to delivery of the wastes.

HAZARDOUS WASTE

The following table summarises the hazardous waste transportation procedures.

Table 8-8 - Procedures for the transportation of hazardous waste

PROCEDURES	DESCRIPTION:	IMPLEMENTATION SCHEDULE
Waste transportation vehicles	Ensure that hazardous waste is transported using appropriate vehicles capable of containing it. These vehicles must be washed and properly disinfected. Equip vehicles with spill containment kits.	When purchasing

PROCEDURES	DESCRIPTION:	IMPLEMENTATION SCHEDULE
	Ensure that collection vehicles and equipment are washed. Send the water resulting from washing the equipment or transport vehicles for treatment.	After each collection cycle
Waste transportation	Transport hazardous waste in sealed, properly identified containers. The means of transport must have metal clamps to secure the containers and ensure safe transportation. The transport vehicle must be identified with specific signs for the transportation of hazardous material.	During the rehabilitation/operation
	Prohibit the transport of hazardous waste and other types of goods in the same vehicle or container. Ensure that the transport of different types of hazardous waste is only carried out if there is compatibility among the waste to be transported (see Annex III of the Regulation on Hazardous Waste Management, approved by Decree No. 83/2014, of 31 December). Drive the vehicle at moderate speed.	During the rehabilitation/operation
Proper handling of hazardous waste	Ensure that the handling of hazardous waste is only carried out by workers with specific training. Implement the SAPP PCB Management Guidelines Provide safety equipment (protective gloves, impermeable steel-toed boots, apron and reflective waistcoats) for the waste team.	During the rehabilitation/operation When hiring and whenever justifiable
Training and skills	Ensure that the waste team workers are technically competent to lead the processes. Train the Waste Team (including vehicle drivers) in the correct handling and transportation of hazardous waste. Raise the driver's awareness for driving the vehicle with moderate speed and to pay attention while driving. Raise awareness among the waste team as to the use of personal protective equipment necessary for handling dangerous waste. Keep a record of all training sessions held.	When hiring When hiring, every year and whenever justifiable

The temporary storage of hazardous waste will be carried out in the temporary storage area for hazardous waste. The following procedures should be taken into consideration:

Table 8-9 - Procedures for the temporary storage of hazardous waste

PROCEDURES	DESCRIPTION:	IMPLEMENTATION SCHEDULE
Temporary storage area	Set a sign (e.g. “Hazardous Waste Storage Area”) and secure fenced access. Restrict access to authorised personnel. Prohibit smoking and open fires in the surroundings. Display symbolic language (“No smoking”, “No fire” and “Danger”). Place fire extinguishers in the premises. Post emergency contacts in a clearly visible place. Place emergency eye-wash and shower near the flammable waste storage area. These should be duly marked in green.	During the rehabilitation/operation

PROCEDURES	DESCRIPTION:	IMPLEMENTATION SCHEDULE
Temporary storage of Hazardous Waste	Condition the hazardous waste according to the type of waste. Ensure that incompatible waste (see Annex III of Decree-Law 83/2014 of 31 Dec.) does not have physical contact with each other and must be stored in separate containment basins to prevent inadvertent contact in the event of a leak in a container. Properly identify all containers. Internal venues should be well organised to allow for the circulation of people and equipment (fork-lift trucks), and for visual inspection.	During the rehabilitation/operation
Maintain clean and hygienic conditions	Keep permanent cleaning routines to ensure hygienic and safe conditions. Send the effluent resulting from floor washing for treatment.	Daily
Proper handling of hazardous waste	Ensure that the handling of hazardous waste is only conducted by workers with specific training. Ensure that containers are properly closed after opening. Ensure that all workers in the unit have suitable personal protective equipment, such as apron, impermeable steel-toed boots, protective gloves and mask.	During the rehabilitation/operation When hiring, every six months and whenever justified
Spill containment	Provide spill control kits (absorbent materials/sand) at hazardous waste storage facilities.	During the operation
Maintenance and Repair of the SS	Ensure maintenance/repair by specialised technicians in the shortest possible time. Notify waste producing entities that the equipment has stopped so that they can make the necessary arrangements for the temporary storage of waste.	In accordance with the equipment manual. In case of breakdown.
Waste Team training and skills	Ensure that the waste team workers have the necessary technical skills to conduct the processes. Train the Waste Team in the correct handling and transportation of hazardous waste. Raise awareness among the Waste Team as to the use of personal protective equipment when handling hazardous waste. Train workers in the use of fire extinguishers. Keep a record of all training sessions held.	When hiring When hiring, every year and whenever justifiable

8.6.1.6 Systematic or Periodic Monitoring and Verification Actions

The following table summarises the systematic and/or periodic follow-up and/or verification actions and the schedule for their implementation.

Table 8-10- Systematic and/or Periodic Follow-up and/or Verification Actions

MONITORING AND/OR VERIFICATION ACTION	DESCRIPTION:	IMPLEMENTATION SCHEDULE
Inspection of temporary storage sites for hazardous waste	Carry out periodic visual inspections: - Interior of secondary containments (trays, containment basins, etc.) to check for spills or leaks; - Integrity of the storage containers and secondary containments; - Keep records of the inspections conducted.	Monthly
Inspection of spill kits	Carry out a visual inspection of the spill control kits. Keep a record of the inspections conducted.	Monthly and after major spills.

MONITORING AND/OR VERIFICATION ACTION	DESCRIPTION:	IMPLEMENTATION SCHEDULE
Inspection of transport vehicles	Check the suitability of the vehicle for the type of waste or containers to be transported. Check the existence of a spill kit when transporting dangerous waste. Check circulation conditions (state of tyres, lights, etc.).	Monthly
Complaint Log	Keep an updated register of complaints from local people and workers about waste.	Whenever there is one
Monitoring the amount of waste managed	All waste received must be registered, mentioning the type and amount of waste. Waste should be quantified either by volume (litres, cubic metres) or by mass (weight). Record the quantity of biomedical waste incinerated.	Daily

8.6.1.7 Documents

The documents required for waste management are summarised in the following table. These must be prepared, filed and kept as an integral part of this programme to facilitate monitoring of the WMP.

Table 8-11- Documents of the Waste Management Program

Document Title	Document Type
Complaint Register (Annex III)	Registration
Training register	Registration
Inspections register	Registration
Register of spills occurred	Registration
Register of cleaning carried out in the different waste storage areas (see Annex II)	Registration
Non-conformity register	Registration
Consignment notes for the transport and disposal of hazardous waste, in accordance with Annex IX of the Regulation on Management of Hazardous Waste, approved by Decree No. 83/2014, of 31 December	Consignment notes
Operator certificate for the transport of hazardous waste (ash resulting from incineration)	Certificate
Waste Management Procedure	Consultation document

8.6.1.8 Waste management equipment

The following table summarises the equipment proposed for handling hazardous waste.

Table 8-12- List of proposed equipment for handling hazardous waste

Equipment
Spill control kits, including shovel and absorbent material
Fire extinguishers

Other equipment

The following means and equipment may be employed in waste management operations:

- Plastic sheets or tarpaulins, for covering the waste during transport;
- Appropriate signage;
- Safety equipment for the waste handling team.

8.6.1.9 Performance indicators

The evaluation of the performance of the WMP will be guaranteed through the determination of performance indicators to measure financial and environmental gains and to enable the creation of future goals and objectives, thus guaranteeing the continuous improvement of environmental performance. The indicators should be determined on an annual basis.

The proposed indicators should be reviewed and reassessed throughout the implementation period of the WMP to best reflect the effectiveness of the proposed waste management procedures.

We propose the following performance indicators:

- Amount of hazardous waste sent to appropriate destination;
- Amount of biomedical waste incinerated;
- Number of spills;
- Number of training sessions carried out
- Number of environmental inspections conducted
- Number of non-conformities recorded;
- Number of complaints from employees and the local community regarding bad waste management.

8.6.1.10 Internal Audits

HCB must conduct annual internal audits and Annual Independent External Audits to verify the correct implementation of this WMP.

The audits should encompass all the processes and installations involved in waste management and all the areas of geographical coverage of this WMP that fall within the scope of the functioning and operation of the SS.

An internal audit protocol must be established and checklists developed for each of the waste management components, namely collection, storage and final destination.

All non-conformities shall be recorded. Whenever applicable, non-conformity notifications shall be issued. Once non-conformities are known, corrective and preventive actions shall be established to avoid their repetition in the future.

The notifications shall be recorded, as well as their response, mentioning the date and actions taken.

8.6.1.11 Reports

The following reports shall be prepared within the scope of waste management:

- Quarterly internal reports evaluating the performance of this WMP. These reports must include a record of non-conformity notifications as well as a summary of the remedial actions implemented to resolve them;
- Biannual follow-up reports on the implementation of this WMP, to be submitted to the MLE, in accordance with the provisions of the legislation;
- Whenever justifiable, addenda to the present WMP for improvement and adaptation to actual conditions, to be submitted to the MLE for approval.

8.6.2 Communication Plan

This programme corresponds to the Communication Plan, which presents the approaches and measures that will be adopted for the management of various aspects of the socio-economic component in the Cahora Bassa district, mainly the neighbourhoods close to the SS area, namely communication.

8.6.2.1 Rationale behind the Programme

This programme is based on the guideline that communication is a process inherent to the whole company, and that the solutions proposed in this ambit must consider and integrate opportunities for positioning and relationship of HCB.

It is based on the premise that communication is not limited to the dissemination of information and the development of tools for this purpose. The contacts established between the proponent and the different agents involved in the activity, whatever the forms used, are also communication actions and opportunities and, as such, should follow a common pattern and direction.

This programme therefore covers:

- **Social Dialogue** - permanent dialogue with stakeholders, using tools that allow interactivity, knowledge and understanding of the activity and its relationship with its audiences.
- **Relationship with strategic stakeholders** - permanent identification of strategic stakeholders and affected parties (S&APs), analysis of the scenarios and their respective players in constant change and the clear definition of approach for each moment, optimising the development of relationships.

8.6.2.2 Objective

The actions proposed in this programme seek to highlight and strengthen HCB's commitment to building a good relationship with the parties involved in the activities associated with the project.

The social communication process will be structured along the following axes:

- Articulation;
- Information;
- Monitoring and Assessment.

8.6.2.3 Articulation

It covers the communication activities and actions developed with the objective of establishing a constructive relationship with the main stakeholders, mainly with the community and local leaderships. It also involves the creation and implementation of communication mechanisms and the preparation of communication instruments.

The stakeholders are the main social players that may impact the conduct of the activity or be impacted by it.

All situations of contact and interface with the different publics should be treated by HCB's agents as opportunities for knowledge and relationship.

8.6.2.4 Information

It involves the set of actions and communication tools developed with the purpose of informing the different target audiences about the various aspects of the activity on site.

At the beginning of the activities, meetings must be held with local community representatives to present information about the SS. The need to establish systematic communication channels must also be analysed.

8.6.2.5 Communication Channels

At present, there are various systematic communication channels used by HCB to disseminate information, namely:

- Cahora Bassa community radio (owned by HCB, operating on company premises);
- Ordinary sessions of the Administrative Post (forum for information, consultation and decision on matters connected with the Administrative Post;
- Balance Sheet and/or Report and Accounts meetings);
- Information displays;
- Institutional e-mail;
- Intranet (company website);
- Instant corporate SMS.

8.6.2.6 Monitoring and Assessment

Considering how social relations are dynamic, it is important that the process is permanently *fed back* with information about S&APs and topics of interest, so that the necessary preventive actions can be taken, the communication strategy adjusted and the actions optimised.

The monitoring will occur during the entire process of development of the activity, through the evaluation of the results achieved, against the objectives and targets proposed. If necessary, the procedures will be revised.

To this end, in addition to direct observation, permanent observation of the teams and community relations with the managers, the possibility of holding specific meetings and/or interviews with community representations may be evaluated as a relevant resource in gauging the commitments envisaged.

8.6.2.7 Timeline

This schedule will be directly related to the activities of the SS or social events that may contribute to changes in the relationship between the infrastructure and the social surroundings.

8.6.2.8 Expected Results

Consolidation of the channels of communication and permanent dialogue with local stakeholders.

8.6.3 Grievance Response Mechanism

8.6.3.1 General Considerations

Interactions with Stakeholders will occur frequently during the separate phases of the project. This includes several types of interaction including nuisance effects caused by construction. Interactions between HCB, or a contractor acting on its behalf, and communities, workers or other stakeholders may generate complaints. A complaint is an issue, concern, problem or claim (perceived or real) that an individual, group, or representative presents to the company, or its contractors, for consideration and resolution (Ombudsman, 2008). A simple complaint can escalate into a dispute if not adequately and timely addressed.

Understanding and managing the concerns of communities, workers and other stakeholders is essential to ensure a good long-term relationship between the Proponent and Stakeholders. Unresolved concerns may negatively affect the project. It is therefore important that a simple and effective grievance management process is developed and implemented.

This sub-chapter presents guidelines for the development of a Project-specific Grievance Response Mechanism (GRM). The scope of this GRM should include all complaints associated with the Project.

It is recommended that a comprehensive GRM be developed, based on the guidelines provided in this ESMP, the scope of which should include all Project activities. The project GRM should be a stand-alone protocol integrated into the HCB/Contractor Environmental and Social Management System.

8.6.3.2 Objectives

The GRM protocol will provide guidance for the management of suggestions and complaints from communities, workers and other stakeholders throughout all project phases. This protocol will allow one to:

- Understand how stakeholders perceive the risks and impacts of the project, to adjust its measures and actions to address their concerns;
- Inform stakeholders and affected parties on the process that will be followed to respond to complaints;
- Address and respond to stakeholder complaints;
- Handling and resolving GBV and SEA related complaints;
- Make available to affected parties an effective grievance mechanism;
- Record stakeholder suggestions as an opportunity for continuous improvement by creating or improving a learning system and process.

8.6.3.3 Target Audience

This protocol applies to any stakeholder (individuals, groups of individuals, workers, communities, companies, institutions, NGOs, among others) affected by the project activities or by the activities of contractors hired by the Proponent to carry out any work under this project. The GRM is therefore a tool for the resolution of stakeholder complaints, throughout the project cycle.

