# ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

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# Project for the Improvement of the Water Supply System of the City of Nampula

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## SIMPLIFIED ENVIRONMENTAL STUDY (SES) REPORT

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**Ready for:**

**June, 2026**

PROJECT TITLE: **Project for the Improvement of the Water Supply System of the City of Nampula**

DOCUMENT TITLE: **Simplified Environmental Study Report - SESR**

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## LIST OF ABBREVIATIONS, ACRONYMS AND ACRONYMS

**ADA** - Directly affected area
**AID** - Area of Direct Influence
**AdRN** - Water of the Northern Region
**AII** - Area of Indirect Influence
**AQUA** - National Administration for Environmental Quality Control
**AdRN** - Water of the Northern Region
**CD** - Distribution Center
**CRM** - Constitution of the Republic of Mozambique
**dB** - Decibel (unit of measurement of noise)
**DPDTA** - Provincial Directorate of Territorial Development and Environment
**SES** - Simplified Environmental Study
**PPE** - Personal Protective Equipment
**EPCs** - Collective Protective Equipment
**FIPAG** - Investment and Heritage Fund in Water Supply
**GA** - Environmental Manager
**HST** - Occupational Health and Safety
**JICA** - Japan International Cooperation Agency
**Km** - Kilometer
**LA** - Environmental License
**MAAP** - Ministry of Agriculture, Environment and Fisheries
**MQR** - Grievance and Grievances Mechanism
**m3** - Cubic meter
**No.** - Number
**NTU** - *Nephelometric Turbidity Unit*
**OSHO** - Occupational Health and Safety Officer
**ESMP** - Environmental and Social Management Plan
**HDPE** - High Density Polyethylene
**I&As** - Interested and Affected Parties
**PPP** - Public Participation Process
**PVC** - Polyvinyl Chloride
**SESR** - Simplified Environmental Study Report
**EMS** - Environmental Management System
**SPA** - Provincial Environment Service
**SSO** - Occupational Health and Safety
**ToR** - Terms of Reference

**TCU** - *True Colour Unit*
**UFC** - Colony Forming Units
**µS/cm** - Microsiemens per centimeter (unit of electrical conductivity)
**mg/L** - Milligram per liter

# I. INTRODUCTION

## 1.1. Project Background

The city of Nampula, with an estimated population of about 1,057,290 inhabitants, is currently served by a water supply system that integrates surface and underground sources and operates in a complementary manner to meet urban demand.

The main source of abstraction is the reservoir on the Monapo River, approximately 12 km from the city center, with a storage capacity of less than 3,800,000 m³, which constitutes the main support of the system. This is reinforced by groundwater abstraction, namely the Namiteka and Muatala borehole fields, which contribute to source diversification and operational resilience. The installed production capacity reaches about 40,000 m³/day at the Monapo dam, 3,600 m³/day at Namiteka and 1,440 m³/day at Muatala; However, these volumes are insufficient to meet current demand.

Accelerated population growth, combined with urban expansion and increased internal migration flows, particularly those resulting from instability in Cabo Delgado province, has intensified pressure on existing infrastructure, especially the supply of drinking water. This situation results in significant limitations on access to water, especially in peri-urban and expansion areas, such as the Muaivire and Muatala neighborhoods. Faced with this scenario, the Government of the Republic of Mozambique requested support from the Government of Japan to expand the supply system, and the Japan International Cooperation Agency (JICA) mobilized non-refundable technical and financial assistance. As part of the preparatory studies conducted by the technical team (JST), Águas da Região do Norte (AdRN) identified the areas of Namiteka and Mapara as priorities for intervention, and these areas are expected to benefit about 50,000 inhabitants currently affected by restrictions on access to drinking water.

Under the terms of the environmental legislation in force in Mozambique, any public or private project likely to cause environmental impacts must be submitted to a formal Environmental Impact Assessment (EIA) process, to obtain the respective Environmental License (LA). In accordance with Law No. 20/97 of 1 October (Environment Law) and Decree No. 54/2015 of 31 December (which implements the Regulation on the Environmental Impact Assessment Process), the proponent submitted the Process Instruction (PI) to the competent authorities for the

environmental categorization of the project. Following the preliminary analysis, the project was classified as Category "B", implying the performance of a Simplified Environmental Study (SES) as an evaluation tool.

For the preparation of this SES, Terms of Reference (ToR) were developed and submitted for the appreciation and approval of the Provincial Environmental Services of Nampula (SPA Nampula), constituting the guiding framework for the evaluation. In compliance with these ToR, the study focuses on identifying, characterizing and evaluating the potential environmental and social impacts associated with the project, covering both the adverse effects and the expected benefits. In addition, the document includes the definition of measures to mitigate, compensate and value positive impacts, as well as the preparation of the Environmental Management Plan (EMP), including monitoring, risk management, emergency response and specific Occupational Health and Safety (OHS) measures, ensuring compliance with national legal requirements and the donor's environmental and social safeguards.

### 1.2. Structure of the Report

This EIA report is structured in 12 chapters, organized as presented in the table below.

**Table 1: Report Structure**

| SECTION | DESCRIPTION |
|---|---|
| Chapter I. **Introduction** | Provides general information about the project and defines the objectives and scope of this report |
| Chapter II: **The EIA Process** | It presents the general overview of the preparation of the EIA in Mozambique and the framework of this study. |
| Chapter III. **Location and Evaluation of Project Alternatives** | It presents details on the location and the description of the alternatives verified for the project's implementation. |
| Chapter IV. **Legal and Institutional Framework** | It analyzes the specific legislative requirements applicable to EIA, including the framing of the project in the Environmental Impact Assessment regime in force in Mozambique and other legal requirements relevant to the proposed activity<br>This chapter also presents the main guidelines of proponents and international organizations concerning the EIA process and public participation. |
| Chapter V: **Description of the Process** | It provides details of the description and rationale of the proposed project, as well as its components, in order to ensure that the project is understood and the impact assessed |

| SECTION | DESCRIPTION |
|---|---|
| Chapter VI. **Characterization of the Environmental and Social Reference Situation of the Project Area** | It describes the physical, ecological, and socio-economic conditions of the project area and its catchment area. |
| Chapter VII. **Identification and Assessment of Environmental Impacts** | It lists and explains the potential environmental impacts of the proposed activity. It classifies the impacts associated with the project across the phases of conception and pre-construction, construction, operationalization, and eventual closure, according to their existence, and identifies measures to mitigate these impacts. |
| Chapter VIII: **Conclusions and Recommendations** | It presents the study's main findings and useful recommendations to capitalize on the impacts, as well as the corresponding mitigation measures adopted. |

**Source:** Prepared by the authors, 2026.

### 1.3. Objectives and Scope of the Simplified Environmental Study

The general objective of this SES is to identify, characterize and systematically evaluate the potential environmental, social and economic impacts associated with the implementation and operation of the Namiteka and Mapara Water Supply System Expansion Project, in the city of Nampula, proposing appropriate prevention, mitigation, compensation and monitoring measures, with a view to ensuring the environmental and social sustainability of the project and compliance with the applicable legal framework.

Specifically, the study aims to analyze the biophysical and socioeconomic components of the project's areas of direct and indirect influence, including the intervention areas in Namiteka, Mapara and Namicopo "B", based on field surveys and review of relevant secondary information. It is also intended to assess the potential impacts, both negative and positive, arising from the construction, operation, and possible decommissioning phases of hydraulic infrastructures, with a special focus on water resources, land use and occupation, local livelihoods, and public health conditions. The study also includes definitions of environmental and social management measures to minimize identified adverse impacts and enhance the benefits associated with increased access to drinking water.

Within the scope of the EIA process, conducted in accordance with Law No. 20/97 of 1 October and Decree No. 54/2015 of 31 December, the SES also integrates the preparation of the ESMP, including monitoring, risk management, and emergency response programs. In addition, public participation is promoted, ensuring the involvement of Stakeholders and Affected Parties (PI&A's) in the decision-making process. Considering that the project may involve the allocation of agricultural areas belonging to local communities, it is planned to implement compensation mechanisms, in accordance with the guidelines of the environmental authorities, as well as the preparation of an Abbreviated Resettlement Action Plan (PARA), in compliance with JICA's environmental and social safeguards, ensuring the restoration of the living conditions of the affected populations.

## 1.4. The Proponent, Consultant and Investment Value

### 1.4.1. Identification of the Bidder

| | |
|---|---|
| **Proponent** | Fundo de Investimento e Património do Abastecimento de Água e Saneamento (FIPPAS) |
| **Address** | Avenida Emília Dausse, Maputo |
| **Telephone Contact** | Mobile +258 87 002 2228 / 258 84 248 4405 |
| **Electronic contact** | Email dario.chongo@fipag.co.mz |

### 1.4.2. Identification of the Consultant

The Terms of Reference were prepared by the company **ECO-TERRA Lda.**, certified by the Ministry of Agriculture, Environment and Fisheries to conduct studies within the scope of the Environmental Impact Assessment Process (see Annex 2).

| | |
|---|---|
| **Consulting:** | Eco-Terra Limitada |
| **AIA Certificate No.** | 66/2023 |
| **Address:** | Avenida União Africana, 1681, 2º ESQ - Maputo |
| **Contact Person** | Jorge J. J. Sitoi |
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To carry out the activities required in the contract, the consultant constituted the team of specialists and support presented in the table below:

### Table 2: Technical Team

| Member/ Specialty | Main functions |
|---|---|
| Jorge Sitoi<br>(Environmental Specialist and SES Team Leader) | • General Coordination of the study team;<br>• Review of the report of the Simplified Environmental Study and the Environmental Management Plan.<br>• Lead the process of surveying, surveying and analyzing socioeconomic data from the project area and identifying the impacts on the social environment and the respective mitigation measures;<br>• Preparation of the Compensation Report. |
| Pita Sitoe<br>(Biologist/Environmentalist) | • Analysis of the biotic situation of the project area and identification of the impacts on the biotic environment and the respective mitigation measures;<br>• Compilation of the Simplified Environmental Study report and the Environmental Management Plan;<br>• Contribution to the preparation and conduct of the public consultation,<br>• Revision of the public consultation report. |
| Alberto Tembe<br>(Geophysics and GIS) | • Coordination of surveys, surveys and analysis of socio-economic data in the project area and identification of impacts on the social environment and the respective mitigation measures;<br>• Contribution to the preparation of the compensation report;<br>• Contribution to the preparation of the Simplified Environmental Study report and the Environmental Management Plan;<br>• Preparation of all documents for the community meeting,<br>• Preparation of the report of the community meeting;<br>• Elaboration and processing of cartographic information; |
| Marcolino Chemane<br>(Water Resources and Environment) | • Analysis of the physical situation of the project area and identification of the physical impacts and the respective mitigation measures;<br>• Contribution to the preparation of the Simplified Environmental Study report and the Environmental Management Plan;<br>• Contribution to the preparation of all documents for public consultation. |
| Elton Sitoe<br>(Public Consultation Meeting) | • Preparation of all documents for public consultation,<br>• Preparation of the public consultation report. |
| Policarpo<br>(Field Specialist and Social) | • Analysis of the socio-economic situation of the project area and identification of the impacts on the socio- |

| | |
|---|---|
| | economic environment and the respective mitigation measures; |

**Source:** Prepared by the authors, 2025.

### 1.4.3. Investment Value

The estimated initial investment for the project is classified due to a tender process in the donor country whereby the project cost must not be known by the tenderers in advance. Therefore, the estimated initial investment for the project is separately communicated to SPA Namupula

# II. ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

## 2.1. EIA process

Within the scope of the Nampula Water Supply System Expansion Project, the EIA process is conducted in strict compliance with the legal framework in force in Mozambique, with emphasis on Law No. 20/97, of 1 October and Decree No. 54/2015, of 31 December. Under these instruments, all activities likely to cause environmental impacts must be preceded by a formal EIA process, with the aim of identifying, predicting, assessing, and mitigating potential negative effects on the physical, biological, and socio-economic environment, ensuring compatibility with the principles of sustainable development.

Considering the nature of the project, which aims to improve the water supply and, consequently, the living conditions of the populations, the EIA is particularly relevant as an instrument for planning and preventive environmental management.

The EIA process begins with the environmental pre-assessment phase (screening), as established in Article 8 of Decree No. 54/2015, of 31 December, and is conducted by the competent environmental authority, which in the applicable territorial context corresponds to the Provincial Environment Service of Nampula. This stage aims to determine the project's environmental categorization, define the required type of environmental study, and ensure compliance with the legal framework for the activity. Due to the technical characteristics of the project and the sensitivity of the implantation area, it was classified as Category B, implying the implementation of SES.

It should be noted that, under the terms of the legislation, projects can be classified in categories A+ and A (subject to an Environmental Impact Assessment – EIA), B (subject to SES) or C (exempt from a detailed study, subject to compliance with good environmental practices), and this categorization is decisive for the depth of the assessment to be carried out.

For Category B projects, such as the present one, the EIA process is simplified, and the preparation of the Pre-Assessment and Scope Definition Study (EPDA) is not required, but the obligation to define Terms of Reference (ToR) and to carry out public participation is maintained. The SES developed within the scope of the Nampula Water Supply System Expansion Project, together with the communal units of

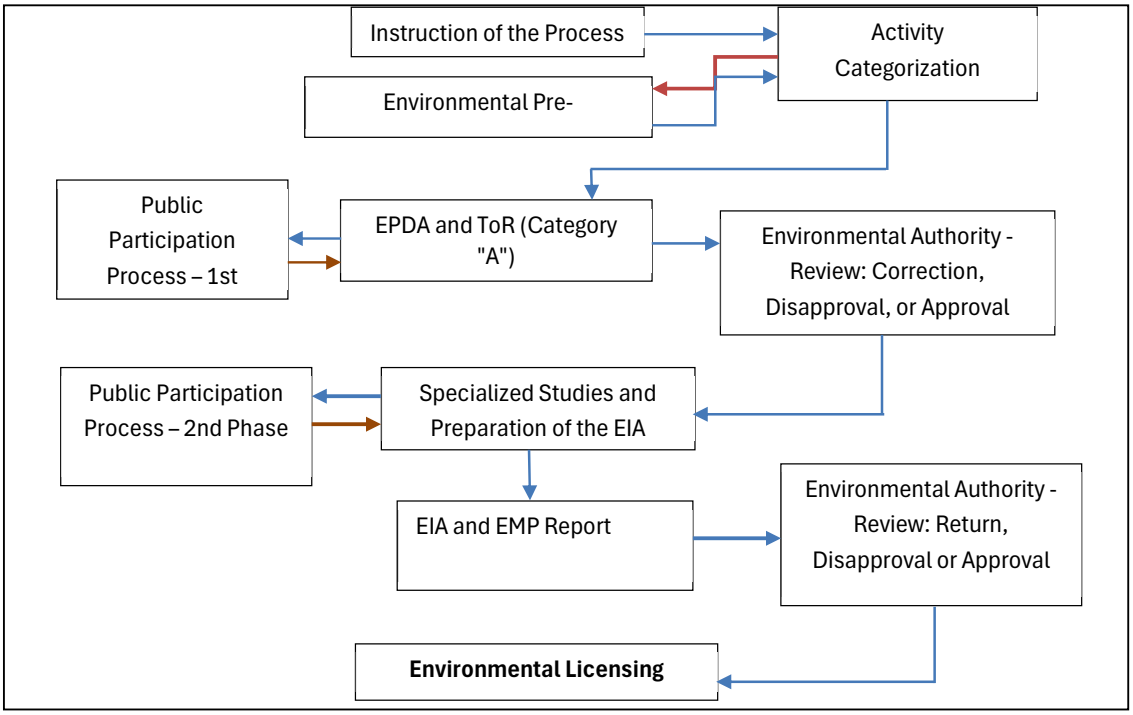
Namiteka and Mapara includes the characterization of the biophysical and socioeconomic environment of the area of influence, the identification and assessment of the main environmental and social impacts associated with the construction and operation phases, as well as the proposal of mitigation measures appropriate to the magnitude of the expected impacts.

As an integral part of the study, the ESMP was prepared, which establishes the environmental management measures, monitoring mechanisms, those responsible for their implementation and the control and reporting procedures, including risk management and HST aspects.

The evaluation of the SES and the associated documents is carried out by a multidisciplinary technical team under the coordination of the competent environmental authority, which may involve different relevant institutional sectors. During this process, the authority may approve the project, request its reformulation or, in extreme cases, reject it. Upon approval, the respective LA will be issued, establishing the conditions and obligations to be fulfilled by the proponent throughout the project's life cycle, including the effective implementation of mitigation measures and strict compliance with the environmental monitoring plan.

Thus, the EIA process is an essential instrument to ensure that the expansion of the water supply systems of Namiteka and Mapara is carried out in an environmentally responsible manner, thereby promoting significant socio-economic benefits and ensuring their sustainable integration into the local context.

**Figure 1:** The schematic below illustrates the phases of the AIA process:




**Source:** Prepared by the authors, 2026.

### 2.1.1. Process Adopted in the Preparation of the SES

This SES, referring to the Project for the Construction and Expansion of the Nampula Water Supply System for the Communal Units of Namiteka and Mapara, was prepared in accordance with the environmental legal framework in force in Mozambique, with a special focus on Law No. 20/97, of 1 October and Decree No. 54/2015, of 31 December, ensuring compliance with the principles of prevention, precaution and sustainable development.

#### a) Instruction of the Case

The process began with the Process Instruction (IP), submitted by AdRN to SPA Nampula, the entity responsible for the screening and environmental framework of the project. After preliminary analysis, the project was classified as Category B, and therefore the preparation of an SES was required, as well as the preparation of associated management tools, including a Compensation Report of the potentially affected assets.

**b) Terms of Reference (ToR)**

The ToR, which is mandatory for Category B projects, was drawn up with the aim of technically guiding the preparation of the SES, defining its scope, methodological approach and minimum contents. Among the main objectives of the ToR are the detailed characterization of the project and its area of direct and indirect influence; the preliminary identification of the main environmental and social issues associated with the project; and the definition of impact assessment methodologies.

The ToR were submitted to the appreciation of SPA Nampula, having been reviewed by a multisectoral Review Board and subsequently approved by reference note no. 279/SPA/RLA/220 of 02 March 2026. The observations and recommendations issued by the environmental authority were fully incorporated in the preparation of this SES, ensuring the technical and legal compliance of the study.

**c) Preparation of the Simplified Environmental Study (SES)**

The SES is the central instrument of the project's environmental assessment process, serving as the basis for the future issuance of the LA. In this phase, the thematic studies were compiled and analyzed, the environmental and social impacts were identified and assessed in the different phases of the project (construction, operation and decommissioning), as well as the definition of measures to mitigate, compensate and enhance positive impacts.

The ESMP was also developed, integrating prevention and mitigation measures, environmental monitoring programs, contingency plans, and environmental education actions. The content of the SES was structured in accordance with Article 12 of Decree No. 54/2015, of 31 December, covering, among other elements, the non-technical summary, the legal framework, the description of the project, the delimitation of the study area, the characterization of the reference situation and the public consultation report.

During this phase, specialized studies and laboratory analyses were carried out across the main environmental media, namely air, noise and vibration, water resources, soils, flora and fauna, thereby establishing an essential environmental baseline for the project's monitoring system.

**d) Environmental and Social Management Plan (ESMP)**

The ESMP, integrated into the SES, consolidates the environmental management measures applicable across all phases of the project and serves as a binding instrument for the proposer. After the approval of the SES, the ESMP becomes mandatory, serving simultaneously as an operational guide and an institutional commitment by the AdRN and other stakeholders in the implementation of the project.

### 2.1.2. SES Elaboration Methodology

The methodology adopted for the preparation of the SES was based on the provisions of Decree No. 54/2015, of 31 December, and on the General Guidelines for EIA established by Ministerial Diploma No. 130/2006, of 19 July (General Directive for the Public Participation Process in the EIA process), ensuring a structured, participatory and technically based approach.

#### 2.1.2.1. Stages of SES Activities

The elaboration of the SES was developed in three main and complementary phases:

**Task I – Data Collection**

In this phase, secondary information was collected from bibliographic, cartographic, statistical, and documentary sources, including previous studies, thematic maps, and project-related technical documentation. This stage enabled the construction of the initial database, essential for the biophysical and socioeconomic characterization of the study area and for planning field activities.

**Task II – Office Work**

The office work consisted of the analysis and integration phase of the information collected, including the definition of the project's area of influence, the identification and preliminary assessment of the environmental and social impacts, the definition of mitigation measures and the structuring of the environmental management system. In this phase, thematic maps were also prepared, the main actors were identified and their respective responsibilities in environmental and social management were defined.

**Task III – Fieldwork**

The fieldwork consisted of direct data collection in the project implementation area, covering the Namiteka and Mapara borehole fields, as well as the areas planned for the installation of the distribution center and pipelines. Environmental measurements (air quality, noise and vibration) were carried out, and samples were collected for laboratory analysis of water, soils, and biotic components.

In addition, socio-economic surveys and inventories of potentially affected assets were carried out, with a special focus on agricultural activities and community infrastructure, as well as surveys of local populations to quantify possible compensation measures. These data form the basis for establishing environmental and social monitoring parameters throughout the project cycle.

During the fieldwork, several sampling and observation points were defined and georeferenced to characterize the environmental reference conditions, assess potential impacts, and establish the basis for the project's environmental and social monitoring. These points include areas for the implementation of hydraulic infrastructures, pipeline crossings, catchment areas, and sensitive areas along the distribution system.

### Table 3: Focal Points of Field Activities

| Website | Latitude | Longitude |
|---|---|---|
| P1 | 15°09'09.00"S | 39°13'14.00"E |
| P2 (Intersection of P1 and P3 ducts) | 15°09'14.51"S | 39°13'19.64"E |
| P1–P3 Pipeline (intersection with track) | 15°09'15.12"S | 39°13'21.85"E |
| P3 | 15°09'16.00"S | 39°13'15.00"E |
| P4 | 15°11'46.00"S | 39°14'35.00"E |
| P4–P5 Duct (intersection) | 15°11'47.85"S | 39°14'28.10"E |
| P5 | 15°11'53.85"S | 39°14'29.47"E |
| P4–P6–P12 (EBH) duct intersection | 15°11'40.05"S | 39°14'19.95"E |
| P6 | 15°11'59.00"S | 39°13'05.00"E |
| P6–P7 Duct (intersection) | 15°12'02.10"S | 39°13'11.83"E |
| P7 | 15°12'03.00"S | 39°13'11.00"E |
| Conduct P6–P8 | 15°12'05.40"S | 39°13'17.66"E |
| P8 | 15°12'08.00"S | 39°13'18.00"E |
| Intersection of P6–P12 ducts | 15°12'13.76"S | 39°13'27.40"E |
| Intersection with river (P6–P12 pipeline) | 15°12'17.13"S | 39°13'29.11"E |
| P9 | 15°12'19.00"S | 39°13'23.00"E |
| Intersection of P9–P12 ducts | 15°12'17.02"S | 39°13'22.00"E |
| P10 | 15°12'26.00"S | 39°13'16.00"E |

| | | |
|---|---|---|
| Intersection ducts P10–P12 | 15°12'23.18"S | 39°13'14.67"E |
| P11 (Intersection with P12) | 15°12'34.00"S | 39°13'13.00"E |
| P12 | 15°12'57.00"S | 39°13'08.00"E |
| | | |
| | | |
| | | |
| | | |

**Source:** Prepared by the authors, 2026.

**Table 4: Water and Soil Sample Collection Points**

| Location | Latitude | Longitude |
|---|---|---|
| Site 1: River (intersection of pipelines) | 15°08'40.21"S | 39°15'41.84"E |
| Site 2: Shallow well near P4 and P5 | 15°11'39.17"S | 39°14'24.20"E |
| Site 3: Existing project hole | 15°12'03.00"S | 39°13'11.00"E |

**Source:** Prepared by the authors, 2026.

**Table 5: Air, Noise and Vibration Sampling Collection Points**

| Point | Latitude (S) | Longitude € |
|---|---|---|
| 1 | 15°11'06.97"S | 39°15'36.37"E |
| 2 | 15°11'43.01"S | 39°14'33.19"E |
| 3 | 15°08'40.28"S | 39°15'41.83"E |

**Source:** Prepared by the authors, 2026.

The points described above were strategically selected along the water supply system route, including catchments, adduction lines, intersections with existing infrastructure, and areas of environmental and social sensitivity. This sampling network enables the establishment of a robust environmental baseline, essential for assessing impacts, defining mitigation measures, and implementing the ESMP, ensuring continuous monitoring of the project's environmental performance throughout its life cycle.

**Task IV – Compilation of SESR and ESMP**

This phase consisted of the systematization, analysis, and integration of all the technical, environmental, and socioeconomic information collected in the previous stages of the SES, including field data, laboratory results, and basic secondary information. Based on this dataset, the potential environmental and social impacts associated with the project were identified, characterized, and evaluated.

From this analysis, impact matrices were structured in the form of tables, allowing a clear relationship between the project's activities and their effects on the biophysical,

socio-economic, and occupational health and safety environments. For each identified impact, mitigation, prevention, or enhancement measures were proposed according to their nature, along with the respective implementation mechanisms and institutional responsibilities.

At the same time, the ESMP was prepared, integrating environmental monitoring, control, and follow-up programs, establishing measurable indicators, monitoring frequencies, and responsible entities. This instrument constitutes the operational basis for the project's environmental management, ensuring compliance with legal requirements and the effective implementation of mitigation measures throughout the project's life cycle.

## 2.2. Public Participation Process

### 2.2.1. General considerations

The Public Participation Process (PPP) constituted a fundamental component of the Environmental and Social Assessment (ESA) for the Nampula City Water Supply System Improvement Project, ensuring that the concerns, expectations, and recommendations of Project Interested and Affected Parties (PIAPs) were incorporated into the environmental decision-making process undertaken by the competent environmental authority. The process enhanced the transparency, institutional accountability, and legitimacy of the project by promoting open dialogue among the project proponent, public authorities, local communities, and other stakeholders.

The project was classified as Category B by the Provincial Environment Service of Nampula, thereby falling within the category of projects for which public consultation is mandatory under Decree No. 54/2015 of 31 December, approving the Regulation on the Environmental Impact Assessment Process, and Ministerial Diploma No. 130/2006 of 19 July, which establishes the General Directive for the Public Participation Process.

In accordance with this legal framework, the PPP was conducted in a structured and phased manner, ensuring that all PIAPs received timely access to relevant project information and were provided with meaningful opportunities to submit comments, concerns, and recommendations prior to the environmental decision-making process.

It should also be noted that, given the nature of the present environmental instrument, all references in this report adopt the term Environmental and Social Assessment (ESA), in accordance with the project's environmental classification and the recommendations issued by the competent authorities during the review and consultation process.

In addition to complying with the national legal framework, the Public Participation Process was implemented in accordance with the stakeholder engagement and consultation principles established by the Japan International Cooperation Agency (JICA), the project's financing agency. The process strengthened consultation

mechanisms, transparency, and the dissemination of information to communities and other stakeholders who are expected to benefit from or be affected by the project.

### 2.2.2. Objectives of the Process

The primary objective of the Public Participation Process (PPP) was to ensure the active involvement of Project Interested and Affected Parties (PIAPs) throughout the preparation of the Environmental and Social Assessment (ESA). The process provided a platform for dialogue that enabled the early identification of potential environmental and social impacts, while incorporating the concerns and recommendations of local communities into the final design of the project.

Specifically, the PPP sought to:

- Disclose the project's technical characteristics, objectives, intervention areas, implementation schedule, and expected benefits in a clear, transparent, and accessible manner;
- Present the preliminary findings of the Environmental and Social Assessment (ESA), including the Environmental and Social Management Plan (ESMP), enabling communities to understand the potential positive and negative impacts associated with project implementation;
- Promote a participatory process through the collection of views, concerns, suggestions, and expectations from Project Interested and Affected Parties (PIAPs), ensuring that these were properly documented, technically assessed, and taken into account in the final ESA Report;
- Establish effective communication channels between the project proponent, the consulting team responsible for the study, the relevant government authorities, and local communities, thereby facilitating a continuous flow of information throughout the construction and operational phases of the project;
- Reduce the potential for social conflicts by providing clear information on issues related to compensation, local benefits, grievance redress mechanisms, and project implementation procedures;

- Strengthen the project's social acceptance by fostering trust among stakeholders and ensuring that the environmental decision-making process

adequately reflected the needs, priorities, and concerns of the affected and beneficiary communities.

### 2.2.3. Implementation of the Process within the Project

The Public Participation Process (PPP) was implemented through a coordinated series of information disclosure, stakeholder engagement, and consultation activities, ensuring the active participation of government institutions, civil society organizations, traditional authorities, and communities potentially affected by the project.

The initial disclosure of the consultation process was carried out through the publication of public notices in the Notícias newspaper and on Rádio Moçambique on 29 May 2026. Subsequently, an addendum was published on 11 June 2026, informing stakeholders of the rescheduling of the main public consultation meeting.

The Main Public Consultation Meeting was held at the Hotel Milénio, in the City of Nampula, on 19 June 2026, bringing together representatives of government institutions, civil society organizations, community leaders, the private sector, and members of the public.

In addition to the main public consultation, a series of community consultation meetings were conducted in the areas directly affected by the project, namely:

- Namicopo-B Communal Unit, on 12 March 2026, 9 April 2026, and 23 June 2026;
- Mapara Community, on 12 March 2026, 9 April 2026, and 24 June 2026;
- Namiteca Community, on 10 April 2026 and 24 June 2026.

These meetings provided an opportunity for more direct engagement with the communities likely to be affected by the project, facilitating the collection of site-specific information on local environmental and social impacts, socio-economic conditions, current land use, and community expectations regarding the anticipated benefits of the project.

In parallel, meetings were held with Administrative Post Chiefs, Neighbourhood Secretaries, Block Leaders, community leaders, and representatives of the relevant district and provincial government services. In addition, socio-economic interviews and

household surveys were conducted with households potentially affected by the proposed project infrastructure.

The consultation sessions achieved active and representative participation from the various stakeholder groups, including men, women, youth, and elderly community members. The consultations generated a substantial number of comments, concerns, and recommendations, which have been carefully considered and incorporated into the environmental and social management measures proposed in this Environmental and Social Assessment (ESA).

#### 2.2.4. Methodology for Public Participation

The Public Participation Process (PPP) was implemented following a structured methodology consisting of four complementary stages, in accordance with the Mozambican legal framework and international good practices for stakeholder engagement.

### *Stage I – Identification of Project Interested and Affected Parties (PIAPs)*

The first stage involved the identification and characterization of institutions, organizations, and social groups with a direct or indirect interest in the project. Stakeholders identified included government institutions, local administrative authorities, civil society organizations, community leaders, private sector operators, academic institutions, and communities located within the project's area of influence, particularly Namiteca**,** Mapara**, and** Namicopo-B**.**

### *Stage II – Preparation of Communication Materials*

All supporting materials required for the public participation process were prepared, including invitation letters, public notices, technical presentations, information brochures, and summaries of the project and the Environmental and Social Management Plan (ESMP). These materials were designed to ensure that project information was presented in a clear, accessible, and understandable manner for the different target audiences.

### *Stage III – Information Disclosure*

Information regarding the project and the public consultation process was disseminated through a variety of communication channels, including public notices published in the print media, radio broadcasts, direct communication with community leaders and local authorities, the distribution of official invitation letters, and oral announcements within the affected communities.

This communication strategy ensured broad dissemination of project information and compliance with the statutory notice periods established under the Mozambican environmental legislation governing public consultations.

### *Stage IV – Conduct of Public Consultations*

The public consultations were conducted through face-to-face meetings organized around four main components:

- Institutional presentation of the project;
- Technical presentation of the Environmental and Social Assessment (ESA) and the Environmental and Social Management Plan (ESMP);
- Open discussion session**,** during which participants were invited to raise questions, express concerns, and provide comments and recommendations; and
- Documentation of the proceedings**,** with all interventions recorded in meeting minutes and participation forms to ensure their subsequent technical assessment and incorporation into the final ESA Report.

#### 2.2.5. Main Findings Raised in the Public Participation Process

The Public Participation Process (PPP) provided an opportunity to collect a wide range of contributions from directly affected communities, administrative authorities, community leaders, public institutions, civil society organizations, and other Project Interested and Affected Parties (PIAPs). The consultations served as an important mechanism for the social validation of the project, enabling the early identification of potential risks, opportunities for improvement, and issues requiring particular attention during the construction and operational phases.

Overall, stakeholders expressed broad support for the project, recognizing it as a priority intervention to address the longstanding shortage of potable water in the City of Nampula. Participants emphasized that strengthening the water supply system would significantly improve public health, enhance the population's quality of life, increase economic productivity, and improve community resilience to periods of water scarcity.

Despite the project's broad acceptance, participants also raised a number of concerns and recommendations that should be taken into account throughout project implementation to ensure that the expected benefits are achieved in an environmentally sustainable, socially equitable, and technically sound manner.

**a) Expectations Regarding Project Implementation**

One of the issues most frequently raised during the public consultations was the communities' cautious attitude, resulting from previous experiences with projects that had been announced but were either never implemented or experienced significant delays.

Participants expressed concern about the risk of creating expectations that might not ultimately be fulfilled. They recommended that the project proponent maintain continuous communication with the communities regarding the progress of project implementation, the planned construction schedule, and any changes that may arise during project execution.

In this context, participants emphasized the importance of ensuring a high level of institutional transparency, regular disclosure of information, and the effective operation of grievance redress and conflict resolution mechanisms.

**b) Recognition of the Project's Social Importance**

The communities acknowledged that the project represents a strategic response to the water supply challenges currently affecting the City of Nampula, particularly in the peripheral areas where access to safe water remains limited.

Participants noted that improvements to the water supply system would:

- reduce the time currently spent by households—particularly women and children—collecting water;
- decrease the incidence of waterborne diseases;
- improve household hygiene and sanitation conditions;
- increase school attendance by reducing the time children spend fetching water; and
- create better opportunities for the development of small-scale economic activities that depend on reliable access to water.

The communities therefore considered the project to be of significant public interest and emphasized that it should remain a priority within the Province of Nampula's development agenda.

**c) Compensation and Livelihood Restoration**

One of the main concerns raised during the public consultations related to the compensation procedures for losses resulting from the construction of the project infrastructure.

Participants requested clarification regarding:

- the criteria to be used for assessing losses;
- the types of assets eligible for compensation;
- the proposed schedule for compensation payments;
- the grievance and appeal mechanisms available in the event of disagreements; and
- the institutional responsibilities throughout the compensation process.

Participants further recommended that all compensation be paid prior to the commencement of civil works and before the occupation of land required for the project, in full compliance with Mozambican legislation, the Compensation and Livelihood Restoration Plan, and the requirements of the project financier.

In cases involving the permanent acquisition of agricultural land, communities recommended that suitable alternatives be identified to ensure the continuity of the productive activities and livelihoods of the affected households.

**d) Direct Benefits for Host Communities**

Participants expressed the expectation that the communities hosting the project's main infrastructure—including production boreholes, reservoirs, pumping stations, and transmission pipelines—should also become direct beneficiaries of the improved water supply system.

