



ANGOLAN GOVERNMENT
MINISTRY OF AGRICULTURE AND FORESTS
INSTITUTE FOR AGRARIAN DEVELOPMENT



Consultant:



Sub-consultant:



Environmental and Social Impact Assessment (ESIA) Environmental and Social Management Plan (ESMP)

**Rehabilitation of Irrigation Systems
Small Scale Climate Change Resistant
(Lunda Sul)**

CPAVCDP-02_24PIU

PREPARATION OF ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENTS (AIAS)
AND ENVIRONMENTAL AND SOCIAL MANAGEMENT PLANS (ESMPS) FOR THE
AGRICULTURAL VALUE CHAIN DEVELOPMENT PROJECT



TECHNICAL FILE

This document refers to the "EIAS - Environmental and Social Impact Study & PGAS" (D5.1 & D5.2) within the scope of **Subproject 1 - Rehabilitation of Small-Scale Irrigation Systems Resistant to Climate Change - Lunda Sul**, of the Agricultural Value Chain Development Project in the Eastern Region of Angola (CPAVCDP-02_24PIU), the following documents are expected to be delivered:

- D1 - Initial report (IR)
- D2 - Complaint Resolution Mechanism (CRM)
- D3 - Stakeholder Involvement Plan (PEPI)
- D4 - Pest Management Plan (PMP)
- **D5 - Environmental and Social Impact Assessment (EIAS) & Environmental and Social Management Plan (PGAS)**
- D6 - Presentation of Reports
- D7 - Final EIAS and ESMP (including RMP)

DOCUMENT CONTROL

CLIENT	CPAVCDP-02_24PIU
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Subproject 1.	Rehabilitation of Small-Scale Irrigation Systems Resistant to Climate Change - Lunda Sul 1.1) Pelengue Canal 1.2) Capuepua Channel
Subproject 2.	2.1-a) Rehabilitation and equipping of a Research Center - Lunda Sul (Instituto Técnico Agrário de Mona Quimbundo) 2.1-b) Rehabilitation and equipping of a Research Center - Cuando Cubango (Instituto Médio Agrário do Missombo) 2.2) Construction of a Moxico Research Station (IDA facilities in Luena)
DOCUMENT	EIAS - Environmental and Social Impact Assessment PGAS - Environmental and Social Management Plan
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NON-TECHNICAL SUMMARY

This report summarizes the background and rationale for the project, the environmental and social baseline, the national and international legal framework, the requirements of the ESIA and licensing, the definition of the areas of influence, the public consultations, the justification and description of the project, the potential environmental and social impacts and the environmental and social management plan.

EIAS followed the ADB's guidelines, as well as Angolan legislation.

As part of the PROJECT TO DEVELOP THE AGRICULTURAL VALUE CHAIN IN THE EASTERN REGION OF ANGOLA, the rehabilitation of small-scale irrigation systems resistant to climate change is planned for two irrigation canals - the Pelengue Canal and the Capuepua Canal, located in the rural area of Saurimo, in the province of Lunda Sul - Subproject 1

The project is an independent investment that comes as a continuation of the Agricultural Sector Reform Program (ASRP), financed by the African Development Bank (AfDB). The aim is to strengthen agricultural policy and the business environment to improve food production, thus contributing to the diversification of the economy and food security. This project is based on the improvement of the policy environment promoted by the ASRP program and on the knowledge acquired in the design and implementation of the Bom Jesus and Calenga Projects, as well as the Cabinda Province Agricultural Value Chain Project.

Subproject 1 "Rehabilitation of small-scale irrigation systems resistant to climate change" is part of Component 1, which aims to increase agricultural production and productivity. It aims to raise crop yields and the production of selected value chains by promoting the adoption of the best available technologies through the Technology for African Agricultural Transformation (TAAT) program, with an emphasis on creating agricultural infrastructure that is resilient to climate change (subcomponent 1.2).

The rehabilitation of the Canal de Pelengue and Canal de Capuepua irrigation canals, which are currently deactivated in Saurimo, brings several benefits for agriculture, the environment and local communities. The restoration of these canals will improve water efficiency, increasing storage capacity and reducing water use losses. This will allow for more effective irrigation, increasing crop productivity and contributing to food security. In addition, rehabilitation will help control soil erosion and promote environmental sustainability by improving water quality and restoring biodiversity in adjacent ecosystems.

In addition to the direct benefits for agriculture, the rehabilitation of the canals also has a significant socio-economic impact. The project can generate direct and indirect jobs, boosting local economic development. Responsible management of water resources will be taken into account and the rehabilitation of the canals is expected to increase farmers' resilience to climate change. Finally, the

involvement of local communities in the rehabilitation process will raise awareness of the importance of water management, making this initiative a valuable strategy for the development of sustainable agriculture in the Lunda Sul region.

The environmental and social baseline describes the current situation with regard to the environmental and social aspects of the intervention area.

The main impacts during the construction and operation phase of the rehabilitation of the irrigation canals were identified and assessed, and mitigation and compensation measures were presented, as well as measures to boost the respective impacts.

In terms of **geology and geomorphology**, during the construction phase, the rural land on which the canals are located is generally flat with a slight slope (less than 1%), and there are no geological features or specific aspects that make it impossible to rehabilitate the canals. On a hydrogeological level, the rehabilitation of the canals may interfere with groundwater resources - aquifers, but it is not expected to cause hydrogeological instability. It is recommended that a hydrogeological study be carried out to verify the existence of aquifers in the area directly affected by the project. During the operation phase, no impacts on geology or geomorphology are expected as a result of the presence and operation of the irrigation canals, since their operation and maintenance will not require significant interventions either in the geological substrate or at the geomorphological level. No impact on hydrogeology is expected either.

At **soil** level, during the construction phase of the rehabilitation of the irrigation canals, the main activity that can impact the soil is excavation and earthmoving. This activity can affect the quality of the soil along the canals, particularly in the temporary working area where the movement of machinery and cleaning and excavation actions will take place. Clearing and excavation can result in soil mobilization and compaction, increasing the risk of erosion due to exposure to wind and rainwater runoff. Although there is a risk of accidental spills of polluting substances related to the operation of the machinery, this risk is considered minimal, as the machinery must comply with standards of use and maintenance, such as oil changes, will be carried out within the yard. Waste management will also be implemented with appropriate containers and training for workers. Therefore, although the impacts are negative and direct, they are considered to be minor once the mitigation measures have been implemented. In the operation phase - running the irrigation canals, the natural vegetation and agricultural production in the surrounding areas will help fix the soil, nullifying the erosive effects. In addition, maintenance operations, which mainly consist of cleaning and clearing the canals, will be carried out punctually and by a small number of workers, which should not result in significant impacts on the soil during the operation phase.

With regard to **climate** and **climate change**, deforestation and blasting at canal sites will result in the destruction of vegetation and may cause a slight increase in the air temperature near the ground and a slight decrease in relative humidity, due to the loss of thermal regularization capacity, which is not significant. In addition, construction activities can contribute to the emission of GHGs by the vehicles involved in the work, such as CO, CO₂, NO_x and SO₂. Emissions will depend on as yet unknown factors, such as the type and quantity of equipment used. However, these emissions

are not expected to be significant, but are temporary and can be mitigated. In the operational phase of irrigation canals and with **climate change**, rainfall is expected to decrease by around 2% by 2100. In this context, the rehabilitation of the canals will ensure greater availability of water for agricultural production in the Lunda Sul region, resulting in moderate to minor positive impacts. The rehabilitation of canals promotes the reactivation of agricultural perimeters and the potential use of machinery will indirectly generate GHG emissions related to agricultural production.

In terms of **water resources**, during the construction phase, soil compaction resulting from the movement of machinery, vehicles and people can reduce the infiltration capacity of water, affecting absorption by the soil and thus the recharge of aquifers (groundwater availability), as well as altering the natural drainage system for rainwater. The impact is moderate to insignificant, being slightly more relevant in the Capuepua canal due to its greater length. No impacts are expected on surface water resources such as the Chicapa River (Pelengue Canal) and the Tamba River (Capuepua Canal). During the operation phase of the canals, sufficient (surface) water is expected to be made available for agricultural production in the adjacent perimeters, resulting in positive impacts. However, it is crucial to ensure regular maintenance of the canals, including cleaning, to avoid obstructions that compromise water circulation. The rehabilitation of the Pelengue and Capuepua canals is important for increasing water availability and favoring agricultural production in the province.

With regard to **Air Quality**, during the construction phase, the main impacts on air quality result from the emission of suspended particles from the excavations and earthmoving required to clean the canals and build accesses. In addition, there will be emissions of typical pollutants related to vehicle traffic and the operation of construction machinery. The most sensitive months in terms of particulate emissions (because they are the driest) are between April and September. The other months are rainier, so the impacts are naturally minimized in terms of the existence of suspended dust. No impacts on air quality were identified during the operation phase.

Water quality may be affected as soil mobilization and vegetation removal may increase the risk of contamination due to the movement of vehicles assigned to the works and the operation of machinery. There may be accidental spills that contaminate aquifers and reservoirs close to the project area through runoff or infiltration. On the construction site and fronts, the machinery will have containment basins. The storage of large quantities of hydrocarbons will also be avoided to reduce the risk of accidental spills. In the operation phase, the impacts of maintenance actions, such as cleaning the channels, are mainly related to the presence of potential sources of soil and water contamination, including machinery, vehicles and equipment, which increase the risk of accidental spillage and consequent contamination.

With regard to the **noise environment**, in the construction phase the noisiest construction activities are generally associated with earthmoving and compaction, as well as the movement of heavy vehicles and the operation of machinery/equipment assigned to the work. In the operation phase, water will flow into the canals by gravity, without the use of pumps or noisy equipment. In relation

to maintenance activities, it may be necessary to use noisier machinery to clean and clear the canals, but this impact will not be significant.

It was found that there is no **waste** management in the rural area where the canals are located, i.e. not only are there no containers or other specific places to store the waste, but there is also no municipal entity or private operator collecting it. Waste is disposed of by the communities of the Pelengue, Muambulo and Capuepua neighborhoods in a random manner, with materials being discarded on the ground, in the open air and in the woods; in addition, some people dig holes to bury the waste. During the construction phase, plant biomass waste will be produced as a result of cleaning, as well as various types of construction waste and MSW, which will be properly packaged and then collected by an ANR-certified company for proper treatment, and is therefore considered a minor impact. During the operation of the canals, in the maintenance activity, the main waste generated is plant biomass, organic matter and sediment resulting from canal cleaning activities. With adequate measures for storing and recovering this type of waste, it is considered a minor impact.

In terms of **Biodiversity - Flora and Fauna** in the rural area, where the canals are located, the flora characteristic of the miombo with dense herbaceous and shrubby vegetation, will have to be removed at the work fronts, along the length of the canals, to create access paths and may also be necessary for the construction site. The removal of vegetation directly affects the flora, which in turn compromises the fauna, since this vegetation serves as a habitat, source of food and shelter for the animals in the project area. Construction activities and vehicle and machinery traffic can generate dust, which settles on the vegetation in the area, reducing plant photosynthesis. This can result in loss of growth, premature leaf fall and less resistance to diseases and pests. In terms of fauna, these activities generate noise that can affect the animals, causing them to move to the surrounding areas. These impacts are not significant.

During the operation phase, the impacts on flora and fauna are not significant.

With regard to **land use**, during the construction phase, the area where the shipyard is located, the easement areas for the work fronts, next to the canals and the area of the access roads occupy the land temporarily and/or permanently, which has a moderately significant impact on land use. During the operation phase of the canals, the impacts are positive with the use of land adjacent to the canals for agricultural development in the Lunda Sul region.

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As for the **landscape**, the impacts resulting from construction activities are linked to the presence of structures, permanent or temporary, such as construction site and machinery, which can cause

an undesirable visual impact, altering the natural landscape characteristics of the area. The impact to be produced is insignificant, and is further reduced when mitigation measures are applied, i.e. positioning construction structures and materials wherever possible in places that minimize their visual impact, in areas that have already been disturbed, reducing visibility in panoramic views.

On a socio-economic level, the activities of the construction phase will have various impacts on the areas directly affected and the areas of direct influence of the project. The negative impacts are diverse, including: an increase in the presence of particles in the air, as well as GHGs and other polluting gases; an increase in noise levels, which could cause discomfort or affect the health of the communities near the construction areas. On the other hand, the significant presence of a non-resident population could impact on the health and well-being of the community, increasing the risk of sexually transmitted diseases (HIV/AIDS and other infections), the risk of family instability, as well as potential cases of SAD/HIV and GBV. There is also an increased risk of accidents and being run over, resulting from the increase in traffic in the area. Although these are direct and negative impacts, they are not significant once mitigation measures have been implemented. It is therefore important to carry out periodic sprinkling to minimize the presence of particles, to implement a plan for monthly education and awareness campaigns aimed at the project's stakeholders, with special emphasis on communities, and a complaints resolution mechanism to manage and resolve all doubts, suggestions and complaints resulting from the project's activities. No negative socio-economic impacts are expected during the operation phase.

There are also positive impacts during the construction phase, which are related to the improvement of access roads, benefiting the movement of people and goods, facilitating travel and the disposal of products.

It is also hoped to promote employment and training opportunities for the local population, especially young people, with the transfer of skills and abilities. In order to boost this impact, it is important to implement a Recruitment and Vocational Training Plan that prioritizes the inclusion of local labor, with a focus on youth, and promotes equal employment opportunities for men and women.

On the other hand, the presence of a non-resident population can increase demand for local goods, products and services, thus stimulating the local economy. This impact should encourage local suppliers to organize regular fairs, markets and cultural events, promoting the region's commerce and culture.

During the operations phase, an increase in the availability of water is expected, allowing for an increase and diversification of local agricultural production, generating a greater availability of food and having an impact on the nutritional picture, with a more varied diet for local communities. During this phase there should also be employment opportunities for the local population, although fewer than during the construction phase, which will guarantee the regular operation and maintenance of the irrigation channels. Implementing water resource management policies that prioritize fair access to water will contribute to the sustainability and responsible use of the canals, while developing farmer training programs will boost the region's agricultural sector.

For both phases, mitigation measures have been proposed that will attenuate, minimize and manage potential impacts in accordance with Angolan and ADB standards. These measures have



been formalized in an Environmental and Social Management Plan that addresses environmental and social monitoring, the implementation of mitigation measures and risk management.

With the application of mitigation measures and management plans, there are still potential "residual" impacts, albeit to a lesser extent, and the existing social and physical environments in the project area are little affected in relation to the benefits resulting from the implementation of the project. It should also be noted that a number of positive impacts will be generated by the implementation of the project and, with the application of the appropriate measures, will mainly benefit farmers, promoting agricultural development in the Lunda Sul region and positively affecting the quality of life of the communities

Adequate human resources should be allocated to monitor and manage the successful implementation of the proposed mitigation measures and the immediate measures to resolve any risks.

Although there are impacts associated with the development of the Project, this report demonstrates that, with commitment and strong leadership, these impacts can be managed in accordance with the legal requirements of Angola and the ADB.

In summary, this document, presenting the ESIA and ESMP, defines a series of management measures, mitigation strategies and actions for the various environmental and social impacts created by the implementation of the Project. These measures must be implemented actively and with committed intent in order to ensure that the environmental and social impacts are managed appropriately.

Prior to the development of the Project, these plans will need to be reviewed and updated to reflect the specific conditions of the development permit and management details. Consideration should also be given to developing a Contractor ESMP to guide the implementation of the necessary mitigation measures.

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LIST OF ABBREVIATIONS

EIA - Environmental Impact Assessment
AID - Area of Direct Intervention
ASRP - Agricultural Sector Reform Program
AfDB - African Development Bank
CH ₄ - methane
Cl ⁻ - Total chlorides
CO - carbon monoxide
CO ₂ - carbon dioxide
VOCs - volatile organic compounds
CP - Public Consultation
dB - Decibels
DPEA - Provincial Directorate for Environmental Studies
STDs - Sexually Transmitted Diseases
EAS/AS - Sexual Exploitation and Abuse/Sexual Harassment
EGM - Contractor/Construction Manager



EHS - Environmental, Health and Safety
 EIA - Environmental Impact Assessment
 EIAS - Environmental and Social Impact Assessment
 EF - Inspection Team
 EN - National Road
 ETA - water treatment plant
 FFD - ductile cast iron
 FRNC - Non-Conformity Record Form
 GHG - Greenhouse Gases
 GEWE - Gender Equality and Women's Empowerment.
 HC - Hydrocarbons
 IDA - Institute for Agrarian Development
 IBA - Important Bird Area
 IBRD - International Bank of Reconstruction and Development
 IFC - International Finance Corporation
 INE - National Statistics Institute
 ISS - Integrated Safeguards System.
 K - Potassium
 KBA - Key Biodiversity Area
 MEA - Millennium Ecosystem Assessment
 MINAGRIF - Ministry of Agriculture and Forestry
 MINAMB - Ministry of the Environment
 WHO - World Health Organization
 NGO - Non-Governmental Organization
 PAGAC - Action Program for Climate Change Management
 PGA - Environmental Management Plan
 PGAS - Environmental and Social Management Plan
 PI&As - Interested and Affected Parties
 PO - Project Owner
 PP - Project Promoter
 PPP - Public Participation Process
 PTS - total suspended particles
 CDW - Construction and Demolition Waste
 MSW - Municipal Solid Waste
 SIA - Integrated Environmental System
 T - temperature
 TDS - total dissolved solids (TDS)
 UIP -PDCVAPC - Implementation Unit for the Cabinda Province Agricultural Value Chain Project
 GBV - Gender-Based Violence

ANNEXES

Annex 1 - ENGIACTIVE Environmental Certificate

Annex 2 - Project Areas of Influence

Annex 3 - List of flora species

Annex 4 - List of Fauna Species

Annex 5 - Public Consultation Guides and Reports

Annex 6 - Matrix for the Identification and Assessment of Environmental and Social Impacts. Mitigation and Enhancement Measures

1. INTRODUCTION

1.1 Identification and Scope of the Document

As part of the Project for the Development of Agricultural Value Chains in the Eastern Region of Angola, the rehabilitation of small-scale irrigation systems resistant to climate change is planned for two irrigation canals - the Pelengue Canal and the Capuepua Canal, in the province of Lunda Sul - Subproject 1.

To carry out the Environmental and Social Impact Assessment (ESIA) for this project, MINAGRIF, with the Institute for Agrarian Development (IDA) as the Proponent, has hired ENGCONSULT Lda as an environmental consultant and ENGIACTIVE Lda as a sub-consultant. These entities are in charge of conducting the Environmental Impact Assessment (EIA) process, which must be approved by the ADB and subsequently by the Ministry of the Environment (MINAMB).

1.2 EIAS Framework

The requirements for Environmental Impact Assessment (EIA) in Angola are established by the General Environmental Law No. 5/98, of June 19, and by Presidential Decree No. 117/20, of April 22, which repeals the previous Decree No. 51/04, of July 23, relating to environmental impact rules and regulations and Decree No. 59/07, of July 13, on the Environmental License.

Presidential Decree No. 117/20 of April 22 identifies the projects that need to undergo an EIA process, describes the submission process that must be developed for MINAMB in order to obtain the Environmental License and also the process of developing and implementing the EIA.

The *Development of Agricultural Value Chains in the Eastern Region of Angola Project*, which is planned to rehabilitate small-scale irrigation systems resistant to climate change, in Lunda Sul, is classified as Category 2 based on the African Development Bank's Integrated Safeguards System (ISS), since the project's potential activities are likely to generate site-specific environmental and social risks and impacts. This category is in line with Angolan regulations on Environmental Impact Assessment and Environmental Licensing Procedures (Presidential Decree no. 117/20, of April 22).

The general aim of the Environmental and Social Impact Assessment (ESIA) is to ensure that the project has the least possible impact on the environment, both in the construction phase (building the project's infrastructure) and in the operation phase of the small-scale irrigation systems.

The EIAS has the following specific objectives:

- ❖ Identify and assess the potential negative and positive environmental and social impacts (biophysical, socio-economic and relating to workers' health and safety) arising from the construction and operational phases of the project;
- ❖ Identify measures that can mitigate negative impacts and increase positive impacts during the construction and operation phases of the project; and
- ❖ Formulating an Environmental and Social Management Plan (ESMP) that assigns responsibilities for implementing mitigation measures, as well as responsibilities for ensuring their proper implementation.

It is essential to note that this Environmental and Social Impact Assessment (ESIA) is being carried out without the definition of the designer and, consequently, without an engineering project or plan detailing the type of rehabilitation to be carried out on the irrigation canals. This absence conditions the information contained and presented in this ESIA.

It should be noted that work was carried out on the social side through communication and awareness-raising initiatives with the provincial, municipal and local authorities, as well as the communities in the neighborhoods and villages involved: Bairro Pelengue 1 and Bairro Pelengue 2, in relation to the Pelengue Irrigation Canal, and in Aldeia Capuepua and Aldeia Muambulo, in relation to the Capuepua Irrigation Canal. The aim of these actions was to identify the length of the canals to be rehabilitated, as well as to characterize their irrigation areas and perimeters. In addition, the aim was to understand the types of products and agricultural systems that currently exist along the canals, which were deactivated, covered by vegetation and without water at the time of the visit. This survey phase aims to involve the project's beneficiaries and stakeholders, ensuring verification of the project's environmental and social viability, as well as its potential to promote the development of agricultural activity in the Lunda Sul region.

1.3 Identification of the EIAS Proponent and Technical Team

Sub-project 1 concerning the rehabilitation of small-scale irrigation systems - two (2) irrigation canals - resistant to climate change, in the province of Lunda Sul, is the responsibility of the **MINISTRY OF AGRICULTURE AND FORESTRY OF ANGOLA (MINAGRIF)**, Its executing agent is the Institute for Agrarian Development (IDA) and its Lunda Sul Provincial Institute (Lunda Sul), located in Saurimo, and its implementing agent is the Cabinda Province Agricultural Value Chain Project Implementing Unit (PIU-PDCVAPC), with the following contact details:

	Address	e-mail	website
MINAGRIF	Largo António Jacinto, Edif. B Luanda - Angola	gticii@minagrif.gov.ao	http://www.minagrif.gov.ao
IDA - Luanda			
IDA - Lunda Sul			

There are currently two environmental and social specialists accompanying the preparation of the documentation for the descriptors and assessment of environmental and social impacts, who are

based at the Institute of Agrarian Development in Luanda (IDA). In addition to these two specialists, the Head of the Provincial Department of the IDA in Lunda Sul was also on hand to accompany and support the field visits. The Project Implementation Unit team consists of a coordinator and two environmental and social specialists who review and approve the documentation in close collaboration with the IDA-Luanda specialists.

Presidential Decree No. 279/22 of December 7, which approves the Organic Statute of the Ministry of Agriculture and Forestry, abbreviated to MINAGRIF, is the Auxiliary Ministerial Department of the Head of the Executive Branch, which is responsible for proposing, formulating, conducting, executing, evaluating, controlling and supervising the Executive's policies in the fields of agriculture, livestock, forestry, food security and food, with a view to sustainable development.

ENGCONSULT Lda. and **ENGIACTIVE Lda.** were responsible for drawing up the Environmental and Social Impact Assessment (ESIA), the latter having been accredited by MINAMB as an environmental consultant (under paragraph 42 of Section IV-Chapter III of Presidential Decree no. 117/20 of April 22) (**ANNEX 1**).

The contact details of the Consultant and Sub-Consultant are as follows:

Table1 - Contact details for the Consultant - ENGCONSULT and the Sub-consultant - ENGIACTIVE

ENGCONSULT (Consultant)	ENGIACTIVE (Sub-consultant)
Rua Rei Katyavala, Edifício Avenca Plaza nº. 43/45, 7º Andar, Maculusso, Luanda - Angola TEL.: +244 949 699 516 222 001 726 E-MAIL: geral@engconsult-ao.com https://www.engconsult-ao.com	Rua General Roçadas Nº 37, Luanda - Angola TEL.: +244 949 699 516 E-MAIL: https://www.engiactive.com

At the time of writing, there are no engineering projects and the only preliminary study that was made available to us and used as a basis for drawing up the ESIA was a document issued on the Agricultural Value Chain Development Project by the AFRICAN DEVELOPMENT BANK GROUP.

The ESIA was drawn up between October 2024 and January 2025 by the technical team listed at table 2.

Table2 - EIAS Technical Team

Experts	Link	Training	Areas of Intervention
Susana Baptistas	ENGCONSULT	Biologist (Wildlife Resources and Environment), Master's Degree in Medical Parasitology, PhD in Biomedical Sciences	General Coordination Environmental and Social Specialist Public consultations
Amândio Gomes	ENGCONSULT	Master's Degree in Biology; PhD in Ecophysiology	Ecologist and Biologist
Oscar Coronel	ENGCONSULT	Master's in Irrigation Engineering Civil Engineer (Hydraulics) Diploma of Advanced Studies in Environmental Technologies	Hydraulics / Irrigation Specialist
Raquel Biscaia	ENGCONSULT	Master's Degree in International Cooperation and NGO Management and Administration; Postgraduate course in Human Rights and Democracy	Specialist in Social Safeguards and GBV&Risk
Erica Esperança	ENGCONSULT	Degree in Biology Degree in Environmental Sciences. Master in Ecotoxicology	Specialist in Waste Management and EHS
Albino Pereira	ENGCONSULT	Degree in Physical Planning and Tourism Postgraduate Diploma in Consulting Master's Degree in Environmental Management and Auditing: Environmental Engineering for Solid Waste Treatment Postgraduate Diploma in Occupational Safety Engineering	Pest Management / Environmental Specialist

1.4 EIAS structure

The ESIA is developed and organized into (i) the Non-Technical Summary (a summary of the main information contained in the ESIA); and (ii) the Environmental and Social Impact Assessment Report, including the necessary Annexes. The following table identifies the chapters included in the main documents.

Table3 - EIAS structure

Non-Technical Summary (Volume I)
• Non-Technical Summary, which summarizes and translates, in non-technical language, the content of the ESIA
Main Report (Volume II), subdivided into the following chapters
• Executive Summary, which summarizes the content of the EAS;
• Chapter 1, corresponding to the General Introduction, where the project, scope, Proponent and Technical Team of the EAS are identified, together with the framework and structure of the EAS;
• Chapter 2, corresponding to the Project Description, where the project solutions are located and described;
• Chapter 3, which identifies the boundaries of the areas of direct and indirect influence of the project and the general methodology applied to the ESIA
• Chapter 4, which characterizes the Legal, Regulatory and Political Framework for the implementation of the Project
• Chapter 5, corresponding to the Environmental Diagnosis, in its various components: physical factors, environmental quality, ecological, human and planning factors, and the evolution of the current situation without the project;
• Chapter 6, corresponding to Public Participation, provides details of the mapping and analysis of stakeholders and the consultation carried out as part of the ESIA;
• Chapter 7, corresponding to the Identification and Assessment of Project Impacts, with an assessment of impacts by thematic area, also including the Without Project Status and cumulative impacts, and the comparative assessment of project alternatives;
• Chapter 8 presents the guidelines for the Environmental Management Plan and the Monitoring Plans, identifying the Minimization Measures to be adopted to mitigate negative impacts and enhance positive impacts;
• Chapter 9, identifying information gaps and the main conclusions and recommendations
Annexes , comprising all the supporting and registration documents for the EIAS

2. PROJECT DESCRIPTION

2.1 Context and Strategy

In July 2023, the Angolan government approved its Vision 2050 and National Development Plan 2023-2027, and the country's commitments to the 2030 Sustainable Development Goals and the African Union's Agenda 2063. Angola's Vision 2050 aims to improve the lives of Angolans and increase the country's dependence outside the oil sector, while guaranteeing food sovereignty and the NDP, the country's medium-term plan to promote socio-economic and territorial development. Agriculture is pivotal to achieving the national aspirations advocated in both Vision 2050 and the National Development Plan 2023-2027. Angola has fertile land and a favorable climate, suitable for a variety of crops and livestock, but only 10%¹ of arable land is cultivated.

Agriculture's share of GDP has increased from 4% in 2002 to 10.5% in 2022 and 4. an average annual GDP growth of 5% from 2020 to 2022. The agricultural sector employs 45% of the country's workforce, of which the majority is made up of informal workers with low wages, since 94.4% of jobs are informal and wages are only 15.5% of those in the extractive sector. Less than 4% of the farming population has access to improved agricultural technologies, including climate-smart and drought-resistant seeds and crop varieties.

The Eastern Angola Agricultural Value Chains Development Project is aligned with the AfDB's Country Strategy Paper (2024-2029), whose main strategic objective is to promote Angola's structural transformation and economic diversification to generate inclusive economic growth with decent jobs. The Bank plans to support the development of the agribusiness sector and governance and institutional capacity for infrastructure development, through Public-Private Partnerships, to enable private sector participation. This selectivity on the part of the Bank and the Government of Angola is consistent with the Bank's prioritization of agricultural development through the Ten-Year Strategy 2024-2033 and its operational priorities, specifically, 'Feeding Africa' through investments to increase agricultural productivity and value addition and 'Improving Quality of Life' through its focus on the inclusion of women and young people, who are the majority agricultural stakeholders. The Project was prioritized by the National Food Supply and Agriculture Pact (2023), which was presented at the Feed Africa Summit in Dakar (Dakar 2) in January 2023. The Pact, among others, prioritized investments in agricultural input markets, infrastructure, training and research; soil productivity and profitability of agricultural investments; promotion of domestic value chain development of selected crops; and production of other cereals

The project is a stand-alone investment designed as a follow-up to the Agricultural Sector Reform Program (ASRP), worth a total of UA 80 million, financed by the *African Development Bank (AfDB)* to strengthen the agricultural policy and business environment for better food production that will ultimately contribute to economic diversification and safe food. It builds on the improved policy environment created under the ASRP program and the design and implementation knowledge

¹ 5FAO, INE/MINAGRIF: Arable land in Angola: 35 million hectares, but only 10% of it is currently cultivated.

generated by the Bom Jesus e Calenga Project and the Cabinda Province Agricultural Value Chain Project.

2.2 Project Location

The city of Saurimo is the capital of Lunda Sul Province, located in eastern Angola. It covers 77,367 km² and borders the province of Lunda Norte to the north, the province of Moxico to the south, the provinces of Malange and Bié to the west and the Democratic Republic of Congo to the east. From an administrative point of view, the province of Lunda Sul is divided into four (4) municipalities: Saurimo, Cacolo, Dala and Muconda, which are home to a total of fourteen (14) communes (Fig. 1).

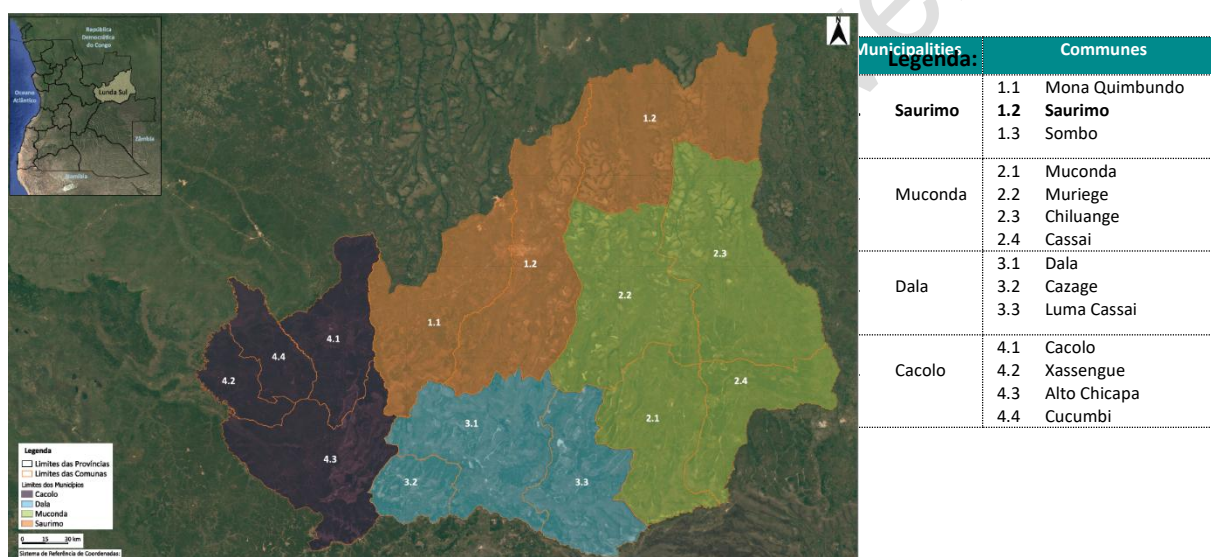
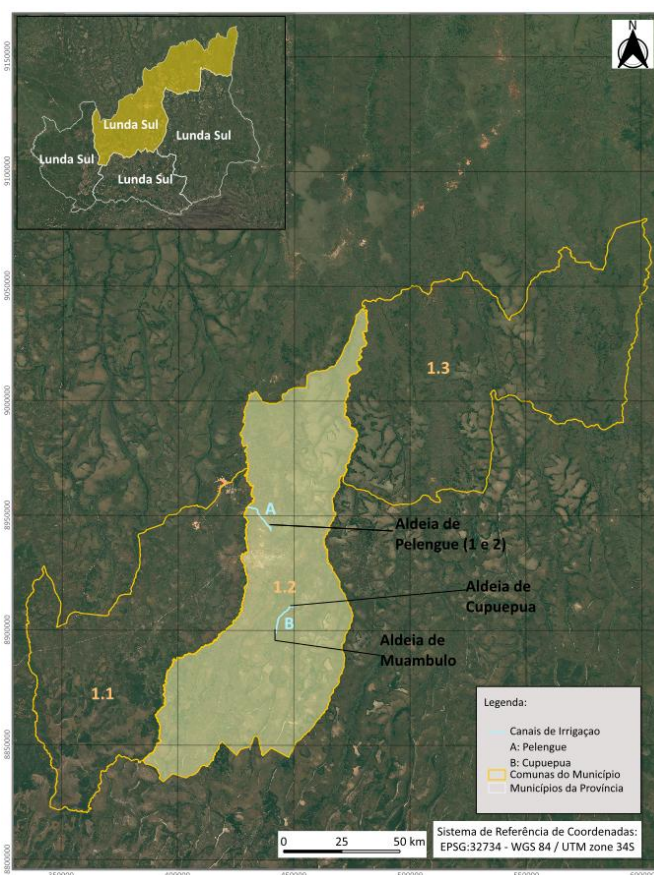


Figure1 - Municipalities and Communes in the Province of Lunda Sul

The project is located in the commune and municipality of Saurimo.

The municipality of Saurimo, capital of the province of Lunda Sul, is located in eastern Angola, with an average altitude of 1081 meters at sea level, and has a territorial extension of 23,327 km². Administratively, it is divided into three (3) communes: Mona Quimbundo, Saurimo and Sombo. It is surrounded to the north by Lucapa, a municipality in the province of Lunda Norte, to the south by the municipality of Dala, to the west by the municipality of Cacolo and to the east by the municipality of Muconda.

The municipality and commune of Saurimo is home to the two implementation areas for *sub-project 1*, namely the **Pelengue canal** and the **Capuepua canal**, as illustrated in *Figure 2*.



Municipality	Communes
Saurimo	1.1 Mona Quimbundo
	1.2 Saurimo
	1.3 Sombo

Figure2 - Villages in the municipality of Saurimo and irrigation canals for rehabilitation, marking the communities affected. A - Pelengue Canal | Pelengue Village 1 and 2 // B - Capuepua Canal | Capuepua Village and Muambulo Village

2.3 Project objectives

The objective of the Development of Agricultural Value Chains in the Eastern Region of Angola project is to improve food and nutrition security, household income and employment in the four eastern provinces of Angola, and is aligned with the three priorities of the AfDB's Strategy to Address Fragility and Build Resilience in Africa (2022-2026), namely strengthening institutional capacities, building resilient societies and catalyzing private investment to support sustainable and resilient livelihoods. In addition, the project is aligned with the AfDB's Climate Change and Green Growth Action Plan (2021-2025), which prioritizes investment in green and climate-resilient agricultural infrastructure through the Climate Change Management Action Programme (CCMAP) component. It is also aligned with the priorities of the ADB's Group Gender Strategy (2021-2025) on market access, improving technical skills and creating gender-sensitive infrastructure that provides an enabling environment for women to work in new agricultural markets to be built under the project.

Providing farmers with access to improved agricultural technologies that are resilient to climate change, through the production and dissemination of quality inputs in the Eastern Provinces of Angola, also known as Angola's "breadbasket".

Farmers in Eastern Angola often face difficulties in accessing quality inputs, agricultural markets and adequate extension services. These limitations result in low agricultural productivity and unsatisfactory incomes for farmers. In addition, Angola is dealing with increasing risks arising from climate change, the impacts of which are already being felt, especially through severe droughts, affecting a number of people and expected to increase in the coming years. In order to address the issues of food and nutritional security, as well as family incomes and employment, the project aims to create an agenda for sustainable agricultural development in Angola, and is structured and bases its intervention on three interconnected pillars/components:

- *Component 1)* Increasing Agricultural Production and Productivity;
- *Component 2)* Increasing Employment for Women and Youth; and
- *Component 3)* Increasing family incomes by facilitating farmers' access to markets.

Table4 - Components and Subcomponents of the Project for the Development of Agricultural Value Chains in the Eastern Region of Angola

#	Components	Subcomponent
1	Increasing Agricultural Production and Productivity	1.1 -Increased agricultural productivity 1.2 -Support for climate-resilient agricultural infrastructure 1.3 -Building Resilience of Livelihoods and Ecosystems in the Zambezi River Basin
2	Increasing Employment for Women and Young People	2.1 - Agribusiness support and market development 2.2 - Rehabilitation of community/rural roads 2.3 - Training farmers and building institutional capacity
3	Increasing Family Income	---

Sub-project 1 falls under component 1 - Increasing Agricultural Production and Productivity, which aims to increase crop yields and the production of selected value chains by promoting the adoption of the best package of technologies available through the Technology for African Agricultural Transformation (TAAT) program, with a focus on supporting agricultural infrastructure that is resistant to climate change (**sub-component 1.2**).

The rehabilitation of two (2) of the irrigation canals in the municipality and commune of Saurimo: the Pelengue Canal and the Capuepua Canal, which are currently disused, without water and overgrown with vegetation, offers various benefits, both for agriculture and for the environment and local communities:

- **Increased Water Efficiency:** Rehabilitation can restore water storage and distribution capacity, reducing losses and improving efficiency in the use of water resources.
- **Improving Agricultural Productivity:** **With** an efficient irrigation system, it is possible to increase crop productivity by ensuring an adequate supply of water.
- **Environmental sustainability:** Rehabilitation can contribute to the reintegration of local ecosystems, improving water quality and biodiversity in adjacent areas.
- **Erosion Reduction and Soil Management:** Well-maintained channels help control soil erosion, protecting soil fertility and structure in agricultural areas.
- **Strengthening Food Security:** By improving irrigation, it is possible to increase food production, contributing to the food security of local communities.
- **Job Creation and Local Development:** Rehabilitation projects can generate direct and indirect jobs, contributing to the economic development of the region.
- **Preservation of Water Resources:** Rehabilitation allows for better management of water resources, ensuring their responsible use and the protection of water sources.
- **Biodiversity Conservation:** By restoring the canals, aquatic and riparian habitats can be improved, promoting local biodiversity.
- **Resilience to Climate Change:** More efficient and well-managed irrigation systems can increase farmers' ability to adapt to climate variability and droughts.
- **Community involvement:** The rehabilitation process often involves local communities, promoting their involvement and awareness of water management.

These benefits make the rehabilitation of irrigation canals a valuable strategy for promoting not only agriculture, but also sustainable development.

The ESIA will be developed in accordance with the requirements of Angolan legislation and the mandatory documents for the installation license will be prepared in accordance with current legislation.

The purpose of the installation license is to authorize the implementation of the work or project, in accordance with the specifications in the project approved by the entity responsible for the activity. The license for operation is intended to start the operation, with the availability of water in the canals, allowing the development of agricultural activity in the areas of the Municipality and Commune of Saurimo, after verification of compliance with all the requirements contained in the EIAS report and the mitigation measures in the installation phase, following an inspection.

This work is aimed at the Environmental License for Installation, with the approval of the EIAS and the PGAS, as well as guiding the other environmental and social instruments to be drawn up in the project phase (design). Both documents will be very locally specific and pragmatic, so as to allow for a more detailed assessment by the national authorities and their implementation by the future contractor responsible for the work.

2.4 Project description

2.4.1 Background and Existing Alternatives

The rehabilitation of irrigation canals involves the improvement and restoration of infrastructure - irrigation canals designed in colonial times and which are currently disused, in order to guarantee the efficient use of water in agriculture. Below are some of the main general characteristics that should be taken into account when rehabilitating irrigation canals:

- **Structure Assessment:** Inspection and assessment of the current condition of the channels, including checking for wear, erosion and obstructions.
- **Sustainability:** Implementing practices that ensure the sustainability of water resources, such as reducing water losses and preserving biodiversity.
- **Materials and Technology:** Use of modern materials and innovative techniques in the reconstruction or repair of canals to increase efficiency and durability.
- **Water Efficiency:** Improving the capacity to distribute and control water, ensuring that it reaches the irrigated perimeters properly.
- **Revegetation and Ecology:** Promoting the revegetation of canal banks and restoring riverside ecosystems, contributing to soil stability and biodiversity.
- **Integrated Management:** An integrated approach that considers all water uses in the river basin and collaboration with local communities.
- **Monitoring and Maintenance:** Establishment of monitoring systems for the ongoing management of the channels and regular maintenance.
- **Training and Capacity Building:** Training for farmers and local managers on canal maintenance and good irrigation practices.

These characteristics aim to ensure that irrigation canals are efficient, sustainable and adapted to the needs of farming communities

The Eastern Angola Agricultural Value Chains Development Project is aligned with the AfDB's Country Strategy Paper (2024-2029), with autonomous investment designed as a follow-up to the Agricultural Sector Reform Program (ASRP), worth a total of UA 80 million, financed by the *African Development Bank (AfDB)* to strengthen agricultural policy and the business environment for better food production that will contribute to economic diversification and safe food.

To this end, this project is being carried out with the rehabilitation two irrigation canals: the Pelengue Canal and the Capuepua Canal, which according to information from government bodies and the population were built in colonial times, before 1974, with a total length of 35km, with the potential to irrigate agricultural perimeters.

The alternative considered is not to implement this project.

2.4.2 Description of Irrigation Canals

The two irrigation canals that will be rehabilitated: Canal de Pelengue (A) and Canal de Capuepua (B) are located in the province of Lunda Sul, in the municipality and commune of Saurimo. They are currently disused, without water and overgrown with vegetation.

Only part of the canals will be rehabilitated with the intention of covering specific agricultural perimeters. For most of their length, the agricultural perimeters as well as the canals are currently covered by native vegetation, and informally, randomly and occasionally used by the communities for subsistence family farming, with small production areas (less than 50m²), mainly near the villages or neighborhoods adjacent to the canals.

The table below (Tab. 5) shows in detail the information and characteristics of the areas where Subproject 1 will be implemented:

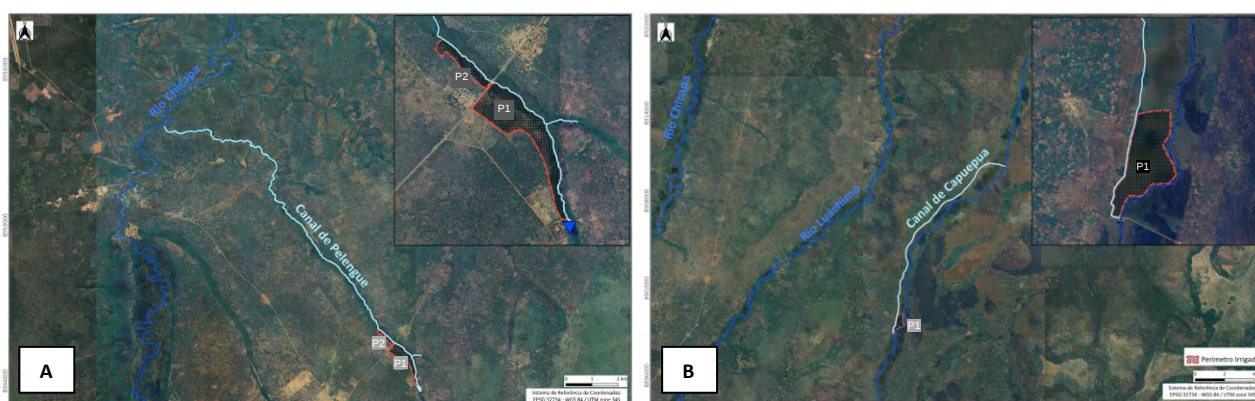
- Pelengue Canal (Fig. 3-A)
- Capuepua Canal (Fig. 3-B)

Table5 - Rehabilitation of the Lunda Sul Irrigation Canals.

Sub-project 1	Linear transect of the Irrigation Canal to be rehabilitated	Agricultural Perimeters	Neighborhoods & Villages Coordinates	Beneficiary No.	Type of Production: Family Farming
Rehabilitation of small-scale irrigation systems resistant to climate change	15.5 Km A - Pelengue Canal (Fig. 3-A)	P 1 = 30ha upstream Chitende Txazango reservoir (artificial dam) south of the canal P 2 = 10ha downstream south of the canal	Pelengue neighborhood 29°32'28.92"S / 20°26'32.62"E	447	Vegetables: tomatoes, onion, cabbage, carrot potato (...)
			Pelengue neighborhood 1) 9°32'6.16"S / 20°26'51.89"E		
	19.5 Km B - Capuepua Canal (Fig. 3-B)	P 1 = 50ha downstream east of the canal (north of the Tamba River Bridge)	Capuepua Village 9°51'17.11"S / 20°31'55.48"E	263	Rice and Vegetables: tomatoes, onions, cabbage, kale carrot potato
			Muambulo Village 9°56'51.73"S / 20°28'8.25"E		

Note: Information shared by IDA - Lunda Sul

In the images below you can see details of each of the canals as well as the irrigated perimeters planned for a first phase of rehabilitation after the irrigation canals have been rehabilitated. Also visible are the surface water resources that will contribute to water flow along the canals.

**Legenda:**

A – Canal Pelengue | P1= 30ha / P2 = 10ha

B – Canal Capuepua | P1 = 50ha

Figure3 - Representation of the two Irrigation Canals for rehabilitation, with the corresponding agricultural perimeters, located in the District and Commune of Saurimo, Province of Lunda Sul.