8.6.3.4 Principles

The protocol is governed by the following principles:

- Security: any interested or affected party should feel safe and confident in making a complaint or suggestion, without fear of reprisal;
- Accessibility: the protocol should be made widely available and easily accessible to any interested party. HCB/the Contractor will make all reasonable efforts to disseminate the mechanism and remove potential constraints to accessing it, such as language, illiteracy and distance;
- Timeliness: all complaints should be managed in a timely manner to avoid escalation into dispute and associated risks to the project;
- Respect: the complaint resolution process will be in accordance with internationally recognised human rights standards, such as the International Covenants on Economic, Social and Cultural Rights and Civil and Political Rights, the Convention on the Elimination of Discrimination against Women (CEDAW), International Convention on the Rights of Persons with Disabilities (CRPD), Committee on the Elimination of Racial Discrimination (CERD) and Convention on the Rights of the Child, all of which have been ratified by Mozambique;
- Transparency and Accountability: the grievance response process and its outcomes should be sufficiently transparent to address public interest concerns without compromising the

privacy and identity of individuals. They should also be fair, independent and legitimate - and be perceived to be so;

- Predictability: the process should be applied consistently, with defined timelines for each step, and should be clear about the type of processes and outcomes that can and cannot be offered.

8.6.3.5 Types of Complaints and Suggestions

There are three types of complaints and suggestions:

- **Individual**: refers to a complaint or suggestion made by an individual member of the communities, a worker or by another individual stakeholder;
- **Group**: refers to a complaint or suggestion submitted by a specific group of individuals or stakeholders such as a gender group, professional association, etc.;
- **Community**: refers to a complaint or suggestion that involves a community. These complaints may be made at a community meeting or by the community leader, on behalf of the community, in which case they should explain why it is a community complaint.

8.6.3.6 Reception and Registration

In compliance with the principle of accessibility, HCB/the Contractor will allow the presentation of grievance through multiple communication channels, namely:

- Verbal complaint in person refers to a formal or informal conversation with a representative of HCB/Contractor;
- Written complaint: refers to a record in a grievance book, or a formal letter, fax or e-mail;
- Telephone complaint: refers to a telephone conversation to a dedicated (toll-free) number, including recorded messages left on voicemail;
- Confidential channels (such as dedicated phone line or designated community liaison contacts) as agreed for exclusive use as part of the VBG (Violence Based on Gender) /SEA (Sexual Exploitation and Abuse) prevention and response framework and action plan.

A Suggestions and Grievance Book will be made available by HCB/the Contractor at specific locations in communities and on HCB/the Contractor premises. Any affected person may register a written complaint in these books. Assistance should be made available to interested parties in registering the complaint as required. As mentioned above, written complaints can also be submitted by formal letter, fax or e-mail.

In the case of verbal complaint (in person or by telephone), the receiver shall complete the appropriate form in the Suggestions and Grievance Book so that the process can be opened (Annex I). In these cases, the receiver should explicitly state that he accepts the suggestion or complaint and register preliminary information about the person affected (e.g. name, community / institution, subject, contact).

Language is often a restriction to communication (especially when interacting with communities with low literacy levels). Therefore, HCB/the Contractor should ensure that complaints and suggestions

can also be made in local languages. Thus, the protocol should adopt both Portuguese and local languages as languages of communication.

8.6.3.7 Suggestion/Request and Complaint Management Procedure

Procedures for Handling Suggestions

Suggestions are typically easier to manage than complaints. Suggestion management will follow the actions outlined in the following table.

Table 8-13- Methods for managing suggestions/requests

Stage	Action	Responsible Person / Entity
Presentation	- Presentation of the suggestion using one of the available communication channels (in-person interaction, complaints and suggestions book, e-mail or telephone call).	Affected person or interested party
Reception and acknowledgment	- Reception of the suggestion; - Registration of the suggestion in the Grievance and Suggestions Book; - Sending a letter of confirmation of receipt, within 5 days.	HCB/ Contractor
Answer	- After proper analysis of the suggestion, prepare a letter indicating the result of the suggestion and deliver it to the affected person.	HCB/ Contractor
Closure	- After the delivery of the reply letter, the matter should be considered closed. The HCB Community Liaison Body will be responsible for additional actions, if necessary.	HCB/ Contractor

Procedure for Managing Grievance

Managing a complaint is more complex than managing a suggestion. The following flowchart and table summarise the steps to be taken for this management.

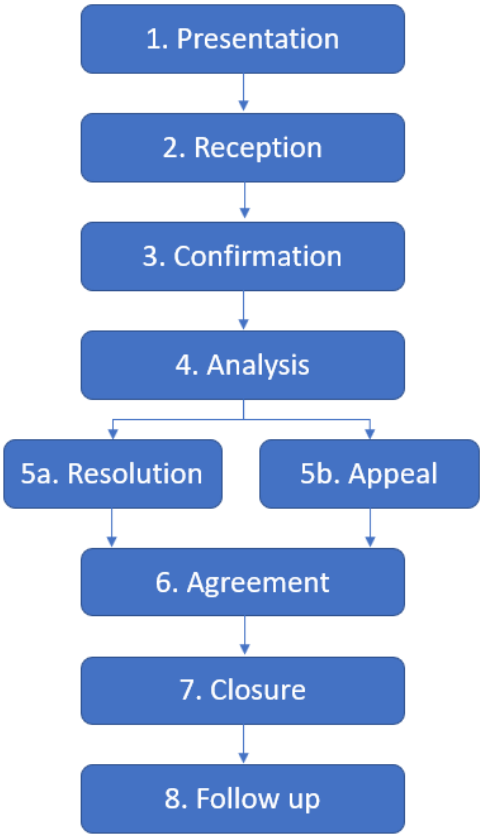


Figure 8-1 – Flowchart of the Suggestion/Request and Complaint Management Procedure

Table 8-14- Complaint management methods

Stage	Action	Responsible Person / Entity	Time
1. Presentation	– Presentation of the complaint using one of the available communication channels (in-person interaction, complaints and suggestions book, e-mail or telephone call).	Affected person or interested party	Day 1
2. Reception	– Complaint receipt; – Registration of the complaint in the Grievance and Suggestions Book; – Confirmation of receipt of letters is made upon delivery, through the stamp, signature and date of receipt. – In cases where the complaint is sent by e-mail, a reply is sent acknowledging receipt...	HCB/Contractor	Day 7
3. Acknowledgment	– Clarification and confirmation of the issues involved in the complaint, through a meeting with the affected person; – Preliminary agreement (if applicable).	HCB/Contractor Affected person or interested party	Day 7
4 .Analyses	– Analysis of the complaint to confirm the alleged facts.	HCB/ Contractor Affected person or interested party Others as needed	Days 7 - 14

Stage	Action	Responsible Person / Entity	Time
5a. Resolution or 5b. Appeal	– Motion for a resolution; – Acceptance or appeal; – Registration of the proposed resolution in the Grievance and suggestions book.	HCB/ Contractor Affected person or interested party Others as needed	Days 15 - 28
6. Agreement	– Meeting with the affected person to communicate the proposed resolution, reach a mutual agreement and sign it.	HCB/ Contractor Affected person or interested party	Day 29
7. Closure	– Delivery of a closing letter to the affected person or interested party; – Complaint closing record in the Grievance and suggestions book.	HCB/ Contractor	Day 30
8. Follow up	– Implementation of agreed corrective or compensatory measures that require a timetable.	HCB/Contractor/ responsible part	According to the agreed schedule

HCB/the Contractor shall manage a complaint within a period of 30 days of receipt. In cases where it takes more than 30 days to carry out the investigation, HCB/the Contractor shall notify the concerned party (in writing and in advance), stating the reasons for the delay.

If the complainant does not agree with the proposed settlement, and it is not possible to reach agreement on it, the complainant may request that the complaint be escalated to the HCB/Contractor's Directors, who will review the case and communicate their decision to the complainant within 29 days.

If the complainant does not agree with the resolution proposed by the HCB/Contractor Managers, the complainant has the right to appeal to a third party, which is proposed herein to be the Arbitration Committee. The Arbitration Committee shall be composed of senior representatives of:

- HCB/the Contractor;
- Representatives of the District Government or of community leaders (as applicable);
- Community representatives (minimum of two, male and female);
- Representative of interested and affected parties;
- Experts as required and agreed.

The Arbitration Committee will consider the case and reach a decision. Decisions made by this forum will be considered final as far as the scope of this grievance management protocol is concerned. If the complainant does not agree with the decision of the Arbitration Committee, he/she may ascend the matter to the judicial system. In this case, the complainant will be provided with information about their right to grievance and the appropriate judicial channel to direct their complaint to. That level of grievance is, however, outside the scope of this management protocol.

8.6.4 Gender Based Violence (GBV) / Sexual exploitation, abuse and sexual harassment (SEAH) Prevention and Response Plan

8.6.4.1 General Considerations

SEAH and GBV are closely related. In this plan, the term SEAH is used to refer to sexual exploitation and abuse and sexual harassment and GBV is violence targeted at individuals because of socially ascribed gender differences. GBV is always perpetrated because of gender inequality whereas SEAH can also be driven by other forms of abuse of power and inequalities (racial, age, social status etc or a combination of these etc). There is both a strong ethical argument and a compelling business case for companies and investors to tackle SEAH and GBV.

Large infrastructure projects often involve major civil works that require labour force and associated goods and services that cannot be fully met by local supply. In such cases, workers are often brought in from outside the project area. Project interventions create a presence of migrant workers due to the likely inability of local communities to fulfil the need for skilled manpower requirement. Other than this, there will also be a floating population of suppliers and transporters for the whole duration of the projects. This influx of workers can exacerbate existing GBV/SEA risks and even create new ones.

8.6.4.2 Legal and Policy Environment for Women's Safety

The international legal and policy framework establishes standards for action by countries to meet their legal obligations and policy commitments to address violence against women. Some of the key International instruments6 for the protection of women include the following:

- **United Nations General Assembly, Convention on the Elimination of All Forms of Discrimination Against Women** (CEDAW): Under CEDAW, States ensure through competent national tribunals and other public institutions the effective protection of women against any act of discrimination and refrain from engaging in any practice of discrimination against women and to ensure that public authorities and institutions shall act in conformity with this obligation.
- **Fourth World Conference on Women, Beijing Declaration and Platform for Action**: The Platform for Action states that 'women may be vulnerable to violence perpetrated by persons in positions of authority in both conflict and non-conflict situations. Training of all officials in humanitarian and human rights law and the punishment of the perpetrators of violent acts against women would help to ensure that such violence does not take place at the hands of the public officials in whom women should be able to place trust, including police and prison officials and the security forces'.
- **United Nations General Assembly, Resolution 52/86 on Crime Prevention and Criminal Justice Measures to Eliminate Violence Against Women**
- **World Bank's Guidance note on Management of Labour Influx, 2016**. The document provides guidelines to address issues and risks arising from influx of migrant labour leading to gender-based violence, forced labour etc.

8.6.4.3 Objectives

The objective of this programme is to:

- Reduce the negative impact of GBV and SEAH on individuals ;
- Improve relations with local communities and service users;
- Have a positive impact on company culture and the working environment through increasing worker morale which heightens productivity.
- Reduce absenteeism and improve workers' concentration and performance at work, which increases profits.

8.6.4.4 Definitions

TERM	*DEFINITION*
SEAH	Sexual Exploitation, Abuse and Sexual Harassment (defined separately below)
Sexual Exploitation	'Any actual or attempted abuse of a position of vulnerability, differential power, or trust for sexual purposes. Includes profiting momentarily, socially, or politically from sexual exploitation of another'. This includes transactional sex, solicitation of transactional sex and exploitative relationship (UN, 2017).
Sexual Abuse	'The actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions. It should cover sexual assault (attempted rape, kissing / touching, forcing someone to perform oral sex / touching) as well as rape.' All sexual activity with someone under the age of 18 is considered sexual abuse (DFID, 2019).
Sexual Harassment	'A continuum of unacceptable and unwelcome behaviours and practices of a sexual nature that may include, but are not limited to, sexual suggestions or demands, requests for sexual favours and sexual, verbal or physical conduct or gestures, that are or might reasonably be perceived as offensive or humiliating' (UN, 2018).
GBV	: Gender-based violence: 'An umbrella term for any harmful act that is perpetrated against a person's will, and that is based on socially ascribed gender differences between males and females' (HMG, 2018). GBV can be perpetrated by staff, contractors, and community members.
VAWG	Violence Against Women and Girls: 'Any act of gender-based violence that results in, or is likely to result in, physical, sexual or psychological harm or suffering to women, including threats of such acts, coercion or arbitrary deprivation of liberty, whether occurring in public or in private life' (Taylor, 2015).

8.6.4.5 Proposed actions and implementation timeline

GBV or SEA/SH Related Actions

The following table summarises the proposed actions and the schedule for their implementation.

Table 8-15- Actions, description and implementation timeline

Action	Description	Responsible	Implementation schedule
Planning	- Clearly define SEA/SH requirements in Bid-documents and the requirement for a CoC which addresses SEA/SH, using Standard AfDB/WB procurement documents - Operationalize or constitute Internal Grievance Committee as per Prevention of Sexual Harassment at Workplace procedure; - Ensure Codes of Conduct are clearly understood and signed by those with a physical presence at the project site.	HCB	Pre Construction/Rehabilitation Phase
Project-level activities	- Develop and implement a specific GBV/SEAH Prevention and Response Plan - Separate, safe and easily accessible facilities for women and men in the place of work and the labour camps. (e.g. toilets should be in separate areas, well-lit) - Display signs that the project site is an area where SEA/SH is prohibited.	Contractor	Construction/Rehabilitation Phase
Training	- Train project staff on the behaviour obligations under the CoC and Disseminate the CoC (including visual illustrations) and discuss with employees and local communities.	Contractor	Upon hiring or whenever necessary
Monitoring	- Undertake regular M&E of progress on SEA/SH prevention and response activities, including reassessment of risks as appropriate	HCB	During Construction/Rehabilitation Phase

Systematic and/or Periodic Monitoring and Verification Actions

The following table summarises the systematic and/or periodic follow-up and/or verification actions and the schedule for their implementation.