It was emphasized that these communities should not bear only the impacts associated with the construction of the infrastructure but should also benefit from improved access to potable water services.

Participants further recommended the future expansion of the water distribution network to neighbourhoods and communal units that are currently outside the project scope, with the aim of reducing territorial disparities in access to public water supply services.

**e) Affordability of Water Supply Services**

Another issue widely discussed during the Public Participation Process was the need to ensure that water tariffs remain affordable for local households.

Several participants referred to previous experiences where high water tariffs had limited access to water supply services, forcing many families to revert to traditional water sources that did not meet adequate health and safety standards.

Participants also noted that financial constraints could contribute to:

- illegal water connections;
- vandalism of water supply infrastructure;
- non-payment of water bills; and
- disconnection or abandonment of household water connections.

Accordingly, it was recommended that the water utility adopt socially equitable tariff policies, consistent with the guidelines of the Water Regulatory Authority (AURA), and complement these policies with community awareness programmes promoting the efficient and responsible use of water.

### f) Local Employment and Economic Development

The communities attached considerable importance to the creation of employment opportunities during the construction phase.

Participants requested that the contractor give priority to the recruitment of local labour, particularly for unskilled and semi-skilled positions, thereby ensuring that a share of the project's economic benefits remains within the directly affected communities.

They further recommended:

- ensuring equal employment opportunities for men and women;
- maintaining transparency throughout the recruitment process;
- publicly advertising available employment opportunities; and
- giving priority to the employment of local youth.

Participants also suggested that, whenever feasible, preference should be given to local suppliers and small service providers based in the City of Nampula.

### g) Technical Quality of Project Infrastructure

During the consultations, participants also made recommendations concerning the technical quality of the proposed infrastructure.

They expressed concerns regarding the long-term durability of the project infrastructure, particularly buried pipelines located beneath roads that are regularly used by heavy vehicles.

Participants recommended that high-quality construction materials be used and that all technical specifications and engineering standards be strictly adhered to during construction in order to minimize future pipeline failures, water losses, and high maintenance costs.

### h) Water Quality and Environmental Monitoring

Communities expressed concerns regarding the quality of groundwater in certain areas, particularly with respect to salinity and physicochemical characteristics.

Participants requested that the project ensure:

- comprehensive laboratory analyses of water quality;
- disclosure of the monitoring results to the affected communities;
- periodic monitoring of water quality throughout the operational phase; and
- implementation of corrective measures whenever deviations from drinking water quality standards are identified.

Participants emphasized that maintaining water quality is a fundamental prerequisite for the successful implementation and long-term acceptance of the project.

**i) Management of Environmental Impacts During Construction**

With regard to the construction phase, participants identified concerns related to the temporary environmental impacts typically associated with civil works, including:

- dust emissions;
- noise and vibration;
- temporary traffic disruptions;
- deterioration of access roads;
- vegetation clearance; and
- generation of solid waste.

In response, participants recommended that the Contractor fully implement all mitigation measures set out in the Environmental and Social Management Plan (ESMP), including erosion control measures, proper waste management, landscape restoration of disturbed areas, and revegetation wherever technically feasible.

**j) Ongoing Communication and Grievance Redress Mechanism**

A common conclusion emerging from the various consultation meetings was the need to maintain continuous communication channels between the Project Proponent, the Contractor, local authorities, and the affected communities.

Participants recommended that accessible mechanisms be established to enable stakeholders to submit grievances, suggestions, and requests for information throughout the implementation of the project.

They also suggested that regular follow-up meetings be held with community leaders to provide updates on construction progress, discuss any challenges encountered during implementation, and facilitate the timely resolution of any disputes or conflicts through mutually agreed solutions.

**Overall Conclusions of the Public Participation Process**

Overall, the Public Participation Process (PPP) demonstrated strong public support for the Nampula City Water Supply System Improvement Project, which was widely recognized as a strategic intervention for promoting local development and improving the living conditions of the population.

The concerns raised by stakeholders focused primarily on the need to ensure transparent project implementation, fulfilment of commitments made during the consultation process, timely payment of compensation, prioritization of local employment, high technical standards for project infrastructure, affordability of water supply services, and the maintenance of effective communication and stakeholder engagement mechanisms throughout project implementation.

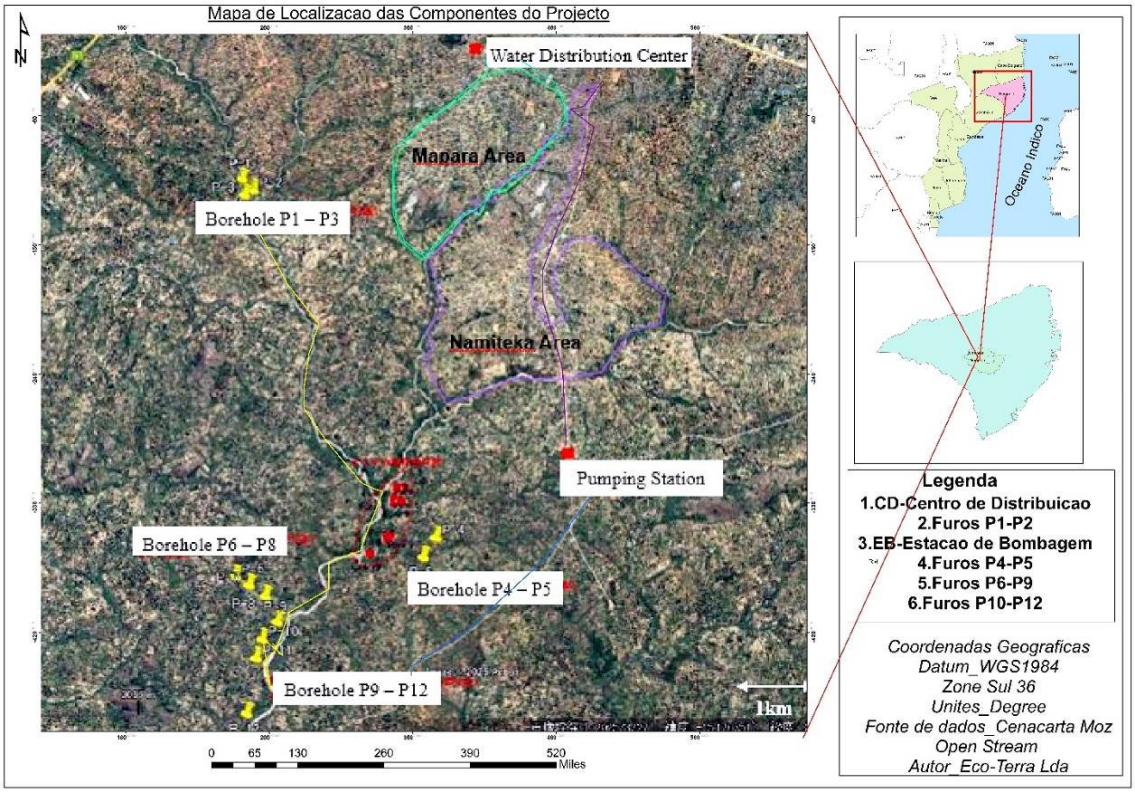
All comments, recommendations, and concerns recorded during the Public Participation Process were carefully reviewed by the technical team responsible for preparing the Environmental and Social Assessment (ESA). Where technically feasible and legally applicable, they have been incorporated into the proposed mitigation measures, the Environmental and Social Monitoring Programme, and the actions included in the Environmental and Social Management Plan (ESMP), thereby contributing to the environmental, social, and institutional sustainability of the project.

# III. LOCATION AND EVALUATION OF PROJECT ALTERNATIVES

## 3.1. Project Location

The Project will be implemented in the city of Nampula, capital of Nampula province, located between the geographical coordinates 15°01'35" and 15°13'15" south latitude and 39°10'00" and 39°23'28" east longitude. The city covers an approximate area of 404 km², with a territorial extension of about 25 km in the East-West direction and between 20 and 25 km in the North-South direction, presenting an urban occupation in continuous expansion, with strong pressure on basic services.

**Figure 2** - Location Map of the Project area




**Source:** Elaboration Itself, 2026.

From an administrative and territorial point of view, the city of Nampula is characterized by a heterogeneous urban structure, with the Central Municipal Administrative Post standing out as the oldest and most densely urbanized area, where several residential and commercial neighborhoods are concentrated. In terms of natural and administrative boundaries, the city is bounded to the north by the Monapo River, where the main water supply dam is located; to the south by the

Mwepelume River; to the east by the Administrative Post of Anchilo, in the district of Nampula; and to the west by the district of Rapale, configuring a strategic urban space from a hydrological and socio-economic point of view.

Within the scope of this project, the interventions will focus on urban and peri-urban areas with significant water supply coverage deficits, namely the neighborhoods of Muahivire Expansão Vila and the localities of Mapara and Namiteka in the district of Nampula. These areas have experienced accelerated population growth, unplanned urban sprawl, and limited access to essential services, particularly drinking water.

The selection of these areas is the result of an integrated technical analysis that considers hydrological, demographic, social, and environmental criteria to maximize system efficiency and ensure a more equitable distribution of water resources. In addition, the proximity of these areas to existing infrastructure and potential underground catchment points enhances the project's technical, operational, and economic feasibility.

Thus, the location of the project reflects a strategic approach aimed at strengthening and sustainably expanding the water supply system in the city of Nampula, contributing to the reduction of inequalities in access to drinking water, the improvement of the living conditions of the populations, and the strengthening of urban resilience in the face of increasing pressure on water resources.

### 3.2. Evaluation of Project Alternatives

Under Article 12 of Decree No. 54/2015, dated 31 December, the SES must include the identification and analysis of technically viable alternatives to support environmental decision-making based on technical, environmental, social, and economic criteria. In this context, the evaluation of alternatives for the project was conducted across different scenarios for implementation, operation, and non-intervention to optimize resources and minimize environmental and social impacts.

The analysis of the alternatives considered, from environmental and socio-economic perspectives, includes the presence of existing infrastructure, residential and agricultural areas, potential land-use conflicts, and the need for resettlement or compensation for affected assets. From a technical point of view, the capacity of the proposed solutions to ensure the sustainable supply of water to the target populations,

the system's resilience to risks such as hydrological variations and urban pressures, and the operational efficiency of the infrastructure were evaluated. In economic terms, the alternatives were compared based on investment, operation, and maintenance costs, as well as energy efficiency, network extension, and system durability.

### 3.2.1. Alternative zero: non-implementation of the project

Alternative zero corresponds to the scenario of non-implementation of the project, i.e., the absence of intervention to expand the water supply system in the areas of Namiteka and Mapara. This scenario implies maintaining the current deficit in access to drinking water, thereby aggravating the structural limitations already existing in the city of Nampula's supply system.

From a socio-economic point of view, failure to implement the project would perpetuate high levels of population vulnerability, particularly in expanding peri-urban areas, where access to water is already insufficient and irregular. This would compromise the quality of life of communities, increase exposure to water-borne diseases, and limit the development of local economic activities. In addition, pressure would remain on unsafe alternative sources, with negative impacts on public health and the environment.

In environmental terms, although the zero alternative does not imply direct impacts resulting from works, indirect degradation associated with the use of uncontrolled sources and the overexploitation of informal water resources remains. Thus, this alternative does not address the objectives of sustainable development or the growing population's supply needs.

### 3.3.2. Project alternative

The technical alternatives considered for the project were evaluated based on engineering criteria, operational efficiency, investment and operating costs, and associated socio-environmental impacts. The following table presents the synthetic comparison of the main options analyzed.

**Table 6: Comparison of alternatives**

| Factors | | Option 1 (Current Plan) | Option 2 | Option 3 (No project) |
|---|---|---|---|---|
| **Civil works** | **Water holes** | Construction of about 12 boreholes with an estimated production of 2,500 m³/day of groundwater. | About 12 boreholes are expected to produce about 2,500 m³ of groundwater per day. | There is no construction of infrastructure. |
| | **Transmission line** | Approximately 20 km of ducts to the distribution points, with a centralized system. | Approximately 60 km of pipelines, with greater dispersion and network complexity. | Not applicable. |
| **Economy** | **Project cost** | About xx million dollars. This information will be hidden in the published version of the EIA report.<br>The water is pumped to the distribution tank. Most pipelines would operate at lower pressure than direct transmission from each borehole, thereby reducing pipeline material costs. In addition, the transmission pipelines can be consolidated, reducing the initial cost of building the pipeline system. | About xxx million dollars (some 30% more than Option 1). This information will be hidden in the published version of the EIA report.<br>In this case, direct drive by borehole, a greater capacity of the submersible motor pumps will be required. This will result in higher costs for the pumps. In addition, the longer pipelines to the distribution reservoir for each borehole will entail additional pipeline costs. | No investment costs. |
| | **Cost of operation and maintenance** | As water can be pumped at low pressure, the power required by submersible pumps can be reduced, lowering electricity costs. In addition, reducing leak volume is expected to lower the facilities' maintenance and repair costs. | The use of high-pressure pipelines would further increase the initial installation costs, and the higher operating pressure should also increase leakage rates, resulting in higher repair and maintenance costs. | No operational costs, as no project will be implemented. |

| Factors | | Option 1 (Current Plan) | Option 2 | Option 3 (No project) |
|---|---|---|---|---|
| **Social** | **Beneficiaries** | This project aims to improve access to clean water for a target population of 50,000 people in Namiteka and Mapara in Nampula City, including the local population and internally displaced persons (IDPs). | This project aims to improve access to clean water for a target population of 50,000 people in Namiteka and Mapara, Nampula city, including the local population and internally displaced persons (IDPs). | 50,000 people in Namiteka and Mapara in the city of Nampula will lack access to drinking water. |
| | **Job creation** | Estimated creation of more than 4,000 jobs in the construction phase. | Estimated creation of more than 4,000 jobs in the construction phase. | There is no job creation. |
| **Environment** | | No negative impact is expected, as groundwater extraction volume is properly planned, and remaining impacts are minimal and expected to be mitigated. | No negative impact is expected, as groundwater extraction volume is properly planned, and remaining impacts are minimal and expected to be mitigated. | No impact is expected, as no project will be implemented. |

| Factors | Option 1 (Current Plan) | Option 2 | Option 3 (No project) |
|---|---|---|---|
| **Results and reasons for the selection** | Based on the comparative analysis, Option 1 (Current Plan) is considered the most appropriate alternative from technical, economic, and environmental perspectives. This option has significant advantages, namely the optimization of the adduction system through a central pumping station, the reduction of operating pressure in the pipelines, the reduction of leak losses, and the improvement of the system's energy efficiency.<br><br>In comparison, Option 2 requires pipelines three times longer than the ones of Option1. It will affect three times more farmlands and their land acquision. This Option 2 also needs more high-pressure pipelines than Option 1, resulting in higher initial investment.Therefore, Option 1 is the most rational and sustainable option for this project..<br><br>On the other hand, the Zero Alternative (non-implementation) is clearly unsustainable, as it perpetuates the deficit of access to drinking water for about 50,000 beneficiaries, aggravating existing social and environmental vulnerabilities.<br><br>Thus, Option 1 is the most balanced and sustainable solution, ensuring the fulfillment of the project's objectives and simultaneously promoting environmental, social, and economic gains for the city of Nampula | | |

**Source:** Prepared by the authors, 2026.

# IV. LEGAL AND INSTITUTIONAL FRAMEWORK

## 4.1. Administrative Aspects

### 4.1.1. Ministry of Agriculture, Environment and Fisheries (APRM)

The Ministry of Agriculture, Environment and Fisheries (MAAP) is a central State body established by Presidential Decree No. 1/2025 dated 16 January. In accordance with the policies, principles, and priorities of the Government, this Ministry is responsible for planning, directing, coordinating, monitoring, and evaluating the implementation of public policies in the sectors of agriculture, environment, natural resources, and the sustainable management of ecosystems.

Within the framework of its competences, the APRM also ensures the implementation of environmental legislation, the promotion of the sustainable management of natural resources, and the integration of environmental issues into development policies. In its functional organizational chart, the National Directorate for Environment and Climate Change stands out, the technical body responsible for the environmental licensing of activities and for the coordination of the EIA Process, including the analysis, approval, and monitoring of environmental studies.

### 4.1.2. Ministry of Public Works, Housing and Water Resources (MOPHRH)

The Ministry of Public Works, Housing and Water Resources (MOPHRH) is the central state body responsible for implementing government policies in the fields of public infrastructure, including public works, housing, urbanization, roads and bridges, as well as the management of water resources, water supply and sanitation. This Ministry was restructured by Decree No. 12/2025, dated 6 February, which revokes the previous institutional framework established by Decree No. 13/2020, dated 15 May. In the context of this project, the following supervised entities stand out:

**a) Investment and Heritage Fund for Water Supply and Sanitation (FIPAAS, I.P.)**

The Water Supply and Sanitation Investment and Heritage Fund (FIPAAS, I.P.) was created by Decree No. 68/2025, of 29 December, succeeding the previous Water Supply Investment and Heritage Fund (FIPAG). This public institution's main functions are the mobilization of financial resources, the development and expansion of water

supply and sanitation infrastructure, and the management of national programs in the sector.

Within the scope of this project, FIPAAS assumes the role of a financial guardianship and support entity for infrastructure implementation, ensuring investment coordination and the sustainability of water supply systems.

**b) Águas de Moçambique, Public Institute (AdM, I.P.)**

Águas de Moçambique, Public Institute (AdM, I.P.), created under Law No. 9/2024, of 7 June, is the entity responsible for the management, operation and maintenance of the public water supply and sanitation assets at the provincial level.

This institution's mission is to ensure the efficient and sustainable provision of water supply services, promoting decentralization of management, strengthening operational efficiency, and reducing territorial asymmetries in access to drinking water and sanitation.

## 4.2. Applicable national legislation

The legal framework of this SES is based, first and foremost, on the Constitution of the Republic of Mozambique (CRM), which enshrines the right of all citizens to a balanced environment and the duty to protect it, as set out in Article 72. The Constitution also establishes the obligation of the State to promote environmental conservation, prevent and control pollution, and integrate environmental issues into all sectoral policies, ensuring sustainable development and the well-being of populations, as provided for in Article 117.

In addition, Article 85 of the CRM guarantees the right to safety, hygiene, and health at work, imposing on the employer the obligation to ensure adequate protective conditions for workers, a principle particularly relevant to the project's construction and operation phases.

In this context, the Nampula Water Supply System Expansion Project is also subject to environmental legislation, water resources, spatial planning, occupational health and safety, and other sectoral normative instruments in force, as systematized in the table of applicable legislation presented in the document.

Table 7 presents the main legal instruments applicable to the project below:

**Table 7: Main legislation applicable to the project**

| Legislation | Brief Description | Relevance |
|---|---|---|
| **ENVIRONMENTAL FRAMEWORK LEGISLATION** | | |
| National Environmental Policy Resolution No. 5/95 of 3 August | It lays the foundation of 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 the above-mentioned objective, the policy must, among other requirements, ensure the management of the country's natural resources – and the environment in general – to preserve their functional and productive capacity for present and future generations. | The proponent is responsible for ensuring that the proposed activities comply with this policy and ensuring the environmental sustainability of the project. |
| Environment Law Law No. 20/97, of 1 October | Article 12 cites the prohibition of activities that threaten the conservation, reproduction, quality and quantity of biological resources, especially those in danger of extinction. The Government must ensure that measures are taken to maintain and regenerate habitats by controlling activities or substances likely to harm fauna species and their habitats.<br>Article 14 prohibits the development or construction of infrastructure that, by reason of its size, nature or location, could cause significant impacts. In particular, in areas susceptible to erosion or desertification, wetlands and environmentally protected areas. | The Proponent is prohibited from polluting aquatic, marine, atmospheric, pedological, and human environments.<br>The Bidder is responsible for avoiding or minimizing the environmental impacts of its activities through the implementation of environmental management actions. |
| Regulation on the Environmental Impact Assessment Process Decree No. | It establishes that one of the fundamental instruments for environmental management is the EIA process, which aims to mitigate | The proposer has the responsibility to ensure that the proposed activities and the EIA |

| Legislation | Brief Description | Relevance |
|---|---|---|
| 54/2015 of 31 December | the negative impacts that certain projects in the public and private sectors may cause on the natural and socio-economic environment by conducting environmental studies before the project starts. It defines the EIA process, the necessary environmental studies, the public participation process, the review studies process, the process of the draft environmental feasibility decision, and the issuance of the environmental license. It applies to all activities, public or private, that directly or indirectly influence environmental components. | (Environmental and Social Impact Assessment) process are in line with the requirements of this Regulation. The bidder is required to apply for an environmental permit and to carry out the EIA process in support of its application, in accordance with this Regulation. The environmental license must be obtained from MAAP. |
| General Directive for the preparation of Environmental Impact Assessments Ministerial Diploma No. 129/2006 of 19 July | Provides details on the procedures for preparing the environmental study and the overall content structure of the EIA report.<br>The aim of this directive is to standardize the procedures for the EIA process. | The SES must be developed in accordance with the specifications of this Ministerial Diploma. |
| General Directive for the Public Participation Process in the EIA Process Ministerial Diploma No. 130/2006 of 19 July | It sets out the basic principles related to public participation, as well as methodologies and procedures.<br>It considers public participation to be an interactive process that begins at the design stage and continues throughout the life of the project. | The AIA Public Participation Process (PPP) must be promoted according to the specifications of this Ministerial Diploma.<br>The Bidder and the Contractors should establish channels of communication with the public regarding the environmental issues arising from their activities. |
| Regulation for the Environmental Audit process | Repeals Decree No. 25/2011, of 15 June. It defines an environmental audit as an objective, documented instrument for the systematic | Once operations have started, the managing entity will have to organize the |

| Legislation | Brief Description | Relevance |
|---|---|---|
| Decree no. 45/2024 of 26 June | management and evaluation of the system and the relevant management and documentation implemented to ensure the protection of the environment.<br>Its objective is to assess compliance with the operational processes for the activities, as set out in the environmental management plan, including the legal environmental requirements in force and approved for a given project. | performance of independent environmental audits, to be carried out at least once a year, without prejudice to any public environmental audits, which may be requested under this decree. |
| Regulation for environmental inspections Decree No. 51/2024 of 17 July | Its purpose is to regulate the supervision, control and verification of compliance with national environmental protection standards. | During the project's implementation, it will be subject to inspections by the MAAP to verify compliance with environmental legislation. The managing body must always collaborate. |
| **AIR QUALITY** | | |
| Decree 18/2004, of 2 June - Regulation on Environmental Quality Standards and Effluent Emission | Mozambican legislation provides: parameters for maintaining air quality (Article 7); emission standards for gaseous pollutants across various industries (Article 8); and standards for the emission of gaseous pollutants from mobile sources (Article 9), including light- and heavy-duty vehicles. It should be noted that Mozambican legislation does not mention the pollutant PM10. | The project must comply with air quality and effluent emission standards, in accordance with applicable legal limits, without compromising the environment. The proposed project shall take into account the levels permitted under this Decree. The violation is subject to fines imposed by the entity responsible for environmental inspections. |
| Decree No. 67/2010, of 31 December - | Includes the amendments to Annexes I and V, referred to in Articles 7 and 16, which enter into | Since this decree amends the previous one (Decree No. |

| Legislation | Brief Description | Relevance |
|---|---|---|
| Amendments to Decree No. 18/2004, of 2 June | force from Annexes I and V of this Ordinance.<br>Approves Annexes IA and B of this decree, which are now part of the Regulation on Environmental Quality Standards and Effluent Emissions. This ordinance prohibits the burning of solid or liquid waste or any other flammable material. | 18/2004) and adds new annexes, the client must ensure that the project complies with these standards. |
| Law No. 20/97 of 1 October - Environment Law | Article 9.1 prohibits the discharge of toxic substances into the atmosphere if they exceed the legal limits. | The requirements must be considered. |
| **WATER RESOURCES AND WATER QUALITY** | | |
| Water policy Resolution No. 46/2007, of 30 October | Repeals the national water policy approved by Resolution No. 75/95. This new policy covers important issues not covered in the previous policy, such as improving sanitation in urban, peri-urban and rural areas, water networks, the development of new water infrastructure and integrated water resources management with the involvement of stakeholders. | The project should be developed in accordance with the principles of water policy, in particular the principle that the use of water resources should promote economic development, job creation and improved social conditions. |
| Water Law<br>Law No. 16/91, of 3 August | This law is based on the principles of public water use, river-basin water management, and user-pays and polluter-pays. It aims to ensure environmental and ecological balance.<br>Article 54 of this law stipulates that any activity with the potential to contaminate or degrade public waters, in particular the discharge of effluents, is subject to special authorization to be issued by the Regional Water Administration (ARA) and to the payment of a fee. | The proponent has the responsibility to implement measures to prevent the pollution of any water resources during and after the implementation of the project.<br>If there is a discharge of effluents to any body of surface water, an authorization from the Regional Water Administration (ARA-Norte) will be required. This authorization is subject to a fee. |

| | | |
|---|---|---|
| Regulation on environmental quality standards and effluent emissions Decree No. 18/2004 of 2 June, as amended by Decree No. 67/2010 of 31 December. | It stipulates that industrial effluents may be discharged into the environment only when they comply with the discharge standards established in Annex II of the decree. The discharge of domestic effluents must comply with the standards set out in Annex IV. Annex III lays down the standards for the discharge of effluents from various industries. | The project must comply with water quality and effluent emission standards, including those permissible by law, without harming the environment.<br>Any project action must consider the levels permissible under this Decree. Violation entails a penalty.<br>Effluents will be discharged into the medium only if they comply with the standards established in this regulation; if discharged into surface water bodies, authorization from the Regional Water Management Authority of the South (ARA-Sul) will be required. This authorization is subject to a fee. |
| Regulation for Groundwater Research and Exploration – RPEAS, Decree No. 18/2012 of 5 July | Establishes technical standards and procedures for the research, capture, and exploration of groundwater; it also regulates the licensing of activities. This regulation also provides for the sustainable use of groundwater resources, avoiding their overexploitation. | The proponent must guarantee prior authorization for the research and exploration of water in the boreholes. It must also ensure compliance with the limits established in the operating license. |
| Regulation of Public Water Distribution and Wastewater Drainage Systems Decree No. 30/2003 of 1 July | It establishes the technical conditions that must be met by public water distribution and wastewater drainage systems to preserve public health and the environment. | The sizing and installation of the project's rainwater and wastewater drainage systems must consider the provisions of this regulation. |

| POLLUTION AND WASTE MANAGEMENT | | |
|---|---|---|
| Law No. 20/97, of 1 October – Environmental Law | Article 9 limits the "production and/or deposition in the soil or subsoil into the water or atmosphere of any toxic or polluting substances, as well as the practice of activities that accelerate erosion, deforestation, desertification or any other form of environmental degradation" to the limits established by the law.<br>Article 9, in reference to environmental pollution, also prohibits the production and deposition of any toxic or polluting substances in soils, subsoils, waters or atmosphere, as well as prohibits any activities that may accelerate any form of environmental degradation beyond the limits established by law. | The proponent is responsible for implementing measures to prevent pollution during and after project implementation. The project must comply with the requirements of this Regulation. |
| Regulation on the Management of Urban Solid Waste Decree No. 94/2014, November 4 (Repeals Decree No. 13/2006, of 15 June) | It establishes the legal framework for the management of urban solid waste. The fundamental objective of the regulation on the management of municipal solid waste is to lay down rules for the generation, removal, and packaging of solid waste in population agglomerations, as well as to regulate activities that potentially generate solid waste comparable to urban waste, which accelerate environmental degradation, in order to minimize their negative impacts on health and the environment. Article 11 sets out the obligations of solid waste-generating activities regarding the production, packaging, transport, and disposal of waste to protect the environment and society. | The proponent is responsible for implementing good waste management practices during the implementation and operationalization phases of the shipyards and camps. The management of solid waste within the project must comply with the requirements of this Regulation. |
| Regulation on the Management of Hazardous Waste (Decree No. | It establishes rules and obligations for all public and private entities involved in generating hazardous waste, requiring them to observe | The hazardous waste to be generated under the project must be handled and disposed of in |

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| 83/2014 of 31 December). | good practices to minimize their impacts on the environment, safety, and public health. | accordance with the provisions of this Regulation.<br>The Bidder and the Contractors are obliged to adopt mechanisms for the safe handling of hazardous waste to prevent accidents or environmental pollution.<br>Article 12 of this regulation establishes that the collection of hazardous waste is the responsibility of the producing entities, and in the event of non-completion in a personal capacity, it must be entrusted to a duly accredited private collection service. |
| **LAND USE** | | |
| National Land Policy<br>Resolution No. 10/95, of 17 October | It establishes that the State must provide land for each family to build or own a dwelling, and that the State is responsible for planning the land's use and physical occupation, although the private sector may participate in preparing plans. | The proponent must ensure that the project complies with the principles of this policy and the regulations set forth in the laws that implement it. |
| Law No. 19/1997, of 1 October - Land Law | It defines people's rights to land use, detailing these rights based on customary claims, as well as procedures for acquiring property for the use and benefit of communities and individuals. This law recognizes and protects rights acquired by inheritance and occupation (customary rights and bona fide duties), except in legally defined reserves or areas where the land has been lawfully transferred to another person or institution. | The project must respect the land rights of the communities. If any activity (such as agriculture) is affected by the proposed project, the affected parties should be duly compensated. |

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| Decree No. 66/98, of December 8 - Regulation of the Land Law | It defines the total protection areas reserved for nature conservation and their protection status, as well as the partial protection areas, where land use titles cannot be granted and where activities cannot be carried out without a permit. The partial protection zones include, among others, the 50-meter strip of land confined to pipelines, the 50-meter strip confined from the shores of lakes and rivers, the 250-meter strip of land confined around dams and reservoirs, and the 100-meter-wide strip of land on the coast and estuaries. | This regulation defines total and partial protection zones. In these areas, land use is restricted. The tenderer must comply with these regulatory requirements. |
| Decree No. 60/2006 of 26 December - Regulation of Urban Land Use | It provides specific guidelines for land use in urban centers, such as cities and towns, in accordance with the Law of the Land. | It provides guidelines for land use in urban environments. |
| **SPATIAL PLANNING** | | |
| Spatial Planning Law<br>Law No. 19/2007, of 18 July | It aims to ensure the organization of the national space and the sustainable use of its natural resources, while observing the legal, administrative, cultural, and material conditions favorable to the country's social and economic development, as well as the protection and conservation of the environment. | The proponent must ensure that the project's activities are in accordance with the principles of this law, so that they do not interfere with the territorial development plans of that area and that the improvement of people's quality of life, as well as the conservation of the environment, through the sustainable use of existing resources, is promoted. |
| Territorial Planning Regulation<br>Decree No. 23/2008 of 1 July | Establishes regulatory measures and procedures that ensure the rational and sustainable occupation and use of natural resources, the enhancement of the various | The proponent must ensure that project activities, especially camps, shipyards, and loan areas, are in |

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| | potentials of each region, infrastructures, urban systems, and the promotion of national cohesion and security of the populations | accordance with the land use plan for the project area to preserve natural resources and the safety of the population. |
| **RESETTLEMENT** | | |
| Decree 31/2012, of 8 August - Regulation of Resettlement Resulting from Economic Activities | It establishes the basic rules and principles governing the resettlement process in Mozambique.<br>Creates a Technical Committee for the review of Resettlement Action Plans (PAR) arising from projects that generate resettlement and defines the responsibilities and procedures of the Commission for the approval of the PAR, as well as for monitoring its implementation. This responsibility lies with the District Government.<br>It presents specific procedures for the design and implementation of the RAP. It defines the content of the RAP and the Action Plan for the Implementation of Resettlement, the rights of PAPs, the responsibilities of Project Proponents, and the public consultation process. | The Resettlement Plan must comply with this Decree. |
| **COMPENSATION** | | |
| Decree No. 181/2010 of 3 November 2010 - Directive on the expropriation procedure for the purposes of territorial management | It presents guidelines and norms for the expropriation process, with a view to land-use planning, arising from development activities of public interest/utility.<br>It defines: i) the contexts in which expropriation can occur for the purposes of spatial planning; and ii) how to conduct the expropriation process. It also establishes the framework for calculating the compensation costs for the expropriation of residential, commercial, industrial, service, coastal and rural infrastructures. | The project proponent must proceed with the compensation process in compliance with this decree. |

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| Regulation 66/1998, of 8 December – Regulation of the Land Law | It defines the guidelines for compensation for the loss of trees and plantations resulting from development projects (which entail the relocation of land occupants).<br>The Provincial Agriculture Authority defines and updates the minimum value of trees and crops at the provincial level. | The compensation process should be carried out, applying the values established in this regulation, for the payment of crops, such as trees and plantations, identified in the project area. |
| **CLIMATE CHANGE** | | |
| National Strategy for Climate Change Adaptation and Mitigation (2013-2025) | It establishes the sustainable management of water resources and the strengthening of community resilience to climate variability as priorities. In this regard, the opening of water boreholes is an adaptation measure that contributes to water security in vulnerable urban areas, provided that the sustainable exploitation of the aquifer is ensured. | The proponent must ensure a balance between catchment and recharge to support the sustainable use of water resources, as climate change underscores the need to rationalize the development of safe water sources, given increased droughts. |
| **BIODIVERSITY** | | |
| Law No. 20/97, of 1 October - Environment Law | Articles 12 and 13 state that the planning, implementation, and execution of projects must ensure the protection of biological resources, in particular animal and plant species which are threatened with extinction or which, because of their genetic, ecological, cultural, or scientific characteristics, require special attention. This protection should extend to their habitats, especially in areas of integrated environmental conservation. | The project must consider protected biodiversity, ensuring its preservation and avoiding degradation. For endangered animal and plant species, they must be previously identified, and appropriate communication must be established with the competent authorities for guidance on the appropriate treatment to be given. |
| Forest and wildlife law<br>Law No. 10/99 of 12 July | It establishes the basic principles and standards regarding the protection, conservation, and sustainable use of forest and fauna resources. | The project should not interfere with the Forest Reserves, and a ban on hunting or the extraction |

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| | | of forest resources should be introduced. |
| Regulation of the Forests and Wild Fauna Law<br>Decree No. 2/2002 of 6 June | It establishes the mechanisms for the management, protection, use, exploitation and production of forest and fauna resources. | Any hunting or logging activities in conservation areas should be prohibited. |
| Regulation of the Law on the Protection, Conservation and Sustainable Use of Biological Diversity Law no. 5/2017, of 11 May, which amends the Regulation of Law no. 16/2014, of 20 June. | It advocates for the legal provisions for the creation of conservation areas in Mozambique to protect the country's natural resources. | The project will not interfere with protected areas, so there is no risk of degrading protected environments. |
| **CULTURAL HERITAGE** | | |
| Cultural Heritage Law<br>Law no. º 10/88 of 22 December | This law concerns the protection of the tangible and intangible assets of Mozambican cultural heritage. | In case cultural assets are found during the exercise of activities, they must be preserved and reported to the competent authorities for guidance on their treatment. |
| State Assets Regulation<br>Decree No. 23/2007 of 9 August | The purpose of this Regulation is to establish a harmonised system of rules for the use and management of State assets, including cultural heritage held by the State. | In case the project affects any property considered cultural heritage of the State, the competent entity should be contacted. |
| **OCCUPATIONAL HEALTH AND SAFETY** | | |
| Labor Law<br>Law No. 23/2007, of 1 August | This law applies to the legal relationships of subordinate work established between employers and national and foreign workers in all industries active in the country. Chapter VI establishes the principles of safety, hygiene and health of workers. | The proponent must provide its workers with good physical, environmental and moral conditions, inform them about the risks of their work and instruct them on proper compliance |