As for the materials and construction characteristics, there is still no project and no information on the type of rehabilitation that will be applied to the irrigation canals.

2.4.3 Environmental and social measures considered in the project

Both canals are located in rural areas, and in October 2024 site visits revealed that they were covered throughout by dense vegetation with no trace of water circulation. Nearby villages were visited and small agricultural perimeters of family production could be seen near the villages.

The surveys carried out on the ground show that there will be no damage to physical assets and as for the ploughs on the land near the canals, they are all family farms, and will be taken into account when the accesses are opened up in order to avoid or reduce the possibility of damage to productions, most of which are short-lived, thus eliminating any type of compensation for the ploughs.

As for the natural vegetation, some clearing will be necessary, but more open or anthropized sites with existing paths will be selected implement access paths that will allow machines and trucks with materials to reach the canals for their rehabilitation.

2.4.4 Phases d and implementation of the Subproject

This sub-project can be divided into 4 (four) phases: Survey Phase; Design Phase; Construction Phase and Operation Phase.

The sub-project is currently in the Survey Phase, which corresponds to the preliminary stage of drawing up documents

As for the design and construction phases, there is still no information on the designer or the contractor. The location of the construction site has also not been identified, but it is already known that new access roads will have to be opened in order to access the canals, which are currently covered in vegetation and have no water passage.

Regarding the activities planned for the rehabilitation of the canals - Construction Phase, a public tender will be launched to select the contractor for the construction and, subsequently, a public tender will be launched to select workers for the operation of the infrastructure. The workforce to be hired will, whenever possible, be local and will be managed by the contractor. At the time of writing this document, there is no information on the number of workers, only a preview of the duties to be carried out, including: a technical team of engineers; a team of civil construction operators; a coordinator and technicians for quality, environment, health and safety at work; administrative staff and drivers.

In the Operation - Operation and Maintenance Phase, a limited number of employees are expected, associated with maintenance activities that focus on cleaning the irrigation channels.

2.4.5 Materials, energy, waste and expected emissions

➤ Raw materials

Whenever possible and feasible, local raw materials will be used and given preference. It is only necessary to import raw materials, if possible, from neighboring countries. Overland travel from Luanda Province to Lunda Sul Province is expected.

The materials to be used depend on the type of rehabilitation that will be carried out and at the time of writing this ESIA there is no such information.

➤ Water and energy consumption

Water should preferably be supplied from a borehole located on the site's premises. In dry periods, tanker trucks will be used as an alternative.

In terms of electricity, power from the grid or a generator will be used. At this stage of the surveys, the pre-project phase, it is not yet possible to estimate consumption during the construction phase, since there is no information on the construction project or the number of workers who will be involved.

During the operation phase, no water or energy consumption is expected for the maintenance and cleaning of the irrigation channels.

➤ Waste

The waste generated during the construction phase of the project will be packaged according to type in a duly marked and appropriate place with a view to being collected by a waste management

company licensed by the National Waste Agency and thus receiving the appropriate treatment, guaranteeing environmental sustainability, as provided for in Angolan law.

Different types of waste are already expected on site (Tab.6), but it is not possible to estimate the quantities of waste generated because the number of workers and the type of renovation to be carried out are unknown.

Table6 - Construction Waste

*activity that should be outsourced

Waste	Name	Classification according to LAR
Waste from the maintenance of equipment, machinery and vehicles	Other engine, gear and lubricating oils	13 02 08 (*)
	Packaging containing residues or contaminated by dangerous substances	15 01 10 (*)
	Absorbents, filter materials, cleaning cloths, protective clothing contaminated by hazardous substances	17 04 09 (*)
Waste associated with deforestation, cleaning and blasting of the infrastructure deployment area	Plant tissue residues	02 01 03
	Soils and stones	17 05 04
	Cement	17 01 01
	Mixture of cement, bricks, tiles and ceramics	17 01 07
	Mixed municipal waste	20 03 01
	Bulky waste (Monsters)	20 03 07
Surplus soil from trenching	Soils and stones	17 05 04
Contaminated soils (accidental spills)	Soil and stones containing hazardous substances	17 05 03(*)
Structure workshop	Iron and steel	17 04 05
	Wood and sawdust	03 01 05
Construction waste (work fronts)	Cement	17 01 01
	Bricks	17 01 02
	Plastic	17 02 03
	Paper and cardboard packaging	15 01 01
Equipment and materials used by workers	Absorbents, filter materials, cleaning cloths and protective clothing	15 02 03
Office consumable waste	Paper and cardboard	20 01 01
	Toner ink cartridges	20 01 35(*) 20 01 36
	Batteries and accumulators	20 01 33(*)

Waste	Name	Classification according to LAR
		20 01 34
Municipal waste or equivalent (yard/office/canteen/work fronts)	Biodegradable kitchen and canteen waste	20 01 08
	Plastics	20 01 39
	Metals	20 01 02
	Glass	20 01 02
	Wooden packaging	15 01 03
	Mixed packaging	15 01 06
	Mixed municipal waste	20 03 01
	Wastewater sludge	20 03 04

The site will have a septic tank that will be sized for the number of workers, and when it is at 80% capacity, the site management will hire a company licensed by the National Waste Agency to collect, transport and treat the wastewater.

During the operation phase, the most relevant waste will be related to the maintenance and cleaning of the irrigation channels. This waste will be the responsibility of MINAGRIF / IDA-Lunda Sul, which will ensure that it is properly stored and sent to the appropriate place for treatment and/or final disposal.

2.4.5.1 Emissions

Atmospheric emissions are expected from the movement of vehicles, the operation of machinery and earthmoving.

These activities, including other construction operations, also result in noise emissions.

In terms of planned equipment, the following table (Tab. 7) shows some of the types most commonly used in civil construction activities and their sound power (standard values).

Table7 - Planned equipment and sound power

No.	Planned equipment	Expected capacity	Sound power ²
1	Dump truck	20T	98
2	Excavator	Digging depth 5~6m/1m ³	112
3	Tanker truck	10m ³	112
4	Generator	14KW	108
5	Front loader	5T	112
6	Cylinder	0.7T	108
7	Cylinder	16T	111
8	Water pump	Discharge:15~20m ³ /h ;Head:8~15m	88
9	Concrete vibrator	0.75KW	113
10	Light truck	5T	112
11	Pick up vehicle	5 seats/0.5T	-

Atmospheric and noise emissions will be minimized with the environmental rules described in the section on mitigation measures that will have to be complied with by the contractor responsible for the work.

2.4.6 Planned activities

Survey phase

The project to rehabilitate the irrigation canals began with site visits in October 2024 to reconnoiter and carry out a preliminary survey of the physical and socio-environmental characteristics of the land. Meetings were held with the Provincial Government of Lunda Sul, the Saurimo Administration and IDA in order to obtain information on the areas where the sub-project will be implemented, the length of the canals and the agricultural perimeters that will be irrigated, which served as the basis for drawing up this preliminary environmental and social assessment document of the project site, including the information obtained from public consultations.

At this stage there is still no Engineering Project, nor is it known which contractor will carry out the rehabilitation of the two irrigation canals: the Pelengue Canal and the Capuepua Canal. Since the type of rehabilitation has not been defined, the activities will be described in general terms, taking into account two types of rehabilitation of the irrigation canals: **natural engineering (green infrastructure)** or **conventional engineering (gray infrastructure)**.

The first step in both types of rehabilitation is cleaning, removing dense vegetation, rocky material and other debris in order to unblock and restore the flow water.

Natural engineering (green infrastructure) focuses on restoring local ecosystems and biodiversity, using methods such as replanting native vegetation and sustainable management practices, seeking

² DSPA (2017). *Instructions for Noise Impact Assessment*. Macau

to create a system that benefits agriculture and the environment. On the other hand, **conventional engineering (grey infrastructure)** focuses on restoring the technical functionality of canals, implementing regularization, building containment structures and clearing debris, with the aim of maximizing the irrigation efficiency of agricultural perimeters.

Although both approaches can be implemented together to achieve a balance between water efficiency and environmental conservation, ecological rehabilitation tends to prioritize the environment and biodiversity, while engineering rehabilitation focuses on the technical performance and functionality of canals for efficient irrigation of agricultural perimeters. Ideally, the integration of these approaches can result in more sustainable and resilient irrigation systems.

Project Phase (Pre-Construction)

The design phase will begin with a conception study, in which a design team will take into account and articulate the precautions to be taken in setting up the infrastructures, particularly at the level of irrigation channels, agricultural perimeters and the construction site area, minimizing and avoiding, whenever possible, the impact on land use and the need for resettlement.

Construction phase

The construction phase is after the design of the project (project phase). At the time of writing, there is no information on the type of refurbishment that will be carried out, however, and in general terms, it is considered that the intervention works will include:

- Cleaning the channels by removing vegetation and rocky material that could obstruct the flow of water
- Earthmoving - the process of moving and leveling earth to clear channels and create access roads (if necessary);
- Construction work that may include:
 - channel regularization: adjusting the profile and shape of the channel bed to ensure efficient water flow, avoiding areas of sedimentation and increasing channel capacity.
 - construction of containment structures: erecting barriers, embankments, dikes or walls to stabilize the banks of the canal and prevent erosion. This helps maintain the structural integrity of the canal, optimizes water flow and ensures the canal's durability and long-term efficiency;
 - strengthening the canal banks: use techniques such as installing geotextile, building vertical ladders or planting native vegetation to prevent bank erosion and strengthen the canal banks
 - implement hydraulic structures, valves and sensors, if the type of rehabilitation deems it appropriate, apply structures such as sluices, hydraulic passages, valves and sensors to increase efficiency and control of water flow.

Below is a table (Tab. 8) summarizing the general activities of the Construction Phase that will probably be implemented for the rehabilitation of the irrigation canals.

Table8 - Activities planned in the Construction Phase for the rehabilitation of irrigation canals

Infrastructure	Stages	Activities	Description
SITE	1. Installation	Land use	Allocation of the construction site area.
		Clearing and deforestation	Removal of vegetation, if necessary, clearing of debris and unwanted materials to prepare the area for the construction site.
		Earthmoving	Digging, backfilling and compacting the area using machinery
		Setting up the shipyard	Civil construction work, among other things, install the shipyard's infrastructure
CHANNELS	2. Preparatory work for regularizing the canals	Topographical survey	Carrying out a detailed survey of the terrain to identify the areas that need adjustment and determine the ideal profile.
		Land use	Allocation of frontage areas and canal easement areas
		Cleaning, Deforestation and Clearance	Removal of vegetation, debris and unwanted materials to prepare the area for the work: i-Identify the nature, type and volume of debris, such as waste, tree trunks and accumulated sediment. ii- Use of excavators, backhoes and trucks for the efficient removal of debris. iii- Collecting and transporting waste to suitable disposal sites, ensuring that the area is kept clean. iv- Clearing the canals.
		Soil Handling: Excavation and Compaction	The use of machinery such as excavators and tractors to move earth and materials, adjusting the topography of the terrain in accordance with the project, ensuring the appropriate slopes and channel beds and the compaction and stability of the terrain in the channel.
	3. Canal rehabilitation	Regularization of the cross section (slopes)	Lining using natural engineering (e.g. gabions with live piles) or using conventional engineering construction methods (e.g. concrete)
		Bed regularization	
		Assembly of Hydraulic Structures and Sensors	Construction and installation of gates and valves
ACCESS	4. Access roads to the shipyard, construction sites and canals, ensuring	Clearing and deforestation	Removal of vegetation, if necessary, clearing of debris and unwanted materials to prepare the area for the construction site.

Infrastructure	Stages	Activities	Description
	the movement of machinery and heavy vehicles	Earthmoving	Digging, backfilling and compacting the area using machinery
SITE CHANNELS ACCESS	Movement of vehicles and machinery		

The activities described above are fundamental to ensuring that irrigation canals meet the irrigation needs of agricultural perimeters, maximizing the efficiency of water use and minimizing environmental impacts. The execution of these interventions must be carried out by professionals specialized in civil and hydraulic engineering, taking into account the specific characteristics of the site.

Phase of Operation

In the operation phase, after the removal of all the equipment and machinery used in the construction phase as well as the dismantling of the Shipyard, a maintenance plan must be established carrying out regular cleaning and a monitoring plan that assesses the functioning of the canals, thus ensuring that the water flow system remains functional and efficient feeding the irrigation systems that will later be built to irrigate the identified perimeters.

2.4.7 Land tenure situation

According to the official visits and meetings held with the IDA of Lunda Sul, the Pelengue Canal and the Capuepua Canal along its entire length to be rehabilitated are located on public land.

The easement strips allocated to the canals have been established as 50 m wide on each side (ADA) in each of the canals, in accordance with *point 7-e*, which is considered a partial reserve of protective land around dams and reservoirs, of *Article 27 - Reserved Land - of the Land Law* (Law no. 9/04, of 9 November), where there will be no use of the land.

2.4.8 Construction and implementation schedule

At this stage of the surveys, there is no information on the construction engineering project, so there is no timetable. It is recommended that as soon as this information is available, this document be revised and the information on this point added.

2.4.9 Investment

The design of this sub-project is part of the Project for the Development of Agricultural Value Chains in the Eastern Provinces of Angola and is part of the AfDB's response to the financing needs of Angola's Agriculture and Food Supply Pact, estimated at around 5.7 billion dollars.

The Development of Agricultural Value Chains in the Eastern Provinces of Angola Project follows on from the Agricultural Sector Reform Program (ASRP), worth a total of 80 million dollars, financed by the ADB, to strengthen agricultural policy and the business environment in order to improve food production, which will ultimately contribute to economic diversification and food security.

As for the investment planned for this specific sub-project at the time of writing this document, the survey phase, the information has not been defined or made available.

3. STUDY AREA AND GENERAL METHODOLOGY

3.1 Project Area of Influence

The aim of the assessment of the project area is to establish a reference table of the environmental and social conditions of the region, in order to provide a preliminary diagnosis of the state of the physical, biological and socio-cultural environment in the area of influence of the project, geared towards the analysis of the impacts arising from the implementation activities of this project.

The most sensitive environmental aspects present in the project area were identified on the basis of an analysis of the information obtained through cartography, aerial photography, prior reconnaissance of the area involved, as well as bibliographical research.

The area of influence of the project has been delimited and divided into three different areas:

- **ADA I Direct** - which essentially relates to the area of direct intervention of the Project, in a *buffer* of 50 m on each side of the channel corresponding to the directly affected area applied. This *buffer* includes all the project infrastructures and temporary infrastructures to support the work during the construction phase, as well as social, agricultural, goods and livelihood resettlements that were not verified during this survey phase, but may be identified during the project phase;
- **AID I Extended** - the area of indirect intervention of the Project, with a *buffer* of 500 m on each side of the channel corresponding to the area of direct influence.
- **All I Municipal** - area surrounding the project, area of indirect influence, larger area, covers 5 km on either side of the canal .

The project's areas of influence are presented in a representative and detailed manner in **ANNEX 2**.

The **Pelengue Canal** (Fig.4-A) is located in the northwest of Saurimo, with the Pelengue 1 and 2 neighborhoods, 15 km north of Saurimo, located next to the national road (EN 180), in the area of direct influence (AID).

The **Capuepua Canal** (Fig.4-B) is located in the southeast of the city of Saurimo, with the village of Capuepua (AID - north of the canal) 25 km south of the city of Saurimo and the village of Muambulo

(All - south of the canal), further away, 32 km south of the city of Saurimo, near the Tamba River Bridge.

The image below (Fig.4) shows the location of the canals in relation to the capital of Lunda Sul Province - Saurimo.

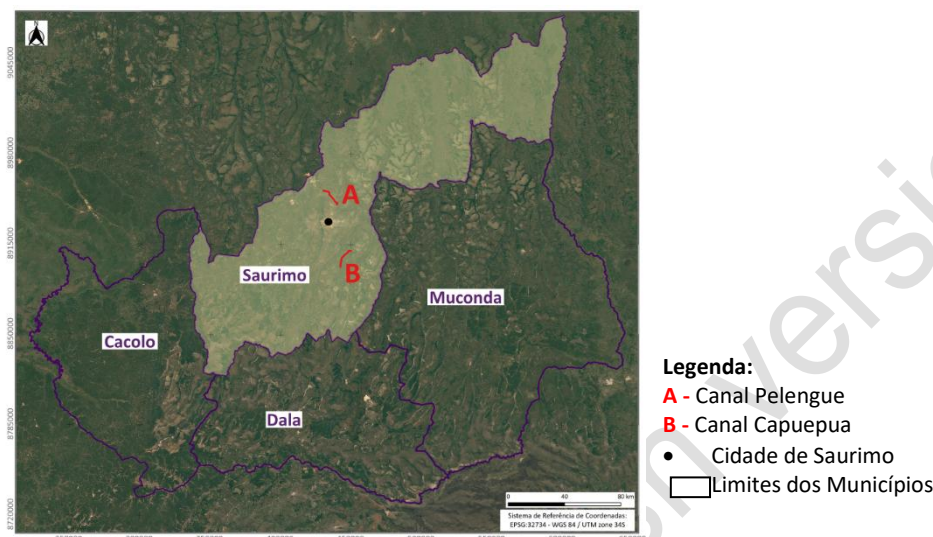


Figure4 - Representation of the Irrigation Canals relative to the position of the City of Saurimo.

The table below (Tab.9) shows the central coordinates of the villages in the area of indirect influence closest to the canals to be rehabilitated.

Table9 - Coordinates of neighborhoods and villages near the project areas - irrigation canals

Channel	Name Neighborhood / Village	E	N
Pelenge	Pelengue neighborhood 1	439446	8945957
	Pelengue 2 neighborhood	438677	8945329
Capuepua	Capuepua Village	448736	8910653
	Muambulo Village	441779	8900340

Note - Coordinate System EPSG 22033 / Camacupa_UTM_Zone_33S

3.2 General methodology of the studies carried out

The ESIA process is a preventive environmental management tool that aims to identify and analyze the positive and negative environmental and social impacts of a proposed activity, as well as to identify the appropriate mitigation measures in order to minimize negative impacts and enhance positive impacts.

The ESIA methodology adopted in this process complies with the environmental legal requirements applicable in Angola, as well as with international best practice.

The **Environmental and Social Impact Assessment (ESIA)** aims to address the environmental, socio-economic and cultural situation at the project site and identify possible direct and indirect impacts, including any cumulative impacts. It also includes appropriate measures to avoid, mitigate or compensate for such impacts wherever possible and provide instruments for their implementation, monitoring and confirmation in the form of an **Environmental and Social Management Plan (ESMP)**.

Across both documents, the public consultation process was developed in parallel, gathering all the necessary information and *feedback* from the main stakeholders, collecting information as well as concerns and contributions to the development and identification of environmental and social impacts.

The main activities required to produce the Environmental and Social Impact Assessment (ESIA) follow the structure described in the new Presidential Decree 117/20, of April 22, namely in Article 14:

- a) *Project description;*
- b) *Environmental impact study report;*
- c) *All the technological and location alternatives for the project, comparing them with the hypothesis of not carrying out the project;*
- d) *Non-technical summary with the main issues addressed, conclusions and proposals;*
- e) *The legal framework of the activity and its inclusion in the existing Land Management Plans for the area of direct influence of the activity;*
- f) *A description of the activity and the various actions envisaged during the planning, construction and operation stages and, in the case of a temporary activity, its decommissioning;*
- g) *The delimitation and geographical representation, as well as the reference environmental and socio-economic situation of the area of influence of the activity;*
- h) *A detailed description and comparison of the different alternatives and a forecast of the future environmental situation with or without mitigation measures*
- i) *The identification and assessment of impacts and the identification of mitigation measures;*
- j) *The Activity's Environmental Management Plan, which includes Impact Monitoring, an Environmental Education Program and an Accident Contingency Plan;*
- k) *Identification of the multidisciplinary team that prepared the EIA;*
- l) *The public consultation report in accordance with Article 16.*

In addition to this framework transposed from Angolan environmental legislation, the recommendations and requirements of the ToR of the contract, established by the Integrated Safeguards System (ISS) of the African Development Bank (AfDB) related to Gender Equality and Women's Empowerment (GEWE), which integrate the Gender and Development Policy, promoting gender equality as one of the main development objectives, seeking to integrate gender issues in all its operations and projects, were also

considered; Economic Empowerment Programs, focused on initiatives that empower women, especially in sectors such as agriculture and agro-processing, aiming to improve access to resources, financing and market opportunities; Food Security, through the implementation of policies to increase food and nutritional security that promote women's productive capacity in agriculture, recognizing the vital role of women in families and communities; governance reforms that ensure greater representation and participation of women in decision-making processes, both in public institutions and in civil society organizations; training and education, supporting programs aimed at developing women's skills and knowledge in key sectors, promoting their ability to participate fully in the economy.

3.3 Public Participation

In accordance with the EIA Regulations (Presidential Decree No. 117/20), the Public Participation Process is an integral part of the Environmental and Social Impact Assessment, which was carried out in a transparent and integral manner, allowing Interested and Affected Parties (IP&As) to understand the project and its implications for the environment (biophysical and socio-economic), thus allowing IP&As (organizations or individuals) to identify issues to be included in the ESIA.

At the time of writing this document - the Survey Phase - there is no information on what type of rehabilitation will be carried out on the canals, what specific activities will be carried out in the construction phase and the timetable. In this context, it is suggested that the Public Participation Process (PPP) be repeated in the Project Phase (pre-construction), when there is definite information on the activities and timetable that allows PI&As be presented with more details about the Project.

The Public Participation Process (PPP), which was developed and promoted by ENGCONSULT in the Survey Phase, took place during November 2024 and had the following main objectives:

- Establishing the communication channel between PI&As, the general public, consultants and the client during the ESIA process;
- Present general information about the project;
- Gather information and understand the sensitivities of PI&As in relation to the project;
- To allow PI&As the opportunity to get to know the project, to be able to contribute information to improve the content of the ESIA and to allow the concerns and issues they raise to be taken into account in the report.
- Present the main points covered in the Environmental Study, presentation of the preliminary structure of the ESIA Report, including the Environmental Management Plan and subsidiary plans;

The following activities were part of the Public Participation Process (PPP):

- Identification of Interested and Affected Parties (IP&As) - Compilation of a (dynamic) list of IP&As, through which notifications and distribution of information can be carried out. Drawing up the PEPI - Stakeholder Involvement Plan;
- Meetings and informal gatherings with Interested and Affected Parties (IP&As) to disseminate general information about the project;
- Holding the Public Consultation Meeting - In order to comply with the requirements of Angolan legislation, meetings were held with the local population (3 locations) on May 26 (one session in Bairro Cdt. Cowboy) and 27, 2022 (two sessions in Bairros Mapunda and A

Luta Continua, respectively) and one with institutional entities on August 3, 2023 at Mediateca de Lubango.

- At all of them, the project and the conclusions of the EIAS were presented and the comments and suggestions of the IP&As were collected, before the final report was drawn up and submitted to MINAMB;
- Collection and analysis of contributions. Through the public consultation meeting and other mechanisms such as e-mail and telephone calls;
- Preparation of the Public Consultation Report - All the information and contributions from the IP&As gathered during the process were duly considered by the ESIA technical team and incorporated into the Public Consultation Report. The Public Consultation Report includes the methodology used, the identification of the IP&As; the minutes with the questions and respective answers and comments received from the IP&As and photographs.

A more detailed description of the Public Consultation Meetings and the issues raised by the PI&As can be found in Section 6 of this document.

4. LEGAL FRAMEWORK

4.1 Legislation Angolan

The legislation listed below represents the national legislation relevant to the Project and is summarized in the following tables: Environmental and Social Legal Framework (Table 10), Summary of Relevant Environmental and Social Legislation (Table 11) and the Multilateral Environmental Agreements (Table 12).

Table10 - National Legal Framework for Environmental and Social Impact Assessment

Subject	Legal instrument	Applicability to the Project
Approves the General Regulations for Environmental Impact Assessment and the Environmental Licensing Procedure.	Presidential Decree No. 117/20, of April 22, repealing Decree No. 51/04, of July 23 and Decree No. 59/07, of July 13	It establishes the legal framework for the Environmental Impact Assessment process. This Decree establishes the required content and structure of an EIA, for each of the project categories A, B, C and D, including public consultation, approval procedure, deadlines and issuance of permits, and identifies the projects subject to the EIA process in the annexes. This ESIA will comply with the legislation in force for obtaining the installation license.
Environmental licensing fees	Presidential Decree No. 83/22, of April 12	Defines the fees payable in the environmental licensing process

Subject	Legal instrument	Applicability to the Project
Regulation on Public Consultation of projects subject to Environmental Impact Assessment	Executive Decree 87/12 of February 24th	Regulates Public Consultations on projects subject to Environmental Impact Assessment This EIAS complies with the provisions of this regulation

Table11 - Summary of Relevant Environmental and Social Legislation

Subject	Legal instrument	Applicability to the project
General Environmental Protection	Basic Environmental Law - Law no. 5/98, of June 19th	This law defines the basic concepts and principles of protecting, preserving and conserving the environment, promoting quality of life and the rational use of natural resources.
	Presidential Decree No. 194/11, of July 7, on Liability for Environmental Damage	Establishes liability for environmental risk and degradation
General Environmental Protection (cont.)	National Environmental Quality Program (PNQA) - Presidential Decree no. 138/20, of May 19	It is governed by the principles of protecting natural resources and citizens' quality of life, and aims to contribute to the implementation of policies to achieve environmental quality. The Plan also aims to prevent and/or reduce negative negative impacts, in order to avoid future recovery or mitigation costs, guaranteeing sustainability for future generations. In particular, the PNQA aims to contribute to improving the quality of life of Angolan citizens living in urban, peri-urban and rural areas, with a focus on guaranteeing the quality of air, water and soil, by pursuing concrete actions and boosting and linking various government plans and programs in the short, medium and long term.
Water	Water Law - Law no. 6/02, of June 21st	This law defines the general principles of the legal regime inherent in the use of water resources, and applies to inland waters, both surface and underground.
	Water Quality - Presidential Decree 261/11, of October 6th	This Decree details the standards and criteria applicable to water quality, in order to protect the aquatic environment and improve water quality, according to its main uses.

Subject	Legal instrument	Applicability to the project
	Register of Waste Management and Water and Wastewater Treatment Companies - Ministerial Order no. 199/12, of February 29th	This Order approves the legal forms for registering companies that carry out activities in the areas of waste, water treatment and wastewater.
	Regulation of Public Water Supply and Wastewater Sanitation - Presidential Decree No. 83/14, of April 22nd	These regulations define the system for carrying out water supply and wastewater sanitation activities. For water supply systems, it defines their typology, objectives, components and the construction and expansion of systems.
	General Regulations for the Use of Water Resources - Presidential Decree No. 82/14, of April 21	It establishes two systems for exercising water services, namely concessions and licenses. Concessions are intended for the management and operation of public water supply and wastewater sanitation systems for population agglomerations of more than 50,000 inhabitants, including a heavy or mixed industrial park with more than 50% industrial facilities dedicated to the food industry or others of a similar nature. Licenses are intended for the management and operation of public water supply and wastewater sanitation systems for population agglomerations of less than 50,000 inhabitants, including a light industrial park with less than 50% industrial installations dedicated to the food industry or others of a similar nature.
	National Strategic Water Plan (2018-2022) - Presidential Decree 158/18, of June 29th	This Decree approves the National Development Plan 2018-2022
Climate change	National System for Monitoring, Reporting and Verification of Climate Policy - Decree Presidential nº 8/22, of January 13	An instrument that aims to regulate the flow of data that enables the preparation and approval of reliable, transparent and comprehensive information on the positive or negative effects at national level, to be submitted under the terms of the United Nations Framework Convention on Climate Change.
	Letter of Accession No. 8/20, of October 20	Makes the Paris Agreement on climate change firm and valid and guarantees that it will be strictly observed

Subject	Legal instrument	Applicability to the project
Biodiversity	General Law on Forests and Wildlife - Law no. 6/17, of October 24th	This law establishes the rules aimed at guaranteeing the conservation and rational and sustainable use of forests and wild fauna in Portugal, as well as the general bases for carrying out activities related to them.
	Angola's Red List of Species - Executive Decree no. 252/18 of July 13	This Executive Decree approves the Red List of Angolan Species.
	Executive Decree 469/15, of July 13th	Prohibits the killing of Protected Species of wild fauna and flora on national territory.
Heritage	Regulation of Immovable Cultural Heritage - Decree Nº53/13, of June 6th	This Decree aims to regulate the rules and procedures for the protection, preservation and enhancement of Immovable Cultural Heritage.
Waste Management	Waste Management Regulations - Presidential Decree no. 190/12, of August 24th	This Decree details the waste management regulations in Angola.
	Construction and Demolition Waste Management - Executive Decree no. 17/13, of January 22nd	A Waste Management Plan for construction and another for operation must be submitted to the National Waste Agency.
Land	Land Law - Law no. 9/04, of November 9th	This law establishes the general bases of the legal regime for land that is part of the state's original property, the land rights that may fall to it and the general regime for the transfer, constitution, exercise and extinction of these rights.
	General Land Concession Regulations - Decree no. 58/07 of July 13th	It defines a set of regulatory standards that guarantee the speed, transparency, impartiality, rigor and objectivity of the process of granting land rights. Classifies areas associated with water supply projects as Partial Reserves
Spatial planning	General Regulations for Territorial, Urban and Rural Plans (REPTUR) - Decree no. 2/06, of January 23rd	The purpose of this law is to regulate the development of the general bases of spatial planning and urbanism, enshrined in Law no. 3/04, of June 25, in terms of the respective management instruments for urban and rural territorial space, regulating the general table of the territorial planning system in an integrated and coordinated manner with other dimensions of the territory, namely the general regime for the defense,

Subject	Legal instrument	Applicability to the project
		occupation and use of land and other spatial planning instruments.
Vulnerable groups	Basic Law on Social Protection - Law no. 7/04, of October 15th	This law defines, among other things, the rights and duties of vulnerable groups, aiming for the well-being of individuals, families and the community, which is achieved through social promotion and regional development, progressively reducing social inequalities and regional asymmetries.
Gender-Based Violence and Gender Equality	Law against domestic violence - Law no. 25/11, of July 14,	Establishes the legal framework for the prevention of domestic violence, protection and assistance to victims
	Executive Plan to Combat Domestic Violence and the Multisectoral Commission for the Implementation of the Plan, as well as the Schedule of Actions - Presidential Decree No. 26/13, of May 8	The Plan aims to improve the living conditions of families and women through policies and programs that prioritize the fight against domestic violence and the moralization of the family and society.
	Presidential Decree No. 165/13 -	Regulation of Law No. 25/11 and measures to support and protect victims of domestic violence and recover the aggressor, and standardizes the operation of shelters and family counseling homes -
	National Policy for Gender Equality and Equity and Advocacy and Resource Mobilization Strategy for Implementing and Monitoring the Policy - Presidential Decree no. 222/13, of December 10	Establishes actions and tasks to achieve gender equality and equity
	Legal Regime of Union by Mutual Agreement; - Presidential Decree no. 36/15, of January 30th,	Aims to recognize unions between couples who cohabit without marriage
	National Action Plan for United Nations Security Council Resolution 1325 on Women, Peace and Security - Decree presidential n.º 143/17, of June 26	Recognizing that peace is closely linked to equality between women and men and to sustainable development, and affirming the important role that women play in preventing and resolving conflicts and consolidating peace, the Plan aims to contribute to increasing women's participation in

Subject	Legal instrument	Applicability to the project
		decision-making processes and their full involvement in all efforts to Maintain and Promote Peace and Security. It also aims to contribute to the eradication of violations of women's human rights in conflict situations, including sexual violence, which affects women, boys and girls in an aggravated manner, and trafficking in women and children.
	New Penal Code 2020	Chapter IV establishes sexual crimes: Article 184 (sexual assault), Article 188 (sexual harassment) and specific articles on sex trafficking (192), among others.
	Organic statute of the Ministry of Social Action, Family and Promotion of Women (MASFAMU) - Presidential Decree 226/20 of September 49, repealed by Presidential Decree 2/23 of January 3	MASFAMU's mission is to design, propose, promote and implement social policy for people and population groups in situations of vulnerability, to promote community development, including actions to combat poverty, as well as defending the well-being of the family, promoting women and guaranteeing their rights, promoting gender equality and equity, and coordinating, monitoring and supervising NGOs that pursue social protection objectives.
Labor and Economic Activities	General Labor Law - Law no. 7/15, of June 15th	This law approves the rules to be established in employment contracts and applies to all workers in the territory of the Republic of Angola who carry out paid work on behalf of an employer within the framework of an organization and under the authority and direction of that employer, such as mixed public and private companies, cooperatives, social and international organizations and diplomatic and consular representations.
Health and Safety at Work	Principles for the promotion of occupational safety, hygiene and health - Decree No. 31/94, of August 5	The aim of this decree is to create the necessary conditions for the prevention of accidents at work, occupational diseases and all threats to the physical integrity and health of workers that may exist and should therefore be eliminated from their workplace, and it applies to state, mixed, private and cooperative companies.
Occupational health and safety	Obligation to organize OHS services in companies - Executive Decree No. 6/96, of February 2	These General Regulations establish the rules governing the Occupational Health and Safety Services in companies, in accordance with Article 18(2) of Decree 31/94 of August 5th.

Subject	Legal instrument	Applicability to the project
	Regulation of the Commissions for the Prevention of Accidents at Work (CPAT) - Executive Decree No. 21/98, of April 30	Approves the guidelines for the Commissions for the Prevention of Accidents at Work (R.G.) - Revokes all regulations that contradict the provisions of this executive decree - D.R. no. 20 .1999
	The contractor and the operating entity must set up a work accident prevention committee in accordance with the rules and objectives that govern and guide work accident prevention committees.	
	Regulation on HIV/AIDS, Employment and Vocational Training - Decree No. 43/03, of July 4th	The regulation lays down mandatory rules for employers, employment and vocational training institutions on the protection mechanisms for HIV-positive citizens and those affected by HIV/AIDS in employment and vocational training, as well as on the adoption of conduct and practices to prevent the spread and dissemination of HIV/AIDS.
	Establishes the rules to be adopted by the contractor and management entity in the adoption of conduct and practices among workers to prevent the spread of HIV/AIDS.	
Security, Risk Prevention, Response and Recovery	Regulation of the legal framework for fire safety in buildings - Presidential Decree No. 195/11 of July 8	This regulation approves the legal framework for fire safety in buildings and is based on the general principles of preserving human life, the environment and cultural heritage.

Table12 - Multilateral Environmental and Social Agreements

Multilateral Environmental and Social Agreements	Legal regulations	Applicability to the project
Convention on the Elimination of All Forms of Discrimination	Resolution AN 15/84, of September 19	This Convention enshrines the various rights of women, paying special attention to their condition and aiming to ensure that they are respected and considered as human beings with a fundamental role in any society.

Multilateral Environmental and Social Agreements	Legal regulations	Applicability to the project
Against Women - CEDAW (1981)		The contractor and the management entity must adopt strategies aimed at eliminating all forms of discrimination against women in their hiring and working activities.
Convention on the Rights of the Child	Resolution AN 20/90, of November 10th	The Convention on the Rights of the Child aims to protect the rights of the child.
Convention on World Cultural and Natural Heritage (UNESCO)	Ratified on November 7, 1991	The Convention on World Cultural and Natural Heritage (UNESCO) aims to protect cultural and natural heritage and preserve them as elements of humanity's world heritage as a whole.

4.2 Integrated Safeguards System of the African Development Bank

According to the ToR, the Development of Agricultural Value Chains in the Eastern Region of Angola Project *was designed to cover a set of sub-projects with different dimensions and impacts and was classified* as Category 2 based on the African Development Bank's Integrated Safeguards System (ISS), since the project's potential activities are likely to generate site-specific environmental and social risks and impacts. This category is in line with Angolan regulations on Environmental Impact Assessment and Environmental Licensing Procedure (Presidential Decree No. 117/20 of April 22, 2020). This decree considers irrigation-related infrastructure as category B, such as irrigation schemes with areas of more than 350ha; dams and dykes with reservoirs of an area equivalent to or greater than 5ha, due to actions that significantly affect living beings and environmentally sensitive areas, and their impacts are of greater duration, intensity, magnitude and significance.

The African Development Bank's Integrated Safeguards System (ISS) classifies projects into three categories (Tab.13), depending on the type, location, sensitivity and scale of the project and the nature and magnitude of its possible environmental impacts, which correspond to the categorization assigned by Angolan regulations, Presidential Decree No. 117/20 of April 22, 2020, on Environmental Impact Assessment.

Table13 - Categories of ISS-BAD Projects *versus* Angolan Legislation (Presidential Decree no. 117/20 of April 22)

Categories		Key decision criteria
ISS - BAD	Angolan legislation	
1	A	Projects that have significant, sensitive and diverse adverse environmental impacts and that require a full EIA to be carried out, in accordance with Angolan regulations, with a detailed assessment and mitigation plan.
2	B	Projects with moderate to minor environmental impacts that may affect human populations or environmentally important areas
3	C	Projects that have no significant environmental impact and can be implemented without the need for a formal environmental assessment.

5. ENVIRONMENTAL DIAGNOSIS

5.1 Physical Environment

5.1.1 Geology, Geomorphology and Hydrogeology

The Lunda Sul region, with a maximum altitude of approximately 1,800 m, is located in the vast geomorphological unit of the Precambrian shield of Angola, characterized by a predominantly high relief (Gomes, 2015). This area is marked by high plateaus and is crossed by important watercourses, which shape the local landscape (Marques, 2018). Among the main rivers that cut through Lunda Sul are the Cassai River, the Chiumbe-Luateche River and the Cuango. Other relevant rivers are the Luia, the Chicapa (which flows through Saurimo), the Luachimo, the Luxiza River and the Cucumbi River, all of which have their source in the province. All the rivers mentioned are tributaries of the Cassai, which in turn is one of the largest tributaries of the Congo basin

In Lunda Sul, the relief is characterized by a combination of plateaus and valleys, where the topographic unevenness varies significantly (Silva & Costa, 2017). The city of Saurimo, which is the provincial capital, is located in an area of gently undulating relief, surrounded by crystalline geological formations (Baptista, 2019). The region is also bounded by lower elevations compared to other parts of Angola, but with significant altimetric variations that impact on hydrographic dynamics and local biodiversity.

The average gradient between the plateau and the city of Saurimo is around 1,000 m (Fig. 5), reflecting the typical characteristics of Lunda Sul's geomorphology.

These topographical and geological features interacting with water resources influence not only the regional climate, but also play a crucial role in maintaining biodiversity and local economic activities, such as mining and agriculture, which are fundamental to the province's development. The interaction between geography and water resources is essential for regional development and the livelihoods of local populations.

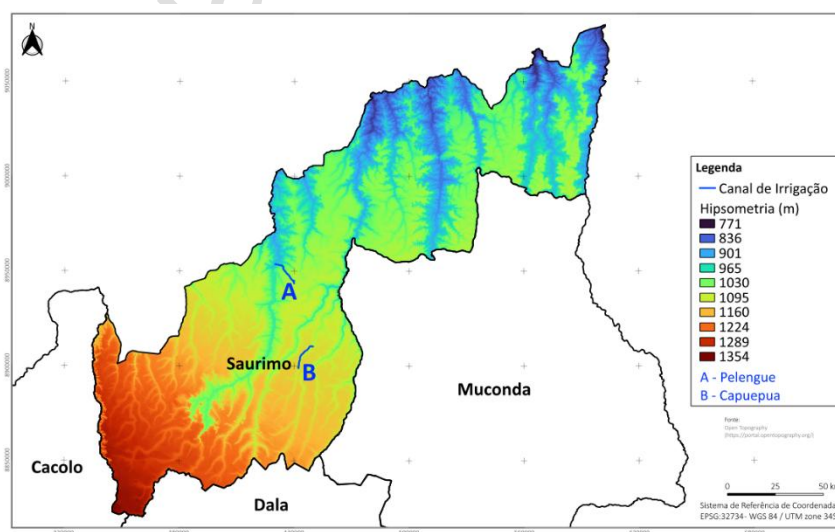


Figure5 - Hypsometry of the Municipality of Saurimo

The geology of the Lunda Sul Province is characterized by a diversity of rock formations, mainly due to the presence of igneous and metamorphic rocks from the Precambrian shield of Angola, such as gneisses and granitoids, formed in the Archaic and Proterozoic periods, which form the basis of the local landscape (Gomes, 2015). The region also has more recent sedimentary deposits from the Cenozoic, often found in sedimentation basins and at lower altitudes (Marques, 2018).

The geological formations in the area where the sub-project is being implemented, the municipality of Saurimo, are deposited in sedimentary basins that exhibit volcano-sedimentary characteristics. These formations rest in discordance on a cratonic socle that corresponds to the Eburnean orogenic belt, with gneiss, migmatite and granite rocks predominating in the area. This geological configuration reflects the complex tectonic history of the region, marked by formation processes that have shaped the landscape and influenced the distribution of mineral resources, especially in the context of the exploitation of diamonds and other minerals.

Mineral exploitation, especially diamonds, is significant for the local economy, as alluvial deposits are often associated with these resources (Baptista, 2019). In addition, the presence of lateritic soils reflects the climatic conditions of the area and influences agricultural practices.

The city of Saurimo is dominated by granites and granitoids, as well as metamorphic rocks, including gneisses and quartzites. The region also has formations associated with anorthosite-type rocks.

5.1.2 Soils

More than three-quarters of Angola (Fig. 6) is covered by two main groups of soils, the arenosols and the ferralsolos.

In the areas where the subproject is being implemented, in the municipality of Saurimo, in the province of Lunda Sul, two types of soil can be observed: latosols, classified as ferral soils, are deeply weathered and rich in iron and aluminum oxides, and are common in tropical zones. These soils, found in forest and savannah areas, are deep and have good drainage capacity, but generally have low natural fertility due to the leaching process (Gomes, 2015).

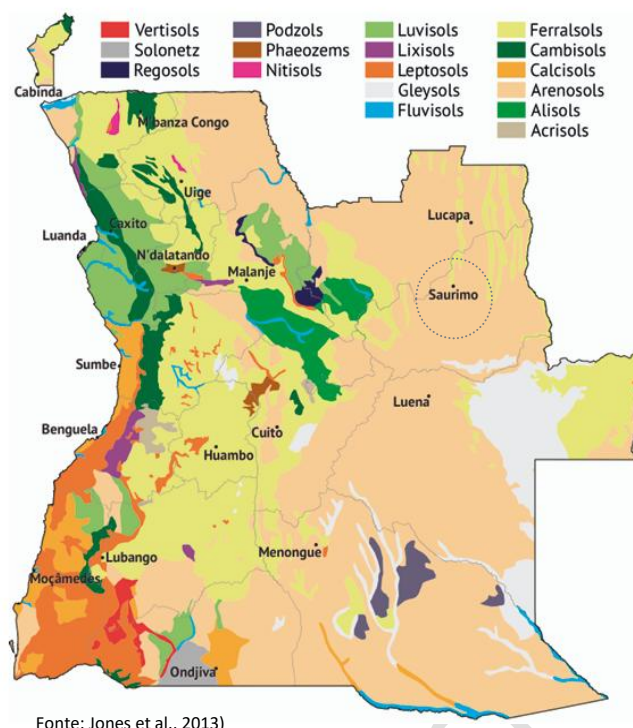


Figure6 - Profile of Angola's main soil types, illustrating the predominance of sandstones in the eastern half of the country, and ferralsols along the western and central plateaus.

Lateritic soils, also the result of intense weathering processes, can be found in elevated areas. Although the fertility of these soils varies, they are used in agriculture and influence cultivation practices in the region (Silva & Costa, 2017).

Another important order is that of the podzolic soils, classified as arenosols, which are characterized by a wash layer that results in acidic and not very fertile soils. These soils are typical of areas with natural vegetation and can be seen in places that have suffered environmental degradation

In addition, the alluvial soils that are present in the subproject implementation area, on the banks of the irrigation canals that are along the , such as the Chicapa River and areas flooded by the Tamba River - Capuepua Canal. These soils are formed by the deposition of sediments and are often rich in nutrients due to the deposition of sediments, making them extremely valuable for agriculture, especially for growing temporary crops.

The argisols and vertisols, which are also found in the region, both have a clay composition. The argisols are characterized by a heavier clay layer at depth, resulting in good fertility and a reasonable moisture retention capacity, which makes them suitable for various crops. Vertisols, on the other hand, have a high proportion of clay, which causes significant expansion and contraction, leading to the formation of cracks in periods of drought and swelling under humidity.

Although both soils are fertile, the agricultural management of vertisols can be more complex due to their variable behavior and plasticity. Thus, while argisols offer more stable management, vertisols require special care, especially in water management.

These soil types present in the municipality of Saurimo (Fig. 7) play a crucial role in the management of natural resources and agricultural practices in Saurimo, reflecting the dynamic interaction between the physical environment and human activities.