Table 8-16- Systematic and/or periodic follow-up and/or verification actions, description and implementation timeline

Action follow-up and/or verification	Description	Implementation schedule
Policies and procedures	- GBV/SEAH has been reflected in company policy - The code of conduct is clear and prohibits all forms from GBV/SEAH - GBV/SEAH policies and codes of conduct are available to workers and stakeholders in accessible formats	Annually
Grievance mechanisms and investigation procedures	- The grievance mechanism is confidential and concerns related to GBV/SEAH can be raised. - Reporting channels available to workers, community members and service users, include anonymous options and are accessible. - Procedures to respond to reports of GBV/SEAH when they are made are in place and include clear investigation procedures that focus on the safety and wellbeing of survivors	Annually
Recruitment and performance assessment	- Recruitment procedures are in place, with interview panels staffed by at least two people - Candidates' identities are checked at interview and references are requested	Upon hiring

Action follow-up and/or verification	Description	Implementation schedule
Training and awareness raising	- Mandatory training on GBV/SEAH, company policies and procedures is provided to all workers of all grades, including contractors and security personnel, as well as induction training for new recruits. - Additional specialised training is provided to members of staff with specific responsibilities for GBV/SEAH prevention and response. - A clear message is provided to service users and communities on GBV/SEAH in how to report it and how reports will be handled.	Annually
Work with contractors and suppliers	- Contractors and suppliers are required to share their GBV/SEAH policies and procedures - Clauses included in contracts are committing contractors and suppliers to adhere to company codes of conduct. - Information is provided to contractors and suppliers about company grievance mechanisms for reporting GBV/SEAH.	Annually
Physical design	- GBV/SEAH is included in workplace safety assessments, including worker accommodation and transportation.	Annually

8.6.4.6 Performance Indicators

The following performance indicators should be considered:

Based on GRM Indicators

- Number of GBV cases received
- Number of GBV cases resolved
- Time taken to resolve

Based on Actions indicators

- Successful implementation of agreed GBV Action Plan.
- Number of training courses related to GBV delivered.
- Percentage of workers that have signed a CoC.
- Percentage of workers that have attended the CoC training.

Performance indicators should be accounted for monthly and compiled into a report.

8.6.4.7 Records

The documents required are summarised in the table below. These are to be prepared, filed and maintained as part of this programme.

Table 8-17 - Documents linked to the GVB/SEAH Prevision and Response Plan

Document title	Document type	Reporting frequency
Code of Conduct (CoC)	Registration	On hiring
Claim Record (GRM)	Registration	Monthly
Attendance record (Training)	Registration	Monthly

8.6.5 Labour and Workforce Conditions Procedures

These procedures were developed in accordance with the World Bank's Environmental and Social Guidelines on Labour and Workforce Conditions (ESS2) and AfDB's Integrated Safeguards System (ISS) AfDB Labour Conditions, Health and Safety (OS 5). Specifically, HCB should adopt a series of policies and procedures on labour and employment conditions as described in the following subsections:

8.6.5.1 HCB Workers

Human Resources Policies and Procedures

The Policy aims to promote workers' rights, foster employment opportunities, improve social protection and strengthen dialogue on work-related issues.

This commitment is guided by the Universal Declaration of Human Rights, the International Labour Organisation (ILO) convention and AfDB's Integrated Safeguards System (ISS) AfDB Labour Conditions, Health and Safety (OS 5).

HCB favours the following principles in creating better working conditions:

- Respect and comply with national laws and international standards applicable to the energy sector;
- Respect and protect Human Rights;
- Avoid using or contributing to child labour;
- Avoid using or contributing to forced labour;
- Not tolerate sexual harassment, intimidation/exploitation and gender-based violence;
- Respect freedom of association and the right to collective negotiation;
- Maintain a fair and just remuneration framework, fair working hours and leave;
- Eliminate discrimination in employment and occupation, including all forms of harassment and abuse.

HCB, its partners and subcontractors shall respect and ensure:

- Promotion of equal opportunity and employment stability;
- Fair treatment and equal working conditions;
- Direct and indirect local employment will be prioritised;
- Equal pay for the same work shall be guaranteed;
- Education and training plans will be planned, developed and implemented to promote the technical and professional skills of workers;
- The recruitment process shall contribute to the economic development of local communities;

- Gender equality will be fundamental in hiring processes;
- Information will be provided on disciplinary rules, promotions, evaluations, benefits, bonuses and incentives, as well as any other relevant aspect of labour relations;
- Workers will be included in all environmental, social, and health and safety activities that the company organises;
- The Grievance Response Mechanism may be used by workers to resolve any labour disputes and improve working conditions will be developed and implemented.

Labour and Employment Conditions

As to working and hiring conditions, HCB establishes working and hiring conditions for all, and is in full compliance with Mozambican labour legislation.

Workers' Organisations

Mozambican law recognises the workers' rights to form and join workers' organisations without any type of interference. HCB also recognises the workers' right to form and join workers' organisations.

Non-discrimination and equal opportunities

HCB never makes employment decisions based on personal characteristics unrelated to the inherent requirements of the job.

Employment decisions at HCB are based on merit and open competition. Job vacancies are publicly advertised and all applicants are encouraged to apply.

The selection process is based on technical skills and experience, and there are tools available to assess a candidate's technical knowledge and organise them accordingly.

In addition, HCB employees also receive equal opportunities for training and development.

Child Labour

HCB fully complies with Mozambique labour legislation about this aspect, and condemns any practice of exploitation of children.

Forced Labour

HCB employees are hired based on their voluntary will to be associated. There is no involuntary or compulsory work.

Gender violence

HCB fully complies with the Mozambican labour legislation in what concerns this aspect, and condemns any practice of exploitation based on gender.

8.6.5.2 Workers hired by third parties

HCB requests all contractors and their subcontractors to declare compliance with applicable regulations and policies on equality, labour and human rights.

8.6.5.3 Suppliers

HCB assesses its suppliers to identify any possible non-compliance with applicable regulations and policies on equality, labour and human rights, in particular risks or incidents of child and/or forced labour and gender-based violence

HCB implements appropriate corrective measures in case incidents are identified, such as adding a clause referring to human rights in contracts.

HCB constantly assesses supplier performance and has a feedback system to record it.

8.6.5.4 Reports

HCB workers, contractors, suppliers and partners have an obligation to report any concern, suspicion or incident of inequality, child and/or forced labour, gender-based violence, harassment, exploitation or sexual abuse suffered by another person.

There will be no consequences if the reported concerns or suspicions prove to be false, provided the reports were made in good faith. Your willingness to raise a concern may protect someone from further abuse.

The reporting person may choose to remain anonymous. The contents of all reports will be handled confidentially and will not be disclosed to any third party except as necessary to conduct a full and fair investigation.

Every report will result in an investigation whenever there is sufficient information available to do so.

The Grievance registration procedure shall apply to reports.

8.6.6 Fauna Dispersal and Rescue Procedures

8.6.6.1 Objectives

The procedure for driving away and rescuing fauna is implemented in the areas to be cleared to minimise negative impacts on fauna, especially the more vulnerable animals that are difficult to move, namely reptiles and amphibians.

8.6.6.2 Methodology

The dispersal and rescue of fauna must be conducted before the mechanised clearing of the land begins. This procedure includes the rescue of vulnerable individuals, such as females with young or nests, the rescue of slow-moving animals and their release in places not affected by these activities.

A record will be made of all animals sighted and the places where they were released. A photographic record will also be made.

8.6.6.3 Equipment used

The following equipment is necessary for the implementation of the Programme:

- Safety and protective equipment for workers:

- steel-toed boots,
- reflective waistcoat,
- safety goggles,
- hard hat,
- gloves,
- safety leg guards,
- trousers and long-sleeved shirt,
- ear protection,
- mask for respiratory protection.

- Boxes for animal rescue;
- Clamps for animal capture
- Photo cameras;
- GPS;
- Canteen.

8.6.6.4 Activity Frequency

The driving away activities will be carried out whenever there are any deforestation actions.

8.6.6.5 Animal Registration

The Table below is an example of registration of Animal Dispersal and Rescue Procedure.

Table 8-18- Example of Registration of Dispersed/Rescued/Run over Animals

Coordinates/Location	Vernacular Name	Popular Name	Scientific Name	Chased Away	Ran over	Rescued	Total

8.6.7 Procedure for Cultural Heritage Incidental Finds

8.6.7.1 Rationale and Objectives

Construction of the project will involve deforestation and earth moving. These activities have the potential to impact on archaeological sites or elements that may exist in these areas. Although no archaeological sites have been identified within the project area, it should be noted that archaeological surveys are based only on the identification of surface remains, so it is possible that sites or elements of heritage interest may still be found during construction works.

The “incidental finds” procedure describes the actions to be taken following the discovery of an archaeological site or element, including its investigation and evaluation by an archaeologist or other suitably qualified technician, to avoid and/or reduce the project's risks to cultural heritage, in accordance with best international practices.

8.6.7.2 Legal Framework

The “incidental finds” procedure aims to ensure compliance with the relevant provisions of the Law for the Protection of Cultural Heritage (Law no. 10/88 of 22 December), which defines sites or places of archaeological or anthropological interest as material cultural assets.

The procedure also aims to ensure compliance with international best practice guidelines, in particular the World Bank's ESS 8 (Cultural Heritage), which requires the implementation of a chance finding procedure to frame what will happen if previously unknown heritage resources, in particular archaeological resources, are found during the construction or operation of the project.

8.6.7.3 Procedure for Incidental Finds

If a heritage or archaeological site is discovered during the construction phase of the Project, the actions detailed in Error! Reference source not found. shall be applied.

Table 8-19 - Procedure of incidental finds - actions and implementation calendar

Action	Responsibility
- If a heritage or archaeological site is found or discovered during construction, work must stop immediately and the TCSA or its representative on site must be notified of the discovery.	Person who finds the archaeological or heritage material
- Mark the site with red tape and determine the GPS position, if possible; - Determine if work can proceed without damaging the find; - Determine and mark an exclusion area; - Appoint a qualified specialist (archaeologist) for field evaluation of the fortuitous find.	Contractor

Action	Responsibility
- Inspect the site and assess the scientific or cultural importance of the findings; - If the findings are of scientific or cultural importance, they must be reported to the National Directorate of Cultural Heritage; - Define appropriate mitigation measures depending on the relevance of the findings. These may include *in situ* protection, excavation and subsequent removal or simple removal from the site, as applicable; - Request written authorization from the National Directorate of Cultural Heritage to remove the findings from the work area, or to implement other relevant mitigation measures; - Collection, packaging and labelling of findings for transfer to museum, if relevant.	Qualified Specialist (Archaeologist)

8.6.8 Environment, Health and Safety Training Programme

All workers shall get training when they are hired, every year and whenever justifiable. The main topics to be addressed for the different target audiences are specified below.

HCB in collaboration with Owner's Engineer will develop all the topics to be addressed in the training sessions. However the Owner's Engineer will be responsible to provide the trainings and keep all records.

8.6.8.1 Objectives

The objective of this programme is to establish criteria and actions for the training of workers on environment, health and safety issues.

8.6.8.2 Proposed actions and implementation timeline

Awareness-raising Actions

The following table summarises the proposed actions and the schedule for their implementation.

Table 8-20 - Training actions, description and implementation timeline

Awareness Action	Description	Implementation schedule
Basic Training	- Basic information on classification of different types of waste; - Disclosure of a code of conduct: - Do not dump or leave waste (hazardous and non-hazardous) on the ground, in watercourses, or the sea; - Do not bury waste (hazardous or non-hazardous); - Do not burn waste (hazardous and non-hazardous); - Do not eat food or drink in workplaces where there may be contamination.	Upon hiring, annually and whenever justified
Waste Management	- Information regarding the characteristics and risks inherent in the handling of each type of waste; - Specific training for the safe and correct execution of the different tasks they perform in the collection, separation, transport and/or storage; - Specific training for the correct and safe handling, transport and storage of hazardous waste;	Upon hiring, annually and whenever justified

Awareness Action	Description	Implementation schedule
	- Raising awareness about the proper use of personal protective equipment necessary for carrying out their activities; - Specific training for driving vehicles; - Emergency procedures in case of contact with waste at an individual level; - Emergency procedures in case of spillage and waste contamination.	
Other training actions	- Periodic campaigns to raise employee awareness through posters, distribution of information leaflets and lectures.	Annually and whenever justified
Health and safety	- Develop a clear STD and HIV and AIDS policy and implement a worker awareness campaign.	Upon hiring, annually and whenever justified
	- Raising awareness of the use of emergency equipment to fight fires, spills and leaks, both from vehicles and machines (fire extinguishers, absorbent material for oil spills, etc.).	
	- Raising awareness of the use of a first-aid post and a vehicle for transporting victims.	
	- Carry out awareness-raising actions to ensure that all employees are aware of the Emergency Response Plan and their commitment to the actions that are their responsibility; - Promote simulations for different emergency scenarios.	
GBV/SEA	- Carry out awareness-raising actions on GBV and SEA - Periodic campaigns to raise employee awareness through posters, distribution of information leaflets and lectures.	Upon hiring, annually and whenever justified
GRM	- Carry out awareness-raising actions on resolution process of related grievance. - Periodic campaigns to raise employee awareness through posters, distribution of information leaflets and lectures.	Upon hiring, annually and whenever justified

Systematic and/or Periodic Monitoring and Verification Actions

The following table summarises the systematic and/or periodic follow-up and/or verification actions and the schedule for their implementation.

Table 8-21- Systematic and/or periodic follow-up and/or verification actions, description and implementation timeline

Action follow-up and/or verification	Description	Implementation schedule
Training of workers	Ensure that all unit workers receive specific training to carry out their activity safely and correctly.	Upon hiring, annually and whenever justified
	Review training records.	

8.6.8.3 Performance Indicators

The following performance indicators should be considered:

- Number of awareness-raising actions performed;
- Number of trainees per awareness-raising action;
- Number of incidents and non-conformities.

Performance indicators should be accounted for monthly and compiled into a quarterly report.

8.6.8.4 Records

The documents required are summarised in the table below. These are to be prepared, filled and maintained as part of this programme.

Table 8-22 - Documents linked to the Environmental and Safety Training Programme

Document title	Document type	Reporting frequency
Awareness action program	Inspection	Quarterly
Attendance record	Registration	Quarterly

8.6.9 Emergency Response Plan

During construction/operation (maintenance) activities, emergency situations may occur, which are defined as critical and fortuitous situations that involve danger to life and/or the occurrence of continuous damage to people, the environment or property.

As such, immediate operational intervention is required to contain such situations, should they occur, and thus prevent/minimise the potential environmental impacts resulting from them.

The Emergency Response Plan (ERP) aims to frame the required actions to ensure the mentioned intervention in a timely and adequate manner, and in accordance with the HCB General Self-Protection Measures (GSPM), namely the “Songo Substation Self-Protection Measures (volume 2)”.

