



CARRINHO GROUP, SA

**ENVIRONMENTAL AND SOCIAL IMPACT
STUDY OF THE CAÁLA-HUAMBO GRAIN
TERMINAL "SILOS"**

TECHNICAL REPORT

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SEPTEMBER 2025

Luanda-Angola

INITIAL NOTE

This document is a Technical Report on the Environmental and Social Impact Study of the Caála GRAIN TERMINAL "SILOS" in the province of Huambo, municipality of Caála. It was prepared by the company HSG - CONSTRUÇÃO, ENGENHARIA E COMÉRCIO, LDA

Luanda, September 2025

Reviewed by HSG (consultant)

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LIST OF ACRONYMS AND ABBREVIATIONS

- ADA - Directly Affected Area
- EIA: Environmental Impact Assessment
- AID - Area of direct influence
- IIA - Indirectly affected area
- WB: World Bank
- CFB - Benguela Railways
- DHANA - Human Right to Adequate Food and Nutrition
- EDA: Agricultural Development Station
- EEs-Specialized Companies
- EIA-Environmental Impact Assessment
- ENDE-National Electricity Distribution Company
- EN-National Road
- EASH-Huambo Water and Sanitation Company
- EPC-Collective Protection Equipment
- PPE-Personal Protective Equipment
- WWTP-Wastewater Treatment Plant
- FAO-Food and Agriculture Organization of the United Nations
- IDA: Institute for Agricultural Development
- INE-National Institute of Statistics
- IPA-Artisanal Fisheries Institute
- LP - Preliminary License
- MINAGRIP: Ministry of Agriculture and Fisheries
- MIP – Integrated Pest Management
- MSGR: Suggestion and Complaint Management Mechanism
- The Economic and Social Development Fund – FDES
- SDG - Sustainable Development Goals
- ILO: International Labor Organization
- PDAC: Angola Commercial Agriculture Development Project

- PDN-National Development Plan
- PENSA Plans such as the National Strategy for Food Security
- PGA-Environmental Management Plan
- PGAS: Environmental and Social Management Plan
- SME: Small and Medium-sized Enterprises
- PND-National Development Plan
- PNOOC-Coastal Zone Management Plan
- RAPP-Agricultural and Fisheries Census
- EIR: Environmental Impact Report
- TDR-Terms of Reference
- UN-United Nations
- GBV: Gender-Based Violence

1 EXECUTIVE SUMMARY

This report concerns the Environmental and Social Impact Assessment (ESIA) for the construction of agricultural infrastructure "Silos" in the municipality of Caála, Huambo province.

The project proponent is Carrinho, SA, which submitted an application to **the U.S. International Development Finance Corporation (DFC)** for project financing through the **African Development Bank (AFDB)**.

In preparing this study, the provisions established in Angolan legislation were taken into account, as well as the guidelines of the AfDB and DFC, duly mentioned and detailed in Chapter 3, which also presents the Institutional Framework of the main entities involved in the agriculture sector, as well as the Ministry of the Environment.

At this stage of the Environmental and Social Impact Assessment, the aim is to identify the activities planned for the implementation of the Project, analyze their possible impacts, and define the corresponding mitigation measures.

Caála is a city and municipality in the province of Huambo, covering an area of 3,680 km² and with a population of around 279,792. The municipality of Caála is located in the central part of the province of Huambo, bordered to the north by the municipality of Ecuinha, to the east by the municipality of Huambo, to the south by the municipality of Chipindo, and to the west by the municipalities of Longonjo and Caconda.

The municipality consists of the commune-headquarters, corresponding to the city of Caála, and the communes of Cuíma, Calenga, and Catata.

The agricultural sector in the municipality of Caála, Huambo province, is the main economic and subsistence base for the local population, and is mainly practiced on a family basis. Benefiting from fertile soils and a favorable climate, the region is suited to the cultivation of various crops, notably corn, beans, potatoes, vegetables, cassava, and some fruits such as bananas and avocados. Despite its productive potential, the sector faces challenges such as poor mechanization, limited access to agricultural inputs, inadequate irrigation infrastructure, and difficulties in marketing production. However, there are promising opportunities with the

investment in agricultural cooperatives, rural extension, and production support infrastructure, which can increase productivity and promote sustainable rural development in Caála.

Taking advantage of the municipality's potential in terms of grain production, the Carrinho group intends to build agricultural infrastructure "Silos," with the aim of facilitating the storage and distribution of grains from various points in the municipality and other regions, not only to mitigate and reduce post-harvest losses, but also to encourage farmers to increase production, contributing to food security and economic development in the region.

The proposed project will be implemented in an area corresponding to 6,750 m² and will be built using reinforced concrete, wire mesh, metal structures, and sheet metal, etc.

The project consists of the construction and operation of existing silos and increasing their grain storage capacity from 3,999 tons to 20,000 tons, in which the following products are expected to be stored: corn, wheat, rice, and soybeans.

The silos, with a storage capacity of 120,000 tons, consist of:

- 1 Road weighbridge with a capacity of 60 tons;
- 1 road reception circuit with a capacity of 270m³/h (200t/h), with straw pre-cleaning;
- 2 conical bottom storage silos with a total capacity of approximately 2,650 m³, i.e., 1,000 tons capacity for each silo. For example, Ø10.66 m, cylinder height 19.52 m, and total height 22.61 m;
- 1 dryer with an output capacity of 100 t/h for corn;
- 12 flat-bottom silos for storage distributed across 2 lines, with a total capacity of approx. 160,000 m³, i.e., 10,000 tons of capacity for each silo. For example, Ø31.98, cylinder height 13.80 m, and total height 21.99 m;
- Aeration system in storage silos;
- 1 road dispatch circuit with a capacity of 135 m³/h (100 t/h);
- Electrical installation;
- Supervision system.

The main environmental conditions at the project site are described below.

The climate of the municipality of Caála is tropical highland (Aw according to Köppen-Geiger), characterized by two well-defined seasons: a rainy season that occurs between October and April, and a dry and cold season, known as cacimbo, from May to September. The average annual temperature varies between 18 °C and 21 °C, with June and July being the coldest months, with minimum temperatures that can reach below 10 °C at night. The average annual rainfall varies between 1,200 mm and 1,500 mm, concentrated mainly in the rainy season. This climate is favorable for agriculture, although it requires the use of soil conservation and water management techniques during dry periods.

The soils in the municipality of Caála are predominantly red and yellow latosols, developed from metamorphic and igneous rocks in the Central Plateau region. These soils are generally deep, well-drained, and clayey to loamy in texture, making them suitable for agriculture. They have good water retention capacity, an important factor for cultivation during the dry season. However, many of these soils are acidic and poor in essential nutrients, especially phosphorus and nitrogen, requiring corrective practices such as the application of limestone and organic or mineral fertilizers. Moderate natural fertility can be maintained with sustainable practices such as crop rotation and green manure. Despite the challenges, Caála soils offer good conditions for growing corn, potatoes, beans, and vegetables, provided they are well managed.

The local hydrology of the municipality of Caála, especially in the area near the source of the Calai River, is marked by the presence of perennial watercourses that are part of the upper Kwanza river basin. The Calai River originates in the highlands of the Angolan central plateau, characterized by altitudes above 1,500 meters, where rainfall is relatively high, ensuring regular flows throughout most of the year. This hydrographic network plays a crucial role in supplying water for domestic, agricultural, and livestock use, as well as in recharging groundwater aquifers. The region also has small tributaries and springs, which contribute to soil fertility and enable subsistence farming systems. However, pressure on water resources—due to deforestation, burning, and inappropriate agricultural practices—

poses a challenge to preserving water quality and quantity. Nevertheless, the proximity to the source of the Calai River offers opportunities for the development of irrigation and sustainable water management projects, which are fundamental to strengthening local agricultural production.