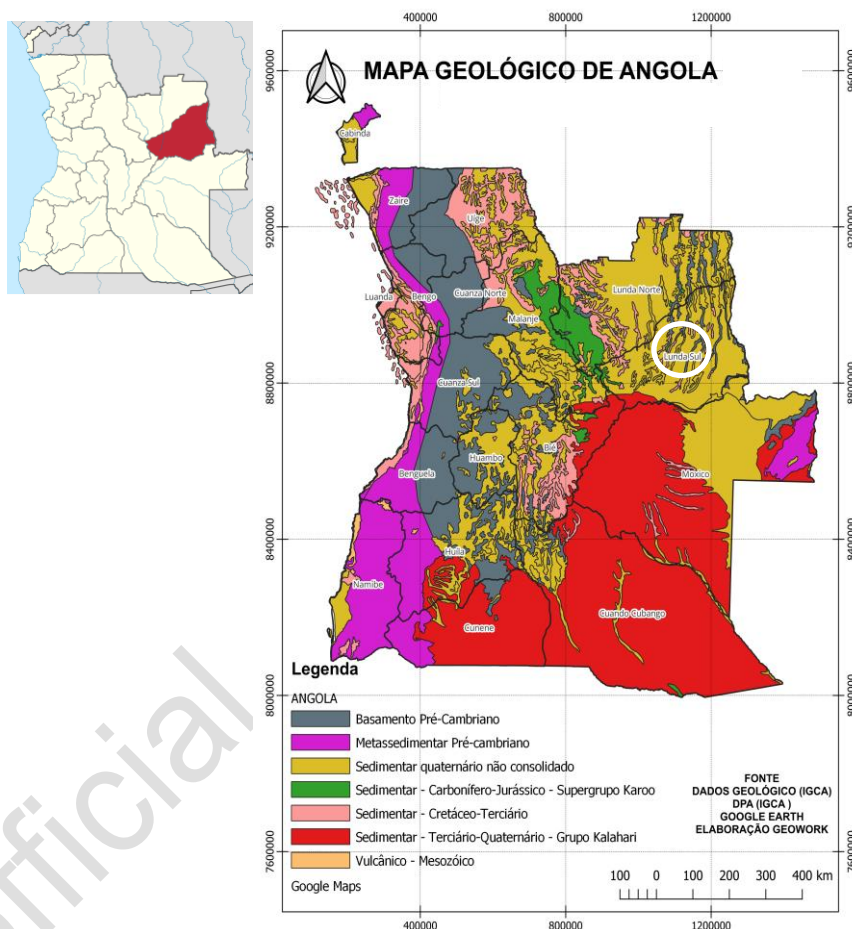


Figure7 - Map of Angola's Soil Types with reference to the Municipality of Saurimo (ALMEIDA, 2017)

5.1.3 Climate and Climate Change

According to the Köppen-Geiger climate classification in Lunda Sul province, the municipality and commune of Saurimo, where the irrigation canals and agricultural perimeters are located, is typically characterized as **Aw - Savannah** climate, which corresponds to a tropical climate with a dry season, the cacimbo season, where the lowest annual temperatures (13 °C) are recorded in the months of May to July. In the wet season, the highest temperatures (31°C) are recorded in September and October, with significant rainfall predominantly between October and March (Fig. 8).

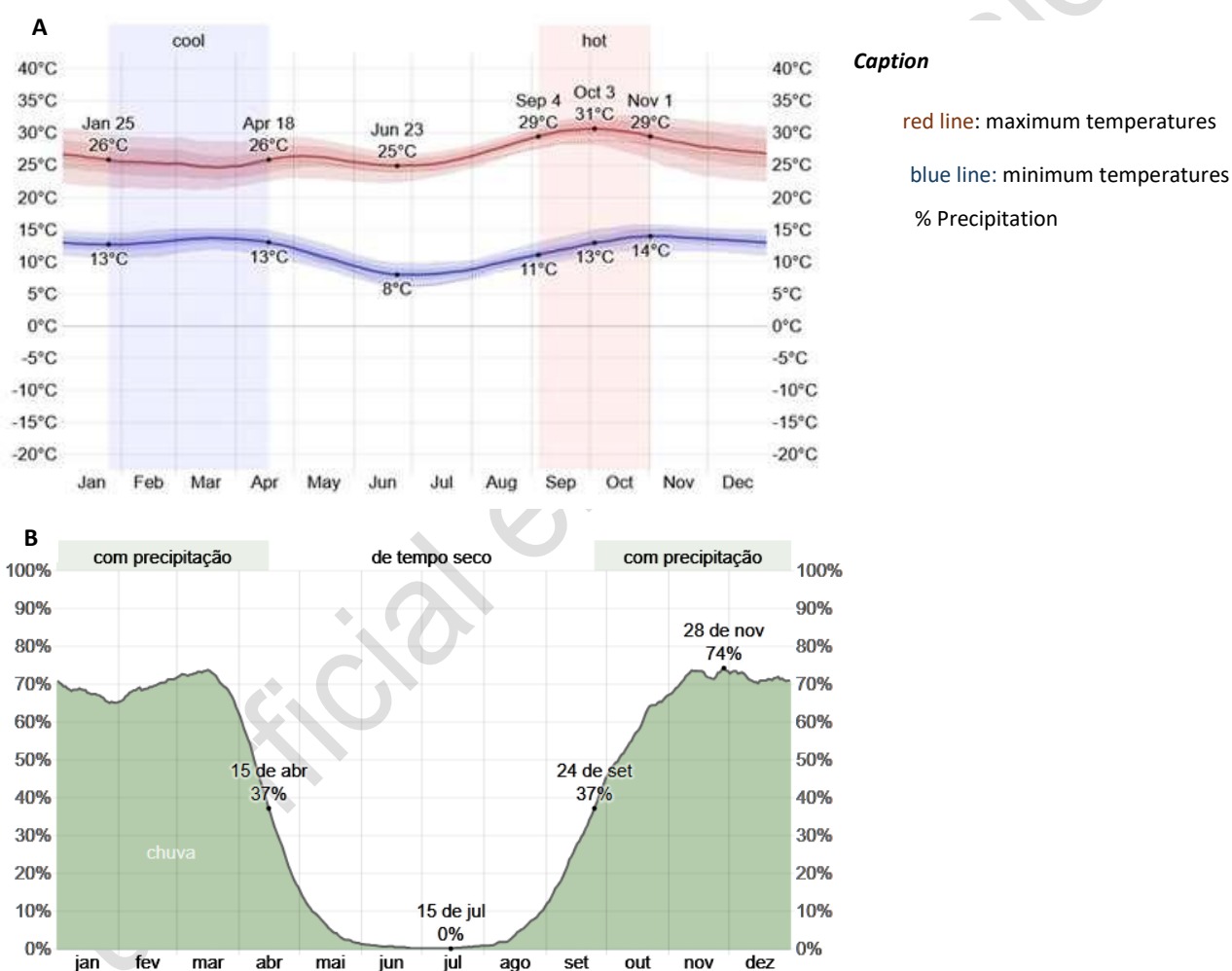


Fig.8 - Average monthly temperature (A) and rainfall (B) during the year in the municipality of Saurimo.

In Lunda Sul Province, annual relative humidity tends to be higher during the rainy season, with relative humidity reaching 75-85%, reflecting the increase in rainfall. In the dry season, relative humidity values decrease, generally between 40-60%.

In the Saurimo region, the lack of rainfall during the dry season results in a significant drop in groundwater levels, which can lead to restrictions in water supply or access during this period. This seasonal variation in rainfall has a direct impact on the availability of water for irrigating agricultural land.

For example, during the rainy season, the productivity of irrigation water sources is generally high, allowing farmers to irrigate their crops adequately. However, when the dry season arrives, the availability of water for irrigation decreases considerably, which can limit cultivation capacity and affect agricultural production. This decrease in water availability can lead to the interruption of agricultural activities in the region, damaging the livelihoods of local farmers. Therefore, the rehabilitation of canals is crucial and is considered an effective management strategy to optimize the use of water and ensure continuous irrigation during the driest periods of the year.

The impact of climate change in Angola will be more relevant in terms of temperature and precipitation³. These changes include an increase in maximum and minimum temperatures of up to 4.9°C by the end of the century and an intensification of droughts.

Rainfall projections are highly variable - going up and down - throughout the region and depend on the scenarios modeled. Despite these differences, precipitation generally decreases over time (approximately -2% by 2100), with the southern region seeing a sharper decrease in precipitation. An increase is expected in the coastal units, especially in the center, while the north of the country generally sees a decline in precipitation, particularly in the coastal units. In monthly terms, a decrease is expected in the driest months, extending the dry season to April and October.

With regard to extreme phenomena, droughts will tend to increase in frequency and intensity in coastal areas, but with significant consolidation in the central and western regions of the country. Floods will increase in frequency and intensity, but will be interspersed with more consolidated periods of drought. Heat waves will also increase in frequency, as will storm surges. As global temperatures rise, forest fires will become more frequent and intense.

Climate risks have effects on the use of natural resources, crop productivity and social impacts on food security. Angola is committed to participating in the aspiration established at international level to fight climate change, thus contributing to global efforts to reduce greenhouse gas (GHG) emissions. To this end, Angola's Nationally Determined Contribution (NDC)⁴ includes, for the purposes of Mitigation and Adaptation, unconditional and conditional measures to reduce GHG emissions and adapt its territory and population to the adverse impacts of climate change. The mitigation and adaptation measures defined in the CDN document will be taken into account when assessing the impact of this sub-project.

³ CARVALHO, S.C.P., F. Santos & M. Pulquério (2016). Climate change scenarios for Angola: an analysis of precipitation and temperature projections using four RCMs. *International Journal of Climatology*. Published online in Wiley Online Library

⁴ MCTA (2021). *Angola's Nationally Determined Contribution 2021*. 95 pp

5.1.4 Water Resources

The canals to be rehabilitated are located in the province of Lunda Sul, in the municipality and commune of Saurimo, in the Cassai Basin, which is an important river basin in the region and is named after the Cassai River. The Cassai River is one of the most significant rivers in the eastern region of Angola, forming the natural border between Angola and the Democratic Republic of Congo, and is vital for irrigating land and fishing activities in riverside communities.

It is within the Cassai Basin that two of the main rivers with a direct influence on the flow of water supplying the irrigation canals of this sub-project stand out: the Chicapa River, which supplies the Pelengue Canal, and the Luachimo River, which through its tributary called the Tamba River will supply the Capuepua Canal. These rivers play a fundamental role in the flow and drainage the water that will go into the irrigation canals and consequently serve to irrigate the lands, agricultural perimeters, surrounding the Pelengue and Capuepua canals that will be rehabilitated.

The Chicapa River is one of the most significant rivers in the Province of Lunda Sul, which, like other local watercourses, has an intermittent regime, fundamental for recharging the region's water resources, especially during the rainy season. The Chicapa River bathes the city of Saurimo and is fundamental for supplying water to the population and also, together with other tributaries and smaller streams, contributes to the irrigation and fertility of the land around Saurimo, being essential for agricultural activities and various other socio-economic activities in the area

The Luachimo River is also important for irrigation and the maintenance of agricultural perimeters and water supply, with a direct influence on the lives of the surrounding communities.

The municipality of Saurimo has diverse hypsometry, reflecting its position in the Cassai basin. The region is characterized by a predominant relief that varies from plateaus and hills to valleys and lowlands, resulting in a wide range of altitudes (Fig. 9). In the northern part of the municipality, the elevations are more pronounced, with altitudes that can reach up to 1,500 meters above sea level. These mountainous areas are covered in dense forests and have a diverse ecosystem. The central regions of Saurimo, which is where the Pelengue and Capuepua irrigation canals are located, have moderate altitudes where the relief is smoother. This area is crucial for agriculture, due to the fertile soil and the availability of water from rivers and streams that form part of the hydrographic network of the Cassai basin. Lastly, the areas close to the rivers cover lower ground, which tends to flood during the rainy season. The agricultural perimeters along the banks of the Chicapa River and the Tamba River (a tributary of the Luachimo River) are characterized by the development of agricultural activities, such as rice cultivation and other flooded crops.

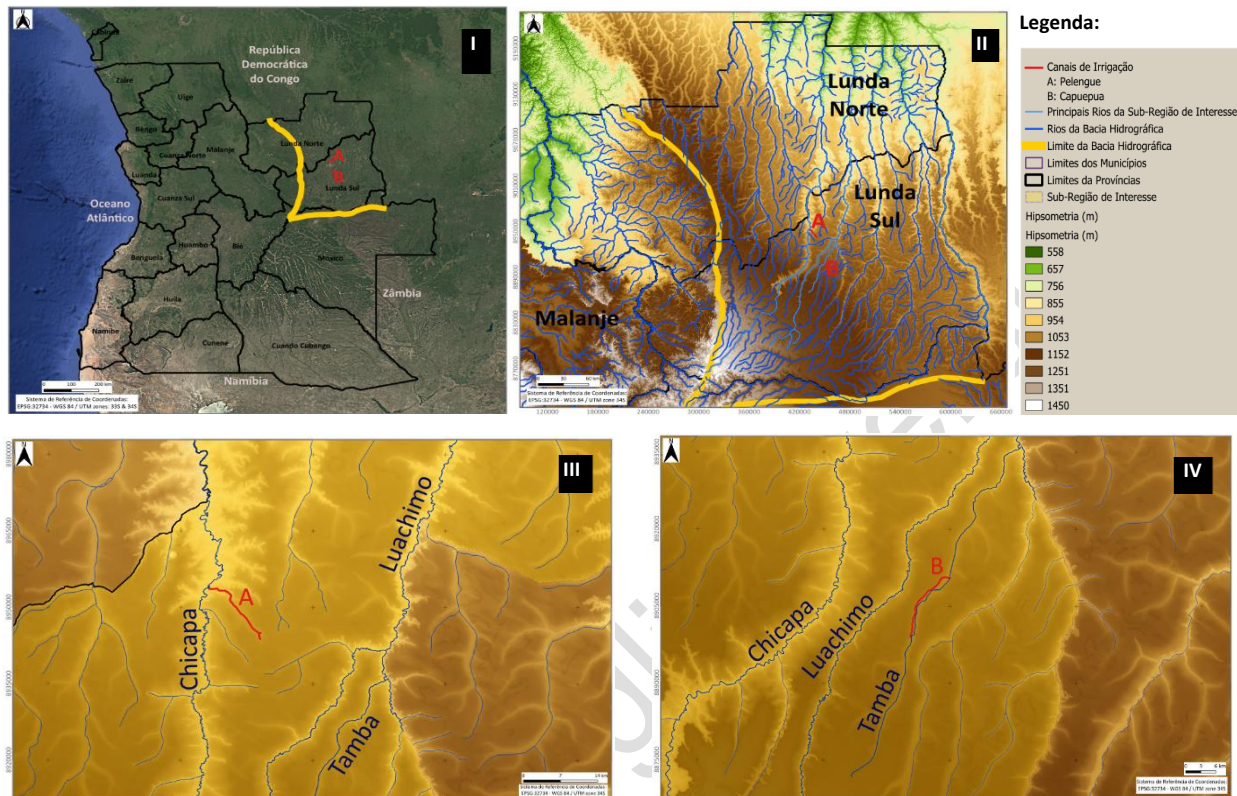


Fig.9 - Geographical layout of the Cassai Basin in the study area (I).

II - Hypsometry of the Cassai river basin (II)

III - Hypsometry along the Pelengue Canal (A)

IV - Hypsometry along the Pelengue Canal (A)

With regard to groundwater resources in the Saurimo region, the existing geological features are favorable to groundwater abstraction. In the area where the canals are located, it is possible to observe weathering processes that are influenced by the local vegetation and the geological nature of the rocks that make up the bedrock. The materials resulting from weathering favour the infiltration of rainwater and the recharge of aquifers in the region.

In addition, the Chicapa River and the Tamba River, which will supply water to the Pelengue and Capuepua irrigation canals, respectively, cut through the areas of the agricultural perimeters and play an essential role in the local water dynamics. The presence of these rivers contributes to maintaining groundwater levels, especially during the rainy season when infiltration is more intense. The interaction between surface and groundwater is crucial for water supply and agriculture in the Saurimo region, where subsistence farming can benefit from the water available through wells, springs and dams or reservoirs. It is recommended that a hydrological study of surface and groundwater be carried out during the project phase, along with a geological-geotechnical study of the sites where the canals to be rehabilitated are located.

5.2 Environmental Quality

5.2.1 Air Quality

The area where the canals to be rehabilitated are located is considered a rural area of the municipality and commune of Saurimo, with lower levels of pollution by particles of anthropogenic origin compared to the (peri-)urban area of Saurimo, both in the dry and rainy seasons, due to the lower circulation of vehicles. However, as it is a rural area, the existence of unpaved roads and mostly unpaved housing areas, as well as the strong mining activity in the municipality, can favor the dispersion of particles by the wind, causing atmospheric dust. High levels of atmospheric dust are more likely to occur in the dry season, which, depending on size and quantity, can affect air quality and consequently people's quality of life, and can affect human health, especially respiratory diseases.

The main sources of emissions at the sites of the interventions have to do with the dispersion of particles by the wind, causing atmospheric dust, and also the occasional burning of waste by the population of the surrounding neighborhoods, due to the lack of containers. During visits to the field and surveys, it was found that waste is mostly buried or thrown on the ground indiscriminately by the population rather than burned.

5.2.2 Water Quality

There is currently no monitoring network for the quantity and quality of groundwater in Angola. With regard to surface water quality, there is also no real network of water quality stations in Angola. There are only a few places where water quality sampling is carried out on a regular basis, such as water abstractions for public supply, reservoir monitoring systems, in some particular cases of public interest.

The rainfall recorded during the rainy season in the Municipality of Saurimo favors the spread of diseases, through the runoff and infiltration of rainwater. Despite the low gradient of the areas where the canals are located, runoff promotes the dispersal of bacteria accumulated on the surface during the dry season and drags residual liquids and solids, polluting the rivers and threatening the health of people and ecosystems. Rainwater infiltration also replenishes groundwater levels (shallow aquifers), causing direct contamination.

The water is potentially used without any kind of treatment by the inhabitants of the villages of Capuepua and Muambulo and Bairro Pelengue, which are the settlements closest to the canals that will be rehabilitated. These inhabitants are not aware of the microbiological risks involved in consuming untreated water, which can lead to water-related health problems.

In the Pelengue neighborhood (1 and 2) the water used is mainly obtained from public fountains, while in Muambulo Village and Capuepua Village there are no fountains and the water is collected

directly from the Tamba River or from cacimbas for different uses: personal hygiene, food preparation, irrigation of crops other activities.

5.2.3 Sound Environment

Noise in the region is influenced by land use and occupation activities which, in the context of this Subproject, as it is a rural area, do not have noise sources such as industrial facilities, construction sites, aircraft (from the airport) and places with large crowds of people (markets, public services/administrative buildings, churches, schools, hospitals, etc.).

In the case of the Pelengue Canal there is a proximity and intersection of the canal with a national road where road traffic generates some noise and there is also the use of generators

In the case of the Pelengue canal, the area is more isolated, far from the national road and there is no noise interference from generators.

In Angola there are no noise standards or guidelines for monitoring and assessing noise pollution.

This project should take into account the sound values (LAeq) stipulated by the WHO, in which the nuisance threshold for continuous daytime noise should be less than 55 dB(A) and during the night, sound levels should be between 5 and 10 dB below the daytime values, to ensure a balanced sound environment.

5.2.4 Waste

With regard to the disposal of solid waste in the neighborhoods and villages near the canals, there are no appropriate places (buckets) for the disposal of waste. There are no waste collection services provided.

The subproject's areas of intervention are not covered by waste collection and management programs or services carried out by the Saurimo Municipal Administration or by private companies. There is no community dump or containers for the waste produced by the community. According to the households surveyed, it was possible to ascertain that there is no waste management, which leads them to adopt practices generally include burying waste in holes made near their homes (67%) or disposing of it indiscriminately in the woods (33%) (Fig. 10).



Figure10 - Type of waste disposal in Pelengue 2: buried in holes

The lack of waste management means that soils and water lines are the usual places where people dispose of their waste. This situation contributes to the proliferation of diseases, both through direct contact and because it is the preferred environment for the development of disease-transmitting animals such as rats and mosquitoes.

5.3 Ecological Environment

5.3.1 Biomes, Ecoregions, Habitats and Ecological Systems

Angola has an extraordinarily wide range of biomes and ecosystems, associated with the diversity of climates and physiography of the territory. There are a total of seven (7) biomes (Fig. 11-A) and fifteen (15) ecoregions (Huntley, 2023), making Angola the African country with the largest number of biomes and the second largest number of ecoregions (Fig. 11-B).

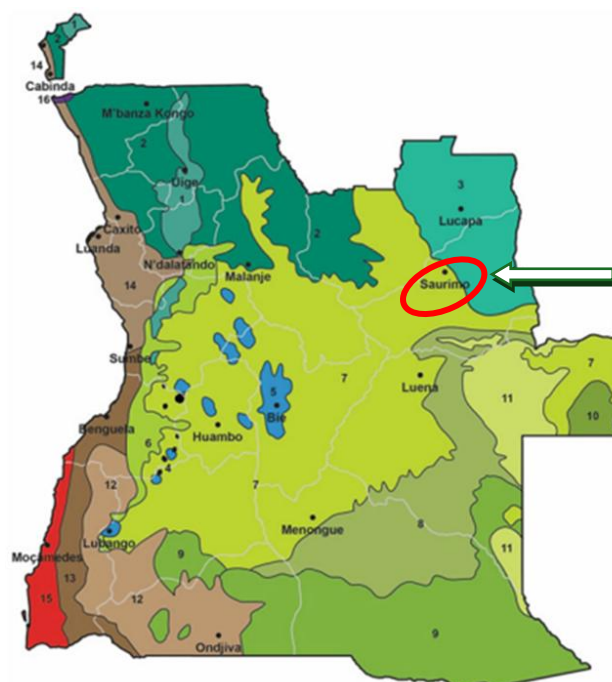
Angola's biomes and mosaics comprise the following zones: Guinea-Congolese tropical forest (I); Afromontane forests and grasslands (II); Mesic savannah (III); Arid savannah (IV); Desert (V); Mangroves (VI) and Guinea-Congolese tropical forest/Mesic savannah transition mosaic (VII) (Fig. 10).

The project implementation area, where the canals are located, falls mainly within the Mixed Savannah, Forest and Grassland Biome, with another part (northeast) falling within the Transitional Mosaic between Guineo-Congolese Tropical Humid Forest and Mesic Savannah. This area includes Angola's Miombo wet forest ecoregion, dominated by the genera *Brachystegia* and *Julbernardia*, and the southern Congolese forest and/or savannah mosaic. This area includes Angola's humid Miombo woodland ecoregion, dominated by the *Brachystegia* and *Julbernardia* genera, and the southern Congolese forest and/or savannah mosaic.

A - Biomas de Angola



B – Ecorregiões de Angola



Fonte:
Huntley (2023)

Figure11 - Angola's Biomes, Ecoregions and Habitats

Caption:

4-A. Angola's biomes

- I - Guinea-Congolese rainforest
- II - Afro-mountain forests and meadows
- III - Mesic savannah
- IV - Arid savannah
- V - Desert
- VI - Mangroves
- VII(F/S) - Guinea-Congolese tropical forest/Mesic savannah transition mosaic

4-B. Ecoregions of Angola

- 1 - Congolese rainforest
- 2 - Forest mosaic/western congoles savannah
- 3 - Forest mosaic/savannah of southern Congo
- 4 - Afromontane forest
- 5 - Mountain grasslands
- 6 - Savannahs of the Angolan escarpment -
- 7 - Angola's miombo wet forest
- 9 - Angola's dry miombo forests
- 10 - Zambebian dry evergreen
- 11 - Zambebian flooded grasslands
- 12 - Angola's mopane forests
- 13 - Forests of the Namib savannah
- 14 - Coastal arid savannas
- 15 - Angola's Namib Desert

Cataloging the species that make up a given environment is fundamental for assessing the risks of the environmental impacts of the projects developed, in order to guarantee a balance between human activities and the natural environment. Biodiversity, represented by fauna and flora, performs fundamental processes of great importance, not only for the maintenance of life, but also for Angola's socio-economic development.

As part of the floristic and faunal characterization, particular emphasis was placed on the potential presence of species that are more relevant in terms of nature conservation and biodiversity, i.e. those that have a threatened status according to the IUCN or that are part of the categories on the Red List of Angolan Species, under the terms of Executive Decree 258/18, as well as those that are endemic and/or have a considered cultural, scientific and tourist value for the country. In this context, particular attention was also paid to any habitats that these species may be associated with.

Secondary and primary information on the flora and fauna of the study area - Saurimo Province, in the Municipality and Commune of Saurimo - was collected based on bibliographic consultations, data provided by the phytogeographic map of Angola and information on Angola's ecoregions mentioned by Huntley (2023), complemented by a daytime survey, carried out in October 2024, focused and rapid, with an assessment of the surrounding ecosystems and habitats, direct observation *in situ* and non-invasive active search using the method of linear transects, each 100m long, traveled in a zig-zag pattern, where sampling points were established in the area directly affected (Fig. 12), identifying the species of flora and fauna present. Informal questionnaires were also carried out in the communities of Bairro, 1 and 2, Pelengue - Pelengue Canal and in the villages of Capuepua and Muambulo - Capuepua Canal.

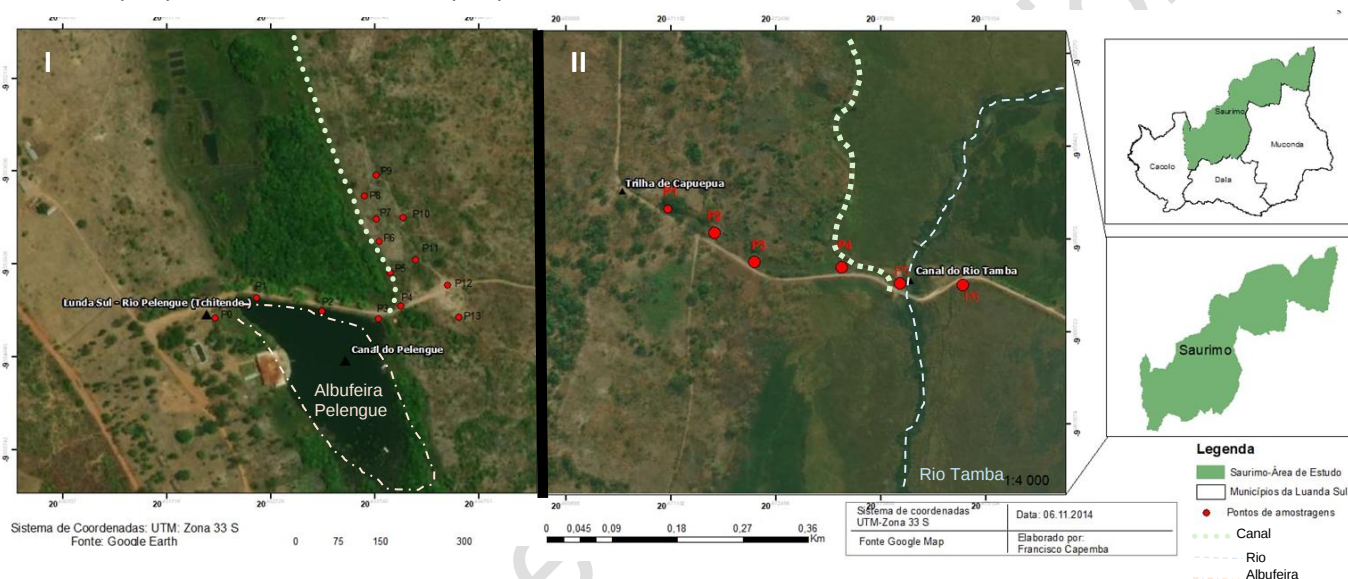


Figure 12 - Survey carried out in the Canals area: to be rehabilitated - October 2024.

The red dots are the sampling sites for local biodiversity, flora and fauna.

I - Pelengue Canal | Sampling near the Pelengue Reservoir, beginning south of the canal rehabilitation area, upstream of the Luachimo River and the Pelengue 1 and 2 neighborhoods

II - Capuepua Canal | Sampling along the Tamba River, beginning south of the canal rehabilitation area

Angola has an extremely rich fauna, with more than 280 dragonflies, 792 butterflies, 117 amphibians, 278 reptiles, 940 birds and 291 native mammal species (Huntley et al, 2019).

Assessing the fauna that occurs in an area is a fundamental parameter for evaluating what damage projects may cause to biodiversity in the short, medium and long term.

The main groups of fauna that are environmental indicators for the project in question are: terrestrial invertebrates of the Order Odonata and Orthoptera (dragonflies and grasshoppers), herpetofauna (reptiles and amphibians), avifauna (birds), mastofauna (mammals), freshwater ichthyofauna of the Luachimo River and Tamba River.

The results of the habitat, flora and fauna sampling are described below.

5.3.2 Flora and Fauna

➤ Flora and Vegetation

More broadly, the area covering the **Pelengue channel** and the **Capuepua channel** belongs to the Dense Humid Forest Mosaic vegetation type; woodlands and savannahs, where the species *Brachystegia spiciformis* occurs in varying densities and robustness according to the soil characteristics. *Julbernardia paniculata* is also widespread in the miombo of the area, along with the genera *Burkea*, *Cryptosepalum*, *Guibourtia* and *Pterocarpus*.

ANNEX 3 shows the main botanical groups in the project area.

• Pelengue Channel - Flora and Vegetation

This area of wet miombo is a mosaic of woodland (Fig.13 - Pelengue Channel), savannah and grassland, with a more or less continuous herbaceous cover, always of grasses even under thin forest cover. The shrubs and small trees in this miombo include *Diplorhynchus condylocarpon*, *Baphia massaiensis* and *Copaifera baumiana*.

On the margins of the meadows along the drainage lines, species of *Monotes*, *Protea* and *Uapaca* occur as low trees. This region also includes vegetation known as rubber chanas, characterized by the presence of the species *Landolphia parvifolia*. It is described as consisting mainly of sufrutesscent formations (plants with a woody stem only at the base and more herbaceous in the rest), rhizomatous (plants with an underground stem) and balcedos (creeping and shrubby plant formations usually on poor soils and in open areas) sometimes with herbaceous savannas. For the specific study area, these rubber chanas tend to have a different habit in terms of the size of the species, being more of a climbing type, but they can still include trees and shrubs.



Figure 13 - Main environments, vegetation aspects, of the Miombo woodland in the project area, near the Pelengue Canal.

The vegetation in the Pelengue canal area alternates between woodland savannah (Fig. 14) and shrub savannah communities with woody elements, and in some flatter areas these tend to be pseudo-steppe communities, i.e. grasses with small shrubs and spaced trees. On the slopes leading down to the watercourses, there is a dense concentration of shrubs and trees, sometimes referred to as woodland savannah.



Figure14 - Woodland savannah vegetation in the Pelengue Canal area.

The flora identified in the project area are shrubs, trees and even vines, namely: *Bambusa vulgaris*, *Paropsia brazzaena*, *Smilax anceps*, *Terminalia macroptera*, *Gardenia imperialis*, *Pterocarpus angolensis*, *Syzygium guineense*, *Syzygium cordatum* and *Cissus erosa*.

Of these species, only *Pterocarpus angolensis* (Fig. 15-F) has its conservation status assessed for Angola. According to Angola's Red List of Threatened Species (LVEA), this species is in vulnerable status, i.e. it faces a high risk of extinction, thus indicating that this species has suffered significant threats such as habitat loss and over-exploitation for commercial purposes, such as charcoal production.

The species *Erythrophleum africanum*, *Combretum laxiflorum*, *Combretum collinum*, *Diplorhynchus condylocarpon*, *Hymenocardia acida*, *Pteleopsis diptera* and *Psorospermum febrifugum* are also part of the area's vegetation. The floristic list of this vegetation, in addition to the shrub species mentioned, describes the frequency of *Guibourtia coleosperma*, *Burkea africana*, *Pterocarpus angolensis*, *Terminalia sericea*, *Terminalia brachystema* and *Protea* sp.

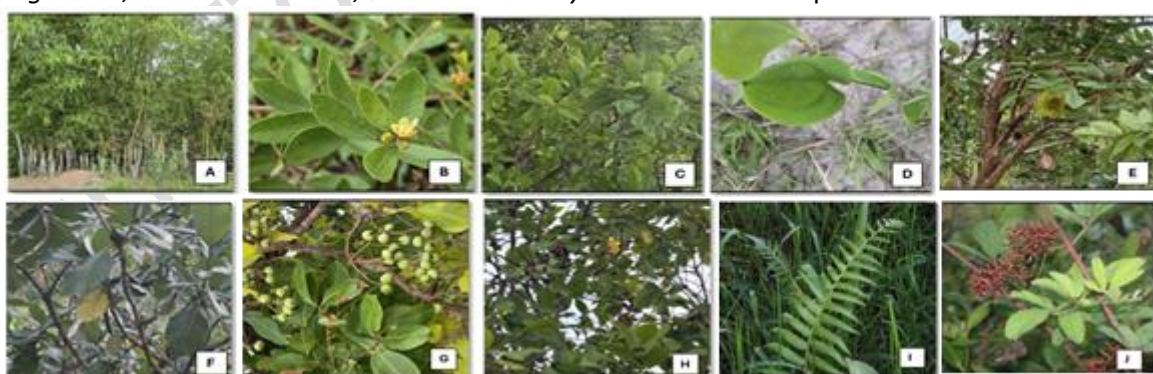


Figure15 - Vegetation recorded near the Pelengue canal (ADA and AID).

Bambusa vulgaris (A), *Paropsia brazzaena* (B), *Smilax anceps* (C), *Terminalia macroptera* (D), *Pterocarpus angolensis* (E) and *Gardenia imperialis* (F), *Syzygium guineense* (G), *Syzygium cordatum* (H), *Samambaia* (I) and *Cissus erosa* (J).

- **Capuepua Channel - flora and vegetation**

The area of the Capuepua canal contains lagoon-type environments, shrub forests, mixed savannah and lagoon plains (Fig.9). Environments rich in plant biodiversity with aquatic plant species, tall grasses, shrub and tree species, where shrub species are dominant and the most abundant aquatic species of local flora is *Crinum harmsii* (Fig. 16 - E), which is abundantly distributed in the project area, mainly in areas with large volumes of water or on the banks of the Tamba River (figure 5).

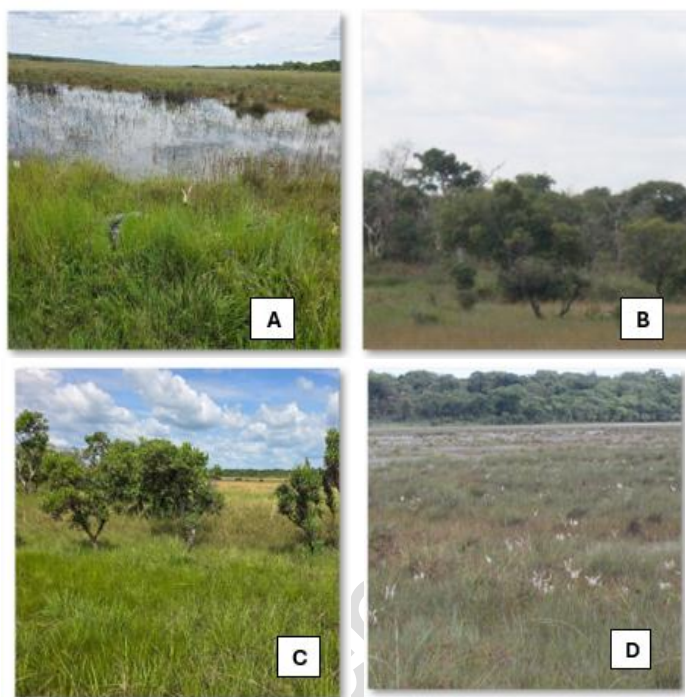


Figure16 - Main environments present in the Capuepua canal area.

Lagoons (A); Shrub forests (B); Mixed savannah (C) and *Crinum harmsii* lagoon plain (D)

The most abundant families present in the environment are: Fabaceae, Arecaceae, Malvaceae and Rubiaceae. During the direct surveys it was possible to record terrestrial species such as: *Crinum harmsii* ., *Strychnos madagascariensis*, *Cyperus alternifolius*, *Psorospermum febrifugum*, *Marprounea africana*, *Gardenia jovis-tonants* and *Pteris tremula* (Fig. 17).

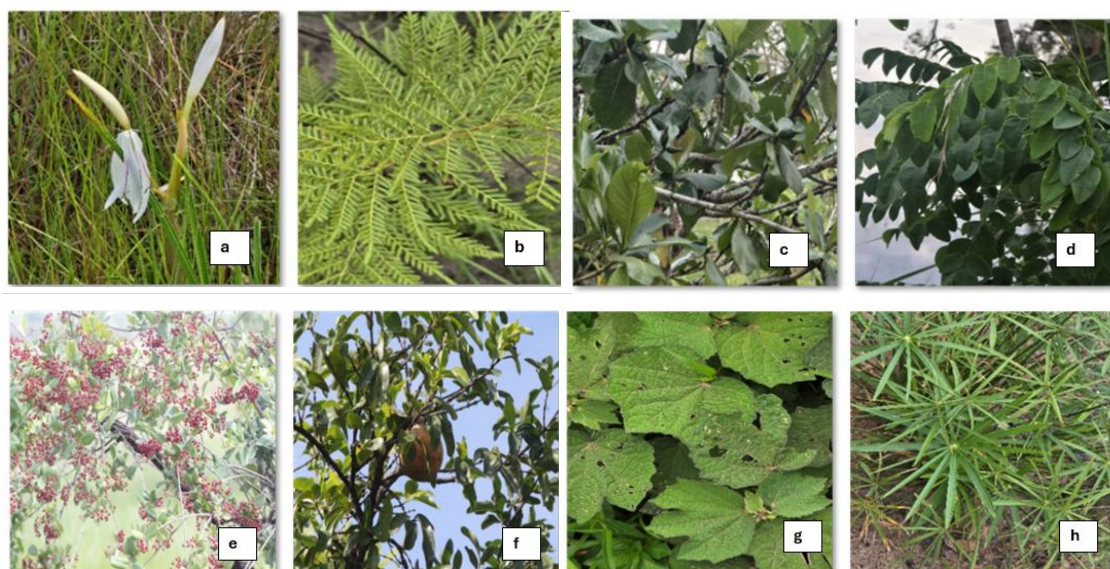


Figure17 - Terrestrial vegetation present and recorded in the Capuepua Canal area.

(a) *Crinum harmsii*; (b), *Pteris sp.*; (c) and *Gardenia jovis-tonants*; (d). *Marprounea africana*; (e) *Psorospermum febrifugum*; (f) *Strychnos madagascariensis*; (g) *Urena lobata* and (h) *Cyperus alternifolius*

• Fauna

Angola has an extremely rich fauna, with more than 280 dragonflies, 792 butterflies, 117 amphibians, 278 reptiles, 940 birds and 291 native mammal species (Huntley et al, 2019).

The main faunal groups considered as environmental indicators in this project were: terrestrial invertebrates - dragonflies and grasshoppers (Order Odonata and Orthoptera), herpetofauna - reptiles and amphibians, avifauna - birds, mastofauna - mammals and freshwater ichthyofauna - fish.

The description of the fauna in the region of Lunda Sul province, where the Pelengue Canal and the Capuepua Canal are located, was based on bibliographic data, complemented by some photographic records collected during the field surveys.

ANNEX 4 shows the main fauna groups in the project area.

- Terrestrial Invertebrates

In the project region, 126 species of terrestrial invertebrates have been described, mostly dragonflies (Order Odonata) and grasshoppers (Order Orthoptera) (Fig. 18). All these species have a conservation status of low concern (IUCN, 2020).



Figure18 - African locust (*Phymateus viridipes*) by the Pelengue Canal

- Avifauna

The avifauna is one of the most important groups in terms of conservation within the Angolan fauna, as it represents the most abundant faunal group and contains one of the greatest diversities of endemic species in the country, making it a clade of great importance for conservation at all levels.

Around 190 species of birds have been identified in the project region, distributed in 16 orders and 52 families, making them the most abundant and diverse group in the project area (Huntley et al 2019; Pinto & Fernandes, 2020).

Of the total number of birds in the project area, around 169 are exclusively terrestrial and 23 have aquatic habits. The group of birds with the largest number of species is the birds (Order Passeriformes) with around 74 species indicated, followed by the eagles (Order Accipitriformes) with 23 species, the bee-eaters and woodpeckers (Coraciiformes) with 17 species, the herons (Order Pelicaniformes) with 10 species, and the falcons (Falconiformes) with 7 species.

Despite their enormous abundance, most of the birdlife indicated for the project area has a medium-low probability of occurrence, as there are anthropized areas that make it difficult to observe them more frequently. The conspicuous species in the project area are: Cormorant (*Corvus albus*) (Fig. 19-I), guinea fowl (*Numida meleagris*) (Fig. 19 - II), African ducks (*Anas* spp.), herons (*Egretta garzetta*), swallows (Hirundinidae family) and common birds (*Passer* sp.).



Figure19 - Avifauna of the project area, near the Pelengue Canal.

(I) Cormorant (*Corvus albus*) and (II) - guinea fowl (*Numida meleagris*)

Most of the species in the project area are considered to be of low concern based on the IUCN assessment. Only one (1) species is in Danger of conservation (EN), which is the Secretary (*Sagittarius serpentarius*), but the project is not considered to be of great concern for impacts on this bird, as it is estimated to be a species of low occurrence in the project area.

According to the Red List of Angolan Species (LVEA), around 3 species of birds that may occur in the project area have been identified as threatened and vulnerable to extinction: the Angolan lark (*Mirafra angolensis*), considered to be of medium occurrence; the Grimwood sentinel (*Macronyx grimwoodi*), considered to be of high occurrence; and the chiricuata (*Phyllastrephus cabanisi*), considered to be of high occurrence in the area. With regard to endemism, two of the bird species indicated for the project area are endemic (*Mirafra angolensis* and *Macronyx grimwoodi*), and 1 species indicated is almost endemic (*Phyllastrephus cabanisi*).

- Herpetofauna: Amphibians and Reptiles

Around 27 species of **amphibians** are indicated for the project area, all of which belong to the Order Anura (frogs and toads), distributed in 8 families, the most abundant in species being the families Ptychadenidae (with 11 species), Bufonidae (with 5 species), Hyperoliidae and Arthroleptidae (each with 3 species) (Marques et al, 2018).

Due to the types of habitats that characterize the project area, such as rivers, lakes, lagoons and also the Pelengue reservoir area, all amphibian species have a high probability of occurrence, as these are areas where these animals occur, especially the species endemic to Angola, such as theanchieta tree frog (*Leptopelis anchietae*), theangola river frog (*Amietia angolensis*), and a species considered almost endemic, the lemaire white-lipped frog (*Amnirana lemairei*).

During the field surveys, it was possible to record two species of amphibians that occur in the ADA (directly affected area) of the Pelengue Canal, namely: the black toad (*Sclerophrys funerea*) and the lemaire white-lipped frog (*Amnirana lemairei*) (Figure 20).

It should be noted that amphibians are important in maintaining environmental balance, as they are both prey and predators of various other creatures (such as lizards and snakes), participating in a large number of food chains. A large number of insects (flies, grasshoppers, mosquitoes), including agricultural pests, are eaten by various amphibians, making them eliminators of pests and mitigators of disease vectors for humans. The conservation of these species during the implementation of projects in areas where they occur is a necessary action for the environmental sustainability of the project.



Figure20 - Amphibians in the project area, present near the Pelengue Canal.

(I) Dark toad (*Sclerophrys funerea*) and (II) - Lemaire's white-lipped frog (*Amnirana lemairei*)

Angola has a vast diversity of **reptiles** due to the diversity of biomes, ecoregions and climatological aspects inherent to the national territory. Recent work on Angolan herpetofauna (Ceríaco et al, 2016; Baptista et al, 2019; Branch et al, 2021) estimates that there are more than 300 species of reptiles in Angola, of which more than 30 are endemic (i.e. they only exist in Angola), representing a great diversity of these animals.

The country is home to representatives of 3 of the 4 orders of reptiles living today (Chelonia, Squamata and Crocodylia), and is one of the countries with the most reptiles in Africa, behind South Africa, Tanzania and the Democratic Republic of Congo (Marques et al, 2018).

44 species of reptiles have been identified for the project region, including 3 species of terrestrial and freshwater turtles (Order Chelonia), 1 species of crocodile (Order Crocodyla), 23 species of lizards (Order Squamata) and 17 species of snakes (Order Squamata).

Lizards and snakes are the most representative reptiles in the area, with approximately 40 species indicated, with lizards being the most expressive with 23 species (Marques et al, 2018).

The main families of lizards belonging to the suborder Sauria for the project areas are: Scincidae (with 6 species), Gerrhosauridae (with 4 species) and Agamidae and Lacertidae (each with 3 species). The most common genera for the project area are *Trachylepis* (Fig. 21), *Agama*, *Chamaeleo*, *Gerrhosaurus* and *Ichnotropis*, with 90% of the species in these genera having a high to moderate probability of occurrence, indicating that they are very common in the environments of the project implementation area.

No species of lizard is threatened according to the IUCN and the LVEA. In Angola, lizard hunting is illegal without a license, and these animals are classified in Category A of the hunting and sustainable management of wildlife regulations, which prohibits their capture and trade without authorization from the environmental authorities.



Figure21 - Painted lizard (*Trachylepis maculilabris*) from the project area, present near the Pelengue Channel.

With regard to chelonians (turtles), only three are indicated as occurring in the lakes, rivers and savannas of the project area, namely: Spek's Back Turtle (*Kinixys spekii*), the Articulated Bell's Back Turtle (*Kinixys belliana*), the Articulated Forest Turtle (*Kinixys erosa*) and the Variable Articulated Plastron Turtle (*Pelusios rhodesianus*).

Only crocodiles can be found in Angola, of which there are three species: the Nile Crocodile (*Crocodylus niloticus*), which is widely distributed in the country, the Thin-nosed Crocodile (*Mecistops cataphractus*) and the African Crocodile (*Osteolaemus tetraspis*), which occurs in the Congo Basin.

For the project area, the slender-nosed crocodile is indicated as likely to occur (Huntley et al, 2019), mainly due to the connection of the canal to the north of the Chicapa River and to the south with the Tamba River. Studies state that this animal can occur in agricultural areas close to marshes with large volumes of water (Shirley, 2014). The species is classified as low occurrence, although there is a strong indication of its presence in rivers and lakes in the project area. The IUCN considers it Critically Endangered (CR), and in Angola it is classified as Vulnerable to Extinction. The main threats include hunting for fur and meat, habitat loss and overfishing, as it feeds mainly on fish.

The group of snakes (Suborder Ophidia) in the project area includes five families: Colubridae, Lamprophiidae, Typhlopidae and Viperidae.

The most iconic species that can be found in the project area is the African python (*Python sebae*), a snake that can reach around 6 to 8 meters in length, and is considered the largest in Africa. This species is classified as near threatened by the IUCN and CITES. It is very threatened by poaching and habitat loss.

There are species in the study area that are venomous and dangerous to humans (poisonous snakes), especially the following: *Naja anchietae* (anchieta snake), *Bitis arietans* (surucucu), *Dispholidus typus* (spotted green snake) and *Limnophis bicolor* (striped swamp snake). These snakes

are involved in many cases of snakebite, especially the *Bitis arietans* (surucucu), which reinforces the need to make efforts to mitigate these accidents.

In terms of conservation, all the snakes listed for the project area are protected by CITES-LEA in Category A (Annex 4), which means that they are prohibited from being hunted and traded without the appropriate permits from the environmental authorities.