The ERP must foresee the necessary procedures for interventions in emergency situations, with special attention to the actions to be developed after the occurrence of incidents or emergency situations, and must be activated whenever an accident takes place, or an uncontrolled incident occurs which, by its nature, may result in emergency situations.

The ERP has a dynamic nature, i.e., the information contained in this document must be updated with the necessary frequency and always in accordance with the legislation in force.

The characteristics of the accident must also be considered in the emergency response planning, since there may be a need for integration of the means available in the SS (HCB Fire Brigade, Medical Post, G4S) and, simultaneously, of the external entities (Fire Brigade - SENSAP, Police of the Republic of Mozambique, Hospitals, National Institute for Disaster Risk Reduction and Management, Media, among others).

8.6.9.1 Objectives

The ERP aims to provide guidelines on the actions to be taken in the event of emergency situations occurring during the project cycle that may have an impact on workers' health or on the environment, with a view to ensuring rapid and effective intervention and thus containing their potential negative implications for people, the environment or property.

It is thus necessary to systematise the set of norms and rules of procedure aimed at minimising the effects of possible accidents or incidents that could potentially occur, managing the available

resources in an optimised manner. The ERP represents an essential instrument of prevention, aiming at:

- The identification of emergency situations inherent to the Project;
- The communication process in case of emergency;
- The distribution of responsibilities and tasks;
- The creation of Risk Scenarios and the procedures to follow in the event of an accident.

To conduct an appropriate planning of intervention actions in case of emergency, the specific characteristics of the project and its surroundings must be considered.

8.6.9.2 Definitions

The following are definitions and concepts that must be noted within the scope of emergency response activities.

Accident Control	The management, direction, control and leadership of staff/teams to provide a response to preserve human life, the environment and heritage.
Emergency	A critical and fortuitous situation that represents danger to life, the environment and heritage, generating ongoing damage that requires immediate operational intervention.
Emergency Response	Actions taken at the site of an accident to preserve life, the environment and property. The emergency response incorporates actions taken by the company itself, partners, municipal services and other authorities/agencies.
Preparation for Response Actions	Includes all activities of assembly and installation of equipment and/or communication for possible emergency situations.
Response	Includes all emergency response activities after the impact of an emergency is felt (including those actions taken immediately before the impact occurs).

8.6.9.3 Application

The provisions of this document apply to prevention and to all emergency situations that may eventually occur, particularly to those typified as Emergency Scenarios in this ERP, which include specific procedures to follow in case of emergency.

For the preparation of this ERP, we considered that the areas of scope are those directly related with the support and logistical facilities, for the construction and operation phases of the Songo SS Converter.

Thus, the area covered by the ERP is:

- The Songo Converter SS and respective access roads;
- The SS expansion implementation area;
- The implementation area of temporary structures, such as the construction site and associated infrastructures, like the canteen, warehouse, medical post, etc.;

- The front area of the building site where construction activities take place.

8.6.9.4 Legal Framework

The ERP establishes safety rules and procedures in the event of accidents, as well as structural measures to complement the prevention and minimisation of risk situations.

The Environment Law (Law 20/97, of 1 October) prohibits all activities that may threaten biodiversity. The principles of the Law include the protection of biodiversity and ecosystems, giving priority to preventive systems against environmental degradation and adopting a holistic and integrated perspective of the environment.

8.6.9.5 Proposed Actions

An incident that affects any area or sector of the Songo converter SS has the potential to affect the areas surrounding that of its origin, and requires an immediate response. In this sense, HCB should plan to manage most incidents autonomously with existing resources.

The occurrence of an incident has the potential to constitute an emergency, which may arise at any time, without warning or with a limited warning in time. The existence of the chain of events during an emergency scenario is unpredictable, and thus, the ERP should be seen as a guiding document and adapted according to the project specifications and the specific needs of each situation in which it is activated.

In this way, when an emergency arises, the priorities in the action of the HCB security teams are:

- The preservation and protection of people;
- The protection and recovery of heritage and infrastructures;
- Protection of the environment;
- Ensuring the continuity of operations/activities;
- Stabilisation of the emergency;
- The complete recovery to the conditions prior to the incident.

The security organisation structures in emergency situations on HCB comprise various intervention units (**Figure 8-2**), such as the Fire Safety Unit (FSU) and the Emergency Operations Situation Centre (EOC), the Fire Brigade (FB), which also includes the Security Manager and the Security Delegate (SM and SD, respectively), and the Internal Security Structure (1st Intervention Team, Evacuation Team, First Aid Team and Maintenance Team), each with their own duly established roles [see Self-Protection Measures for the Songo converter SS (volume 2)].

In the event of emergency situations with the potential occurrence of work accidents or environmental impact (such as fires and dangerous product spillages), the safety teams should be prepared to immediately set a series of actions in motion with a view to containing such situations and thus preventing the potential negative impacts resulting from them.

The safety teams are made up of a group of professionals, who are HCB workers and are duly organised and prepared, and who have the resources to intervene in the event of an event that involves risk. They have appropriate training, including the provision of first aid, and are therefore qualified to act in response to scenarios of various natures, such as fires, explosions, dangerous product spillages, floods, earthquakes, etc. Each team is composed of 6 (six) elements and is subdivided into 3 (three) teams of 2 (two) elements each (**Figure 8-3**).

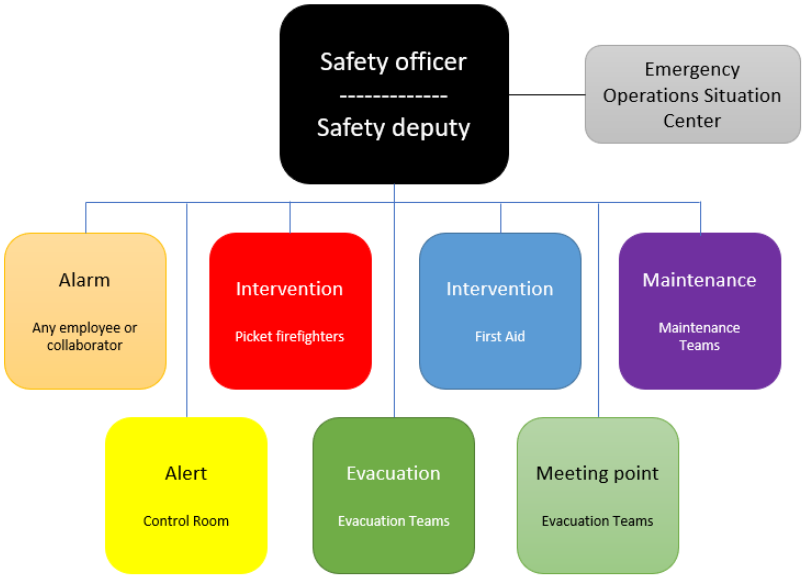


Figure 8-2 – Organisation chart of the emergency intervention and response units

First intervention team	Evacuation Team	First aid team	Maintenance team
- intervene with the appropriate means to extinguish fire - use of fire extinguishers and fire hydrants	- evacuation of the sectors assigned to it in accordance with established procedures - check that the zones have been fully evacuated - lead all workers to the Meeting Point	- provide support to victims - inform the COE and DS about the number of injured people and the exact location where they are - promote the evacuation of victims	- ensure technical support in emergency control (e.g. carry out power and/or fluid cuts, control of equipment, transport of materials, etc.) - support to other emergency teams

Figure 8-3 – Security teams' duties

The control room and the EOC support the security teams and, if the emergency lasts for a longer period, it may be necessary to set up an Emergency Office (EO).

Internal procedures for emergency intervention and response should be established, so that appropriate responsibilities are delegated to the different security team members. In other words, in

case of emergency, and depending on the situation detected, there should be an alarm known by all the SS players, alerting them to the actions to take informing of the location of the incident/accident, type of occurrence, if there are victims involved, etc., so that evacuation can be arranged, firefighting can be carried out, toxic fluids can be contained and removed, etc.

To facilitate the **evacuation** of the areas affected by the accident or incident, it is extremely important to organise an exit for all people and prevent third parties from risking entering. In this sense, it is essential to know the circulation routes, so that evacuation is facilitated and conducted in a safe manner.

There must be emergency plans, placed in visible places, so that workers know the evacuation routes and where to go in case of emergency. At the time of the initial training/introduction, the workers who make up the Evacuation Group in each area of operation of the SS should be identified, so that all workers are aware of whom they should follow in the event of an emergency.

The provision of **first aid** is another task of the safety teams, and is fundamental in the event of serious accidents that have harmful consequences for the health and well-being of workers. In these situations, first aid should be given to workers, and in more serious situations, specialised medical services should be awaited at the designated place for triage of the injured.

Given the probable inexistence and/or unavailability of public structures capable of intervening in emergency situations in suitable time, HCB created a Fire Brigade. The motivation was to obtain an autonomous capacity to intervene in matters of safety against fires and other risks in its premises, creating a body capable of intervening technically and operationally in emergency situations. Within the scope of Self-Protection Measures, safety teams have been formed and are equipped with the basic means, equipment and knowledge that give them autonomy and the ability to respond in a first intervention manner to emergency situations that may arise. To that end, they receive regular and up-to-date training/awareness-raising on how to act and the actions to take when any emergency is identified.

The following aspects should be considered so that the actions developed by the security teams are efficient and effective:

- There should be the necessary means to trigger the primary actions for which the elements of the security teams have been trained, namely fire extinguishers in the facilities and vehicles used in the activities, and adequate containers for the storage of contaminated materials (following the actions of containment of oil spills or other hazardous products) and first aid kit;
- All members of the safety teams shall get instructions concerning the procedures to be adopted when any emergency is identified, namely with regards to how to communicate the situation identified. In this way, all workers should know who make up the security teams, so that they can quickly report any occurrence to the member of that team closest to the site of the occurrence;

- The security teams, namely the SD should prepare a brief report (which may be summarised as the completion of an “emergency action form”) at the end of any emergency for which they have been called to intervene, and this report should be sent to the SM and/or the EO;
- Once the occurrence of any incident/accident is reported, the SD shall communicate and interact as necessary, and according to the situation, with the Environmental Management Department;
- In case of incapacity to fully contain and resolve the situation or unavailability of resources to contain the emergency in a satisfactory manner, or even in more serious cases, the security teams shall request instructions and/or support from the SD, SM, or the EO.

8.6.9.6 Definition of Emergency Situations

The emergency response procedures aim at identifying the actors involved and defining their specific patterns of action in case of emergency. These actions allow one to effectively fight the disaster and minimise its consequences, to ensure the physical integrity of all people working at the SS, environmental protection, the safety of assets and that the equipment remains operational.

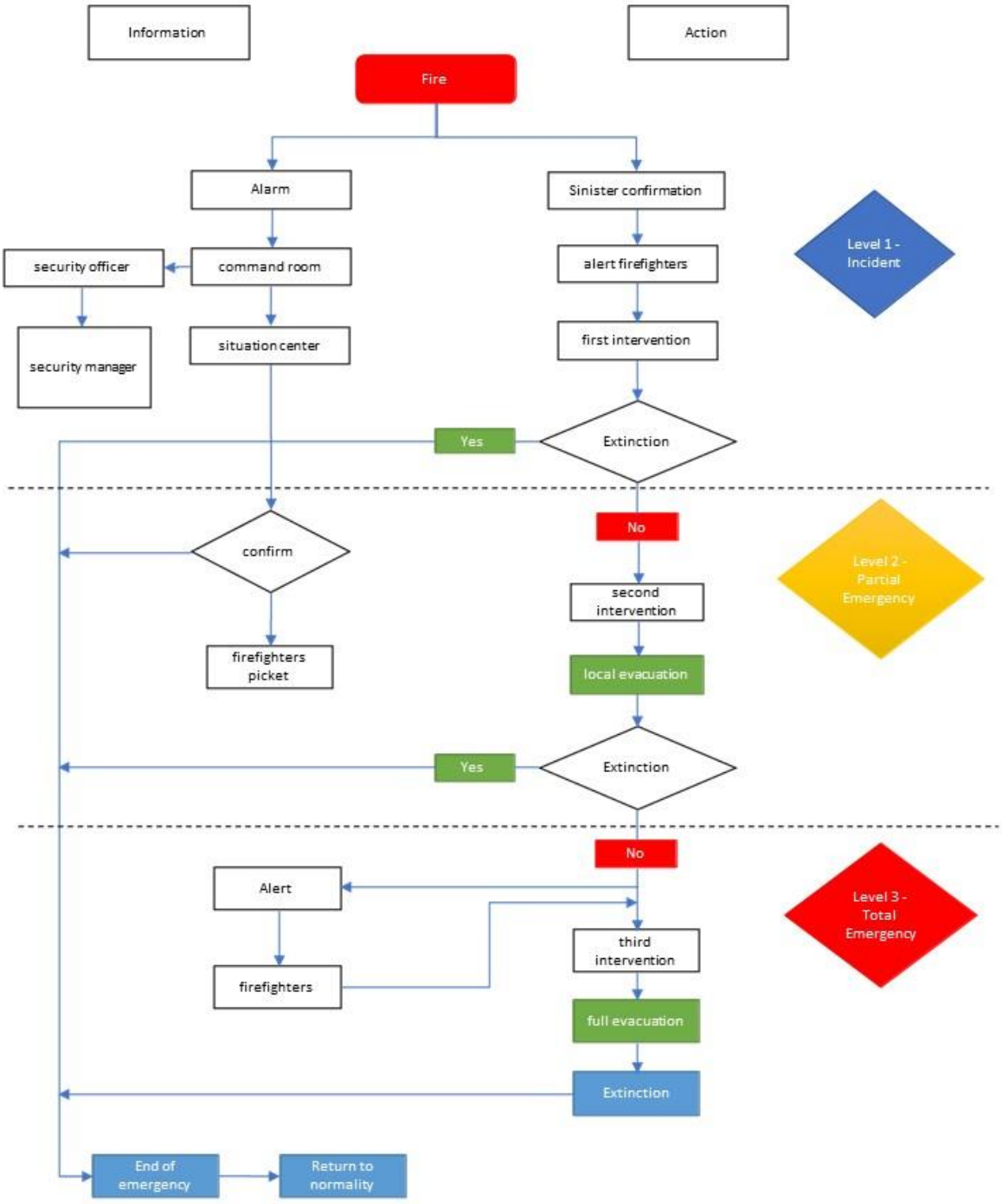
The response procedures for the main emergency situations defined by HCB in the Self-Protection Measures for the Songo SS are presented below:

- Fire;
- Explosion;
- Hazardous Substance Spill;
- Gas Leak;
- Accidents at work (falls, traumas, burns, sudden illnesses, etc.);
- Social Threat;
- Earthquake.