The local vegetation of the municipality of Caála is part of the ecological context of the Central Plateau of Angola, being predominantly composed of humid savannah, open forests, and miombo woodlands. This vegetation is marked by a combination of tall grasses and tree species such as *Brachystegia*, *Julbernardia*, and *Isobertinia*, characteristic of miombo ecosystems. In the more humid areas and near watercourses, there are riparian galleries with denser vegetation. Human activity, namely the use of fire, extensive agriculture, and woodcutting, has contributed to the degradation of native vegetation, resulting in areas of secondary vegetation or abandoned agricultural fields in the process of regeneration. Despite these impacts, local vegetation continues to play an essential role in soil conservation, regulating the water cycle, and providing resources such as firewood, medicinal plants, and fodder. The protection and sustainable management of these plant resources are fundamental to ensuring ecological balance and the subsistence of local communities.

The main source of air pollution in the area in question is the dust raised by vehicle traffic on the unpaved road that provides access to the facilities, which generates fine particles (PM10 and PM2.5) that are harmful to health. In addition, emissions from motor vehicles, such as carbon monoxide and nitrogen oxides, aggravate the situation. Other sources include the burning of waste and biomass, a common practice in rural areas, and construction or earthmoving activities, which also contribute to dust suspension. Measures such as road watering, speed limits, and environmental awareness can help mitigate these impacts.

Noise pollution will mainly be caused by construction activities such as excavation, the operation of heavy equipment and vehicles, the assembly of metal structures, and the transport of materials, in addition to traffic on the EN-120 highway. Although the area is not densely populated and does not have high traffic volumes, temporarily high noise levels may cause occasional discomfort to nearby communities and construction workers.

With appropriate mitigation measures, it is possible to significantly reduce these impacts.

From an ecological point of view, the installation of the silos is not expected to have a significant impact on local biodiversity, as the area is subject to anthropogenic changes. The area where the silos will be built is devoid of vegetation. The surrounding vegetation is relatively significant, but subject to constant burning by the population, thus reducing its diversity. No endangered or threatened species of fauna and flora were observed in the immediate vicinity of the project.

From a landscape perspective, the intervention area is located in a rural zone characterized by human occupation coexisting with areas of relatively significant natural vegetation, which are, however, affected by increasing disorderly occupation and construction of buildings, impacting on the visual quality of the landscape.

The municipality of Caála has a population of around 139,720, of whom 66,807 are male and 72,914 are female. Caála has a young and dynamic population, with more than half of its residents of working age and a young population that far outnumbers the elderly population.

The population of the municipality of Huambo has a literacy rate of 55.2%.

The employment rate is 39.2%. Most of the population works in the primary sector (agriculture, animal production, hunting, forestry, and fishing), the tertiary sector (commerce and services), and public administration.

As part of the EIAS work, the following entities were contacted: Huambo Provincial Government (municipal department of environment and basic sanitation), Caála Communal Administration

These entities are in favor of the project, as it will have significant implications for the economic development of the municipality.

The main negative environmental impacts of the project will occur during the construction phase and relate to noise and dust due to the movement of heavy and light vehicles and the potential disturbance to the surrounding population. It is expected that the implementation of mitigation measures and

monitoring programs will keep the negative impacts during the construction phase at a low level.

At this stage, another positive impact to be noted is the boost to the local economy resulting from the construction activity, creating jobs and stimulating local restaurants and accommodation for an estimated period of 36 months.

During the project's operational phase, the negative impacts are associated with situations of potential risk, although these are unlikely to occur with the adoption of the proposed measures, namely accidental spills of polluting substances, noise, dust, and road accidents involving the population.

It is during the operational phase that all the benefits of the project will materialize, in the form of improved socioeconomic conditions for the population of Caála and the surrounding area. At this stage, it is expected that the population will be able to sell their grain at a competitive price and receive incentives to increase their productivity and improve their cultivation and storage techniques.

The main measures to mitigate negative impacts are aimed at ensuring minimal disruption to the areas involved and reducing environmental and social impacts during the construction and operation phases. Among these, the following stand out:

- a) Do not burn vegetation cover or any type of material or waste.
- b) Avoid driving vehicles and machinery at high speeds, complying with the established speed limits (60 km/h and 30 km/h) near and within towns;
- c) Ensure the maintenance and periodic inspection of all vehicles and machinery;
- d) Workers who are exposed to high noise levels must be required to wear personal protective equipment (PPE) and/or collective protective equipment (CPE) specifically designed for this purpose;
- e) Use water resources sustainably and avoid waste;
- f) Conserve tree and shrub species in areas that do not interfere with the project;
- g) Hazardous waste must be managed properly and appropriately, taking into account the recommendations of the Waste Management Plan (WMP);
- h) Do not perform maintenance on equipment and machinery in areas that are not waterproofed;

- i) Implement a Construction Site Management Program, including monitoring of solid waste generated during construction;
- j) Effluent Monitoring Program;
- k) Spray traffic routes and the construction site yard during the execution of works;
- l) Create a noise monitoring program;
- m) Install speed limit signs on the main access roads to the intervention area;
- n) Conduct educational campaigns for the protection of fauna and flora;
- o) Promote an awareness campaign to recruit labor for the construction phase, giving priority to the local population, in accordance with ILO guidelines;
- p) Maintain a campaign for the prevention of traffic accidents and defensive driving;
- q) Provide temporary accommodation sufficient for the entire construction period;
- r) Request greater responsibility in the transportation of materials from the service providers involved in the construction of the project;
- s) Install safety signage in all areas affected by construction work, etc.

Implementation of the Environmental and Social Management Plan (ESMP)

The implementation of the Environmental and Social Management Plan (ESMP) is an essential step in ensuring that the construction and operation of the grain storage silos are conducted in an environmentally responsible and socially sustainable manner. This plan defines the preventive, mitigating, and corrective measures to be applied to minimize negative impacts and maximize benefits for local communities and the environment.

The PGAS covers actions related to waste management, control of atmospheric emissions and noise, preservation of water and soil quality, promotion of occupational safety and health, and mechanisms for communication and community involvement, etc. Its implementation will be accompanied by a continuous monitoring system and periodic reports, ensuring compliance with Angolan legislation and applicable international standards, as well as transparency towards stakeholders.

Some **key indicators of PGAS implementation** that can be monitored during the construction and operation phases of grain silos:

- **Air quality** – dust levels (PM₁₀, PM_{2.5}) and equipment emissions.
- **Environmental noise** – sound pressure levels near sensitive areas.
- **Water quality** – physical-chemical and microbiological parameters.
- **Waste management** – amount generated, segregation, and final destination.
- **Resource consumption efficiency** – volume of water and energy consumed.
- **Occupational health and safety conditions** – number of accidents/incidents recorded.
- **State of vegetation and soil** – impacted areas and recovery actions.
- **Compliance with mitigation measures** – percentage of PGAS measures implemented.
- **Community engagement** – number of consultations, complaints, and resolutions.
- **Training and capacity building** – number of workers trained in environment and safety, etc.