- Masofauna (Mammals)

Matofauna represent one of the main groups of fauna used as environmental indicators in the areas where they occur. Around 291 species of mammals have been described for Angola, 12 of which are endemic.

During the field survey phase, no wild mammal species were observed in all areas of the study zone, however, the community of Muambulo, a village near the Tamba River - Capuepua Channel, presented hunting tokens, including the horns of the sitatunga (*Tragelaphus speki*) (Fig. 22).



Figure22 - Hunting trophy: sitatunga horns (*Tragelaphus speki*) presented by the Muambulo Village community, next to the Capuepua Canal.

As these are anthropized areas, it was possible to observe domesticated mammals that inhabit the region, including those used in farming, such as cattle, pigs and goats.

Based on surveys carried out in the project area by other authors, around 11 Orders and 28 Families of wild mammals are indicated as occurring in the project areas. The main mammal orders are: Rodentia (with 22 species), Carnivora (with 18 species); Cetartiodactyla (with 11 species); Chiroptera (10 species).

In the project area, a near-endemic species, the Angolan genet (*Genetta angolensis*), and two endemic species: the Anchieta bat (*Plerotes anchietae*) and the Anchieta swamp rat (*Otomys anchietae*), have been identified in bibliographic records. In terms of conservation, the leopard (*Panthera pardus*) and hippopotamus (*Hippopotamus amphibius*) are classified as vulnerable, while the Cape otter (*Aonyx capensis*) is considered near threatened. The yellow-garou goat (*Cephalophus silvicultor*) and the quissema (*Kobus ellipsiprymnus defassa*) are also listed as near threatened. The white-bellied pangolin (*Phataginus tricuspis*) is classified as vulnerable and is listed in Appendix I of CITES.

- Freshwater Ichthyofauna (Fish)

As for the fish fauna, as the project area is part of the Congo basin, the Cassai River is one of the main watercourses in the region, and its tributaries are the Chicapa River and the Tamba River which will supply water to the Pelengue Canal and the Capuepua Canal, respectively, once they have been rehabilitated.

The ichthyofauna described for the project area includes that found in all the tributary streams of the Cassai River.

Around 151 species of fish have been indicated as occurring in the project areas, distributed taxonomically in 10 Orders and 19 Families, which indicates a considered abundance of fish biodiversity. The main groups of the local ichthyofauna are Cypriniformes (with 42 species), followed by Siluriformes (with 35 species), Osteoglossiformes (with 23 species), Characiformes (with 20 species) and Perciformes (with 14 species). These groups are indicated as the main and most common in all Angolan rivers and lakes, especially the Siluriformes (catfish), Cypriniformes (barbs and carps) and the Perciformes (tilapias or cacussos).

The most significant genera of local ichthyofauna in the project area are: Enteromius (with 23 species); Labeo (with 16 species) and Clarias (with 10 species). These groups represent around 33% of all fish in the area with a total of 49 species (Huntley et al, 2019).

Resources from the local ichthyofauna are one of the main means of subsistence for the communities, and the conservation of the aquatic ecosystems in the project area is crucial for the sustainability and food security of these communities. Fig. 23 shows some examples of the variety of fish caught by the community in the villages near the project area.

I - Albufeira Tchitende | Canal Pelengue



II - Rio Tamba | Canal Capuepua



Figure23 - Ichthyofauna present in the project areas.

I-1 Striped tilapia (*Tilapia sparrmanii*); **I-2** Lumpfish (*Parauchenoglanis ngamensis*)

II-1 Cacusso (*Tilapia* sp.); **II-2** Bagre (*Clarias* sp.)

The endemic species indicated for the project area are: *Marcusenius cuangoanus* (cuango-markuskala); *Marcusenius dundoensis* (Dundo elephant fish); *Enteromius ansorgii* (Angolan barbel); *Enteromius petchkovski* (Sese); *Distichodus fasciolatus* (tshisakamamba); *Dundocharax bidentatus* (dundokala); *Zaireichthys dora* (Chobe sand catfish); *Phractura macrura* (katende); *Platyclarias machadoi* (Cuango catfish); *Euchilichthys royauxi* (Cuango head-down catfish); *Atopochilus macrocephalus* (Cuango inverted catfish) (Huntley et al, 2019). In terms of near-endemic species, the following have been recorded: *Parakneria vilhenae* (kasutunguna); *Marcusenius angolensis* (ndembe-de-Angola) and *Campylomormyrus cassaiicus* (Cassai elephant fish).

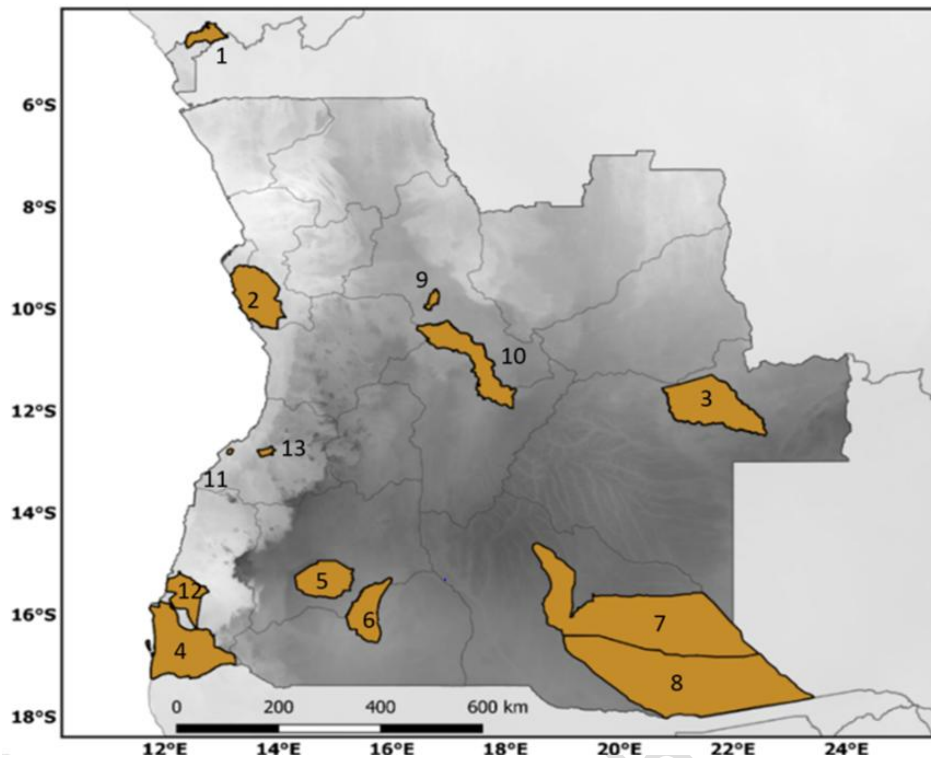
In the analysis of the ichthyofauna, two species are classified as vulnerable, *Marcusenius cuangoanus* (Markuskala cuango) and *Oreochromis macrochir* (Green-headed tilapia). The other species are considered to be out of conservation danger or not evaluated. According to the LVEA, all tilapia are seen as potential invaders and could threaten habitats and biodiversity. Although there are no fish species listed in the CITES appendices in the project area, all the species present are classified in Category B in the CITES-LEA at national level. All species have a medium-high probability of occurrence in the rivers and lakes of the Cassai Basin region.

5.3.3 Conservation Areas

According to the Law on Environmental Conservation Areas (Law no. 12/21 of May 7), a Conservation Area (Fig. 24) is a geographical area of national territory with relevant natural characteristics, defined, delimited and protected by law, whose function is to ensure the long-term conservation of the natural and cultural heritage, as well as the associated ecosystem services.

According to the National System of Conservation Areas (SNAC), drawn up by the National Institute of Biodiversity and Conservation (INBC) of the Ministry of the Environment (MINAMB), there are no legally established conservation areas in the province of Lunda-sul.

The environmental conservation area closest to the project area is the Cameia National Park, located in the province of Moxico. This park is approximately 300 km from the project area, so the activities carried out in implementing the project will not have a negative impact on the conservation unit, as the minimum threshold for considering an impact on conservation areas is 5 km (IUCN, 2020).



Nota: foram utilizados para o parque de Mavinga os limites das antigas reservas de caça, correspondentes ao actual limite. 1- Maiombe; 2 - Quiçama; 3-Cameia; 4 - Iona; 5 - Bicular; 6 - Mupa; 7 - Mavinga; 8 - Luengue-Luiana; 9 - Cangandala; 10 - Luando; 11 - Búfalo; 12 - Namibe; 13 - Chimalavera.

Figure24 - Terrestrial conservation areas.

5.4 Human Environment

5.4.1 Land Use

Land use in the rural environment of the municipality and commune of Saurimo, where the canals to be rehabilitated are located, is diverse and reflects the socio-economic and ecological characteristics of the region.

Agriculture is a predominant activity, with areas dedicated to subsistence cultivation - family farming, predominantly cassava, but also other crops such as corn, beans, eggplants, tomatoes, potatoes and other vegetables. Through agriculture, the inhabitants use the land to support their families and, in many cases, also for the informal marketing of products on the side of the national road (EN 180), in the rural areas surrounding the city of Saurimo or delivered by farmers to intermediaries to be resold in markets and stores in the city of Saurimo.

In the rural areas of Saurimo, in Bairro Pelengue (1 and 2) - Canal de Pelengue and in Aldeia de Muambulo and Aldeia de Capuepua - Canal de Capuepua, land use is mainly characterized by traditional agricultural practices, where local communities cultivate small plots of land that are often worked in a rotation system. This method helps to maintain soil fertility and crop diversification.

Another important component of land use is livestock farming, which involves areas used for grazing cattle, complementing the local diet and the family economy.

Miombo woodlands cover a large part of the land in rural areas and are crucial for both biodiversity and the livelihoods of local communities, providing wood, food and other resources.

At the same time, urbanization in Saurimo has been growing, especially in the central areas, where services, commerce and infrastructure are concentrated. This transformation implies the conversion of rural areas into urban ones. In addition, the region has significant mineral activity, especially the exploitation of precious stones such as diamonds, which has an impact on land use, altering the landscape and land use.

Finally, there are conservation initiatives aimed at preserving environmental areas and raising awareness among the population about the importance of sustainability in the use of natural resources. These factors together shape land use in Saurimo, reflecting the interactions between human practices and the environment in the region.

5.4.2 Landscape

In general, the increase in population combined with the socio-economic characteristics of the region's peoples has, over the years, left its mark on the landscape, which has been strongly affected by agricultural practices near the region's main watercourses, as well as by deep-rooted pastoralism among the Cokwe, the region's main group, among other ethnic groups: Lundas, Minungos, Bangalas and the Xinges.

The canals are within the Cassai Basin where major rivers such as the Luachimo - Pelengue Canal and other tributaries such as the Tamba - Capuepua River contribute to irrigation and agriculture.

The tropical climate, with dry and rainy seasons, favors the growth of vegetation. At the site of the canals, the vegetation is mainly herbaceous and shrubby, with some cornfields in the surrounding area. It is a rural intervened landscape unit in which communities interact with natural elements.

The region is marked by flat areas and low hills, where the soils are generally fertile, favoring agriculture.

5.4.3 Socio-economic aspects

5.4.3.1 Demographics

From an administrative point of view, the province of Lunda Sul is divided into 4 municipalities that are home to 14 communes, namely: Saurimo, Cacolo, Dala and Muconda.

This province, located in the south of the country, has a territorial size of 77,367 km². It is bordered to the north by the province of Lunda Norte, to the south by the province of Moxico, to the west by the provinces of Malange and Bié and to the east by the Democratic Republic of Congo.

According to data from the General Population and Housing Census (INE, 2016a), Lunda Sul is one of the provinces with the lowest population density in the country. The population projection indicates that, in 2024, this province will have a population density of 732,600 inhabitants, 19.4% of whom live in rural areas (INE, 2016b). In terms of gender distribution, the number of women is slightly higher than that of men, with 368,261 women (50.2%) and 364,339 men (49.8%) in the province Fig.25).

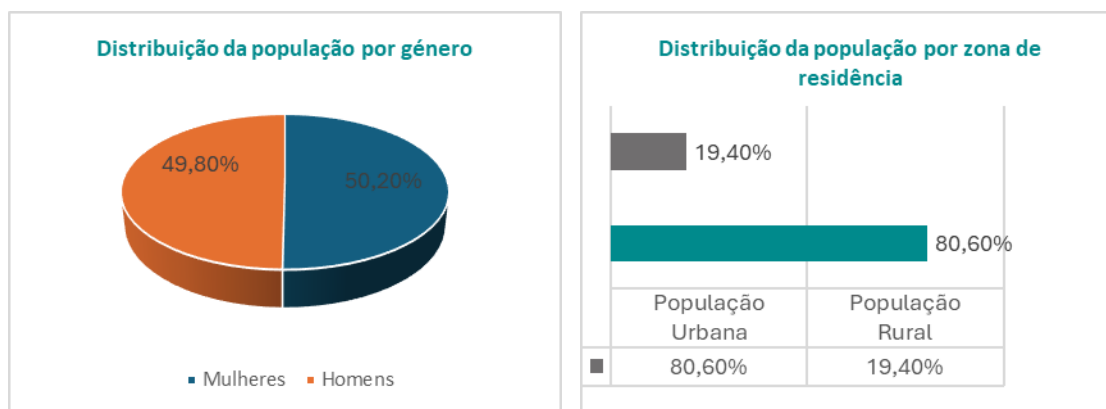


Figure25 - Distribution of the provincial population by gender and area of residence

The population of Lunda Sul province is quite young, with a median age of 17. The population aged 0 - 29 is 527,852 people (with a slight gender difference, 51.2% are women and 49.8% are men), which is equivalent to 72% of the total resident population. The gap between young and old is huge, with only 2.5% of the population aged 65 or over, 9,340 men and 9,091 women (INE, 2016b).

The working-age population (15-64 year olds) is 395,402 (representing 53.9% of the province's population), of which 196,081 are men (49.5%) and 199,321 are women (50.5%).

Saurimo

The municipality of Saurimo is the capital of the province of Lunda Sul. It has a territorial extension of 23,327 km². It is administratively divided into three communes (Mona Quimbundo, Saurimo and Sombo) and is bordered to the north by Lucapa (a municipality in the province of Lunda Norte), to the south by the municipality of Dala, to the west by the municipality of Cacolo and to the east by the municipality of Muconda.

As the provincial capital, the municipality of Saurimo is the most populous, concentrating 82.3% of the province's total population. The other municipalities are home to the remaining 17.7% of the province's population: Muconda with 6.2%, Cacolo with 5.9% and Dala with 5.6% (Fig. 26).

The municipality of Saurimo has the same gender configuration as the province of Lunda Sul, i.e. although with a very slight difference, women make up the majority of the population, representing 50.5% of the inhabitants. Men make up the remaining 49.5%.

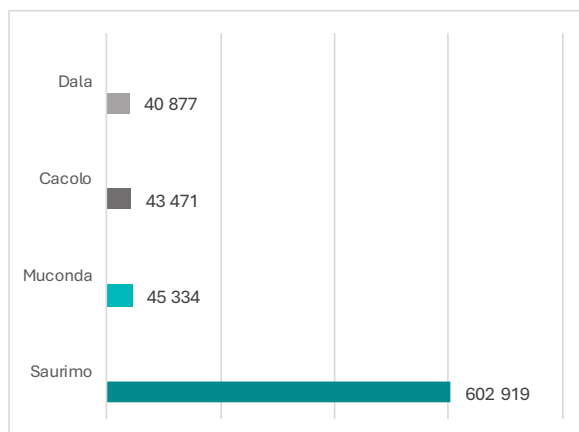


Figure26 - Inhabitants of the municipalities in the province of Lunda Sul

Every square kilometer in the province of Lunda Sul is home to 6 inhabitants. The municipality of Saurimo has the highest population density in the province with 17 inhabitants per square kilometer. Households are mainly made up of 7 individuals on average.

This high population density in Saurimo, as in the country's main cities, is mainly due to the unequal levels of development and opportunities in the cities compared to other towns in the province. Saurimo offers greater opportunities for employment, survival and well-being, making it a center of attraction for individuals belonging to the various ethnic communities in the province.

Saurimo, as the administrative seat of Lunda Sul, is home to the Provincial Government, Provincial Delegations of the different Ministries, Regional Directorates of Public Companies and also the province's main support infrastructures (schools, secondary institutes, universities, reference hospitals, etc.). It is mainly home to the province's middle and upper classes. The city is crossed by a number of major overland communication routes, such as the EN-180 and EN-230 national roads, which brings even more activity and gives it some economic dynamism.

The urban configuration of the Municipality of Saurimo follows two characteristics common to other provinces in the country, where you can find an urban area, which is undergoing rapid development and expansion (accompanied by a peri-urban area) and a rural area.

The urban area of the municipality of Saurimo has a building pattern in line with the conventional modern urban model. The city has several old buildings in a deteriorated state due to poor maintenance. Its high population density and rapid urban growth have led to a strong imbalance between demand and supply and the distribution of adequate and safe housing.

From an ethnic and linguistic point of view, the population of the municipality of Saurimo is mostly of the Cokwe ethnic group. The other ethnic groups present are the Lundas, Minungos, Bangalas and Xinges. The predominant language is Cokwe .

As described above, the municipality of Saurimo is home to the implementation areas of *sub-project 1*. This sub-project, which aims to *rehabilitate climate-resistant small-scale irrigation canals*, has the following implementation areas: (i) the ***Pelengue canal***, which covers the villages of *Pelengue 1* and 2 and (ii) the ***Capuepua canal***, which covers the villages of *Capuepua* and *Muambulo*.

The following is a description of the areas where *sub-project 1* will be implemented, using as the main sources of information the data from the surveys carried out on a sample of the population and also the data collected during other visits to these communities.

➤ **Pelengue Channel**

The village of *Pelengue* is located in a rural area, 15 km north of the city of Saurimo. It is divided into two parts (*Pelengue 1* and *Pelengue 2*). The Pelengue canal serves as the dividing line between the two villages, 650 meters from Pelengue 1 and 340 meters from *Pelengue 2*.

These villages have a relatively low population density, with households made up of an average of 6 members and are mostly led by men.

From an organizational point of view, *Pelengue* villages 1 and 2 are characterized by precarious adobe buildings, with zinc sheeting or dry grass roofs, scattered throughout the neighbourhood and with no sanitary services (Fig. 27).



Figure27 - Housing typology, Pelengue 1

➤ Capuepua Channel

The Capuepua canal, which begins at the *Tamba* river, passes through the *Capuepua* and *Muambulo* villages.

Capuepua village is located in the rural area of Saurimo, 26 km southeast of the city. According to information shared by the local traditional leaders (soba and soba's secretary), the village consists of around 104 dwellings. The men generally head the households, which are made up of an average of 6 members.

The organizational structure of this village follows the pattern of rural areas, consisting of houses built, in general, of adobe, with roofs made of zinc sheets or dry grass and floors made of earth or cement.

The village of **Muambulo** is also located to the south-east of Saurimo, 32 km from the city. According to the traditional leaders, the village has around 113 dwellings and a population density of around 495 inhabitants. Men make up the majority of the population, with 149 inhabitants. There are 137 women and 209 children.

The results of the household survey carried out as part of the study in these villages in the implementation area of *sub-project 1* indicate that 97% of the dwellings used adobe as the main building material (Fig. 28 and Fig.29).

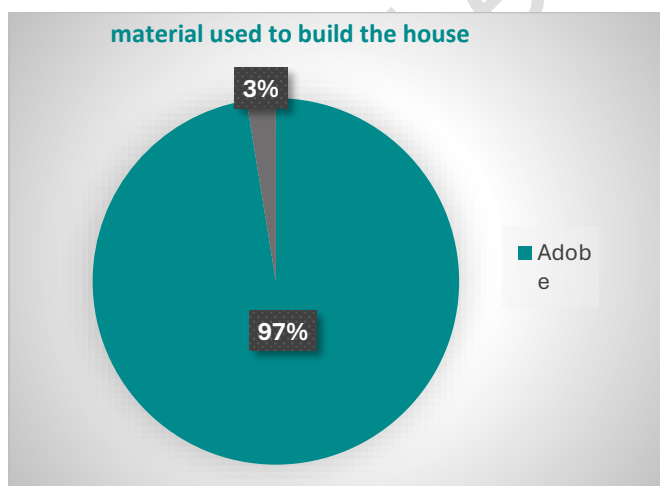


Figure28 - Material used to build the houses

During the field visits, it was also possible to see that most of the houses need some kind of repair (small or large) to make them safe and guarantee minimum living conditions.



Figure29 - Typology of housing in Capuepua

On the other hand, 95% of the respondents claimed to own their homes, 2% live in rented homes and 3% live in homes they neither own nor rent, as shown in the graph below (Fig. 30).

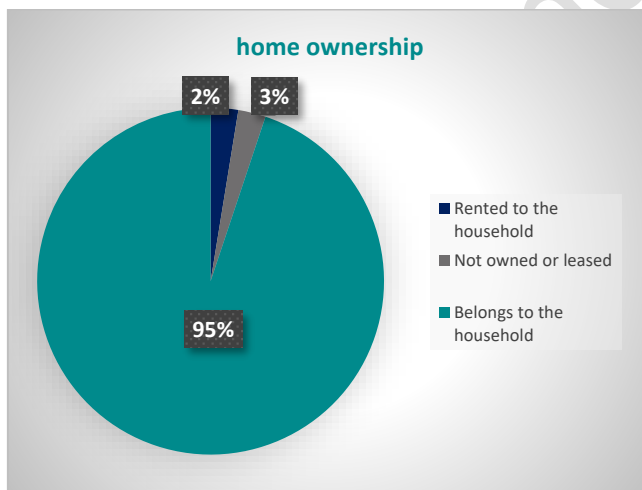


Figure30 - Home ownership

The villages in *sub-project 1*'s area of intervention have a traditional, locally established leadership structure, made up of sobas, sobetas, secretaries of the soba and/or zone coordinator. They do not have any public institutions, with the exception of a primary school in *Pelengue 1*. They have churches, especially Catholic and Seventh-day Adventist.

5.4.3.2 Gender and Vulnerabilities

As described, the province of Lunda Sul has a population density of around 732,600 inhabitants and the municipality of Saurimo absorbs 82% of the province's inhabitants. In terms of gender distribution, women make up the majority of the population, with around 368,261, while men account for 364,339 (Fig.31).

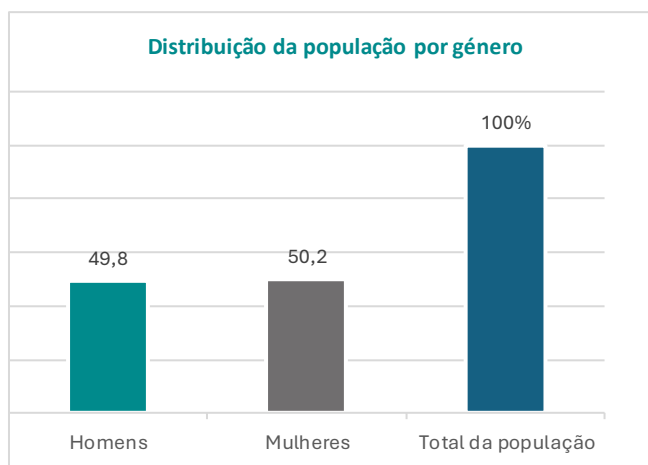


Figure31 - Distribution of the province's population by gender

In socio-economic terms, gender inequality is still significant, especially in terms of access to education, decision-making and employment. Women are still at a disadvantage compared to men in many aspects of social and human development. For example, women are more likely to be employed in lower-paid jobs or in the informal market.

According to the National Policy for Gender Equality and Equity (Presidential Decree No. 222/13 of December 24), there is a great disparity between men and women in terms of income, access to basic services (energy, water and sanitation), access to housing, land and credit and access to continuing education for a considerable number of women. This means that although women are a demographic majority, they are often a sociological minority, as they have limited access to resources, opportunities and public services and are in a position of vulnerability.

Vulnerable groups are understood here as those who are more likely to be negatively affected by the sub-project's actions, because of their gender, ethnicity, age, disability (physical or mental), financial capacity. Thus, vulnerable groups can include, among others, ethnic minorities, children, people with disabilities, the elderly, women.

According to the Anuário Estatístico da Educação 2021-2022 (INE, 2024), the province of Lunda Sul, with around 1,997 classrooms, is the fifth province with the lowest number of non-higher education

classrooms, with a total of 284,735 students enrolled. Taking gender as the axis of analysis, it can be seen that women have lower literacy rates. And in rural areas this rate is even worse.

In terms of employability, women are the ones who occupy the informal market in large numbers. According to the Gender Equality Diagnosis (2022), by the third quarter of 2021, the proportion of women in the informal market was around 4,792,114 people (90%), while men accounted for 3,847,051 people (72%).

5.4.3.3 Economic Activities

The province of Lunda Sul has a fairly young population, with a high number of people of working age. Around 54% of the population is of economically active age, i.e. between 15 and 65 years old. Despite its fairly young population, data from the Angolan Employment Survey (INE, 2023) shows that Lunda Sul is the province with the lowest employment rate⁵ in the country, at 36.1%. Huambo province has the highest employment rate, at 83.1% (Fig.32).

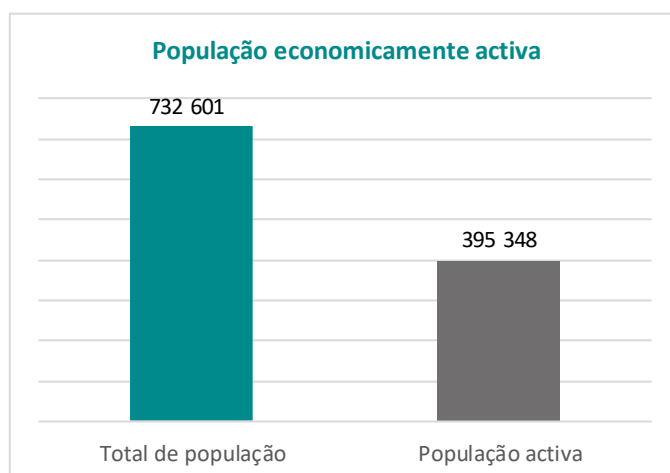


Figure32 - Economically active population in Lunda Sul

Meanwhile, the province has made significant progress in the agriculture, trade and services sectors.

In various regions of the province, agriculture is the main productive activity, followed by hunting and handicrafts. The main agricultural products that stand out are: rice, cassava, corn, avocado, pineapple, sweet potato, beans, cassava, mango, vegetables, among others.

⁵ The employment rate makes it possible to define the relationship between the employed population and the total working-age population.

The province has also made significant progress in industry and commerce. The Sociedade Mineira de Catoca, whose main activity is diamond mining, is an important industrial park. Formal commerce is carried out by a network of companies that operate mainly in the municipal centers.

In Saurimo, in the urban area, the population is dedicated to a multiplicity of activities, with an emphasis on commerce and services. The informal markets (called public squares) are an important source of income. In the rural area, farming and other activities related to the direct extraction of goods produced by nature, such as collecting firewood, predominate.

The household survey sought to ascertain the areas in which the heads of households work. The data indicates that in the areas where *sub-project 1* is being implemented, consisting of the villages of *Pelengue 1* and *2*, *Capuepua* and *Muambulo*, the economic activities practiced by the households are quite similar. Most families have agriculture as their main occupation and source of income. As can be seen in Fig. 33, 82% of the households surveyed practiced agriculture.

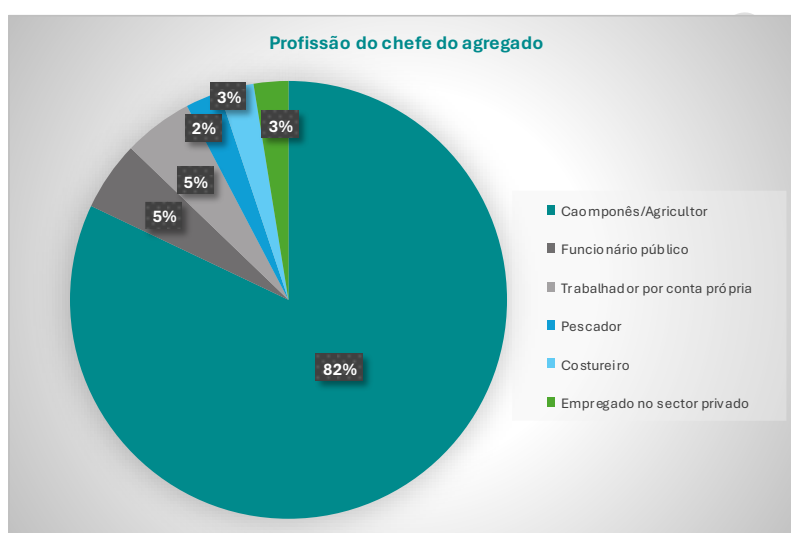


Figure33 - Profession of the head of household

During the field visits carried out as part of the study, the households also reported that, in addition to farming, they also fished and hunted. For hunting activities, the techniques and utensils used include burning, scabbards, traps, nets and shotguns (Fig.34).

The main products of these activities can be highlighted in agriculture: the production of manioc, potatoes, beans, maize, watermelon, cabbage; in fishing, the fish catfish and *tchequele* stand out; and in hunting: animals such as wild boar, forest goat, gazelle, gulungo.



Figure 34 - Tools used for hunting used by the Muambulo Village community.

Commercial activity also has some expression in the households of these localities. Generally, families sell surplus produce and game to traders who travel to their respective villages or, alternatively, to the Saurimo market to sell their products. The cost of traveling to Saurimo City (three-wheeled motorcycle cab) is around 1,000 kz per person and 1,000 kz for luggage.

It is important to note that a large part of the households in these areas practice rainfed agriculture and have very limited access to financial services, agricultural technologies, markets and irrigation systems. Thus, although they have fertile land available, they have very low levels of production and productivity.

5.4.3.4 Social Services

Access to education

As mentioned above, the province of Lunda Sul has around 1,997 classrooms in non-tertiary education and around 298,274 inhabitants are between 5 and 19 years old. In other words, around 40.7% of the inhabitants are old enough to attend non-higher education levels.

The literacy rate in the province of Lunda Sul is 55.8%, below the national average of 66%. The illiteracy rate is 44%, above the national average of 34.4% (Lopes *et al*, 2022).

In the areas where *sub-project 1* will be implemented, the situation is still quite challenging. There are few classrooms and many of them do not have suitable conditions.

In **Pelengue** village, for example, the local population has access to an elementary school, located within the *Pelengue 1* neighborhood, which teaches in the morning and afternoon. According to the survey data, 56% of the households questioned in this village reported that their highest academic level was basic education.

There is no school in **Capuepua**. Two classrooms have been adapted (in a church and in an old warehouse used in the colonial era for storing and preserving agricultural products). 72% of the households surveyed reported not having any level of schooling.

In the village of **Muambulo**, the situation is similar to **Capuepua**. There is no school in the community. There is one classroom (adapted from a church), which teaches elementary school in two shifts (morning and afternoon). More than half of the respondents have secondary education. It is important to note that in **Muambulo** there is no school or classroom that teaches secondary school. These respondents acquired this level of education outside the village.

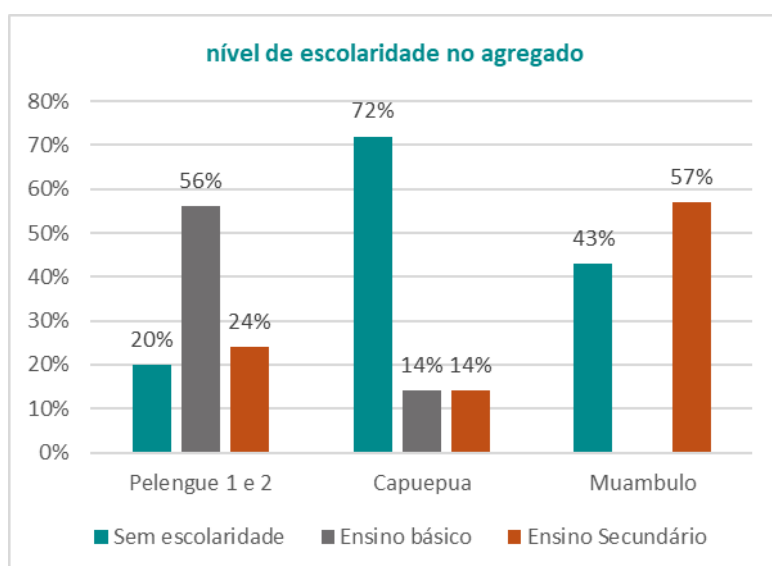


Figure35 - Level of education in households

Access to Health

In the health sector, the challenges are repeated at provincial, municipal and community level. In general, malaria is one of the main public health problems and one of the main causes of demand for health services and death. For example, in the first quarter of 2024 alone, around 57,000 cases of malaria were recorded in the province of Lunda Sul.

The epidemiological picture in the province of Lunda Sul, and particularly in the municipality of Saurimo, is similar to that of other large cities in Angola. The reality is that many people suffer or die from diseases caused by the lack of basic sanitation and the consumption of contaminated water.

During the field visits to the areas where the *sub-project* is being implemented, it was possible to see that in the four villages - *Pelengue 1 and 2*, *Capuepua* and *Muambulo* - there is no health unit. Households have to travel long distances to access health services.

For the **Pelengue 1 and 2** households, if they need medical treatment, they travel to the city of Saurimo, with the main alternatives being motorcycle cabs or walking, a distance of over an hour.

For the inhabitants of **Capuepua**, in case of medical treatment, they have the option of the medical post located in the neighboring village of **Camundambola**, 2 to 3 hours away, mainly on foot or by motorcycle cab. For households in **Muambulo** village, the alternatives are the city of Saurimo or the village of **Tchanguilo**. The households reported that they also travel on foot or by motorcycle cab.

According to the data obtained from the surveys, the most common diseases reported by households in the villages of **Pelengue**, **Capuepua** and **Muambulo** are malaria (62%) and diarrhea (15%) (Fig.36).

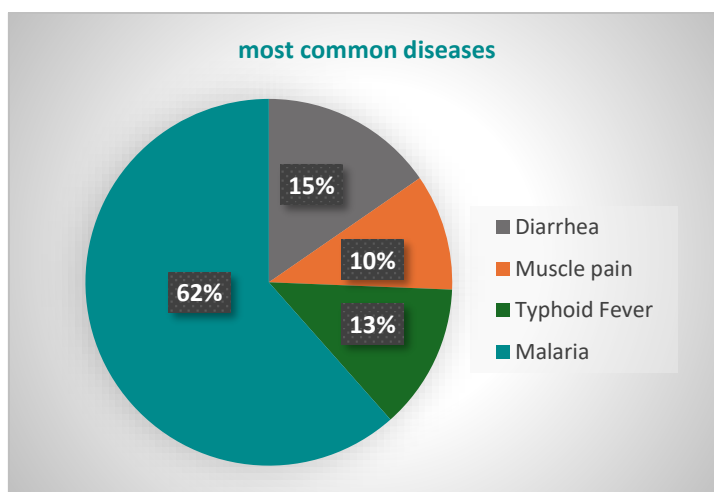


Figure36 - Most common diseases in the intervention areas

5.4.3.5 Water and Sanitation

Water supply

According to data shared by the Empresa Publica de Água e Saneamento da Lunda Sul (EPAS-Lunda Sul, 2024) in its Management and Accounts Report, 1,587,780 m³ of water was distributed to a total of 7,774 customers in 2023. Most of these customers (76.9%) are concentrated in the peri-urban areas of the province's main cities (Fig.37).

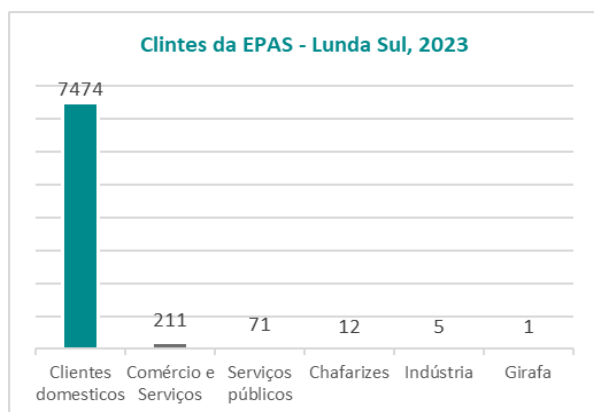


Figure37 - EPAS customers - Lunda Sul, 20203

In Saurimo, the supply to domestic customers, such as in the city center, Agostinho Neto district, 11 de Novembro, Verde, Feira, Luavur, Acampamento, Ngagi and others, is made through the water catchments in operation. However, for some neighborhoods, such as Bairro Social da Juventude and Mwono Waha, supply is guaranteed through small borehole systems.

The capacity installed by the public drinking water distribution network is still insufficient to meet demand, especially in Saurimo, where there is rapid development and expansion in urban and peri-urban areas.

The villages in the *sub-project* implementation area have similar aspects in terms of access to drinking water sources. For example, in **Pelengue 1** and **2**, although there are no household connections, families have access to water from the public network via a community connection (one chariz in *Pelengue 1* and two in *Pelengue 2*), the supply of which, although not regular/daily, takes place in the early hours of the day.

Through the surveys and field visits, it was possible to ascertain that for the households in these two villages, the *Chicapa* River and the cacimbas are also alternative sources of water for domestic consumption (Fig.38).



Figure38 - Community water supply system in Pelengue 2

In the village of **Capuepua**, the challenges are repeated. The source of water for domestic consumption is the River *Tamba* and the cacimbas built by the population near the river. There is no functional water supply system for the community, through household or community connections.

Households generally have to travel more than 1,000 meters to access water. And the task of fetching water for domestic consumption is mostly carried out by women and children.

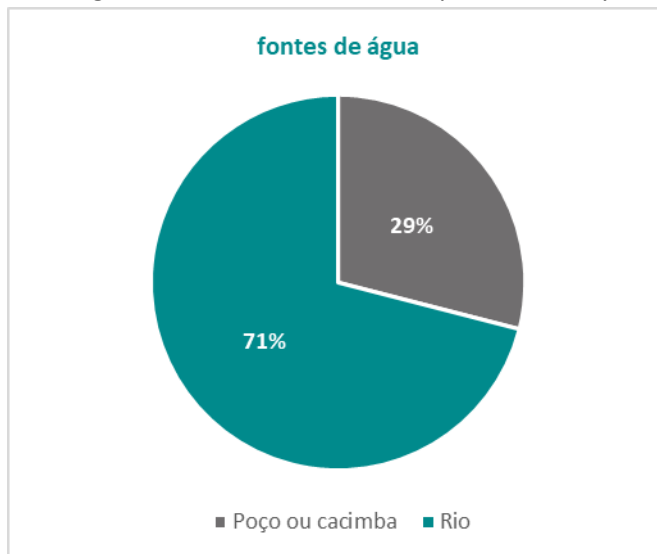


Figure39 - Water sources in Capuepua

In **Muambulo** village, although there are community water connection structures, namely three fountains, the community no longer benefits from a drinking water supply. The system has been obsolete for years. The households' only source of water for domestic consumption is the River *Tamba*, and they walk more than a kilometer to bring water home from the river in buckets, jerry cans and/or small containers.



Figure40 - Obsolete water supply system, Muambulo

It should also be noted that, according to the households surveyed, water for domestic consumption does not go through any disinfestation or treatment process. The consumption of unsuitable water may be associated with the diarrheal diseases and typhoid fever that occur in these areas.

Sanitation and Waste

Like the country's main cities, Saurimo faces challenges in terms of sanitation services. For example, there is not enough installed capacity, such as means and infrastructure, for effective solid waste and wastewater management.

In rural areas, which is where the sub-project is being implemented, the challenges are even greater. There are no waste management systems (collection and treatment) in these areas. Many households don't have access to latrines, so open defecation is still a widespread practice.

All the villages in the subproject intervention area are not covered by waste collection and management programs. There are no community dumps or containers for the waste produced by the households. According to the households interviewed, it was possible to ascertain that the waste management practices adopted generally include burying waste in holes made near the house (67%) or disposing of it indiscriminately in the woods (33%), as shown in Fig.41.



Figure41 - Waste management

5.4.3.6 Electricity and Security

Electricity distribution and access

According to the Provincial Directorate of Energy and Water, the province of Lunda Sul has a system in place for supplying energy. In the inland municipalities, electricity is supplied by generator sets that serve as the main source.

In the city of Saurimo, energy is supplied by the Chipaca hydroelectric plant and the Tchicumina thermal power station. The electricity grid covers the entire city. In the suburbs, coverage is not complete. There are drastic restrictions due to demand versus supply. This is mainly due to the expansion of peri-urban areas.

In the villages in the implementation areas of *sub-project 1*, households face challenges in accessing and using electricity. The villages of *Pelenge 1 and 2*, *Capuepua* and *Muambulo* are not covered by public grid distribution systems.

Households are looking for alternatives to meet these challenges. According to surveys carried out, the battery-operated flashlight is the main source of lighting for households in these villages. A small number of families use a generator as a source of energy.

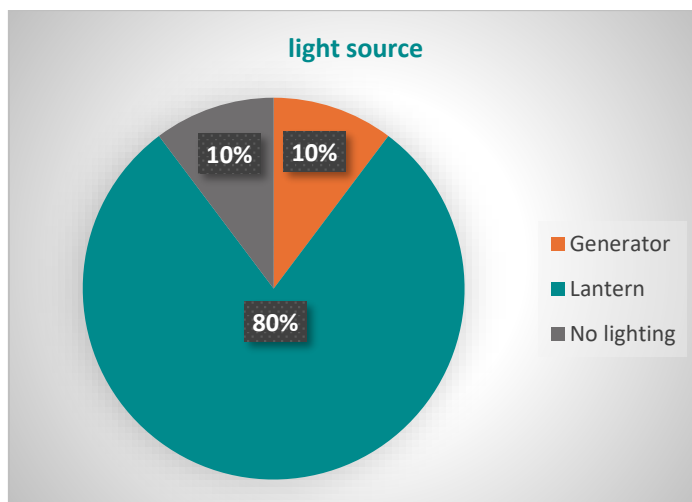


Figure42 - Lighting source for households households

Security

In the villages in the sub-project implementation areas there is no police post (temporary or permanent). However, most households reported that public security is not a problem. The crime rate is quite low.

In *Pelengue 1 and 2* there is a general social perception of safety. Most of the households surveyed described the neighborhood as safe. In *Muambulo*, on the other hand, the social perception of public safety is more divided, with some crimes recorded in the community.

The households surveyed in *Pelengue* and *Muambulo* reported that the crimes that happen in their villages are generally related to the theft of animals (such as chickens, pigs and goats). In *Capuepua*, all the households surveyed said that the neighborhood was safe. They also said that they couldn't remember any crime that had taken place in the last 12 months.

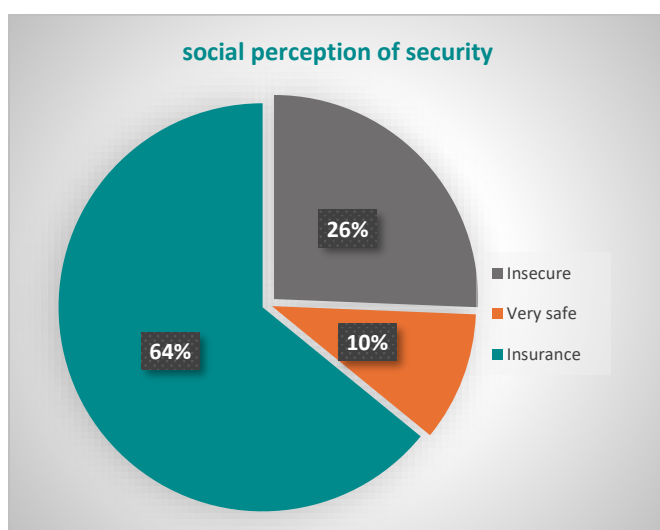


Figure43 - Social perception of public safety

It should be noted that there is no police station in any of the villages. The households surveyed reported that the nearest police station is more than a kilometer away.

5.4.3.7 Transportation and Communication

The city of Saurimo has a collective urban transport network, made up of several buses from public and private companies. Among the different operators that provide this service in Saurimo are Lumege, Macon, Cacuechi and Camatcha.

In recent years, private companies offering personalized cab services have also sprung up, including Yashi Taxi, Nosso Táxi, Hideal, Táxi City and others. Motorcycle cabs are also widespread and are one of the main mobility options for residents.

The villages that make up the implementation areas of *sub-project 1, Pelengue, Capuepua and Muambulo*, are 15 km, 23 km and 32 km, respectively, from the city of Saurimo. As mentioned earlier, most of these villages do not have essential goods and services locally. Families often have to travel to the city in search of these services.

These villages are not covered by public transport systems. If they need to get around, households generally use motorcycle cabs or walk.

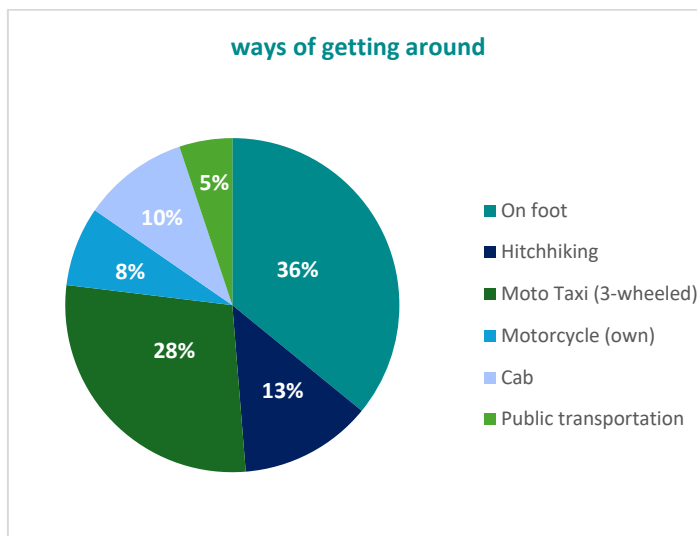


Figure44 - Main ways in which households travel (left); Moto-taxi on the way to Saurimo (right)

According to the data from the survey and the field visits carried out in the areas where the sub-project is being implemented, it was possible to ascertain that the cost of travel varies from 500.00 kz to over 1000.00 kz per passenger for each trip. The households reported that the main reasons for traveling are: to find goods and services that are not available in their villages (to find medical services, schools, to sell and/or buy products at the markets in the capital) and to visit family.