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| | | with health and safety standards at work. The proponent must also provide first aid to workers in the event of an accident, sudden illness, poisoning, or indisposition.<br>The tenderer, in cooperation with the trade union, shall inform the competent labour administration body of the nature of accidents at work or occupational diseases, their causes and consequences, after carrying out consultations and registration. |
| Law on the Protection of Workers with HIV/AIDS<br>Law No. 5/2002, of 11 January | This law sets out the general principles to ensure that all employees and job seekers are not discriminated against in the workplace or when applying for jobs, because they are suspected or have HIV/AIDS. Article 8 establishes that work, in connection with his professional occupation, in addition to the compensation to which he is entitled, is guaranteed adequate medical care to alleviate his state of health, in accordance with the labor law and other applicable legislation, funded by the employer. | Testing for HIV/AIDS of workers, job applicants, training assessment candidates, or promotion candidates at the request of employers without the consent of the worker or job applicant is prohibited. The applicant shall train and redirect all workers or jobseekers infected with HIV/AIDS who are able to fulfill their duties at work, taking them to employment commensurate with their residual abilities. |
| Law on the Protection of Persons, Workers or Job Seekers Living with HIV/AIDS, Law No. | It sets out the rights and duties of people, workers, or jobseekers living with HIV/AIDS, including people at risk of contamination, such as medical personnel. | Access to employment opportunities and integration into the enterprise should be based on the principle of equality and not on |

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| 19/2014 of 27 August | Article 47 states that workers or job seekers with HIV/AIDS should not be discriminated against because of their HIV-positive status, and the principle of equal rights and opportunities should be ensured.<br>Article 53 establishes the obligation of the employer to provide assistance to HIV-positive workers. | discrimination against HIV-positive individuals.<br>It is the duty of the proponent to ensure the maintenance of medical care for workers with HIV/AIDS. It should also create a program to combat and prevent HIV/AIDS, as well as implement occupational health and safety standards that avoid or reduce the risk of occupational infection. |
| Regulation that Establishes the Legal Regime of Accidents at Work and Occupational Diseases<br>Decree No. 62/2013, of 4 December. | It characterises accidents at work and occupational diseases, as well as the responsibilities of employers and workers in the field of health and safety at work, including the competent institutions for accidents and occupational diseases. The regulation also establishes the obligation to establish an insurance system to cover expenses arising from workplace accidents and occupational diseases. | The proponent is obliged to ensure occupational health and safety conditions for workers to prevent work accidents. It should also develop training actions for workers on the rules for preventing accidents and occupational diseases during the project's construction and operation phases. |
| Regulation on General Labour Inspection<br>Decree No. 45/2009 of 14 August | This Regulation sets out the rules for inspection activities to control the legality of work. Article 4(2) sets out the employer's responsibilities for preventing risks to the employee's occupational health and safety. | The proponent must comply with the requirements. In the case of an inspection, the tenderer must help to provide all necessary information to the inspectors. |

**Source**: Prepared by the authors, 2026.

### 4.3. Applicable Mozambican Standards

The National Institute for Standardization and Quality (INNOQ) is the entity responsible for standardization, certification, and metrology in Mozambique, establishing technical standards applicable to products, processes, and services. In the context of the present project to expand the water supply system in the city of

Nampula, compliance with national standards is essential to ensure the quality of the water supplied, the operational safety of the infrastructure, environmental protection, and public health. The Mozambican rules applicable to the project include:

**Table 8: Mozambican standards applicable to the project**

| Standard | Identification | Relevance to the Project |
|---|---|---|
| **Water for human consumption – quality requirements** | NM 181:2014 (or updated equivalent) | It establishes the quality standards of drinking water, including physical, chemical, and microbiological parameters, which are fundamental to ensuring the sanitary safety of the water distributed to the population. |
| **Solid waste – classification** | NM 339:2011 | It guides the classification, handling, and disposal of waste generated during the construction and operation phases (including packaging, excavation materials, and domestic waste from the shipyard), ensuring environmental compliance. |
| **Fire Safety Symbols and Signs – Specifications** | NM 66:2008 | Defines safety signage in operational facilities (pumping stations, reservoirs, shipyards), ensuring adequate response in emergency situations. |
| **General Purpose Safety Signs** | NM 67:2008 | It establishes requirements for risk signaling, the mandatory use of Personal Protective Equipment (PPE), and the delimitation of restricted areas, thereby contributing to occupational safety. |
| **Environmental management systems** | NM ISO 14001:2015 | It defines requirements for implementing an Environmental Management System (EMS), applicable to the project's environmental management and the continuous improvement of environmental performance. |
| **Greenhouse gases – Part 2: Monitoring and reporting** | NM ISO 14064-2 | It establishes guidelines for quantification and monitoring of greenhouse gas emissions associated with project activities (equipment, transport, construction). |
| **Chemicals – safety, health and environment** | NM 660:2016 | It regulates the handling, storage, and safe use of chemical products, such as fuels, lubricants, and reagents, eventually used in water treatment. |
| **Occupational health and safety – management systems** | NM ISO 45001:2018 | Defines requirements for occupational risk management, applicable to the construction and operation of hydraulic infrastructures. |

**Source**: Prepared by the authors, 2026.

## 4.4. International Agreements and Conventions

The project must comply with Mozambique's commitments under various international agreements and conventions related to environmental protection, sustainable management of water resources, public health, biodiversity, and the control of hazardous substances. These obligations reinforce the proponent's responsibility to implement the project in an environmentally sustainable and socially responsible manner, ensuring the protection of ecosystems and the well-being of beneficiary communities.

**Table 9: International Agreements and Conventions applicable to the Project**

| Agreement / Convention | Description | Relevance to the Project |
|---|---|---|
| United Nations Framework Convention on Climate Change (UNFCCC), 1994 | Ratified by Mozambique in 1994, it establishes commitments for mitigation and adaptation to climate change. | The project shall promote energy efficiency, reduce emissions associated with construction and operation, and contribute to the climate resilience of water supply infrastructure. |
| Convention on Biological Diversity, 1992 | Ratified in 1994, it aims at the conservation of biodiversity and sustainable use of natural resources. | The project activities should avoid negative impacts on natural habitats by protecting local flora and fauna, especially in peri-urban areas. |
| RAMSAR Convention on Wetlands, 1971 | It promotes the conservation and rational use of wetlands of international importance. | Relevant for the protection of water sources and associated ecosystems, ensuring that water abstraction and use do not compromise wetlands. |
| Stockholm Convention on Persistent Organic Pollutants (POPs), 2001 | It aims to eliminate or restrict the use of persistent hazardous chemicals. | The project must ensure the safe use of chemicals in water treatment, avoiding substances that are prohibited or harmful to health and the environment. |
| Basel Convention on the Movement of Hazardous Wastes, 1989 | Regulates the transport and disposal of hazardous waste. | The hazardous waste generated (oils, fuels, lubricants) must be managed safely and in accordance with international and national standards. |
| Bamako Convention, 1991 | It prohibits the import and improper disposal of hazardous waste in Africa. | The project must ensure that there is no contamination of soil and water resources by hazardous waste. |
| UNESCO Convention for the Protection of the World Cultural and Natural Heritage, 1972 | It promotes the preservation of cultural and natural heritage. | The project must respect cultural heritage and avoid interference in places of historical or social value. |

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| International Labor Organization (ILO) Conventions | They establish standards on decent work, safety, and occupational health. | The project must ensure safe working conditions, prevent accidents, and respect workers' rights. |

**Source**: Prepared by the authors, 2026.

### 4.5. Integration with Municipal Regulations

Given that the project is entirely within the urban perimeter of the Municipality of the City of Nampula, its implementation must strictly comply with the municipal normative instruments applicable to territorial planning, urban construction, sanitation, and local environmental management. These instruments aim to ensure the project's compatibility with current urban planning and to mitigate impacts on land use, existing infrastructure, and public safety.

In this context, the following municipal regulatory instruments stand out:

- **Resolution No. 20/AMCN/2019**, which approves the Sanitation and Drainage Posture Code of the City of Nampula, establishing standards for wastewater management, urban drainage and pollution control associated with urban infrastructures;
- **Municipal Code of Postures of Nampula**, which defines rules for urban coexistence, occupation of public space, hygiene, safety and environmental protection in the municipal territory;
- **Urban Structure Plan of the City of Nampula**, a guiding instrument for urban development, which defines areas of expansion, consolidation and protection, and the layout of the project's infrastructures must be compatible with these guidelines;
- **Urban Construction Regulation of the City of Nampula**, which establishes technical and administrative standards for the execution of civil construction works, including licensing requirements, structural safety and urban control.

The observance of these instruments is essential to ensure that the implementation of water collection, adduction, pumping, and distribution infrastructures occurs in an orderly, safe, and environmentally appropriate manner, minimizing conflicts with existing land uses and ensuring compliance with municipal urban management.

## 4.6. Applicable International Standards and Good Practices

In addition to the national and municipal legal framework, this project, as it integrates support from international partners, must also comply with the environmental and social safeguards established by financing entities, especially the Japan International Cooperation Agency (JICA) and the World Bank, thereby ensuring compliance with international standards for sustainability and socio-environmental responsibility.

JICA's Guidelines on Environmental and Social Considerations set out guiding principles for the preparation and implementation of funded projects, requiring, among other things: (i) the early integration of environmental and social issues into the project cycle; (ii) inclusive and transparent public consultations from the earliest stages; and (iii) categorizing projects according to the magnitude of their impacts (Categories A, B, C, and FI). In addition, these guidelines require that impact assessment cover not only biophysical components (air, water, soil, biodiversity, and climate) but also social dimensions, such as involuntary resettlement, livelihoods, gender, vulnerable groups, occupational health and safety, cultural heritage, and local socio-economic dynamics.

In addition, the project should comply with the World Bank's operational policies, such as:

- **World Bank Environmental Standards: OP 4.01** – Environmental Assessment, whose objective is to ensure that financed projects are environmentally sustainable by promoting the identification, analysis, and mitigation of environmental and social impacts. This policy covers impacts on physical, biological, socio-economic, public health, and cultural resources, classifying projects into categories A, B, or C according to the level of environmental risk;
- **World Bank Environmental Standards OP 4.12 – Involuntary Resettlement**, which aims to avoid or minimize involuntary displacement, ensure the improvement or restoration of the living conditions of affected populations, promote public participation in resettlement processes and ensure fair compensation, regardless of the legal status of occupation. This policy applies to both the physical displacement of populations and the loss of property, access to resources, or livelihoods.

In this way, the integration of national standards and international safeguards ensures that the project is developed in accordance with the highest standards of environmental and social sustainability, promoting community acceptance, reducing risks, and maximizing benefits for the population of Nampula City.

# V. PROJECT DESCRIPTION

## 5.1. Project Justification

The implementation of this project is based on the pressing need to respond to the structural deficit of drinking water supply in the city of Nampula, resulting from accelerated population growth, unplanned urban expansion and the significant increase in internal migratory flows, particularly associated with instability in Cabo Delgado province. The current system, supported mainly by surface abstraction from the Monapo River and complementary groundwater sources, has limitations in installed capacity, operational reliability, and spatial coverage, resulting in intermittent supply and unequal access to drinking water, especially in peripheral and urban expansion areas.

From a technical point of view, the project is justified by the need to strengthen and diversify supply sources, favoring the sustainable exploitation of deep aquifers, which have greater natural protection against contamination and better microbiological quality, as evidenced by the available analytical data. This approach reduces the system's vulnerability to climate variability and to degradation of surface water quality, ensuring greater resilience and continuity of supply. At the same time, the expansion of the hydraulic infrastructure and the distribution network will improve system efficiency and increase service coverage.

From a socio-economic point of view, the project is of high strategic relevance, as it promotes equitable access to drinking water for about 50,000 inhabitants in the Namiteka and Mapara areas, contributing directly to improved public health by reducing the incidence of waterborne diseases and enhancing the well-being of the populations. In addition, the availability of water in adequate quantity and quality is a determining factor in the development of local economic activities, as well as in reducing physical effort and time spent, especially by women and children, in searching for this essential resource.

Finally, the project is part of the strategic priorities of the Government of Mozambique in the field of water supply and the sustainable management of water resources, and it is aligned with public policy instruments and the international commitments assumed by the country, particularly within the scope of the United Nations, in particular

Sustainable Development Goal 6 (SDG 6), on universal and equitable access to safe drinking water and sanitation. In this way, its implementation is configured as a structuring and priority intervention for the promotion of sustainable development and urban resilience in the city of Nampula.

## 5.2.General Planning of Project Activities

The main objective of the project is to capture groundwater through artesian boreholes, then treat, transport, and distribute it to the areas of Namiteka and Mapara in the city of Nampula, Nampula province. Its implementation includes an integrated set of hydraulic, electrical, and mechanical infrastructure, organized along the supply chain.

The main activities planned include:

- ***i)*** Drilling and equipment of approximately 12 artesian holes, each equipped with a pump house, electromechanical equipment, protection system and safety guardhouse;
- ***ii)*** Excavation and installation of raw water supply pipes, connecting the boreholes to the main public roads, over an approximate length of 20 km;
- ***iii)*** Construction of a pumping station (EB), equipped with pump houses and generator set, intended for pressure reinforcement and system flow control;
- ***iv)*** Execution of pipelines connecting the pumping station and the Distribution Center (DC);
- ***v)*** Construction of a Water Distribution Center with a 1,000 m³ reservoir, chlorination disinfection system and flow measurement room;
- ***vi)*** Implementation of about 80 km of water distribution network in the Namiteka and Mapara areas, including the installation of public taps at strategic points to ensure equitable access to water.

### a) Complementary Activities

For the proper functioning of the project, complementary activities to support construction and operation are also planned, namely:

- ***i)*** Implementation of a construction site, including storage areas for materials and camping for workers;
- ***ii)*** Execution of reinforced concrete structures to support hydraulic and mechanical infrastructures;

*iii)* Installation of hydraulic systems associated with pipelines and reservoirs;

*iv)* Installation of mechanical equipment, including pumps and pressure control systems;

*v)* Installation of electrical and automation systems for operational control of the system.

**b) Brief Description of Construction Technologies**

The construction technologies to be adopted correspond to conventional civil and hydraulic engineering practices used in similar water supply projects. The use of unconventional or highly technically complex technologies is not foreseen.

Current civil construction equipment will be used, including backhoe loaders, motor graders, dump trucks, drilling rigs, concrete mixers, welding equipment, compactors, and mechanical support tools, ensuring efficient execution of the works and compliance with the required technical standards.

**c) Main Equipment and Materials**

The implementation of the project will require the mobilization of various equipment and materials, including:

*i)* **Equipment:** drilling rigs, backhoe loaders, tanker trucks, compactors, electric generators and pumping equipment;

*ii)* **Materials:** PVC and high-density polyethylene (HDPE) pipes, cement, steel for metal structures and reinforcement, aggregates (sand and gravel), submersible pumps and water meters.

**d) Land Availability for Project Implementation**

The project will be implemented in previously identified areas partially allocated to the water supply sector, under competent institutional management, namely the existing borehole field in Namiteka. In this area, about 10 operational boreholes are currently installed, contributing to the supply of local communities.

Each borehole will occupy an area of approximately 10 m x 10 m, to be properly sealed to ensure the health and operational protection of the infrastructure. It should be noted that these areas are currently used by local communities for subsistence farming

activities, which implies the occurrence of potential impacts on existing crops, which will be duly assessed and addressed under the Compensation Plan and the Abbreviated Resettlement Plan (when applicable).

### e) Labor to be Hired During Activities

The hiring of labor for the construction phase will be the responsibility of the selected contractor, in accordance with the applicable legal and contractual procedures. At this stage of the project's development, more than 4,000 jobs are expected to be mobilized; however, the needs will be determined by the execution plan for the work.

However, it is expected to generate direct and indirect employment during the construction phase, contributing to the dynamism of the local economy and strengthening income opportunities in the communities covered by the project.

**Table 10: Main Interventions of the Project**

| No. | Intervention | Technical Description | |
|---|---|---|---|
| 1 | **Drilling of catchment holes** | Drilling and equipping of approximately 12 artesian boreholes for groundwater abstraction, including a pumping system and sanitary protection. | |
| 2 | **Raw water pipes** | Installation of about 20 km of pipelines to transport raw water from the boreholes to the main connection points. | |
| 3 | **Pump station** | Construction of a pumping station (pump house), equipped with electromechanical systems and a support generator set. | |
| 4 | **CD ducts** | Implementation of adduction pipelines between the pumping station and the Distribution Center (DC) to ensure continuous water transport. | |
| 5 | **Distribution Center (DC)** | Construction of distribution infrastructure with the following components: | |
| | | *5.1. Reservoir* | 1,000 $m^3$ reservoir for water supply storage and regulation. |
| | | *5.2. Disinfection system* | Chlorination system to guarantee the quality of water intended for human consumption. |
| | | *5.3. Flow measurement room* | Installation of equipment for monitoring and controlling distributed water volumes. |
| | | *5.4. Electrical installations and control* | Electrical and automation system for system operation and management. |
| 6 | **Distribution network** | Implementation of approximately 80 km of water distribution network in the areas of Namiteka and Mapara, including installation of public taps whenever technically feasible. | |

**Source**: Prepared by the authors, 2026.

# VI. CHARACTERIZATION OF THE ENVIRONMENTAL AND SOCIAL REFERENCE SITUATION OF THE PROJECT AREA

The characterization of the reference environmental situation is a fundamental element of the SES, allowing assessment of the current state of the biophysical and socioeconomic components of the project's area of influence before its implementation. According to John et al. (2013), this step is essential for the identification, prediction, and assessment of environmental impacts, ensuring the definition of appropriate and contextualized mitigation measures.

## 6.1. Description of the Biotic Environment

The biotic environment comprises the set of living organisms and the ecological interactions they establish among themselves and with the surrounding physical environment, forming the functional basis of ecosystems. These components play an essential role in maintaining ecosystem services, such as climate regulation, soil protection, the hydrological cycle, and biodiversity support (Millennium Ecosystem Assessment, 2005).

In the context of the project's area of influence, located in peri-urban areas of the city of Nampula, the biotic environment presents characteristics resulting from the combination of natural savannah ecosystems and secondary formations influenced by anthropogenic activities, namely urban expansion, subsistence agriculture and exploitation of woody resources.

### 6.1.1. Flora

The vegetation cover of the study area predominantly comprises miombo formations, typical of southern Africa, characterized by open forests and wooded savannas adapted to seasonal tropical climatic conditions (Frank, 1983). These formations are dominated by three species of the genera: *Brachystegia spp.; Julbernardia spp.;* and *Isoberlinia spp.* Associated with these, there are also shrub and herbaceous species, including: *Combretum spp.*; *Terminalia spp.;* and *Acacia spp.* (currently in the genus *Vachellia* and *Senegalia*).

According to FAO (2020), miombo ecosystems are of high ecological and socioeconomic importance, providing resources such as firewood, charcoal, non-wood products and habitats for various fauna species.

The area of direct influence is an area that has been modified for residential use. Once most of the natural habitat has been removed, the area's flora is modified, with scattered trees and shrubs. The project area is crossed by the Muhala and Muahivire rivers, along which there is typical riverside vegetation, predominantly herbaceous.

In this study area, 251 plant species belonging to 54 families were identified. The most representative families were Fabaceae, with 49 species, Poaceae, with 41 species, Malvaceae (19), Asteraceae (14 species), and Lauraceae (12 species). The remaining families were represented by a number of species that varied between one (1) and eight (8) species (Table 1).

Specifically in relation to the crops in all the areas of influence of the project, crops such as melon (Cucumes melo), peanut (Arachis hypogaea L.), tomato (*Lycopersicon esculentum L.*), common beans (*Phaseolus vulgaris L.*), sweet potato (*Ipomoea batatas L.* (Lam), maize (*Zea mays L.*), okra (*Abelmoschus esculentus L.*), banana (*Musa acuminata*), cassava (*Manihot esculenta Crantz.*), cowpea (*Vigna unguiculata L.*) and cassava (*Vigna subterranea L.*), among others, were recorded.

**Figure 1: Cultivated area**

### 6.1.2. Fauna

The fauna of the project's area of influence is representative of savannah ecosystems and peri-urban environments, with a composition shaped by ecological and anthropogenic factors, including habitat availability, food resources, and the degree of human disturbance.

In the study area, fauna diversity is considered reduced due to increasing anthropogenic pressure, including urban expansion, agricultural practices, and exploitation of natural resources. According to IUCN (2022), anthropized environments tend to favor generalist and adaptable species, to the detriment of more sensitive species. The occurrence of large mammals is unlikely due to habitat fragmentation and proximity to urbanized areas.

The mammals present are mostly small and medium-sized, with an emphasis on rodents (Mastomys spp., Rattus spp.), small carnivores (e.g., mongooses – Herpestes spp.), and bats (order Chiroptera), which are ecologically important for pollination and insect control. In the bed of the Muhala and Muahivire rivers, fish (*Clarias gariepinus*) occur, which is a local alternative source of protein.

The avifauna is relatively diverse, comprising species adapted to open, agricultural, and urban environments, where granivorous and insectivorous birds stand out; synanthropic species (associated with humans); and small birds of prey.

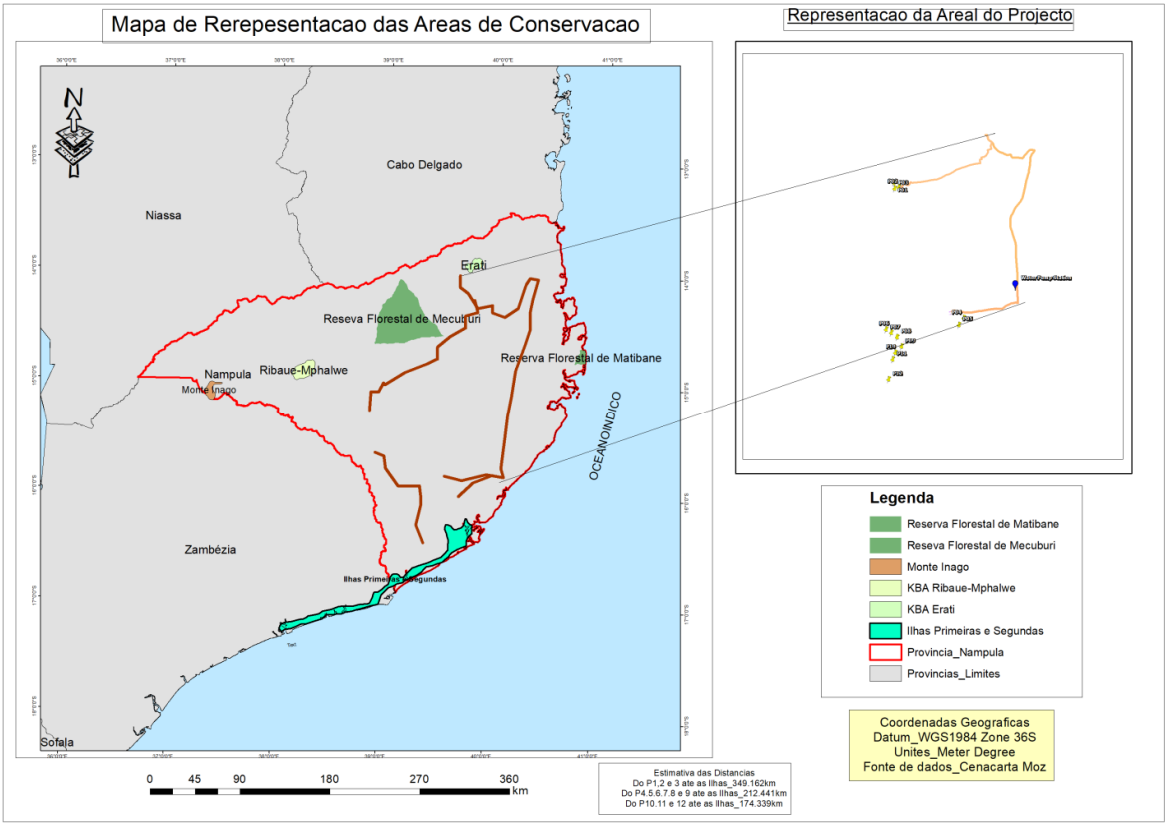
According to Primack (2014), habitat fragmentation and biodiversity loss are critical factors in developing areas, and it is essential to integrate conservation measures into infrastructure projects.

Thus, it is essential that the project's implementation includes mitigation measures that minimize habitat disturbance and promote the conservation of local biodiversity.

**Conservation areas**

There are no conservation areas in the city and district of Nampula. The province of Nampula has the Environmental Protection Area of the First and Second Islands (APAIPS), which occupies an area of just over 2,500 km², located along the coast of the border districts of Moma, Larde and Angoche, in Nampula province, and Pebane, in Zambezia province. There is also an IBA (Important Area for the Conservation of Birds and Biodiversity) in the Mphpàluwé Forest Reserve in Ribáuè. This area is recognized as an IBA – a Key Biodiversity Area (KBA), covering approximately 264.95 km². It is home to rare, endemic and endangered species of both fauna and flora (WCS, Government of Mozambique and USAID, 2021).

Figure 3: Location of Conservation Areas



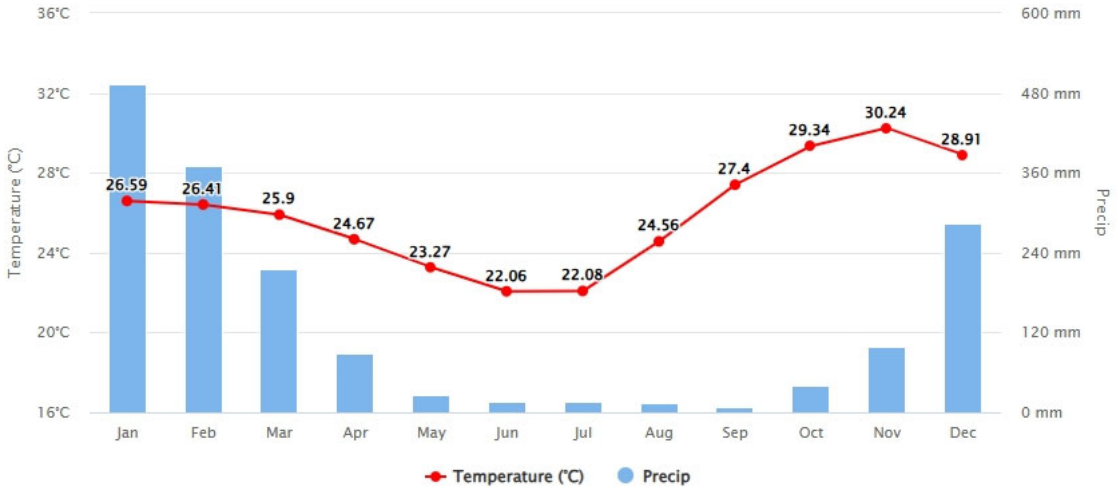

## 6.2. Description of the Physical Environment

The physical environment encompasses the abiotic components, including climate, geology, geomorphology, soils, hydrology, and air quality, which condition ecosystem functioning, the availability of natural resources, and the viability of human activities. These elements directly influence the environmental dynamics of the project's catchment area, specifically regarding aquifer recharge, soil stability, and pollutant dispersion (Brady & Weil 2016).

### 6.2.1. Climatic conditions

The city of Nampula has a humid tropical climate with a dry season, classified as AW under the Köppen climate classification (1936). This climatic type is characterized by pronounced seasonality in rainfall distribution, with a well-defined rainy season alternating with a dry season. According to data from INAM (2022), the region's main climatic characteristics include an average annual temperature ranging from 24°C to 27°C, with higher values from October to January. The average annual rainfall is between 800 mm and 1,200 mm, with a rainy season that usually occurs between November and March, concentrating most of the annual rainfall, and a dry season that extends from April to October, characterized by low rainfall and lower relative humidity.

**Graph 1:** Thermo-pluviometric graph of the City of Nampula




**Source:** https://weatherandclimate.com/mozambique/nampula accessed on April 17, 2026.

Climate variability in the region is influenced by large-scale atmospheric phenomena, such as the El Niño-Southern Oscillation (ENSO), which can cause irregularities in precipitation patterns, with direct implications for the availability of water resources (INAM, 2022). From an environmental perspective, the climatic regime strongly influences groundwater recharge, soil dynamics (erosion and infiltration), vegetation productivity, and the dispersion of air pollutants.

According to Barry & Chorley (2003), understanding local climatic conditions is essential for assessing environmental impacts, particularly for projects involving water resources, such as the present water supply project.

In addition, extreme weather events, such as heavy rainfall and prolonged drought, may pose significant risks to the project's implementation and operation, requiring the integration of adaptation and resilience measures into infrastructure planning.

### 6.2.2. Hydrology

The hydrology of the project's area of influence is characterized by the predominance of groundwater, which is the primary source of water for human consumption, especially in peri-urban contexts with limited coverage of formal distribution systems. This dependence on aquifers makes their quantity and quality highly relevant to environmental sustainability and public health.

According to Freeze & Cherry (1979), hydrogeological systems in tropical regions are conditioned by geological characteristics, climate regime, and recharge mechanisms,

and they exhibit high spatial and temporal variability, as reflected in the heterogeneity of water availability and quality in the study area.

***i) Groundwater Resources***

In the area under analysis, aquifers are predominantly of two types:

- **Fissured aquifers**, associated with crystalline rocks (granites and gneisses), in which water is stored and circulates through fractures;
- **Porous aquifers**, present in surface sedimentary formations, have greater storage capacity.

The productivity of these systems depends on fracture density, hole depth, material permeability, and recharge conditions. Exploration occurs primarily through boreholes and wells, which form the basis of the local supply system and the project under analysis.

Aquifer recharge occurs predominantly during the rainy season through direct infiltration of precipitation and is influenced by factors such as soil type and permeability, vegetation cover, topography, and land use and land cover.

The results of the laboratory analyses conducted by SwissLab (see annexes) show significant variability in groundwater quality, depending on the type of abstraction:

- The water from deep boreholes has excellent microbiological quality, with no detectable fecal or total coliforms, indicating adequate natural protection against surface contamination. However, it has high mineralization, with emphasis on hardness (453 mg/L), conductivity (685 µS/cm), chlorides (220 mg/L), and high levels of boron (22 mg/L), which may limit its use for human or agricultural consumption without adequate treatment.

- Shallow well water reveals moderate microbiological contamination (63 Ufc/100 mL fecal coliforms), indicating influence from nearby pollution sources, such as inadequate sanitation systems. Additionally, it has a high aluminum concentration (2.74 mg/L) and a slightly acidic pH (6.04), which can compromise its potability and may indicate geochemical interactions or anthropogenic contamination.

These results show that shallower aquifers are more vulnerable to contamination, while deep aquifers, although more protected, may have chemical limitations.

According to FAO (2016), overexploitation of aquifers in expanding urban areas can lead to lower piezometric levels, reduced water availability, and degraded water quality, a scenario that may apply to the area under study.

***ii) Surface Water Resources***

Surface water resources are scarce and predominantly seasonal, characterized by temporary drainage lines; intermittent watercourses; and areas of accumulation during the rainy season.

These systems play an important role in recharging aquifers through infiltration, but they are highly dependent on precipitation.

Surface water (river) analyses indicate a critical quality situation, characterized by:

- High turbidity (303 NTU) and color (5850 TCU), associated with a high load of suspended solids (530 mg/L);
- Severe microbiological contamination (720 Ufc/100 mL of fecal coliforms);
- High concentrations of ammonia (7.11 mg/L), suggesting recent organic pollution, possibly associated with sewage discharges or agricultural activities.

These data confirm that surface water resources in the area are unfit for human consumption without rigorous treatment and thus constitute potential vectors of waterborne diseases.

There is a dynamic interconnection between surface and groundwater, particularly during the rainy season, when increased infiltration promotes aquifer recharge. According to Custodio & Llamas (1983), this interaction is essential to the sustainability of water systems and is highly sensitive to changes in land use and anthropogenic pressure.

***iii) Water Quality and Environmental Vulnerability***

The quality of water resources in the area is influenced by natural and anthropogenic factors, namely:

- Geological composition of aquifers;
- Infiltration of contaminated water;
- Use of fertilizers and pesticides;
- Inadequate sanitation systems;
- Disorderly urban expansion.

The analytical results demonstrate the coexistence of:

- Significant microbiological contamination, especially in surface waters and wells;
- Chemical quality issues, including high mineralization, hardness, aluminum, and boron in groundwater.

According to the World Health Organization (2021), continuous monitoring of water quality is essential to ensure its suitability for human consumption and should cover physical, chemical, and microbiological parameters.

The project area presents an increasing vulnerability of water resources, resulting from:

- Accelerated population growth;
- Unplanned urban sprawl;
- Increased demand for drinking water;
- Presence of diffuse sources of pollution.

According to Todd & Mays (2005), the sustainable management of water resources requires the integration of measures such as:

- Systematic monitoring of water quality and quantity;
- Protection of charging areas;
- Control of the exploitation of aquifers;
- Implementation of adequate sanitation systems.

In this context, the project should incorporate sustainable water resources management practices to ensure their availability, quality, and long-term resilience.

### 6.2.3. Geology and Geomorphology

The geological and geomorphological characterization of the project's area of influence is essential to understanding the physical processes that govern the occurrence, circulation, and storage of groundwater, as well as the stability of the terrain and its susceptibility to erosion.

**i) Geology**

The city of Nampula lies within the geological context of northern Mozambique, which is dominated by crystalline basement formations consisting essentially of pre-Cambrian metamorphic and igneous rocks. According to IAM (2018), these formations predominantly include gneisses and migmatites, which have high mechanical resistance; granites and granodiorites, associated with magmatic intrusions; and various metamorphic rocks resulting from ancient tectono-metamorphic processes.

These lithologies generally have low primary porosity, and groundwater circulation and storage depend on the presence of fractures, faults, and alteration zones.

From a hydrogeological point of view, these characteristics favor the occurrence of fissured aquifers, whose productivity is variable and conditioned by the density and connectivity of the fractures (Freeze & Cherry, 1979).

**ii) Geomorphology**

The geomorphology of the project area is characterized by a gently undulating to moderately dissected relief, typical of regions sitting on ancient crystalline rocks. The main geomorphological elements consist of hills and gentle interfluves, with moderate slopes; gently sloping plains, often associated with accumulation zones; and shallow valleys, with seasonal drainage.

According to Summerfield (1991), this type of relief results from long-term processes of chemical weathering and erosion, common in tropical environments, which lead to the formation of thick alteration profiles. The main geomorphological processes acting in the area include intense chemical weathering, favored by tropical climatic conditions; water erosion, especially during the rainy season; and sediment transport and deposition in areas of lower slope.