The presentation of the costs associated with the implementation of the Monitoring Programs proposed in this environmental and social impact assessment (ESIA) is structured in two phases: Construction Phase and Operation Phase.

The financial costs related to the implementation of monitoring programs during the construction phase will be borne by the contractor.

The costs of implementing the monitoring programs during the operational phase will be borne by Carrinho, SA.

Table 1: Program implementation costs

Programs	Estimated costs (annual)	
	Construction phase	Operational phase
Effluent monitoring plan stored in septic tanks	3,500 USD	8,200 USD
Worker health and safety plan	\$8,000	10,000 USD
Atmospheric emissions monitoring program and air quality monitoring program	12,000 USD	15,000 USD
Noise level monitoring program	4,500 USD	6,000 USD
Environmental education program	12,000 USD	18,000 USD
Biodiversity monitoring program	7,500 USD	9,000 USD
Emergency plan	8,000 USD	16,000 USD
Waste monitoring and management program waste	4,500 USD	8,000 USD
Pest control and eradication plan		12,000 USD
Communication and stakeholder relations program stakeholders	18,000 USD	22,000 USD
Mechanism for submitting 10,000 USD	10,000 USD	12,000 USD
Environmental and social performance audits		USD 20,000
Total	88,000 USD	156,200 USD

The conclusions of the EIAS are that the project is environmentally viable, provided that the proposed mitigation measures are effectively implemented.

It should also be noted that the province of Huambo has all the institutional capacity to successfully implement the project proposed by the Carrinho, Sa. group. Nevertheless, Carrinho, Sa. will have to strengthen its environmental and social capacities by hiring a technician qualified to deal with environmental and social issues in accordance with the requirements defined by the financing institution.

Summary of Public Consultation and Participation

Public consultation is a mandatory step in the Environmental Impact Assessment process, as established by the Basic Environment Law (Law No. 5/98 of June 19), Presidential Decree No. 117/20 of April 22, and Executive Decree No. 87/12 of February 24, which regulate public participation in environmental matters. This procedure aims to ensure transparency, inclusion, and participation of communities, local authorities, and other stakeholders in the analysis of projects with potential environmental and social impact, a requirement also reinforced by the African Development Bank (AfDB) through its Operational Safeguard No. 1, which requires free, prior, and informed consultations.

As part of the Agricultural Infrastructure Construction Project "Silos" in the province of Huambo, a consultation session was held on June 16, 2025, with representatives of the local administration and the municipalities of Huambo, Caála, and Bailundo, addressing the presentation of the project, the main environmental and social impacts, the proposed mitigation measures, and gathering contributions, comments, and recommendations from participants. Seven individuals were present, of whom six were men and one was a woman.

During public consultations on the Agricultural Infrastructure Construction Project "Silos" in Huambo province, provincial authorities presented recommendations focused on institutional integration, land use planning, and maximizing community benefits. They highlighted the need to formally define the implementation areas in accordance with the PDMs, preserve water lines, involve the Provincial Government in environmental studies, establish a complaints mechanism, and prioritize the strategic municipalities of Caála and Bailundo. In response, the project coordination team committed to incorporating all suggestions, ensuring institutional alignment, transparency, and continuous information sharing to strengthen the project's socioeconomic impact.

On October 9, 2025, a public consultation session was held at the Caála municipal headquarters on the Carrinho Group's Agricultural Infrastructure Project, aimed at building silos to expand grain storage capacity. The meeting was chaired by the

Deputy Municipal Administrator for Political, Social, and Community Affairs, Felismina Ussombo Marcolino, accompanied by the Municipal Director of Tourism and Culture, Dr. Venâncio Jorge Janeiro Lopes. Traditional authorities expressed their support for the project, highlighting the benefits in terms of employment and local development, but requested that the initiative also cover more remote communities. The event, which ended in an atmosphere of consensus and satisfaction, was attended by 69 people, including 63 men and 6 women.

Executive Summary

This report concerns the Environmental and Social Impact Assessment (ESIA) of the agricultural infrastructure construction project “Silos” in the municipality of Caála, Huambo Province. The Project Proponent is the company Carrinho, S.A., which submitted an application to the U.S. International Development Finance Corporation (DFC) for financing of the project through the African Development Bank (AfDB) and the European Investment Bank (EIB).

In preparing this study, the provisions established in Angolan legislation were considered, as well as the guidelines of the AfDB and DFC, duly mentioned and detailed in Chapter 3, which also presents the Institutional Framework of the main entities involved in the agricultural sector, as well as the Ministry of Environment.

At this stage of the Environmental and Social Impact Assessment, the aim is to identify the activities planned for the execution of the Project, analyze its possible impacts, and define the corresponding mitigation measures.

Caála is a city and municipality in Huambo Province, with an area of 3,680 km² and approximately 279,792 inhabitants. The municipality of Caála is located in the central part of Huambo Province, bordered to the north by the municipality of Ecuinha, to the east by the municipality of Huambo, to the south by the municipality of Chipindo, and to the west by the municipalities of Longonjo and Caconda.

The municipality is composed of the commune headquarters, corresponding to the city of Caála, and the communes of Cuíma, Calenga, and Catata.

The agricultural sector in the municipality of Caála, Huambo Province, constitutes the main economic and subsistence base of the local population, being practiced mostly under family-based systems. Benefiting from fertile soils and favorable climate, the region is oriented towards the cultivation of various crops, particularly maize, beans, Irish potatoes, vegetables, cassava, and some fruit trees such as banana and avocado. Despite its productive potential, the sector faces challenges such as low mechanization, limited access to agricultural inputs, deficient irrigation infrastructure, and difficulties in marketing production. However, there are promising opportunities with investments in agricultural cooperatives, rural extension, and production support

infrastructure, which can increase productivity and promote sustainable rural development in Caála.

Taking advantage of the grain production potential of this municipality, the Carrinho Group intends to build agricultural infrastructure “Silos”, with the aim of facilitating the storage and distribution of grains from various points of the municipality and other regions, not only to mitigate and reduce post-harvest losses, but also to encourage farmers to increase production, contributing to food security and the economic development of the region.

The proposed project will be implemented in an area of 6,750 m², and will be built in reinforced concrete, mesh, metal structures, and sheets, among others. The project consists of the construction and operation of the existing silos, as well as increasing their cereal storage capacity from 3,999 tons to 20,000 tons, intended for the storage of the following products: maize, wheat, rice, and soy.

The silos, with a total storage capacity of 120,000 tons, are composed of:

- 1 truck scale with a capacity of 60 tons;
- 1 truck reception circuit with a capacity of 270 m³/h (200 t/h), with pre-cleaning of straw;
- 2 buffer silos with conical bottoms, with a total capacity of approximately 2,650 m³, i.e., 1,000 tons of capacity for each silo. For example: Ø10.66 m, cylinder height 19.52 m, and total height 22.61 m;
- 1 dryer with an output capacity of 100 t/h for maize;
- 12 flat-bottom silos for storage, distributed in 2 rows, with a total capacity of approximately 160,000 m³, i.e., 10,000 tons of capacity for each silo. For example: Ø31.98 m, cylinder height 13.80 m, and total height 21.99 m;
- Aeration system in the storage silos;
- 1 truck expedition circuit with a capacity of 135 m³/h (100 t/h);
- Electrical installation;
- Supervision system.