5.5 Evolution of the Environmental Situation without a Project

Failure to rehabilitate the existing and currently disused canals affects the development of agricultural production in the Lunda Sul region due to water scarcity, loss of fertile soil through erosion and degradation, compromising the quality and viability of arable land. In addition, the decrease in production can lead to food insecurity and increased poverty in the communities.

Given the forecasts of the consequences of climate change for this part of Angola, it is to be expected that the effects of drought will be more significant, which will lead to a lowering of the aquifers and, as a consequence, less water being available in the existing reservoirs, with significant negative impacts for the population and the economic activities of this district capital.

The existence of irrigation canals plays a crucial role in increasing water availability, since they facilitate the conduction and distribution of water from water sources to agricultural areas. Thanks to their infrastructure, irrigation canals allow farmers to have access to an adequate amount of water, even in periods of drought, promoting efficient and controlled use of water resources. This not only improves crop productivity, but also ensures the sustainability of agriculture throughout the year. In addition, proper irrigation can help reduce dependence on rainfall, mitigating the risks associated with climate fluctuations and ensuring more stable and secure food production. The effective management of these canals is therefore fundamental to agricultural development and the food security of communities.

6. PUBLIC PARTICIPATION PROCESS

6.1 Methodology

Public participation is an essential formality of the Environmental Impact Assessment procedure that ensures the intervention of the interested public in the decision-making process. The active participation of interested and/or affected parties is decisive and must take place in a free and informed manner.

The African Development Bank's Environmental Standards guide the holding of public consultation meetings with the parties interested in and affected by the project. The Angolan legal framework, through Executive Decree 87/12, of February 24 (*Regulation of Public Consultations on projects subject to Environmental Impact Assessment*), ensures and guides the entire process of participation by stakeholders and those affected by projects, defining its purposes (art. 3):

- Gathering opinions, suggestions and other input from the public interested in projects subject to Environmental Impact Assessment;
- To guarantee the participation and consultation of the holders of subjective rights or legally protected interests, within the scope of the decisions taken in the Environmental Impact Assessment administrative procedure;
- Identify, as broadly as possible, all relevant aspects of the project that is the subject of the Public Consultation;
- To consider and appraise any exhibitions and complaints submitted in connection with the project;
- Ensure that information on projects subject to Environmental Impact Assessment is disseminated and made available to the public;

In order to ensure greater and more effective public participation by interested and affected parties, the public participation process was conducted in different stages:

- Identification of Interested and Affected Parties (IAPs);
- Involvement of the PIA's (Calling participants and publicizing the Consultation venues);
- Holding Public Consultation Meetings;

Below are the main stakeholders and/or affected parties in the subproject implementation areas, identified at national, provincial and municipal level:

- Ministry of Agriculture and Forestry
- Government of the Province of Lunda Sul
- Provincial Office of Agriculture, Livestock and Fisheries
- Provincial Office for the Environment, Solid Waste Management and Community Services
- Provincial Office for Social Action, Family and Gender Equality
- Institute for Agrarian Development (IDA)

- Saurimo Municipal Administration
- Traditional Authorities
- Residents' committees
- Agricultural cooperatives
- Party Political Organizations
- Vulnerable groups (women, children, the elderly and ethnic minorities).

Before work began with the population, several meetings were held: with the Provincial Vice-Governor for the Political, Social and Economic Sector (30/10/2024); with the Provincial Office for Agriculture, Livestock and Fisheries, the Institute for Agrarian Development (IDA) and the Saurimo Municipal Administration (30/10/2024) and with the traditional authorities of the villages in the areas where *sub-project 1* will be implemented (30/10/2024 with the authorities of *Pelengue 1* and *2*, 31/10/2024 with the authorities of *Capuepua* and *Muambulo*).



Figure 45 - Meetings with Stakeholders (with the Deputy Governor, right; and with the Municipal Administration, left)

At the meeting with the Provincial Office of Agriculture, Livestock and Fisheries, IDA and the Saurimo Municipal Administration, in addition to presenting the project, information was requested on the areas of implementation that could be useful for characterizing the study and the strategy for contacting the population was discussed, namely in the following aspects:

- Need for the consulting team to be accompanied by technicians from the IDA and the Municipal Administration.
- Need to hold a consultation meeting with the traditional authorities in the villages, to share information about the sub-project and schedule the PC.
- Detailed definition of the sites where the surveys will be carried out.

6.2 Public consultations held

As part of this study, a total of three (3) public consultation sessions were held, one in each village: Pelengue 1 & 2 - 20/10/2024, Capuepua and Muambulo - 21/11/2024, at locations previously selected by the traditional authorities (Fig.46)



Figure46 - Public Consultation Sessions - Pelengue (right), Capuepua (middle) and Muambulo (left)

These public consultations brought together interested and/or affected parties from the subproject's areas of implementation in order, on the one hand, to gather complementary information for the ESIA and, on the other, to provide general information about the project and capture the main suggestions, doubts or concerns they may have about the project.

The mobilization of the population was carried out in good time by the Saurimo Municipal Administration, IDA and the support of community leaders.

The sessions were all held in the courtyard of the sobas' houses in the respective villages, and the following numbers of people took part:

- Pelengue Villages 1 and 2, 121 people took part in this session, including 31 women.
- 50 people took part in this session, including 21 women.
- Muambulo Village, 44 people took part in this session, 14 of them women.

The Public Consultation sessions in the respective villages were conducted using a script and followed the following order of work:

1. *Presentation of the session's objectives*
2. *Presentation of general information about the sub-project*
3. *Discussion*
4. *Conclusions and Closing*

According to the work order presented above, the team first presented the objectives of the session and then gave general information about the sub-project. Then, in order to gather input from the participants, focus groups with women and men were held simultaneously in different spaces.

6.3 Results of Public Consultations

The public consultation sessions gave the project team a real insight into the situation in the project's area of influence.

The answers given to the questions, suggestions, concerns and requests for clarification/information presented by the participants and the PC team in the sessions can be found in the PC Reports in **ANNEX 5**.

On the part of the participants in the CP sessions, the main issues raised relate to:

- Date of start of work;
- Main areas of the neighborhoods that will be covered by the project;
- Type of reservoirs to be built;
- Water supply situation in areas without reservoirs;
- Irregular water supply;
- Number of new connections;
- Network to be used by the new reservoirs to get water to homes;

6.4 Expectations and concerns about the project

The field surveys and public consultations with the communities showed that the community was very satisfied with *sub-project 1*, Rehabilitation of Small-Scale Irrigation Systems Resistant to Climate Change.

The communities in the implementation areas expect that the sub-project will have a positive impact on their quality of life, due to the availability of water, which will allow them, to a certain extent, to increase productivity levels and diversify the types of crops they produce.

According to the participants in the PC meetings and in the surveys, the main advantages and expectations in relation to *sub-project 1* are related :

- (i) reducing dependence on rainfall for agricultural practice.
- (ii) the creation of jobs, especially for young people.
- (iii) increased rice production and vegetable cultivation.
- (iv) reduced distances traveled to access water for domestic use.
- (v) 'reactivation' of agricultural fields that were deactivated due to lack of water.

On the other hand, participants expressed concern about the "credibility" of the sub-project, showing discouragement at various promises and projects that are not carried out in their communities. Another concern raised by the participants is related to the lack of identification documents for the young people available to work.

Most of the participants in the public consultation sessions say that the expected impacts will not cause major constraints for the communities in the area where the subproject will be implemented. At these public consultation meetings with the communities, some recommendations were made, such as:

- Ensure the direct involvement of the community in the next phases, especially young people.
- Avoid making the same mistakes as previous projects, such as projects that were delayed too long.

6.5 Strategy to be adopted in the EIAS

The local contributions obtained from the field surveys carried out by the EIAS team and the public consultations were all taken into account in the development of the EIAS, in the characterization of the reference situation, in the impact assessment and in the definition of mitigation measures for the negative impacts and measures to enhance the positive impacts.

The impact assessment considered all the concerns of the population and other *stakeholders* about the negative impacts, assessing their relevance and valuing the positive impacts of the project expected by the people.

In the ESMP, mitigation measures are proposed in relation to social and environmental issues related mainly to the activities and impacts of the construction phase but also in the operation phase.

This ESIA is considered to provide guidelines for mitigating all negative environmental and social impacts and compensating, if necessary, all those affected, in the fairest and most beneficial way possible. It also provides guidelines for reinforcing positive impacts.

7 IMPACT ASSESSMENT

7.1 Methodology

7.1.1 Project's expected impacts

Taking into account the various activities planned in the different phases of the project described in Section 2.4.6, the main activities and their respective expected impacts are summarized in the following table (14).

Table14 - Summary of activities generating impacts and forecast of the respective impacts

ACTIVITIES	DESCRIPTION	EXPECTED IMPACTS
I - CONSTRUCTION PHASE		
Land allocation	Temporary or permanent land use and occupation	(-) Land use: agricultural; natural habitats and other existing uses (-) Increase in sealed area (decrease in infiltration capacity and increase in surface runoff) (-) Affecting the landscape
Cleaning, Deforestation and Clearance	Vegetation Removal and Land Clearing	(-) Land use (-) Microclimate change due to deforestation (-) Reduced water infiltration capacity in the soil and increased surface runoff (-) Potential contamination of surface and groundwater (-) Particulate emissions from earthmoving (-) Increased sound levels (-) Waste Production (-) Affection of vegetation / natural habitats (-) Disturbance of
Earthmoving	Blasting, Excavation, Backfill and Compaction	(-) Land use (-) Reduced infiltration capacity and increased surface runoff (-) Potential contamination of surface and groundwater (-) Particulate emissions from earthmoving (-) Increased sound levels (-) Disturbance to fauna (noise)
Presence and Operation of the Shipyard and Work Fronts Material Storage	Occupation of areas for the installation of construction support structures	(-) Increase in sealed area (decrease in infiltration capacity and increase in surface runoff) (-) Possible soil contamination due to accidental spills, waste disposal, etc. (-) Potential contamination of water resources (groundwater and surface water) (-) Emission of particles, GHG and other pollutants

ACTIVITIES	DESCRIPTION	EXPECTED IMPACTS
I - CONSTRUCTION PHASE		
		(-) Increased sound levels (-) Waste production
Rehabilitation / Regularization of Canals	Regularization of canals	(-) Increase in waterproofed area decrease in infiltration capacity (particularly if conventional engineering techniques are adopted) (-) Affecting soil quality due to possible soil contamination from accidental spills, waste disposal, etc. (-) Affection of water resources with the need to divert natural runoff to rehabilitate the channel, if necessary (use of a cofferdam) (-) Potential contamination of water resources (groundwater and surface water) (-) Increased sound levels (-) Waste production
Creating Access Paths	Access to the shipyard, construction sites and canals	(-) Land use (-) Potential contamination of water resources (surface and groundwater) (-) Reduced water infiltration capacity in the soil (-) Emission of particles, GHG and other pollutants (-) Increased sound levels (-) Affection of vegetation / natural habitats (-) Disturbance of fauna (+) Improving the movement of people and goods in rural areas
Circulation of vehicles for transporting materials, equipment and workers and moving machinery	Moving different types of vehicles and machines around a workplace,	(-) Possible soil contamination due to accidental spills (-) Potential contamination of water resources (surface and groundwater) (-) Emission of particles, GHG and other pollutants (-) Increased sound levels (-) Disturbance of fauna (-) Increase in traffic - potential increase in road accidents and trampling.
Hiring labor	Hiring local and external workers	(+) Increase in local employment (+) Increased training for the local population (+) Promotion of the local economy due to the increased flow of non-resident population (-) Affecting human health, with an increase in sexually transmitted diseases (HIV/AIDS and STDs) due to the increased flow of non-resident population

ACTIVITIES	DESCRIPTION	EXPECTED IMPACTS
I - CONSTRUCTION PHASE		
		(-) Potential social disruption and family instability due to the increased flow of non-resident population (-) Potential increase in situations of SAEs and GBV, particularly in vulnerable groups (-) Workers' safety risks including occupational diseases and accidents
Purchase of materials and equipment	Procurement of materials and equipment needed to carry out the project	(+) Promote the local economy
II - OPERATION PHASE		
Presence and functioning of channels	Operation of canals for irrigation of agricultural perimeters	(+) Adapting to climate change (+) Protection of the soil surface from erosion (+) Improvement of the water regime by improving interception, infiltration and water retention capacity (+) Promoting Biodiversity (+) Water availability (+) Development of the local economy (+) Increase in Agricultural Production (+) Improving the nutritional conditions of the region's population with access to more food (+) Hiring local staff
Maintenance	Cleaning canals and, if necessary, repairing faults in hydraulic systems, valves or sluices that may have been installed to optimize the irrigation of agricultural perimeters.	(-) Waste production (+) Local economy: business opportunities for local companies (+) Hiring local staff

7.1.2 Impact Assessment Criteria

The impact assessment will make it possible to evaluate the consequences that the implementation of the project (Tab.15) will have on the physical, environmental, ecological and human (socio-economic) environment at each stage of the project:

- The **Construction Phase**, with the work actions associated with the Execution Project, the number of people and vehicles, the location of the temporary facilities to support the work - the Shipyard, which at the time of writing this document does not yet have any information.

- The **Operation Phase** with the physical presence and operation of the canal which plays a fundamental role in the irrigation of agricultural perimeters;

Table15 - Summary project characteristics

Phases	Project aspects	Extension
Construction phase Temporary infrastructure	Shipyard	Not identified
	Work fronts	Not identified
	Purchasing Materials	Not defined
	Regularization and rehabilitation of canals	35 km
	Access roads	Not defined
	Labor	Not defined
Operation phase Permanent infrastructure	Irrigation Canal	15.5 km
	Capuepua Irrigation Canal	19.5 km

In this ESIA, the alternatives evaluated are the implementation of the project and the "No Action" option. In terms of environmental and social impacts, the alternative of implementing the project is evaluated, since the "No Action" alternative represents the current situation of reduced water for irrigation, which hinders agricultural development in the region. The mitigation and enhancement measures will be presented in point 8 of this document, which corresponds to the Environmental and Social Management Plan.

For an overall idea of the impacts, a **rating scale** was used based on a set of parameters that define the Significance of the Impact.

The impacts identified and classified are generalized since **there is no implementation project**, as well as all the measures associated with good environmental practices. All negative impacts that cannot be mitigated are justified, along with residual impacts.

The parameters for classifying the significance of the impact are shown in the following table (Tab. 16).

Table16 - Criteria used to classify impacts

Criteria		Classification (Code)	Description	Value (for calculating the Significance of Impact)
Nature (the impact produces benefits or damages for the environment and society)	N	Positive (+)	Beneficial impact	Not applicable
		Negative (-)	Harmful impact	Not applicable

Criteria		Classification (Code)	Description	Value (for calculating the Significance of Impact)
Incidence (will the impact occur only inside or also outside the project's area of influence)	I	Direct/Local (D)	The impact is exclusively on the project's area of direct concern (ADA)	1
		Enlarged (A)	The impact affects the project's area of direct influence (AID)	2
		Provincial/Regional (REG)	The impact has an impact on the area of indirect influence (AII) or has an impact at municipal/provincial level.	3
Probability (possibility of occurrence)	P	Right (C)	The impact that will certainly occur	4
		Probable (P)	The impact that can occur	3
		Uncertain (INC)	The impact that may occur	2
		Unlikely (IMP)	The impact that is unlikely to occur	1
Duration (period during which the impact manifests itself)	D	Temporary (T)	The impact over a maximum period of 5 years (normally associated with the construction phase)	1
		Permanent (P)	The impact that occurs while the project is in operation	2
Reversibility (extent to which the impact can be reversed to the previously existing situation)	R	Reversible (R)	The impact allows, at a high or very easy level, the restoration of the environmental and/or social component of the basic situation	Not applicable
		Irreversible (IR)	The impact makes it practically impossible to restore the environmental and/or social component of the situation	Not applicable
Occurrence (type of attribution resulting from the impact)	O	Direct (DIR)	The impact occurs directly	Not applicable
		Indirect (IND)	The impact that occurs indirectly	Not applicable
Magnitude (magnitude in absolute terms of the intensity or extent of the impact)	M	High (E)	The impact has a strong intensity or extent of affectation	3
		Moderate (M)	The impact has medium intensity or extent affectation	2
		Reduced (RE)	The impact has low intensity or extent of affectation	1
Significance (importance of environmental and social effects)	S	Significant	Major impacts	The score is greater than 45
		Moderately Significant	Important impacts	The score is greater than 12 and equal to or less than 45
		Not significant	Minor impacts	The score is 1 and equal to or less than 12
		Not Significant	Practically non-existent	The score is less than 6

The **Impact Significance** value is the product of the parameters, obtained using the following formula: $S = P \times I \times M \times x$

The impact can be negative or positive, and is classified into four classes of significance: Significant (high), Moderately Significant (medium), Not Significant (low) and Not Significant.

- **Significant** if the score is greater than 45.
- **Moderately Significant** the score is greater than 11 and equal to or less than 45.
- **Not Significant** the score is less than or equal to or greater than 11

MINOR POSITIVE		NEGLECTIBLE NEGATIVE	
MODERATELY SIGNIFICANT POSITIVE		MODERATELY SIGNIFICANT NEGATIVE	
SIGNIFICANT POSITIVE		SIGNIFICANT NEGATIVE	

With the classification of the impacts identified, mitigation measures are considered, in the case of negative impacts, with the intention of reducing or eliminating their significance, leading to **residual impacts**. In the case of positive impacts, if applicable, enhancement measures are described.

The identification and assessment of impacts during the construction and operation phases can be found in the following section.

7.2 Identification and Assessment of Environmental and Social Impacts

7.2.1 Construction phase

The identification and assessment of the environmental and social impacts for the **construction phase**, based on table 1 (I - Construction Phase) of point 7.1.1, are clearly presented in the table below (Tab. 17). These impacts have been duly classified and explained, associated with the corresponding activities and their respective descriptors. For more details on the classification, see ANNEX 6 (I) - Construction Phase Environmental and Social Impacts Identification and Assessment Matrix.

Table17 - Table for the Identification and Assessment of Environmental and Social Impacts in the Construction Phase.

Activities	Descriptors Affected	Identification and Assessment of Environmental and Social Impacts, without Mitigation and Enhancement Measures		
		Identification	Explanation	Significance
CONSTRUCTION PHASE				
Land allocation	Soil / Land Use	Allocation of agricultural land and other uses	The area where the shipyard is located, the easement areas next to the canals and the access roads temporarily or permanently occupy the land.	-36
		Affecting natural habitats	The area where the shipyard is located, the easement areas next to the canals and the access roads temporarily or permanently occupy the land.	-24
	Water Resources	Increased soil sealing (decrease in infiltration capacity and increase in surface runoff)	Decreased infiltration capacity and increased surface runoff can affect the recharge/availability of water in underground aquifers.	-12
	Landscape	Affecting the landscape	Temporarily or permanently built structures can create an undesirable visual impact, leading to a loss of the area's natural landscape features.	-6
Cleaning, deforestation and desilting	Soil	Land use	Removing vegetation exposes the soil to the weather, causing water to run off the surface instead of being absorbed. This can increase the risk of erosion and flooding.	-16
	Climate and Climate Change	Microclimate change due to deforestation	The removal of vegetation, with the possible felling of trees, causes a slight rise in air temperature near the ground and a decrease in relative humidity, resulting from a possible loss of thermal regularization capacity, limited to the areas where deforestation will take place.	-16
	Water Resources	Reduced water infiltration capacity in the soil and increased surface runoff	Vegetation plays an important role in the infiltration of water into the soil, its removal can reduce infiltration, increasing surface runoff, affecting the recharge/availability of water in underground aquifers.	-8
		Potential contamination of surface and groundwater	The use of heavy vehicles and other machinery can result in leaks of fluids, such as oil and fuel, which, if not contained, can run off into bodies of water or seep into the ground and reach underground aquifers.	-6
	Air Quality	Particulate emissions from earthmoving	Increase in dust particles in the atmosphere could affect the health of workers on site	-8
			An increase in dust particles in the atmosphere can affect the health of communities close to the construction area (allergies and other respiratory diseases) and of workers on site	-6
	Sound environment	Increased sound levels	The use of heavy vehicles and other machinery can result in an increase in noise causing nuisance to the communities near the construction area.	-4
			The use of heavy vehicles and other machinery can result in an increase in noise, which can affect the health of the workers on site.	-6
	Waste	Waste Production	Production of plant biomass waste: trees, shrubs, weeds and other plant materials that are cut down or removed during the clearing and deforestation process.	-8
	Flora	Affecting vegetation / natural habitats	Reduction in the area covered with vegetation, with the felling of some trees affecting plant biodiversity and causing changes in the site's habitat conditions	-16
	Fauna	Disturbance of fauna	The use of heavy vehicles and other machinery causes noise that can disturb the fauna, forcing them to leave their habitat. This displacement can result in the death of animals.	-12
			The reduction and elimination of vegetation can destroy habitat, feeding areas and shelter for fauna, which can scare away fauna, causing individuals to move or even die	-8
Earthmoving	Soil	Affecting soil (quality)	Earthmoving: excavation, embankments and compaction affect structures and the soil and can decrease the capacity for water infiltration, causing water to run off the surface instead of being absorbed. This can increase the risk of erosion and flooding.	-24
	Water Resources	Decreased infiltration capacity and increased surface water runoff	Earth movement: excavation, embankments and compaction affect soil structures and can reduce the infiltration of water into the soil, increasing surface water run-off, affecting the recharge/availability of water in underground aquifers.	-6

Activities	Descriptors Affected	Identification and Assessment of Environmental and Social Impacts, without Mitigation and Enhancement Measures		
		Identification	Explanation	Significance
CONSTRUCTION PHASE				
		Potential contamination of surface and groundwater	The use of heavy vehicles and other machinery in earthmoving can result in leaks of fluids, such as oil and fuel, which, if not contained, can run off into bodies of water or seep into the ground and reach underground aquifers.	-4
	Air Quality	Particulate emissions from earthmoving	Increase in dust particles in the atmosphere could affect the health of workers on site	-6
			Increased dust particles in the atmosphere can affect the health of communities close to the construction area (allergies and other respiratory diseases) and of workers on site	-6
	Sound environment	Increased sound levels	The use of heavy vehicles and the operation of machinery results in an increase in noise that can cause nuisance to the communities near the construction area	-6
			The use of heavy vehicles and the operation of machinery results in an increase in noise that can affect the health of the workers assigned to the site	-6
	Fauna	Disturbance of fauna	The use of heavy vehicles and other machinery causes noise that can disturb the fauna, forcing them to leave their habitat. This displacement can result in the death of animals.	-8
Presence and Operation of the Shipyard and Work Fronts Storage of materials	Soil	Increase in sealed area (decrease in infiltration capacity and increase in surface runoff)	The establishment of the shipyard, the storage of materials in the yard and on the construction site can waterproof areas of the ground, reducing the capacity for water infiltration, causing water to run off the surface instead of being absorbed. This can increase the risk of erosion and flooding.	-6
		Possible soil contamination due to accidental spills, waste disposal, etc.	Leaking fluids, such as oil and fuel, from machinery and equipment used on the site, as well as improper waste disposal and incorrect storage of materials, can release toxic substances into the soil, contaminating it.	-6
	Water Resources	Increase in sealed area (decrease in infiltration capacity and increase in runoff)	The establishment of the shipyard, the storage of materials at the shipyard and the front of the site can waterproof areas of the ground, reducing the capacity for water infiltration, causing water to run off the surface instead of being absorbed, which can affect the recharge/availability of water in underground aquifers.	-8
		Potential contamination of water resources (groundwater and surface water)	Leakage of fluids (spills), such as oil and fuels, from machinery and equipment assigned to the work, as well as improper disposal of waste and incorrect storage of materials, can release toxic substances into the soil, which can run off into surface water bodies or seep into underground water tables.	-6
	Air Quality	Emission of particles, GHG and other pollutants	The operation of the shipyard is associated with the increased movement of vehicles and the operation of machinery, such as generators, which can increase airborne particles such as dust and smoke that can affect the health of the community, causing respiratory, cardiovascular and allergic problems.	-12
			Incorrect storage of materials such as soil and other building materials can increase airborne particles such as dust, which can affect the health of the community, causing respiratory, cardiovascular and allergic problems.	-6
	Sound environment	Increased sound levels	The use of heavy vehicles and the operation of machinery results in an increase in noise that can cause nuisance to the communities near the construction area	-6
			The use of heavy vehicles and the operation of machinery results in an increase in noise that can affect the health of the workers assigned to the site	-6
	Waste	Waste Production	Leftover building materials (e.g. concrete, wood, etc.), packaging (plastic, cardboard and other packaging materials used to protect materials during transportation), construction waste, hazardous waste (leftover chemical substances such as paints,	-8

Activities	Descriptors Affected	Identification and Assessment of Environmental and Social Impacts, without Mitigation and Enhancement Measures		
		Identification	Explanation	Significance
CONSTRUCTION PHASE				
			solvents and cleaning products) organic waste such as vegetation and food waste.	
Rehabilitation / Regularization of Canals	Soil	Increased waterproofed area decreases infiltration capacity (particularly if conventional engineering techniques are adopted)	The regularization of canals can waterproof areas of the ground, decreasing the infiltration capacity of water, causing water to run off the surface instead of being absorbed. This can increase the risk of erosion and flooding.	-6
		Affecting Soil Quality	Possible soil contamination due to accidental spills, incorrect deposition and storage of construction waste.	-6
	Water Resources	Increased waterproofed area decreases infiltration capacity (particularly if conventional engineering techniques are adopted)	The regularization of channels can waterproof areas of the ground, decreasing the infiltration capacity of water, causing water to run off the surface instead of being absorbed, which can affect the recharge/availability of water in underground aquifers.	-6
		Allocation of Water Resources	During the regularization of channels, it may be necessary to divert the natural flow of water bodies to allow the work to be carried out without flooding the work area. This can be done through cofferdams or temporary barriers. This detour can temporarily alter local water dynamics, affecting water flow, sedimentation and the ecology of riparian habitats.	-6
		Potential contamination of water resources (groundwater and surface water)	Leaking fluids, such as oil and fuel, from machinery and equipment used on the site, as well as improper waste disposal and incorrect storage of materials, can release toxic substances into the soil, which can run off into surface water bodies or contaminate underground water tables.	-6
	Sound environment	Increased sound levels	The use of heavy vehicles and the operation of machinery results in an increase in noise that can cause nuisance to the communities near the construction area	-6
			The use of heavy vehicles and the operation of machinery results in an increase in noise that can affect the health of the workers assigned to the site	-6
	Waste	Waste Production	Leftover building materials (e.g. concrete, wood, etc.), packaging (plastic, cardboard and other packaging materials used to protect materials during transportation), construction waste, hazardous waste (leftover chemical substances such as paints, solvents and cleaning products) organic waste such as vegetation and food waste.	-8
	Creating Access Paths	Soil	Affecting geological formations	The construction of paths usually involves the removal of native vegetation, which helps to stabilize the soil. This can increase erosion, especially in sloping areas where the soil is exposed to the action of rain and wind.
Affecting soil impermeability			Soil compaction reduces its porosity and water infiltration capacity, which can negatively affect soil quality.	-6
Water Resources		Potential contamination of water resources (groundwater and surface water)	Leaking fluids, such as oil and fuel, from machinery and equipment used on the construction site, as well as improper waste disposal and incorrect storage of materials, can release toxic substances into the soil, which can seep down to surface or underground bodies of water.	-6
		Reduced water infiltration capacity in the soil	The creation of access roads can waterproof areas of the ground, decreasing the capacity for water infiltration, causing water to run off the surface instead of being absorbed, which can affect the recharge/availability of water in underground aquifers.	-6
Air Quality		Emission of particles, GHG and other pollutants	The machines used to create the paths increase the particles of dust and smoke in the atmosphere, which can affect the health of the workers assigned to the work.	-8
			The machines used to create the paths increase the particles of dust and smoke in the atmosphere, which can affect the health of the communities near the	-8

Activities	Descriptors Affected	Identification and Assessment of Environmental and Social Impacts, without Mitigation and Enhancement Measures		
		Identification	Explanation	Significance
CONSTRUCTION PHASE				
			construction area (allergies and other respiratory diseases).	
	Sound environment	Increased sound levels	The use of heavy vehicles to create the paths results in an increase in noise that can cause annoyance to the communities near the construction area	-3
			The use of heavy vehicles to create the paths results in an increase in noise that can affect the health of the workers assigned to the work	-6
	Flora	Affecting vegetation / natural habitats	Reduction in the area covered with vegetation, with the felling of some trees affecting plant biodiversity and causing changes in the site's habitat conditions	-8
	Fauna	Disturbance of fauna	The use of heavy vehicles and other machinery causes noise that can disturb the fauna, forcing them to leave their habitat. This displacement can result in the death of animals.	-8
			The reduction and elimination of vegetation can destroy habitat, feeding areas and shelter for fauna, which can scare away fauna, causing individuals to move or even die	-8
Socio-economic	Improving the movement of people and goods in rural areas	Access roads offer direct routes to rural areas, improving connectivity between rural communities. This facilitates the movement of people and the flow and arrival of goods and services in rural communities.	8	
Circulation of vehicles for transporting materials, equipment and workers and moving machinery	Soil	Soil contamination due to accidental spills	Moving different types of vehicles and machinery around the workplace can cause accidental spills, contaminating the soil	-6
	Water Resources	Potential contamination of water resources (groundwater and surface water)	Vehicles on the job can leak fluids such as oil and fuels, which are toxic substances, into the ground, which can run off into surface water bodies or contaminate underground water tables through seepage.	-6
		Reduced water infiltration capacity	The circulation of vehicles causes soil compaction, which increases soil sealing, decreasing water infiltration capacity, causing water to run off the surface instead of being absorbed, which can affect the recharge/availability of water in underground aquifers.	-6
	Air Quality	Emission of particles, GHG and other pollutants	An increase in dust particles and smoke in the atmosphere due to increased traffic can affect the health of construction workers and communities close to the construction area (allergies and other respiratory diseases).	-8
	Sound environment	Increased sound levels	The movement of vehicles results in an increase in noise that can cause annoyance to the communities near the construction area and to workers	-6
	Fauna	Disturbance of fauna	The movement of heavy vehicles causes noise that can disturb the fauna, scaring them away from their habitat. Such displacement can result in the death of animals.	-6
	Socio-economic	Affecting the health and well-being of the community due to increased traffic	The increase in traffic can lead to road accidents and pedestrian accidents, affecting the safety of nearby communities	-8
Hiring labor	Socio-economic	Increasing local employment	The demand for labor (skilled and unskilled) will be an important boost to local employability, especially for young people	16
		Increasing the capacity of the local population	The presence of the contractor can be an opportunity to transfer construction and other skills to the local population in the surrounding communities.	12
		Promotion of the local economy due to the increased flow of non-resident population	The presence of a non-resident population can increase demand for goods, products and services, thus stimulating local commerce.	18
		Affecting Human Health	The increase in the flow of non-resident population can be a risk to the health of the local population, with an increase in sexually transmitted diseases (HIV/AIDS and other infections).	-6
		Social disruption and family instability	The increase in the flow of non-resident population can lead to social disruption and family instability	-6
		Potential increase in EAS/AS and GBV situations	Risk of cases of SAE/SAE and GBV among project workers, affecting vulnerable groups	-6

Activities	Descriptors Affected	Identification and Assessment of Environmental and Social Impacts, without Mitigation and Enhancement Measures		
		Identification	Explanation	Significance
CONSTRUCTION PHASE				
		Worker safety risks including occupational diseases and accidents	Safety risks for workers include accidents at work, such as falls and injuries, noise and vibrations caused by the operation of machinery and equipment, and occupational illnesses, which can result from exposure to harmful agents such as dust and chemicals.	-6
Purchase of materials and equipment	Socio-economic	Promoting the local economy	Fostering the local market with the purchase of materials and equipment needed to carry out the project	8

7.2.2 Operation phase

The identification and assessment of the environmental and social impacts for the **construction phase**, based on table 14 (II - Operation Phase) of point 7.1.1, are clearly presented in the table below (tab. 18). These impacts have been duly classified and explained, associated with the corresponding activities and their respective descriptors. For more details on the classification, see ANNEX 6 (II) - Matrix for the Identification and Assessment of Environmental and Social Impacts for the Operation Phase.

Table18 - Table for the Identification and Assessment of Environmental and Social Impacts in the Operation Phase.

Activities	Descriptors Affected	Identification and Assessment of Environmental and Social Impacts, without Mitigation and Enhancement Measures		
		Identification	Explanation	Significance
OPERATION PHASE				
Presence and functioning of channels	Climate and Climate Change	Adapting to climate change	More efficient and well-managed irrigation systems can increase farmers' ability to adapt to climate variability and droughts.	24
	Soil	Protection of the soil surface from erosion	The presence of well-maintained irrigation channels helps control soil erosion, protecting the fertility and structure of the soil in agricultural areas	24
	Water Resources	Improving the water regime by improving interception, infiltration and water retention capacity	Canal rehabilitation can restore water storage and distribution capacity, reducing losses and improving efficiency in the use of water resources.	16
	Fauna & Flora	Promoting Biodiversity	By restoring the canals, aquatic and riparian habitats can be improved, promoting local biodiversity.	16

Activities	Descriptors Affected	Identification and Assessment of Environmental and Social Impacts, without Mitigation and Enhancement Measures		
		Identification	Explanation	Significance
OPERATION PHASE				
	Socio-economic	Water availability	Increased water availability, translated into greater access to water for agricultural production and domestic use, reducing the distances traveled by inhabitants	16
		Development of the local economy	The operation of irrigation canals can develop the local economy by increasing agricultural productivity, which results in higher incomes for farmers, while also stimulating related economic activities such as food processing.	32
		Increased Agricultural Production	The operation of the irrigation canal will stimulate an increase (quantity and quality) in the production of local farmers, making it possible to diversify agricultural production and reduce rainfed agriculture.	16
		Improved nutritional conditions for the region's population, with access to more food	Increased production and, consequently, greater availability of food will lead to improvements in the nutritional status of communities, through a more varied diet, reducing the incidence of malnutrition.	24
		Hiring local staff	Hiring local labor (especially young people) to ensure that the irrigation canals are operational.	16
Maintenance	Waste	Waste Production	The main waste that can be produced by canal maintenance activities is organic waste (vegetation and food waste) and other sediments such as soil that clog up the canals.	-6
	Socio-economic	Local economy: business opportunity for local companies	Stimulate local trade by purchasing all the materials needed to maintain the irrigation canals from local suppliers	16
		Hiring local staff	Hiring local labor (especially young people) to clean and maintain the irrigation canals.	16

7.2 Identification of other situations inducing Environmental Risks

Throughout the study, the impacts relating to the project's main activities were identified, which correspond to the most common risks of the project's construction and operation phases.

It was found that, in the main, these are current risks that can be mitigated, and no situations were identified that induced an environmental risk with significantly negative consequences in environmental terms and/or human damage to individuals present outside.

In terms of internal sources of risk at the operational level, in addition to those described above, there are possible risks of flooding the banks of the canals, which can be safeguarded by monitoring and placing floodgates at the beginning and end of the canals.

Natural risks arise as a result of an impact or an extreme or intense natural phenomenon, such as periods of drought, precipitation or intense winds, which can cause potential damage, such as the loss of agricultural production. In the case of precipitation, flooding can occur due to the land's inability to absorb water.

In this sense, heavy rainfall is the natural risk most likely to occur in the province of Lunda Sul and consequently at the canal sites.

The unregulated occupation of rural areas can cause severe constraints on the free circulation of water in irrigation channels. Human occupation, combined with the occurrence of extreme hydro-meteorological events, can lead to floods with damaging effects on agricultural perimeters. Similarly, the indiscriminate felling of vegetation, leaving the soil increasingly exposed, increasing its erodibility and potentially damaging the structure of the canals, compromising the flow of water along their entire length.

The type of canal rehabilitation, the materials used to rehabilitate the canals and the organization of the agricultural perimeters adjacent to the canals must reduce the harmful effects of these natural hazards, ensuring that the canals are adequately protected.

7.3 Cumulative Impacts

With the irrigation canals coming into operation, which will allow the agricultural development of adjacent land, the cumulative impacts will be positive and significant in terms of the production of food in quantity and quality in Lunda Sul Province.

8 ENVIRONMENTAL MANAGEMENT PLAN AND SOCIAL

8.2 Framework

Due to the identification and assessment of the impacts resulting from the analysis of the project and its relationship with the area of implantation, the measures of interest for mitigating, minimizing or compensating and enhancing the identified impacts are presented here, structured in an Environmental and Social Management Plan (ESMP).

This document describes the commitment to achieving and demonstrating solid environmental performance by controlling the impacts of activities.

The proposed measures aim to implement the project in the most optimal way from an environmental and social point of view, safeguarding the interests of the biophysical and social environment, reducing or annulling potentially significant negative impacts that could affect the project or have serious consequences on any of the environmental descriptors considered in the ESIA.

In general terms, the structure of this ESMP involves the articulation of various actions, namely in the following areas:

- Prevention and mitigation of environmental and social impacts, including the environmental compliance of the shipyard and work fronts - Mechanisms for the Prevention and Mitigation of Environmental Impacts;
- Education and information (environmental awareness and education) - Environmental Education Plan;
- Audit and monitoring (environmental and social monitoring of the project) - Audit and monitoring plan

The mitigation and enhancement measures indicated relate to the construction and operation phases. In the phase prior to construction, the following measures are indicated to be implemented by the Owner and the Contractor:

- Compliance with Angolan legislation on public works contracts, particularly with regard to working conditions and wages, child labor, non-discrimination, workers' health and safety, etc. (General Labor Law no. 75/15, of June 15, and all legislation in force);
- Application of good practices from the Angolan ADB legislation: information, impact reduction, adequate compensation, complaints procedures, etc.
- The developer must contact the National Demining Institute of Lunda Sul Province and provide maps of the location of the Project, the construction site and other areas supporting the work fronts, in order to check whether the areas are free of mines or require demining. If it is necessary to clear a certain area, this must be done before any construction

activity begins and a Quality Assurance and Control Certificate must be issued by the Executive Demining Commission.

The proposed mitigation measures cover the impacts of the rehabilitation of the two Climate Change Resistant Small-Scale Irrigation Canals located in the Province of Lunda Suma, Municipality and Commune of Saurimo in the various environmental and social thematic areas.

This chapter presents the residual impacts that have been identified for the construction and operation phases after the application of mitigation and compensation measures.

8.3 Responsibilities

8.3.2 Institutional provisions

In schematic form, the general organization chart for the implementation of the ESMP (Fig.47) within the scope of this project. In the implementation project phase, this organization chart could be more detailed and the main players identified.

The **Project Owner** is the Ministry of Agriculture and Forestry (MINAGRIF) , which has appointed the Institute for Agrarian Development (IDA) as the **Project Promoter/Executor (PP)** .

The **Construction Contractor (EO)** which will be responsible for implementing the ESMP and ensuring that all mitigation measures and monitoring actions are carried out, must compile a Monthly Environmental and Social Report and submit it to the Project Promoter (IDA-MINAGRIF).
How the Promoter

To ensure compliance with the provisions of this document, the project promoter has appointed a **Project Implementation Unit (PIU-Cabinda)** which analyzes and approves the environmental and social documentation during the Project Phase.

Prior to the start of the work, it is planned to appoint an **Inspection Team (EF)**, which will be the interlocutor between the Contractor (EO) and the Project Promoter (PP) with regard to environmental and social issues, responsible for approving the documents.

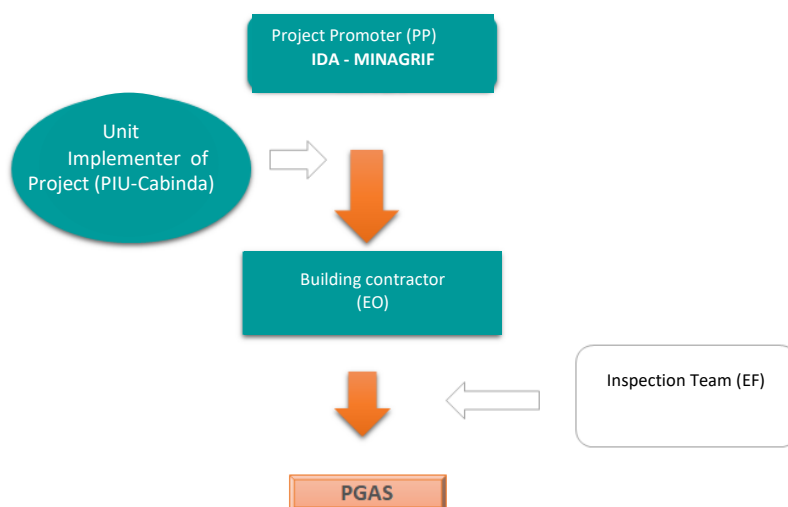


Figure -47 General organization chart for implementing the ESMP

The Inspection Team will supervise the contractors responsible for implementing the ESMP. To this end, the Inspection Team should have dedicated environmental, social, health and safety personnel to ensure the implementation of the plans and to confirm that all environmental and social commitments are incorporated into construction activities and work processes. Specific responsibilities include:

- a) Supervising and supporting contractors in fulfilling their responsibilities, as described in the ESMP;
- b) Issue notices of non-compliance to contractors;
- c) Providing information, advice and approval of specific work plans for activities related to the ESMP;
- d) Supervising the implementation of specific activity work plans;
- e) Regularly review and assess environmental risks throughout the construction phase;
- f) Review and evaluate environmental induction and training materials;
- g) Carry out environmental and social training and raise awareness of HIV/AIDS and STDs;
- i) Helping the Contractor to address and resolve complaints and claims related to the environment;
- j) Responding to work, health and safety incidents, as necessary (Supervision carries out the investigation and the Contractor implements the measures);
- k) Manage compliance reports related to the Project and prepare monthly ESMP compliance reports;
- l) Support the Contractor in liaising with ES for effective environmental management on site;
- m) Support the Contractor in liaising with Public Affairs and Health Clinics and other relevant Project entities; and
- n) Review the ESMP and revise it, if necessary, every six months.

8.3.3 Implementation

The ESMP is dynamic and evolves during the course of the contract and must include records of all the measures and plans implemented.

Adaptations and/or additions to the ESMP will always be made in accordance with the construction processes and working methods to be used in the execution of the work by the Contractor, and taking into account the existing constraints, the organization of the construction fields and the detailed planning of the Work.

The implementation and application of mitigation measures must be monitored:

- Continuous monitoring of the construction work by one of the above parties;
- Periodic on-site supervision by PIU technicians and the PP;
- Regular checks by the authorities.

In addition to the records produced during the work, proving compliance with pre-established measures, actions, programs and plans and others that may be issued, such as the Non-Compliance Record Form, the Contractor must draw up an Environmental Monitoring Report on a monthly basis, with the aim of informing the PP about the implementation and supervision of all environmental management actions in Construction. Reports on the monitoring carried out must also be drawn up.

At the end of the project, the Contractor will present a Final Environmental Monitoring Report, with the aim of presenting an evolutionary analysis and summary of all the actions carried out in the Environmental Management of the Project.

The purpose of reviewing the Environmental Management System is to analyze the environmental performance of the work, based on the visits made to the project site, the monitoring carried out and any non-conformities identified by the Client, and the need to make changes to this ESMP. To this end, it will be appropriate to hold periodic meetings, depending on the needs (within the limit, monthly), between the Site Contractor and the Project Promoter. These meetings will also analyze the environmental monitoring reports.

8.4 Environmental and Social Management Measures and Specific Plans

8.4.2 Introduction

The minimization measures will be divided into:

- The measures already incorporated into the project, resulting from the most significant positive impacts of the project, particularly those related to the development of agriculture in the eastern region of Angola;
- Measures for the pre-construction phase, consisting mainly of recommendations for the Tender procedures and a list of plans to be developed and implemented by the Contractor;

- Measures for the construction phase, divided into general measures related to the construction phase and consisting of a set of good environmental and social practices to be taken into account by the contractor, and specific measures by descriptor;
- Measures for the operation phase, presented by descriptor.

All mitigation measures and construction plans must follow the existing guidelines already described in the ADB Policies; IFC's Environment, Health and Safety (EHS); WHO Guidelines and Angola's Environmental Social Legislation.

8.4.3 Project-specific measures

The location of the canals to be rehabilitated is in the rural area of the Municipality and Commune of Saurimo, outside the residential area, without affecting dwellings, but affecting the natural vegetation of the Miombo and it may be necessary to remove some small family ploughs.

8.4.4 Project Phase Measures (Pre-Construction)

These measures are related to the preparation of the Tender Terms of Reference and specific construction plans for the Shipyard, in addition to the presentation of the works schedule to the local population - Public Consultations, as well as the implementation of a public service for consultations and complaints - MRR, in close collaboration with the district authorities and local leaders.

With regard to the Construction Project and specific Construction Plans, at this stage of the surveys, no proposals have yet been submitted. However, the form and deadline for submitting these proposals must be defined by the Project Promoter and applied by the contractor before construction activities begin, based on the previously defined construction activities and sites.

The management of the irrigation canals will be the responsibility of MINAGRIF. Some operating plans may be adopted to support this management.

The plans should detail the specific related mitigation measures, location details, layouts and designs, schedules, roles and responsibilities, methodologies and procedures and key performance indicators. A brief description of these plans is provided in Table 19.

Table19 - Proposed construction and operation plans

Designation of the Plan	Description
Policies	Description of all H&S procedures, code of conduct, legislation on child labor, GBV, labor code, legislation on the protection of human rights, including women's rights, etc.