Fire

Objective: Establish a guideline for action in the event of a fire occurring.

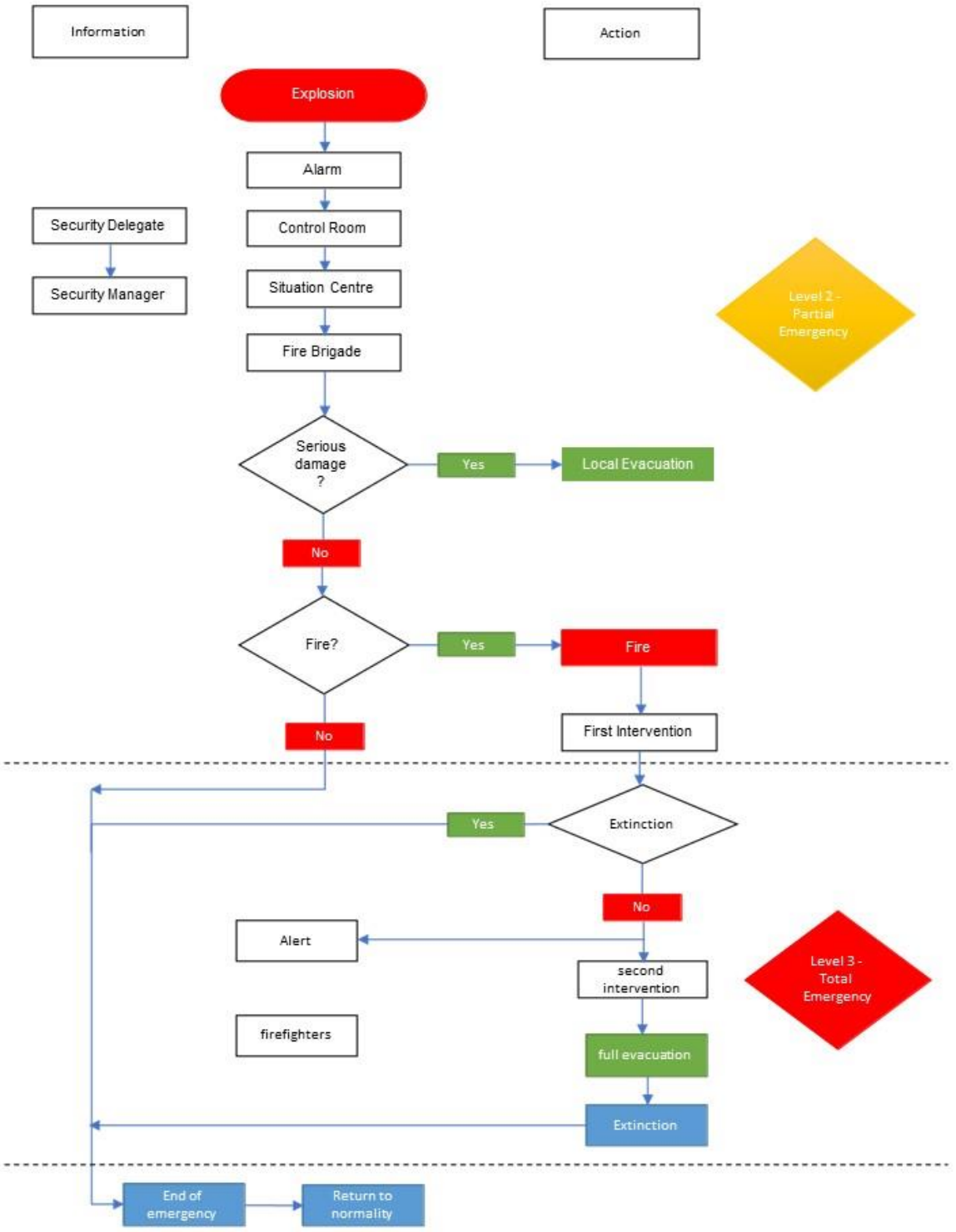
How to act in case of emergency:



Explosion

Objective: Establish a guideline for action in the event of an explosion occurring.

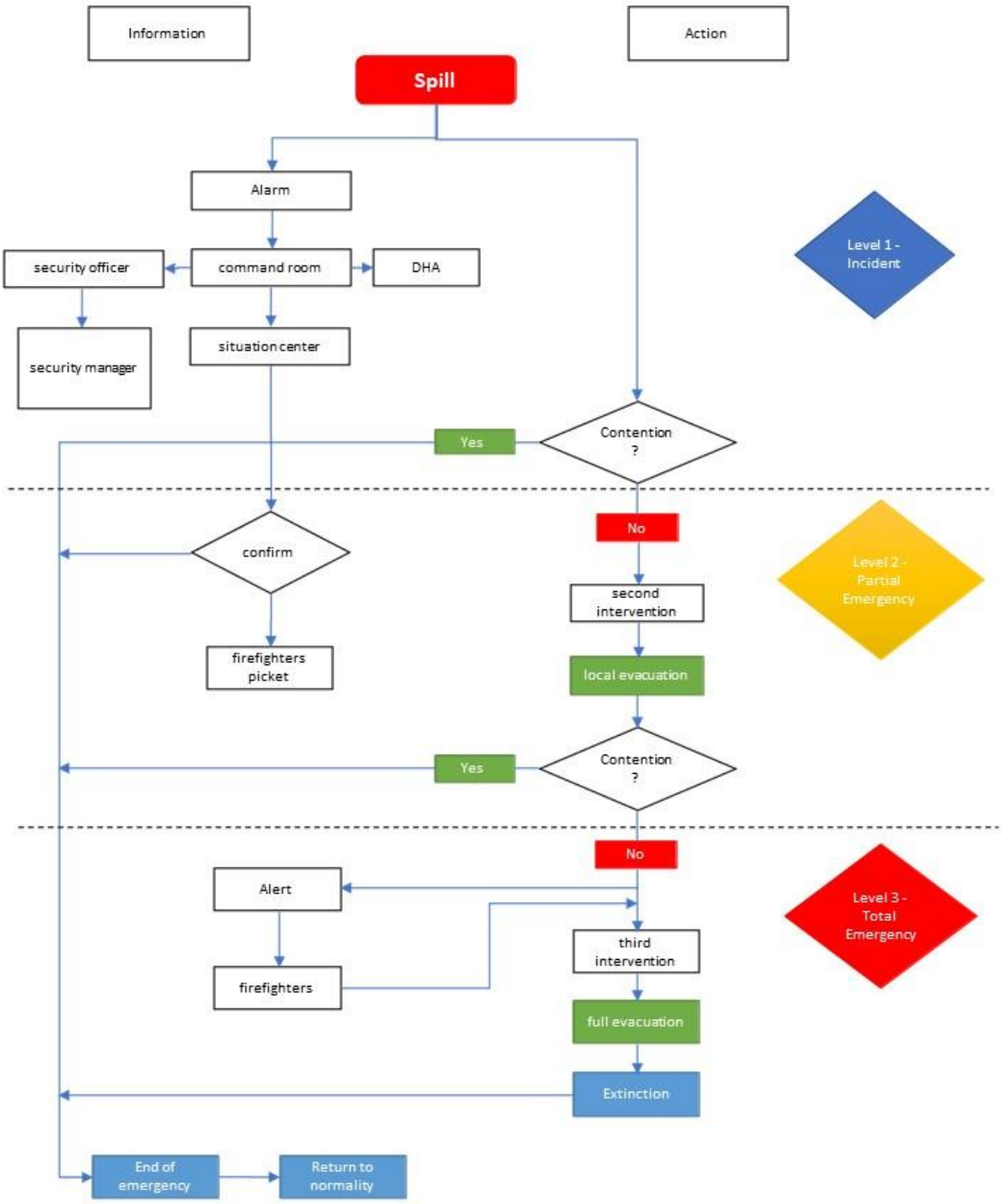
How to act in case of emergency:



Hazardous Substance Spill

Objective: Establish a guideline for action in the event of a hazardous product spill occurring.

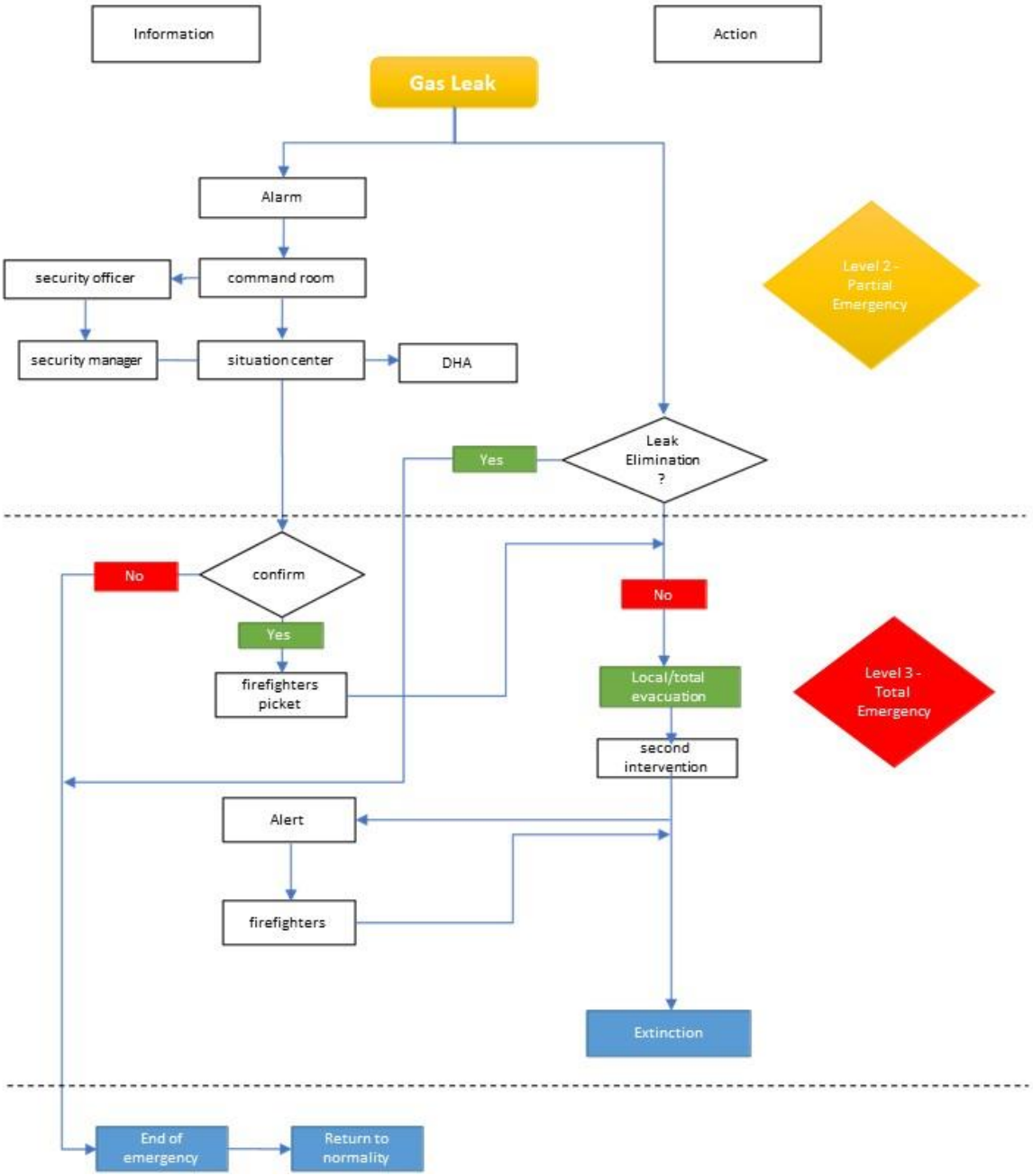
How to act in case of emergency:



Gas Leak

Objective: Establish a guideline for action in the event of a gas leak occurring.

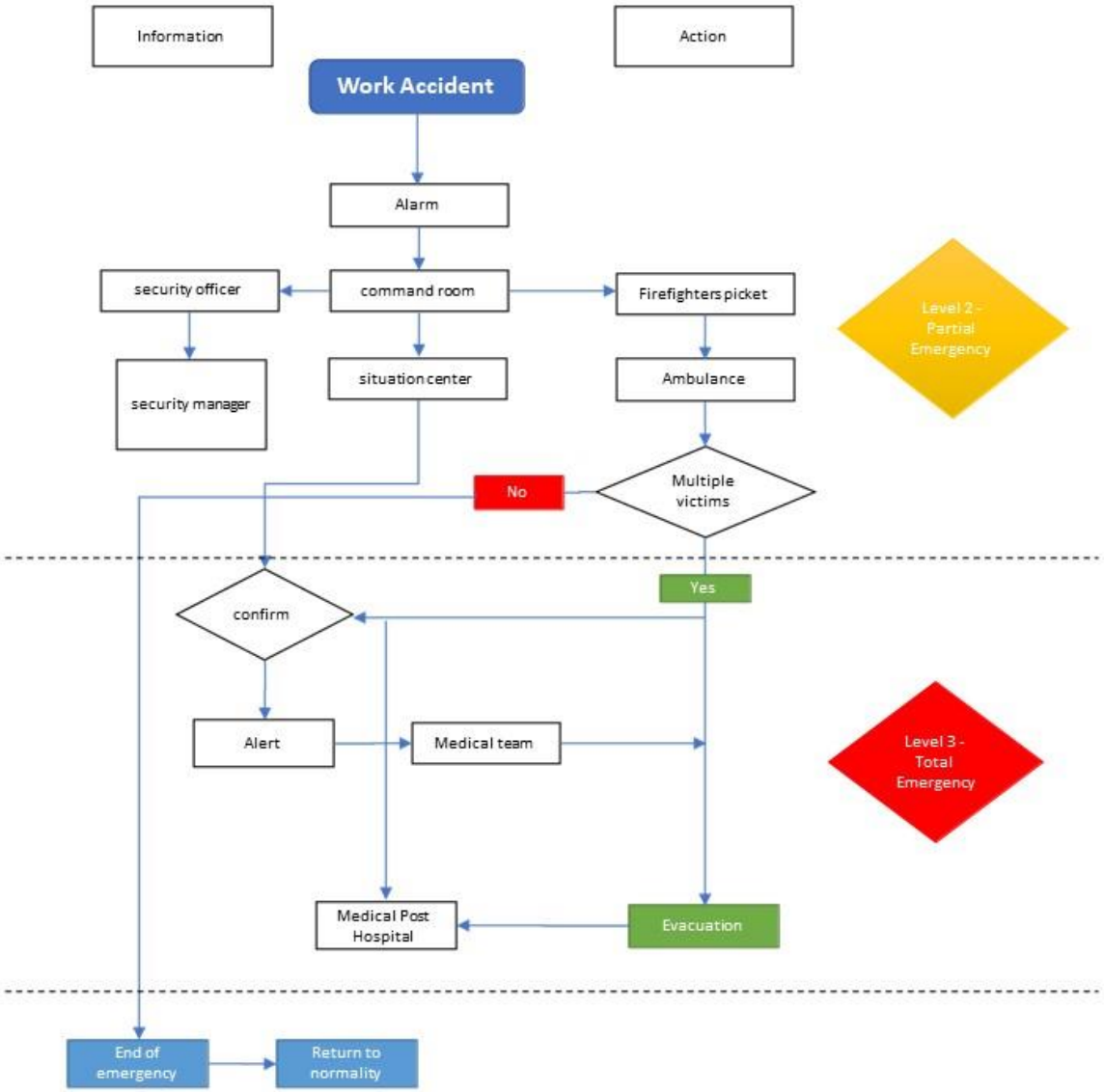
How to act in case of emergency:



Work accidents

Objective: Establish a guideline for action in the event of occurrence of bodily injury due to accidents at work (falls, traumas, burns, sudden illnesses, etc.).