Main Environmental conditions at the project site are described below. The climate of the municipality of Caála is of the tropical highland type (Aw according to Köppen-

Geiger), characterized by two well-defined seasons: a rainy season occurring between the months of October and April, and a dry and cold season, known as *cacimbo*, from May to September. The annual average temperature ranges between 18 °C and 21 °C, with June and July being the coldest months, where minimums can drop below 10 °C at night. The average annual rainfall varies between 1,200 mm and 1,500 mm, concentrated mainly in the rainy season. This climate regime favors agricultural practices, although it makes the use of soil conservation and water management techniques necessary during the dry periods.

The soils of the municipality of Caála are predominantly red and yellow latosols, developed from metamorphic and igneous rocks of the Central Plateau region. These soils are generally deep, well-drained, and have a clay to clay-loam texture, making them suitable for agriculture. They have good water retention capacity, an important factor for cultivation during the dry season. However, many of these soils are acidic and poor in essential nutrients, especially phosphorus and nitrogen, requiring corrective practices such as the application of lime and organic or mineral fertilizers. Their moderate natural fertility can be maintained with sustainable practices such as crop rotation and green manuring. Despite these challenges, the soils of Caála offer good conditions for the cultivation of maize, Irish potatoes, beans, and vegetables, provided they are well managed.

The local hydrology of the municipality of Caála, particularly in the area near the source of the Calai River, is characterized by the presence of perennial watercourses that form part of the Upper Kwanza River basin. The Calai River rises in the highlands of the central Angolan plateau, at altitudes above 1,500 meters, where precipitation is relatively high, ensuring regular flows throughout much of the year. This hydrographic network plays a crucial role in providing water for domestic, agricultural, and livestock use, as well as in recharging groundwater aquifers. The region also has small tributaries and springs, which contribute to soil fertility and enable subsistence farming systems. However, pressure on water resources—due to deforestation, burning, and inadequate agricultural practices—represents a challenge to the preservation of water quality and quantity. Even so, the proximity to the source of the Calai River offers opportunities for the development of irrigation and sustainable water management projects, which are essential for strengthening local agricultural production.

The local vegetation of the municipality of Caála is part of the ecological context of the Central Plateau of Angola, being predominantly composed of moist savanna, open woodlands, and miombo forests. This vegetation is characterized by a combination of tall grasses and tree species such as *Brachystegia*, *Julbernardia*, and *Isoberlinia*, typical of miombo ecosystems. In more humid areas and near watercourses, riparian galleries with denser vegetation occur. Human activity—namely the use of fire, extensive agriculture, and firewood collection—has contributed to the degradation of native vegetation, resulting in areas of secondary vegetation or abandoned farmland undergoing regeneration. Despite these impacts, the local vegetation continues to play an essential role in soil conservation, regulation of the hydrological cycle, and the provision of resources such as firewood, medicinal plants, and fodder. The protection and sustainable management of these plant resources are fundamental to ensuring ecological balance and the subsistence of local communities.

The main source of air pollution in the area under consideration is the raising of dust caused by vehicle traffic on the unpaved road that provides access to the facilities, which generates fine particulate matter (PM10 and PM2.5) harmful to health. In addition, emissions from motor vehicles, such as carbon monoxide and nitrogen oxides, worsen the situation. Other sources include the burning of waste and biomass, a common practice in rural areas, as well as construction or earthmoving activities, which also contribute to dust suspension. The adoption of measures such as road watering, speed limitation, and environmental awareness campaigns can help mitigate these impacts.

With regard to noise pollution, this will mainly be caused by construction activities, such as excavations, the operation of heavy equipment and vehicles, the assembly of metal structures, and the transportation of materials, in addition to the circulation of vehicles along the EN-120. Although the area does not have a high population density or heavy road traffic, temporarily elevated noise levels may cause occasional disturbances to nearby communities and construction workers.

With appropriate mitigation measures, it is possible to significantly reduce these impacts. From an ecological point of view, the implementation of the silos is not expected to cause significant impacts on local biodiversity, as the area is already subject to anthropogenic alterations.

The site where the silos will be built is devoid of vegetation. The surrounding vegetation is relatively abundant but is constantly affected by burning practices carried out by local populations, thus reducing its diversity. No endangered or threatened species of flora and fauna were observed in the immediate vicinity of the project.

From a landscape perspective, the intervention area is in a rural area, characterized by human occupation coexisting with areas of relatively abundant natural vegetation. However, these areas are affected by increasing unplanned occupation and the construction of buildings, which impacts their visual quality.

The municipality of Caála has about 139,720 inhabitants, of whom 66,807 are male and 72,914 are female. Caála has a young and dynamic population, with more than half of its residents being of working age, and with a youth population that largely exceeds the elderly population.

population municipality Huambo literacy rate 55.2%. The employment rate stands at 39.2%. Most of the population is engaged in activities within the primary sector (agriculture, livestock production, hunting, forestry, and fishing), the tertiary sector (trade and services), and public administration.

Within the scope of the ESIA activities, the following entities were consulted: the Provincial Government of Huambo (municipal directorate of environment and basic sanitation) and the communal administration of Caála. These entities expressed support for the implementation of the project, as it will have significant implications for boosting the economy of the municipality.

The main negative environmental impacts of the project will occur during the construction phase and are related to noise and dust generated by the circulation of heavy and light vehicles, as well as the potential disturbance of the surrounding population. However, with the implementation of the proposed mitigation measures and monitoring programs, it is expected that the negative impacts during construction will remain at low levels of significance.

During this phase, a positive impact is also expected from the stimulation of the local economy resulting from construction activities, creating jobs and boosting the local trade of food services and accommodation for an estimated period of 36 months.

In the operational phase of the project, the negative impacts are associated with potential risk situations, although with a low probability of occurrence if the proposed measures are adopted, namely accidental spills of polluting substances, noise, dust, and road accidents involving the population.

It is during the operational phase that all the benefits of the project will materialize, reflected in the improvement of the socioeconomic conditions of the population of Caála and its surroundings. At this stage, it is expected that the population will be able to market grains at competitive prices and receive incentives to increase their productivity and improve cultivation and storage techniques.

The main mitigation measures for negative impacts aim to ensure minimal disturbance within the areas of intervention and to reduce environmental and social impacts during both the construction and operation phases. Generally, the following actions are highlighted:

- a) Do not burn vegetation cover or any other materials or waste.
- b) Avoid high-speed movement of vehicles and machinery, complying with the established speed limits (60 km/h and 30 km/h) near and within communities.
- c) Ensure regular maintenance and periodic inspection of all vehicles and machinery.
- d) Workers exposed to high noise levels must be required to use appropriate Personal Protective Equipment (PPE) and/or Collective Protective Equipment (CPE).
- e) Use water resources sustainably and avoid waste.
- f) Preserve tree and shrub species in areas not affected by the project.
- g) Hazardous waste must be properly and safely managed in accordance with the Waste Management Plan (WMP).
- h) Do not perform maintenance of equipment and machinery in non-impermeable areas.
- i) Implement a Construction Site Management Program, including monitoring of solid waste generated during the works.

- j) Establish a Wastewater Monitoring Program.
- k) Spray water on circulation routes and the construction yard during work execution to control dust.
- l) Develop a Noise Monitoring Program.
- m) Install speed limit signs along the main access roads to the intervention area.
- n) Carry out awareness campaigns for the protection of fauna and flora.
- o) Promote recruitment campaigns for the construction phase, giving priority to local labor in accordance with **ILO** guidelines.
- p) Maintain campaigns on road safety and defensive driving.
- q) Provide temporary and adequate accommodation for the entire construction period.
- r) Request greater responsibility from service providers involved in material transport during construction.
- s) Install safety signage in all construction-related areas, among others.