Designation of the Plan	Description
	Prepared and implemented by the Contractor on the basis of ADB Safeguards and IFC EHS guidelines (2007), Angolan legislation, as well as the mitigation measures set out in this ESIA. The Plan will be submitted to Supervision for review and approval before the Contractor is mobilized
Waste Management Plan	Promoted by PP with the subcontracting of a consultancy, it is based on Angolan legislation, as well as the mitigation measures set out in this ESIA. During construction, the Contractor will be responsible for implementation and during the operation phase MINAGRIF will be in charge. The Plan will be submitted to the Supervisory Authority for review and approval before the Contractor is mobilized
Traffic Management Plan	Prepared by the Contractor on the basis of the mitigation plans presented in this ESIA, after discussion with the authorities responsible for roads and traffic. The Plan will be submitted to the Supervisory Authority for review and approval prior to mobilization by the Contractor.
Occupational Health and Safety Plan	Prepared by the Contractor, to address the identified hazards and include safe working procedures to mitigate, reduce or control the identified hazards. During operation, MINAGRIF (or another subcontractor) will be responsible for preparation and implementation. The Plan shall be submitted to the Supervisory Authority for review and approval prior to mobilization by the Contractor. It must include an log
Construction Environmental and Social Management Plan	Prepared by the Contractor on the basis of the Detailed Design and also the mitigation plans provided in this ESIA. The plan will include the layout of the construction site, details of various facilities, including supply, storage and warehouse. The plan will be submitted to Fisvcalização for analysis and approval prior to mobilization by the Contractor.
Accommodation Management Plan	Prepared by the Contractor, to ensure that employees have adequate accommodation for the work to be carried out. The Plan will be submitted to the Supervisory Authority for review and approval prior to mobilization by the Contractor.
Management Plan for Working Conditions and the Influx of Workers	A workforce management plan should be drawn up by the Contractor, based on the mitigation measures set out in the ESIA, that addresses specific aspects of the establishment and operation of the sites where the workers will be located and a labour influx management plan that addresses specific activities that will be carried out to minimize the impact on the local community, including worker codes of conduct, HIV/AIDS training programmes, etc. The Plan will be submitted to the Supervisory Authority for review and approval prior to mobilization by the Contractor.
Emergency Preparedness and Response Plan	Prepared by the Contractor after assessing the potential risks and hazards that may be encountered during the construction of the project. During operation, MINAGRIF (or another subcontractor) will be responsible for preparation and implementation. The Plan will be submitted to the Supervisory Authority for review and approval prior to mobilization by the Contractor. For the operational phase, this plan must be updated by MINAGRIF
Stakeholder Involvement Plan	Promoted by the PP with the subcontracting of a Consultancy is implemented by the Contractor with the collaboration of the Supervision to demonstrate how to

Designation of the Plan	Description
	communicate with local community leaders, how to provide details on mobilization employment opportunities, HIV/AIDS management, construction schedule and traffic management during the construction period. The Contractor's communication strategy should define a process for receiving, registering and responding to complaints and also monitor the success of any response action taken to avoid any conflict escalating. The Plan will be submitted to the Project Implementation Unit for review and approval prior to mobilization by the Contractor.
Community Health and Safety Plan	Prepared by the Contractor which is a Plan designed to ensure that all Parties directly involved in the construction and operation phases of the project, including managers and workers, are informed about the need to prevent/minimize the degradation of the environment and health/safety conditions. The Plan will be submitted to the Supervisory Authority for review and approval prior to mobilization by the Contractor.
Cultural Heritage Management Plan	Prepared by the Contractor, with procedures describing the actions required if previously unknown heritage resources, particularly archaeological resources, are encountered during the construction or operation of the project. The Plan will be submitted to the inspectorate for review and approval prior to mobilization by the Contractor.

8.4.5 Construction and Operation Phase Measures

The ESMP identifies the main measures to be implemented on site and must be adapted or supplemented by additional measures resulting from the Project Execution Plan and the construction strategies and solutions adopted by the Contractor during the course of the work

It is the Contractor's responsibility to carry out the analysis of these measures and to propose their detailing and detailing, and it is also the Contractor's responsibility to adapt them to strict and full compliance with the applicable environmental legislation in force. Any changes to the Plan must be submitted to the Project Promoter for approval before being included in the ESMP.

In the Operation Phase, the ESMP will provide guidance to the Proponent to ensure better environmental sustainability of the project and liaison with all the stakeholders involved.

The measures for the construction and operation phase presented in the tables below were defined on the basis of the environmental and social identifications and assessments and include not only specific measures per thematic area, but also cross-cutting measures that may apply to various environmental and social factors.

The correspondence of each measure can be seen in detail in the Matrix for the Identification and Assessment of Environmental and Social Impacts - **ANNEX 6**.

Table20 - Table of Measures to Mitigate and Potentiate Environmental and Social Impacts I CONSTRUCTION PHASE

Code	Type of Measures (MM or MP)	Description of measures
MC 1	MM	Implementation of a Resettlement Plan or Livelihood Restoration Plan, if necessary.
MC 2	MM	Choose construction sites with little vegetation, reducing interference in sensitive natural habitats, avoiding areas with high biodiversity and critical ecosystems.
MC 3	MM	Design and implement a Replanting Program, promoting reforestation and native vegetation in adjacent areas. <i>Note: Plant roots help create spaces in the soil that facilitate water permeation.</i>
MC 4	MM	Whenever possible, position construction structures and materials in places that minimize their visual impact, in areas that have already been disturbed, reducing visibility in panoramic views.
MC 5	MM	Land clearing, with the removal of vegetation, should only take place in the areas strictly necessary for the work, avoiding the felling of trees whenever possible.
MC 6	MM	Carry out periodic maintenance on the machines, heavy and light vehicles assigned to the work, to ensure good working conditions, thus reducing noise and combustion gas emissions and preventing spills.
MC 7	MM	Have "Spill Prevention Kits" available in heavy vehicles and near machinery.
MC 8	MM	Mandatory use of PPE - masks by workers when carrying out activities that emit particles
MC 9	MM	Sprinkle the work fronts regularly, especially on dry and windy days, to mitigate dust.
MC 10	MM	Acquire, whenever possible, soundproofed equipment or implement soundproofing techniques in equipment
MC 11	MM	Mandatory use of PPE - ear protection for workers handling heavy machinery and vehicles
MC 12	MM	Reuse the cut materials by donating the tree trunks to the community for various uses.
MC 13	MM	Implementation of the Waste Management Plan

Code	Type of Measures (MM or MP)	Description of measures
MC 14	MM	Acquire, whenever possible, equipment and machinery that produces less noise and/or implement soundproofing techniques in equipment
MC 15	MM	Turn off machines and vehicles when not in use
MC 16	MM	Move machinery and workers at times that minimize disturbance to fauna, avoiding breeding periods or times when animals are most active.
MC 17	MM	Implement natural engineering techniques, such as the use of geotextiles and containment blankets, as well as barriers such as retaining walls and vegetation on slopes, which contribute to stabilizing the soil and reducing erosion.
MC 18	MM	Generators must be stored in impermeable places or over an oil and hydrocarbon retention basin.
MC 19	MM	Use permeable sidewalks that allow water to infiltrate, using materials such as permeable concrete, which facilitates drainage and water absorption in the soil.
MC 20	MM	Construction materials must be secured and covered with a tarpaulin, for example, to prevent the finer materials, such as aggregates and other materials, from being blown away by the wind. Also cover the open boxes of earthmoving vehicles.
MC 21	MM	Develop a Water Resources Management Study that minimizes the need for prolonged detour from the natural flow, taking into account the seasonality and water characteristics of the region.
MC 22	MP	Use existing paths to avoid creating new ones
MC 23	MM	Development of a Maintenance Plan for access roads to guarantee the mobility of rural communities after the construction phase of the project. Carry out integrated planning that considers the mobility needs of rural populations, including public transport routes, access to services and interconnections with other routes.
MC 24	MM	Establish fixed routes for the movement of machinery, heavy vehicles and light vehicles.
MC 25	MM	Implementing a Traffic Plan that establishes periods for the circulation of heavy vehicles as well as speed limits within the perimeters of the areas affected by the project.
MC 26	MP	Implement a Recruitment and Vocational Training Plan that prioritizes the inclusion of local labor, with a focus on the youth of the affected communities; promotes equal employment opportunities for men and women, with special attention to the recruitment of vulnerable groups, such as widows responsible for families and people with disabilities.

Code	Type of Measures (MM or MP)	Description of measures
MC 27	MP	Creating a space for weekly fairs, markets and cultural events that attract both the local and non-resident population, promoting the region's commerce and culture.
MC 28	MM	Implement a plan for monthly education and awareness campaigns aimed at the project's stakeholders, with a special emphasis on communities. Note: Presentation of the Theme: STDs, forms of transmission, prevention and the importance of early diagnosis.
MC 29	MM	Implementation of a Complaints Management and Resolution Mechanism
MC 30	MM	Implement a plan for monthly education and awareness campaigns aimed at the project's stakeholders, with a special emphasis on communities. Note: Presentation of the Theme: Importance of integration and peaceful coexistence between residents and non-residents, addressing prejudices and creating empathy.
MC 31	MM	Implement a plan for monthly education and awareness campaigns aimed at the project's stakeholders, with a special emphasis on communities. Note: Presentation of the Theme: Avoiding EAS/AS and GBV behaviors
MC 32	MM	Use of Personal Protective Equipment (PPE)
MC 33	MM	Implementation of a PSS that includes work procedures as well as a regular training plan on safety at work
MC 34	MP	Establish partnerships with local suppliers and companies in the project's areas of influence to purchase materials, goods and services.

Caption:

MM - Mitigation Measures

MP - Measures of Potentiation

MC - Construction Phase Measures

Table21 - Table of Measures to Mitigate and Potentiate Environmental and Social Impacts I OPERATION PHASE

Code	Type of Measures (MM or MP)	Description of measures
MO 1	MP	Implementation of efficient, precision irrigation systems, such as drip irrigation. This method directs water directly to the roots of the plants, minimizing waste and increasing water use efficiency.
MO 2	MP	Training program for farmers promoted by the ECAs
MO 3	MP	Implementation of native vegetation restoration projects on the banks of canals. This creates buffer zones that protect aquatic ecosystems and promote local biodiversity.

Code	Type of Measures (MM or MP)	Description of measures
MO 4	MP	Construction and rehabilitation of water storage and distribution infrastructure, such as reservoirs and piping systems. This will facilitate access to water for agricultural production and domestic use, ensuring that communities have an efficient and nearby supply network
MO 5	MP	Implementing water management policies that prioritize fair access to water will contribute to the sustainability and responsible use of this resource.
MO 6	MP	Develop marketing channels that connect local farmers to markets, ensuring that diversified products can be sold efficiently.
MO 7	MP	Facilitate access to micro-credits and subsidies for the purchase of seeds, fertilizers and appropriate technologies that encourage the diversification of production.
MO 8	MP	Implement a Recruitment Plan that prioritizes the inclusion of local labor, with a focus on the youth of the affected communities. Promote equal employment opportunities for men and women, with special attention to the recruitment of vulnerable groups, such as widows responsible for families and people with disabilities.
MO 9	MM	Implementation of the Waste Management Plan
MO 10	MP	Establish partnerships with local suppliers and companies, prioritizing the purchase of materials locally
MO 11	MP	Implement a Recruitment Plan that prioritizes the inclusion of local labor, with a focus on the youth of the affected communities. Promote equal employment opportunities for men and women

Caption:

MM - Mitigation Measures

MP - Measures of Potentiation

MO - Operation Phase Measures

8.5 Summary of Residual Impacts

This section summarizes the potential significant residual impacts that may remain after the construction phase and during the operation phase of the irrigation canals.

Residual impacts are the final or intended impacts that occur after the proposed mitigation measures have been applied. They refer to the degree of change that will occur after the proposed mitigation measures have been applied. The same scale was used to classify the impacts (Table 16).

Annex 6 shows the impact identification and assessment matrix with the "residual impact" column, after applying the mitigation measures defined in the previous point.

With the adoption of mitigation measures, a reduction in the assessment of negative impacts can be seen, which indicates that the impacts are not significant, thus demonstrating the feasibility of implementing the project.

The only significant impact is the non-implementation of the project in terms of compliance with the objectives of the Agricultural Value Chain Development Plan.

The positive impacts are mainly related to the availability of water for the development of agricultural production in the Lunda Sul region, which will simultaneously benefit several descriptors: climate change, water resources, water quality and socioeconomics.

Table22 - Summary Table of the Assessment (Classification) of the Residual Environmental and Social Impacts. - Construction Phase and Operation Phase

(-) Negative impacts // (+) Positive impacts

Activities	RESIDUAL IMPACTS
I - CONSTRUCTION PHASE	
Land allocation	(-8) Land use: agricultural; natural habitats and other existing uses (-6) Increase in sealed area (decrease in infiltration capacity and increase in surface runoff) (-3) Affecting the landscape
Cleaning, Deforestation and Clearance	(-8) Land use (-8) Microclimate change due to deforestation (-4) Reduced water infiltration capacity in the soil and increased surface runoff (-3) Potential contamination of surface and groundwater (-3) Particle emissions from earthmoving (-2) Increased sound levels (-4) Waste Production (-8) Affection of vegetation / natural habitats (-6) Disturbance of fauna
Earthmoving	(-8) Land use (-4) Reduced infiltration capacity and increased surface runoff (-2) Potential contamination of surface and groundwater (-4) Particulate emissions from earthmoving (-4) Increased sound levels (-2) Disturbance to fauna (noise)
Presence and Operation of the Shipyard (implementation of the Shipyard) and Work Fronts	(-2) Increase in sealed area (decrease in infiltration capacity and increase in surface runoff) (-2) Possible soil contamination due to accidental spills, waste disposal, etc. (-2) Potential contamination of water resources (groundwater and surface water) (-3) Emission of particles, GHG and other pollutants

Activities	RESIDUAL IMPACTS
I - CONSTRUCTION PHASE	
Material Storage	(-4) Increased sound levels (-4) Waste production
Rehabilitation / Regularization of Canals	(-3) Increase in waterproofed area decrease in infiltration capacity (particularly if conventional engineering techniques are adopted) (-2) Affecting Soil Quality due to possible soil contamination from accidental spills, waste disposal, etc. (-2) Affectation of water resources with the need to divert natural runoff to rehabilitate the channel, if necessary (use of a cofferdam) (-2) Potential contamination of water resources (groundwater and surface water) (-2) Increased sound levels (-3) Waste production
Creating Access Paths	(-6) Land use (-2) Potential contamination of water resources (surface and groundwater) (-2) Reduced water infiltration capacity in the soil (-4) Emission of particles, GHG and other pollutants (-2) Increased sound levels (-3) Affectation of vegetation / natural habitats (-2) Disturbance of fauna (+16) Improving the movement of people and goods in rural areas
Circulation of vehicles for transporting materials, equipment and workers and moving machinery	(-2) Possible soil contamination due to accidental spills (-4) Potential contamination of water resources (surface and groundwater) (-3) Emission of particles, GHG and other pollutants (-4) Increased sound levels (-2) Disturbance of fauna (-4) Increase in traffic - potential increase in road accidents and trampling.
Hiring labor	(+24) Increase in local employment (+24) Increased training of the local population (+24) Promotion of the local economy due to the increased flow of non-resident population (-4) Affecting human health, with an increase in sexually transmitted diseases (HIV/AIDS and STDs) due to the increased flow of non-resident population (-3) Potential social disruption and family instability due to the increased flow of non-resident population (3-) Potential increase in situations of SAEs and GBV, particularly in vulnerable groups (-2) Workers' safety risks including occupational diseases and accidents
Purchase of materials and equipment	(+18) Promoting the local economy

Activities	RESIDUAL IMPACTS
I - CONSTRUCTION PHASE	
I - OPERATION PHASE	
Presence and functioning of channels	(+32) Adapting to climate change (+32) Protection of the soil surface from erosion (+36) Improvement of the water regime by improving interception, infiltration and water retention capacity (+36) Promoting Biodiversity (+24) Water availability (+48) Development of the local economy (+24) Increase in Agricultural Production (+24) Improved nutritional conditions for the region's population with access to more food (+24) Hiring local staff
Maintenance	(-3) Waste production (+36) Local economy: business opportunities for local companies (+24) Hiring local staff

8.6 Monitoring plans

During the construction phase, it is the Contractor's responsibility to implement the mitigation or compensation measures with frequent monitoring of the environmental and social aspects presented in this study. Compliance monitoring will be carried out by the Supervision at the work sites, under the direction and guidance of the Project Implementation Unit.

In the operation phase, responsibility for monitoring will be transferred to MINAGRIF. One of the main recommendations is to carry out frequent measurements of the amount of water flowing per unit time in the canals. This monitoring is crucial to verify the availability of water, which is the basis for the success of this project. This water will be used to irrigate the agricultural perimeters, thus enabling agricultural development, with an expected increase in agricultural production and product quality.

It is essential that periodic and continuous monitoring is maintained over time. To ensure the effectiveness of the monitoring programs to be implemented, it is necessary to clearly define the following aspects:

- Parameters to be monitored - Identification of key indicators for analysis.
- Sampling sites - Cartographic representation of the monitoring points at an appropriate scale to guarantee the representativeness of the data.
- Sampling program - Defining an appropriate frequency and schedule for data collection;
- Analysis techniques and methods - Methodological choices that will ensure the accuracy of the data obtained;

- Data evaluation criteria - Establishing standards that will facilitate the interpretation of results.

The rigorous implementation of monitoring programs will be key to ensuring the environmental and social sustainability of the project, as well as the full use of the agricultural potential it aims to promote. Collaboration between all those involved, from the contractor to MINAGRIF, is essential for the success and effectiveness of the management strategies over time.

8.7 Training and Capacity Building

The Contractor shall ensure that workers are trained and informed, taking into account the functions they perform and the jobs they hold.

The aim is to ensure the competence of all workers who carry out tasks likely to lead to significant negative environmental impacts, through their qualifications, specific training, experience and awareness, in order to provide adequate knowledge of the environmental and social aspects and impacts associated with the activities they carry out and how they can influence them.

It is the responsibility of the contractor:

- a) Promote the training and information of its staff in the area of the environment, in order to guarantee the necessary skills to comply with the requirements set out in this document.
- b) Ensure and prove, whenever requested by the Supervisory Body or within the scope of audits, that the necessary and sufficient training has been provided for carrying out activities with associated environmental and social risks.

Given the characteristics of the work to be carried out, the work sites, the existing constraints and the associated environmental aspects, the Contractor must submit an annual Worker Training and Information Plan, which must be approved by the Supervisory Authority before being integrated into the ESMP.

The Workers' Training and Information Plan can include various types of actions, namely: Awareness-raising actions, Dissemination of Information, Periodic Meetings by Groups of Workers, etc.

8.7.2 Awareness-raising activities

Awareness-raising sessions should take place on one of the first days after the construction site opens and at predetermined intervals during the course of the work. It is recommended that awareness-raising sessions do not exceed 30 minutes.

The Contractor, with the collaboration and support of the Supervisory Body, will pass on to the group of workers (including subcontractors and self-employed workers) the essential aspects contained in the ESMP.

Among the topics covered are:

- Environmental Management Plan;
- Environmental procedures related to the activities to be carried out;
- Environmental verification records;
- Waste management;
- Water quality;
- Soil and groundwater contamination;
- Noise;
- Contacts with local communities (cultural issues and conflict prevention, GBV, EAS/AS, child protection), Code of Conduct; raising awareness of the risks of HIV/AIDS and STDs, etc);
- Awareness-raising on sexual abuse, harassment and exploitation (EAS-AS) with a group of workers and the community;
- Biodiversity (protection of flora and fauna, prevention of conflicts with local fauna);
- Heritage (identification of cemeteries);
- Cleanliness and organization;
- Reporting incidents/accidents with an environmental impact;
- Dangerous goods;
- Flammable substances;
- Health and safety (safe ways of working - on the construction site, near equipment, near water, at height, etc.);
- Evacuation/emergency plan;

Initial environmental training should always be given to employees starting work in the project area, through induction training sessions.

8.7.3 Disclosure of Information

General information highlighting essential aspects of the ESMP should be displayed, namely on windows to be placed on the construction site and in other places with high visibility for workers - offices, dormitories, canteens, leisure areas, warehouses, support containers:

- Actions to be carried out in the Construction Field on Environmental and Social Prevention;
- Code of Conduct;
- Prohibition of VBG/EAS/AS;
- Complaints Resolution Mechanism (CRM) poster;
- Specifications for specific works;
- The Environmental Emergency Plan;
- Occurrence of incidents.

8.7.4 Periodic Workers' Group Meetings

In addition to awareness-raising actions aimed at all workers on the site, periodic meetings should be planned with smaller groups of workers, preferably at the work fronts.

These groups can be made up of professional categories or by the type of work they do, taking into account the characteristics of the work and the number of workers on site.

At these meetings, the procedures applicable to the work that the group of workers will be carrying out will be discussed and special attention will also be paid to actions related to gender-based violence.

The duration of these meetings should be kept to a minimum, it is recommended that they do not exceed 30 minutes, however, there will be cases where, depending on the complexity of each type of work, more time may be needed.

All the documentation developed within the scope of the Workers' Training and Information Plan, including the timetable for the activities, as well as the records proving that they were carried out, must be included in the monthly and final reports for the work.

All actions in the field of Employee Training and Information must be recorded and must contain all the relevant information, such as attendance records, identification of the trainer, topics covered, duration, etc. Topics should be developed using the active method (encouraging trainees to participate).

In addition, the Contractor undertakes to make his staff available to take part in environmental awareness actions, organized and coordinated by the Project Promoter/Project Owner, whenever he deems it necessary. These actions will obviously take into account the nature of the different works and associated risks, their duration and the resources involved and, in particular cases, may be carried out before work begins.

In addition to these training sessions, informal awareness-raising sessions should be carried out with the employees responsible for each work front, based on the following situations that may have arisen:

- Conclusions of the visits to the work carried out;
- Non-conformities detected;
- Obligation to comply with specific requirements;
- Occurrence of environmental emergencies.

8.8 Monitoring the ESMP

During the course of the work, an audit of the site should be carried out in order to verify compliance with the measures proposed in this ESMP and in the Monitoring Program presented by the contractor and with good environmental management standards.

This audit can be carried out by the Contractor, the Supervisory Authority or the Project Promoter. Table23 summarizes the main objectives of each type of audit.

Table23 - Types of Audits of the ESMP

Audits	Main objectives		
VERIFICATION AND CONTROL MECHANISMS BY THE CONTRACTOR	Verification of the correct application of procedures during work by workers and subcontractors		
Internal audits	Internal Audit Program, clearly identifying the Activities to be audited, including those of Subcontractors, the respective procedures to be followed, specific to each of them, if relevant. The Internal Audit Program must establish the frequency with which Internal Audits are carried out, defining the respective timetable. Procedures relating to the competencies of the audit team, the preparation and dissemination of the respective audit reports and any corrective action plans should also be defined.		
Periodic checks	The Contractor will have to present an Internal Periodic Verification Program, clearly identifying the work fronts and facilities verified and the environmental aspects assessed, including those related to Subcontractors. The Program must establish the frequency with which Internal Checks are carried out, defining the respective timetable.		
VERIFICATION AND CONTROL MECHANISMS BY THE PROMOTER	Verification of the correct application of the ESMP, minimization measures, plans and control of activities		
Unscheduled visits	Checks, without prior appointment, which will result in records of observed occurrences		
Scheduled visits (monthly)	<table border="1"> <tr> <td data-bbox="552 1290 719 1904">Technical visits and external audits, by appointment, which will result in technical visit and audit reports</td><td data-bbox="719 1290 1426 1904"> Promoter - the PP/PO will accompany the Inspectorate (PCE) on the Technical Visits, to be carried out on a monthly basis, recording the results in the corresponding Technical Visit Reports. It may also, by its own means or through external entities contracted for this purpose, carry out External Audits, suitable for verifying the environmental management activities of the work from the second month after the award of the Contract. The Audit Team will record the results of these audits in the corresponding External Audit Reports Supervision - As part of the day-to-day checks carried out in the course of its work, the Supervision (ES) will notify the Contractor of any environmental anomalies that have been identified and of the deadline for their correction. Immediately (within a maximum of 24 hours), the Contractor must record this on the appropriate form, as well as identify its causes and define corrective actions, which must be implemented within the timeframe established by the Supervisory Body or agreed by both. </td></tr> </table>	Technical visits and external audits, by appointment, which will result in technical visit and audit reports	Promoter - the PP/PO will accompany the Inspectorate (PCE) on the Technical Visits, to be carried out on a monthly basis, recording the results in the corresponding Technical Visit Reports. It may also, by its own means or through external entities contracted for this purpose, carry out External Audits, suitable for verifying the environmental management activities of the work from the second month after the award of the Contract. The Audit Team will record the results of these audits in the corresponding External Audit Reports Supervision - As part of the day-to-day checks carried out in the course of its work, the Supervision (ES) will notify the Contractor of any environmental anomalies that have been identified and of the deadline for their correction. Immediately (within a maximum of 24 hours), the Contractor must record this on the appropriate form, as well as identify its causes and define corrective actions, which must be implemented within the timeframe established by the Supervisory Body or agreed by both.
Technical visits and external audits, by appointment, which will result in technical visit and audit reports	Promoter - the PP/PO will accompany the Inspectorate (PCE) on the Technical Visits, to be carried out on a monthly basis, recording the results in the corresponding Technical Visit Reports. It may also, by its own means or through external entities contracted for this purpose, carry out External Audits, suitable for verifying the environmental management activities of the work from the second month after the award of the Contract. The Audit Team will record the results of these audits in the corresponding External Audit Reports Supervision - As part of the day-to-day checks carried out in the course of its work, the Supervision (ES) will notify the Contractor of any environmental anomalies that have been identified and of the deadline for their correction. Immediately (within a maximum of 24 hours), the Contractor must record this on the appropriate form, as well as identify its causes and define corrective actions, which must be implemented within the timeframe established by the Supervisory Body or agreed by both.		

Non-conformities are all deviations from procedures and implementation of mitigation and monitoring measures described in the ESMP that are detected during previous audits. Each non-conformity will be recorded on the corresponding Non-Conformity Record Form (FRNC), which must be filed by the Contractor.

9 NEED TO UPDATE THE ESIA STUDY

9.2 Environmental aspects

The studies carried out on the basis of the literature and field surveys provided a detailed description of the project area that allowed for an adequate assessment of the project's impacts.

It is recommended that a hydrological study of the study areas be carried out during the Project Phase, including the Chicapa River and the Tamba River, which are the rivers that will have a direct influence on the water supply of the canals to be rehabilitated: Pelengue Canal and Capuepua Canal, respectively.

More information on the construction project and the type of rehabilitation that will be carried out will help to better detail the impacts.

For the rest, no other gaps have been identified that require further studies.

9.3 Social Aspects

As above, for the social aspects, a detailed characterization was carried out, based on interviews and observations in the field, public consultations and also data from official authorities, which allowed an understanding of the Saurimo population, its demographic and economic situation, and in the rural area where the project will be implemented, the opinions and expectations of the communities of the villages closest to the canals were collected in relation to the project.

It is assumed that this basic characterization was sufficient to develop a preliminary and adequate assessment of the project's social impacts. However, it is recommended that when the construction project is completed, new public consultations be held with the communities of the Pelengue 1 and 2 neighborhoods, Capuepua Village and Muambulo Village.

10 CONCLUSIONS

The implementation of the irrigation canal rehabilitation project represents a valuable opportunity for the rural area of the municipality of Saurimo, by promoting the restoration of infrastructure and improving water management in the Lunda Sul region, generating both environmental and socio-economic benefits. The rehabilitation of irrigation canals will increase the capacity (quantity) and



distribution of water, facilitating agricultural development in the region, with a potential increase in production. These improvements will strengthen farmers' resilience to climate variations and optimize water use, contributing to more sustainable and efficient agriculture. In addition, by increasing agricultural production, the project will allow wider access to food, improving food security and the nutritional conditions of the local population.

With the preparation of the Environmental Impact Assessment (EIA) and the Environmental and Social Management Plan (ESMP), it was possible to identify and assess the impacts resulting from the specific activities of each phase (construction phase and operation phase) generated by the project, as well as to define a series of management measures, strategies and actions to deal with the potential environmental and social impacts, with the aim of minimizing or enhancing their effects. These measures were formalized in an Environmental and Social Management Plan (point 8), accompanied by proposals for environmental and social monitoring, with the implementation of mitigation measures and risk management. Despite the implementation of mitigation measures and management plans, there are still some "residual" impacts of limited significance which do not make the project unfeasible. It is therefore considered that this document offers clear and concrete guidelines to mitigate and compensate for all negative environmental and social impacts, as well as to reinforce positive impacts.

It is recommended that this document be reviewed and updated during the design phase, before work begins, to include the specific conditions of the project's execution. Consideration should also be given to the development of an ESMP by the contractor, based on the information contained in this document, to ensure the active and effective implementation of all the measures to mitigate and enhance the environmental and social impacts envisaged for this project.

In summary, although there are impacts associated with the development of the project, this document demonstrates that, with commitment and strong leadership, these impacts can be managed, becoming practically non-existent in the case of the negative ones and enhancing them in the case of the positive ones.

11 BIBLIOGRAPHICAL REFERENCES

ALMEIDA, A.R.V. (2017). *The Problem of Urban Solid Waste Management in Angola: Case Study: Huíla Province Lubango Municipality*. Master's dissertation in Territorial Management, Specialization Area in Environment and Natural Resources, Faculty of Social and Human Sciences, Universidade Nova de Lisboa. 114 pp

BAPTISTA, M. A. (2019). *Hydrogeology of Angola: Resources and Sustainability*. International Association of Hydrogeology.

BARBOSA, L. A. GRANDVAUX (1970). Phytogeographic map of Angola. Scientific Research Institute of Angola, Luanda.

CARVALHO, S.C.P., F. Santos & M. Pulquério (2016). Climate change scenarios for Angola: an analysis of precipitation and temperature projections using four RCMs. *International Journal of Climatology*. Published online in Wiley Online Library

EPAS (2024). *Management Report and Accounts 2023*, Saurimo: EPAS-LUNDA SUL.

GOMES, J. D. (2015). *Geology of Angola: Geosystems and Natural Resources*. University Edition.

HUNTLEY, J. (2023) *Ecology of Angola: Terrestrial Biomes and Ecoregions*. University of Porto, Porto, Portugal.

HUNTLEY, J. RUSSO, V. LAGES, F. & ALMEIDA N. F. (2019). *Biodiversity of Angola*. Art and Science.

HUNTLEY, J., (1974). Outlines of wildlife conservation in Angola. *Jl. Southern Africa Wildlife Management Association* 4:157-166.

INE (2016a). *Definitive Results of the General Population and Housing Census of Angola 2014*, Luanda: INE.

INE (2016b). *Population Projection of Lunda Sul Province (2014-2050)*, Luanda: INE.

INE (2023). *Angola Employment Survey: Yearbook 2022*, Luanda: INE.

INE (2024). *Statistical Yearbook of Education, 2020-2021*, Luanda: INE.

NATIONAL INSTITUTE OF STATISTICS (INE), Ministry of Health (MINSA), Ministry of Planning and Territorial Development (MINPLAN) & ICF. (2017). *Survey of Multiple Indicators and Health in Angola 2015-2016*. Luanda, Angola and Rockville, Maryland, USA: INE, MINSA, MINPLAN and ICF.

IUCN (2020). Red List of Threatened Species. A Global Species Assessment. IUCN, Gland, Switzerland, LOPES, Paulo Carlos, CAMELO, João Carlos, CORREIA, Luís Grosso (2022). *School education in eastern Angola: perceptions of secondary school teachers and students on the process of implementing school education*, *Journal of Education*, vol 10, pp 127-149.

MARQUES, T. (2018). *Landscape Dynamics in Angola: Geomorphology and Environment*. University Editions. MCTA (2021). Angola's Nationally Determined Contribution 2021.

MINISTRY OF URBANISM AND ENVIRONMENT (MINUA) (2006). First National Report to the Conference of the Parties to the Convention on Biological Diversity. National Biodiversity Strategy and Action Plan (NBSAP).

SILVA, C. R., & Costa, E. A. (2017). *Geology and Minerals of Angola*. Luanda: INEGI.

Websites:

<https://pt.weatherspark.com/>

ANNEXES

unofficial english version

ANNEX 1

ENGIACTIVE Environmental Certificate



REPÚBLICA DE ANGOLA

GABINETE JURÍDICO E INTERCÂMBIO

CERTIFICADO DE CONSULTORIA AMBIENTAL

N.º 6015665245

O Gabinete Jurídico e Intercâmbio do Ministério do Ambiente, atesta que foram cumpridas todas as formalidades legais conducentes ao Registo Técnico da Sociedade de Consultoria Ambiental ENGIACTIVE, LDA, nos termos do Decreto Executivo n.º 86/12, de 23 de Fevereiro de 2012, que aprova o Regulamento sobre o Registo Técnico de Sociedade de Consultoria Ambiental.

Emitida em, 11 de Abril de 2024	Válida até, 11 de Abril de 2025
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Assinatura


RUI LEONEL BAPTISTA FERREIRA

(DIRECTOR DO GABINETE JURÍDICO E INTERCÂMBIO)



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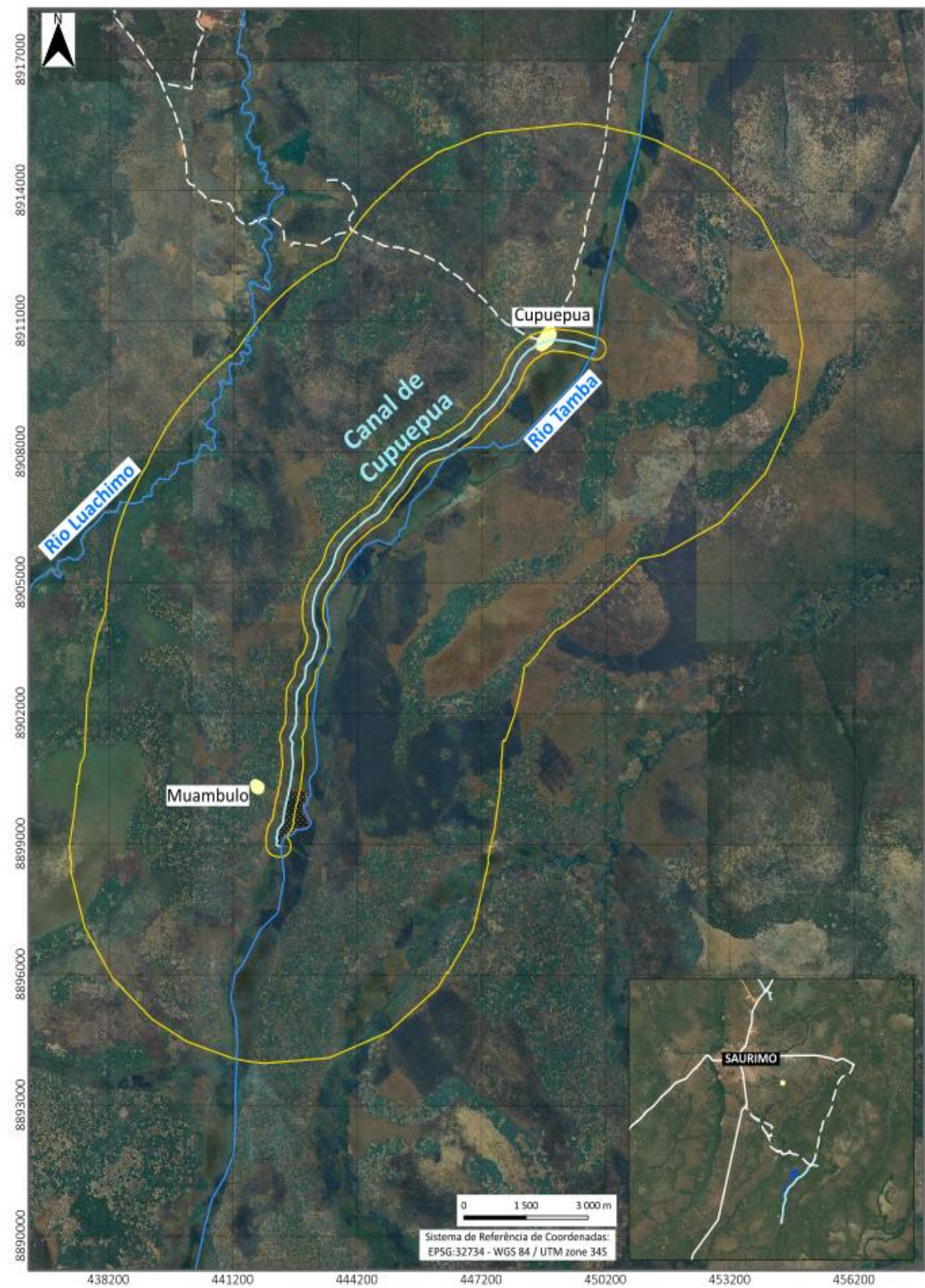
ANNEX 2

Project Areas of Influence

➤ Pelengue Irrigation Canal



➤ Capuepua Irrigation Canal



ANNEX 3

List of Flora Species

Annex 3 - Main botanical groups in the project area.

POTENTIAL COMPOSITION OF THE FLORA IN THE PROJECT AREA									
Taxonomic groups		Species			Conservation status			Ecological behavior	
Class	Families	Scientific name	Common name	Size	IUCN Status	National Status		Exotic	Invader
						LVEA	Costa et al, 2019		
Magnoliopsida	Apocynaceae	<i>Diplorhynchus condylocarpon</i>	Diboto(kioko)	Tree	LC	NA	VU		
		<i>Landolphia parvifolia</i>	Caiçuma	Climbing vine	LC				
Magnoliopsida	Combretaceae	<i>Combretum</i>	Musungua	Shrub	LC	NA	NA		
		<i>Combretum</i>	Muhoho	Tree	LC	NA	NA		
		<i>Terminalia macroptera</i>		Tree	LC	NA	NA	x	
		<i>Terminalia sericea</i>		Tree	LC	NA	VU		
		<i>Terminalia brachystema</i>	Kilungo-veva	Shrub	NE	NA	NA		
Magnoliopsida	Euphorbiaceae	<i>Maprounea africana</i>		Tree	LC	NA	NA		
Magnoliopsida	Fabaceae	<i>Baphia massaiensis</i>	Katshiua	Shrub	LC	NA	NA		
		<i>Brachystegia spiciformis</i>	Chicungo	Tree	LC	VU	VU		
		<i>Burkea africana</i>	Mussesse	Tree	LC	NA	DD		
		<i>Cassia alata</i>		Tree	LC	NA	NA	x	
		<i>Copaifera baumiana</i>		Shrub	NE	NA	NA		
		<i>Daniellia alsteeniana</i>		Tree	NT	NA	NA		
		<i>Erythrophleum africanum</i>	Mussamba	Tree	LC	NA	VU		
		<i>Guibourtia coleosperma</i>	Muxi	Tree	NE	NA	LC		
		<i>Julbernardia paniculata</i>	Musondo	Tree	LC	NA	VU		
		<i>Pterocarpus angolensis</i>	Mukula	Tree	LC	VU	VU		
Magnoliopsida	Hypericaceae	<i>Psorospermum febrifugum</i>	Pau-febre	Shrub	LC	NA	NA		
Magnoliopsida	Myrtaceae	<i>Syzygium guineense</i>		Tree	LC	NA	NA		
		<i>Syzygium cordatum</i>	Muzela-kuangu	Tree	LC	NA	NA		
Magnoliopsida	Phyllantaceae	<i>Hymenocardia acida</i>	Lukanda	Shrub	LC	NA	LC		
Magnoliopsida	Passifloraceae	<i>Paropsia brazzaena</i>		Shrub	NE	NA	NA		
Liliopsida	Poaceae	<i>Bambusa vulgaris</i>	Bamboo	Giant herb	NE	NA	NA	x	
Liliopsida	Smilacaceae	<i>Smilax anceps</i>	Mukalele	Climbing vine	NE	NA	NA		
Magnoliopsida	Vitaceae	<i>Cissus erosa</i>	Wild grapes	Climbing vine	NE	NA	NA		
Magnoliopsida	Rubiaceae	<i>Gardenia imperialis</i>	Mumbula	Tree	LC	NA	NA		
Magnoliopsida	Proteaceae	<i>Protea sp</i>		Subshrub	NE	NA	NA		
Magnoliopsida	Crysobalanaceae	<i>Parinari capensis</i>	Sand apple	Shrub	NE	NA	NA		

POTENTIAL COMPOSITION OF THE FLORA IN THE PROJECT AREA

Taxonomic groups		Species			Conservation status			Ecological behavior	
Class	Families	Scientific name	Common name	Size	IUCN Status	National Status		Exotic	Invader
						LVEA	Costa et al, 2019		
Magnoliopsida	Dipterocarpaceae	<i>Marquesia macroura</i>	Mavuca	Tree	LC	NA	NA		

IUCN categories: **LC** - Least Concern, **NE** - Not Evaluated, **VU** - Vulnerable. **Red List of Angolan Species (LVEA) categories:** Category A - **Extinct Species (Ex)**, Category B - **Endangered Species (AEx)**, Category C - **Vulnerable Species (VU)**, Category D - **Invasive Species (Inv.)**.

ANNEX 4

Fauna Species List

Annex 4.1 - List of potential birds in the project area.

IUCN Abbreviations: LC - Least Concern; NT - Near Threatened; VU - Vulnerable; EN - Endangered; CR - Critically Endangered; DD - Insufficient Data; NE - Not Evaluated. **Abbreviations Endemism:** EE - Endemic Species (only occurs in Angola); QE - Near Endemic Species (with more than 50% of its global distribution in Angola); SE - Endemic Subspecies (subspecies that only occurs in Angola). **Probability of Occurrence:** B - Low; M - Medium; A - High. **Categories on the Angolan Red List of Species (LVEA):** Category A - **Extinct Species (Ex)**, Category B - **Endangered Species (AEx)**, Category C - **Vulnerable Species (VU)**, Category D - **Invasive Species (Inv.)**.