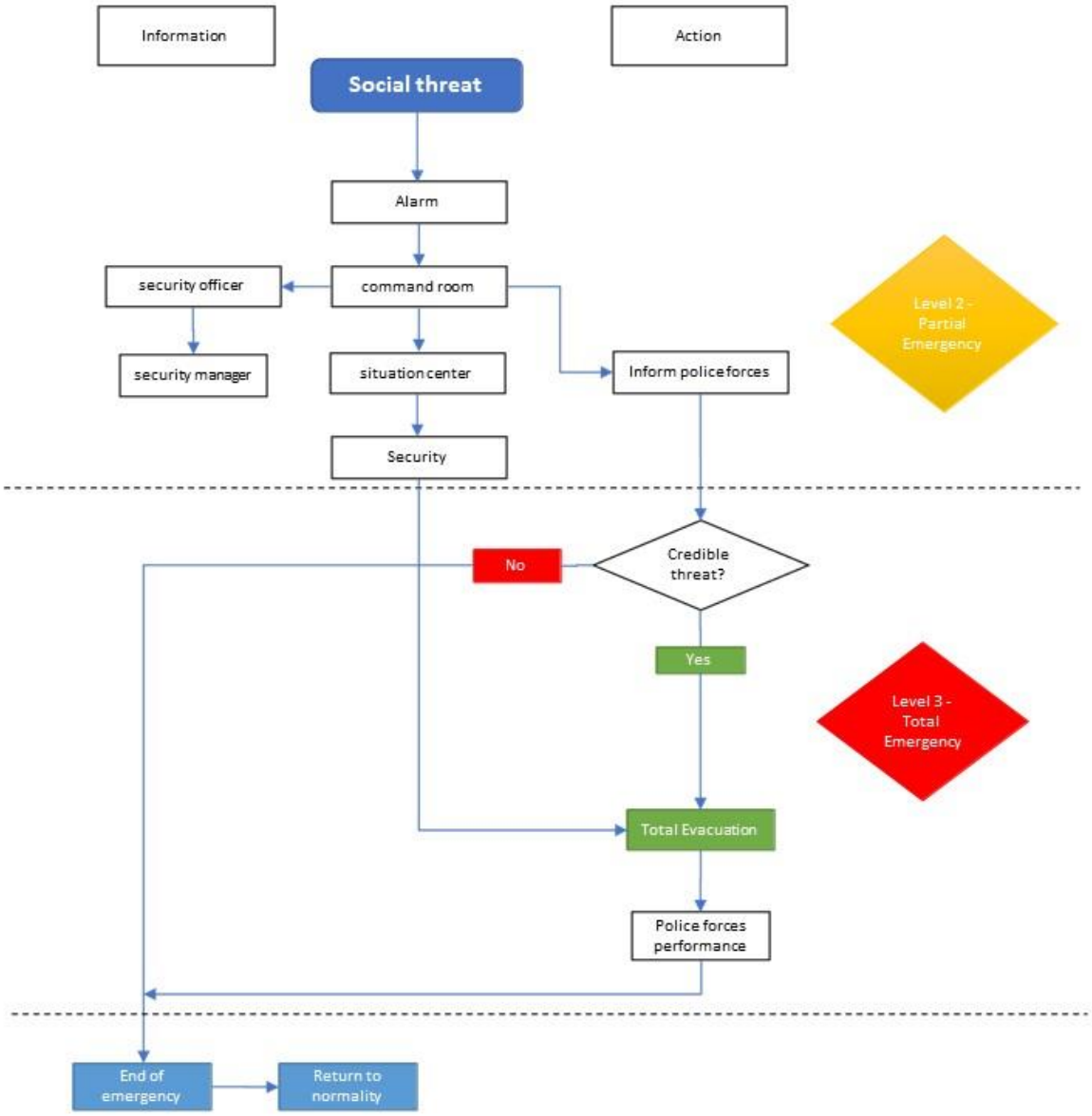
How to act in case of emergency:



Social Threat

Objective: Establish a guideline for action in the event of a social threat occurring.

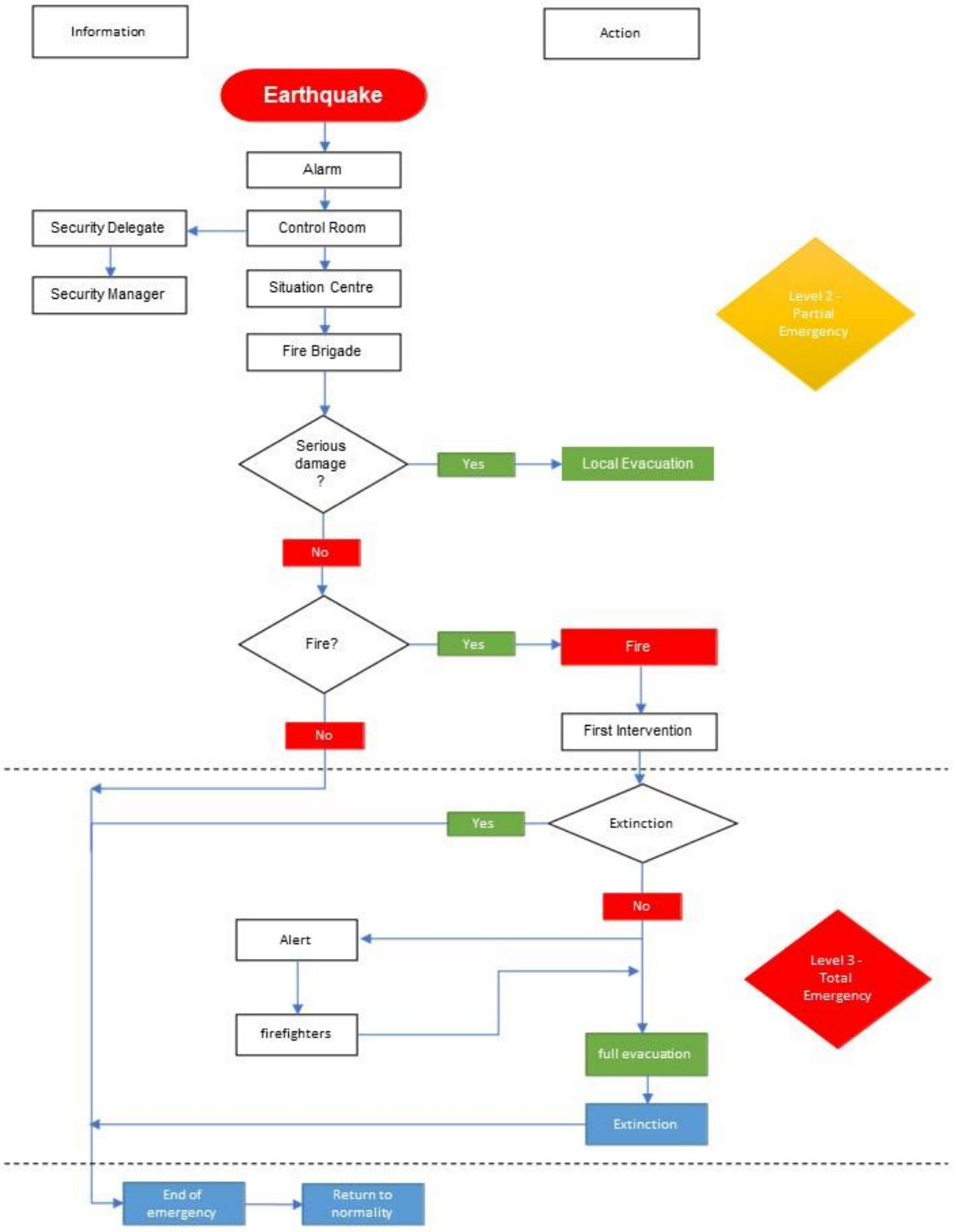
How to act in case of emergency:



Earthquake

Objective: Establish a guideline for action in the event of an earthquake occurring.

How to act in case of emergency:



8.7 Environmental and Social Monitoring Plan

The Environmental and Social Monitoring Plan must comply with the current and applicable legal requirements. Monitoring plans were prepared, which were informed by the Environmental Impact Study, namely:

It should be noted that the monitoring programme is dynamic and should change over time in accordance with different phases of the mine. The programme will be reviewed and revised if necessary.

The objectives of the environmental monitoring system are to:

- Prevent and minimise the environmental impacts associated with the proposed project construction and operation;
- Ensure that the ESMP performs according to mitigation statements;
- Check compliance with the licence requirements; and
- Ensure consistent auditing and reporting protocols.

The HCB shall undertake internal audits for compliance and continual improvement purposes. If, when compared with the baseline characterisation, a significant increase in the concentration of monitored parameters is identified, measures should be adopted including additional environmental management precautions and the establishment of temporary containment or treatment structures.

8.8 Estimated Budget

Most of the costs associated with the development of specific social and environmental management plans and the implementation of mitigation measures cannot be specified at this stage of the project. Many of these measures will be the responsibility of the Contractor(s) who will oversee the project construction; therefore these costs will be integrated in the construction costs.

It should be noted that the ESMP must be attached to the Tender Documents to ensure that these activities are placed under the responsibility of the Contractor(s) and quoted as part of their bids. The ESMP for each contractor will include a budget to be approved by HCB.

Additionally, given that the implementation of operational measures will be the responsibility of the HCB, part of the operational budget required to implement the measures is not known at this time. The budget estimate shown below for the operation phase is limited to the first five years of operation.

The following table presents a preliminary estimate of the budget for the ESMP, based on the main costs. It should be noted that resettlement costs are not included in the table below.

Table 8-23- Preliminary Estimated ESMP Budget based on core costs

Phase	Item	Cost (USD)
Pre-construction	**Environment, Health and Safety Training Programme;**	**$5,000**
	Pre-construction Subtotal	**$5,000**
Construction	Develop and implement the Communication Plan	$5,000
	Community awareness campaigns during construction	$5,000
	Development and implementation of the Waste Management Plan for the construction phase (Including PCB safe disposal)	$1,000,000
	Set and implement the Project's CRM	$5,000
	Develop and implement a GBV/SEA Plan	$5,000
	Procedure for Cultural Heritage Incidental Finds	$2,500
	Environmental management, auditing and monitoring activities[4]	$100,000
	Construction Subtotal	**$1,122,500**
Operations	Development of an Emergency Response Programme, including the acquisition of spill response kits	$75,000
	Development and implementation of the Waste Management Plan for the operation phase	$60,000
	Development and implementation of a Communication Plan and Grievance Response Mechanism (GRM) for the operation phase	$5,000
	Monitoring social and environmental performance, including the development of adaptive mitigation measures (if necessary)	$50,000
	Operation Subtotal	**$190,000**
	Contingency Fund (~20% of the construction and operating budget)	**$263,500**
	Preliminary Global Total (per year)	**$1,581,000**

4 Including preparatory activities.

8.9 Audits

The Regulation on the Environmental Audit Process approved by Decree No. 25/2011, of 15 June, requires annual environmental audits, for the operation, closure and restoration phases, of particular activities that have the potential to cause environmental damage, in order to ensure compliance with the approved ESMP.

HCB must conduct annual internal audits to verify the correct implementation of this ESMP.

The audits should encompass all processes and installations within the functioning and operation of the SS.

An independent auditor should conduct annual audits, except were indicated in the conditions of approval issued by the environmental authority.

A protocol for conducting internal audits should be established and checklists developed for each of the components inherent to the operation of the SS and the requirements of this ESMP.

The audit programme should include the following:

- The list of issues to be audited;
- A report on the audit findings;
- A performance records.

All non-conformities shall be recorded. Whenever applicable, non-conformity notifications shall be issued. Once non-conformities are known, corrective and preventive actions shall be established to avoid their repetition in the future, a Corrective Action Plan (CAP) shall be drawn up in response to the non-conformities identified.

The notifications shall be recorded, as well as their response, mentioning the date and actions taken.

The audit results should be made available to relevant people, so that any issues identified can be discussed and addressed.

8.10 Performance and Reporting

As part of the ESMP implementation, performance reports should be prepared for the construction phase and the operation phase monthly, respectively. The contractor will prepare environmental and social monthly performance report as part of monthly progress report. HCB will use contractor's environmental and social report to the environmental and social monthly implementation and submit to the Bank (AfDB)

The performance reports aim to:

- Collect information on the quarterly and semi-annual environmental performance management of the Contractor and HCB respectively;
- Demonstrate transparency in responding to disclosure requests from stakeholders (including regulators, investors and communities) with up-to-date and verifiable information on environmental performance;
- Play a role in ensuring full compliance with applicable legal and statutory obligations and promoting internal accountability;
- Give information about the Contractor/HCB's environmental training programmes;
- Help identify opportunities to improve resource use and reduce environmental footprint;
- Support performance benchmarking programs that will help the Contractor/HCB identify the best practices;
- Provide a means of communicating new environmental initiatives being undertaken by the Contractor/HCB.