The removal of vegetation cover and disordered land occupation tends to intensify erosive processes, contributing to soil degradation and landscape alteration. In these terms, the geological and geomorphological characteristics of the area have direct implications for the implementation of the project, with influence on the following aspects:

- *Borehole drilling:* dependent on the location of fractured areas with aquifer potential;
- *Soil stability:* influenced by topography and erosive processes;
- *Aquifer recharge:* conditioned by soil permeability and terrain morphology;
- *Risk of erosion:* aggravated in areas intervened in without adequate control measures.

According to Fetter (2001), integrating geological and geomorphological information is essential to ensure the sustainability of groundwater supply projects. It is recommended to reinforce the need for a careful technical approach in the selection of drilling sites and the implementation of appropriate environmental management measures.

#### 6.2.4. Soils

Soils are a fundamental component of the physical environment, performing essential functions in supporting vegetation, regulating the hydrological cycle, and filtering pollutants. Its characterization is decisive for assessing the suitability of the land for implementing the project, as well as for identifying potential associated environmental impacts (Brady & Weil, 2016).

In the project's area of influence, the soils are predominantly derived from the alteration of basement crystalline rocks and, in general, have a sandy to sandy loam texture; a poorly developed structure with poor aggregation; variable colors ranging from reddish-brown to reddish, associated with iron oxides; and variable depth, which can be moderate too deep in flat areas and shallower in areas of steep relief.

According to FAO (2015), these soils often fall into classes such as Acrisols and Ferralsols, which are typical of humid tropical regions and are characterized by low natural fertility and high susceptibility to degradation.

The soils in the area have high permeability, which favors water infiltration and contributes to aquifer recharge; low water retention capacity due to their sandy texture; low natural fertility, with reduced organic matter and essential nutrients; and moderate to high acidity, common in intensely leached tropical soils. According to Lal Rattan (2004), soils with these characteristics are particularly vulnerable to degradation under intensive use without adequate conservation practices.

The soils in the project's catchment area are mainly used for subsistence agriculture (cultivating crops such as maize, cassava, and beans); housing expansion in peri-urban areas; and the exploitation of natural resources (firewood and charcoal). These activities have contributed to significant changes in soil structure and quality, including compaction, loss of vegetation cover, and reduced fertility.

Susceptibility to erosion in the area is considered moderate to high, especially where vegetation cover is removed, inappropriate agricultural practices occur, and slopes are moderate to steep. During the rainy season, the intensity of rainfall can intensify water erosion, resulting in the loss of topsoil, siltation of drainage lines, and environmental degradation.

According to Morgan (2005), soil erosion is one of the main drivers of environmental degradation in tropical regions, directly affecting the productivity and sustainability of ecosystems. The characteristics of the soil have significant implications for the implementation of the project, mainly:

- *Drilling holes:* facilitated in less compact soils, but requiring care regarding the stability of the walls;
- *Civil works:* need for erosion control and adequate drainage;
- *Protection of aquifers:* permeable soil increases the risk of contaminant infiltration;
- *Environmental management:* the need for soil conservation measures, such as revegetation and runoff control.

The conditions described above reinforce the need to adopt appropriate soil management and conservation practices to minimize the environmental impacts of the project's implementation.

### 6.2.5. Air Quality

Air quality is an essential element of the physical environment, directly influencing human health, community well-being, and ecosystem balance. Its assessment in the context of the SES enables identification of existing air pollution levels and establishes a baseline for predicting project-related impacts.

In the project's area of influence, located in the peri-urban areas of the city of Nampula, air quality is generally considered acceptable to moderate, though it varies spatially and seasonally due to human activities and climatic conditions. The main sources of air pollutant emissions in the area include the burning of biomass, namely for the production of charcoal and for solid waste disposal; emissions from motor vehicles, associated with the growth of urban traffic; domestic activities, such as the use of firewood and charcoal for cooking; and dust movement resulting from unpaved roads and construction activities.

According to the World Health Organization (2021), these sources are common in urban areas of developing countries and significantly contribute to air pollution.

The most relevant pollutants in the project area are particulate matter (PM10 and PM2.5) associated with dust and incomplete combustion; nitrogen oxides (NOx) from vehicle emissions and fuel combustion; sulfur oxides (SOx) from fossil fuel combustion; and carbon monoxide (CO) from incomplete combustion of biomass and fuels. According to the World Health Organization (2021), prolonged exposure to these pollutants can cause adverse health effects, including respiratory and cardiovascular diseases.

Local climatic conditions play a decisive role in the dispersion and concentration of atmospheric pollutants, whose dynamics are influenced by the following factors: wind speed and direction; temperature; relative humidity; and precipitation.

During the dry season, the concentration of dust and suspended particles often increases, whereas in the rainy season it decreases due to atmospheric washing (Seinfeld & Pandis, 2016).

Measurement campaigns should be conducted to determine the levels of the main pollutants in accordance with applicable national and international standards, including the World Health Organization guidelines.

The implementation of the project may generate temporary impacts on air quality, especially during the construction phase, including dust (particulate matter) emissions; emissions of gases from machinery and vehicles; and soil movement. However, these impacts are generally localized and short-lived and can be mitigated through appropriate measures, such as humidifying roads and work areas, performing regular equipment maintenance, and controlling emissions of gases and dust.

All the above recommendations should be translated into an air quality monitoring and management program to ensure the protection of public health and minimize the environmental impacts associated with the project.

#### 6.2.6. Noise and Vibration

The characterization of the reference environmental situation regarding noise and vibration levels in the area of influence of the Project for the Improvement of the Water Supply System of the City of Nampula allowed the identification of the acoustic and vibratory conditions currently existing in the areas of Namiteka and Mapara, before the implementation of the activities planned in the project.

In general, the study area presents an acoustic environment shaped by natural and anthropogenic sound sources of low to moderate intensity, which vary with the level of human occupation, vehicle traffic, community dynamics, and local land-use characteristics. The evaluation shows that noise and vibration levels vary with the characteristics of the territory's occupation, the intensity of human activities, and the dynamics of the circulation of people and vehicles. The measurements were carried out at different times of the day and showed relatively stable acoustic behavior in rural areas and higher sound intensity in semi-urbanized areas.

In the absence of specific Mozambican legislation applicable to environmental noise assessment, the results of the present study were compared with the noise limits established in the International Finance Corporation’s (IFC) General Guidelines on Environment, Health and Safety (SSA), part of the World Bank Group, specifically in the Environmental Noise Management document (2007). In addition, the requirements defined in the South African National Standard (SANS) 10103:2008, Version 6 – Measurement and Classification of Environmental Noise in Relation to Speech Disturbance and Communication, were considered a complementary reference, including the methodological procedures adopted for the assessment. The noise level

limits established by the IFC Guidelines are presented in Table 11 and apply to outdoor receivers.

In addition, IFC's Environment, Health and Safety (EHS) Guidelines state that noise-related impacts must not exceed previously specified reference limits or increase by more than 3 dB(A) above the existing baseline noise levels within the project's area of influence. This criterion aims to minimize disturbances to sensitive receptors and ensure environmentally acceptable acoustic conditions.

**Table 11: IFC's typical rating level for noise in various types of neighborhoods**

| Environment Type | Day (07:00–22:00) dB(A) | Night (22:00–07:00) dB(A) |
|---|---|---|
| Residential, Institutional & Educational | 55 | 45 |
| Industrial and Commercial | 70 | 70 |

Note: The limits shown apply to receivers located outdoors and should be considered in conjunction with the criterion of maximum variation of 3 dB(A) for baseline noise.

The surveys were conducted at three monitoring points and revealed spatial differences in noise levels. Regarding environmental noise, the equivalent sound level (LAeq) values recorded at Points 1 and 2 were, in most periods, within the ranges considered acceptable by the guidelines of the World Health Organization (WHO) and the International Finance Corporation (IFC), ranging from normal to potentially nuisance conditions. These levels reflect the predominance of low-intensity local activities, occasional motorcycle and light-vehicle traffic, and the influence of natural sounds, including wind, bird vocalizations, and the current of the Muhala River.

Point 3, located in a semi-urbanized area along the pipeline's planned route, recorded the highest noise levels, with LAeq values often exceeding the recommended limits for residential areas, particularly during the daytime and afternoon. The results indicate a significant influence of anthropogenic factors, such as:

- frequent circulation of motorcycles and vehicles;
- local commercial activities;
- intense community interaction;

- vehicle washing activities in the vicinity of the Muhala River.

During the workday, noise levels increased at all monitored points compared with the weekend, indicating the direct influence of human activities on local acoustic dynamics. The highest value was recorded at Point 3 in the afternoon, reaching 73.9 dB(A), which is classified as harmful according to WHO criteria.

Regarding environmental vibration, the results showed globally reduced levels consistent with rural and semi-urban environments. Most vibration velocity and peak particle velocity (PPV) values were in the low or slightly perceptible range, and none were found to be disturbing or likely to cause structural damage.

As observed for noise, Point 3 exhibited the highest vibratory levels, especially during periods of greater daytime activity, reaching values classified as clearly perceptible. However, the recorded levels remained below the international criteria for significant discomfort or potential structural impacts, indicating that the vibratory environment remained controlled.

The main sources of vibration identified in the study area include:

- circulation of motorcycles and vehicles on unpaved roads;
- movement of people and community activities;
- mechanical actions associated with local traffic;
- low-intensity natural environmental factors.

Taken together, the results indicate that the project's area of influence currently has a moderately high level of noise and vibration, influenced by human activities, especially in semi-urbanized areas. Although periods and locations with noise levels above the recommended values for residential areas have been identified, particularly at Point 3, vibration levels remain within standards considered acceptable for human comfort and the stability of existing structures.

In this context, it is essential that, during the future phases of the project, adequate noise and vibration management and control measures be implemented, including preventive maintenance of equipment, limiting noisy activities during sensitive periods, controlling vehicle speeds, and conducting periodic environmental monitoring, to

minimize potential impacts on local communities and ensure compliance with internationally recommended good environmental practices.

## 6.3. Description of the Socio-economic Background

The socio-economic environment comprises the demographic, economic, institutional, infrastructural, and socio-cultural conditions that characterize the project's area of influence. Its analysis helps us understand the organization and dynamics of communities, as well as their access to basic services and their primary means of subsistence. Within the scope of the SES, this characterization is essential for identifying potential social impacts of the project and for supporting the definition of appropriate mitigation measures, ensuring compatibility between the proposed intervention and the well-being of local populations.

### 6.3.1. Administrative division of the city of Nampula

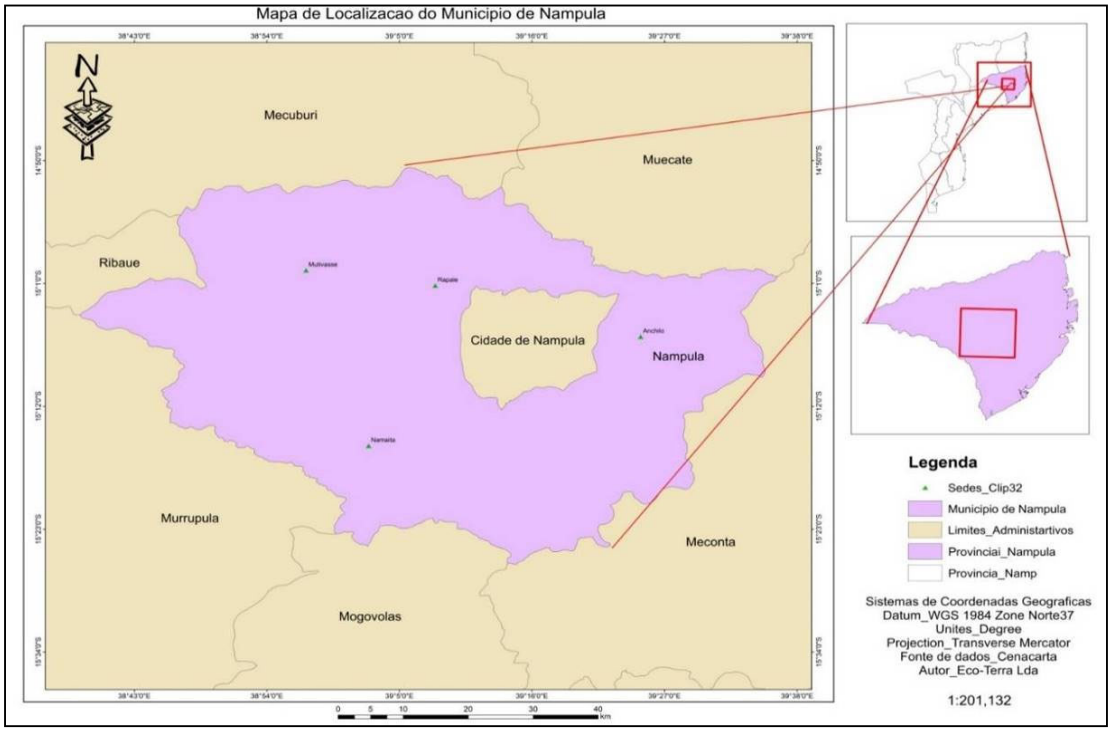
Regarding the administrative division of the Municipality of Nampula, the Municipality borders the district of Nampula and comprises 6 administrative posts (PA), each subdivided into neighborhoods. The city of Nampula has 18 neighborhoods. The central Administrative Post covers about 308.12ha and has 6 neighborhoods. It is the only consolidated area of the municipal territory, and all other Administrative Posts are organized as follows. See the table below.

**Table 12: Administrative Division of the Municipality of Nampula**

| Administrative post | Number of Neighborhoods | Area in ha |
|---|---|---|
| Central Administrative Post | 6 | 308.12ha |
| Natikiri Administrative Post | 3 | 10192.69ha |
| Muhala Administrative Post | 3 | 6806.82ha |
| Muatala Administrative Post | 2 | 6106.ha |
| Administrative Post of Napipine | 2 | 6872.34ha |
| Administrative Post of Namicopo | 2 | 13590.12ha |
| Total | 18 | 43879.09ha |

**Source**: Prepared by the authors, 2026.

**Figure 4: Location map of the city of Nampula**




**Source**: Prepared by the authors, 2026.

### *i) Insertion of project sites*

The project to improve the water supply system has the scope of opening 12 boreholes to supply drinking water in the two Administrative Posts, namely Mautala Administrative Post and Muhala Administrative Post, in the neighborhoods of Muahivire and Muatala, specifically in the communal units of Namicopo B, Mapara, and Namiteka.

This project aims to benefit about 50000 people, including the local population and internally displaced people. The Administrative Posts covered by the project are located within the city and municipality of Nampula. The Muatala PA is located in the city's cement area. It comprises two (2) neighborhoods, Mutauanha and Muatala, and a total of twenty-one (21) communal units, 11 in Mutauanha and 10 in Muatala. It has about 381 blocks, 208 in the Mutauanha neighborhood and 175 in the Muatala neighborhood.

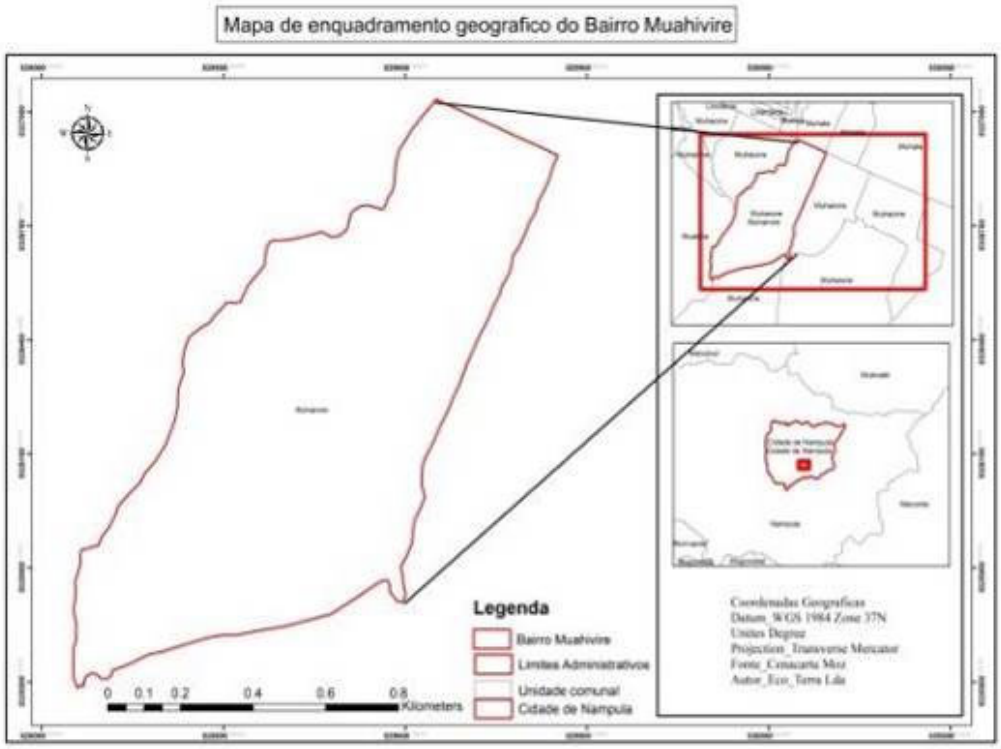
Muatala is bordered to the east by the district of Nampula, to the north by the neighborhood of Namicopo, to the south by the Administrative Post of Anchilo, and to the west by the Central Administrative Post. The Muhala Administrative Post is located

in the southeast of PA Central and has an area of about 68.86 km (6872 ha). It is bordered to the north by the PA of Namicopo, to the south and east by the district of Nampula, and to the west by Central PA and the PA of Mutala. The PA of Mutala has three (3) neighborhoods: Namutequeliua, Muahivire, and Muhala.

The Namutequeliua neighborhood has 6 communal units and 79 blocks; the Muhala neighborhood has 7 communal units and 56 blocks; and the Muahivire neighborhood has 13 communal units and 138 blocks.

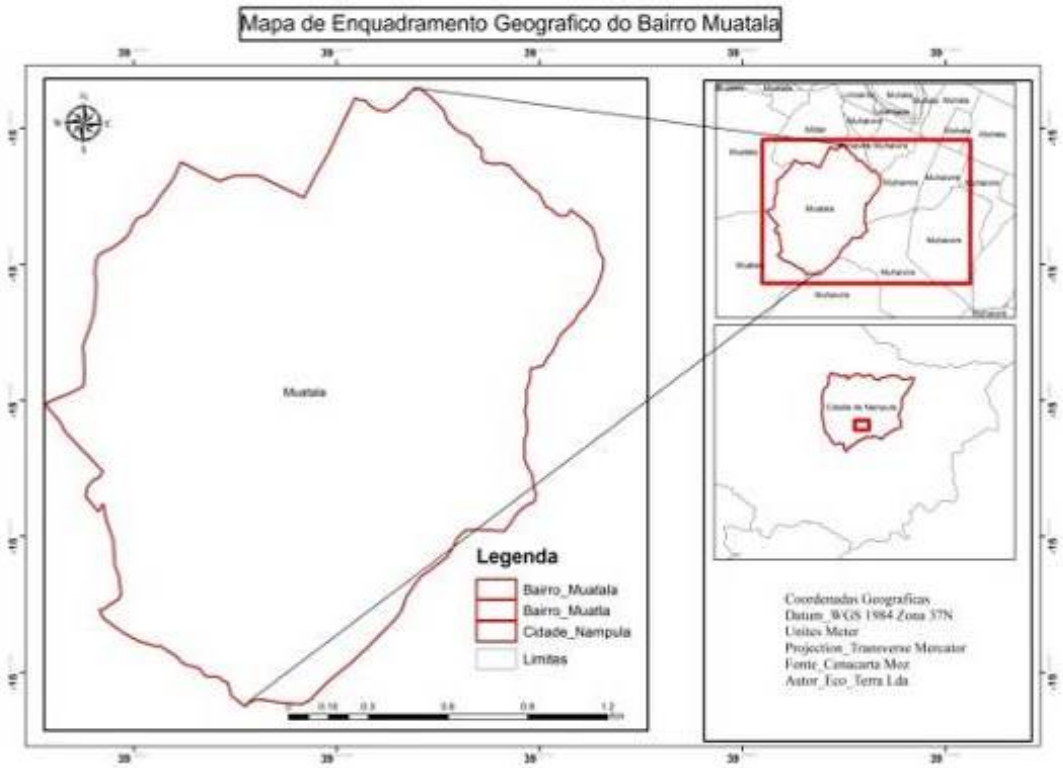
In the Muatala neighborhood, the project will cover two communal units, Namicopo B and Mapara. In the Muahivire Quarter, the project will be limited to the communal unit of Namiteka. Below are the location maps for the two neighborhoods mentioned above.

**Figure 5:** Location of Muahivire neighborhood




**Source**: Prepared by the authors, 2026.

**Figure 6:** Location of Muatala neighborhood




**Source**: Prepared by the authors, 2026.

The neighborhoods of Muatala and Muahivire are growing rapidly and are marked by urban sprawl and significant population growth. As a result, there is pressure on basic services: housing, infrastructure, water and electricity, education, health, among others. The project for the Improvement of the Water Supply System in the City of Nampula was established to address the lack of water in the three communal units and, to a lesser extent, in the city and district of Nampula.

### 6.3.2 Population

According to INE (2017), the city of Nampula, known as the "Capital of the North" of Mozambique, is marked by rapid, disorderly population growth driven by migration (rural exodus) and the war in Cabo Delgado. With a population of about 743,125, the city faces informal expansion, high density, and a young demographic profile.

The process of population growth was accompanied by the proliferation of informal settlements, indicating a disorderly occupation of space. In characteristic terms, the population of Nampula is mostly black and young (following the national pattern), with growing needs for housing and infrastructure.

The Administrative Posts of Muatala and Muhala reflect the population reality described for the city. Because the two posts are located within the urban area, their populations tend to grow in geometric progression, especially in the neighborhoods of Muahivire and Muatala. The tables below present the population statistics and gender distribution for the locations mentioned above.

**Table 13: Total population of the Muatala Emergency Room and Muatala neighborhood**

| Administrative Post of Muatala | | Muatala Neighborhood | |
|---|---|---|---|
| **Total Population** | 142,063 | **Total Population** | 61,712 |
| **Men** | 69,820 | **Men** | 30,253 |
| **Women** | 72,243 | **Women** | 31,459 |

**Source:** INE, 2017.

**Table 14: Summary of the Population of the P.A. of Muhala and Muhala neighborhood**

| Muhala Administrative Post | | Muahivire Neighborhood | |
|---|---|---|---|
| **Total Population** | 231,355 | **Total Population** | 96,580 |
| **Men** | 113,115 | **Men** | 47,144 |
| **Women** | 118,240 | **Women** | 49,436 |

**Source:** INE, 2017.

### 6.3.3. Agriculture

Agriculture is the key driver of economic and social development and is crucial for food security, poverty reduction, and job creation, especially in developing economies. It drives industrialization, provides raw materials, generates foreign exchange through exports, and sustains the livelihoods of the majority of the rural population. In the project's insertion area, agriculture is the main economic activity, although it is combined with formal and informal trade, which is driven by the presence of foreigners. The main crops produced in the project's insertion area are cassava, sweet potato, pigeon pea, butter beans, pumpkin leaf, sorghum, corn, rice, yams, among others. In the markets of Nampula, it is possible to find a little of what the province produces.

### 6.3.4. Livestock

Livestock farming in the Nampula region, including the Rapale district near the city, is an expanding sector, with an emphasis on industrial and family poultry farming, producing thousands of tons of chicken and eggs. The province also maintains a significant cattle herd, with a focus on animal health (vaccination against foot-and-mouth disease) and the promotion of livestock, as well as the potential for agricultural expansion. Other animals, such as sheep, goats, pigs, and various birds, are also present. Regarding birds, it was notable during our field activity that a new type of Indian bird was present, proliferating in that corner of the country because of emigration. The local population is still unaware of the main reason behind the presence of this type of bird but says that it is not typical of the region.

### 6.3.5. Trade & Services

The socioeconomic situation of the city of Nampula is characterized mainly by the informal sector, which employs a large share of the workforce, especially young people. The neighborhoods of the city of Nampula are full of informal markets and stalls run

by small traders selling various industrial products of diverse origins, mainly foreign. It is also possible to find agricultural inputs for farmers in these markets.

Due to insufficient space and a lack of territorial planning in this city, informal markets stand out more, to the detriment of formal ones. Vendors use sidewalks as points of sale, hindering the movement of people and goods in this city. In the city of Nampula, informal commerce is responsible for the tons of organic and inorganic solid waste that are produced, a fact that endangers the health of users and neighboring residents.

**Figure 7: Representation of the informal market**

**Source**: Prepared by the authors, 2026.

### 6.3.6. Education

Education in Nampula is marked by significant structural challenges, with a focus on expanding access to primary and secondary education, according to Law 18/2018, Article 7, Point 1. It defines 9 years of compulsory basic schooling. It also faces a high illiteracy rate (28.9% nationally, higher in rural areas) and gender disparity.

The curricular structure is organized into 6 primary and 6 secondary classes to provide greater coverage. One of the major challenges of accessing education is social inequality. Women are the most affected due to domestic work, and few attend school. Another challenge is the lack of qualified teachers and teaching infrastructure, as many schools in rural areas are precarious, as illustrated in the image.

**Figure 8: Detail of a Local School**

**Source**: Prepared by the authors, 2026.

Primary education prepares students for secondary education and comprises the first seven classes, subdivided into two grades. It provides basic training in communication, the mathematical sciences, the natural and social sciences, and physical, aesthetic, and cultural education. It transmits knowledge of techniques and develops manual skills, attitudes, and convictions that provide entry into productive life, and it provides a basic formation of the individual's personality (Momade, 2018). The National Education System (SNE) comprises the following subsystems:

- Preschool Education Subsystem;
- General Education Subsystem;
- Adult Education Subsystem;
- Professional Education Subsystem;
- Subsystem of Education and Training of Teachers;
- Higher Education Subsystem.

### 6.3.7. Health

The health system in the city of Nampula is integrated into the country's national health system (SNS) and is characterized by a predominantly public model focused on primary care and the prevention of prevalent diseases, with structural challenges due to high population density. The system is organized hierarchically, integrating the National Health Service (SNS), which covers the country. The central hospital is the largest unit at the provincial level. We also have the Health Units, which assess

resource availability and serve as a link between the primary network and health centers distributed throughout the neighborhoods and cities. These units are responsible for basic care, vaccination, and maternal health programs.

The health system in the city of Nampula faces structural challenges, like those in other cities in the country. The focus is on the lack of equipment, medicines, and specialized medical staff.

The pressure on the health system means that, even with some private operators (clinics) in place, there remains a greater demand for services. The campaigns carried out by partnerships (NGOs) have made a significant contribution to raising awareness in communities about joining health services. It has been observed that in remote communities, where basic health services "are almost non-existent," the community has resorted to traditional medicine. These traditional practices have brought serious consequences to the community itself (sudden deaths). They also hinder the medical team's analysis and interpretation.

The project's areas of insertion are located within the urban area of the city of Nampula, and they have health centers very close to the communities. In addition, this project will significantly improve sanitation in the communities involved, as well as among the displaced.

#### 6.3.8. Historical and cultural heritage

The historical and cultural heritage of Nampula, the capital of Northern Mozambique, reflects its military origins and local development, highlighting the Cathedral of Our Lady of Fatima, the National Museum of Ethnography, and the architecture of the city center dating back to the early twentieth century.

The Cathedral of Our Lady of Fatima, an architectural masterpiece built in the 1940s and 1950s, is a religious and cultural landmark. The images below depict the two heritage sites mentioned earlier (Cathedral of Our Lady of Fatima and the Island of Mozambique).

**Figure 9:** Cathedral of Our Lady of Fatima

**Figure 10:** Detail of the Island of Mozambique

**Source:** Elaboration

The city of Nampula exhibits a mix of Arab, Muslim, and Western influences in its architecture and traditions. Although many old colonial heritage sites are located on the neighboring Island of Mozambique, the island is home to one of the oldest buildings, which is designated as a historical and cultural heritage site. This is because the island was where the country's first capital city was established.

#### 6.3.9. Transport

The city of Nampula is the province's main commercial and administrative center. The city is crossed by the N1 national road, which connects the North to the South of the country. Due to its strategic importance, two other important road axes start or end there.

- The N13 national road towards Lichinga, in the northern province of Niassa;
- The N104 national road, to the coastal town of Angoche; e
- The R686 regional road in the southeast direction to the town of Liupo is 99km away.

National Road No. 1 (EN1) runs along the railway line and operates within the Municipality of Nampula. It serves as the main urban road, known as AV. Do Trabalho, serving both the city's population and traffic diversion. The current road hierarchy is structured as follows:

- Main roads;
- Secondary (complementary) pathways:
- Tertiary roads (proximity) structuring the neighborhoods; e
- Local access roads.

Regarding the road network at the level of the Administrative Posts of Muatala, it is important to note that there are three roads where semi-collective passenger transport vehicles also circulate:

The main road, AV. Do Trabalho, which coincides with the National Road no1 (EN1), towards Murrupula.

The tertiary roads, which are structured at the neighborhood level, are:

- Rua dos Sem Medo with origin in AV. Filipe Samuel Magaia bifurca;
- Street 3,023 originates at Rua da Solidariedade (central neighborhood), crossing the neighborhood until it ends at AV. Do Trabalho (Rua NO 3.029 - 3.023.3314 -3.275).
- Streets No. 3,016 – 3,014 – 3,298 – 3,306 – 3,309.

At the level of the Muhala Administrative Post, there are three (3) roads where semi-collective passenger transport vehicles circulate;

- The N1 National Road (towards Nacala);
- Av. Eduardo Mondlane that separates Namutequeliua and Muhala;
- Av. FPLM that connects the city center with Napalala.

There is also a main road;

- Av. Do Trabalho serving the Namutequeliúa neighborhood, the secondary road Av. Samora Machel, Muhala and the tertiary road Av. Martyrs of Mueda.

In general terms, mobility in the city of Nampula is conditioned by the type of equipment available and the consequent degradation of the quality of the urban environment, as a result of growing traffic congestion and a consequent reduction in road safety, leading to fragile urban living conditions and, in particular, a decrease in conditions for the "soft modes of travel".

#### 6.1.10. Sanitation of the environment

The sanitation system in the city of Nampula faces critical challenges, including poor solid waste management, garbage outbreaks in residential areas, and road obstructions. Inadequate sewage management, limited septic tanks and latrines, and restricted access to drinking water increase the risk of waterborne diseases, especially during the rainy season. The following image portrays a reality of inefficiency in solid

waste management in the arteries of the city of Nampula, specifically in the Muahivire neighborhood.

**Figure 11:** Solid waste disposal in the city of Nampula

**Source**: Prepared by the authors, 2026.

### 6.3.11. Water supply

Generally speaking, the water supply in the city of Nampula is insufficient, even with the Monapo River dam producing about 17,000-18,000 m3/day. The dam faces serious capacity constraints in meeting the city's population needs. According to the head of the Muhala Administrative Post, a large part of the population of the Muhala Administrative Post has a piped water supply system but does not have water. They use water from the river or from small suppliers who have the system.

This reality is also present in the Administrative Post of Muatala, specifically in the communal units of Mapara and Namicopo B. In the former, the nearest source wells that some residents have dug in their homes, as is the case with Mr. Martins, chief of block 21. In the latter communal unit, the situation is extremely difficult because they rely on the river to obtain water.

The project to drill the 12 boreholes at the above-mentioned locations is of paramount importance because it will significantly help address the lack of water and, by extension, improve sanitary conditions, as well as promote the social and economic development of the communities.

### 6.1.12. Housing

Housing in Nampula province and city is characterized by a stark contrast between planned areas and rapid and precarious peripheral growth. Informal settlements with

irregular mesh and constructions of conventional and precarious materials predominate, alongside the emergence of closed condominiums that contribute to spatial fragmentation and peripheralization. There is also a supply of properties for rent and sale, ranging from single-story houses to apartments.

**Figure 12:** Demonstration of the predominant housing type on the outskirts of the city


**Source:** Elaboration

In the three (3) project locations in the city and district of Nampula, several types of housing predominate, including traditional houses, masonry houses, and houses (precarious and conventional), as illustrated in the images. In the communal units of Namiteka and Mapara, there is currently geometric growth in urbanization, which generates significant challenges in the management of land and urban infrastructure, unlike the communal unit of Namicopo B, which registers arithmetic growth in urbanization, where much of the use and occupation of the land is characterized by green areas.

#### 6.3.13. Culture, Religion, and Cultural Practices

The cultural construction of the population in the city of Nampula is initially instilled through Macua cultural practices (such as initiation rites and ancestral spirit cults) and religion (the Sharia laws for Muslims and the Bible and its interpretations for Christianity). Language, as a cultural practice, is important not only for communication and access to information but also for a deeper understanding of the changing world in which people live. A common language also strengthens the social cohesion of a population group and serves as an important vehicle for cultural values and norms.

The importance of religion in the communities where the project is located (Namiteka, Mapara, and Namicopo B) does not mean that traditional spiritual practices have become less important. Along these lines, most of the community regularly practice ancestor worship ("Epapa", "Mukutho", "Swadaka", and "Kupatha"), regardless of the

imposed religions. The proportion of the population that practices ancestral cults is smaller, resulting from household changes or even the process of acculturation, which is driven by the massive presence of people from different corners of the world.

Its essence is to relate to ancestors and their spirits to ensure a good life and to solve family and community problems, based on a perception of close interconnections between the past and the present. The complexity of male-female relationships is well exemplified by the continued importance of women (apyamwene n'loko / apyamwne nihimo) in these cults.

Traditionally, the type of cultural practice most directly related to religion and the cultural perception of men and women was initiation rites. In the historical Macua tradition, women were taught to behave as wives during their initiation ceremonies. These ceremonies took place when the girls were around ten years old and were under the tutelage of older women who taught them about hygiene, sexual behavior, and what their duties should be towards their future husbands. For boys, the initiation rites were intended to teach them bravery and responsibility; in these ceremonies, both women and men are taught traditional practices for invoking spirits (SHELDON 2002).

#### 6.3.14. Language

The city of Nampula is a multicultural center, characterized by the strong influence of the Emakhuwa (Macua) language and culture, predominantly in the northern region of the country. It coexists with Portuguese, the official language. Religiosity is diverse, with an emphasis on Muslim and Catholic communities, reflecting a blend of Arab and Bantu traditions.