Implementation of the Environmental and Social Management Plan (ESMP)

The implementation of the Environmental and Social Management Plan (ESMP) is a crucial step to ensure that the construction and operation activities of the grain storage silos are carried out in an environmentally responsible and socially sustainable manner. This plan defines the preventive, mitigating, and corrective measures to be applied in order to minimize negative impacts and enhance the benefits for local communities and the environment.

The ESMP includes actions related to waste management, control of atmospheric emissions and noise, preservation of water and soil quality, promotion of occupational health and safety, and mechanisms for communication and community engagement. Its implementation will be supported by a continuous monitoring system and periodic reporting, ensuring compliance with Angolan legislation and applicable international standards, as well as transparency before all relevant stakeholders.

Some key implementation indicators of the ESMP that may be monitored during the construction and operation phases of the grain silo projects include:

- **Air quality:** levels of particulate matter (PM₁₀, PM_{2.5}) and equipment emissions.
- **Environmental noise:** sound pressure levels near sensitive areas.
- **Water quality:** physicochemical and microbiological parameters.
- **Waste management:** quantities generated, segregation, and final destination.
- **Resource use efficiency:** volume of water and energy consumed.
- **Occupational health and safety conditions:** number of accidents and incidents recorded.
- **State of vegetation and soil:** impacted areas and recovery actions implemented.
- **Compliance with mitigation measures:** percentage of ESMP measures effectively implemented.
- **Community engagement:** number of consultations, complaints, and resolutions conducted.
- **Training and capacity building:** number of workers trained in environmental and safety practices, among others.

The presentation of costs associated with the implementation of the monitoring programs proposed in this Environmental and Social Impact Assessment (ESIA) is structured into two phases: **Construction Phase** and **Operation Phase**.

Financial responsibilities related to the implementation of the monitoring programs during the construction phase will be assumed by the **contractor**, while the costs associated with the implementation of the monitoring programs during the operation phase will fall under the responsibility of **Carrinho, S.A.**

Table 2: Implementation Costs of the Programs

Programs	Cost Estimate (Annual)	
	Construction Phase	Operation Phase
Monitoring Plan for Effluents Stored in Septic Tanks	3,500 USD	8,200 USD
Occupational Health and Safety Plan for Workers	8,000 USD	10,000 USD
Atmospheric Emissions and Air Quality Monitoring Program	12,000 USD	15,000 USD
Noise Level Monitoring Program	4,500 USD	6,000 USD
Environmental Education Program	12,000 USD	18,000 USD
Biodiversity Monitoring Program	7,500 USD	9,000 USD
Emergency Plan	8,000 USD	16,000 USD
Waste Management and Monitoring Program	\$4,500	8,000 USD
Pest Control and Management Plan		12,000 USD
Stakeholder Communication and Engagement Program	18,000 USD	22,000 USD
Mechanism for Submitting Environmental and Social Impact Assessment (ESIA) Monitoring Reports	10,000 USD	12,000 USD
Environmental and Social Performance Audits		20,000 USD
Total	88,000 USD	156,200 USD

The conclusions of the Environmental and Social Impact Assessment (ESIA) indicate that the project is considered environmentally viable, provided that the proposed mitigation measures are effectively implemented.

It is also noted that the Province of Huambo possesses, at the institutional level, all the necessary capacities to successfully carry out the project proposed by the Carrinho Group, S.A. Nevertheless, Carrinho S.A. will need to strengthen its environmental and social capacities through the hiring of a qualified specialist to manage environmental and social matters in accordance with the requirements established by the financing institution.

Summary of Public Consultation and Participation

Public consultation is a mandatory stage in the Environmental Impact Assessment process, as established by the Environmental Framework Law (Law No. 5/98 of June 19), Presidential Decree No. 117/20 of April 22, and Executive Decree No. 87/12 of February 24, which regulate public participation in environmental matters. This procedure aims to ensure transparency, inclusion, and the participation of communities, local authorities, and other stakeholders in the analysis of projects with potential environmental and social impacts. This requirement is further reinforced by the African Development Bank (AfDB) through its Operational Safeguard No. 1, which mandates free, prior, and informed consultations.

As part of the Agricultural Infrastructure Construction Project “Silos” in Huambo Province, a consultation session was held on June 16, 2025, with representatives from the local administrations of the municipalities of Huambo, Caála, and Bailundo. The session addressed the project’s presentation, the main environmental and social impacts, the proposed mitigation measures, and gathered participants’ contributions, comments, and recommendations. A total of seven (7) individuals attended, including six (6) men and one (1) woman.

During the public consultations of the Agricultural Infrastructure Construction Project “Silos” in Huambo Province, provincial entities presented recommendations focused on institutional integration, land-use planning, and the maximization of community benefits. Key points included the formal definition of installation areas in accordance with the Municipal Master Plans (PDMs), the preservation of water lines, the involvement of the Provincial Government in environmental studies, the establishment of a grievance mechanism, and the prioritization of the strategic municipalities of Caála and Bailundo. In response, the project coordination team committed to incorporating all suggestions, ensuring institutional alignment, transparency, and the continuous sharing of information to strengthen the project’s socioeconomic impact.

On October 9, 2025, a public consultation session was held at the municipal headquarters of Caála regarding the Agricultural Infrastructure Project of the Carrinho Group, aimed at building silos to increase cereal storage capacity. The meeting was chaired by the Deputy Municipal Administrator.

for Political, Social, and Community Affairs, Ms. Felismina Ussombo Marcolino, accompanied by the Municipal Director of Tourism and Culture, Dr. Venâncio Jorge Janeiro Lopes. Traditional authorities expressed their support for the project, highlighting its potential for job creation and local development, while requesting that the initiative also benefit more remote communities. The event concluded in a spirit of consensus and satisfaction, with 69 participants in attendance, 63 men and 6 women.

2 INTRODUCTION

2.1 GENERAL INFORMATION

Agriculture plays a crucial role in the global economy, especially in a context of population growth and increased demand for food. Agricultural infrastructure is an essential component for successful grain production, and proper storage is one of the most critical steps in the production chain. Silos, as structures dedicated to grain storage, play a key role in preserving product quality, managing inventories, and maximizing farmer profitability.

In this scenario, grain storage infrastructure becomes vital to ensuring food quality and safety. Silos, in their various forms and technologies, offer effective solutions to protect grains from adversities and pests, allowing for greater production and profitability. The modernization of storage facilities not only improves efficiency but also promotes sustainability in the sector.

As part of the expansion and diversification of its activities, this group intends to extend its silo installation bases to various parts of the country for the storage of grain produced in the regions where these infrastructures will be built, in order to facilitate its internal distribution and export, as well as to extend its shelf life and quality.

To this end, silos for grain storage will be built in the municipality of Caála, in the province of Huambo. Silos are infrastructures for protecting and storing grain, minimizing post-harvest losses and ensuring the quality of the products. In addition, with the advent of innovative technologies, silos have become more efficient, offering sustainable solutions that benefit both farmers or producers and the environment.

This document constitutes a technical report on the Environmental and Social Impact Assessment (ESIA) of the project to construct agricultural infrastructure for grain storage "Silos" in Caála, belonging to the Carrinho Group, SA. This Environmental and Social Impact Assessment was prepared in accordance with Article 4 of Presidential Decree 117-20 - Regulation on Environmental Impact Assessment and Environmental Licensing Procedure, which regulates

environmental protection in the course of infrastructure activities and requires the preparation of an Environmental Impact Assessment, as well as guidelines for the project proponent.