The SS project performance report should include the following:

- Environmental and sustainability information;
- Activities and status of environmental compliance;
- Results of the environmental monitoring programme;
- Grievance and non-conformities;
- Highlighted actions and successes.

This document shall be prepared, filed and maintained by the Contractor and HCB in order to document the results of the ESMP implementation.

The performance report should be made available every year to relevant persons, including environmental authorities and finance institutions so that any issues identified can be discussed and addressed.

9 Public Participation Process

9.1 Introduction

Public participation is a key element of the ESIA Process. Its main objective is to involve I&APs in the proposed project, so that they can highlight the opportunities, risks and aspects that concern them. Public participation helps the ESIA team and the Proposer to consider locally relevant conditions, avoiding the imposition of potentially insensitive project designs from a social and environmental points of view. Compliance with the basic requirement of public participation is a legal requirement, and failure to comply may cause significant risks to the development of the Project.

The Public Participation Process (PPP) carried out for the ESIA Process of the present Project was carried out by Consultec, Consultores Associados Lda., in accordance with Mozambican legislation and international best practices. The PPP was basically carried out in accordance with the General Directive for the f Public Participation Process in the ESIA Process, Ministerial Diploma nr 130/2006, a diploma that defines the guidelines to be followed in any PPP carried out as part of an EIA process, pursuant to Decree Nr. 54/2015.

According to this legal provision, the PPP to be developed within the scope of this project must include a public meeting to present the project and the ESIA process undertaken.

The general strategy of the PPP for the present project provided for the following activities:

- Definition of COVID-19 prevention Measures to be implemented during the public consultation process and their disclosure to I&APs;
- Disclosure of project information and PPP to I&APs, namely with the provision of the Executive Summary.
- Public consultation meeting in the project area;
- Consideration and analysis of the issues and concerns raised at the meetings or in comments received and inclusion of these in the final ESIA.

The activities developed under the PPP are described below, as well as the main conclusions of the consultation carried out.

9.2 PPP Objectives

The main objective of the consultation process is to inform all I&APs of the proposed activities and their potential impacts, allowing them an opportunity to present their views, concerns and expectations regarding the project.

The PPP is based on the following principles:

- Understanding the social and environmental context of the project area is a fundamental element for a successful impact assessment. I&APs are valuable sources of relevant local information;
- Building and promoting trust in the PPP is critical to positive and effective engagement of I&APs and to ensuring a successful impact assessment process. The key element in building the trust is to ensure an open and transparent EIA process;
- The involvement of I&APs allows for a more comprehensive and defensible EIA process through the comments received and opinions expressed;
- I&APs have the right to express their views and have their concerns answered; and
- The dissemination and availability of information is a fundamental element for a participatory EIA process, constitutes a legal obligation and is aligned with the best practices.

Based on these principles and in accordance with the above-mentioned guidelines, Error! Reference source not found. presents the summary of the goals and objectives of the PPP carried out in the present EIA process.

Table 9-1- Objectives of the PPP

OBJECTIVE	MOTIVATION
Identify all Project I&APs	Involving as many I&APs as possible can facilitate good communication and capture a wider range of questions and concerns. Interaction with stakeholders should aim to represent the perspectives of all stakeholders, including relevant civil society groups.
Disseminate accurate information about the project	Ensure the availability of information to P&IAs, particularly those directly affected by the proposed project, to allow them to make appropriate comments and allow them to plan for their future, thus reducing levels of uncertainty and anxiety. The information should enable the parties to develop an understanding of the potential impacts, risks and benefits of the project.
Collect relevant information for technical and environmental studies	Identifying issues through people familiar with the local environment, and including them within the scope of the assessment, ensures that experts focus on relevant issues. It is equally important to ensure the best design and proper management of the project.
Promotion of constructive interaction between all parties	Developing a relationship of trust between the developer and I&APs contributes to proactive interactions and avoids, whenever possible, unnecessary conflicts based on rumours and lack of information. Identifying dispute and grievance resolution structures and processes, rather than obstructing disputes, can provide a better understanding of *stakeholder concerns and expectations,* thereby increasing opportunities to enhance the project's benefit to them.
Record and respond to public concerns, questions and suggestions	Documenting I&APs issues allows tracking and justification of project decisions and provides the opportunity for participants to track the inclusion of their input in the planning and design process. This documentation makes it possible to reduce the potential concern of I&APs that their consultation is just a symbolic gesture by the promoters, to respect legal requirements.
I&AP expectations	Maintaining realistic expectations (e.g. around employment opportunities, provision of local infrastructure, social development, disruption of daily life) limits the disillusionment and frustration of directly affected parties at later stages of project implementation. Frustration and unfulfilled expectations are factors that instigate conflicts and require mitigation and management, which can be avoided through an adequate PPP.

OBJECTIVE	MOTIVATION
Comply with national public consultation requirements	Ensuring compliance with regulatory standards can avoid potential project delays resulting from purely procedural issues.

9.3 Identification of Interested Parties

The first step on the PPP was the creation of a I&APs database. Factors considered in the identification of I&APs included the nature, type and location of the project, analysis of other I&APs databases, desk research and the consultants' experience in similar PPPs, including PPPs carried out in Tete Province.

The list of identified I&APs that were invited to participate in the public consultation meeting is presented in the following table. The I&APs identified include government institutions, non-governmental organizations (NGOs), the private sector, academic and research institutions, and civil society in general.

The list of I&APs invited to the public consultation meeting is presented in Error! Reference source not found..

Table 9-2 - List of I&APs

ADMINISTRATIVE LEVEL	INSTITUTION	CATEGORY
National	National Directorate for the Environment (DINAB)	Government Institutions
Tete Province	Provincial Government	Government Institutions
	Tete Provincial Attorney's Office	
	Provincial Secretary of State	
	Provincial Directorate of Territorial Development and Environment	
	Provincial Directorate of Agriculture and Fisheries	
	Provincial Directorate of Mineral Resources and Energy	
	Provincial Directorate of Culture and Tourism	
	Provincial Directorate of Development and Education	
	Provincial Directorate for Gender, Children and Social Action	
	Provincial Directorate of Health	
	Provincial Directorate of Commerce and Industry	
	Provincial Directorate of Transport and Communications	
	Provincial Directorate of Employment, Work and Social Security	
	Provincial Environmental Service	
	Provincial Infrastructure Service	
	Provincial Justice and Labour Service	
	Mozambique Oceanographic Institute	

ADMINISTRATIVE LEVEL	INSTITUTION	CATEGORY
	Human Rights League (LDH)	NGO's
	Foundation for Community Development (FDC)	
	Provincial Union of Peasants	
	Women Paralegals Maria Cussaia	
	Network of Associations for Good Governance - RAMBOG	
	Amanhecer Association for the Protection of Land and Natural Resources (Kubecera - PTRN)	
	Association for Environmental Health - ASA	
	Provincial NGO Forum - FOPRONGT	
	Association of Support and Legal Assistance to Communities - AAAJC	
	National Roads Administration (ANE) Delegation of Tete	Other Institutions
	Zambezi Valley Development Agency	
	Water and Sanitation Infrastructure Administration (AIAS)	
	Fisheries Research Institute (IIP)	
	EDM	
	ARA - Centre	
Cahora Bassa	District Government	Government Institutions
	District Secretary	
	District Planning and Infrastructure Service	
	District Service of Economic Activities	
	District Service of Education, Youth and Technology of Cahora Bassa	
	District Service for Health, Women and Social Action	
	Association of Semi-Industrial Fishermen of the Cahora Bassa Reservoir	Local Associations
	Association of Artisanal Fishermen of the Cahora Bassa Reservoir	
	Community Radio of Cahora Bassa	Press
	Local Leaders (1st, 2nd and 3rd tier)	Local communities and personalities
	Local Communities (Stakeholders)	

Invitation letters were sent to specific institutions previously identified. In addition to these direct invitations, a public announcement of the meeting was published, as described in the next subchapter. During the consultation meeting, an attendance sheet was always available for the formal registration of all participants.

9.4 Information Disclosure and Public Consultation Announcement

As per the ESIA regulations, and considering the type and nature of the I&APs identified, a couple of channels were used to publicize the project and the respective public consultation meeting, namely:

- Advertisements in Songo Community Radio (Annex V);
- Direct invitations through letters and emails accompanied with the Non-Technical Summary - with Project key information to the relevant entities;
- Phone calls to confirm the invitations reception;
- Opening, by the Environmental Consultant, of communication channels (e-mail, fax, telephone, web page) to receive questions/suggestions from the public regarding the Project and respective publicity of the ESIA in these channels.

The delivering of individual invitations, through letters, aims to publicize the public consultation with institutional stakeholders, including governmental and non-governmental institutions. The letters were sent in the two weeks preceding the public meeting (Annex VI).

To allow the consultation of technical documents, the Preliminary ESIA Report, including the respective Executive Summary, were made available to the public, during the two weeks before the public meetings, in the following places:

- HCB Headquarters in Songo Village; and
- Consultec office in Tete City.

In addition to these locations, the ESIA was also available at Consultec's website (https://www.consultec.co.mz/) during the PPP period.

9.5 Public Consultation Meeting

One public consultation meeting was held as part of the project, in Songo Village, Tete province. The meeting took place 15 days after the announcement, to allow sufficient time for I&APs to effectively participate in the project's public consultation meetings.

After the publication of the announcement and the distribution of individual invitations to the identified I&APs, telephone calls were made to confirm participation and formalize registration on the dates/times available for the public consultation meetings.

Table 9-3 shows the place where the public meeting was held, the date as well as the number of registered participants (Annex VIII).

Table 9-3- Meeting general information

Place	Venue/Room	Date | 2022	Participants
Songo Village	HCB Cultural Centre	May 23rd	**30 Participants enrolled, including:** - Representatives of Provincial Government Institutions and the Provincial State Secretariat, namely: Provincial Environment Service (SPA), and Provincial Directorate of Public Housework. - Representatives of other public institutions such as the Centre Water Administration (ARA-Centro). - Representatives of Fisheries Associations (Kapenta). - Representative of Songo Community Radio. - HCB Departments

9.6 Summary of Public Consultation Meeting

During the meeting held, the proposed Project and the main conclusions of the ESIA report were presented, based on an audio-visual presentation composed of 23 *slides* that addressed different aspects of the project and the ongoing ESIA process, as listed in the following table.

Table 9-4- Aspects highlighted in the presentation

Theme	Description
Project Characteristics _	- Main Components of the Project - Project Phases and Main Activities - Preliminary Investment Values
Description of the Environment in the Project Area	- Physical Environment - Biotic Environment - Social Environment
Environmental Impact Assessment Process	- Legislative Framework - Objectives of the EIA Process - EIA Process Phase
Identification of Potentials impacts	- Potential Impacts, causes and common mitigation or enhancement measures
Environmental Management Plan (EMP)	- Description of the management plans

The Executive Summary was distributed to all meeting participants. After the presentation, a period for open debate was reserved, during which the I&APs were encouraged to express their views and ask their questions, regarding both, the Project and the ESIA Process.

The presentation and clarifications were made using simple, objective and clear language, to facilitate the understanding and enhancing of the consequent debates. All comments and suggestions made are recorded and compiled in this report.

At the end of the meeting, the I&APs were informed that they could submit additional comments and suggestions until June 6th, 2022, through telephone, email and fax addresses provided at the meeting and disclosed in the Executive Summary that was distributed.

The following photos illustrate some of the meetings held.

Figure 9-1 - Photographic record

9.7 Main Questions Collected

The main questions, suggestions and comments collected in the public consultation meeting are presented (Annex VII), at this point, in a summarized and non-exhaustive way.

Table 9-5 - Summary of the main issues addressed in the meetings held

Component	Main issues (Q), concerns, comments (C) and suggestions (S) addressed
Technical aspects	- What will be the rainwater treatment system in the substation? (Q) - (A)The rainwater in the substation yard is all channelled to decanters system that was installed in the substation and which is subject to periodic monitoring as stated in the Water Resource Management Program for HCB Operation ESMP.

Component	Main issues (Q), concerns, comments (C) and suggestions (S) addressed
	- Final destiny of the equipment's and materials that will be removed from both infrastructures. (Q) - (A) The final destiny of material and equipment dismantled from the project will be according to the Waste management Plan in line with national legislation and international best pratices. Non-hazardous waste (scrap metal) will be sold for recycling company, while hazardous waste PCB containing equipment will be destroyed in South Africa as per SAPP Guidelines. Other hazardous waste will be disposed within the country by licensed companies. There also a plan to stablish a HCB Museum to keep the history of HCB technology.
About environmental aspects	- Will there be a decrease on the actual flows in the dam? (Q) - (A) The variation of levels during HPP rehabilitation will be properly monitored , and even if there is some reduction in the generation level of the plant, the spill gates will be opened to compensate the outflow and keep the environmental flow downstream - What are the main impacts of the project downstream of the dam? (Q) - The plan is to stop one generator per year for rehabilitation. With 4 generator working there will be no impact on outflow level downstream. But as stated above if needed the spill gates will be opened.
About socio-economic aspects	- It is important to consider community action plan to cover social demands. (C) - The contractor must have its own Social Responsibility Plan - This action plan will have to be implemented by the contractor to avoid any responsibility to HCB. (C)

All the concerns raised by the stakeholder is well captured and addressed in the ESMP and will be included in the Contractor´s ESMP.

9.8 Comments Received

After the public meeting, a period of 15 days was considered for the reception of comments during which I&APs were invited to contribute by sending their concerns and suggestions to the EIA team.

This contribution could be made by written comments by email, phone calls or fax to the addresses disclosed during the public consultation meetings. The comment period ended on June 6th, 2022, during which no additional contributions were received.

10 Conclusions and Recommendations

The main objective of this Environmental and Social Impact Assessment (ESIA) is to identify and assess the impacts of the Refurbishment and Operation of the Songo Converter Substation, and to define the respective mitigation measures that ensure adequate environmental management in order to guarantee the sustainability and environmental performance of the project.

The ESIA was prepared considering the most detailed information available at this stage, national environmental legislation in line with international best practices including the AfDB Integrated Environmental and Social Assessment Guidelines and World Bank Environmental and Social Framework.

The environmental management programmes were drawn up to ensure the environmental sustainability of project during the construction and operation phase.