### 5.4. Land Use and Occupation

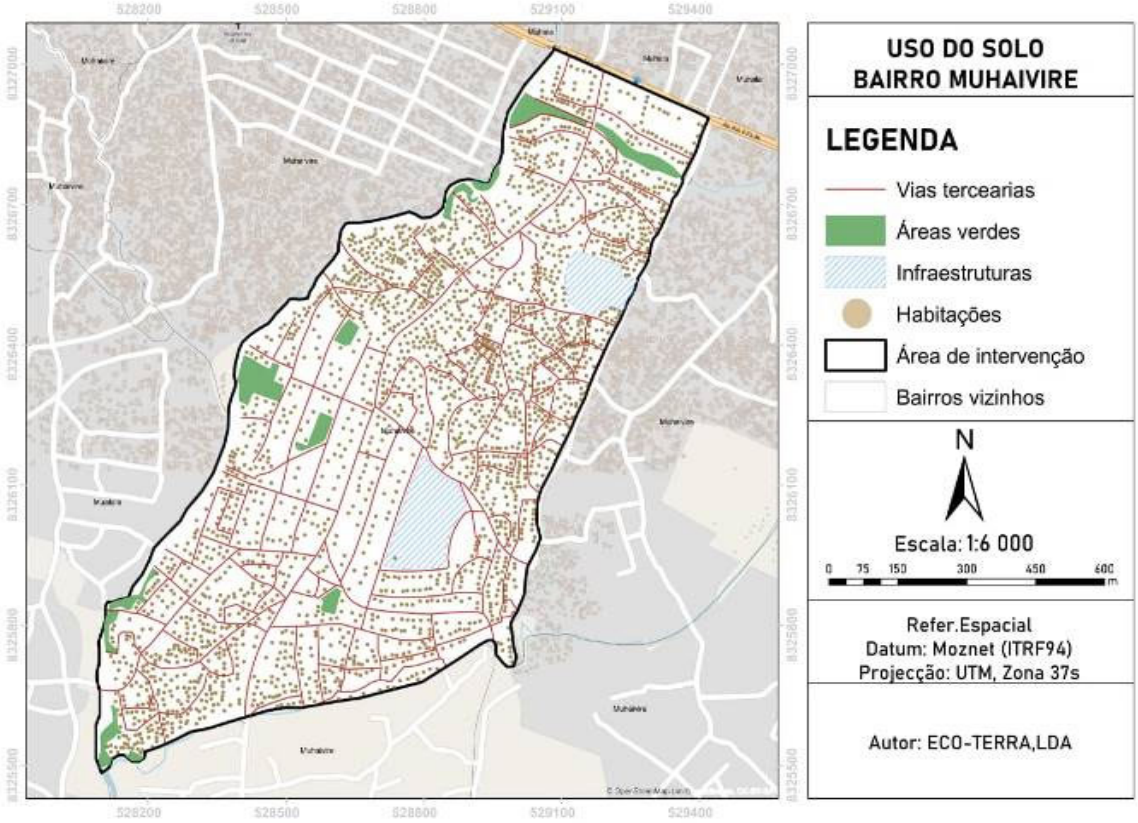
Regarding the use and exploitation of land in the communal units covered by the project (Namicopo B, Mapara, and Namiteka), the reality mirrors a little of what exists in the city of Nampula, the area of influence of these communal units.

In general, land use and exploitation are characterized by the rapid growth of social and economic infrastructure that provides various services. Green areas are also notable for agricultural fields, access roads, idle areas, and bodies of water, such as rivers and small lagoons, among other features.

In the development process in the province and city of Nampula, the use and exploitation of land vary by the type of investment in each area. In the communal unit of Namicopo B, the emergence of small factories and a strong presence of small shopping centers are notable. In the communal units of Mapara and Namiteka, what stands out most are agricultural fields and commercial stall areas.

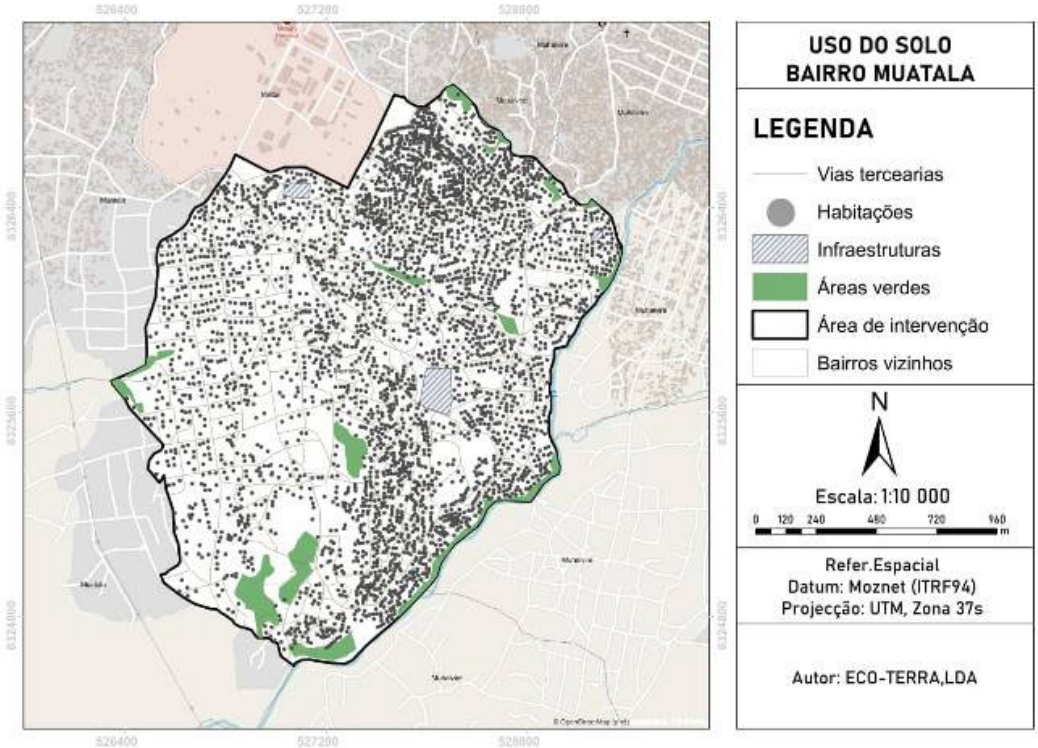
In short, the use and exploitation of the land vary according to the potential of each soil, region, and population, and, above all, by the presence of access roads and improved living conditions, with emphasis on the distribution of services and basic infrastructure. See the land use and land cover maps below, which illustrate the types of land use in the communal units covered by the project.

**Figure 13:** Map of Land Use and Land Cover in Muahivire Neighborhood



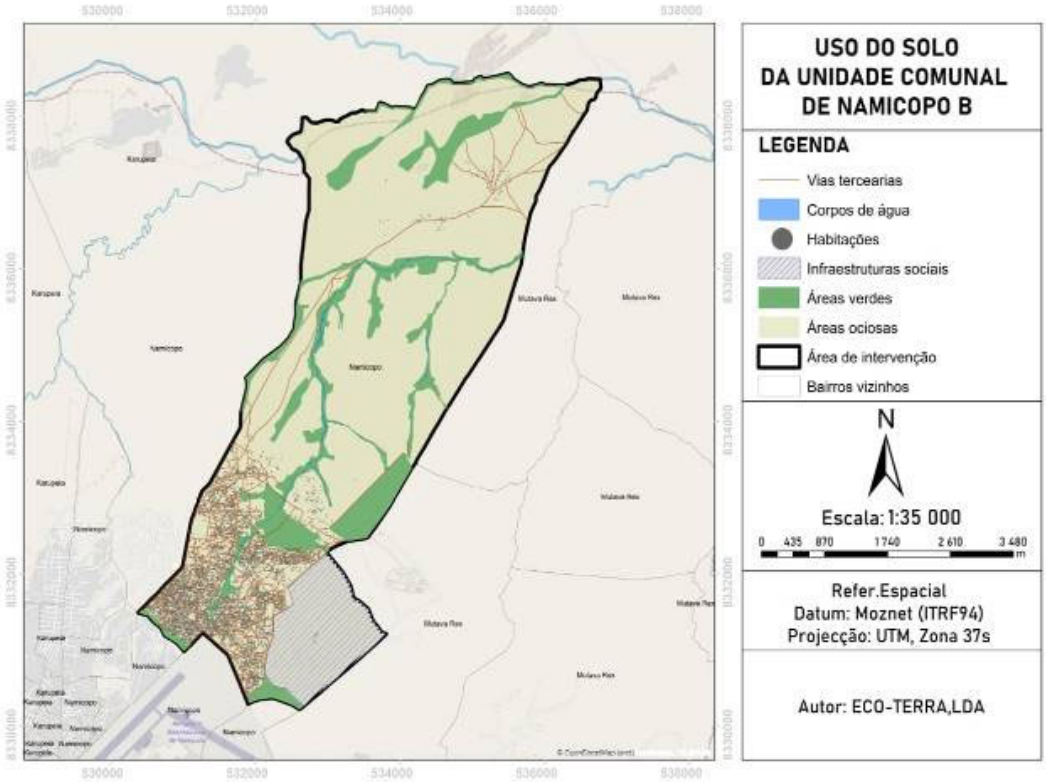

**Source**: Prepared by the authors, 2026.

**Figure 14: Map of Land Use and Land Cover in Muatala Neighborhood**




**Source**: Prepared by the authors, 2026.

**Figure 15:** Map of Land Use and Land Cover in the Namicopo B Neighborhood




**Source**: Prepared by the authors, 2026.

# VII. IDENTIFICATION AND ASSESSMENT OF ENVIRONMENTAL IMPACTS

This chapter describes the project's main impacts, both positive and negative. For this SES, impact is understood as the change in a specific environmental factor at a given time, which may be biophysical, socioeconomic, or cultural, caused directly or indirectly by the project's action, compared with the situation at the same time and in the future in the absence of the project.

The environmental impacts below were identified throughout the evaluation process. These are considered to have the potential to positively and negatively influence environmental development in the presence of the enterprise.

To identify the impacts, it is necessary to comply with the following assumptions:

- Good understanding of the activities to be implemented by the project during the construction, operation, and decommissioning phases, to identify those that are likely to have a direct or indirect impact on the environment or local communities;
- Knowledge/assessment of the physical, environmental, and socioeconomic context of the project's insertion area before its execution, allowing the identification of aspects that may be affected by the project.

## 7.1. Impact Assessment Methodology

The methodology used to identify, characterize, and evaluate the project's environmental and socioeconomic impacts was based on qualitative and quantitative methods, with an emphasis on an interaction matrix linking project activities to potentially affected environmental factors. This approach enables the establishment of cause-and-effect relationships, the identification of significant impacts, and the definition of appropriate mitigation, compensation, and monitoring measures.

The first stage consisted of preparing a preliminary list of potential impacts, based on the project's technical information, the activities foreseen in the different phases of the project, and the environmental diagnosis carried out around the Direct Influence Area (IDA) and the Area of Indirect Influence (IIA) of the project. This identification considered the biophysical, socioeconomic, and cultural components. Following the

methodological procedures, the impacts included in the preliminary list were evaluated according to the following classification parameters:

***a) Sign:***

- Positive impact - improvement of the existing situation regarding the state of a given resource or population, as well as the project's felt or foreseeable satisfaction.
- Negative Impact - temporary or permanent adverse effects on the physical, biotic or socio-economic environment.

***b) Probability*** – refers to the degree of possibility of the impact occurring and will be classified as:

- Unlikely - the possibility of the impact occurring is low given its nature of occurrence;
- Probable - existence of an evident possibility of the impact occurring;
- Highly probable - the possibility of the impact occurring is almost certain;
- Definitive - when there is certainty of the occurrence of the impact, no matter how many mitigation and/or prevention measures are applied.

***c) Extent*** – refers to the spatial behavior of the activity and its impacts on the limits of the ADA, AID, and IIA, being classified as:

- Local - Local impacts are confined to the area of occurrence of the Project's actions (it is limited to ADA and AID);
- Surroundings - in the project's IIA;
- Regional - the region, which can be defined in various ways (the entire province of Nampula or the Northern Region of the country):
- National – throughout the country;

***d) Duration*** – refers to the lifetime of the impact, which can be classified as:

- Temporary - lasting (up to 6 months) and occasional or intermittent
- Short-Term - (0 to 1 years) encompassing most of the impacts;
- Medium Term - (1 to 5 years);

- Long-Term – (5 to 10 years) the impact has effects during this period of time, and may or may not end even when the activity ceases;
- Permanent – (more than 10 years) the impact is prolonged even after the end of the activity and even after the application of mitigation and/or prevention measures.

**e) Intensity** - this parameter evaluates the magnitude with which impacts violate norms and regulations, affect communities and social processes, and affect the action of environmental processes. In this context, intensity is classified as:

- Low - the impact occurs without affecting the functioning of natural and socio-cultural processes;
- Medium – the impact temporarily alters the functioning of natural, social or cultural processes; and
- High - the impact alters the functioning of natural, cultural or social processes in a lasting or definitive way.

***f) Significance -*** refers to the natural or social importance of the impact on the environment, determined using technically based, objective criteria and synthesized from the previous parameters and aspects (extent, duration, intensity, and probability), and will be classified as:

- Low – actions produce insubstantial impacts and are probably associated with very small and/or not very important real changes. These are significant, usually short-term, impacts on the social and/or natural environment;
- Medium - are impacts that result in changes that are generally important and real, but not substantial, whose effects are easily mitigated or potential. These are generally medium-term effects on the receiving environment;
- High - These are impacts whose effects are difficult to contain, regardless of the degree of mitigation. These impacts will result in long-term effects, producing important changes in the receiver. These are very serious impacts from the perspective of human society.

## 7.2. Description of the Main Impacts on the Project Phases

The identification and assessment of the project's environmental and social impacts were structured around the project's life cycle phases, namely: (i) design and pre-

construction phase, (ii) construction phase, and (iii) operation phase. This approach enables a systematic, integrated analysis of the project's potential effects, ensuring the definition of appropriate mitigation measures at each stage.

- Design **and Pre-Construction Phase:**

At this stage, the impacts are primarily associated with planning activities, technical studies, and institutional and community interactions. Positive impacts of IP&A involvement are evident in public consultation processes, which promote transparency and social inclusion. However, negative social impacts may arise, including high community expectations, potential land-use conflicts, and concerns about the future occupation of areas used for subsistence agriculture. This phase continues until equipment is mobilized and on-the-ground activities begin.

- **Construction Phase**

It is characterized by more significant impacts, especially temporary and local ones. Among the main negative impacts are the removal of vegetation, changes in land use, dust and noise emissions, disruption of local socio-economic activities, the risk of accidents at work, and temporary impairment of infrastructure and access. In addition, there may be a loss of agricultural crops in the areas where the infrastructure is implemented. On the other hand, this phase generates relevant positive impacts, such as job creation, boosting the local economy, and developing technical skills. This phase covers everything from land preparation to the completion of the works and the shipyard's demobilization.

- **Operation Phase**

It spans the longest period of the project cycle and is associated with the operation and maintenance of the water supply system. The positive impacts are predominant, highlighting significant improvements in access to drinking water, reductions in waterborne diseases, improved hygiene and sanitation, and the promotion of local socio-economic development. However, there may be low-magnitude negative impacts, such as the risk of overexploitation of groundwater resources, energy consumption associated with system operation, and the need for proper management of chemicals used in water treatment (e.g., chlorine). These impacts will be controlled through management measures and continuous environmental and social monitoring.

In this way, the phased analysis enables anticipation of risks and maximization of project benefits, ensuring implementation in an environmentally sustainable and socially responsible manner.

### 7.3. Main Environmental Impacts in the Design and Pre-Construction Phase

The design and pre-construction phase of the Namiteka and Mapara Water Supply System comprises the preparatory activities necessary to implement the project, including technical and environmental studies, field surveys, public consultations, the definition of intervention areas, institutional mobilization, and planning of the works. Although there are no significant physical interventions in the environment at this stage, some activities may generate environmental and socio-economic impacts, both positive and negative, mainly associated with interactions with communities, the collection of basic information, and the operational preparation of the project. The impacts identified at this stage are generally of low magnitude and predominantly temporary, and can be adequately managed through the application of preventive measures and good environmental and social management practices.

#### 7.3.1. Positive Impacts in the Design and Pre-Construction Phase

The positive impacts associated with the design and pre-construction phase of this project stem primarily from the technical, environmental, and social decisions made during the project's planning stage. At this stage, the project adopts a preventive and strategic approach, enabling us to anticipate potential environmental and social risks before work begins, reducing future mitigation costs and promoting technically viable, environmentally sustainable solutions. Thus, decisions made at the project design level are an important mechanism for preventing impacts, contributing to the harmonization of infrastructure implementation with environmental conservation and the protection of the livelihoods of local communities.

Among the main benefits of this phase is promoting the sustainability of groundwater resources through hydrogeological studies and by defining safer rates of aquifer exploitation. The technical design of the catchment system was intended to avoid overexploitation of the water table, minimize the risk of reduced water availability in neighboring community wells, and prevent potential changes in ecosystems dependent on groundwater. This approach helps ensure the water balance of the project's catchment area and the long-term sustainable use of water resources.

Another positive impact is the minimization of deforestation and environmental degradation by optimizing the layout of the proposed infrastructure, including pipelines, access routes, and borehole locations. Whenever technically feasible, the project layout has been adjusted to avoid sensitive areas, large trees, and environmentally vulnerable zones, reducing the need to remove vegetation cover and partially preserving existing natural habitats.

The design phase also strengthened the protection of community assets and local livelihoods. The integration of technical surveys and social mapping of the affected areas enabled the identification, in advance, of housing, agricultural areas, social infrastructure, and places of community interest, allowing the project design to be adjusted to minimize direct interference. In this context, priority was given to preventive measures such as diverting routes to avoid affecting housing and social infrastructure, defining buffer zones between the construction areas and community assets, and incorporating shared-benefit solutions, including the provision of public fountains associated with the projected boreholes, to expand the social benefits of the project for local communities.

Overall, the positive impacts of this phase help strengthen the project's social acceptance, improve its environmental sustainability, and reduce potential conflicts associated with implementing the planned infrastructure.

**(a) Generating positive expectations for improved water supply**

During the design and pre-construction phase, the dissemination of the project to beneficiary communities and local authorities generates positive expectations for improved access to drinking water, reduced supply difficulties, and improved public health and social welfare. This impact is particularly relevant in the areas of Namiteka and Mapara, where populations face severe limitations in accessing safe drinking water.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Positive | Definitive | Surroundings | Long Term | High | High |

**Potentiation measures:**

- Ensure continuous and transparent communication with communities regarding the project's progress;
- Strengthen public participation and complaint management mechanisms;
- Raise awareness in communities about the project's benefits and limitations, avoiding unrealistic expectations;
- Prioritize the integration of local communities into the activities associated with the project.

**b) Institutional strengthening and inter-institutional coordination**

The design phase of the project promotes articulation among different public, private, and community institutions involved in the management of water resources, the environment, spatial planning, and local development. This process contributes to strengthening institutional coordination and improving environmental and social planning and management capacity.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Positive | Highly likely | Regional | Medium Term | Average | Average |

**Potentiation measures:**

- Promote periodic coordination meetings among the institutions involved;
- Strengthen institutional communication mechanisms;
- Ensure compliance with the project's legal and environmental obligations;
- Train local technicians in environmental and social management.

**c) Creation of preliminary employment and service opportunities**

Even before the start of the works, the project preparation phase can create temporary employment opportunities and provide services such as topographic surveys, environmental studies, logistics, public consultations, and technical support, benefiting part of the local population.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Positive | Probable | Location | Short Term | Low | Low |

**Potentiation measures:**

- Prioritize the hiring of local labor whenever technically feasible;
- Encourage the participation of small local service providers;
- Ensure transparency in recruitment and hiring processes.

**d) Improvement of environmental and social knowledge of the project area**

Environmental studies, field surveys, community consultations, and laboratory analyses provide a deeper understanding of the biophysical and socioeconomic characteristics of the project's implementation area, creating an important technical basis for the sustainable management of the territory and for future development interventions.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Positive | Definitive | Regional | Long Term | Average | Average |

**Potentiation measures:**

- Ensure the systematization and conservation of the collected environmental data;
- Share relevant information with local institutions;
- Use the results of the studies to support future environmental monitoring;
- Integrate local communities into the processes of collecting and validating information.

### 7.3.2. Negative Impacts in the Design and Pre-Construction Phase

Despite the benefits associated with the current project, the design and pre-construction phase can also lead to negative environmental and social impacts, mainly related to the planning process, the definition of the infrastructure layout, the delimitation of the areas of implementation, and the initial interaction with the potentially affected communities.

At this stage, the impacts tend to be associated with the generation of expectations in communities, the possibility of preliminary allocation of assets and economic activities, and conflicts related to the use and occupation of land. Although these impacts do not yet constitute significant physical changes in the environment, they can influence the social perception of the project and shape its acceptance by local communities.

For this reason, it is essential that the planning process be conducted in a participatory, transparent, and technically grounded manner, ensuring the accurate identification of potential impacts and the early definition of appropriate measures for prevention, mitigation, and compensation.

### a) Generation of expectations and uncertainties in communities

During the design and pre-construction phases, project dissemination and public consultations can raise high expectations in local communities for access to clean water, employment, and improved living conditions. However, implementation delays, project changes, or communication failures can lead to frustration, mistrust, and social insecurity among affected populations.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Highly likely | Surroundings | Short-Term | Average | Average |

**Mitigation measures:**

- Ensure continuous, transparent communication with communities;
- Disseminate clear information on project timelines, limitations, and phases;
- Avoid making unsupported promises regarding employment and social benefits;
- Strengthen public participation and complaint management mechanisms;
- Involve community leaders in disseminating information.

### (b) Potential preliminary allocation of agricultural areas and Community assets

The preliminary definition of the sites for boreholes, pipelines, and associated infrastructure may affect areas currently used for subsistence agriculture, community movement, or other local activities. Even before construction, uncertainty about the

future use of these areas can limit agricultural investments and generate social concerns.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Location | Medium-Term | Average | Average |

**Mitigation measures:**

- Optimize infrastructure layout to minimize the use of productive areas;
- Conduct a detailed survey of potentially affected assets;
- Inform communities in advance about the areas of intervention;
- Implement fair compensation mechanisms for unavoidable losses;
- Prioritize areas that have already been anthropized or have lower socioeconomic sensitivity.

### c) Conflicts related to the use and occupation of land

The occupation of areas designated for the project's infrastructure may generate conflicts among communities, local land users, and the proponent, especially in areas with agricultural activities, informal occupations, or unclear plot boundaries.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Location | Medium-Term | Average | Average |

**Mitigation measures:**

- • Conduct inclusive and transparent community consultations;
- • Coordinate the process with local authorities and community leaders;
- • Ensure respect for customary rights to use and exploit land;
- • Establish accessible conflict-resolution mechanisms;
- • Clearly delineate the areas of intervention before the start of the works.

### d) Social anxiety associated with the compensation process

Identifying potentially affected assets and crops can cause anxiety and insecurity among the families covered, especially when there are doubts about the evaluation criteria, deadlines, and compensation amounts.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Highly likely | Surroundings | Short-Term | Average | Average |

**Mitigation measures:**

- Clearly explain the eligibility and compensation criteria;
- Ensure transparency in the asset valuation process;
- Ensure the participation of affected families in the surveys;
- Establish accessible and effective complaint channels;
- Make compensation before the actual occupation of the affected areas.

**(e) Possibility of inadequate infrastructure planning**

Failures in technical and environmental planning may result in inappropriate location or layout choices, increasing the risk of erosion and social conflicts, affecting natural habitats, and leading to additional maintenance costs.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Unlikely | Regional | Long-Term | High | Average |

- **Mitigation measures:**
- Conduct detailed technical and environmental studies;
- Integrate environmental and social criteria into the project design;
- Consider location- and technology-based alternatives;
- Incorporate appropriate hydrogeologic and geotechnical studies;
- Ensure a multidisciplinary review of the project prior to implementation.

## 7.4. Main Environmental Impacts in the Construction Phase

The construction phase marks the transition of planned infrastructure from paper to the ground, involving activities such as drilling boreholes, trenching, laying pipelines, and building a pumping station and a water distribution plant. Conventional civil and

hydraulic construction equipment will be used to carry out these activities, including drilling rigs (rotary, rotopneumatic, or percussion), backhoe loaders, graders, transport trucks, air compressors, mud pumps, winches, cement injection systems, and other auxiliary equipment necessary for the construction process.

The impacts associated with this phase result directly from construction activities and the use of machinery on the ground, and may affect the physical, biotic, and socio-economic environments. In the physical environment, there may be temporary changes in air quality, noise levels, vibrations, and soil movement. In the biotic environment, impacts tend to be limited because the intervention areas already have a strong anthropogenic influence. In the socio-economic environment, both positive and negative impacts are expected, with a predominance of positive ones, associated with job creation, local economic dynamism, and future improvement in access to drinking water.

In general, although this phase involves a higher intensity of on-the-ground activities, the project is not considered a catalyst for critical or irreversible environmental impacts, provided that the mitigation measures and good construction practices set forth in the ESMP are implemented, thereby ensuring compatibility between the execution of the works and the protection of the environmental and social values of the intervention area.

### 7.4.1. Positive Impacts in the Construction Phase

The construction phase of the project is a period of intense technical, logistical, and social activity during which the fundamental infrastructure of the water supply system is implemented. Although this stage involves environmental impacts typical of civil works, it is also marked by a significant set of positive impacts, with a strong impact on the socio-economic environment.

These positive impacts are primarily associated with the mobilization of local labor, the contracting of services and supplies within the project's area of influence, and the increased circulation of financial resources in surrounding communities. In addition, opportunities for technical training and practical learning for local workers are promoted, contributing to the strengthening of skills in the civil construction and hydraulic sectors.

In this way, the construction phase plays a significant role not only in the physical realization of the project but also as a temporary engine of local economic dynamism, generating multiplier effects that directly and indirectly benefit the communities of Namiteka and Mapara.

### a) Generation of temporary direct employment

During the construction phase, the project will require labor for activities such as trenching, drilling holes, transporting materials, assembling equipment, and providing logistical support. This will create temporary employment opportunities for local workers, including unskilled labour.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Positive | Definitive | Location | Temporary | Average | Average |

**Potentiation measures:**

- Prioritize the hiring of local labor;
- Ensure safe and dignified working conditions;
- Promote basic training in safety at work;
- Ensure gender equity in hiring whenever possible.

### b) Generation of indirect employment and dynamism of the local economy

The presence of the construction site and construction teams stimulates local economic activity, including food supply, transportation, informal trade, and small services.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Positive | Highly likely | Surroundings | Temporary | Average | Average |

**Potentiation measures**

- Encourage the local supply of goods and services;
- Integrate local traders into the project's supply chains;

- Ensure transparent rules for contracting auxiliary services.

**(c) Skills transfer and capacity building of the local workforce**

The interaction between local workers and specialized technical teams enables the transfer of practical knowledge in civil construction, hydraulic infrastructure installation, and safety standards.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Positive | Probable | Location | Medium Term | Average | Average |

**Potentiation measures:**

- Implement on-site training programs;
- Include training sessions on safety and good environmental practices;
- Document and systematize good practices for future replication.

**(d) Temporary improvement of access to local services and infrastructure**

The project's presence may lead to temporary improvements in local access, the opening of service roads, and punctual rehabilitation of paths used to transport materials and equipment.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Positive | Probable | Location | Temporary | Low | Low |

**Potentiation measures:**

- Plan access roads to also benefit the communities;
- • Ensure maintenance of the roads used during work;
- • Prevent damage to existing infrastructure.

**e) Improvement of the organization and planning of the intervention space**

The implementation of the construction site, the delimitation of work areas, and the organization of the site contribute to a clearer definition of land use in the intervention area, reducing disorderly occupations during the execution of the project.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Positive | Highly likely | Location | Temporary | Low | Low |

**Potentiation measures:**

- Clearly define and signal all work areas;
- Implement an organized and controlled shipyard plan;
- Avoid disorderly occupation of spaces outside the project area.

### f) Stimulation of local commerce and complementary services

The presence of workers and suppliers increases demand for daily consumer goods, food, transportation, and small services, boosting local commerce.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Positive | Definitive | Surroundings | Temporary | Average | Average |

**Mitigation/optimization measures:**

- Encourage the purchase of local products;
- Support small traders in formalizing services for the project;
- Ensure fair and transparent business practices.

### g) Improvement of operational safety and prevention culture

The construction phase requires the implementation of occupational safety standards, which helps foster a culture of risk prevention among workers and nearby communities.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Positive | Probable | Location | Medium Term | Average | Average |

**Potentiation measures:**

- Implement an occupational health and safety plan;
- Conduct regular safety training;
- Ensure the allocation of EPCs and the mandatory use of PPE;
- Sensitize communities about the risks associated with the works.

### 7.4.2. Negative Impacts in the Construction Phase

The construction phase, although essential to achieving the expected socioeconomic benefits, entails technical and operational activities that can generate adverse environmental and social impacts. These impacts are mainly associated with excavation, drilling, earthmoving, material transport and circulation, operation of heavy machinery, pipeline installation, and implementation of various hydraulic infrastructure.

In general, the negative impacts of this phase are predominantly temporary, reversible and localized, affecting ADA and IDA. However, depending on the intensity of the activities, the conditions of the receiving environment and the effectiveness of the environmental management measures implemented, some of these effects may extend to the IIA, taking on greater relevance, particularly with regard to the emission of dust and noise, disturbance of mobility and traffic, temporary alteration of the landscape and interference with local socio-economic activities.

Thus, the identification and assessment of these negative impacts are fundamental steps in defining appropriate mitigation measures, ensuring that the execution of the works takes place in accordance with the principles of environmental sustainability, safety, and the well-being of the affected communities.

#### a) Alteration and/or destruction of vegetation

The implementation of the project will involve preparing the land for the installation of hydraulic infrastructure, which may require the localized removal of the existing vegetation cover in the ADA. The vegetation present is predominantly herbaceous and riverside, composed of common species with wide distribution that are adapted to anthropic environments. Despite its low ecological relevance for conservation, this

vegetation plays important roles in protecting the soil against erosion and maintaining the surface stability of the land.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Definitive | Location | Short | Low | Low |

**Mitigation measures:**

- Restrict construction activities to the previously defined ADA only;
- Ensure strict control of vehicle and equipment circulation in the work areas;
- Prohibit deforestation activities outside technically delimited areas;
- Train and sensitize workers on good environmental practices to avoid trampling and unnecessary destruction of vegetation;
- Proceed with deforestation of areas that are strictly necessary, according to the executive project and the map of quantities.

### b) Decrease in biodiversity due to the destruction of botanical species

Land clearing and infrastructure implementation may result in the loss of some specimens of botanical species in the project area. However, these are common species, widely distributed and adapted to disturbed habitats, and no species with conservation status or classified as threatened by the IUCN Red List have been identified. Thus, the reduction in local biodiversity will be limited and of low ecological significance.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Definitive | Location | Long-term | Low | Average |

**Mitigation measures:**

- Limit vegetation suppression to areas that are strictly necessary;
- Preserve, whenever possible, viable tree and shrub specimens;
- Implement a plant replacement program using native species, offsetting at least twice the area affected; and

- Promote landscape recovery of the affected areas after the completion of the works.

### (c) Increased levels of wildlife disturbance

The movement of equipment, the presence of workers, and noise emission during the construction phase can cause disturbances in the local fauna. However, the study area exhibits a high degree of anthropization and is dominated by synanthropic species adapted to human presence, thereby significantly reducing the sensitivity of the receptor environment.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Definitive | Location | Short | Low | Low |

**Mitigation measures:**

- Prohibit workers from capturing, hunting, or killing fauna;
- Implement procedures for rescuing and moving fauna during deforestation;
- Create escape corridors for small animals before vegetation is removed;
- Ensure that qualified personnel intervene in the rescue and relocation of species;
- Release rescue animals into compatible, previously identified habitats.

### (d) Visual disturbance of the landscape

The presence of construction sites, heavy equipment, excavations, and material handling during the construction phase will cause temporary changes to the local landscape, affecting its visual quality. Although the area already shows some degree of human intervention, the concentration of construction activities may intensify the perception of visual disorder, especially near residential areas.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Location | Short | Low | Low |

**Mitigation measures:**

- Install temporary fences at the work fronts near residential areas;
- Concentrate equipment and materials in previously defined, organized areas;
- Avoid dispersing materials and vehicles outside the intervention areas;
- Minimize unnecessary movement of equipment outside the work area;
- Implement good practices for organizing and cleaning the shipyard;
- Sensitize workers to avoid crowding in visible and sensitive areas.

### e) Emission of dust and particulate matter

Excavation, trenching, soil moving, borehole drilling, and truck driving on unpaved roads will generate dust and suspended particulate matter emissions. This impact may temporarily affect air quality in the ADA and its immediate surroundings, causing respiratory distress, reduced visibility, and deposition of particles on nearby surfaces, vegetation, and dwellings. Although this is a typical impact of civil works and reversible, its intensity can vary depending on weather conditions, especially in dry and windy periods.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Highly likely | Location | Temporary | Average | Average |

**Mitigation measures:**

- Regular wetting of excavation areas and unpaved roads to reduce dust dispersion;
- Mandatory coverage of trucks transporting fine materials (sand, soil, and rubble);
- Limiting vehicle speeds within the work area;
- Proper maintenance of equipment and machinery to prevent excessive emissions;
- Scheduling activities that generate more dust during periods of lower wind intensity;
- Visual monitoring and, where necessary, spot measurements of air quality in sensitive areas.

## f) Noise and vibration emission

Based on the characterization of the reference environmental situation, the project's area of influence currently exhibits noise and vibration levels ranging from moderate to occasionally high, with greater expression in semi-urbanized areas, where sound pressure levels close to or exceeding the recommended reference values for residential areas are already recorded. This context indicates that the introduction of construction activities may temporarily increase local acoustic and vibratory loads, especially in more sensitive areas and near housing receivers.

During the construction phase, the operation of heavy equipment such as drills, backhoe loaders, compactors, compressors, trucks, and generators, as well as the execution of excavation, drilling, and material handling activities, will generate additional noise and vibration emissions. These effects will be particularly relevant during periods of greater operational intensity and in locations close to communities and may result in a noticeable increase in sound and vibration levels compared to the current reference conditions.

The expected impacts include disturbance of the comfort of communities living near the work fronts; interference with daily and community activities; increased perception of acoustic nuisance; and, in localized areas, potential vibration effects on more fragile structures in the immediate surroundings of the interventions. However, these impacts are typically associated with civil works, are temporary and reversible, and are limited to the duration of construction activities.

Based on the characterization of the reference environmental situation, the results indicate that, under current conditions, noise levels in the project's area of influence vary between approximately 39 dB(A) and 74 dB(A) (LAeq), with occasional higher values at Point 3, especially during the day, exceeding the limits recommended by the WHO (55 dB(A) for daytime residential areas and 45 dB(A) at night) and the IFC guidelines (55 dB(A) for daytime residential areas and 45 dB(A) at night).

Likewise, vibration currently ranges from low to clearly perceptible, with PPV records up to about 0.79 mm/s, still below thresholds for structural damage but relevant to human perception in more dynamic areas (Point 3).