The EIAS is a fundamental component of the environmental impact assessment process, which aims to identify and assess the main environmental impacts, analyze mitigation alternatives, including the environmental and social feasibility of the Project, supporting the decision-making of the Ministry of the Environment (MINAMB) with a view to the environmental licensing of the Project.

The Agricultural Infrastructure Construction Project for Grain Storage "Silos" to be developed, which includes the construction of food storage facilities. According to Annex I of Presidential Decree No. 117/20 of April 22, the project falls under category **B**.

Projects classified as Category B are those that may cause moderate to significant environmental and social impacts, but which can be controlled and minimized through the implementation of mitigation measures. These projects require a Simplified Environmental Impact Assessment (SEIA) or an Environmental and Social Management Plan (ESMP), but do not require a full Environmental Impact Assessment (EIA) as in Category A.

Main Characteristics of Category B Projects:

- Localized environmental impacts – Environmental effects are moderate and restricted to the project area, with less risk of severe degradation;
- Mitigation measures required – Impacts can be reduced with good environmental practices and management plans;
- Require a Simplified Environmental Impact Assessment (SEIA) – A technical report must be prepared, containing a description of the project, the possible impacts, and mitigation measures.

Examples of Category B Projects:

- Small and medium-sized industrial units;
- Medium-sized agricultural and livestock infrastructure;
- Small-scale natural resource exploitation projects;

- Small power plants or substations;
- Construction of secondary and tertiary roads;
- Silos and grain storage facilities.

2.2 IDENTIFICATION OF THE PROJECT PROPOSER

Table 3: Identification of the proponent

COMPANY IDENTIFICATION	
Company name	CARRINHO INDÚSTRIA (SU), LDA
Full address	Rua de São Tomé s/n -Lobito/Benguela
Phone	+244 934719989
COMPANY REPRESENTATIVE	
Name	Décio Catarro
Position	CEO-Carrinho Indústria
Phone	+244 XXXXXXX
Email	Decio.catarro@carrinho-sa.com
PERSON CONTACT PERSON	
Name	Adriano Condumulã
Position	Licensing Technician
Phone	(+244) 923383335
Email	Adriano.condumula@carrinho-sa
REGISTRATION	
Commercial Registration Number	0002.240111
Tax Identification Number (NIF)	5000202665

2.3 IDENTIFICATION OF THE COMPANY RESPONSIBLE FOR PREPARING THE EIAs

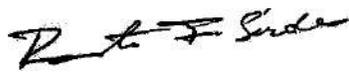
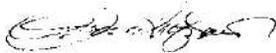
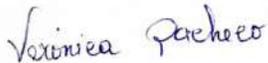
Table 4: Identification of the company responsible for the EIAs

COMPANY IDENTIFICATION	
Company Name	HSG - CONSTRUÇÃO, ENGENHARIA E COMÉRCIO, LDA
MINAMB Registration No.	8320352235
Address	Rua Nossa Senhora de Fátima, nº2-BC-105, Luanda/Angola
Tax ID	5417007978
COMPANY REPRESENTATIVES	
Name	Herineu Gomes
Position	General Manager
Phone	(+244) 923439634
Email	Euclideskid1@hotmail.com

2.4 EQUIPATÉCNICA RESPONSIBLE FOR THE EIAS

This Environmental and Social Impact Assessment (ESIA) was prepared in September 2024 by technicians and consultants from HSG - CONSTRUÇÃO, ENGENHARIA E COMÉRCIO, LDA, as detailed in the table below.

Table 5: Technical team responsible for preparing the EIAS

Technical	Qualifications	Position	Signature
Renato Feliz Sirdes	✓ Master's Degree in Management and Governance Environmental	Coordinator	
Bruno Constantino	✓ Master's Degree in Engineering of and Environment	Technician	
Albertina J. A. Pascoal	✓ Bachelor's Degree in Environmental	Technician	
Nelson Morais	✓ Geologist	Technician	
Camilo Rebocho Váz dos Santos	✓ Degree in Architecture and Urban Planning.	Technician	
Belarmino Pascoal	✓ Degree in Biology	Technician	
Verônica Pacheco	✓ Bachelor's Degree in Environmental Engineering Environmental	Technician	

3 LEGAL FRAMEWORK

This chapter establishes the legal framework for the project with regard to Angolan government legislation on environmental and social impacts. The legal framework of the project is also aligned with the environmental and social safeguard policies established by the African Development Bank (AfDB), as well as international standards and policies for the protection of the environment, occupational health and safety of workers and the local community.

3.1 National legal framework

Constitution of the Republic of Angola 2010

Article 39 of the Constitution of the Republic of Angola enshrines the right to the environment and declares the right of citizens to live in a healthy and unpolluted environment, as well as the duty to defend and preserve it. The same article requires the State to adopt the necessary measures to protect the environment and species of flora and fauna throughout the national territory, maintain ecological balance, ensure the correct location of economic activities, and promote the rational exploitation and use of all natural resources, within the framework of sustainable development and respect for the rights of future generations and the preservation of different species. It also punishes acts that endanger or harm the preservation of the environment.

Therefore, according to the nature of the project under review, the table of applicable legislation is provided below.

Table 6: National legislative framework

Legal framework	Publication
General	
Basic Environment Law	Law No. 5/98, of June 19
Law on Environmental Protection Associations	Executive Decree No. 3/06, of January 18
Environmental Impact Assessment	
Environmental audits of public or private activities	Executive Decree No. 1/10, of January 13
Incompatibility of consulting companies registered with the Ministry of the Environment that carry out supervisory activities and cumulative auditing and environmental impact study activities	Order No. 680/11, of October 10

Legal Framework	Publication
Regulation on the Technical Registration of Environmental Consulting Companies	Executive Decree No. 86/12, of February 23
Legal Framework	Publication
Regulation on Liability for Environmental Damage	Executive Decree No. 194/11, of June 7
Regulation on Public Consultations for projects subject to Environmental Impact Assessment	Executive Decree No. 87/12, of February 24
Cancels environmental consulting activities in Environmental Impact Assessment carried out by individual environmental consultants	Executive Decree No. 85/12, of May 27
Assessment committee for each Environmental Impact Study for Environmental Licensing, coordinated by the National Director of Environmental Impact Assessment and Prevention Environmental Impacts	Order No. 2745/13, of December 6
Data to be submitted with Environmental Impact Studies for Environmental Licensing	Order No. 2746/13, of December 6
Environmental Monitoring and Industrial Audit Support Unit	Order No. 72/15, dated February 13
Commission of Evaluation of Curricula of Environmental Consultants and Calculation of the Amount Payable for Environmental Licensing	Decree No. 34/15, of October 23
Environmental Impact Assessment Unit - Repeals Order No. 87/15, of March 6	Order No. 405/15, of December 1
Classification of Environmental Consulting and Auditing Companies	Executive Decree No. 302/16, of June 30
Regulation of Environmental Environmental for Certification	Executive Decree No. 249/17, of April 25
Amends the deadline for MINAMB to submit an opinion to the project licensing entity - Repeals Executive Decree No. 241/16, of May 25	Executive Decree No. 119/19, of May 20
Approves the amendment to the wording of Article 31(1), Article 36, Article 37(3), and Article 39(1) 39 of Presidential Legislative Decree No. 8/19, of June 19, which approves the Organization and Functioning of the Auxiliary Bodies of the President of the Republic	Presidential Legislative Decree No. 4/20, of April 1