The Impact Assessment Process reveals that there are no critical environmental and social issues related to the project implementation. However the main aspect to be considered is related to hazardous waste material such as PCB's containing equipment that should be disposed off in line Stockholm Convention.

Based on the assumption that HCB is committed to ensuring that the operation of the Songo Substation is guided by standards, achieved through the implementation of the recommended management measures and plans and the continuous monitoring of performance. The Consultant team believe that with effective implementation of the management programmes by the project (HCB, Owner´s engineer and contractor) included herein, the potential adverse impacts will be reduced to levels that conform to national and international standards.

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ANNEXES

ANNEX I - Consultec's Environmental Consultant Registration with MTA

República de Moçambique

MINISTÉRIO DA TERRA, AMBIENTE E DESENVOLVIMENTO RURAL

CERTIFICADO DE CONSULTOR AMBIENTAL

Nº. 42 / 2019

O Ministério da Terra, Ambiente e Desenvolvimento Rural (MITADER), ao abrigo do Regulamento sobre o Processo de Avaliação do Impacto Ambiental, aprovado pelo Decreto nº 54/2015, de 31 de Dezembro, certifica-se que o (a) sr (a) *Consultec – Consultores Associados, Lda*

está devidamente credenciado (a) a exercer funções de Consultor Ambiental em Moçambique.

Maputo, aos 05 / 07 /20 19 Validade até 05 / 07 /20 22

O Ministro

ANNEX II - Project Categorization Letter

REPÚBLICA DE MOÇAMBIQUE
MINISTÉRIO DA TERRA E AMBIENTE
DIRECÇÃO NACIONAL DO AMBIENTE

À:
Hidroeléctrica de Cahora Bassa
Exmo Senhor Rosaque Guale
Director de Recursos Hídricos e Ambiente

Tete

N/Refª Nº /MTA/ 218 /DINAB/GDN/252/2021 **Maputo: 19-02-2021**

Assunto: Instrução do Processo do Projecto de Reabilitação e Modernização da Subestação de Songo

Exmo Senhor,

A Direcção Nacional do Ambiente (DINAB), recebeu do Serviço Provincial do Ambiente de Tete, o documento com assunto em epígrafe, para a definição do tipo de avaliação ambiental a ser efectuada, com vista ao licenciamento ambiental da actividade.

A Subestação de Songo, em operação há bastante tempo, foi construída dentro da área de concessão da Hidroeléctrica de Cahora Bassa, e faz parte do complexo desta grande infraestrutura.

Assim sendo, para o projecto de reabilitação e modernização da subestação, o proponente deverá submeter o Plano de Gestão Ambiental (PGA) contendo entre outra informação pertinente, acções concretas de gestão ambiental dos impactos derivados da remodelação, operação e desactivação, incluindo o Plano de Monitorização Ambiental com a com respectiva responsabilização, periodicidade, objecto e parâmetros de monitorização.

O PGA deverá ser elaborado por consultores registados no MTA, e deverá ser submetido à DINAB em oito (05) exemplares em formato de papel A4 e o respectivo formato electrónico e quatro (04) exemplares do mesmo documento deverá ser submetido ao Serviço Provincial do Ambiente de Tete.

Com os melhores cumprimentos.

A Directora Nacional

Guilhermina Amurane
(Técnica Superior N1)

C.C: Serviço Provincial do Ambiente de Tete

Rua da Resistência, 1746/47, +258 823113668, C. P. 2020, Maputo, mta@mta.gov.mz

ANNEX III - GRM Register

GRIEVANCE RESPONSE MECHANISM			
CLAIM RECORD			
Claim ID	**Date**	**Register by:**	
Claimant name	**Organization**	**Contact**	
Claim details			
(including date, time, people involved, witnesses, events, expectations, etc.)			
Complaint analysis results (brief case description and examination results, attach supporting documentation)			
Proposed actions to resolve the complaint		**End date**	**Closing date**
(attach additional pages and supporting documentation if necessary)			
Action			
1.			
2. **3.**	**By**		
	Date		

ANNEX IV - Record of cleaning waste storage areas

Area	Date/Hour	Product	Controller	Observations

ANNEX V - Public Radio Announcement

HIDROELÉCTRICA DE CAHORA BASSA

CONSULTEC Consultores Associados, Lda

CONVITE

APRESENTAÇÃO DOS PLANOS DE GESTÃO AMBIENTAL DOS PROJECTOS DE REABILITAÇÃO DA SUBESTAÇÃO CONVERSORA DO SONGO E DA CENTRAL SUL

REUNIÕES DE CONSULTA PÚBLICA

A Hidroeléctrica de Cahora Bassa S.A. (HCB) pretende implementar os Projectos de Reabilitação da Subestação (SE) Conversora do Songo e da Central Sul. No âmbito do Processo de Participação Pública, a CONSULTEC, em representação da HCB, vem por este meio convidar a **todos os interessados a participar na Reunião de Consulta Pública**.

A reunião tem como objectivo de informar o público sobre o Projecto, e recolher as principais preocupações e sugestões da sociedade civil e instituições governamentais sobre o Projecto e os Planos de Gestão Ambiental. A reunião será realizada 23 de Maio de 2022 entre as 9 e as 11 horas na Sala de Reuniões do Centro Cultural da HCB.

Os Planos de Gestão Ambiental estão disponíveis para consulta:

- Escritórios da HCB, na Vila do Songo;
- Escritório da Consultec, em Tete;
- Página Web da Consultec: www.consultec.co.mz

Para mais informações ou esclarecimentos, queiram, por favor, contactar a Consultec, por intermédio de Nuno Barreiros ou Décio Camplé através dos telefones 21491555 (escritório), fax 21491578 ou por correio electrónico, pelos seguintes endereços nbarreiros@consultec.co.mz e dcample@consultec.co.mz.

ANNEX VI - Example of Invitation Letters sent

Maputo, 13 de Maio de 2022

N/Refª 460/C21-26/2022

Ao
Instituto Oceanográfico de Moçambique
Songo

Assunto: **Convite para reunião de apresentação dos Planos de Gestão Ambiental (PGA), dos Projectos de Reabilitação da Subestação Conversora do Songo e da Central Sul.**

Exmo Senhor(a),

A Hidroeléctrica de Cahora Bassa S.A. (HCB) pretende implementar os Projectos de Reabilitação da Subestação (SE) Conversora do Songo e da Central Sul, tendo o primeiro sido classificado como C, e o segundo, por se tratar apenas da substituição de equipamento, não sido enquadrado na legislação nacional para o processo de Avaliação do Impacto Ambiental (AIA).

Contudo, ambos os projectos foram sujeitos à elaboração de Planos de Gestão Ambiental (PGA), tendo o PGA da SE do Songo sido submetido à DINAB, para aprovação no âmbito do Licenciamento Ambiental.

Uma vez que os projectos terão financiamento internacional (i.e. Banco Africano de Desenvolvimento), deverão cumprir com os requisitos ambientais dessa instituição financiadora, pretendendo a HCB submeter os PGAs a uma apresentação pública.

A CONSULTEC - Consultores Associados, Lda, empresa nomeada pela HCB para realizar os PGA dos referidos projectos, em representação da HCB, vem por este meio, **convidar V. Exa. a participar na Reunião de Consulta Pública**. Esta reunião será realizada com o objectivo de apresentar os projectos e os PGA, e recolher as principais preocupações e sugestões das partes interessadas.

A reunião será realizada na seguinte data e local:

Reunião Pública | Província de Tete | Vila do Songo	
Data	23 de Maio de 2022
Hora	09:00 – 11:00
Local:	Sala de Reuniões do Centro Cultural da HCB
Contingência:	Inscrição Prévia Obrigatória

ua Tenente General Oswaldo Tazama, 169 - Maputo - Moçambique
el.: 21 491 555 / 491 832 - Fax: 21 491 578 - E-mail: consultec@consultec.co.mz

Os PGAs estão disponíveis para consulta nos locais a seguir mencionados:

- Escritórios da HCB, na Vila do Songo;
- Escritório da Consultec, em Tete (Bairro Matundo, EN 7, Edifício Mário Santos, Escritório 1);
- Página web da Consultec, em www.consultec.co.mz.

Para mais informações ou esclarecimentos, por favor, contacte a Consultec – Consultores Associados, Lda., por intermédio de Décio Camplé ou Nuno Barreiros, através dos telefones 21491555 (escritório), fax 21491578 ou por e-mail, pelos seguintes endereços dcample@consultec.co.mz ou nbarreiros@consultec.co.mz.

Com os melhores cumprimentos,

Consultec
Consultores Associados, Lda

Tiago Dray

ANNEX VII - Meeting Minute

Minute of the Public Consultation Meeting Held in HCB Cultural Centre

Location: HCB Cultural Centre

Data: June 23rd, 2022

Time: 09:30 to 11:30 (2h)

Participants

The meeting was attended by 30 people, which included:

- Representatives from Tete Provincial Government and Directorates.
- Civil Society Organizations.
- Representatives from the various departments of HCB.
- Representatives of the environmental consulting company – Consultec: Décio Cample and Nuno Barreiros.

Introduction

Rosaque Guale, HCB Director of Water Resources and Environment started the meeting by welcoming everyone and thanking everyone for their presence. He briefly explained the objectives of the meeting and called the consultant, which proceeded with the presentation of the project using power point slides.

Environmental and Social Impact Assessment Presentation.

Décio Cample briefly explained the meeting objectives and agenda, the project, its location, components and main activities. Following that, he has presented the project impacts, both for the construction and operation phases, as well as their respective mitigation measures.

At the end of the presentation, the consultant opened the room for the debate, comments, questions and answers, which are specifically registered in the table below. Before the intervention of the participants, the consultant explained that it was important that each participant identified himself first, saying his name and institution to facilitate the registration of all the participations in the debate.

Table 0-1- Summary of interventions and responses given at the public consultation meeting

Questions (Q) / Comments (C)	Answers (R) / Comments (C)
Benedito Valoi – Kapenta Producers Association **Q1.** I would like to know if there will be a decrease in the dam flow?	**Décio Cample - Consultec** **R1.** As illustrated in the figure, the works that will take place are civil construction works and will take place specifically in those areas. Therefore, there will be no direct intervention in the dam or changes in existing water levels and flows.

Questions (Q) / Comments (C)	Answers (R) / Comments (C)
Antônio Elija – ARA Zambeze **Q2.** I thank and congratulate you for the presentation of the project. I would you like to know what impacts will be caused by the project downstream of the dam, in hydrological terms? **C1.** I couldn't verify, in the environmental management plan, how the water drainage system occurs in the substation enclosure. It would be important to elucidate the model of rainwater drainage systems.	**Décio Cample - Consultec** **R2**. All the work that will be carried out will not have any hydrological impact on the Zambezi, they are specific works of rehabilitation, of civil construction, which should take place in energy generation infrastructures. **Décio Cample - Consultec** **C1.** Rainwater does not pose any risk to the environment if it is properly drained and directed. They present a risk to the environment when there is a mixture or contamination with external agents. **Nico Savaio – HCB** **C2.** The rainwater in the substation yard is all channelled through a collection system that was installed in the substation and which is subject to periodic monitoring. **Helder Francisco – HCB** **C3.** The variation of levels will be properly monitored during this process, and even if there is some reduction in the generation level of the plant, the spill gates will be opened to compensate the outflow and keep the environmental flow downstream. There is no intention of emptying the reservoir and the works will proceed as shown, and at some point, it may have some influence on the reduction of power. Therefore, it will not be this slight reduction that will happen in the reservoir that will impact or contribute to a rise in the level of the dam/reservoir. However, what will really influence is the amount of water that will be flowing or entering the dam.
Pedro Conhaque – HCB **Q3**. My concern is related to management plans. Here we have action plans for different aspects, but no action plan for the communities. In response to community demands, we have complaints management plan, and this management is a reactive way of meeting social demands. For me, among an action plan for archaeological or other findings, perhaps an action plan for social demands is much more relevant. I would like to know if the aspect related to social demands will be considered. **C2.** One of the components that I would like to be considered is related to the fact that normally, the problems that HCB contractors bring end up being under the management of HCB, while in practice it should not be so. HCB must manage the problems it creates because of its own activity. Contractor companies must also have a social responsibility plan. **C3.** The issue related to pressure on land must be foreseen in the plan. There will be great pressure on available land, especially on land that is owned by communities for agricultural activities. **C4.** It is important that disease-related issues are not considered only with disease issues such as HIV. Diseases also extend to other types of diseases. I also saw the action plan for occupational health and safety in the presentation.	**Décio Cample - Consultec** **R3.** In terms of specific management plans for communities, they are not foreseen at the level of the environmental management plans as the projects will be developed in in existing areas. We have actions that are related to the labour hiring and we propose that communities shall be involved in this process. **Nico Savaio – HCB** **R4.** The summary presented may not have included the programs that you´ve mentioned. But the ESIA already includes all those aspects that are our measures of action, and the ESIA were carried out by a multi-disciplinary team that used our existing documents. Therefore, the questions that were posed are considered there. **C4.** Thank you very much for your contribution. As mentioned, the purpose of this meeting is to collect subsidies to enrich our study.

Questions (Q) / Comments (C)	Answers (R) / Comments (C)
However, we also did not proactively envisage an action plan for community health and education.	
Constantino Adão- Environmental Provincial Services (SPA) **C5.** Congratulations for the presentation. According to the presentation, the project foresees the removal of old equipment and material. So, I suggest that the document should include what will be the destination of these materials.	**Edite Nhantumbo – HCB** **C5.** Within these environmental management plans, we have a waste management program considering national legislation and international conventions. We will have an detailed list, from hazardous waste, non-hazardous waste, with commercial value and waste that is under these international conventions. This waste management plan complies with legislation and good practices and is provided for the destination of waste according to its specificity. We already have a landfill for non-hazardous waste, we have contracts with hazardous waste management companies, and we also have a regional program for waste that is under these international conventions that cannot be disposed of. It is already a practice at HCB and will be passed on to the projects.

After the clarifications by the representatives of the Proponent and Consultec, Décio Cample from Consultec thanked everyone for the presence and closed the meeting, giving the room to the HCB Director of Water Resources and Environment, Mr. Rosaque Guale for the final remarks.

ANNEX VIII - Attendance Registration

PROJECTO DE REABILITAÇÃO DA SUBESTAÇÃO CONVERSORA DO SONGO E DA CENTRAL SUL

FASE DE PGA

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