POTENTIAL COMPOSITION OF BIRDLIFE IN THE PROJECT AREA									
Order	Species				Conservation status				Probability occurrence
	Family	Scientific name	Common name	Endemism	IUCN Status	LVEA National Status	National Status DP 222/24	CITES/LEA	
Piciformes	Lybiidae	<i>Stactolaema anchietae</i>	Anchieta beards		LC	NA		Category A	B
		<i>Tricholaema frontata</i>	Columbus beard		LC	NA		Category A	M
Passerines	Alaudidae	<i>Mirafra angolensis</i>	Angolan lark	EE	LC	Category C		Category A	M
	Hirundinidae	<i>Phedina brazzae</i>	Bricklayer		LC	NA		Category A	M
		<i>Hirundo nigrorufa</i>	Black-and-blue swallow		LC	NA	Annex I	Category A	B
		<i>Psolidoprocne pristoptera</i>	Common black swallow		LC	NA	Annex I	Category A	B
		<i>Hirundo angolensis</i>	Swallow from Angola		LC	NA	Annex I	Category A	A
		<i>Hirundo dimidiata</i>	Pearl-breasted swallow		LC	NA	Annex I	Category A	A
		<i>Delichon urbicum</i>	Swallow		LC	NA	Annex I	Category A	A
	Cecropidae	<i>Cecropis cucullata</i>	Great crested swallow		LC	NA	Annex I	Category A	A
		<i>Cecropis abyssinica</i>	Lesser crested swallow		LC	NA	Annex I	Category A	A
		<i>Cecropis semirufa</i>	Red-breasted Swallow		LC	NA	Annex I	Category A	A
		<i>Cecropis senegalensis</i>	Mesquite Swallow		LC	NA	Annex I	Category A	A
		<i>Petrochelidon spilodera</i>	South African swallow		LC	NA	Annex I	Category A	A
		<i>Melocichla mentalis</i>	Great-capped nightingale		LC	NA		Category A	B
	Macrosphenidae	<i>Sylvietta ruficapilla</i>	Red-tailed kabbit		LC	NA		Category A	M
	Cysticolidae	<i>Prinia subflava</i>	Brown-flowered prinnia		LC	NA		Category A	M
		<i>Cisticola erythrops</i>	Red-faced weasel		LC	NA		Category A	M
		<i>Cisticola rufilatus</i>	Red-tailed weasel		LC	NA		Category A	M

POTENTIAL COMPOSITION OF BIRDLIFE IN THE PROJECT AREA									
Order	Species				Conservation status				Probability occurrence
	Family	Scientific name	Common name	Endemism	IUCN Status	LVEA National Status	National Status DP 222/24	CITES/LEA	
		<i>Cisticola melanurus</i>	Black-tailed weasel		LC	NA		Category A	M
		<i>Eremomela atricollis</i>	Black-necked hermomela		LC	NA		Category A	M
	Passeridae	<i>Passer domesticus</i>	House sparrow		LC	NA		Category A	M
		<i>Passer diffusus</i>	Southern gray-headed sparrow		LC	NA		Category A	M
		<i>Gymnoris supercilialis</i>	Yellow-crowned sparrow		LC	NA		Category A	B
	Ploceidae	<i>Ploceus temporalis</i>	Weaver-of-Bocage		LC	NA		Category A	M
		<i>Ploceus bicolor</i>	Forest weaver		LC	NA		Category A	B
		<i>Euplectes hordeaceus</i>	Red-crowned cardinal seal		LC	NA		Category A	M
		<i>Euplectes capensis</i>	Yellow uropygial cardinal-techelon		LC	NA		Category A	M
		<i>Euplectes macroura</i>	Yellow-bellied widow		LC	NA		Category A	M
		<i>Euplectes albonotatus</i>	White-winged widow		LC	NA		Category A	M
		<i>Euplectes ardens</i>	Red-collared widow		LC	NA		Category A	M
	Estrildidae	<i>Uraeginthus angolensis</i>	Sky-breast		LC	NA		Category A	M
		<i>Estrilda astrild</i>	Common lacewing		LC	NA		Category A	M
	Viduidae	<i>Vidua macroura</i>	Widow		LC	NA		Category A	M
		<i>Vidua paradisaea</i>	Paradise-rabilong widow		LC	NA		Category A	B
		<i>Vidua obtusa</i>	Widow-of-paradise-rabilarga		LC	NA		Category A	B
	Fringillidae	<i>Crithagra mozambica</i>	Canary from Mozambique		LC	NA		Category A	B
		<i>Crithagra sulphurata</i>	Sun canary		LC	NA		Category A	B
	Emberizidae	<i>Emberiza tahapisi</i>	Stone scribbler		LC	NA		Category A	B
	Motacillidae	<i>Macronyx grimwoodi</i>	Grimwood Sentinel	EE	LC	Category C		Category A	A
	Nectariniidae	<i>Cyanomitra bannermani</i>	Bannerman's Hummingbird		LC	NA		Category A	B
	Pycnonotidae	<i>Phyllastrephus cabanisi</i>	Chiricuata	EQ	LC	Category C		Category A	A

POTENTIAL COMPOSITION OF BIRDLIFE IN THE PROJECT AREA

Order	Species				Conservation status				Probability occurrence
	Family	Scientific name	Common name	Endemism	IUCN Status	LVEA National Status	National Status DP 222/24	CITES/LEA	
	Sturnidae	<i>Lamprotornis acuticaudus</i>	Acuminate-tailed starling		LC	NA		Category A	B
	Fringillidae	<i>Crithagra capistrata</i>	Black-faced canary		LC	NA		Category A	B
		<i>Crithagra benguelensis</i>	Mangrove Canary		LC	NA		Category A	B
	Corvidae	<i>Corvus albus</i>	Cormorant		LC	NA	Annex I	Category A	B
	Motacillidae	<i>Motacilla flava</i>	Yellow aloe		LC	NA		Category A	B
		<i>Motacilla clara</i>	Arabic aloe		LC	NA		Category A	B
		<i>Motacilla aguimp</i>	Black-and-white hawkweed		LC	NA		Category A	B
		<i>Macronyx fuelleborni</i>	Fülleborn Sentinel		LC	NA		Category A	B
		<i>Macronyx ameliae</i>	Red Sentinel		LC	NA		Category A	B
		<i>Anthus nyassae</i>	Woodpecker		LC	NA		Category A	B
		<i>Anthus leucophrys</i>	Smooth-billed petite		LC	NA		Category A	B
	Platysteiridae	<i>Batis molitor</i>	Batis-common		LC	NA		Category A	B
		<i>Platysteira peltata</i>	Caruncle eye		LC	NA		Category A	B
	Prionopidae	<i>Prionops plumatus</i>	White shoelace		LC	NA		Category A	B
	Malaconotidae	<i>Chlorophoneus sulfureopectus</i>	Orange-breasted shrike		LC	NA		Category A	B
		<i>Tchagra senegalus</i>	Black-crowned sandpiper		LC	NA		Category A	B
		<i>Dryoscopus cubla</i>	Australian cushion shrike		LC	NA		Category A	B
		<i>Laniarius major</i>	Tropical shrike		LC	NA		Category A	B
		<i>Nilaus afer</i>	Brubru		LC	NA		Category A	B
	Campephagidae	<i>Coracina pectoralis</i>	Grey-and-white lizard		LC	NA		Category A	B
		<i>Campephaga flava</i>	Black lizard		LC	NA		Category A	B
	Laniidae	<i>Lanius collurio</i>	Red-breasted shrike		LC	NA		Category A	B
		<i>Lanius minor</i>	Small grey shrike		LC	NA		Category A	B

POTENTIAL COMPOSITION OF BIRDLIFE IN THE PROJECT AREA									
Order	Species				Conservation status				Probability occurrence
	Family	Scientific name	Common name	Endemism	IUCN Status	LVEA National Status	National Status DP 222/24	CITES/LEA	
		<i>Lanius collaris</i>	Common tax shrike		LC	NA		Category A	B
	Oriolidae	<i>Oriolus oriolus</i>	African figwort		LC	NA		Category A	B
		<i>Oriolus larvatus</i>	Eastern black-headed figwort		LC	NA		Category A	B
	Dicruridae	<i>Dicrurus adsimilis</i>	Hard-tailed drones		LC	NA		Category A	B
	Monarchidae	<i>Terpsiphone viridis</i>	Common Paradise Flycatcher		LC	NA		Category A	B
	Stenostiridae	<i>Elminia albicauda</i>	White-tailed blue		LC	NA		Category A	M
	Paridae	<i>Parus griseiventris</i>	Great Tit		LC	NA		Category A	M
	Alaudidae	<i>Mirafra rufocinnamomea</i>	Cassowary lark		LC	NA		Category A	M
		<i>Calandrella cinerea</i>	Red-bellied lark		LC	NA		Category A	M
		<i>Atimastillas flavicollis</i>	Yellow-throated Marmoset		LC	NA		Category A	M
		<i>Neolestes torquatus</i>	Prickly bulbul		LC	NA		Category A	M
Columbiformes	Columbidae	<i>Columba livia</i>	Homing pigeon		LC	NA		Category C	A
		<i>Streptopelia semitorquata</i>	Red-eyed night-owl		LC	NA	Annex II	Category C	M
		<i>Streptopelia capicola</i>	Rola-do-Cabo		LC	NA	Annex II	Category C	M
		<i>Spilopelia senegalensis</i>	Senegal roll		LC	NA		Category C	M
		<i>Turtur chalcospilos</i>	Emerald roll		LC	NA		Category C	M
		<i>Treron calvus</i>	African green pigeon		LC	NA		Category C	M
Psittaciformes	Psittacidae	<i>Poicephalus meyeri</i>	Meyer's parrot		LC	NA		Category C	B
Musophagiformes	Musophagidae	<i>Tauraco schalowi</i>	Turaco de Schalow		LC	NA	Annex I	Category A	B
		<i>Tauraco rossae</i>	Ross hole		LC	NA	Annex I	Category A	B

POTENTIAL COMPOSITION OF BIRDLIFE IN THE PROJECT AREA									
Order	Species				Conservation status				Probability occurrence
	Family	Scientific name	Common name	Endemism	IUCN Status	LVEA National Status	National Status DP 222/24	CITES/LEA	
Cuculiformes	Cuculidae	Centropus cupreicaudus	Copper-tailed cuckoo		LC			Category A	M
		Centropus superciliosus	Eye-brow cuckoo		LC	NA		Category A	M
		Clamator levaillantii	Coffee cuckoo		LC	NA		Category A	M
		Clamator jacobinus	Jacobin cuckoo		LC	NA		Category A	M
		Pachycoccyx audeberti	Cuckoo		LC	NA		Category A	M
		Chrysococcyx caprius	Bronzed cuckoo-May		LC	NA		Category A	M
		Cuculus clamosus	Black cuckoo		LC	NA		Category A	M
		Cuculus gularis	African cuckoo		LC	NA		Category A	M
Strigiformes	Tytonidae	Tyto alba	Barn owl		LC	NA		Category A	M
Caprimulgiformes	Caprimulgidae	Caprimulgus pectoralis	Golden-necked nightjar		LC	NA		Category A	M
		Caprimulgus ruwenzorii	Mountain linnnet		LC	NA		Category A	M
		Caprimulgus natalensis	Noitibó do Natal		LC	NA		Category A	M
		Caprimulgus tristigma	Freckled nightjar		LC	NA		Category A	M
		Caprimulgus fossii	Noitibó from Mozambique		LC	NA		Category A	M
		Macrodipteryx vexillarius	Balancer		LC	NA		Category A	M
	Apodidae	Cypsiurus parvus	Tree swallow		LC	NA		Category A	M
		Apus apus	European black swift		LC	NA		Category A	M
		Apus affinis	Lesser Swift		LC	NA		Category A	M
		Apus horus	Barred swift		LC	NA		Category A	M
		Apus caffer	Swift swallow		LC	NA		Category A	M
Trogoniformes	Trogonidae	Apaloderma narina	Republican		LC	NA		Category A	B

POTENTIAL COMPOSITION OF BIRDLIFE IN THE PROJECT AREA									
Order	Species				Conservation status				Probability occurrence
	Family	Scientific name	Common name	Endemism	IUCN Status	LVEA National Status	National Status DP 222/24	CITES/LEA	
Podicipediformes	Podicipedidae	<i>Tachybaptus ruficollis</i>	Common grebe		LC	NA		Category A	A
	Sagittariidae	<i>Sagittarius serpentarius</i>	Secretary		EN	NA	Annex I	Category A	B
	Accipitridae	<i>Aviceda cuculoides</i>	Cuckoo hawk		LC	NA		Category A	B
		<i>Pernis apivorus</i>	Hornbill		LC	NA		Category A	M
		<i>Macheiramphus alcinus</i>	Bat hawk		LC	NA		Category A	M
		<i>Elanus caeruleus</i>	Grey Kestrel		LC	NA		Category A	M
		<i>Milvus migrans</i>	Common black kite		LC	NA		Category A	M
		<i>Milvus aegyptius</i>	Yellow-billed black kite		LC	NA		Category A	M
		<i>Ichthyophaga vocife</i>	African magpie		LC	NA		Category A	M
		<i>Circaetus cinereus</i>	Short-toed eagle		LC	NA		Category A	M
		<i>Circaetus pectoralis</i>	Black-bellied eagle		LC	NA		Category A	M
		<i>Trigonoceps occipitalis</i>	White-headed vulture		LC	NA		Category A	M
		<i>Gyps africanus</i>	White-rumped griffin		LC	NA		Category A	M
		<i>Circaetus cinerascens</i>	White-tailed eagle		LC	NA		Category A	M
		<i>Terathopius ecaudatus</i>	Ballerina eagle		LC	NA		Category A	M
		<i>Melierax metabates</i>	Goshawk		LC	NA		Category A	M
		<i>Micronisus brag</i>	Sparrowhawk		LC	NA		Category A	M
		<i>Kaupifalco monogrammicus</i>	Sparrowhawk		LC	NA		Category A	M
		<i>Buteo buteo</i>	Common buffalo		LC	NA	Annex I	Category A	M
		<i>Aquila pomarina</i>	Pomarine eagle		LC	NA		Category A	M
		<i>Aquila rapax</i>	Bald eagle		LC	NA		Category A	M
		<i>Aquila spilogaster</i>	Domino eagle		LC	NA		Category A	M

POTENTIAL COMPOSITION OF BIRDLIFE IN THE PROJECT AREA									
Order	Species				Conservation status				Probability occurrence
	Family	Scientific name	Common name	Endemism	IUCN Status	LVEA National Status	National Status DP 222/24	CITES/LEA	
		Polemaetus bellicosus	Martial eagle		LC	NA		Category A	M
		Lophaetus occipitalis	Plume eagle		LC	NA		Category A	M
Falconiformes	Falconidae	Falco rupicolus	African Kestrel		LC	NA		Category A	B
		Falco ardosiaceus	Grey kestrel		LC	NA		Category A	B
		Falco dickinsoni	Dickinson's Kestrel		LC	NA		Category A	M
		Falco vespertinus	Vesper hawk		LC	NA		Category A	B
		Falco cuvierii	African Ogee		LC	NA		Category A	B
		Falco subbuteo	Ogea-Eurasian		LC	NA		Category A	B
		Falco peregrinus	Peregrine falcon		LC	NA		Category A	B
Coliiforms	Coliidae	Colius striated	Bare-chested pigtails		LC	NA		Category A	M
Bucerotiformes	Upipidae	<i>African Upupa</i>	African savings		LC	NA		Category A	M
	Bucerotidae	<i>Lophoceros alboterminatus</i>	Crowned Calau		LC	NA		Category A	M
		<i>Lophoceros nasutus</i>	Grey kettle		LC	NA		Category A	B
		Lophoceros fasciatus	Calau-do-Congo		LC	NA		Category A	M
	Phoeniculidae	Phoeniculus purpureus	Red-billed buzzard		LC	NA		Category A	B
		Phoeniculus cyanomelas	Mockingbird of Damara		LC	NA		Category A	M
	Indicatoridae	Indicator meliphilus	Pale indicator		LC	NA		Category A	M
		Indicator minor	Grey-headed-pointer		LC	NA		Category A	M
		Indicator variegatus	Indicator-brown		LC	NA		Category A	B
		Indicator indicator	Indicator-large		LC	NA		Category A	M
		Prodotiscus regulus	Elegant brown-black indicator		LC	NA		Category A	M

POTENTIAL COMPOSITION OF BIRDLIFE IN THE PROJECT AREA									
Order	Species				Conservation status				Probability occurrence
	Family	Scientific name	Common name	Endemism	IUCN Status	LVEA National Status	National Status DP 222/24	CITES/LEA	
	Picidae	Campethera bennettii	Bennett's Woodpecker		LC	NA		Category A	M
Galliformes	Numididae	Numida meleagris	guinea fowl		LC	NA	Annex II	Category C	A
	Phasianidae	Coturnix delegorguei	Harlequin quail		LC	NA		Category C	B
Coraciiformes	Meropidae	Merops pusillus	Golden bee-eater		LC	NA		Category A	A
		Merops variegatus	Blue-collared bee-eater		LC	NA		Category A	A
		Merops persicus	Persian bee-eater		LC	NA		Category A	A
		Merops apiaster	European bee-eater		LC	NA		Category A	A
		Merops nubicoides	Roseate bee-eater		LC	NA		Category A	A
	Coraciidae	Eurystomus glaucurus	Yellow-billed Roller		LC	NA		Category A	M
	Alcedinidae	Halcyon leucocephala	Grey-bellied Woodpecker		LC	NA		Category A	M
		Halcyon albiventris	Brown-bellied woodpecker		LC	NA		Category A	M
		Halcyon chelicuti	Striped woodpecker		LC	NA		Category A	M
		Halcyon senegalensis	Woodpecker		LC	NA		Category A	M
		Ispidina picta	Pygmy woodpecker		LC	NA		Category A	M
		Corythornis cristatus	Red-cockaded woodpecker		LC	NA		Category A	M
		Megaceryle maxima	Giant woodpecker		LC	NA		Category A	M
		Ceryle rudis	Lesser spotted woodpecker		LC	NA		Category A	M
		Coraciidae	Coracias spatulatus	Racquet-tailed roller		LC	NA		Category A
	Coracias caudatus		Lilac-breasted Roller		LC	NA		Category A	M
	Coracias garrulus		European Roller		LC	NA		Category A	M
Aquatic birdlife									

POTENTIAL COMPOSITION OF BIRDLIFE IN THE PROJECT AREA									
Order	Species				Conservation status				Probability occurrence
	Family	Scientific name	Common name	Endemism	IUCN Status	LVEA National Status	National Status DP 222/24	CITES/LEA	
Anseriformes	Anatidae	<i>Plectropterus gambensis</i>	Iron duck		LC	NA		Category A	A
		<i>Sarkidiornis melanotos</i>	Caruncle duck		LC	NA		Category A	A
		<i>Nettapus auritus</i>	Eared duck		LC	NA		Category A	M
		<i>Anas sparsa</i>	African black duck		LC	NA	Annex II	Category A	M
Ciconiiformes	Ciconiidae	<i>Mycteria ibis</i>	Yellow-billed stork		LC	NA		Category A	M
		<i>Ciconia abdimii</i>	Abdim's stork		LC	NA		Category A	M
		<i>Ciconia ciconia</i>	White stork		LC	NA	Annex I	Category A	M
		<i>Ephippiorhynchus senegalensis</i>	Jabiru		LC	NA		Category A	M
Pelecaniformes	Threskiornithidae	<i>Bostrychia hagedash</i>	Singanga		LC	NA		Category A	M
		<i>Plegadis falcinellus</i>	Ibis-black		LC	NA		Category A	M
		<i>Threskiornis aethiopicus</i>	Sacred Ibis		LC	NA		Category A	M
	Ardeidae	<i>Egretta garzetta</i>	Little egret		LC	NA	Annex II	Category A	M
		<i>Ardea goliath</i>	Great egret		LC	NA		Category A	M
		<i>Ardea purpurea</i>	Reddish egret		LC	NA		Category A	M
		<i>Ardea alba</i>	Great Egret		LC	NA		Category A	M
		<i>Ardea melanocephala</i>	Black-headed egret		LC	NA		Category A	M
	Pelecanidae	<i>Pelecanus rufescens</i>	Grey pelican		LC	NA		Category A	M
	Scopidae	<i>Scopus umbretta</i>	Hammerbird		LC	NA		Category A	M
Gruiformes	Heliornithidae	<i>Podica senegalensis</i>	Finfoot		LC	NA		Category A	B
	Rallidae	<i>Crex egregia</i>	African quail		LC	NA		Category A	B
		<i>Zapornia flavirostra</i>	Black-winged Teal		LC	NA		Category A	M



POTENTIAL COMPOSITION OF BIRDLIFE IN THE PROJECT AREA									
Order	Species				Conservation status				Probability occurrence
	Family	Scientific name	Common name	Endemism	IUCN Status	LVEA National Status	National Status DP 222/24	CITES/LEA	
		Porphyrio madagascariensis	African Cayman		LC	NA		Category A	B
		Porphyrio alleni	Allen's Cayman		LC	NA		Category A	B

Annex 4-2: List of potential reptiles and amphibians in the project area.

IUCN Abbreviations: LC - Least Concern; NT - Near Threatened; VU - Vulnerable; EN - Endangered; CR - Critically Endangered; DD - Insufficient Data; NE - Not Evaluated. **Abbreviations Endemism:** EE - Endemic Species (only occurs in Angola); QE - Near Endemic Species (with more than 50% of its global distribution in Angola); SE - Endemic Subspecies (subspecies that only occurs in Angola). **Probability of Occurrence:** B - Low; M - Medium; A - High. **Categories on the Angolan Red List of Species (LVEA):** **Category A** - Extinct Species (Ex), **Category B** - Endangered Species (AEx), **Category C** - Vulnerable Species (VU), **Category D** - Invasive Species (Inv.).

POTENTIAL COMPOSITION OF THE HERPETOFAUNA IN THE PROJECT AREA									
Order	Species			State of Conservation/Protection				Endemism	Probability of occurrence
	Family	Scientific name	Common name	IUCN Status	National Status		CITES/LEA		
					LVEA	DP 222/24			
Turtles and Crocodiles									
Chelonia	Testudinidae	<i>Kinixys spekii</i>	Hawksbill turtle	NE	NA	Annex II	Appendix II / Category A		A
		<i>Kinixys belliana</i>	Bell's turtle with articulated back	LC	Category C	Annex II	Appendix II / Category A		M
		<i>Kinixys erosa</i>	Forest articulated turtle	NE	NA	Annex II	Appendix II / Category A		M
	Pelomedusidae	<i>Pelusios rhodesianus</i>	Variable articulated plastron tortoise	LC	NA	Annex II	Category A		M
Crocodylia	Crocodylidae	<i>Mecistops cataphractus</i>	Thin-nosed crocodile	CR	Category C	Annex I	Appendix I / Category A		B
Lizards									
Squamata (Sauria)	Agamidae	<i>Acanthocercus cyanocephalus</i>	Agama-das-angola-trees	LC	NA		Category A		A
		<i>Agama aculeata</i>	Agama do chão	LC	NA		Category A		A
		<i>Agama congica</i>	Agama do-congo	LC	NA		Category A		A
	Amphisbaenidae	<i>Dalophia angolensis</i>	Angola short-tailed amphisbaenian	LC	NA		Category A	EQ	B
		<i>Zygaspis nigra</i>	Black round-headed amphisbaenian	LC	NA		Category A		B
	Lacertidae	<i>Holaspis guentheri</i>	Saw-tailed lizard	LC	NA		Category A		A
		<i>Ichnotropis bivittata</i>	Angolan apex lizard	LC	NA		Category A		A
		<i>Ichnotropis capensis overlaeti</i>	Overlap scales lizard	LC	NA		Category A		A
		<i>Nucras scalaris</i>	Laurentian sand lizard	LC	NA		Category A		A
	Gekkonidae	<i>Hemidactylus mabouia</i>	Tropical house gecko	LC	NA		Category A		A
		<i>Lyadactvlus anaolensis</i>	Angola dwarf gecko	LC	NA		Category A		M

POTENTIAL COMPOSITION OF THE HERPETOFAUNA IN THE PROJECT AREA										
Order	Species			State of Conservation/Protection			Endemism	Probability of occurrence		
	Family	Scientific name	Common name	IUCN Status	National Status				CITES/LEA	
					LVEA	DP 222/24				
	Gerrhosauridae	<i>Gerrhosaurus nigrolineatus</i>	Black-lined plate lizard	LC	NA		Category A		M	
		<i>Gerrhosaurus auritus</i>	Kalahari plate lizard	LC	NA		Category A		A	
		<i>Gerrhosaurus bulsi</i>	Laurentian plate lizard	LC	NA		Category A		A	
		<i>Tetradactylus ellenbergeri</i>	ellenberger's snake lizard	LC	NA		Category A		M	
	Scincidae	<i>Acontias jappi</i>	Japp's pawless gecko	LC	NA		Category A		M	
		<i>Lubuya ivensii</i>	Envenomed water lizard	LC	NA		Category A		M	
		<i>Trachylepis punctulata</i>	Spotted lizard	LC	NA		Category A		A	
		<i>Trachylepis maculilabris</i>	Painted lip lizard	LC	NA		Category A		A	
		<i>Trachylepis megalura</i>	Grass lizard	LC	NA		Category A		A	
		<i>Trachylepis wahlbergi</i>	Wahlberg's gecko	LC	NA		Category A		A	
	Chamaeleonidae	<i>Chamaeleo dilepis</i>	Common chameleon	LC	NA		Category A		A	
		<i>Chamaeleo gracilis etiennei</i>	Ethienne chameleon	LC	NA		Category A		M	
	Snakes									
	Squamata (Ophidia)	Typhlopidae	<i>Afrotyphlops lineolatus</i>	Blind snake with lines	LC	NA	Annex II	Category A		B
<i>Afrotyphlops mucruso</i>			Giant blind snake	LC	NA	Annex II	Category A		B	
Pythonidae		<i>Python sebae</i>	African python	NT	NA	Annex II	Appendix II/Category A		M	
Viperidae		<i>Bitis arietans</i>	Surucucu	LC	NA	Annex II	Category A		M	
		<i>Causus rhombeatus</i>	Rhombic night viper	LC	NA	Annex II	Category A		M	
Lamprophiidae		<i>Atractaspis congica</i>	Cong-underground aspen	LC	NA	Annex II	Category A		M	
		<i>Boaedon fuliginosus</i>	Brown house snake	LC	NA	Annex II	Category A		B	
		<i>Lycophidion multimaculatum</i>	Scarlet wolf snake	LC	NA	Annex II	Category A		B	
		<i>Psammophis mossambicus</i>	Mozambique grass snake	LC	NA	Annex II	Category A		M	
		<i>Psammophylax acutus</i>	Striped snake with snout in beak	LC	NA	Annex II	Category A		B	
Elapidae		<i>Naja anchietae</i>	Anchialine snake	LC	NA	Annex II	Category A		B	

POTENTIAL COMPOSITION OF THE HERPETOFAUNA IN THE PROJECT AREA									
Order	Species			State of Conservation/Protection				Endemism	Probability of occurrence
	Family	Scientific name	Common name	IUCN Status	National Status		CITES/LEA		
					LVEA	DP 222/24			
	Colubridae	<i>Crotaphopeltis hotamboeia</i>	White-lipped snake	LC	NA	Annex II	Category A		B
		<i>Dispholidus typus typus</i>	Spotted green snake	LC	NA	Annex II	Category A		B
		<i>Dispholidus typus punctatus</i>	Green-headed snake	LC	NA	Annex II	Category A		B
		<i>Philothamnus hoplogaster</i>	South-eastern green snake	LC	NA	Annex II	Category A		B
		<i>Thelotornis capensis oatesi</i>	Oates snake	LC	NA	Annex II	Category A		B
	Natricidae	<i>Limnophis bicolor</i>	Striped marsh snake	LC	NA	Annex II	Category A		B
Amphibians (CLASS ANPHIBIA)									
Anura	Pipidae	<i>Xenopus petersii</i>	Peter's toenail frog	LC	NA		Category A		A
	Bufonidae	<i>Sclerophrys buchneri</i>	Buchner's toad	LC	NA		Category A		A
		<i>Sclerophrys funerea*</i>	Dark toad	LC	NA		Category A		A
		<i>Sclerophrys garmani</i>	Eastern olive toad	LC	NA		Category A		A
		<i>Sclerophrys lemairii</i>	Lemaire toad	LC	NA		Category A		M
		<i>Sclerophrys regularis</i>	African common toad	LC	NA		Category A		A
	Brevicipitidae	<i>Breviceps adspersus</i>	Common tree frog	LC	NA		Category A		A
	Hyperoliidae	<i>Hyperolius adspersus</i>	Painted-long-line ring	LC	NA		Category A		A
		<i>Hyperolius kivuensis</i>	Rela-de-kivu	LC	NA		Category A		A
		<i>Hyperolius nasutus</i>	Pointed-nose longnose ring	LC	NA		Category A		A
	Arthroleptidae	<i>Arthroleptis lameerei</i>	Mudskipper frog	LC	NA		Category A		A
		<i>Arthroleptis xenochirus</i>	Long-fingered gopher frog	LC	NA		Category A		A
		<i>Leptopelis anchietae</i>	Anchovy tree frog	LC	NA		Category A	EE	A
	Ptychadenidae	<i>Ptychadena ansorgii</i>	Hansorge's rocket frog	LC	NA		Category A		A
		<i>Ptychadena bunoderma</i>	Rough-skinned rocket frog	LC	NA		Category A		A
		<i>Ptychadena grandisonae</i>	Grandison's rocket frog	LC	NA		Category A		A
		<i>Ptychadena keilingi</i>	Rocket-keiling frog	LC	NA		Category A		A

POTENTIAL COMPOSITION OF THE HERPETOFAUNA IN THE PROJECT AREA									
Order	Species			State of Conservation/Protection			Endemism	Probability of occurrence	
	Family	Scientific name	Common name	IUCN Status	National Status				CITES/LEA
					LVEA	DP 222/24			
		<i>Ptychadena oxyrhynchus</i>	Beaked rocket frog	LC	NA		Category A		A
		<i>Ptychadena perplicata</i>	Rocket frog with many folds	LC	NA		Category A		A
		<i>Ptychadena taenioscelis</i>	Little rocket frog	LC	NA		Category A		A
		<i>Ptychadena upembae</i>	Upland rocket frog	LC	NA		Category A		A
		<i>Ptychadena uzungwensis</i>	Rudzungwa rocket frog	LC	NA		Category A		A
		<i>Phrynobatrachus cryptotis</i>	Cryptic tree frog	LC	NA		Category A		A
		<i>Phrynobatrachus natalensis</i>	Snoring frog	LC	NA		Category A		A
	Pyxicephalidae	<i>Amietia angolensis</i>	Angola river frog	LC	NA		Category A	EE	M
	Ranidae	<i>Amnirana darlingi</i>	Darting white-lipped frog	LC	NA		Category A		A
		<i>Amnirana lemairei</i>	Lemaire white-lipped frog	LC	NA		Category A	EQ	M

Annex 4-3: List of potential mammals in the project area.

IUCN Abbreviations: LC - Least Concern; NT - Near Threatened; VU - Vulnerable; EN - Endangered; CR - Critically Endangered; DD - Insufficient Data; NE - Not Evaluated. **Abbreviations Endemism:** EE - Endemic Species (only occurs in Angola); QE - Near Endemic Species (with more than 50% of its global distribution in Angola); SE - Endemic Subspecies (subspecies that only occurs in Angola). **Probability of Occurrence:** B - Low; M - Medium; A - High. **Categories on the Angolan Red List of Species (LVEA):** Category A - Extinct Species (Ex), Category B - Endangered Species (AEx), Category C - Vulnerable Species (VU), Category D - Invasive Species (Inv.).

POTENTIAL COMPOSITION OF THE MASTOFAUNA IN THE PROJECT AREA									
Order	Species			Conservation status				Endemism	Probability of occurrence
	Family	Scientific name	Common name	IUCN Status	National Status		CITES		
					LVEA	DP 222/24			
Afrosoricide	Tenrecidae	<i>Potamogale velox</i>	Counterfeit	LC					
Carnivora	Canidae	<i>Canis adustus</i>	Rayed jackal	LC	Category C	Annex I	Annex IB		B
	Felidae	<i>Felis silvestris</i>	Wildcat	LC	Category C	Annex II	Annex IB		M
		<i>Leptailurus serval</i>	Serval	LC	Category C	Annex II	Annex IB		M
		<i>Panthera pardus</i>	Leopard	VU	Category C	Annex I and Annex II	Appendix I and Annex IB		B
		<i>Atilax paludinosus</i>	Marsh mangrove	LC					A
	Herpestidae	<i>Helogale parvula</i>	Dwarf mongoose	LC					A
		<i>Herpestes ichneumon</i>	Corkscrew	LC					A
		<i>Herpestes sanguineus</i>	Little red mangrove	LC					A
		<i>Ichneumia albicauda</i>	White-tailed mangrove	LC					A
		<i>Mungos mungo</i>	Striped mangrove	LC					A
		Hyaenidae	<i>Crocuta crocuta</i>	Spotted hyena	LC	Category B	Annex I	Annex IA	
	Mustelidae	<i>Aonyx capensis</i>	Cape Otter	NT		Annex II			M
		<i>Ictonyx striatus</i>	Zorriho	LC					M
		<i>Mellivora capensis</i>	Ratel	LC	Category C	Annex II	Annex IB		M
		<i>Poecilogale albinucha</i>	Striped weasel	LC					M
		Viverridae	<i>Civettictis civetta</i>	African civet	LC	Category C	Annex II	Annex IB	
	<i>Genetta angolensis</i>		Geneta de Angola	LC	Category C	Annex II	Annex IB	EQ	B

POTENTIAL COMPOSITION OF THE MASTOFAUNA IN THE PROJECT AREA									
Order	Species			Conservation status				Endemism	Probability of occurrence
	Family	Scientific name	Common name	IUCN Status	National Status		CITES		
					LVEA	DP 222/24			
		<i>Genetta maculata</i>	Red-breasted genet	LC	Category C	Annex II			B
Cetartiodactyla	Bovidae	<i>Cephalophus silvicultor</i>	Yellow-garbed goat	NT		Annex I			B
		<i>Kobus ellipsiprymnus defassa</i>	Quissema	NT		Annex II			B
		<i>Hippotragus equinus</i>	Sable	LC					B
		<i>Philantomba monticola</i>	Pebble	LC					M
		<i>Redunca arundinum</i>	Nunce	LC		Annex I	Annex I-C		M
		<i>Sylvicapra grimmia</i>	Bambi	LC		Annex II	Annex I-C		M
		<i>Tragelaphus scriptus</i>	Golungo	LC		Annex II	Annex I-C		M
		<i>Tragelaphus spekii</i>	Sitatunga	LC		Annex II	Annex I-C		M
	Suidae	<i>Phacochoerus africanus</i>	African wild boar	LC			Annex I-C		M
		<i>Potamochoerus larvatus</i>	Bush pig	LC			Annex I-C		M
	Hippopotamidae	<i>Hippopotamus amphibius</i>	Hippopotamus	VU		Annex III			B
Chiroptera	Emballonuridae	<i>Taphozous mauritanus</i>	Crop bat	LC			Annex I-C		B
	Hipposideridae	<i>Hipposideros ruber</i>	Noack's leaf-nosed bat	LC			Annex I-C		M
	Nycteridae	<i>Nycteris hispida</i>	Hairy split-face bat	LC			Annex I-C		M
	Pteropodidae	<i>Eidolon helvum</i>	Straw-colored bat	LC			Annex I-C		M
	Pteropodidae	<i>Epomophorus crypturus</i>	Peter's dragon bat	LC			Annex I-C		M
		<i>Epomophorus wahlbergi</i>	Wahlberg's dragon bat	LC			Annex I-C		M
		<i>Epomops dobsoni</i>	Dobson's dragon bat	LC			Annex I-C		M
		<i>Plerotes anchietae</i>	Anchieta's bat	DD			Annex I-C	EE	M
	Vespertilionidae	<i>Neoromicia nanus</i>	Dwarf pipistrelle	L C			Annex I-C		B
<i>Scotophilus dinganii</i>		Yellow-bellied bat	L C					B	

POTENTIAL COMPOSITION OF THE MASTOFAUNA IN THE PROJECT AREA									
Order	Species			Conservation status				Endemism	Probability of occurrence
	Family	Scientific name	Common name	IUCN Status	National Status		CITES		
					LVEA	DP 222/24			
Lagomorpha	Leporidae	Lepus victoriae	African common hare	L C					A
Macroscelidea	Macroscelididae	Elephantulus brachyrhynchus	Short-tailed elephant shrew	L C					B
Pholidota	Manidae	Phataginus tricuspis	White-bellied Pangolin	EN	Category C	Annex I	Appendix I		M
Primates	Cercopithecidae	Chlorocebus cynosuros	Black-faced monkey	LC					B
		Papio cynocephalus	yellow baboon	LC	Category C		Annex IB		B
	Galagidae	Galago moholi	Galago de Mohol	LC		Annex I			B
		Otolemur crassicaudatus	Gálago de Monteiro	LC		Annex I			B
Rodentia	Pedetidae	Pedetes capensis	Jumping hare	LC		Annex II			A
	Hystriidae	Hystrix africaeaustralis	Southern porcupine	LC					B
	Muridae	Dasymys incomtus	Swamp rat	LC					A
		Gerbilliscus validus	Savannah gerbil	LC					A
		Grammomys dolichurus	Woodrat	LC					A
		Mastomys natalensis	Multiple-nipple mouse	LC					A
		Mus minutoides	Cinnamon mouse	LC					A
		Mus triton	Grey-bellied mouse	LC					A
		Otomys anchietae	Anchieta swamp rat	LC				EE	A
		Otomys angoniensis	Angoni's marsh rat	LC					A
		Pelomys fallax	Peter's Toothless Mole Rat	LC					A
		Rhabdomys dilectus	Median four-striped mouse	NE					A
		Zelotomys hildegardeae	Hildegarde's mouse	LC					A
	Nesomydae	Cricetomys ansorqei	Ansorge's giant rat	LC					A

POTENTIAL COMPOSITION OF THE MASTOFAUNA IN THE PROJECT AREA									
Order	Species			Conservation status				Endemism	Probability of occurrence
	Family	Scientific name	Common name	IUCN Status	National Status		CITES		
					LVEA	DP 222/24			
		<i>Dendromus melanotis</i>	Grey tree mouse	LC					A
		<i>Dendromus mystacalis</i>	Brown tree mouse	LC					A
		<i>Saccostomus campestris</i>	Southern African pocket mouse	LC					A
		<i>Steatomys krebsii</i>	Kreb's fat mouse	LC					A
		<i>Steatomys parvus</i>	Small fat mouse	LC					A
		<i>Steatomys pratensis</i>	Chubby mouse	LC					A
		Sciuridae	<i>Funisciurus congicus</i>	White-striped squirrel	LC				
	<i>Heliosciurus gambianus</i>		Gambian sun squirrel	LC					M
	Soricomorpha	Soricidae	<i>Crocidura olivieri</i>	Giant musk shrew	LC				
<i>Crocidura parvipes</i>			Short-footed musk shrew	LC					B
Tubulidentata	Orycteropodidae	<i>Orycteropus after</i>	Jimbo	LC	Category C		Annex IB		B



ANNEX 5

Public Consultation Guide and Report



REPUBLIC OF ANGOLA
MINISTRY OF AGRICULTURE AND FORESTS
PROJECT TO DEVELOP AGRICULTURAL VALUE CHAINS IN THE EASTERN REGION OF ANGOLA
REHABILITATION OF SMALL, CLIMATE-RESILIENT IRRIGATION SYSTEMS
CPAVCDP-02_24PIU

GUIDE FOR PUBLIC CONSULTATIONS

Activity: Carry out Public Consultations involving the communities of the different intervention neighborhoods of Subproject 1.

Location: Pelengue (1&2), Capuepua and Muambul (in Saurimo)

Target group: Community/neighborhood residents, traditional authorities, residents' committees and other interested parties.

Methodology to be used: expository and interactive (questions and answers).

Material to be used: Transportation, megaphone/sound system

Date: November 20 and 21, 2024

Expected duration for each Public Consultation: 1:30h

Activity / Estimated Time	What should be shared	Facilitator	Means of support
Aperture Dynamics: 5 m	Greeting to the participants, welcome and thanks for everyone's presence.	Community leader	
Presentation of the objectives of the session (why are we here today) 5 min.	We are here today to present to you the Rehabilitation of Climate Resilient Small Irrigation Systems sub-project, to be implemented as part of the Eastern Angola Agricultural Value Chains Development Project. Once you've gotten to know the project, we want to hear and record your opinions, suggestions, expectations and concerns about it. Why is it important for you to take part in this initial phase of the study? You are interested and affected parties in the sub-project and should therefore participate in it at all stages. To this end, we want to hear your opinions, doubts or questions you may have about it. We want to hear from each and every one of you, all your contributions matter! The information gathered will help the project team to better understand the real situation in your neighborhood and ensure that the proposed solutions respond to the local situation.	Ines	Stereo/telephone and camera



Presentation of general information about the sub-project 20 min.	The Angolan government, through the Ministry of Agriculture and Forestry, with funding from the African Development Bank, is implementing this sub-project which includes the Rehabilitation of Climate Resilient Small Irrigation Systems. The sub-project plans to cover 2,500 hectares in the provinces of Lunda Sul, Lunda Norte, Moxico and Cuando Cubango, helping to improve drought and flood control. Here in the province of Lunda Sul, the sub-project will focus on the municipality of Saurimo, with the rehabilitation of the Pelengue canals (which covers the villages of Pelengue 1 and 2) and the Cupuepua canal (which covers the villages of Cupuepua and Muambulo. The sub-project is expected to directly benefit around 610 families/farmers (447 on the Pelengue canal and 263 on the Cupuepua canal). The project is scheduled to begin in mid-2026 to 2030 Thank the participants for following the presentation of the sub-project. To announce that there will then be a debate period in which we will ask some questions and we also hope that the audience will ask questions. I would also like to inform you that the participants will be divided into two groups (men and women) in order to better capture the contributions of both men and women.	Willi & Muaiuma	Stereo/mega phone, notepads.
Divide (group of men and women, separated into different spaces). Open the discussion with questions. 45 min.	I would like to thank the people for listening and say that they can now participate actively through some questions that we are going to ask. • <i>What did you think of this project?</i> • <i>What benefits can this project bring to the community?</i> • <i>What products will they be able to grow with the rehabilitation of the canal and the availability of water at different times of the year?</i> • <i>What problems do you think the project could bring to the community?</i> • <i>And what problems can the community bring to this project?</i> • <i>What can we do to collaborate/contribute to this project so that everything runs smoothly?</i>	Willi, João, Inês	Notepad
Conclusions 10 min.	- Thank people for their participation Summarize the contributions received, the unanswered questions, the main results (e.g. <i>you said you..., you expressed concern about, you thought the project...</i>) - Inform them that their opinions, suggestions and concerns will be duly reported and will form part of the project's Environmental and Social Impact Study and will be delivered to the developer (e.g. your contributions were very important and will form part of the final project). I would also like to say that before the work begins, another meeting will be held to present any changes that may have been made to the project and you will be able to ask any other questions that may arise and you will be given more precise information about the work.	Willi	
Activity evaluation 5 min.	We've come to the end of our meeting and we'd like to know: • What did you think of this activity? • What can be improved?	John	

➤ **Public Consultation Reports**

PROJECT TO DEVELOP THE AGRICULTURAL VALUE CHAIN IN EASTERN ANGOLA						
Subproject #01 - Rehabilitation of Climate-Resistant Small-Scale Irrigation Systems						
CPAVCDP-02_24PIU						
Date	20/11/2024	Location	Soba's courtyard			
Neighborhoods	Pelengue 1	Participants	Total	Man	Woman	Teenagers/children
	Pelengue 2		121	27	31	63
Activity	Public Consultation Meeting					
Activity objectives	- Presenting the Subproject to the communities - Know and record the expectations, suggestions and concerns of the participants					
Methodology	- Interactive and participatory - Brainstorming in Focus Groups					
Participants/Target Groups	- Community members (men, women and adolescents/children) - Sobas, bloco coordinators and members of the residents' committee					
Team of Facilitators	Engconsult Social Team / Inquirers					
Support Team	IDA					
MINUTES OF THE MEETING: QUESTIONS AND CONTRIBUTIONS FROM THE FOCUS GROUPS						
Men's and Boys' Group			Women's and Girls' Group			
1. What did you think of this sub-project?						
Txitxi: the project is good, it will bring benefits to the community. Henriques: I want the project to be carried out. We all accept it, we just don't want you to just say it and then not do it. Francisco Candala: thank you for coming. Secondly, the ditch is old, but because of the war it was closed and the government couldn't do it, but with this project of yours we'll know that the government is thinking of us. Dinís Chembo: We all need to be united for the work to be done well. We need to join forces to do this work as God commands.			Maria: When we farm, they don't give us things. Hoes and machetes aren't given to us. We like to grow manioc, corn, rice and beans. We don't have a tractor to work the fields and take the hunger away. We like to grow manioc. People are too lazy to work because they don't have these things, and then they sell them to help their children at school. Josefa: We really like the initiative, we really want water to help us farm, so we can buy oil and salt to cook with. Lídia Nené: we really want this project, we're grateful that you're coming here. Lucrecia Pitxi: The government itself has only been lying to us that they're going to come and do work here, they've already come many times and they've never come back to do what they've been telling us.			
2. What benefits can this sub-project bring to the community?						
Adão Maurício: the project is good and we appreciate it. Don't stop here. Ilunga Adriano: This project will help us a lot because we'll be able to grow more crops. It's also going to help us young people because we're going to get jobs so we can help our families.			Domingas David: It will make farming easier and will help our families make a living. Antónia: We're very grateful because we want to work, we have the will to work.			



3. What products will they be able to grow with the rehabilitation of the canal and the availability of water at different times of the year?	
• Lucas Henriques: tomatoes, corn, potatoes, carrots, cassava, etc. • Carlos: gindungo, eggplant, tomatoes, okra, etc.	• Rebeca: Manioc, ginguba, cabbage, that's what we're going to grow. • Lídia Nené: We're going to grow cabbage and potatoes, but they have to give us food to have strength. They give us coffee, sugar, salt, oil, fish, soap, tractors and other machines.
4. What problems do you think the sub-project could bring to the community?	
• Gildo, Santo, Dinis: none. • Benvindo: It depends. We can't say any right away because we don't know if there will be problems during construction or if the company will do the job properly. • Saint Henry: before you start, you should visit the area you are growing in.	• Lucrécia Pitixi: There won't be any problems. • Domingas David: It won't be a problem if they don't lie to us. • Celeste: It won't be a problem for us if they don't lie to us.
5. And what problems can the community bring to this sub-project?	
• Saint Henry: none. There will be jobs for the community there, so none. Unless they sell the land, then there will be a problem. • Brito Sacandondolo (Soba): Just as he (Santo Henriques) said, he spoke very well.	• Lucrécia Pitixi: That's what the mothers are saying, we're not going to bring problems because we want help. • Lídia Nené: no, we're not going to bring a problem because that's what we've been asking for. • Antonica Fina: that's exactly what we're asking for, so there's no problem for us.
6. What can we do to collaborate on this sub-project so that everything runs smoothly?	
• Welcome: we have to stick together so that everything goes well. • Lucas Henriques: we should consult the Soba before doing anything. • Tito: workers and young people in the community should not be given alcohol. • Gildo: You can't tell lies again.	• Marta Neia: We don't have a hospital, we don't have medicine and that doesn't make it any easier for us because of the rains. • Antonica Fina: you have to come and help us to see how we're working. • Ana Paula: They bring us tractors, we have the strength, but with a hoe, without a machine, it's difficult. • Madalena Manassa: we need "chupa" from the fields. Bring us "chupa" from the fields, boots, raincoats, bells, hats and seeds for us to cultivate. • Meta Mucumbi: and you have to have the patience to come and ask us how the project is going.
Expectations, Suggestions and Concerns	
• Ilunga Adriano: It's all very well that they're going to open the ditch and bring water, and we're grateful for that. But what seed will the government give us to sow? They're going to bring water, but the water won't sow itself, we want the government to give us seed to plant. • Antónica: We've been lied to a lot and we never get what we were promised. We want to help our parents bring food home.	



- **Adão Maurício:** are we going to work together during the canal project?

Willi: When a company comes to do a job in the community, it usually hires local labor. So the contractor, the company that is going to carry out the project, may hire young people from the community. They bring their technicians, but, in principle, they can also hire some young people from the locality where the work is going to be done.

- **Santos Henriques:** Will we need a document to be hired?

Willi: payments are usually made through a bank account. To have a bank account, you need an identity card. I don't know if there will be any coordination between the IDA and the Saurimo Administration to help the community with this. But I think it will be necessary to have an identity card.

- **Gildo Cassongo:** are they going to use machines to open the ditch?

Willi: the contractor will visit the job site to see the type of work he'll be doing and determine what kind of equipment he can use. But generally, machines are used.

- **Meta Mucumbi:** how long can we wait?

Inês Victorino: the project is currently at the study stage. This is one of them. Other studies are still to be carried out. But in principle the project will be implemented between 2026 and 2030.

- **Domingas David:** Are you really coming?

Inês Victorino: we won't be coming, but the team that's going to do the work, the opening of the ditch, will.

- **Angelina Domingos:** When these things come, will we be able to eat or will we give them to the government as well?

Inês Victorino - Yes, you'll be able to eat because the opening of the ditch, the irrigation channel, will make it easier for the water to pass through to where you're going to grow your crops. In principle, you won't have to pay anything, neither to the government nor to the project team.

Photographic record



General session to present the Subproject to the Pelengue 1 & 2 community



Focus Group of Women and Girls



Focus Group of Men and Boys

PROJECT TO DEVELOP THE AGRICULTURAL VALUE CHAIN IN EASTERN ANGOLA

Subproject #01 - Rehabilitation of Climate-Resistant Small-Scale Irrigation Systems

CPAVCDP-02_24PIU

Date	21/11/2024	Location	Soba's courtyard			
Neighborhood	Capuepua	Participants	Total	Man	Woman	Teenagers/children
			50	24	21	5
Activity	Public Consultation Meeting					
Activity Objectives:	- Subproject presentation - Know and record the expectations, suggestions and concerns of the participants					
Methodology:	- Interactive and participatory - Brainstorming in Focus Groups					
Participants/Target groups:	- Community members (men, women and adolescents/children) - Sobas, bloco coordinators and members of the residents' committee					
Team of Facilitators:	Engconsult Social Team / Inquirers					
Support team:	IDA					

MINUTES OF THE MEETING: QUESTIONS AND CONTRIBUTIONS FROM THE FOCUS GROUPS

Men's and Boys' Group	Women's and Girls' Group
1. What did you think of this sub-project?	
António José: The project is praiseworthy because the general population likes the project to reduce hunger and poverty. It will also provide jobs for young people. In this context, if the government brings jobs to young people, the population will be very grateful. Rodrigues Alberto: This project is good and will help us a lot, but you've been talking about it for a long time and you never do it. You come and deceive us by saying you're going to do it and then you leave for good and disappear. If you're really going to do it, do it, we'll be grateful, but my word is that you won't lie again. José Pinto (Soba): Nowadays people are always talking about the ditch, but do you know why it was built? The ditch was built in 1960 to help plant rice. It was built by the Portuguese. Do you think the ditch will work on its own? Say. They're going to build the ditch, but how do you think we're going to plant? When the Portuguese built the ditch, they gave us rice and other things to plant, and are you going to give us a hoe or materials to plant with? Brazilians, Chinese, Indians have come because of this ditch, what do you want with this ditch?	Alice: I'm grateful! This project will make it easier for us in the field. We have a lot of trouble with products and water. Albertina: I'm grateful. In times of cacimbo we look for a lot of water to make things easier for ourselves. Quinta Augusto: thank you for bringing us water. It will make it easier for our children and ourselves. The seeds we're going to sow will make it easier for us to bring in more food. Teresa Augusta: We're grateful. We suffer a lot because of the lack of water and food. We thank you for bringing us food. Odete Eduardo: Food is the most important issue. Seeds, rice, onions, tomatoes, we can't see how to sow because of the lack of food. Joia Sónia: we're suffering. We have children, to see if they will eat, we also want to plant.
2. What benefits can this sub-project bring to the community?	