Legal framework	Publication
Approves the table of fees to be charged for the issuance and renewal of Environmental Licenses for Environmental Impact Assessment, as well as the registration and renewal of environmental consulting companies.	Presidential Decree No. 83/22, of April 22
General Regulations on Environmental Impact Assessment and the Environmental Licensing Procedure	Presidential Decree No. 117/20, of April 22
Waste	
Registration of companies operating in the areas of waste, water treatment, and wastewater	Order No. 199/12, of February 29
Regulation on Waste Management	Presidential Decree No. 190/12, of August 24
Management of Construction and Demolition Waste	Executive Decree No. 17/13, of January 22
Guidelines for the Preparation of Provincial Urban Waste Management Plans	Executive Decree No. 234/13, of July 18
PESGRU - Strategic Plan for Urban Waste Management	Presidential Decree No. 196/13, dated August 30
Water and Basic Sanitation	
Law on Sanitary Regulations	Law No. 5/87, of February 23
Water Law	Law No. 6/02, of June 21
Water Sector Development Strategy	Council of Ministers Resolution No. 10/04, of June 11
Water for All Program	Council of Ministers Resolution No. 58/07, of July 30
Regulation on Water Quality	Presidential Decree No. 261/11, of October 6
Regulations for the Prevention and Control of Pollution of National Waters	Executive Decree No. 141/12, of June 21
Regulations for the General Use of Water Resources	Presidential Decree No. 82/14, dated April 21
Regulations for Public Water Supply and Wastewater Sanitation	Presidential Decree No. 83/14, of April 22
National Water Plan	Presidential Decree No. 126/17, of June 13
National Strategic Water Plan (2018-2022)	Presidential Decree No. 158/18, of June 29
General Plan for the Integrated Use of Water Resources in the Cubango River Basin (PGUIRH)	Presidential Decree No. 27/16, of January 26
Legal regime governing water abstraction charges.	Presidential Decree No. 41/21 of February 12
Regulation of Tariffs for Water Supply and Wastewater Services	Presidential Decree No. 255/20, of October 7
Regulation of Registration and Licensing of Companies that operate in the areas of waste, water treatment, and wastewater	Executive Decree No. 24/15, of January 29
Regulation on Transfer of Waste for Reuse, Recycling, and Recovery	Presidential Decree No. 265/18, of November 15
Legal Framework for Landfills	Presidential Decree No. 203/19, dated June 25

Legal framework	Publication
Flora and Terrestrial Flora	
Basic Law on Forests and Wildlife	Law No. 6/17, of October 24
Regulations for the protection of flora resources and plant species, including forest resources.	Decree No. 40.040 / 1955, of January 20
Convention on the Conservation of Nature and Natural Resources in Africa - Maputo Convention	Resolution No. 5/14 (National Assembly) of January 20
Prohibits the killing of protected species of wild fauna and flora on national territory	Executive Decree No. 469/15, of July 13
Red List of Species of Angola	Executive Decree No. 252/18, of July 13
Forestry Regulations	Presidential Decree No. 171/18, of July 23
Protected Areas	
Regulation of National Parks	Ordinance No. 10,375/1958, of October 15
Environmental Conservation Areas Law	Law No. 8/20, of April 14
Resettlement	
Rules on the resettlement of displaced populations.	Decree No. 1/01, of January 5
Regulation on Relocation Operations	Presidential Decree No. 117/16, of May 30
Hygiene, Health, and Safety at Work	
Principles for the promotion of safety, hygiene, and health at work	Decree No. 31/94, of August 5
Obligation to organize SHST services in companies.	Executive Decree No. 6/96, of February 2
Rules governing the Commissions for the Prevention Workplace Accidents, hereinafter referred to as "CPAT"	Executive Decree No. 21/98, of April 30
Regulations on HIV/AIDS. Employment and Vocational Training	Decree No. 43/03, of July 4
Regulations on Safety, Hygiene, and Health at Work.	Executive Decree No. 128/04, of November 23
The Angolan State is a member of the World Health Organization (WHO), an institution under the auspices of the International Health Regulations (2005).	Resolution 32/08, of September 1
Legal Framework for Occupational Accidents and Diseases	Decree No. 53/05, of August 15
Regulation on the legal framework for fire safety in buildings.	Presidential Decree No. 195/11, of July 8
Regulation on Licensing for the Provision of Occupational Safety, Hygiene, and Health Services	Presidential Decree No. 179/24, of August 1
Regulations on Safety Accessories, Special Alarms, Use of Fire Extinguishers, First Aid Equipment, and Light Signals for Bicycles	Presidential Decree No. 145/17 of June 26
General Labor Law	Law No. 12/23 of December 27

Land Use Planning	
Land Law	Law No. 3/04, of June 25
Political-Administrative Division Law	Law No. 14/24, of September 5
Law on Land Use Planning and Urban Development (LOTU)	Law No. 9/04, of November 9
Basic Law on the Administrative Organization of the Territory	Law No. 13/16, of September 12
State Local Administration Law	Law No. 15/16, of September 12
Regulation on the Coastal Zone Management Plan	Decree No. 4/01, of February 2
General Regulations on Territorial, Urban, and Rural Plans (REPTUR)	Decree No. 2/06, of January 23
Cultural Heritage	
Cultural Heritage Law	Law No. 14/05, of October 7
Gender	Executive Decree No. 222/13, of December 24
National Policy for Gender Equality and Equity	Executive Decree No. 222/13, of December 24
Natural Disasters	
National Plan for Preparedness, Contingency, Response, and Recovery from Calamities and Natural Disasters, for the period 2015/2017	Executive Decree No. 29/16, of January 1
Strategic Plan for Disaster Risk Prevention and Reduction, within the scope of the 2013/2017 National Development Plan	Executive Decree No. 30/16, of January 3

3.2 International Protocols and Agreements

In the absence of national legislation governing air quality issues, an analysis was conducted of the conventions and international protocols ratified by Angola in this area.

Table 7: International Legal Framework

Convention on the Elimination of All Forms of Discrimination Against Women – CEDAW (1981)	Resolution AN 15/84, of September 19
Convention on the Law of the Sea	Resolution No. 17/90, of October 6
Convention on the Rights of the Child	Resolution AN 20/90, of November 10
African Charter on Human and Peoples' Rights	Resolution AN 1/91, of January 19
International Covenant on Civil and Political Rights	Resolution AN 26-B/9/91, of December 27
International Covenant on Economic, Social, and Cultural Rights (1966)	Resolution AN 26-B/9/91, of December 27
African Charter on the Rights and Welfare of the Child	Resolution AN 1-B/92, of May 15
Convention on the Protection of the Underwater Cultural Heritage (UNESCO)	Adopted in 1995
Convention on Biological Diversity, 1992	Resolution No. 23/97, of July 4
Vienna Convention for the Protection of the Ozone Layer and the Montreal Protocol	Resolution No. 12/98, of April 20
Convention Concerning the Protection of the World Cultural and Natural Heritage (UNESCO)	Ratified on November 7, 1991
Convention to Combat Desertification	Resolution No. 12/00, of May 5