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Definitive | Location | Temporary | Average | Average |

**Mitigation measures:**

- Strict management of working hours, restricting the noisiest activities (digging, drilling, compaction, and generator operation) to daytime hours (07:00–18:00), avoiding interventions during already sensitive periods observed in the study (nighttime with values up to ~63 dB(A) in semi-urban areas);
- Selection and use of low-noise equipment with controlled emission levels, preferably below 70 dB(A) at the source, given that background levels already reach up to 73.9 dB(A) under current conditions in Point 3;
- Mandatory and systematic preventive maintenance of all machinery, with special attention to engines, exhaust systems, and mechanical components, to avoid additional noise increases greater than 3 dB(A), as recommended by the IFC;
- Control vibration at the source, ensuring that compaction and drilling equipment operate within limits compatible with low vibration (<0.5 mm/s whenever technically feasible in areas near dwellings), given that the study has already recorded values up to 0.79 mm/s;
- Defining operational exclusion zones to increase the distance between emission sources and sensitive receivers (housing and commerce), especially at Point 3, where acoustic and vibration sensitivity is higher;
- Installation of temporary acoustic barriers (containment panels or curtains) at work fronts near residential areas, especially where the current LAeq already exceeds 60 dB(A);
- Control of the circulation of heavy vehicles, including speed limits on unpaved roads, to reduce both traffic noise and induced ground vibrations;
- Optimization of material transport logistics to reduce unnecessary truck movements during periods of heightened sensitivity (early morning and late in the day), when peaks of up to 88 dB(A) have already been observed under current conditions;

- Continuous monitoring of noise and vibration during construction, with direct comparison to the reference values already established in the baseline (LAeq up to 73.9 dB(A) and PPV up to 0.79 mm/s), enabling immediate corrective actions;
- Raising operator awareness and providing training to reinforce good operational practices and avoid unnecessary accelerations, sudden impacts, and prolonged operation of empty equipment;
- Mandatory use of appropriate PPE, including hearing protectors, especially for workers exposed to levels above 85 dB(A), in accordance with the occupational exposure limits referenced in the study.

### g) Generation of solid construction waste

During the construction phase, various types of solid waste will be generated from activities such as excavation, drilling, pipeline installation, infrastructure construction, and the operation of construction sites. This waste includes surplus soils, concrete scraps, pipe fragments, metal materials, packaging, oils, and other materials associated with equipment operation. If not properly managed, this waste can cause visual degradation, localized soil contamination, and obstruction of surface drains, temporarily affecting the ADA environment.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Highly likely | Location | Temporary | Average | Average |

**Mitigation measures:**

- Implementation of a Construction and Demolition Waste Management Plan (PGRCD);
- Collection and separation of waste by type (inert, metallic, hazardous, and recyclable);
- Temporary storage in properly delineated and controlled areas on the shipyard;
- Forwarding waste to licensed operators or authorized sites;
- Reuse of inert materials whenever technically feasible (e.g., soil and gravel);

- Prohibition of waste disposal in unauthorized locations or adjacent natural areas;
- Signage of waste disposal sites with appropriate EPCs.

### (h) Soil compaction and degradation

At this stage, the frequent movement of heavy machinery, trucks, and construction equipment, along with excavations, landfills, and infrastructure installations, may cause soil compaction in the intervention areas and adjacent areas. This process reduces soil porosity, decreases water infiltration, and can compromise the soil's natural structure, increasing the risk of surface erosion and degradation of its productive capacity, especially in areas previously used for subsistence agriculture.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Location | Medium Term | Average | Average |

**Mitigation measures:**

- Limit the movement of heavy machinery to previously defined access corridors;
- Avoid unnecessary vehicle movement outside the construction areas;
- Implement erosion control measures (drainage ditches and temporary stabilization of exposed soils);
- Rehabilitate compacted areas after completion of the work, including mechanical decompaction and replacement of fertile soil;
- Minimize the time the soil is exposed without vegetation cover;
- Properly store the removed topsoil for reuse in landscape reclamation.

### i) Temporary allocation of mobility and traffic

During the construction phase, the movement of trucks, heavy machinery, and other vehicles supporting the works, as well as the opening of trenches for pipeline installation, may temporarily disrupt local mobility. This disruption can lead to partial obstruction of secondary roads, reduced traffic flow, increased travel time, and

potential conflicts with pedestrians and semi-collective transport, especially in more densely populated urban and peri-urban areas.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Highly likely | Surroundings | Temporary | Average | Average |

**Mitigation measures:**

- Preparation and implementation of a Traffic Management Plan during the works;
- Definition of alternative routes for heavy-vehicle circulation;
- Adequate temporary signage in intervention areas and on adjacent roads, with adequate EPCs;
- Scheduling activities with the greatest impact during off-peak hours;
- Coordination with local authorities for traffic control and guidance;
- Ensuring safe access for pedestrians and residents to residential areas and essential services.

### j) Risk of accidents at work

Activities such as digging, drilling holes, operating heavy equipment, laying pipelines, and working on construction sites significantly increase the risk of workplace accidents. These can include falls into ditches, being run over by machinery, cuts, electric shocks, burial, and injuries from improper handling of tools and materials. The risk is exacerbated by the simultaneous presence of multiple work fronts and by interactions among workers, machines, and the work environment.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Location | Temporary | High | High |

**Mitigation measures:**

- Strict implementation of an Occupational Health and Safety Plan (PSST);

- Mandatory training for workers in hygiene, safety, and prevention of occupational risks;
- Mandatory use of PPE appropriate to each activity;
- Use of EPCs for clear signage and isolation of risk areas (open trenches, drilling zones, and machinery circulation areas);
- Regular inspection and maintenance of construction equipment and machinery;
- Presence of safety supervisors at all work fronts;
- Establishment of on-site emergency and first-aid procedures.

### k) Possible use of vegetation and land cover

Activities such as clearing the land, digging trenches for pipelines, drilling boreholes, and constructing infrastructure may involve the localized removal of existing vegetation and the alteration of the natural land cover. Although ADA's vegetation is predominantly herbaceous and of low ecological value, its temporary removal reduces the soil's natural protection and may increase susceptibility to erosion and surface degradation in exposed areas.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Location | Medium Term | Average | Average |

**Mitigation measures:**

- Limitation of vegetation suppression to areas strictly necessary for the works;
- Prior marking of intervention areas to avoid unnecessary deforestation;
- Reuse of topsoil in rehabilitating affected areas;
- Implementation of erosion control measures in areas without vegetation cover;
- Landscape rehabilitation of intervened areas after completion of the works;
- Awareness among workers of the need to preserve vegetation outside authorized construction areas.

### (l) Temporary social conflicts and disruption of local activities

The mobilization of workers, the movement of heavy equipment, the temporary occupation of spaces, and the possible restriction of access may disrupt the daily activities of local communities. These situations can lead to perceptions of inconvenience, occasional tensions between workers and residents, and conflicts over access to existing pathways, fields, and water collection points.

Although these are essentially temporary impacts, their occurrence can be more pronounced in densely populated areas or in areas highly dependent on informal and subsistence activities, requiring careful social management throughout the execution of the works.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Surroundings | Temporary | Average | Average |

**Mitigation measures:**

- Implementation of a communication and complaint mechanism accessible to affected communities;
- Conducting prior and ongoing awareness campaigns on the schedule and nature of the works;
- Guaranteeing alternative access whenever roads or paths are temporarily blocked;
- Ongoing coordination with community leaders and local authorities for conflict resolution;
- Proper management of the presence of external workers, including rules of conduct and respect for local communities;
- Planning construction activities to minimize interference with times and places of greater community use.

## m) Occupational Health and Safety

During the construction phase, workers will be exposed to various occupational health and safety risks associated with typical civil works conditions. These include exposure to adverse weather conditions, dust, equipment noise, vibrations, and possible biological agents associated with the local context. In addition, the risk of accidents at work may arise during operations with heavy machinery, excavations, work at heights, and vehicle circulation.

Ergonomic risks, such as inadequate postures, fatigue from prolonged work and operational stress, can increase the likelihood of accidents, especially when associated with insufficient use of Personal Protective Equipment (PPE).

**Impact classification**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Location | Short | Low | Low to Medium |

**Mitigation measures**

- For the execution of the project, hire qualified and experienced professionals who use appropriate techniques and equipment.
- Assess the physical and psychological fitness of workers who must perform work at great heights, by personnel duly qualified for this purpose.
- Provide adequate training for work at great heights;
- All workers involved in the construction activity should receive occupational health and safety induction training before the start of the works, as awareness of occupational health and safety is a key component of complying with Mozambican legislation on this aspect and of preventing accidents.
- Write and disseminate, through training in occupational health and safety, a manual of safety procedures for the construction phase. This manual shall contain, but is not limited to, the following:
  - Information on the materials to be used (their risks, safety specifications, handling, transport, and storage – usually compiled from summaries of the material safety data sheets);
  - The main risks associated with the various construction processes, along with work safety rules;

  - The signage to be used on the site, as well as the procedures to be followed in the event of accidents.
- Ensure that appropriate first-aid equipment is available and that all workers are properly trained to use it;
- Ensure that trained and equipped workers are available to respond to accidents;
- Make PPE available and enforce its use;
- Work equipment should be properly inspected and maintained to reduce the risk of falling;
- Place EPCs for signage at clearly visible locations where the risk is higher;
- Conduct regular exercises related to emergency procedures (e.g., fire simulations);
- Smoking is strictly prohibited in construction areas; however, the contractor must provide a designated smoking area, which must be properly signposted;
- Provide fire extinguishers in appropriate locations and carry out their regular maintenance;
- Make the use of PPE mandatory (uniforms, fluorescent vests, boots, gloves, earplugs, goggles, etc.);
- Ensure that all work fronts, including shipyards, display and clearly specify on a placard the type of PPE required for access to the site;

### n) Possibility of explosions/fires

The storage and handling of fuels and other flammable materials during the construction phase can pose a risk of fire or explosion, especially in the event of storage failures, spills, or improper handling. Although the expected quantities are reduced, these events can result in property damage and risks to workers' physical integrity.

**Impact classification**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Unlikely | Location | Short | Average | Low |

**Mitigation measures**

- Safe storage of flammable liquids in suitable, properly closed and identified containers, placed in designated, ventilated areas, and kept away from sources of heat, sparks, or electrical equipment;
- Creation of properly insulated and signposted storage areas, built with fire-resistant materials to ensure containment in case of spills or incidents;
- Implementation of adequate ventilation systems in fuel and chemical storage areas to reduce the accumulation of flammable vapors;
- Strict prohibition of smoking and any source of ignition in areas of storage and handling of flammable substances, with visible and reinforced signage;
- Installation of clear and permanent safety signs indicating the risk of fire and explosion and the prevention measures to be adopted;
- Provision of firefighting equipment, including fire extinguishers appropriate to the type of materials stored, strategically distributed, and with periodic maintenance;
- Training workers in fire prevention and response, including emergency procedures, evacuation, and use of fire extinguishers;
- Controlled handling of chemicals, ensuring that all operations are performed by trained and authorized personnel;
- Mandatory monitoring of all chemicals with MSDS (Safety Data Sheet for Chemicals) available during storage, transport, and use, ensuring knowledge of risks and response measures;
- Regular inspection of storage areas and associated equipment to identify and correct risk situations in a timely manner.

### o) Increase in Sexually Transmitted and Infectious Diseases

The presence of external workers and the socioeconomic dynamics associated with the construction phase can contribute to an increase in risk behaviors, favoring the spread of HIV/AIDS and other sexually transmitted diseases. At the same time, inadequate sanitation conditions at the shipyard can favor diseases such as malaria, cholera, and other infectious diseases.

This impact may be exacerbated in contexts with labuor mobility and weak health control capacity.

**Impact classification**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Local/Regional | Average | Average | Average |

**Mitigation measures**

- Implementation of continuous civic education and health and environmental programs for workers and local communities, with a focus on preventing STDs, HIV/AIDS, malaria, and other endemic diseases associated with the work context;
- Creation of organized and controlled camps for external workers, with restricted access, clear internal rules, and permanent supervision, to reduce risky interactions with the community;
- Distribution and availability of condoms in strategic locations, such as restrooms, cafeterias, and camps, accompanied by awareness campaigns on their proper use;
- Holding regular lectures, educational sessions, and screenings of informative materials (films, pamphlets, and posters) on STD and HIV/AIDS prevention and risk behaviors;
- Designation of a health officer for the project by the Contractor and the Proponent to coordinate and articulate health education activities and to liaise with the health authorities;
- Implementation of a specific program for the prevention and control of endemic diseases, including malaria, cholera, and other infectious diseases, prepared with the support of competent health professionals;
- Distribution of personal protective measures against malaria, including repellents, insecticides, and installation of mosquito nets in the windows and dormitories of the camps;
- Monitoring workers' health status and ensuring that any worker with symptoms of illness is immediately referred to health facilities for diagnosis and treatment;
- Adequate management of sanitation and drainage in the construction and encampment areas, ensuring the elimination of stagnant water and the prevention of pond formation after periods of rain;

- Improvement of hygiene and basic sanitation conditions, including regular cleaning of sanitary facilities and proper management of solid and liquid waste.

## p) Increase in crime

The arrival of outside workers and the increased circulation of goods and equipment can contribute to higher levels of petty and local crime, placing additional pressure on law enforcement authorities and potentially causing social instability.

**Impact classification**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Location | Short | Average | Average |

**Mitigation measures**

- Prior articulation with the provincial and district police authorities before the start of the works to assess security risks and define prevention and response strategies;
- Strengthening the operational capacity of local police forces, whenever necessary, by improving material and human resources, depending on the size and duration of the work;
- Establishment of a system of communication and ongoing cooperation among the Bidder, the Contractor, and the Police, ensuring the rapid exchange of information on suspicious occurrences or confirmed cases of crime;
- Implementation of access control mechanisms for the shipyard and camp areas, with registration of entries and exits of workers and visitors;
- Proper organization and surveillance of camps and storage areas for equipment and materials, reducing opportunities for theft and other illegal acts;
- Raising workers' awareness of standards of conduct and social coexistence, including safety rules and the prohibition of illegal behavior;
- Immediate reporting of any criminal occurrence to the competent authorities to ensure rapid response and deter criminal practices.

## q) Impact: Increase in cases of GBV and child abuse/exploitation

The population movement associated with the project may increase the risk of gender-based violence (GBV) and child abuse and exploitation, with potential serious social impacts, including early pregnancy and school dropout.

**Impact classification**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Location | Short | Low | Average |

**Mitigation measures**

- Preparation and implementation of a specific Action Plan for Prevention and Response to GBV and CAE, duly aligned with national legislation and with international good practices applicable to the construction sector;
- Conducting a prior assessment of GBV/CAE risks before the start of activities, identifying vulnerability factors associated with the workforce, local social dynamics, and the presence of the shipyard;
- Mandatory integration of GBV and CAE prevention clauses into the project's Codes of Conduct, ensuring individual signatures from all workers, subcontractors, and associated staff;
- Explicit inclusion in the Code of Conduct of the prohibition of any sexual relationship with minors under 18 years of age, as well as the prohibition of sexual exploitation, prostitution, and any form of abuse of power;
- Implementation of clear and enforceable disciplinary mechanisms with proportional sanctions for violations of the Code of Conduct, including warnings, suspensions, termination of the contract, and reporting to the competent authorities;
- Creation and implementation of an accessible, secure and sensitive Grievance Mechanism (MQR) for GBV/CAE cases, ensuring confidentiality, victim protection and timely response;
- Provision and dissemination of victim support services, including coordination with health units, police, social services, NGOs, and specialized community associations;

- Ensuring adequate housing and hygiene conditions on the site, including separate facilities for men and women, with good lighting, safety, and the possibility of internal closure;
- Installation of visible signage in all areas of the project and in nearby communities, stating zero tolerance for GBV and CAE;
- Implementation of ongoing community and employee awareness and education programs on gender equality, human rights, violence prevention, and responsible behavior;
- Ensuring equal opportunities and non-discrimination in the recruitment and management of workers and promoting a safe and inclusive work environment;
- Independent monitoring by an external entity (a specialized NGO) to follow the implementation of the measures of the Action Plan and report on the project's performance and compliance.
- Independent monitoring of the implementation of the measures.

### r) Interference with historical and archaeological sites

Although no archaeological sites have been identified in the ADA and IDA, there is a possibility of fortuitous finds during excavations or the use of borrow materials.

**Impact classification**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Location | Long-term | Low | Average |

**Mitigation measures**

- Full compliance with Mozambican legislation on the protection of cultural and archaeological heritage, in particular Laws No. 10/88 of 22 December and No. 27/94 of 20 July, ensuring the preservation of all remains, even those not inventoried;
- Mandatory implementation of a "chance finds procedure" during all excavation, earthmoving, and foundation excavation activities;
- Immediate suspension of activities at the site of any archaeological discovery whenever remains, structures, or materials with potential historical value are identified;

- Formal notification to the competent authorities, namely the Ministry of Culture and Tourism, within a maximum period of 48 hours, ensuring the due technical assessment of the discovery;
- Ensure the intervention of specialists in archaeology within the legally established period, for evaluation, registration and definition of conservation measures or scientific excavation;
- Prior training and awareness for all workers and supervisors of the work on the identification of possible archaeological artifacts and the procedures to be followed in case of discovery;
- Inclusion of specific guidelines in the Safety and Construction Procedures Manual, including clear instructions for the preservation of cultural heritage;
- Guarantee of technical monitoring of excavation areas considered sensitive, especially in areas with a higher probability of archaeological finds;
- Responsibility of the Contractor for the preservation of the heritage found, including the temporary interruption of the works whenever necessary and full compliance with the recommendations of the competent authorities;
- Coverage of the costs associated with any archaeological interventions by the Proponent, as provided in the applicable legislation.

### (s) Decommissioning of construction activities

The decommissioning phase involves the removal of construction sites, equipment, and waste, which can generate environmental impacts related to solid waste, contaminated soils, and abandonment of temporary infrastructures.

**Impact classification**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Location | Short | High | High |

**Mitigation measures**

- An Environmental Deactivation and Rehabilitation Plan must be prepared and implemented to ensure proper waste management, the recovery of the affected areas, and the prevention of environmental liabilities. This plan should, in an integrated manner, include the following measures:

- Preparation of a detailed Deactivation Plan that defines procedures for the demobilization of equipment, removal of temporary facilities, and management of solid, liquid, and hazardous waste generated during the final phase of the work;
- Implementation of a decommissioning waste management system, ensuring segregation at the source, safe temporary storage, and forwarding to licensed final destinations;
- Promotion of the reuse and recycling of materials, whenever technically feasible, to reduce the amount of waste to be disposed of;
- Collection and appropriate treatment of contaminated soils, especially those with traces of fuels, oils, or other hydrocarbons, ensuring their disposal at authorized sites;
- Environmental rehabilitation of the intervened areas, including reconfiguring the terrain, stabilizing slopes, and replacing vegetation cover in the affected areas;
- Adequate technical closure of storage areas and temporary disposal of waste, eliminating any risk of future contamination;
- Final assessment of the environmental conditions of the IDA and ADA, including identification of degraded areas, erosion foci, and loss of vegetation, followed by implementation of corrective measures;
- Complete removal of temporary infrastructure to support the work, ensuring that the space is restored to environmentally safe conditions and compatible with the intended use;
- Post-decommissioning monitoring, where applicable, to verify the effectiveness of the implemented rehabilitation measures and correct any nonconformities.

### (t) Job losses

With the completion of the construction phase, there will be a gradual reduction in the workforce, resulting in the loss of temporary income and possible socio-economic impact on family's dependent on employment generated by the project.

**Impact classification**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Local/Regional | Medium/Long | High | High |

**Mitigation measures**

- Clarity and transparency in the recruitment process, ensuring that all workers are informed from the outset of the temporary nature of jobs and the expected duration of contracts;
- Adequate formalization of employment contracts in accordance with current labor legislation, including the explicit indication of the conditions for termination and the termination of functions;
- Promoting the hiring and training of local labor to maximize benefits during the construction phase and improve workers' future employability;
- Implementation of professional training programs aimed at developing transferable skills, facilitating the reintegration of workers into other projects or economic sectors;
- Articulation with existing employment and training programs, promoted by government entities or local partners, aimed at the referral of dismissed workers;
- Encouraging reintegration into local economic activities, including agriculture, commerce, and small businesses, reducing the exclusive dependence on the project's temporary employment;
- Referral to community development and self-employment initiatives, where possible, via technical support or institutional partnerships.

## 7.5. Main Environmental Impacts on the Operation Phase

This section identifies and analyzes the main environmental and socioeconomic impacts associated with the operation phase of the water supply system. This phase corresponds to the continuous operation of the water collection, treatment, storage, and distribution infrastructure, marking the period when the project's effects become more stable and permanent.

The impacts at this stage are predominantly positive, reflected in improved living conditions for the populations, strengthened public health, increased economic activity, and the promotion of sustainable development. At the same time, there may be residual negative impacts, generally associated with the operation and maintenance of the system, which should be properly controlled through appropriate environmental management and monitoring measures.

In general, the impacts of the operation phase tend to be continuous and long-term, with local incidence and, in some cases, extended positive effects on the IIA, mainly due to improvements in social welfare and increases in economic productivity.

### 7.5.1. Positive Impacts in the Operation Phase

The operation phase is the period when the implemented infrastructure begins to operate fully and continuously, thereby playing its structuring role in the socio-economic and environmental development of the project's area of influence.

At this stage, the project's benefits become more evident and consolidated, as the water collection, treatment, storage, and distribution system ensures a reliable supply of drinking water to the beneficiary populations. This translates into a substantial improvement in living conditions, with direct impacts on public health, hygiene, basic sanitation, and environmental quality.

The positive impacts of the operational phase are cumulative and long-term, contributing to the significant reduction of water-borne diseases, the strengthening of community resilience in the face of health and environmental risks, and the improvement of human development indicators.

In addition, the continuous availability of drinking water is a catalyst for local and regional economic development, promoting the expansion of productive activities, increased agricultural and livestock productivity, the growth of small businesses, and the strengthening of the formal and informal economy. These effects tend to extend beyond the area of direct intervention and may positively influence the area of indirect influence through increased social welfare and economic dynamism.

In general terms, the operation phase represents the consolidation of the project's strategic objectives, translating into the maximization of the social, economic and environmental benefits associated with sustainable access to drinking water.

#### (a) Improving access to drinking water

The operationalization of the proposed Water Supply System will enable a more continuous and reliable supply of drinking water to beneficiary communities, substantially reducing dependence on unsafe alternative sources that are often vulnerable to microbiological and physicochemical contamination.

Improving access to drinking water is one of the main social benefits of the project, with direct impacts on public health, domestic hygiene, sanitation, and the population's quality of life. The availability of water in adequate quantity and quality will help reduce the incidence of water-borne diseases, improve personal and domestic hygiene practices, and strengthen the health security of communities.

In addition, the project will reduce the time and physical effort previously spent searching for water, particularly for women and children, freeing up time for productive, educational, and social activities.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Positive | Definitive | Location | Permanent | High | High |

**Potentiation measures:**

- Ensure the efficient and continuous operation of the system by implementing preventive and corrective maintenance programs for hydraulic infrastructure, electric pumps, reservoirs, and distribution networks;
- Implement a permanent water quality monitoring program, including regular physicochemical and microbiological analyses, in accordance with national standards for the quality of water for human consumption;
- Strengthen the technical and institutional capacity of the system management entity, ensuring ongoing training for operational and administrative staff;
- Develop community health and environmental education campaigns on water conservation, domestic hygiene, and the rational use of the resource;
- Promote participatory mechanisms for community management and for communication with users to report leaks, breakdowns, and illegal connections;
- Establish programs to reduce water losses in the distribution network, aiming to improve the system's operational efficiency;
- To raise awareness among communities about the protection of the system's infrastructure and the preservation of catchment areas;
- Ensure the financial and operational sustainability of the system by implementing adequate mechanisms for charging and managing the services provided.

### b) Reduction of water-borne diseases

The continuous availability of treated drinking water for beneficiary communities will significantly reduce the incidence of waterborne diseases, which are often associated with contaminated water and poor hygiene and sanitation. Among the main diseases whose occurrence may be reduced are diarrhea, cholera, dysentery, typhoid fever, and other gastrointestinal infections.

Improving the quality of drinking water, combined with increasing water availability for personal hygiene, washing utensils, and household cleaning, will have direct positive effects on public health and community well-being. This impact is highly socially relevant, especially in communities that were previously dependent on unsafe sources and vulnerable to contamination.

It is also expected to reduce pressure on local health facilities and to improve indicators of community health, social productivity, and quality of life.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Positive | Definitive | Local/Regional | Permanent | High | High |

**Potentiation measures:**

- Implement regular health monitoring and quality control programs for distributed water, including microbiological and physicochemical analyses and verification of residual chlorine levels;
- Ensure continuous chlorination and the proper functioning of water treatment and disinfection systems;
- Develop permanent health education and community awareness campaigns on personal hygiene, handwashing, safe water storage, and prevention of waterborne diseases;
- Strengthen institutional coordination between the water supply system management entity and the district health services for epidemiological monitoring and rapid response to disease outbreaks;
- Promote good environmental sanitation practices by encouraging the proper use of latrines and the safe disposal of household waste;

- Carry out inspections and preventive maintenance on the distribution network to avoid secondary contamination and infiltration;
- To raise awareness among communities about the protection of water sources and the preservation of the system's infrastructure;
- Implement community communication mechanisms for rapid reporting of problems related to water quality, supply interruptions, or health risks.

### c) Improvement of hygiene and sanitation conditions

The increased availability and accessibility of drinking water provided by the project will significantly improve personal, domestic, and community hygiene conditions. Increased water availability will facilitate regular handwashing, body hygiene, cleaning household items, washing clothes, and maintaining safer sanitary conditions.

This impact will have direct positive effects on public health by reducing communities' exposure to pathogens associated with unhealthy environments and helping prevent diseases linked to poor hygiene and sanitation. Improving sanitation conditions can also strengthen cleaning habits and promote positive behavioral changes in beneficiary communities.

In addition, improved access to water will promote the adoption and proper use of basic sanitation infrastructure, including improved latrines, thereby promoting better environmental conditions and greater dignity for households.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Positive | Definitive | Local/Regional | Permanent | Medium/High | Medium/High |

**Potentiation measures:**

- Develop ongoing community awareness campaigns on personal hygiene, household hygiene, and sanitation;
- Integrate health and environmental education programs into schools, community centers, and local organizations;
- Encourage and support the construction and use of improved latrines and other adequate sanitation infrastructure.

- Promote appropriate solid waste and domestic wastewater management practices;
- Conduct periodic monitoring of sanitation and hygiene conditions in the beneficiary communities;
- Strengthen coordination among the system management entity, local authorities, and public health services to promote good health practices;
- Raise awareness among families about safe water storage at the household level to avoid secondary contamination;
- Encourage community participation in collective cleaning activities and in the environmental preservation of the areas surrounding the water supply system's infrastructure.

### d) Boosting the local economy

Improving the availability and reliability of drinking water supplies is an important factor in stimulating local and regional economic development. Regular access to water will promote increased productivity and the sustainability of various economic activities, with an emphasis on family farming, livestock, horticulture, informal trade, catering, small services, and micro-enterprises that depend on water resources.

The operationalization of the system will also create more favorable conditions for the emergence and expansion of income-generating initiatives, contributing to the diversification of household livelihoods and the strengthening of the local economy. The increase in water availability will also reduce the constraints associated with water scarcity, enabling greater stability of productive activities throughout the year.

This impact could translate into higher household income, stronger local markets, improved food security, and more self-employment opportunities, particularly for women and young people.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Positive | Definitive | Regional | Long Term | High | High |

**Potentiation measures:**

- Promote the efficient, productive, and sustainable use of water in local economic activities;
- Support community income-generating initiatives based on irrigated agriculture, horticulture, livestock, and small businesses;
- Encourage technical training programs in the management of small enterprises and in the rational use of water;
- Stimulate small-scale agricultural activities with a focus on sustainable irrigation and soil conservation;
- Facilitate the participation of women and young people in local economic development programs;
- Ensure socially accessible tariffs and efficient mechanisms for managing the water supply system;
- Promote partnerships among communities, local authorities, and development institutions to strengthen local production chains;
- Raise awareness among beneficiaries of the importance of conserving infrastructure and the sustainable use of water resources to ensure the continuity of economic benefits.

**e) Reduction of domestic workload, especially for women and children**

Improving access to drinking water by bringing supply points closer to beneficiary communities will significantly reduce the time and physical effort previously spent collecting and transporting water. This impact will be especially relevant for women and children, who are traditionally responsible for this task in rural and peri-urban communities.

Reducing long daily commutes to fetch water will help reduce physical fatigue, exposure to risks during the journeys, and school absenteeism, especially among girls. The time previously dedicated to water collection could be redirected to productive activities, education, family care, leisure, and participation in community initiatives.

This impact has significant social and gender relevance, promoting greater social inclusion, improving family well-being, and strengthening the human and economic development opportunities for beneficiary communities.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Positive | Definitive | Regional | Permanent | Average | Average |

**Potentiation measures:**

- Ensure the equitable and strategically located distribution of water supply points, prioritizing more vulnerable and densely populated areas;
- Promote community awareness campaigns on gender equality, emphasizing the balanced participation of men and women in domestic responsibilities;
- Encourage and strengthen women's participation in the management and maintenance committees of the water supply system;
- Regularly monitor the accessibility, functionality, and safety of the supply points;
- Develop community programs for women's economic empowerment by taking advantage of the time freed up by reduced water collection time;
- Raise awareness among families about the permanence of children, especially girls, in the education system;
- Promote participatory mechanisms to identify and resolve difficulties in accessing water supply services;
- Ensure continuous maintenance of infrastructure to prevent prolonged interruptions in water supply.

### f) Improvement of Public Health and reduction of medical care costs

The regular availability of high-quality drinking water will significantly improve overall public health in beneficiary communities. Safe access to water will reduce the incidence of waterborne diseases and diseases associated with poor hygiene and sanitation, such as diarrhea, cholera, typhoid, intestinal parasitosis, and skin infections.

The reduction in the incidence of these diseases will ease pressure on local health units, contributing to greater efficiency in health services and improving the quality of life for the population. At the same time, households will benefit from reduced expenses for medical consultations, medications, transportation, and treatment for diseases related to the consumption of unsafe water.

The impact will be positive for economic productivity and social well-being, since a reduction in the number of sick people will lead to less school and work absenteeism,

thereby favoring the socio-economic development of the communities covered by the project.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Positive | Definitive | Regional | Permanent | High | High |

**Potentiation measures:**

- Strengthen permanent campaigns to prevent waterborne diseases and promote community hygiene;
- Articulate the activities of the water supply system to the local public health and sanitation services;
- Implement regular programs to monitor the quality of the water distributed to the communities;
- Monitor community health indicators for waterborne diseases and sanitation conditions;
- Ensure the continuity, reliability, and quality of the drinking water supply;
- Promote health education initiatives on safe water storage at the household level;
- Encourage proper personal hygiene, handwashing, and household cleaning practices;
- Strengthen rapid response mechanisms in the event of water contamination or epidemiological outbreaks;
- To sensitize communities to the rational use and conservation of the water supply system's infrastructure.

### g) Creation or increase of employment opportunities

The operationalization and expansion of the Nampula Water Supply System will be an important factor in generating direct and indirect employment in the communities the project covers. It is expected to create permanent jobs associated with the operation, maintenance, and technical and administrative management of hydraulic infrastructure, creating an unspecified number of direct jobs.

In parallel, increasing the availability and reliability of the water supply will boost the growth of formal and informal economic activities, including trade, service provision, irrigated agriculture, livestock, small industries, and local micro-enterprises, resulting in additional indirect employment opportunities.

Strengthening local and regional economic activity will contribute to higher family incomes, improved living conditions for beneficiary populations, and reduced levels of poverty and social vulnerability. This impact is particularly relevant given the potential for economic inclusion of young people, women, and socially vulnerable groups.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Positive | Definitive | Regional | Long-term | High | High |

**Potentiation measures:**

- Prioritize hiring local labor whenever there are technical skills compatible with the requirements of the functions;
- Ensure transparent, inclusive recruitment processes and coordination with administrative authorities and local community leaders;
- Promote the integration of the gender component into recruitment, encouraging women's participation in technical, operational, and administrative roles;
- Develop technical and ongoing training programs for local workers, aimed at strengthening professional skills;
- Raise awareness in communities about the real employment opportunities associated with the project, avoiding unreasonable expectations;
- Encourage local entrepreneurship and the development of small businesses in the water supply chain and complementary services;
- Ensure adequate conditions for safety, health, and well-being at work for all workers involved in operating the system;
- Promote partnerships with technical and professional training institutions to train young people in the areas of hydraulics, maintenance of water systems, and operational management;
- Stimulate self-employment initiatives and sustainable economic activities that benefit from improved water supply.

### h) Promotion of the local and regional formal economy

The start-up of the water supply system will be an important factor in boosting the local and regional formal economy by creating more favorable conditions for the development of productive activities that depend on a reliable water supply. Sectors such as irrigated agriculture, livestock, horticulture, catering, the food industry, commerce, and service provision will tend to benefit directly from improved water supply conditions.

The greater availability and reliability of the water resource will contribute to increased economic productivity, a stronger local business fabric, and the expansion of small and medium-sized enterprises. This process could stimulate private investment, increase the circulation of goods and services, and boost the creation of new business opportunities in the areas covered by the project.

In addition, the expansion of formal economic activities will increase tax collection at the local and regional levels, strengthen the institutional capacity of public entities, and contribute to improving the socioeconomic conditions of the beneficiary populations.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Positive | Definitive | Regional | Long-term | High | High |

**Potentiation measures:**

- Promote, in coordination with government and professional training institutions, technical training programs in areas related to water supply, sanitation, irrigated agriculture, and small business management;
- Encourage local entrepreneurship and the development of sustainable economic activities that support the productive use of water;
- Publicize business and investment opportunities arising from improvements to the water supply system;
- Stimulate the creation and strengthening of community associations, cooperatives, and local production groups;
- Promote the integration of the local private sector into the supply, maintenance, and service delivery chains related to the system;

- Encourage sustainable and efficient water use in production, reducing waste and promoting the conservation of the resource;
- Facilitate access to information and technical assistance for small producers and local entrepreneurs;
- Strengthen institutional mechanisms to support local and regional economic development;
- To raise awareness among economic actors of the importance of conserving infrastructure and using water rationally to ensure the sustainability of the economic benefits generated by the project.

### i) Improvement of water supply in the City of Nampula

The implementation of the project will significantly increase the availability and reliability of drinking water for the City of Nampula and surrounding areas. It is estimated that the system will produce approximately 2,500 m³/day of treated water, benefiting about 50,000 inhabitants and contributing to the reduction of the current deficit in water supply service coverage in urban and peri-urban areas.

Improving supply capacity will have direct positive impacts on public health, domestic hygiene, basic sanitation, and the quality of life of beneficiary populations, reducing dependence on unsafe sources that are vulnerable to contamination. Regular access to drinking water will also improve the operating conditions of schools, health facilities, markets, and other social and economic infrastructure.

In addition, the greater availability of water will be an important factor in boosting local economic activities, promoting the development of small businesses and agricultural, commercial, and service activities, and reinforcing the socio-economic development of the region.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Positive | Definitive | Regional | Permanent | High | High |

**Mitigation/enhancement measures:**

- Implement effective systems to monitor and control physical and commercial losses across the distribution network;
- Strengthen mechanisms to combat clandestine connections and illegal water use, in coordination with communities and local authorities;
- Create and implement an efficient mechanism for customer service, reception, and complaint management;
- Promote ongoing environmental education and awareness campaigns on the rational use, conservation, and enhancement of drinking water;
- Ensure regular preventive and corrective maintenance of the hydraulic infrastructure and equipment of the system;
- Ensure permanent monitoring of the quality of the distributed water, in accordance with national standards for the quality of water for human consumption;
- Strengthen community participation in the supervision and protection of the system's infrastructure;
- Develop technical training programs for operators and managers of the water supply system;
- Promote the gradual expansion of household connections to increase the service's coverage and accessibility;
- Implement institutional mechanisms for the sustainable management of the system to ensure the continuity and operational efficiency of the water supply.