• José Pinto (Soba): I'm older, I'm from 1950, I've seen everything that's happened in this town. We need machines to prepare the land. You can grow all kinds of crops here. It's fertile land. • Domingos Afonso: Thank you for the project. We are suffering a lot. We thought the project would be done this year. With the project we'll get work and be able to buy sheets to build new houses and support our family.	• Joia Sônia: It's a benefit for us. This project will make it easier for us to have food to grow, we'll grow everything. • Conceição: we want this project to come on time, you've been lying to us a lot. • Alice: thank you for hearing that the project is coming. You can't lie to us like others do. If we see they're not coming, we'll say they lied to us. We don't have the strength to fetch water from far away. • Maria Txicolassonhi: We're suffering, we don't have salt or anything. If you're bringing a project, we'd appreciate it. As you can hear the mothers screaming, their children are becoming disabled because of the lack of vaccines, they can't walk. They're also trying to bring us medicine. • Júlia Engrácio: we're tired, other people's neighborhoods make money, but here "KWENDA" has never passed, they go elsewhere to make money, but not here. The houses we sleep in are getting wet. The government has never given us a plate, they don't give our children lunch and they're running away at school.
3. What products will they be able to grow with the rehabilitation of the canal and the availability of water at different times of the year?	
• António José: rice, cabbage, kale. This land is fertile, we can grow a bit of everything.	• Odete Eduardo: rice, onions, tomatoes, sweet potatoes, potatoes. • Joia Sônia: eggplant, cabbage, corn, etc.
4. What problems do you think the sub-project could bring to the community?	
• José Pinto (Soba): none. • Alione: none. • Domingos Afonso: none either.	• Maria Chicolassonhi: You won't have any problems. We're waiting. • Júlia Engrácia: That's right, it won't cause any problems as the moms have already said.
5. And what problems can the community bring to this sub-project?	
• José Pinto (Soba): none.	• Conceição: We're not going to have any problems, because we're looking for a lot of water. • Joia Sônia: we won't have any problems because we look for water a lot. We dig holes to drink water.
6. What can we do to collaborate on this sub-project so that everything runs smoothly?	



- | | |
|---|---|
| <ul style="list-style-type: none"> • José Pinto (Soba): All right. We're going to do very well. | <ul style="list-style-type: none"> • Odete Eduardo: to bring products for us to plant. They should bring us food to eat, so that we have the strength to go farming. • Alice: They bring us a hoe, machete, axe and shovel. |
|---|---|

Expectations, Suggestions and Concerns

- **Domingas Eduardo:** we're tired of being stepped on, we're full of hurt. What kind of government is this that doesn't bring us grinding? We have many children who want to study, but there's no school. The government says that these are my people, but they make us suffer so much. Mothers are tired. We're going to draw water far away. We have no more life, the government has to look at us.
- **Júlia Engrácia:** Is this project you're bringing in going to pay the population?
Inês Victorino: There may be a workforce because young people in the community have to be given the opportunity to work. So everyone will have a job based on what they're going to do.
- **Dajar Machingo:** will the young people from here who work on the project be paid or not?
Willi Domingos: the company that is going to do the work will define the strategy of having young people from the community in their teams or not. If so, they will define the amount to be paid. If young people from the community are hired to work on the project, they should be paid.
- **Silvano José:** will only young people who have an identity work?
Willi Domingos: It all depends on whether the company responsible for carrying out the work will work with young people from the neighborhood. But salaries are usually paid through the bank. And to open a bank account you need a ticket. I can't say how it will be managed if the young people don't have ID cards, but they do need to have ID cards.
- **Feliz Muambeno:** do you have to use a ticket to work or can you use a ballot?
José Pinto (Soba): this question has already been answered. Payment is made at the bank and you only need a ticket to open an account.
- **André Kulacama:** I think the date for this project is too far away, and that could make it difficult for us.
Willi Domingos: The project is funded by the African Development Bank and studies need to be carried out before the project can be implemented. The one we're doing here is one of those studies. There are several phases and it takes some time.

Photographic record



General session to present the Subproject to the community of Bairro Capuepua



Focus Group of Women and Girls



Focus Group of Men and Boys



PROJECT TO DEVELOP THE AGRICULTURAL VALUE CHAIN IN EASTERN ANGOLA

Subproject #01 - Rehabilitation of Climate-Resistant Small-Scale Irrigation Systems

CPAVCDP-02_24PIU

Date	21/11/2024	Location	Soba's courtyard			
Neighborhood	Muambulo	Participants	Total	Man	Woman	Teenagers/children
			44	11	14	19
Activities	Public Consultation Meeting					
Activity Objectives:	- Presenting the Subproject to the community - Know and record the expectations, suggestions and concerns of the participants					
Methodology:	- Interactive and participatory - Brainstorming in Focus Groups					
Participants/Target groups:	- Community members (men, women and adolescents/children) - Sobas, block coordinators and members of the residents' committee					
Team of Facilitators:	Engconsult Social Team / Inquirers					
Support team:	IDA					

MINUTES OF THE MEETING: QUESTIONS AND CONTRIBUTIONS FROM THE FOCUS GROUPS

Men's and Boys' Group	Women's and Girls' Group
1. What did you think of this sub-project?	
Zé Cahilo: Thank you very much. First of all, what we think we need is a school, water, a hospital and a road. These are the projects we think the community needs. Castro Muambulo (soba): We were very happy with the project to open the ditch, but what the government always does is promise and then do nothing. The government's eyes are only on diamond mining, there's so much suffering. There's no school, no hospital. We have to walk to the Camundamabala neighborhood to be attended to. The project is good, our land is rich for agricultural production, we accept it, but it depends on the government. Upale Rocha: this canal allowed the production of many products, such as rice, beans, onions and tomatoes, from here to Capuepua. The young population here will work to help the country move forward. The project is good and must go ahead. Things are difficult. So make an effort to move the project forward to reduce hunger. With the produce we'll be able to sell the agricultural products to support our children who are studying in the city. Simo: The project is good, even if it's waterlogged we'll be able to have water to irrigate the crops and have products like cabbage, onions, kale, carrots, tomatoes, pineapples and others. We have approved the project.	Sara da Silva: thank you! We didn't know this project was coming to the neighborhood. Luisa Francisco: We suffered a lot. The children with the 20-liter drums all the way to the Tamba River. Sara da Silva: We really want this project to get here because we have a hard time. It's hard to get water from the river. Sometimes, when we get tired from plowing, we still have to go and draw water from the river.
2. What benefits can this sub-project bring to the community?	



• Zé Cahilo: we're going to have a vegetable garden where we'll plant carrots, lettuce, gindungo, tomatoes, reindeer potatoes, sweet potatoes. Everything! We can't grow crops because of the lack of water.	• Esperanza Muhangueno: a school, a hospital would help us a lot. If a person is sick or pregnant, we have nothing to do, we're asking for a medical center, we don't even have a telephone or antennas. • Florinda Suequele: There's no network. It's too far to have a network, it's very difficult to get to Camundambala. This project would help us a lot because there would be water for us to go farming. • Domingas Laurinda: If we have water, it will be good for us to work. We don't have the strength in our bodies, they do their best to send us milling, we really want to cultivate. • Esperança Muhangueno: It's going to be good. Let more people bring this project to us so we can grow and sell the produce to help out at home.
3. What products will they be able to grow with the rehabilitation of the canal and the availability of water at different times of the year?	
• Paiva: sugar cane and bananas. • Castro Muambulo (soba): pineapple.	• Maria Marta: We're going to grow onions, sweet potatoes, cucumbers, cassava, ginger, cabbage. We want to work. Tomatoes also grow a lot. Jimboa, okra. • Urana Caquesse: We want to grow bananas, corn, ginguba, tangerines. We want to work. • Mima Napassa: the young people really cultivate! 50 meters, so the older ones, a bit, a bit, we don't have the strength, we want to grow cabbage, potatoes, that's what the mothers said.
4. What problems do you think the sub-project could bring to the community?	
• Castro Muambulo (soba): none! • Zé Cahilo: None. We want water, so it won't be a problem for us.	• Zita Ngueji: the project won't cause any problems. We need it. • Silvana Glória: It would be good for us because it will help us a lot to go farming, to cultivate a lot. That's it! • Maria Cheme: That wouldn't be a problem for us, the project. We want to work. The children are suffering. If you bring us the project, we'll be able to do everything. • Janete: The project would be good for us. There's no hoe, no machete, but we really want to work.
5. And what problems can the community bring to this sub-project?	
• Simo: none. Here goes.	• Zita Ngueji: we weren't going to bring any problems. • Adelaide Handjica: we weren't going to bring a problem, because that's what we want, that's what we've been asking for.



	• Dorca Wassamba: How are we going to bring problems if that's what we want, that's what we're asking for? • Beatriz Canama: The older people are tired, so this project would help us a lot.
6. What can we do to collaborate on this sub-project so that everything runs smoothly?	
• Zé Cahilo: We, the community, are going to collaborate.	• Marta Marta: bring us a hoe, hammer, axe, boot, glove, raincoat, umbrella and other things. • Isabel: You have to come and help us control it. • Joia Martins: working directly with the people here. • Florinda Sequele: bring us a network, because for us to talk on the phone we go very far away. • Josefa: other students are studying without a gown. They're bringing us scrubs. You have to speak the truth and really bring this project.
Expectations, Suggestions and Concerns	
• Castro Muambulo (soba): We always hear these promises, but they are never kept. What we want is for the promises to be kept. • Vieira: I like this project, because many young people can benefit from it. What Soba said is true, many come here promising and then don't deliver. We hope that the work is done with machines and not by hand as in colonial times. To dig the canal, it has to be done in dry weather, otherwise they won't be able to do it in rainy weather. • Zé Cahilo: we have nothing more to say. Right now we're just waiting for you. • Silvana Glória: will they bring a machine? and what kind of machine? Inês Victorino: We're just here to collect data. Whether or not it's necessary to bring in machinery is for the company to decide. The types of machines will also be decided by the company that is going to rehabilitate the canal. • Beatriz Canama: aren't they going to fix the tank? Inês Victorino: The company's job here will be to restore the canal, to make it easier for you to farm. That's what we've come to present. • Jorgeta Upale: In other provinces you help, you give money to put into the plow, but why not here? Inês Victorino: We're here to present this project. But I believe you have other projects to solve these problems.	
Photographic record	



General session to present the Subproject to the Bairro Mambulo community



Focus Group of Women and Girls



Focus Group of Men and Boys

ANNEX 6

Matrix for the Identification and Assessment of Environmental and Social Impacts Mitigation and Enhancement Measures

I - Matrix for the Identification and Assessment of Environmental and Social Impacts | CONSTRUCTION PHASE

Activities	Descriptors Affected	Impacts		Evaluation without measurements												Assessment with Measures - RESIDUAL IMPACTS												Measures to Mitigate and Enhance WSS Impacts	
		Identification	Explanation	S	N	P	#	I	#	M	#	D	#	R	O	S	N	P	#	I	#	M	#	D	#	R	O	Measures	Responsible
CONSTRUCTION PHASE																													
Land allocation	Soil / Land Use	Allocation of agricultural land and other uses	The area where the shipyard is located, the easement areas next to the canals and the access roads temporarily or permanently occupy the land.	-36	NEG	PR	3	A	2	E	3	P	2	IR	DIR	-8	NEG	INC	2	A	2	RE	1	P	2	IR	DIR	MC 1	DP / PM
		Affecting natural habitats	The area where the shipyard is located, the easement areas next to the canals and the access roads temporarily or permanently occupy the land.	-24	NEG	PR	3	A	2	M	2	P	2	IR	DIR	-8	NEG	INC	2	A	2	RE	1	P	2	IR	DIR	MC 2	DP / PM
	Water Resources	Increased soil sealing (decrease in infiltration capacity and increase in surface runoff)	Decreased infiltration capacity and increased surface runoff can affect the recharge/availability of water in underground aquifers.	-12	NEG	PR	3	D	1	M	2	P	2	IR	DIR	-6	NEG	PR	3	D	1	RE	1	P	2	R	DIR	MC 3	PM / EO
	Landscape	Affecting the landscape	Temporarily or permanently built structures can create an undesirable visual impact, leading to a loss of the area's natural landscape features.	-6	NEG	PR	3	D	1	M	2	T	1	R	DIR	-3	NEG	PR	3	D	1	RE	1	T	1	R	DIR	MC 4	EO
Cleaning, deforestation and desilting	Soil	Land use	Removing vegetation exposes the soil to the weather, causing water to run off the surface instead of being absorbed. This can increase the risk of erosion and flooding.	-16	NEG	C	4	D	1	M	2	P	2	R	DIR	-8	NEG	C	4	D	1	RE	1	P	2	R	DIR	MC 5	EO
	Climate and Climate Change	Microclimate change due to deforestation	The removal of vegetation, with the possible felling of trees, causes a slight rise in air temperature near the ground and a decrease in relative humidity, resulting from a possible loss of thermal regularization capacity, limited to the areas where deforestation will take place.	-16	NEG	C	4	D	1	M	2	P	2	R	DIR	-8	NEG	C	4	D	1	RE	1	P	2	R	DIR	MC 3 MC 5	PM / EO
	Water Resources	Reduced water infiltration capacity in the soil and increased surface runoff	Vegetation plays an important role in the infiltration of water into the soil, its removal can reduce infiltration, increasing surface runoff, affecting the recharge/availability of water in underground aquifers.	-8	NEG	INC	2	D	1	M	2	P	2	R	DIR	-4	NEG	INC	2	D	1	RE	1	P	2	R	DIR	MC 5	EO
		Potential contamination of surface and groundwater	The use of heavy vehicles and other machinery can result in leaks of fluids, such as oil and fuel,	-6	NEG	PR	3	D	1	M	2	T	1	R	DIR	-3	NEG	PR	3	D	1	RE	1	T	1	R	DIR	MC 6 MC 7	EO

I - Matrix for the Identification and Assessment of Environmental and Social Impacts | CONSTRUCTION PHASE

Activities	Descriptors Affected	Impacts		Evaluation without measurements												Assessment with Measures - RESIDUAL IMPACTS												Measures to Mitigate and Enhance WSS Impacts	
		Identification	Explanation	S	N	P	#	I	#	M	#	D	#	R	O	S	N	P	#	I	#	M	#	D	#	R	O	Measures	Responsible
CONSTRUCTION PHASE																													
			which, if not contained, can run off into bodies of water or seep into the ground and reach underground aquifers.																										
	Air Quality	Particulate emissions from earthmoving	Increase in dust particles in the atmosphere could affect the health of workers on site	-8	NEG	C	4	D	1	M	2	T	1	R	DIR	-3	NEG	PR	3	D	1	RE	1	T	1	R	DIR	MC 8 MC 9	EO
			An increase in dust particles in the atmosphere can affect the health of communities close to the construction area (allergies and other respiratory diseases) and of workers on site	-6	NEG	PR	3	D	1	M	2	T	1	R	DIR	-3	NEG	PR	3	D	1	RE	1	T	1	R	DIR	MC 9	EO
Sound environment	Increased sound levels	The use of heavy vehicles and other machinery can result in an increase in noise causing nuisance to the communities near the construction area.	-4	NEG	INC	2	D	1	M	2	T	1	R	DIR	-2	NEG	INC	2	D	1	RE	1	T	1	R	DIR	MC 6 MC 10	EO	
		The use of heavy vehicles and other machinery can result in an increase in noise, which can affect the health of the workers on site.	-6	NEG	PR	3	D	1	M	2	T	1	R	DIR	-2	NEG	INC	2	D	1	RE	1	T	1	R	DIR	MC 6 MC 10 MC 11	EO	
Waste	Waste Production	Production of plant biomass waste: trees, shrubs, weeds and other plant materials that are cut down or removed during the clearing and deforestation process.	-8	NEG	C	4	D	1	M	2	T	1	R	DIR	-4	NEG	C	4	D	1	RE	1	T	1	R	DIR	M 12 MC 13	EO	
Flora	Affecting vegetation / natural habitats	Reduction in the area covered with vegetation, with the felling of some trees affecting plant biodiversity and causing changes in the site's habitat conditions	-16	NEG	C	4	D	1	M	2	P	2	IR	DIR	-8	NEG	C	4	D	1	RE	1	P	2	IR	DIR	MC 3 MC 5	EO	
Fauna	Disturbance of fauna	The use of heavy vehicles and other machinery causes noise that can disturb the fauna, forcing them to leave their habitat. This displacement can result in the death of animals.	-12	NEG	PR	3	A	2	M	2	T	1	R	DIR	-6	NEG	PR	3	A	2	RE	1	T	1	R	DIR	MC 14 MC 15 MC 16	EO	

I - Matrix for the Identification and Assessment of Environmental and Social Impacts | CONSTRUCTION PHASE

Activities	Descriptors Affected	Impacts		Evaluation without measurements												Assessment with Measures - RESIDUAL IMPACTS												Measures to Mitigate and Enhance WSS Impacts	
		Identification	Explanation	S	N	P	#	I	#	M	#	D	#	R	O	S	N	P	#	I	#	M	#	D	#	R	O	Measures	Responsible
CONSTRUCTION PHASE																													
			The reduction and elimination of vegetation can destroy habitat, feeding areas and shelter for fauna, which can scare away fauna, causing individuals to move or even die	-8	NEG	C	4	D	1	M	2	T	1	R	DIR	-4	NEG	C	4	D	1	RE	1	T	1	R	DIR	MC 3	PM / EO
Earthmoving	Soil	Affecting soil (quality)	Earthmoving: excavation, embankments and compaction affect structures and the soil and can decrease the capacity for water infiltration, causing water to run off the surface instead of being absorbed. This can increase the risk of erosion and flooding.	-24	NEG	PR	3	A	2	M	2	P	2	IR	DIR	-8	NEG	INC	2	A	2	RE	1	P	2	IR	DIR	MC 17	EO
	Water Resources	Decreased infiltration capacity and increased surface water runoff	Earth movement: excavation, embankments and compaction affect soil structures and can reduce the infiltration of water into the soil, increasing surface water run-off, affecting the recharge/availability of water in underground aquifers.	-6	NEG	PR	3	D	1	M	2	T	1	R	DIR	-4	NEG	INC	2	D	1	RE	1	P	2	R	DIR	MC 17	EO
		Potential contamination of surface and groundwater	The use of heavy vehicles and other machinery in earthmoving can result in leaks of fluids, such as oil and fuel, which, if not contained, can run off into bodies of water or seep into the ground and reach underground aquifers.	-4	NEG	INC	2	D	1	M	2	T	1	R	DIR	-2	NEG	INC	2	D	1	RE	1	T	1	R	DIR	MC 6 MC 7	EO
	Air Quality	Particulate emissions from earthmoving	Increase in dust particles in the atmosphere could affect the health of workers on site	-6	NEG	PR	3	A	2	RE	1	T	1	R	DIR	-4	NEG	INC	2	A	2	RE	1	T	1	R	DIR	MC8 MC 9	EO
			An increase in dust particles in the atmosphere can affect the health of communities close to the construction area (allergies and other respiratory diseases) and of workers on site	-6	NEG	PR	3	A	2	RE	1	T	1	R	DIR	-4	NEG	INC	2	A	2	RE	1	T	1	R	DIR	MC 6 MC 10	EO
	Sound environment	Increased sound levels	The use of heavy vehicles and the operation of machinery results in an increase in noise that can cause nuisance to the communities near the construction area	-6	NEG	PR	3	A	2	RE	1	T	1	R	DIR	-4	NEG	INC	2	A	2	RE	1	T	1	R	DIR	MC 6 MC 10	EO

I - Matrix for the Identification and Assessment of Environmental and Social Impacts | CONSTRUCTION PHASE

Activities	Descriptors Affected	Impacts		Evaluation without measurements												Assessment with Measures - RESIDUAL IMPACTS												Measures to Mitigate and Enhance WSS Impacts	
		Identification	Explanation	S	N	P	#	I	#	M	#	D	#	R	O	S	N	P	#	I	#	M	#	D	#	R	O	Measures	Responsible
CONSTRUCTION PHASE																													
			The use of heavy vehicles and the operation of machinery results in an increase in noise that can affect the health of the workers assigned to the site	-6	NEG	PR	3	A	2	RE	1	T	1	R	DIR	-4	NEG	INC	2	A	2	RE	1	T	1	R	DIR	MC 6 MC 10 MC 11	EO
	Fauna	Disturbance of fauna	The use of heavy vehicles and other machinery causes noise that can disturb the fauna, forcing them to leave their habitat. This displacement can result in the death of animals.	-8	NEG	INC	2	A	2	M	2	T	1	R	DIR	-2	NEG	INC	2	D	1	RE	1	T	1	R	DIR	MC 6 MC 10 MC 15 MC 16	
Presence and Operation of the Shipyard and Work Fronts	Soil	Increase in sealed area (decrease in infiltration capacity and increase in surface runoff)	The establishment of the shipyard, the storage of materials in the yard and on the construction site can waterproof areas of the ground, reducing the capacity for water infiltration, causing water to run off the surface instead of being absorbed. This can increase the risk of erosion and flooding.	-6	NEG	PR	3	D	1	M	2	T	1	R	DIR	-2	NEG	INC	2	D	1	RE	1	T	1	R	DIR	MC 3	PM / EO
		Possible soil contamination due to accidental spills, waste disposal, etc.	Leaking fluids, such as oil and fuel, from machinery and equipment used on the site, as well as improper waste disposal and incorrect storage of materials, can release toxic substances into the soil, contaminating it.	-6	NEG	PR	3	D	1	M	2	T	1	R	DIR	-2	NEG	INC	2	D	1	RE	1	T	1	R	DIR	MC 13 MC 18	EO
	Water Resources	Increase in sealed area (decrease in infiltration capacity and increase in runoff)	The establishment of the shipyard, the storage of materials at the shipyard and the front of the site can waterproof areas of the ground, reducing the capacity for water infiltration, causing water to run off the surface instead of being absorbed, which can affect the recharge/availability of water in underground aquifers.	-8	NEG	C	4	D	1	M	2	T	1	R	DIR	-3	NEG	PR	3	D	1	RE	1	T	1	R	DIR	MC 19	EO
		Potential contamination of water resources (groundwater and surface water)	Leakage of fluids (spills), such as oil and fuel, from machinery and equipment assigned to the work, as well as improper disposal of waste and incorrect storage of materials, can release toxic substances into the soil, which can run off into surface water bodies or, through infiltration,	-6	NEG	PR	3	D	1	M	2	T	1	R	DIR	-2	NEG	INC	2	D	1	RE	1	T	1	R	DIR	MC 7 MC 13 MC 18	EO

I - Matrix for the Identification and Assessment of Environmental and Social Impacts | CONSTRUCTION PHASE

Activities	Descriptors Affected	Impacts		Evaluation without measurements												Assessment with Measures - RESIDUAL IMPACTS												Measures to Mitigate and Enhance WSS Impacts	
		Identification	Explanation	S	N	P	#	I	#	M	#	D	#	R	O	S	N	P	#	I	#	M	#	D	#	R	O	Measures	Responsible
CONSTRUCTION PHASE																													
			contaminate underground water tables.																										
	Air Quality	Emission of particles, GHG and other pollutants	The operation of the shipyard is associated with the increased movement of vehicles and the operation of machinery, such as generators, which can increase airborne particles such as dust and smoke that can affect the health of the community, causing respiratory, cardiovascular and allergic problems.	-12	NEG	PR	3	A	2	M	2	T	1	R	DIR	-3	NEG	PR	3	D	1	RE	1	T	1	R	DIR	MC 6 MC 10 MC 15	EO
			Incorrect storage of materials such as soil and other building materials can increase airborne particles such as dust, which can affect the health of the community, causing respiratory, cardiovascular and allergic problems.	-6	NEG	PR	3	D	1	M	2	T	1	R	DIR	-2	NEG	INC	2	D	1	RE	1	T	1	R	DIR	MC 20	EO
			Sound environment	Increased sound levels	The use of heavy vehicles and the operation of machinery results in an increase in noise that can cause nuisance to the communities near the construction area	-6	NEG	PR	3	A	2	RE	1	T	1	R	DIR	-4	NEG	INC	2	A	2	RE	1	T	1	R	DIR
	The use of heavy vehicles and the operation of machinery results in an increase in noise that can affect the health of the workers assigned to the site	-6			NEG	PR	3	D	1	M	2	T	1	R	DIR	-2	NEG	INC	2	D	1	RE	1	T	1	R	DIR	MC 6 MC 10 MC 11	EO

I - Matrix for the Identification and Assessment of Environmental and Social Impacts | CONSTRUCTION PHASE

Activities	Descriptors Affected	Impacts		Evaluation without measurements												Assessment with Measures - RESIDUAL IMPACTS												Measures to Mitigate and Enhance WSS Impacts	
		Identification	Explanation	S	N	P	#	I	#	M	#	D	#	R	O	S	N	P	#	I	#	M	#	D	#	R	O	Measures	Responsible
CONSTRUCTION PHASE																													
	Waste	Waste Production	Leftover building materials (e.g. concrete, wood, etc.), packaging (plastic, cardboard and other packaging materials used to protect materials during transportation), construction waste, hazardous waste (leftover chemical substances such as paints, solvents and cleaning products) organic waste such as vegetation and food waste.	-8	NEG	C	4	D	1	M	2	T	1	R	DIR	-4	NEG	C	4	D	1	RE	1	T	1	R	DIR	MC 13	EO
Rehabilitation / Regularization of Canals	Soil	Increased waterproofed area decreases infiltration capacity (particularly if conventional engineering techniques are adopted)	The regularization of canals can waterproof areas of the ground, decreasing the infiltration capacity of water, causing water to run off the surface instead of being absorbed. This can increase the risk of erosion and flooding.	-6	NEG	PR	3	D	1	M	2	T	1	IR	DIR	-3	NEG	PR	3	D	1	RE	1	T	1	IR	DIR	MC 3	PM / EO
		Affecting Soil Quality	Possible soil contamination due to accidental spills, incorrect deposition and storage of construction waste.	-6	NEG	PR	3	D	1	M	2	T	1	R	DIR	-2	NEG	INC	2	D	1	RE	1	T	1	R	DIR	MC 13	EO
	Water Resources	Increased waterproofed area decreases infiltration capacity (particularly if conventional engineering techniques are adopted)	The regularization of channels can waterproof areas of the ground, decreasing the infiltration capacity of water, causing water to run off the surface instead of being absorbed, which can affect the recharge/availability of water in underground aquifers.	-6	NEG	PR	3	D	1	M	2	T	1	R	DIR	-3	NEG	PR	3	D	1	RE	1	T	1	R	DIR	MC 19	EO
		Allocation of Water Resources	During the regularization of channels, it may be necessary to divert the natural flow of water bodies to allow the work to be carried out without flooding the work area. This can be done through cofferdams or temporary barriers. This detour can temporarily alter local water dynamics, affecting water flow, sedimentation and the ecology of riparian habitats.	-6	NEG	PR	3	D	1	M	2	T	1	R	DIR	-2	NEG	INC	2	D	1	RE	1	T	1	R	DIR	MC 21	PM / EO

I - Matrix for the Identification and Assessment of Environmental and Social Impacts | CONSTRUCTION PHASE

Activities	Descriptors Affected	Impacts		Evaluation without measurements												Assessment with Measures - RESIDUAL IMPACTS												Measures to Mitigate and Enhance WSS Impacts	
		Identification	Explanation	S	N	P	#	I	#	M	#	D	#	R	O	S	N	P	#	I	#	M	#	D	#	R	O	Measures	Responsible
CONSTRUCTION PHASE																													
		Potential contamination of water resources (groundwater and surface water)	Leaking fluids, such as oil and fuel, from machinery and equipment used on the site, as well as improper waste disposal and incorrect storage of materials, can release toxic substances into the soil, which can run off into surface water bodies or contaminate underground water tables.	-6	NEG	PR	3	D	1	M	2	T	1	R	DIR	-2	NEG	INC	2	D	1	RE	1	T	1	R	DIR	MC 6 MC 7	EO
	Sound environment	Increased sound levels	The use of heavy vehicles and the operation of machinery results in an increase in noise that can cause nuisance to the communities near the construction area	-6	NEG	PR	3	D	1	M	2	T	1	R	DIR	-2	NEG	INC	2	D	1	RE	1	T	1	R	DIR	MC 6 MC 10	EO
			The use of heavy vehicles and the operation of machinery results in an increase in noise that can affect the health of the workers assigned to the site	-6	NEG	PR	3	D	1	M	2	T	1	R	DIR	-2	NEG	INC	2	D	1	RE	1	T	1	R	DIR	MC 6 MC 10 MC 11	EO
	Waste	Waste Production	Leftover building materials (e.g. concrete, wood, etc.), packaging (plastic, cardboard and other packaging materials used to protect materials during transportation), construction waste, hazardous waste (leftover chemical substances such as paints, solvents and cleaning products) organic waste such as vegetation and food waste.	-8	NEG	C	4	D	1	M	2	T	1	R	DIR	-3	NEG	PR	3	D	1	RE	1	T	1	R	DIR	MC 13	EO
Creating Access Paths	Soil	Affecting geological formations	The construction of paths usually involves the removal of native vegetation, which helps to stabilize the soil. This can increase erosion, especially in sloping areas where the soil is exposed to the action of rain and wind.	-12	NEG	PR	3	D	1	M	2	P	2	R	DIR	-6	NEG	PR	3	D	1	RE	1	P	2	R	DIR	MC 3 MC 22	PM / EO
		Affecting soil impermeability	Soil compaction reduces its porosity and water infiltration capacity, which can negatively affect soil quality.	-6	NEG	PR	3	D	1	M	2	T	1	R	DIR	-3	NEG	PR	3	D	1	RE	1	T	1	R	DIR	MC 3	PM / EO

I - Matrix for the Identification and Assessment of Environmental and Social Impacts | CONSTRUCTION PHASE

Activities	Descriptors Affected	Impacts		Evaluation without measurements												Assessment with Measures - RESIDUAL IMPACTS												Measures to Mitigate and Enhance WSS Impacts	
		Identification	Explanation	S	N	P	#	I	#	M	#	D	#	R	O	S	N	P	#	I	#	M	#	D	#	R	O	Measures	Responsible
CONSTRUCTION PHASE																													
	Water Resources	Potential contamination of water resources (groundwater and surface water)	Leaking fluids, such as oil and fuel, from machinery and equipment used on the site, as well as improper waste disposal and incorrect storage of materials, can release toxic substances into the soil, which can seep down to surface or underground bodies of water.	-6	NEG	PR	3	D	1	M	2	T	1	R	DIR	-2	NEG	INC	2	D	1	RE	1	T	1	R	DIR	MC 7 MC 13 MC 18	EO
		Reduced water infiltration capacity in the soil	The creation of access roads can waterproof areas of the ground, decreasing the capacity for water infiltration, causing water to run off the surface instead of being absorbed, which can affect the recharge/availability of water in underground aquifers.	-6	NEG	PR	3	D	1	M	2	T	1	R	DIR	-2	NEG	INC	2	D	1	RE	1	T	1	R	DIR	MC 19	EO
Air Quality	Emission of particles, GHG and other pollutants	The machines used to create the paths increase the particles of dust and smoke in the atmosphere, which can affect the health of the workers assigned to the work.	-8	NEG	C	4	D	1	M	2	T	1	R	DIR	-4	NEG	C	4	D	1	RE	1	T	1	R	DIR	MC 8 MC 9	EO	
		The machines used to create the paths increase the particles of dust and smoke in the atmosphere, which can affect the health of the communities near the construction area (allergies and other respiratory diseases).	-8	NEG	C	4	D	1	M	2	T	1	R	DIR	-4	NEG	C	4	D	1	RE	1	T	1	R	DIR	MC 6 MC 10	EO	
Sound environment	Increased sound levels	The use of heavy vehicles to create the paths results in an increase in noise that can cause annoyance to the communities near the construction area	-3	NEG	PR	3	D	1	RE	1	T	1	R	DIR	-2	NEG	INC	2	D	1	RE	1	T	1	R	DIR	MC 6 MC 10 MC 22	EO	
		The use of heavy vehicles to create the paths results in an increase in noise that can affect the health of the workers assigned to the work	-6	NEG	PR	3	D	1	M	2	T	1	R	DIR	-4	NEG	INC	2	D	1	M	2	T	1	R	DIR	MC 6 MC 10 MC 11	EO	
Flora	Affecting vegetation / natural habitats	Reduction in the area covered with vegetation, with the felling of some trees affecting plant biodiversity and causing changes in the site's habitat conditions	-8	NEG	C	4	D	1	M	2	T	1	R	DIR	-3	NEG	PR	3	D	1	RE	1	T	1	R	DIR	MC 3 MC 5	PM / EO	

I - Matrix for the Identification and Assessment of Environmental and Social Impacts | CONSTRUCTION PHASE

Activities	Descriptors Affected	Impacts		Evaluation without measurements												Assessment with Measures - RESIDUAL IMPACTS												Measures to Mitigate and Enhance WSS Impacts	
		Identification	Explanation	S	N	P	#	I	#	M	#	D	#	R	O	S	N	P	#	I	#	M	#	D	#	R	O	Measures	Responsible
CONSTRUCTION PHASE																													
	Fauna	Disturbance of fauna	The use of heavy vehicles and other machinery causes noise that can disturb the fauna, forcing them to leave their habitat. This displacement can result in the death of animals.	-8	NEG	INC	2	A	2	M	2	T	1	R	DIR	-2	NEG	INC	2	D	1	RE	1	T	1	R	DIR	MC 10 MC 15 MC 16	EO
			The reduction and elimination of vegetation can destroy habitat, feeding areas and shelter for fauna, which can scare away fauna, causing individuals to move or even die	-8	NEG	INC	2	A	2	M	2	T	1	R	DIR	-2	NEG	INC	2	D	1	RE	1	T	1	R	DIR	MC 3	PM / EO
	Socio-economic	Improving the movement of people and goods in rural areas	Access roads offer direct routes to rural areas, improving connectivity between rural communities. This facilitates the movement of people and the flow and arrival of goods and services in rural communities.	8	POS	C	4	D	1	M	2	T	1	R	DIR	16	POS	C	4	D	1	M	2	P	2	R	DIR	MC 22	EO
Circulation of vehicles for transporting materials, equipment and workers and moving machinery	Soil	Soil contamination due to accidental spills	Moving different types of vehicles and machinery around the workplace can cause accidental spills, contaminating the soil	-6	NEG	PR	3	D	1	M	2	T	1	R	DIR	-2	NEG	INC	2	D	1	RE	1	T	1	R	DIR	MC 6 MC 7 MC 24	EO
	Water Resources	Potential contamination of water resources (groundwater and surface water)	Vehicles on the job can leak fluids such as oil and fuels, which are toxic substances, into the ground, which can run off into surface water bodies or contaminate underground water tables through seepage.	-6	NEG	PR	3	A	2	RE	1	T	1	R	DIR	-4	NEG	INC	2	A	2	RE	1	T	1	R	DIR	MC 7 MC 13	EO
		Reduced water infiltration capacity	The circulation of vehicles causes soil compaction, which increases soil sealing, decreasing water infiltration capacity, causing water to run off the surface instead of being absorbed, which can affect the recharge/availability of water in underground aquifers.	-6	NEG	PR	3	A	2	RE	1	T	1	R	DIR	-2	NEG	INC	2	D	1	RE	1	T	1	R	DIR	MC 25	EO
	Air Quality	Emission of particles, GHG and other pollutants	An increase in dust particles and smoke in the atmosphere due to increased traffic can affect the health of construction workers and communities close to the construction area (allergies and other respiratory diseases).	-8	NEG	C	4	D	1	M	2	T	1	R	DIR	-3	NEG	PR	3	D	1	RE	1	T	1	R	DIR	MC 6 MC 9 MC 25	EO

I - Matrix for the Identification and Assessment of Environmental and Social Impacts | CONSTRUCTION PHASE

Activities	Descriptors Affected	Impacts		Evaluation without measurements												Assessment with Measures - RESIDUAL IMPACTS												Measures to Mitigate and Enhance WSS Impacts	
		Identification	Explanation	S	N	P	#	I	#	M	#	D	#	R	O	S	N	P	#	I	#	M	#	D	#	R	O	Measures	Responsible
CONSTRUCTION PHASE																													
	Sound environment	Increased sound levels	The movement of vehicles results in an increase in noise that can cause annoyance to the communities near the construction area and to workers	-6	NEG	PR	3	A	2	RE	1	T	1	R	DIR	-4	NEG	INC	2	A	2	RE	1	T	1	R	DIR	MC 6 MC 10	EO
	Fauna	Disturbance of fauna	The movement of heavy vehicles causes noise that can disturb the fauna, scaring them away from their habitat. This displacement can result in the death of animals.	-6	NEG	PR	3	A	2	RE	1	T	1	R	DIR	-2	NEG	INC	2	D	1	RE	1	T	1	R	DIR	MC 10 MC 15	EO
	Socio-economic	Affecting the health and well-being of the community due to increased traffic	The increase in traffic can lead to road accidents and pedestrian accidents, affecting the safety of nearby communities	-8	NEG	C	4	D	1	M	2	T	1	R	DIR	-4	NEG	C	4	D	1	RE	1	T	1	R	DIR	MC 25	EO
Hiring labor	Socio-economic	Increased local employment	The demand for labor (skilled and unskilled) will be an important boost to local employability, especially for young people	16	POS	C	4	A	2	M	2	T	1	R	DIR	24	POS	C	4	A	2	E	3	T	1	R	DIR	MC 26	EO
		Increasing the capacity of the local population	The presence of the contractor can be an opportunity to transfer construction and other skills to the local population in the surrounding communities.	12	POS	PR	3	A	2	M	2	T	1	R	DIR	24	POS	C	4	A	2	E	3	T	1	R	DIR	MC 26	EO
		Promotion of the local economy due to the increased flow of non-resident population	The presence of a non-resident population can increase demand for goods, products and services, thus stimulating local commerce.	18	POS	PR	3	A	2	E	3	T	1	R	DIR	24	POS	C	4	A	2	E	3	T	1	R	DIR	MC 27	PM / EO
		Affecting Human Health	The increase in the flow of non-resident population can be a risk to the health of the local population, with an increase in sexually transmitted diseases (HIV/AIDS and other infections).	-6	NEG	PR	3	D	1	RE	1	P	2	R	DIR	-4	NEG	C	4	D	1	RE	1	T	1	R	DIR	MC 28 MC 29	EO / EF
		Social disruption and family instability	The increase in the flow of non-resident population can lead to social disruption and family instability	-6	NEG	PR	3	D	1	RE	1	P	2	R	DIR	-3	NEG	PR	3	D	1	RE	1	T	1	R	DIR	MC 30	EO

I - Matrix for the Identification and Assessment of Environmental and Social Impacts | CONSTRUCTION PHASE

Activities	Descriptors Affected	Impacts		Evaluation without measurements												Assessment with Measures - RESIDUAL IMPACTS												Measures to Mitigate and Enhance WSS Impacts	
		Identification	Explanation	S	N	P	#	I	#	M	#	D	#	R	O	S	N	P	#	I	#	M	#	D	#	R	O	Measures	Responsible
CONSTRUCTION PHASE																													
		Potential increase in EAS/AS and GBV situations	Risk of cases of SAE/SAE and GBV among project workers, affecting vulnerable groups	-6	NEG	PR	3	D	1	RE	1	P	2	R	DIR	-3	NEG	PR	3	D	1	RE	1	T	1	R	DIR	MC 29; MC 31	EO / EF
		Worker safety risks including occupational diseases and accidents	Safety risks for workers include accidents at work, such as falls and injuries, noise and vibrations caused by the operation of machinery and equipment, and occupational illnesses, which can result from exposure to harmful agents such as dust and chemicals.	-6	NEG	PR	3	D	1	M	2	T	1	R	DIR	-2	NEG	INC	2	D	1	RE	1	T	1	R	DIR	MC 6 MC 9 MC 32 MC 33	EO
Purchase of materials and equipment	Socio-economic	Promoting the local economy	Fostering the local market with the purchase of materials and equipment needed to carry out the project	8	POS	INC	2	A	2	M	2	T	1	R	DIR	18	POS	PR	3	A	2	E	3	T	1	R	DIR	MC 34	EO / EF

II - Matrix for the Identification and Assessment of Environmental and Social Impacts | OPERATION PHASE

Activity	Descriptors Affected	Impacts		Evaluation without measurements												Assessment with measures - RESIDUAL IMPACTS												Mitigating and enhancing impact measures	
		Identification	Explanation	S	N	P	#	I	#	M	#	D	#	R	O	S	N	P	#	I	#	M	#	D	#	R	O	Measures	Responsible
OPERATION PHASE																													
Presence and functioning of channels	Climate and Climate Change	Adapting to climate change	More efficient and well-managed irrigation systems can increase farmers' ability to adapt to climate variability and droughts.	24	POS	PR	3	A	2	M	2	P	2	R	DIR	32	POS	C	4	A	2	M	2	P	2	IR	DIR	MO 1	EO/ PM
	Soil	Protection of the soil surface from erosion	The presence of well-maintained irrigation channels helps control soil erosion, protecting the fertility and structure of the soil in agricultural areas	24	POS	PR	3	A	2	M	2	P	2	IR	DIR	32	POS	C	4	A	2	M	2	P	2	IR	DIR	MO 2	PM
	Water Resources	Improving the water regime by improving interception, infiltration and water retention capacity	Canal rehabilitation can restore water storage and distribution capacity, reducing losses and improving efficiency in the use of water resources.	16	POS	INC	2	A	2	M	2	P	2	IR	DIR	36	POS	PR	3	A	2	E	3	P	2	IR	DIR	MO 2	PM
	Fauna & Flora	Promoting Biodiversity	By restoring the canals, aquatic and riparian habitats can be improved, promoting local biodiversity.	16	POS	INC	2	A	2	M	2	P	2	IR	DIR	36	POS	PR	3	A	2	E	3	P	2	IR	DIR	MO 3	EO/ PM
	Socio-economic	Water availability	Increased water availability, translated into greater access to water for agricultural production and domestic use, reducing the distances traveled by inhabitants	16	POS	C	4	D	1	M	2	P	2	R	DIR	24	POS	C	4	D	1	E	3	P	2	R	DIR	MO 4; MO 5	EO/ PM
		Development of the local economy	The operation of irrigation canals can develop the local economy by increasing agricultural productivity, which results in higher incomes for farmers, while also stimulating related economic activities such as food processing.	32	POS	C	4	A	2	M	2	P	2	R	DIR	48	POS	C	4	A	2	E	3	P	2	R	DIR	MO 2; MO 6	PM
		Increased Agricultural Production	The operation of the irrigation canal will stimulate an increase (quantity and quality) in the production of local farmers, making it possible to diversify agricultural production and reduce rainfed agriculture.	16	POS	C	4	D	1	M	2	P	2	R	DIR	24	POS	C	4	D	1	E	3	P	2	R	DIR	MO 2; MO 6; MO 7	PM
		Improved nutritional conditions for the region's population, with access to more food	Increased production and, consequently, greater availability of food will lead to improvements in the nutritional status of communities, through a more varied diet, reducing the incidence of malnutrition.	24	POS	PR	3	A	2	M	2	P	2	R	DIR	24	POS	PR	3	A	2	M	2	P	2	R	DIR	---	
		Hiring local staff	Hiring local labor (especially young people) to ensure that the irrigation canals are operational.	16	POS	C	4	A	2	M	2	T	1	R	DIR	24	POS	C	4	A	2	E	3	T	1	R	DIR	MO 8	EO
	Maintenance	Waste	Waste Production	The main waste that can be produced by canal maintenance activities is organic waste (vegetation and food	-6	NEG	PR	3	D	1	M	2	T	1	R	DIR	-3	NEG	PR	3	D	1	RE	1	T	1	R	DIR	MO 9

II - Matrix for the Identification and Assessment of Environmental and Social Impacts | OPERATION PHASE

Activity	Descriptors Affected	Impacts		Evaluation without measurements												Assessment with measures - RESIDUAL IMPACTS												Mitigating and enhancing impact measures	
		Identification	Explanation	S	N	P	#	I	#	M	#	D	#	R	O	S	N	P	#	I	#	M	#	D	#	R	O	Measures	Responsible
OPERATION PHASE																													
			waste) and other sediments such as soil that clog up the canals.																										
	Socio-economic	Local economy: business opportunity for local companies	Stimulate local trade by purchasing all the materials needed to maintain the irrigation canals from local suppliers	16	POS	INC	2	A	2	M	2	P	2	R	DIR	36	POS	PR	3	A	2	E	3	P	2	R	DIR	MO 10	EO
		Hiring local staff	Hiring local labor (especially young people) to clean and maintain the irrigation canals.	16	POS	C	4	A	2	M	2	T	1	R	DIR	24	POS	C	4	A	2	E	3	T	1	R	DIR	MO 11	EO

Caption:

MINOR POSITIVE	
MODERATELY SIGNIFICANT POSITIVE	
SIGNIFICANT POSITIVE	

NEGLIGIBLE NEGATIVE	
MODERATELY SIGNIFICANT NEGATIVE	
SIGNIFICANT NEGATIVE	

S - Significance (S=PxIxMxD)
N - Nature
P - Probability
I - Incidence
M - Magnitude
D - Duration
R - Reversibility
O - Occurrence

MC - Construction Measures
DP - Owner
EO - Building Contractor
EF - Inspection Team

- **Significant** if the score is greater than 45.
- **Moderately Significant** the score is greater than 11 and equal to or less than 45.
- **Not Significant** the score is less than or equal to or greater than 11