### j) Increased availability of time and reduction of physical effort

Improving the water supply system and making drinking water available near homes will significantly reduce the need for long, frequent trips to collect water, which are traditionally made by women, girls, and children in the communities covered by the project.

Reducing the time and physical effort required to transport water will free up more time for productive, educational, social, and leisure activities, contributing to improved quality of life for the beneficiary families. This impact is especially relevant in the context of women's empowerment, as it enables women to participate more in income-generating economic activities, literacy programs, and community decision-making processes.

In addition, the decrease in the domestic burden on children and adolescents, particularly girls, may contribute to increased school attendance and retention, improved academic performance, and reduced school absenteeism associated with water collection. Reducing the excessive physical effort associated with manual water transport will also improve the health and well-being of beneficiary populations.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Positive | Definitive | Regional | Permanent | High | High |

**Mitigation/enhancement measures:**

- Promote community income-generating programs targeting women, including horticulture, small-scale irrigated agriculture, and food processing activities;
- Develop community awareness campaigns to encourage girls to remain in the education system and reduce school dropout;
- To encourage the active participation of women in the committees responsible for the management and maintenance of the water supply system;
- Create and strengthen community groups responsible for the sustainable management, conservation, and rational use of water;
- Promote financial education programs, women's entrepreneurship, and small business development;
- Raise awareness among communities about the equitable sharing of household tasks and the promotion of gender equality;
- Encourage the efficient use of water in domestic and productive activities to avoid waste;
- Regularly monitor the accessibility, functionality, and equitable distribution of water supply points;
- Develop health education and community hygiene initiatives, reinforcing the social and health benefits of easy access to drinking water.

### 7.5.2. Negative Impacts on the Operation Phase

While the operational phase of the proposed water supply system is predominantly associated with positive impacts, residual negative impacts may occur during the continued operation of the infrastructure. These impacts are generally linked to the

operation, maintenance, and management of the system and to user behavior, and may affect environmental, social, and economic components, although, in most cases, their intensity can be controlled through good management practices.

### (a) Water losses due to leakage in the distribution network

During the operational phase of the water supply system, significant water losses can occur in the distribution network due to leaks in pipes, ruptures at joints, faulty connections, the progressive aging of materials, and failures in preventive maintenance. These losses compromise the system's overall efficiency, increase operating costs, and reduce the availability of water for end users. In environmental terms, they can also lead to localized flooding, soil erosion, and degradation of road and urban infrastructure in the affected areas.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Highly likely | Location | Long-term | Average | Average |

**Mitigation measures:**

- Implementation of a structured and continuous program for preventive and corrective maintenance of the entire distribution network;
- Permanent monitoring of pressure, flow, and losses of non-invoiced water using appropriate control instruments;
- Introduction of early leak detection systems (measurement and control zones – DMA's);
- Phased replacement of old or degraded pipes with modern, more durable materials;
- Continuous training for the technical teams responsible for the operation and maintenance of the system;
- Implementation of an integrated water loss management system (reduction of unaccounted water);
- Regular inspections of the network with a technical and georeferenced record of occurrences;

- Promotion of good operating practices to prevent losses associated with illegal or defective connections.

### b) Water contamination due to treatment failures

During the operation phase, contamination of the distributed water may occur as a result of failures in the treatment process, errors in chemical dosing (such as chlorine), operational deficiencies, or inadequate maintenance of the treatment units. These failures can significantly compromise the quality of the water supplied, increasing the risk of waterborne diseases and jeopardizing the health security of the beneficiary populations.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Regional | Medium term | High | High |

**Mitigation measures:**

- Implementation of a rigorous program of periodic laboratory monitoring of water quality at different points in the network (collection, treatment and distribution);
- Regular preventive and corrective maintenance of all treatment units, with special attention to filtration and disinfection systems;
- Continuous training and technical certification of water treatment system operators;
- Ensuring the permanent availability of essential reagents, especially chlorine and other disinfection products;
- Implementation of a Water Quality Control Plan based on national and international standards;
- Registration and traceability of all operational treatment parameters (dosage, turbidity, pH and residual chlorine);
- Installation of early warning systems to detect anomalies in the treatment process;
- Periodic technical audits of the treatment system to verify operational compliance.

### c) Generation of operational solid waste

During the operational phase of the water supply system, solid waste will be generated from treatment, operation, and maintenance activities. This waste includes sludge from treatment plants, used filters, chemical packaging, cleaning materials, mechanical maintenance waste, and any hazardous waste. If not properly managed, this waste can cause soil and water contamination and pose risks to the health of workers and the surrounding community.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Location | Long-term | Average | Average |

**Mitigation measures:**

- Implementation of an Operational Solid Waste Management Plan, properly structured and updated;
- Strict separation of waste at source, according to its nature (hazardous and non-hazardous);
- Safe and temporary storage of waste in appropriate, waterproofed and properly signposted places;
- Forwarding hazardous and non-hazardous waste to licensed operators for treatment, recycling, or final disposal;
- Promotion of reduction, reuse, and recycling practices, where technically feasible;
- Continuous training of workers in good waste management practices and in the safe handling of hazardous substances;
- Implementation of records for the production, storage, and final destination of waste to ensure traceability and environmental control;
- Conducting periodic environmental audits of the waste management system.

### d) Energy consumption and associated emissions

During the operation of the water supply system, the continuous operation of pumps, treatment systems, reservoirs, and auxiliary equipment requires significant electricity. Depending on the energy matrix used, this consumption can indirectly contribute to

greenhouse gas emissions, worsening the project's carbon footprint. Additionally, the energy inefficiency of poorly sized equipment or systems can result in wasted energy and increased operating costs.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Definitive | Surroundings | Long-term | Average | Average |

**Mitigation measures:**

- Use of highly energy-efficient equipment, including pumps and motors with low specific energy consumption;
- Optimization of the operation of pumping systems, adjusting schedules and pressures to the real consumption needs;
- Implementation of automatic control and energy monitoring systems to reduce losses and avoid unnecessary operation;
- Gradual promotion of the integration of renewable energy sources (e.g., solar photovoltaic) for partial or total system support;
- Carrying out regular preventive maintenance of equipment to ensure its efficient operation and reduce energy losses;
- Reduction of water losses in the network, indirectly contributing to the reduction of energy consumption associated with pumping;
- Periodic monitoring of energy consumption and definition of energy efficiency indicators of the system;
- Training of operators in good energy efficiency practices and sustainable operational management.

### (e) Risk of soil contamination by chemicals

During the operation phase of the water supply system, the storage, handling, and use of chemicals, such as chlorine, coagulants, and other reagents used in water treatment, pose a potential risk of contamination of the soil and, in more serious cases, groundwater. This impact can occur due to accidental spills, container leaks, storage failures, or improper handling. The resulting contamination can compromise local

environmental quality, affect the health of workers and communities, and degrade surrounding ecosystems.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Unlikely | Location | Medium term | Average | Average |

**Mitigation measures:**

- Safe storage of all chemicals in specifically designated areas, waterproofed, ventilated and properly signposted;
- Use of suitable, corrosion-resistant and properly identified containers with secondary containment systems to prevent leaks and spills;
- Continuous training of operators and technicians on safe handling, transport, dosing and storage of chemical products;
- Implementation and availability of spill kits in all areas of storage and use of chemical products;
- Elaboration and implementation of environmental emergency procedures, including rapid response protocols to spills and contamination;
- Restriction of access to chemical storage areas only to authorized and properly trained personnel;
- Regular inspection and maintenance of storage systems, including tanks, containers and associated pipes;
- Adequate management of chemical waste, ensuring its collection, transport and final disposal by licensed entities;
- Clear and visible signage of chemical risk areas, with safety instructions and procedures for action in the event of an accident;
- Periodic environmental monitoring of sensitive areas, especially soils near chemical storage and use zones.

### f) Improper occupation and vandalism of infrastructures

During the operational phase of the water supply system, infrastructure may be subject to vandalism, clandestine connections, sabotage, or improper occupation of technical and protective areas. These actions compromise the physical integrity of equipment,

reduce system efficiency, increase water losses and maintenance costs, and may also cause supply interruptions. In addition, they pose risks to facility safety and the sustainability of the service, directly affecting the quality and continuity of water supply to beneficiary communities.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Location | Long-term | High | High |

**Mitigation measures:**

- Strengthening institutional and community surveillance and inspection of the infrastructures of the water supply system;
- Active involvement of local authorities, community leaders and administrative structures in the protection and monitoring of the system;
- Continuous awareness of communities about the importance of legal, safe and sustainable use of water, as well as the negative impacts of illegal connections;
- Implementation of infrastructure control and security systems, including adequate fencing, signaling and access control to critical areas;
- Installation of technical mechanisms for detecting losses and illegal connections in the distribution network;
- Applying strict legal and administrative sanctions for cases of vandalism and clandestine connections, in coordination with the competent authorities;
- Creation of community mechanisms for reporting and reporting irregular situations;
- Strengthening the participatory management of the system, encouraging the sense of belonging and collective responsibility of the beneficiary communities;
- Conducting periodic civic education campaigns on the preservation of public infrastructures;
- Regular monitoring of the physical state of infrastructures, with preventive maintenance and quick repair of identified damages.

### (g) Pressure on groundwater resources

Continuous operation of the water supply system, based on groundwater abstraction, can exert significant pressure on local aquifers. This impact is especially pronounced when the extraction rate exceeds the aquifer's natural recharge capacity, which may result in a lowering of the piezometric level, reduced water availability in the medium and long term, and, in more critical cases, degradation of water quality. The absence of strict extraction controls can also compromise the resource's sustainability for future uses and for other communities dependent on the same source.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Regional | Long-term | Average | Average |

**Mitigation measures:**

- Mandatory installation of monitoring equipment in the boreholes, including flow meters (master meter) and piezometers/air lines to monitor the static and dynamic groundwater levels;
- Implementation of a regular and continuous monitoring system, including:
- Daily flow measurement (m³/day);
- Monitoring of the static level at the start of each operation (or at least weekly);
    - Monitoring of the dynamic level during pumping, after at least 8 hours of operation;
- Rigorous and sustainable management of extraction rates, ensuring that they do not exceed the authorized volume, respecting the availability of up to 60% of the flow tested;
- Limitation of the extraction period to a maximum of 10 hours per day, depending on the capacity of the aquifer;
- Installation of valves with automatic shut-off to avoid waste and unnecessary extraction;
- Conducting periodic hydrogeological studies to assess the recharge, availability and vulnerability of aquifers;
- Operational adjustment of the system according to water availability and monitoring results;

- Protection and conservation of aquifer recharge areas, preventing activities that may compromise natural infiltration;
- Preparation, by the drilling company, of a detailed technical roadmap outlining the control procedures, responsibilities, and measurement frequency.

### h) Social conflicts related to access and pricing of water

During the operational phase of the water supply system, social conflicts may arise related to tariff collection, perceived inequality in access to the service, and possible failures or interruptions in the supply. These conflicts can be compounded by poor institutional communication, limited understanding of pricing criteria, and high expectations among recipient communities. In contexts of socioeconomic vulnerability, these factors can generate social dissatisfaction, resistance to payment, and tensions between users and the system management entity.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Location | Medium term | Average | Average |

**Mitigation measures:**

- Definition of a socially fair and balanced tariff structure, considering the economic capacity of families and principles of equity in access to water;
- Ensuring transparency in the financial and operational management of the system, including clear disclosure of operating and maintenance costs;
- Creation and implementation of formal complaint, feedback and conflict resolution mechanisms, accessible to the entire community;
- Promoting the active participation of local communities in the management and supervision of the water supply system;
- Strengthening continuous and inclusive communication on access criteria, pricing, usage rules and consumer responsibilities;
- Carrying out community awareness campaigns on financial sustainability and the importance of regular payment of tariffs for the maintenance of the system;
- Establishment of local water committees for mediation between the management entity and users;

- Periodic monitoring of the level of user satisfaction and early identification of potential sources of conflict.

### (i) Contamination of the aquifer

Groundwater contamination is one of the most critical impacts during the operation phase of the water supply system. It can occur when pollutants from septic tanks, domestic wastewater, intensive agricultural activities, improper use of agrochemicals, fuel spills, or poor chemical storage infiltrate the groundwater. In addition, failures in sanitary sealing or the physical protection of boreholes can allow contaminants to enter the aquifer. This impact directly compromises the quality of the collected water, significantly increasing risks to public health and reducing the availability of safe water for human consumption.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Regional | Long-term | High | High |

**Mitigation/optimization measures:**

- Definition, implementation, and maintenance of a protective sanitary perimeter around the boreholes, with a minimum distance of 10 meters, depending on the local hydrogeological vulnerability;
- Strict prohibition of the installation of septic tanks, solid waste dumps or any potentially polluting activity in the borehole protection zones;
- Adequate waterproofing of the catchment areas and reinforcement of the sealing structures to prevent surface infiltration;
- Prohibition of the use of pesticides, fertilizers, herbicides, fuels and other chemicals in the areas adjacent to the catchment points;
- Installation of robust physical protection in the holes, including sealed covers, raised structures and security systems to prevent unauthorized access;
- Implementation of continuous water disinfection systems, such as controlled chlorination or appropriate filtration systems;
- Periodic laboratory analyses of water quality (at least once a year or more frequently in high-risk areas);

- Technical, safe and properly sealed closure of abandoned boreholes, preventing them from becoming routes of contamination of the aquifer;
- Continuous supervision of the activities carried out in the health protection zone, with the involvement of local authorities and communities;
- Raising awareness of communities on good practices for the protection of groundwater and risks associated with contamination.

### j) Increased noise levels

Based on the characterization of the reference environmental situation, the current noise levels in the project's area of influence range from moderate to high, reaching LAeq values above 60 dB(A) in semi-urbanized areas and peaks that can exceed 70 dB(A) during periods of greater anthropogenic activity. These results indicate that the area already has significant acoustic pressure, especially at Point 3, where the observed levels approach or exceed the limits recommended by the WHO (55 dB(A) daytime and 45 dB(A) nighttime) and by the IFC for residential areas.

In this context, during the operation phase of the water supply system, the continuous operation of pumps, motors, pressurization systems, and any support generators may contribute to localized and persistent increases in noise levels, especially in the vicinity of pumping stations and reservoirs.

Although these are generally continuous-operating equipment, the impact may be more pronounced in areas closest to the infrastructure and may primarily affect workers at the facilities and, to a lesser extent, communities located in the ADA and AID. In areas closer to sensitive receptors, there may be increased perception of nuisance, disturbance of rest, and reduced environmental comfort, especially at night, when background noise is naturally lower (approximately 45 dB(A) or lower in quieter areas).

However, because modern pumping systems have relatively low emission levels (often below 70 dB(A) at the source), the impact tends to be localized and of low intensity, provided that adequate acoustic control and management measures are implemented.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Location | Long-term | Low | Low |

**Mitigation/optimization measures:**

- Selection of low-noise pumping equipment, favoring modern technologies whose noise level at the source is lower than the critical values identified in the study area (ideally ≤ 65–70 dB(A)), to avoid worsening the levels already observed in semi-urban areas;
- Acoustic encapsulation of engine rooms and equipment rooms using insulating and sound-absorbing materials to reduce the propagation of noise to the outside, especially relevant given that local reference values are already close to 60–65 dB(A);
- Installation of permanent or semi-permanent acoustic barriers around the noisiest infrastructure, particularly when located within walking distance of homes or sensitive areas;
- Structural isolation of vibrating equipment, including anti-vibration bases and damping supports, given that the study identified vibration levels up to about 0.79 mm/s (PPV) under current conditions;
- Rigorous and continuous preventive and corrective maintenance, ensuring the efficient operation of equipment and avoiding a progressive increase in noise associated with mechanical wear;
- Periodic monitoring of noise levels in an operational regime, with LAeq measurements during the day and night, ensuring compliance with WHO and IFC limits (55/45 dB(A)) and comparing with the established baseline;
- Strategic placement of the noisiest equipment to maximize the distance from sensitive receptors (homes, schools, and health units), especially in areas where environmental noise levels are already high;
- Operational management of the operating periods of auxiliary equipment (such as generators), limiting their use to situations of need and avoiding continuous operation at night;
- Implementation of a continuous environmental monitoring program, allowing the identification of deviations from the already recorded reference levels (up to 73.9 dB(A) under current conditions) and the adoption of corrective measures in a timely manner;

- Raising awareness and providing training for operational workers, promoting good operation and maintenance practices with a focus on noise and vibration reduction;
- Strict compliance with applicable national and international standards, ensuring that operating noise levels do not increase by more than 3 dB(A) above existing background levels, in accordance with IFC best practices.

### k) Generation of solid waste

During the operation phase of the water supply system, various types of solid waste will be generated from administrative activities, maintenance workshops, canteens, facility cleaning, and equipment operation. This waste includes organic materials, plastics, paper and cardboard, waste oils, waste electrical and electronic equipment (WEEE), and hazardous waste associated with mechanical maintenance. If not properly managed, this waste can cause soil and water contamination, proliferation of disease vectors, landscape degradation, and risks to the health of workers and surrounding communities.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Definitive | Location | Long-term | Low | Average |

**Mitigation measures:**

- Preparation and implementation of a Solid Waste Management Plan (PGRS) covering all the infrastructures of the system;
- Strict application of the waste management hierarchy, prioritizing: prevention, reduction, reuse, recycling, recovery (including co-processing), and, as a last resort, final disposal;
- Mandatory separation of waste at source, according to its nature (organic, recyclable and hazardous);
- Implementation of specific, signposted and waterproofed areas for temporary storage of hazardous waste;
- Guarantee of safe packaging of hazardous waste in appropriate containers, properly identified and resistant to spills and contamination;

- Forwarding of waste to licensed operators, ensuring transport, treatment and proper final disposal;
- Continuous training of workers on good waste management practices and safe handling procedures;
- Availability and mandatory use of spill kits in the operational and maintenance areas;
- Registration and documentary control of all waste streams, including quantities, types, destinations and responsible entities;
- Raising awareness among workers to reduce waste production and promoting sustainable practices in the workplace;
- Periodic inspection and monitoring of waste storage areas, ensuring compliance with environmental and safety standards.

### l) Occupational Health and Safety in the operation phase

During the operation phase of the water supply system, workers are exposed to various occupational risks associated with handling mechanical and electrical equipment, operating pumping and treatment systems, vehicle traffic, noise, and contact with chemical substances used in water treatment. In addition, there may be risks of occupational accidents, such as falls, electric shocks, crashes, and mechanical injuries, as well as exposure to biological agents and infectious diseases. Failure to strictly observe Occupational Health and Safety (OH&S) standards can result in serious accidents, reduced productivity, and adverse effects on workers' health.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Location | Short term | Low | Average |

**Mitigation measures:**

- Periodic medical and psychotechnical evaluation of workers, ensuring physical and mental fitness to perform their duties;
- Implementation of continuous training and capacity building programs in Occupational Health and Safety (OH&S) for all workers;

- Preparation, dissemination and regular updating of an Operation Safety Manual, containing detailed safe work procedures, associated risks, preventive measures and emergency responses;
- Mandatory availability and strict supervision of the use of PPE appropriate to each function (helmets, boots, gloves, eyewear, reflective vests, hearing protectors, among others);
- Guarantee of regular preventive and corrective maintenance for all equipment, machinery, and infrastructure to reduce operational failures and the risk of accidents;
- Implementation of EPCs to create an adequate safety signaling system that clearly identifies risk areas, evacuation routes, and restricted zones;
- Provision of first-aid equipment at all operational points and training of workers in its use;
- Preparation and implementation of emergency response plans, including procedures for fires, mechanical accidents and spills of hazardous substances;
- Periodic emergency drills (evacuation and accident response exercises) to strengthen workers' preparedness;
- Continuous monitoring of compliance with OH&S standards, with the application of corrective measures in case of noncompliance;
- Prohibition of risky behaviors within the facilities, including negligence in the use of PPE and unsafe operating practices;
- Control and monitoring of noise levels and other occupational risk agents, ensuring compliance with the established legal limits;
- Promotion of a culture of safety at work through awareness campaigns and reinforcement of the individual and collective responsibility of workers.

### 7.6. Environmental Impacts in the Decommissioning Phase of the Project

The possible deactivation of the Nampula Water Supply System corresponds to a scenario in which the infrastructure ceases to operate, either fully or partially, for reasons such as technical obsolescence, replacement by more modern systems, operational restructuring, or the definitive closure of the service. At this stage, relevant environmental and social impacts may occur, mainly associated with the removal or abandonment of infrastructure, the demobilization of equipment, the generation of

waste, temporary or permanent changes in land use, and the possible interruption of essential services for the beneficiary communities.

Although this phase is conditioned by a future decision and therefore hypothetical, its effects can be significant if it is not properly planned, executed and monitored. The absence of a deactivation and environmental rehabilitation plan may exacerbate risks of landscape degradation, soil and groundwater contamination, undue occupation of deactivated infrastructure, and socioeconomic impacts resulting from the loss of water supply service. For this reason, decommissioning must be preceded by appropriate technical and environmental procedures to ensure a safe, orderly and environmentally responsible transition.

### a) Abandonment of infrastructure and landscape degradation

The absence of a properly planned and executed decommissioning process can lead to the partial or total abandonment of infrastructure such as pumping stations, reservoirs, pipelines, and support facilities. This situation results in the progressive degradation of physical structures, loss of equipment integrity, and negative alterations to the local landscape. In addition, abandoned infrastructure tends to become sites of unauthorized occupation, illegal waste dumping, and potential sources of environmental and public safety risks, compromising the aesthetic and functional quality of the territory.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Location | Long-term | Average | Average |

**Mitigation measures:**

- Preparation and implementation of an Environmental Deactivation and Rehabilitation Plan previously approved by the competent authorities;
- Controlled and safe removal of all obsolete, degraded or non-reusable infrastructure;
- Environmental and landscape rehabilitation of the intervened areas, including soil recovery and replacement of vegetation cover;

- Prior technical assessment for the reuse or conversion of existing infrastructures whenever feasible, promoting resource savings;
- Technical and safe closure of decommissioned installations, including fencing, signalling and elimination of structural hazards;
- Post-deactivation monitoring of the intervened areas to ensure environmental stabilization and avoid undue occupation;
- Involvement of local authorities and communities in the protection of rehabilitated areas and in the prevention of inappropriate uses.

**(b) Contamination of soil and groundwater by remaining residues**

During the decommissioning phase of the project, improper disposal or abandonment of equipment, contaminated materials, oils, lubricants, chemical reagents, and other hazardous wastes can lead to soil contamination and the infiltration of pollutants into groundwater. This impact is particularly critical in areas with boreholes, reservoirs, or high soil permeability, and can compromise aquifer quality and pose significant risks to public health and local ecosystems. The absence of rigorous management of this waste increases the likelihood of persistent pollution that is difficult to reverse.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Location | Long-term | High | High |

**Mitigation measures:**

- Full removal of all hazardous and non-hazardous waste generated during system operation and decommissioning;
- Collection, segregation and proper forwarding of contaminated chemicals, oils and materials to licensed operators;
- Implementation of procedures for the treatment and safe final disposal of hazardous substances, in accordance with current environmental legislation;
- Implementation of decontamination actions of potentially affected soils, including removal and replacement of contaminated layers, when necessary;
- Carrying out post-decommissioning environmental monitoring, with a special focus on soil and groundwater quality;

- Adequate technical closure of boreholes, reservoirs and other hydraulic structures, ensuring their sealing and elimination of infiltration risks;
- Implementation of a final environmental verification plan to ensure that all areas have been properly recovered and do not present residual risks.

### c) Loss of access to the water supply service

The deactivation of the water supply system may result in the total or partial interruption of drinking water supply to beneficiary communities, especially if there is no properly planned transition to alternative systems. This situation directly affects the satisfaction of the population's basic needs, compromising public health, hygiene, sanitation, and general well-being. Additionally, the absence of safe water can lead to increased dependence on unprotected sources, thereby worsening the risk of waterborne diseases and negatively affecting local socioeconomic activities.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Unlikely | Regional | Permanent | High | High |

**Mitigation measures:**

- Advance and integrated planning of alternative water supply systems before the decommissioning of the existing system;
- Implementation of a phased and progressive transition to new infrastructures, ensuring continuity of service;
- Identification and assurance of safe alternative sources of supply for potentially affected communities;
- Permanent coordination with water management entities and local authorities to ensure the continuity and sustainability of the service;
- Timely, clear and continuous communication to communities on the decommissioning process, deadlines and available alternative solutions;
- Preparation of contingency plans for situations of temporary interruption of supply;
- Social monitoring during the transition process, ensuring that no community is left without access to clean water;

- Promotion of decentralised solutions (community sources, reservoirs or temporary local systems) during the transition period.

### (d) Socio-economic impacts associated with the loss of the system

Decommissioning the system can reduce local economic activity, increase water access costs, and affect both direct and indirect jobs associated with the system's operation and maintenance. Decommissioning the water supply system can generate significant socio-economic impacts, including a reduction in local economic activity that depends directly or indirectly on the availability of drinking water. This scenario can result in increased water access costs for families, worsening living conditions for communities, and decreased productivity in sectors such as agriculture, commerce, and small services. At the same time, system interruption may lead to the loss of direct (operations and maintenance) and indirect (associated economic activities) jobs, contributing to increased socio-economic vulnerability among affected populations.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Regional | Long-term | High | High |

**Mitigation measures:**

- Implementation of professional retraining plans and training of workers affected by the deactivation of the system;
- Promotion of sustainable local economic alternatives, with a focus on the diversification of income sources;
- Technical and institutional support for the transition to new sources or alternative water supply systems;
- Development of labour reintegration programmes in conjunction with public and private entities;
- Permanent coordination with local authorities to identify and mitigate the social impacts resulting from the loss of the system;
- Promotion of local entrepreneurship initiatives to absorb affected labor;
- Implementation of temporary social protection measures for the most vulnerable groups during the transition period.

### e) Risk of undue occupation of decommissioned infrastructures

After the system is decommissioned, decommissioned infrastructure may become vulnerable to unauthorized occupation by individuals or community groups and may be used for illicit purposes, informal storage of materials, or as an unsafe shelter. This situation poses a significant risk to public safety and can lead to accidents, further degradation of structures, and increased local crime. In addition, the lack of control over these infrastructures contributes to their rapid deterioration and the loss of heritage and functional value.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Highly likely | Location | Long-term | Average | Average |

**Mitigation measures:**

- Implementation of adequate fencing and reinforcement of the physical security of deactivated infrastructures, preventing unauthorized access;
- Controlled and safe demolition of structures that do not present technical or functional feasibility for reuse;
- Strengthening supervision by local authorities and articulation with community surveillance structures;
- Raising awareness of communities about the risks associated with the improper occupation of abandoned infrastructures;
- (c) the promotion of the re-use, conversion or upgrading of infrastructure where technically and economically feasible;
- Clear signage of deactivated areas with indication of danger and prohibition of access;
- Periodic monitoring of deactivated areas until their complete rehabilitation or removal.

### (f) Generation of waste during decommissioning

The deactivation phase of the system involves removing infrastructure such as pipelines, electromechanical equipment, reservoirs, and support structures, which can generate significant volumes of solid waste. This waste includes inert (concrete,

masonry), recyclable (metals, plastics), and hazardous (oils, lubricants, contaminated components, and electronic waste) materials. If not properly managed, these materials can cause soil contamination, excessive use of space, and environmental degradation, increasing pressure on local waste management systems.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Definitive | Location | Temporary | Average | Average |

**Mitigation measures:**

- Preparation and implementation of a specific Waste Management Plan for the decommissioning phase, with a clear definition of responsibilities and procedures;
- Rigorous separation, sorting and classification of waste at source, according to its nature (hazardous and non-hazardous);
- Promotion of recycling and recovery of reusable materials, such as metals and structural components;
- Mandatory forwarding of hazardous waste to licensed and duly authorized operators for treatment and final disposal;
- Reuse of materials whenever technically feasible, promoting the circular economy and reducing environmental impacts;
- Implementation of temporary storage areas duly signposted and waterproofed for waste during the deactivation process;
- Continuous environmental monitoring during the decommissioning phase, ensuring compliance with good waste management practices and prevention of secondary impacts.

### (g) Risk of erosion and soil degradation

The deactivation and removal of infrastructure can leave large areas of exposed, unprotected soil, especially in areas where excavation, trenching, and earthmoving have occurred. This condition significantly increases the soil's vulnerability to water and wind erosion, especially during periods of heavy rainfall. In addition, the loss of vegetation cover and the absence of immediate stabilization measures can accelerate

soil degradation, reduce fertility, and cause siltation of drainage lines, with negative impacts on the ecological balance and the local landscape.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Location | Long-term | Average | Average |

**Mitigation measures:**

- Implementation of an environmental rehabilitation program for the intervened areas immediately after the deactivation of the infrastructures;
- Replacement of vegetation cover with native species appropriate to local ecological conditions, promoting soil stabilization;
- Application of erosion control techniques based on natural engineering, such as plant barriers, light rockfill and sediment retention structures;
- Physical stabilization of exposed soils through leveling, controlled compaction and protection against surface runoff;
- Implementation of adequate drainage systems to reduce the impact of rainwater on vulnerable areas;
- Post-decommissioning environmental monitoring to assess the effectiveness of recovery measures and ensure the progressive regeneration of affected ecosystems;
- Involvement of local communities in revegetation actions and protection of rehabilitated areas, promoting the sustainability of interventions.

## 7.6. Environmental Impacts in the Decommissioning Phase of the Project

The possible deactivation of the Nampula Water Supply System corresponds to a scenario in which the infrastructure ceases to operate, either fully or partially, for reasons such as technical obsolescence, replacement by more modern systems, operational restructuring, or the definitive closure of the service. At this stage, relevant environmental and social impacts may occur, mainly associated with the removal or abandonment of infrastructure, the demobilization of equipment, the generation of waste, temporary or permanent changes in land use, and the possible interruption of essential services for the beneficiary communities.

Although this phase is conditioned by a future decision and therefore hypothetical, its effects can be significant if it is not properly planned, executed and monitored. The absence of a deactivation and environmental rehabilitation plan may exacerbate risks of landscape degradation, soil and groundwater contamination, undue occupation of deactivated infrastructure, and socioeconomic impacts resulting from the loss of water supply service. For this reason, decommissioning must be preceded by appropriate technical and environmental procedures to ensure a safe, orderly and environmentally responsible transition.

**a) Abandonment of infrastructure and landscape degradation**

The absence of a properly planned and executed decommissioning process can lead to the partial or total abandonment of infrastructure such as pumping stations, reservoirs, pipelines, and support facilities. This situation results in the progressive degradation of physical structures, loss of equipment integrity, and negative alteration of the local landscape. In addition, abandoned infrastructure tends to become sites of unauthorized occupation, illegal waste dumping, and potential sources of environmental and public safety risk, compromising the aesthetic and functional quality of the territory.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Location | Long-term | Average | Average |

**Mitigation measures:**

- Preparation and implementation of an Environmental Deactivation and Rehabilitation Plan previously approved by the competent authorities;
- Controlled and safe removal of all obsolete, degraded or non-reusable infrastructure;
- Environmental and landscape rehabilitation of the intervened areas, including soil recovery and replacement of vegetation cover;
- Prior technical assessment for the reuse or conversion of existing infrastructures whenever feasible, promoting resource savings;

- Technical and safe closure of decommissioned installations, including fencing, signalling and elimination of structural hazards;
- Post-deactivation monitoring of the intervened areas to ensure environmental stabilization and avoid undue occupation;
- Involvement of local authorities and communities in the protection of rehabilitated areas and in the prevention of inappropriate uses.

**(b) Contamination of soil and groundwater by remaining residues**

During the decommissioning phase of the project, improper disposal or abandonment of equipment, contaminated materials, oils, lubricants, chemical reagents, and other hazardous waste can lead to soil contamination and the infiltration of pollutants into groundwater. This impact is particularly critical in areas with boreholes, reservoirs, or high soil permeability, and can compromise aquifer quality and pose significant risks to public health and local ecosystems. The absence of rigorous management of this waste increases the likelihood of persistent pollution that is difficult to reverse.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Location | Long-term | High | High |

**Mitigation measures:**

- Full removal of all hazardous and non-hazardous waste generated during system operation and decommissioning;
- Collection, segregation and proper forwarding of contaminated chemicals, oils and materials to licensed operators;
- Implementation of procedures for the treatment and safe final disposal of hazardous substances, in accordance with current environmental legislation;
- Implementation of decontamination actions of potentially affected soils, including removal and replacement of contaminated layers, when necessary;
- Carrying out post-decommissioning environmental monitoring, with a special focus on soil and groundwater quality;
- Adequate technical closure of boreholes, reservoirs and other hydraulic structures, ensuring their sealing and elimination of infiltration risks;

- Implementation of a final environmental verification plan to ensure that all areas have been properly recovered and do not present residual risks.

### c) Loss of access to the water supply service

The deactivation of the water supply system may result in the total or partial interruption of drinking water supply to beneficiary communities, especially if there is no properly planned transition to alternative systems. This situation directly affects the satisfaction of the population's basic needs, compromising public health, hygiene, sanitation, and general well-being. Additionally, the absence of safe water can lead to increased dependence on unprotected sources, thereby worsening the risk of waterborne diseases and negatively affecting local socioeconomic activities.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Unlikely | Regional | Permanent | High | High |

**Mitigation measures:**

- Advance and integrated planning of alternative water supply systems before the decommissioning of the existing system;
- Implementation of a phased and progressive transition to new infrastructures, ensuring continuity of service;
- Identification and assurance of safe alternative sources of supply for potentially affected communities;
- Permanent coordination with water management entities and local authorities to ensure the continuity and sustainability of the service;
- Timely, clear and continuous communication to communities on the decommissioning process, deadlines and available alternative solutions;
- Preparation of contingency plans for situations of temporary interruption of supply;
- Social monitoring during the transition process, ensuring that no community is left without access to clean water;
- Promotion of decentralised solutions (community sources, reservoirs or temporary local systems) during the transition period.

### (d) Socio-economic impacts associated with the loss of the system

The decommissioning of the system can reduce local economic activity, increase the cost of access to water, and affect direct and indirect jobs linked to the operation and maintenance of the system. The decommissioning of the water supply system can generate significant socio-economic impacts, namely the reduction of local economic activity that depends directly or indirectly on the availability of drinking water. This scenario can result in increased costs of access to water for families, worsening living conditions for communities, and decreased productivity in sectors such as agriculture, commerce, and small services. At the same time, the interruption of the system may lead to the loss of direct (operation and maintenance) and indirect (associated economic activities) jobs, contributing to increased socio-economic vulnerability among the affected populations.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Regional | Long-term | High | High |

**Mitigation measures:**

- Implementation of professional retraining plans and training of workers affected by the deactivation of the system;
- Promotion of sustainable local economic alternatives, with a focus on the diversification of income sources;
- Technical and institutional support for the transition to new sources or alternative water supply systems;
- Development of labour reintegration programmes in conjunction with public and private entities;
- Permanent coordination with local authorities to identify and mitigate the social impacts resulting from the loss of the system;
- Promotion of local entrepreneurship initiatives to absorb affected labor;
- Implementation of temporary social protection measures for the most vulnerable groups during the transition period.

### e) Risk of undue occupation of decommissioned infrastructures

After the system is decommissioned, decommissioned infrastructure may become vulnerable to unauthorized occupation by individuals or community groups and may be used for illicit purposes, informal storage of materials, or as an unsafe shelter. This situation poses a significant risk to public safety and can lead to accidents, further degradation of structures, and increased local crime. In addition, the lack of control over these infrastructures contributes to their rapid deterioration and the loss of heritage and functional value.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Highly likely | Location | Long-term | Average | Average |

**Mitigation measures:**

- Implementation of adequate fencing and reinforcement of the physical security of deactivated infrastructures, preventing unauthorized access;
- Controlled and safe demolition of structures that do not present technical or functional feasibility for reuse;
- Strengthening supervision by local authorities and articulation with community surveillance structures;
- Raising awareness of communities about the risks associated with the improper occupation of abandoned infrastructures;
- (c) the promotion of the re-use, conversion or upgrading of infrastructure where technically and economically feasible;
- Clear signage of deactivated areas with indication of danger and prohibition of access;
- Periodic monitoring of deactivated areas until their complete rehabilitation or removal.

### (f) Generation of waste during decommissioning

The deactivation phase of the system involves removing infrastructure such as pipelines, electromechanical equipment, reservoirs, and support structures, which can generate significant volumes of solid waste. This waste includes inert (concrete, masonry), recyclable (metals, plastics), and hazardous (oils, lubricants, contaminated

components, and electronic waste) materials. If not properly managed, these materials can cause soil contamination, excessive use of space, and environmental degradation, increasing pressure on local waste management systems.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Definitive | Location | Temporary | Average | Average |

**Mitigation measures:**

- Preparation and implementation of a specific Waste Management Plan for the decommissioning phase, with a clear definition of responsibilities and procedures;
- Rigorous separation, sorting and classification of waste at source, according to its nature (hazardous and non-hazardous);
- Promotion of recycling and recovery of reusable materials, such as metals and structural components;
- Mandatory forwarding of hazardous waste to licensed and duly authorized operators for treatment and final disposal;
- Reuse of materials whenever technically feasible, promoting the circular economy and reducing environmental impacts;
- Implementation of temporary storage areas duly signposted and waterproofed for waste during the deactivation process;
- Continuous environmental monitoring during the decommissioning phase, ensuring compliance with good waste management practices and prevention of secondary impacts.

### (g) Risk of erosion and soil degradation

The deactivation and removal of infrastructure can leave large areas of exposed, unprotected soil, especially in areas where excavation, trenching, and earthmoving have occurred. This condition significantly increases the soil's vulnerability to water and wind erosion, especially during periods of heavy rainfall. In addition, the loss of vegetation cover and the absence of immediate stabilization measures can accelerate

soil degradation, reduce fertility, and cause siltation of drainage lines, with negative impacts on the ecological balance and the local landscape.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Location | Long-term | Average | Average |

**Mitigation measures:**

- Implementation of an environmental rehabilitation program for the intervened areas immediately after the deactivation of the infrastructures;
- Replacement of vegetation cover with native species appropriate to local ecological conditions, promoting soil stabilization;
- Application of erosion control techniques based on natural engineering, such as plant barriers, light rockfill and sediment retention structures;
- Physical stabilization of exposed soils through leveling, controlled compaction and protection against surface runoff;
- Implementation of adequate drainage systems to reduce the impact of rainwater on vulnerable areas;
- Post-decommissioning environmental monitoring to assess the effectiveness of recovery measures and ensure the progressive regeneration of affected ecosystems;
- Involvement of local communities in revegetation actions and protection of rehabilitated areas, promoting the sustainability of interventions.

## 7.7. Cumulative Environmental Impacts of the Project

The cumulative impacts are the effects resulting from the interaction and sum of the impacts generated by the Nampula Water Supply System Expansion Project with other projects, activities, and development processes already existing or potentially planned in its area of influence. These impacts do not result from a single isolated action but from the progressive combination of multiple pressures on the physical, biotic, and socio-economic environment.

In the project's area of influence, these effects can be intensified by population growth, urban expansion, intensification of economic activities, increased demand for water resources, and the installation of new public and private infrastructure. Thus, although

many of the individual impacts associated with the project are of low or medium intensity, their accumulation over time can result in more significant and lasting changes, particularly in the availability and quality of water resources, pressure on local ecosystems, and the socioeconomic dynamics of communities.

Thus, cumulative impacts require an integrated management approach, based on inter-institutional coordination, territorial planning, and continuous environmental monitoring, to ensure the sustainability of the water supply system and minimize negative effects associated with the region's progressive development.

**(a) Cumulative pressure on groundwater resources**

The continuous operation of the water supply system, together with multiple groundwater abstractions in the region, including domestic wells, community boreholes, agricultural uses, and eventual industrial abstractions, can create significant cumulative pressure on local aquifers. This progressive overexploitation tends to reduce piezometric levels, decrease water availability, and alter the natural conditions of aquifer recharge over time. In more critical scenarios, this pressure can compromise the sustainability of the groundwater resource, affecting both public supply and other water-dependent economic activities.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Highly likely | Regional | Long-term | High | High |

**Mitigation measures:**

- Implementation of an integrated and sustainable management system for groundwater abstraction in the project's area of influence;
- Continuous and systematic monitoring of piezometric levels and water quality at strategic points in aquifers;
- Effective coordination with other users of water resources, including agricultural, industrial sectors and local communities, promoting shared and rational management of the resource;
- Definition and strict application of extraction limits according to the natural recharge capacity of aquifers, based on up-to-date hydrogeological studies;

- Periodic carrying out of hydrogeological studies to reassess water availability and adjust exploitation rates;
- Promotion and encouragement of the use of alternative sources of water supply, where technically and economically feasible, in order to reduce exclusive dependence on groundwater;
- Implementation of efficiency measures in the use of water, reducing losses and waste throughout the system.

### (b) Accumulation of risks of contamination of the aquifer

The combination of different sources of pollution in the project's catchment area, such as poorly constructed or localized septic tanks, fertilizer- and pesticide-intensive agricultural practices, inadequate chemical storage, and domestic activities without adequate sanitation systems, can lead to a progressive accumulation of groundwater contamination risks. This scenario becomes more critical when associated with the continuous operation of catchment holes, which can facilitate the mobilization and dissemination of contaminants in the aquifer. Over time, this situation can compromise water quality, increasing public health risks and reducing the availability of safe water for human consumption.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Regional | Long-term | High | High |

**Mitigation measures:**

- Reinforcement and strict compliance with the sanitary perimeters for the protection of boreholes, with effective control of the use of the land in the surroundings;
- Implementation of territorial planning measures in aquifer recharge areas, limiting potentially polluting activities;
- Stricter control and enforcement of agricultural and domestic activities with potential pollution in the ADA, IDA and IIA;
- Periodic and systematic monitoring of the physical-chemical and microbiological quality of groundwater, with dissemination of the results to the competent authorities;

- Continuous sensitization of local communities on safe sanitation practices, waste management and responsible use of chemicals;
- Promoting the improvement of basic sanitation systems, including the construction of improved latrines and safe and properly located septic tanks;
- Interinstitutional coordination between the water, environment, health and local authorities for an integrated management of aquifer protection.

### (c) Urban growth and pressure on social infrastructure

The significant improvement of the water supply in the intervention area tends to act as a factor of population attraction and territorial dynamism, and may induce processes of accelerated and, in many cases, disorderly urban growth. This phenomenon can result in the expansion of informal settlements and increased population density in previously less occupied areas. As a consequence, there is cumulative pressure on existing infrastructure and social services, such as basic sanitation, health, education, housing, energy, and urban mobility. Although this growth can represent opportunities for economic development, when not properly planned, it can compromise the quality of services and urban sustainability.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Positive/Negative | Highly likely | Surroundings | Long-term | Average | Average |

**Mitigation/enhancement measures:**

- Permanent articulation with spatial planning instruments and urban development master plans, ensuring the alignment of the project with territorial planning;
- Strengthening the institutional capacity of local authorities in the management and control of land use and urban growth;
- Promotion of the phased, balanced and planned expansion of social infrastructures and public services, following population growth;
- Continuous monitoring of population dynamics, land occupation patterns and expansion of urban settlements in the area of influence;

- Integration of the project into sustainable urban development strategies, ensuring cross-sectoral coordination between water, sanitation, housing, health and energy;
- Promotion of community awareness mechanisms on orderly land use and prevention of informal settlements in non-infrastructure areas.

### d) Cumulative increase in municipal and operational solid waste

The increased availability of drinking water, driven by population growth, the expansion of economic activities, and improved living conditions, tends to generate a progressive and cumulative rise in the production of urban and operational solid waste. This growth includes household, commercial, and light industrial waste, as well as waste from the maintenance and operation of the water supply system itself. If management capacity is not strengthened, this increase can overwhelm existing municipal systems, leading to the accumulation of waste in inappropriate locations, degradation of environmental quality, proliferation of disease vectors, and increased health risks.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Highly likely | Surroundings | Long-term | Average | Average |

**Mitigation measures:**

- Institutional and operational strengthening of municipal solid waste management systems, including technical, logistical and financial means;
- Promotion of circular economy practices, encouraging the reduction, reuse and recycling of materials at community and institutional level;
- Continuous implementation of environmental education and awareness programs aimed at communities, schools and economic agents;
- Establishment of partnerships with licensed operators for the collection, transport, treatment and proper final disposal of waste;
- Introduction and strengthening of waste separation systems at source, differentiating organic, recyclable and hazardous waste;

- Encouraging the creation of local micro-enterprises for waste management and recovery, as a way to reduce pressure on public systems and generate employment opportunities.

### (e) Cumulative increase in energy consumption and associated emissions

The continuous operation of the water supply system, particularly through pumps, treatment plants and distribution networks, implies a permanent consumption of electricity. When associated with population growth, the expansion of the served area and the increase in water demand, this consumption tends to accumulate over time. Depending on the energy matrix used, this increase can indirectly contribute to higher greenhouse gas emissions, aggravating the system's environmental footprint at the regional level. Thus, this is a relevant cumulative impact, especially in the context of energy and climate sustainability.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Regional | Long-term | Average | Average |

**Mitigation measures:**

- Promotion of energy efficiency through the adoption of high-performance pumping equipment and automated control systems;
- Progressive integration of renewable energy sources, such as solar photovoltaics, to partially or fully feed infrastructures;
- Operational optimization of the distribution system, reducing pressure losses and adjusting the operation of the pumps to the actual demand;
- Implementation of a rigorous program of preventive and corrective maintenance of equipment, ensuring greater energy efficiency and waste reduction;
- Continuous monitoring of energy consumption and establishment of efficiency indicators (kWh/m³ of distributed water), allowing operational adjustments based on performance;
- Institutional awareness for the adoption of sustainable energy management practices in the water supply sector.

### f) Cumulative increase in pressure on public health services

Improved water supply directly reduces waterborne diseases and, consequently, some types of demand on health services. However, this positive effect can be partially offset by cumulative impacts associated with population growth, urban sprawl, and the intensification of economic activities induced by the project. This dynamism may result in an overall increase in demand for health services, especially in peripheral areas, where the response capacity of health facilities may be more limited. Thus, the cumulative impact translates into increased pressure on the public health system, requiring reinforcement of its response capacity and coverage.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Positive/Negative | Probable | Surroundings | Long-term | Average | Average |

**Mitigation / enhancement measures:**

- Strengthening institutional coordination between the water supply sector and public health services for integrated planning;
- Expansion and improvement of the coverage of health services, with a special focus on peripheral areas and areas with greater population growth;
- Continuous reinforcement of health education campaigns and promotion of preventive health in communities;
- Systematic monitoring of epidemiological indicators, allowing the early identification of trends of increased demand or disease outbreaks;
- Promotion of community health programs, with a focus on prevention, hygiene and environmental sanitation;
- Integration of water supply system planning with municipal public health and urban development strategies.

### g) Cumulative intensification of social conflicts over access to water

Improving and expanding the water supply system tend to increase the availability of the resource and its socio-economic relevance, which, in turn, can generate greater demand and competition for access. In contexts of population growth and urban expansion, this scenario can intensify social conflicts related to water distribution,

perceptions of injustice in tariff collection, illegal connections, and inequality in access to service. The accumulation of these factors can weaken social cohesion and increase tensions between communities, operators, and local authorities if effective governance and mediation mechanisms are not in place.

**Impact classification:**

| Signal | Probability | Extension | Duration | Intensity | Significance |
|---|---|---|---|---|---|
| Negative | Probable | Surroundings | Long-term | Average | Average |

**Mitigation measures:**

- Strengthening participatory and inclusive mechanisms for the management of the water supply system, with effective involvement of local communities;
- Guarantee of transparency in the definition of tariffs, connection criteria and rules for access to the service;
- Creation and strengthening of formal and accessible mechanisms for complaints, mediation and conflict resolution;
- Continuous involvement of local authorities and community leaders in the management and supervision of the system;
- Promotion of permanent education and awareness campaigns on responsible, sustainable and equitable use of water;
- Establishment of regular communication channels between the system operator and users, promoting trust and conflict prevention.

# VIII. CONCLUSIONS AND RECOMMENDATIONS

## 8.1. Conclusions

The analysis developed in this SESR allows us to conclude that the Nampula Water Supply System Expansion Project has significant positive environmental and social impacts, as well as negative impacts that are essentially temporary and mitigable, which were duly identified, evaluated, and classified throughout the different phases of the project cycle.

Among the main positive impacts, the substantial improvement in access to drinking water for about 50,000 beneficiaries, the reduction in the incidence of water-borne diseases, the strengthening of hygiene and public health conditions, and the promotion of local socio-economic development stand out. Additionally, the project will contribute to strengthening the urban resilience of the city of Nampula, reducing inequalities in access to basic services, and boosting the local economy through job creation during the construction phase. These benefits are long-lasting and structuring, in line with the objectives of sustainable development and the improvement of the living conditions of the populations.

The negative impacts are primarily concentrated in the construction phase, including vegetation removal, dust and noise emissions, temporary disruption of local activities, construction waste generation, possible effects on agricultural crops, and occupational hazards. In the operation phase, the negative impacts are considered to be of low magnitude and may include the system's energy consumption, the risk of over-exploitation of aquifers, and the need for proper management of chemicals used in water treatment. In general, these impacts are localized, temporary, and mitigable through the effective implementation of the measures proposed in the ESMP.

Thus, the project is environmentally and socially viable, provided it is implemented in accordance with applicable Mozambican legislation, international good practices, and the technical recommendations contained in this SES. Adopting a preventive, integrated, and participatory approach will maximize the project's benefits and minimize adverse impacts, contributing to sustainable and inclusive urban development in the city of Nampula.

## 8.2. Recommendations

To ensure effective environmental and social management of the project, it is recommended that the following measures be adopted:

- Fully implement the ESMP as a guiding and binding instrument, ensuring compliance with all mitigation, monitoring, and reporting measures as foreseen;
- Ensure the proper management of construction waste, including its sorting, safe temporary storage, and forwarding to duly licensed destinations, favoring reuse and recycling whenever possible;
- Reduce atmospheric and noise impacts during the construction phase through periodic irrigation of roads for dust control, adequate maintenance of equipment, and limiting noisy activities to previously defined times;
- Minimize disruptions to local mobility and accessibility by defining routes for heavy-vehicle circulation, providing adequate signage for work areas, and coordinating with municipal authorities;
- Implement strict occupational safety and health measures, including worker training, allocation of Collective Protective Equipment (CPE), mandatory use of PPE, and control of risks associated with construction activities;
- Ensure the sustainable management of groundwater resources, including regular monitoring of aquifer exploitation levels and water quality;
- Ensure the safe handling, storage and application of chemicals (such as chlorine), in compliance with safety and health standards;
- Promote the hiring of local labor whenever possible, contributing to the economic development of the communities covered;
- Maintain a continuous mechanism for communication and engagement with stakeholders and affected parties, ensuring the proper management of complaints and suggestions;
- Submit periodic environmental and social monitoring reports to the competent authorities, ensuring the monitoring and verification of compliance with the established measures.

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# X. ANNEXES

## ANNEX 1 - APPROVAL NOTE FOR THE TDR'S

**ANNEX 2: ENVIRONMENTAL CONSULTANCY CERTIFICATE**

República de Moçambique

MINISTÉRIO DA TERRA E AMBIENTE

# CERTIFICADO DE CONSULTOR AMBIENTAL

Nº. 66 / 2023

O Ministério da Terra e Ambiente, ao abrigo do Regulamento sobre o Processo de Avaliação do Impacto Ambiental, aprovado pelo Decreto nº 54/2015, de 31 de Dezembro, certifica que o (a) sr (a) Eco-Terra, Limitada

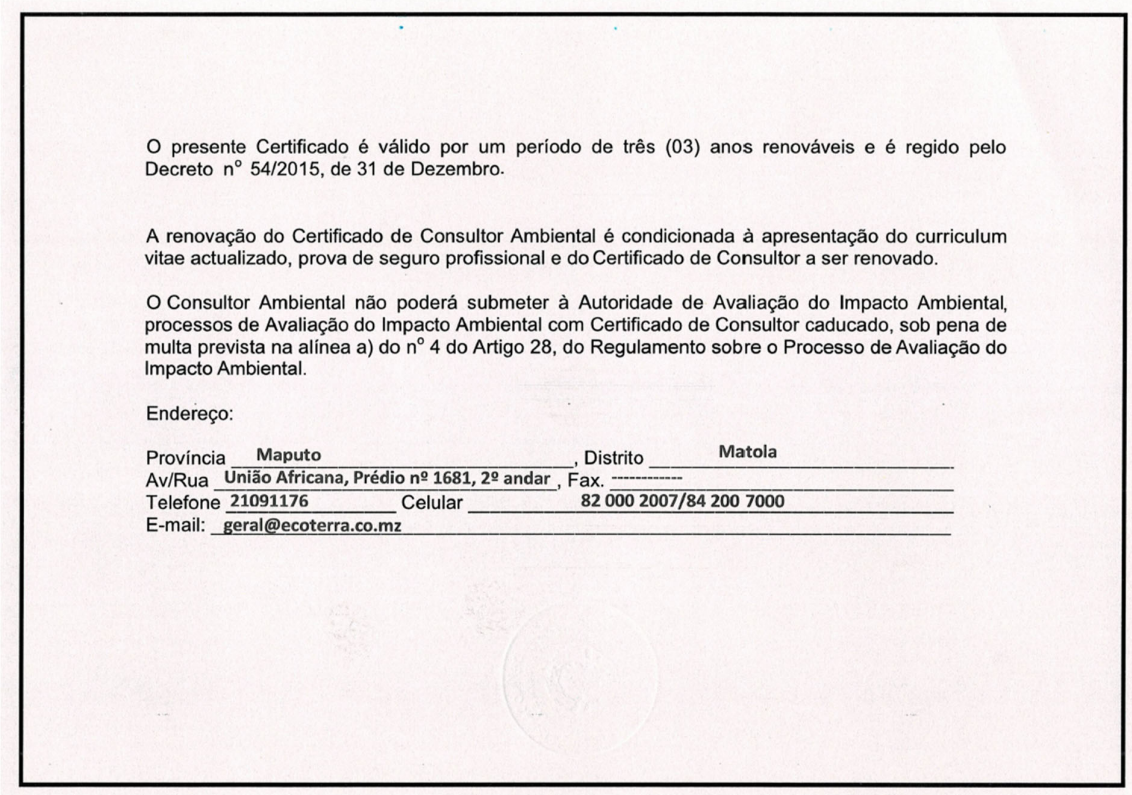
está devidamente credenciado (a) a exercer funções de Consultor Ambiental em Moçambique.

CERTIFICADO DE CONSULTOR

Maputo, aos 09 / 11 /20 23 Validade até 09 / 11 /2026

Ivete Joaquim Maibaze

A Ministra



O presente Certificado é válido por um período de três (03) anos renováveis e é regido pelo Decreto nº 54/2015, de 31 de Dezembro.

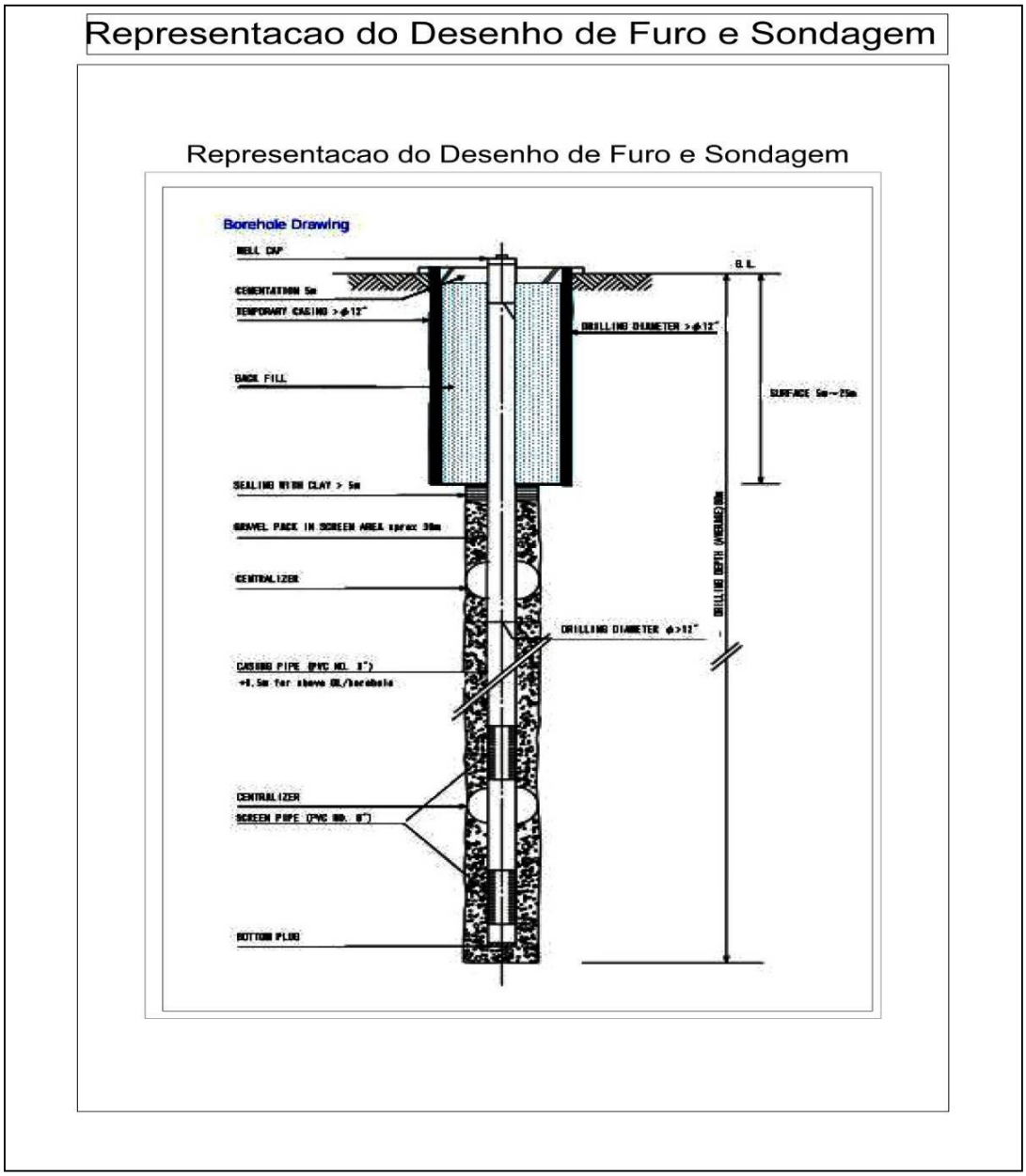
A renovação do Certificado de Consultor Ambiental é condicionada à apresentação do curriculum vitae actualizado, prova de seguro profissional e do Certificado de Consultor a ser renovado.

O Consultor Ambiental não poderá submeter à Autoridade de Avaliação do Impacto Ambiental, processos de Avaliação do Impacto Ambiental com Certificado de Consultor caducado, sob pena de multa prevista na alínea a) do nº 4 do Artigo 28, do Regulamento sobre o Processo de Avaliação do Impacto Ambiental.

Endereço:

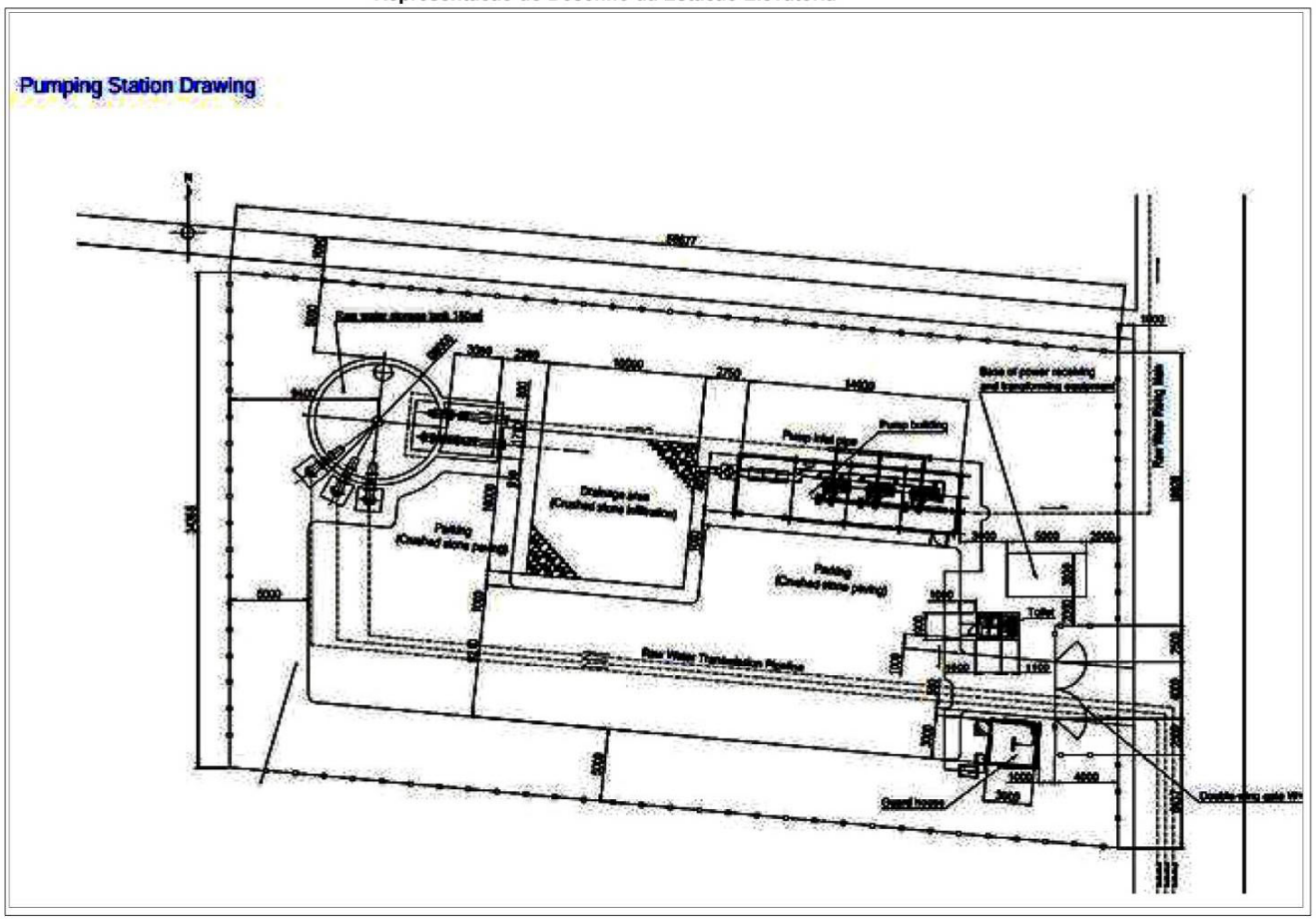
Província Maputo, Distrito Matola
Av/Rua União Africana, Prédio nº 1681, 2º andar, Fax. ----------
Telefone 21091176 Celular 82 000 2007/84 200 7000
E-mail: geral@ecoterra.co.mz

**ANNEX 3: REPRESENTATION OF THE DRAWINGS OF THE DRILLING SYSTEM, ROUTE, BOREHOLE, PUMPING SYSTEM AND WATER TRANSMISSION**

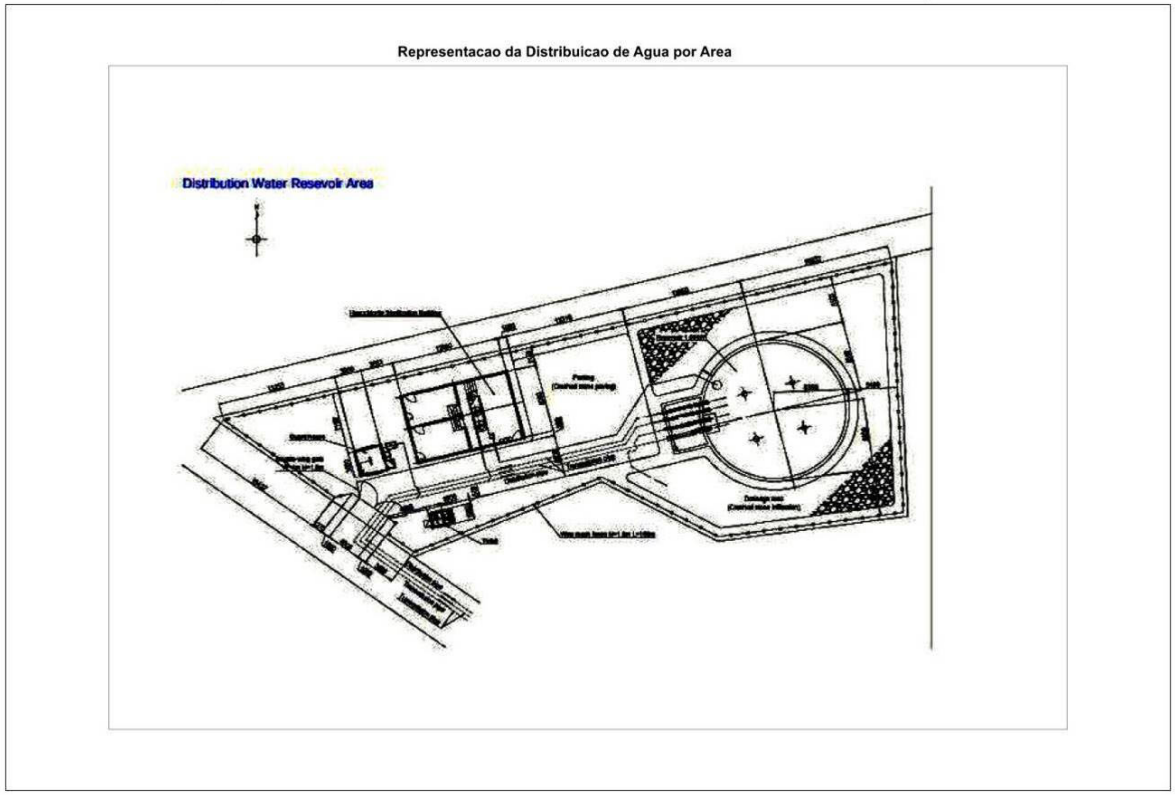


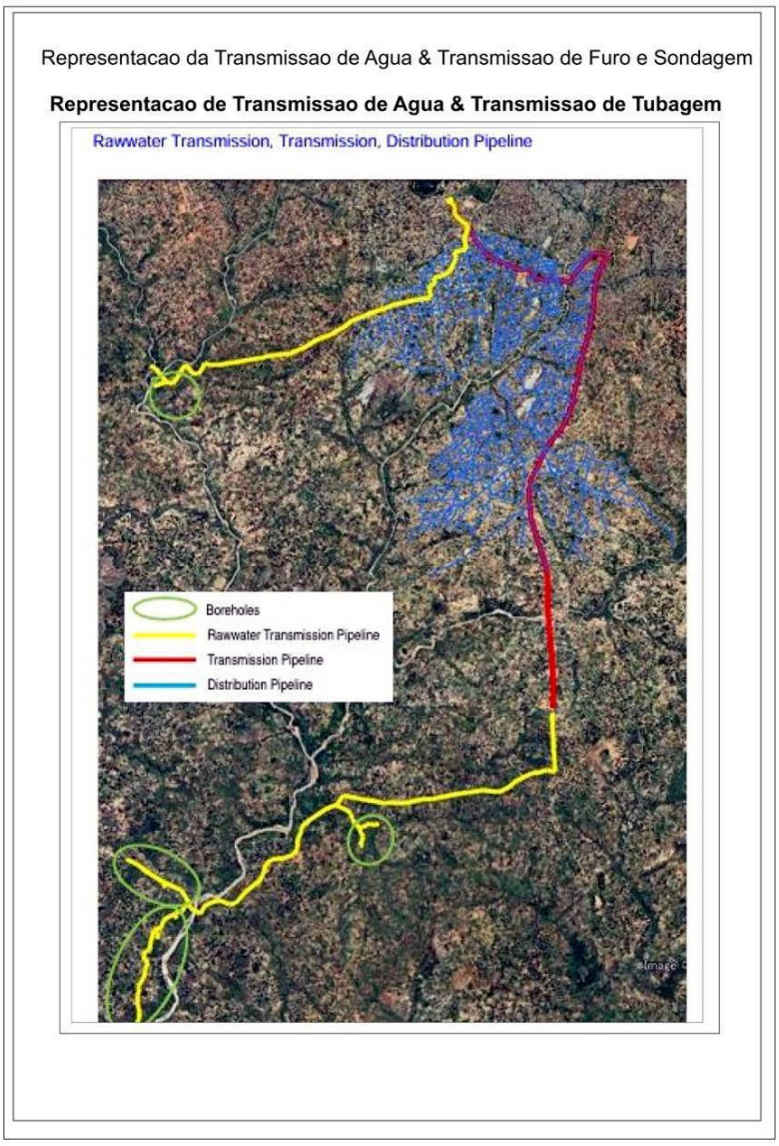
Representacao do Desenho da Estacao Elevatoria

**Representacao do Desenho da Estacao Elevatoria**



Representacao do Desenho da EDistribuicao da Agua por Area




Representacao da Transmissao de Agua & Transmissao de Furo e Sondagem
Representacao de Transmissao de Agua & Transmissao de Tubagem
Rawwater Transmission, Transmission, Distribution Pipeline
Boreholes
Rawwater Transmission Pipeline
Transmission Pipeline
Distribution Pipeline