International Legal Framework	
Convention for the Safeguarding of Intangible Cultural Heritage (UNESCO)	Approved in 2003
Convention on Migratory Species of Wild Animals (Bonn Convention)	Resolution No. 14/03, of April 15
IUCN – International Union for Conservation of Nature	Resolution No. 21/03, of May 27
Convention on the Protection and Promotion of the Diversity of Cultural Expressions (UNESCO)	Ratified on February 7, 2005
Stockholm Convention on Persistent Organic Pollutants	Resolution No. 49/05, of October 30
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	Resolution No. 1/07, of February 14
United Nations Framework Convention on Climate Change, 1997	Resolution No. 14/07, of March 28
Convention on the Rights of Persons with Disabilities	Resolution AN 1/13, of June 11, 2007
Optional Protocol to the Convention on the Rights of Persons with Disabilities	Resolution AN 1/13, of June 11, 2007
Optional Protocol to the Convention on the Elimination of All Forms of Discrimination Against Women	Resolution AN 23/07, of June 23
Inquiry into the implementation of CEDAW	Resolution AN 23/07, of June 23
Benguela Current Convention	Resolution No. 15/15, of July 3
Protocol to the African Charter on Human and Peoples' Rights on the Rights of Women in Africa	Resolution AN 25/07, of July 16
Convention on Wetlands of International Importance	Resolution No. 27/16, of July 22
Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal	Resolution No. 29/16, of July 25
Convention on Cooperation in the Field of Protection and Development of the Coastal Environment of the West and Central African Region	Resolution No. 32/16, of July 29,
Paris Agreement on climate change	Resolution No. 37/20, of October 12
Cartagena Protocol on Biosafety	Approved on January 29, 2000
Rotterdam Convention on Chemicals and Pesticides	Adopted on September 10, 1998, and entered into force on February 24, 2004.

3.3 Integrated Safeguards System of the African Development Bank

The Integrated Safeguards System is part of the African Development Bank (AfDB) strategy to promote socially inclusive and environmentally sustainable growth.

Safeguards are a powerful tool for identifying risks, reducing development costs, and improving project sustainability, benefiting affected communities and helping to preserve the environment.

With this Integrated Safeguards System, the AfDB is better equipped to address emerging environmental and social development challenges. The Integrated Safeguards System not only promotes best practices in these areas, but also encourages greater transparency and accountability.

The Integrated Safeguards System is designed to protect populations affected by World Bank-financed operations, especially the most vulnerable communities, by providing, for example, project-level grievance and compensation mechanisms, i.e., allowing the concerns of affected populations to be heard and addressed in a structured, systematic, and managed manner during the planning and implementation phases of the project.

The AfDB, in accordance with its mandate set out in Article 1 of the Bank Agreement and Article 2 of the Fund Agreement, and the provisions of Article 38 of the Bank Agreement and Article Article 21 of the Fund Agreement considers economic and social rights to be an integral part of human rights and, consequently, affirms that it respects the principles and values of human rights as defined in the Charter of the United Nations and the African Charter on Human and Peoples' Rights. These were some of the principles that guided the development of the Integrated Safeguards System. The AfDB encourages member countries to observe international human rights norms, standards, and best practices, based on their commitments under the International Covenants on Human Rights and the African Charter on Human and Peoples' Rights.

Consideration of these values and principles places the AfDB at the forefront of multilateral development banks, with a set of clear and integrated policies and procedures for addressing safeguarding issues that arise in the course of development. With the Integrated Safeguards System, the AfDB is empowered to fulfill its mandate and help increase the effectiveness and development impact of its operations.

The Integrated Safeguards System is thus one of the most robust tools at the AfDB's disposal to help promote the well-being of those it serves, i.e., the people of Africa.

In general, the safeguards aim to:

- Avoid adverse impacts of projects on the environment and affected people, while maximizing development benefits;
- Minimize, mitigate, and/or compensate for adverse impacts on the environment and affected people when such impacts cannot be avoided; and
- Help borrowers/clients strengthen their safeguard systems and develop the capacity to manage environmental and social risks.

The AfDB requires borrowers/clients to comply with these safeguard requirements during project preparation and implementation. The Integrated Safeguards Policy Statement sets out the basic principles that guide and underpin the AfDB's approach to environmental safeguards.

In addition, the AfDB has adopted five operating systems, limiting their number to what it considers necessary to achieve the goals and optimal functioning of the Integrated Safeguards System, namely: Integrated Safeguards System, namely:

Operational Safeguard 1: Environmental and social assessment - This comprehensive safeguard governs the process of determining the environmental and social category of a project and the applicable environmental and social assessment requirements: scope; category; implementation of a strategic environmental assessment or an environmental and social impact assessment, where appropriate; Environmental and Social Management Plans; assessment of vulnerabilities to climate change; public consultation; impacts on the community; assessment and treatment of vulnerable groups; and grievance procedures. The Safeguard updates and consolidates the commitments set out in the AfDB's environmental policy.

Operational Safeguard 2: Acquisition of land for involuntary resettlement, displacement of populations, and compensation - This safeguard consolidates the commitments and requirements set out in the AfDB's policy on involuntary resettlement and incorporates a number of refinements designed to improve the operational effectiveness of these requirements. In particular, it comprises comprehensive and forward-looking notions of livelihoods and assets, addressing social, cultural, and economic dimensions. It also adopts a definition of community and common property that emphasizes the need to maintain social cohesion, community structures, and social interconnections that common property provides. This safeguard ensures the requirement for compensation, covering full replacement; reiterates the importance of resettlement that improves living standards, income-earning capacity, and livelihoods in general; and emphasizes the need to ensure that social considerations such as gender, age, and participation in project outcomes do not particularly disadvantage those affected by the project.

Operational Safeguard 3: Biodiversity and Ecosystem Services – This safeguard aims to conserve biological diversity and promote the sustainable use of natural resources. It also translates the AfDB's commitments in its integrated water resources management policy and the United Nations Convention on Biological Diversity into OS requirements. This safeguard reflects the importance of biodiversity on the African continent and the value of key ecosystems to the population, emphasizing the need to “*respect, conserve, and maintain the knowledge, innovations, and practices of indigenous and local communities (...) and to protect and encourage the customary use of biological resources in accordance with traditional cultural practices that are compatible with conservation or sustainable use requirements.*”

Operational Safeguard 4: Pollution prevention and control, hazardous substances, and resource efficiency - This safeguard covers the range of key impacts of pollution, waste, and hazardous substances for which there are agreed international conventions, as well as specific industry and regional standards, including greenhouse gas accounting

of greenhouse gases, which other multilateral development banks adopt. This safeguard also introduces vulnerability analysis and monitoring of greenhouse gas emission levels and provides a detailed analysis of possible reduction or a framework for compensatory measures.

Operational Safeguard 5: Labor, Health, and Safety – This safeguard establishes the AfDB's requirements for its borrowers or clients regarding workers' conditions, rights, and protection against abuse or exploitation. It thus covers working conditions, workers' organizations, occupational health and safety, and the prevention of child or forced labor. It also ensures greater harmonization with most other multilateral development banks.

3.4 Alignment and Complementarity Between Angolan Legislation and AfDB and DFC Requirements

Table 8: Alignment and Complementarity Between Angolan Legislation and AfDB and DFC Requirements

Item	Angolan Legislation	Integrated Security System (ISS of the AfDB)	Alignment and Complementarity
<p>Environmental and Social Impact Assessment</p>	<p>The Annex to Presidential Decree No. 117/20 of April 22 presents the categorization of activities (A, B, C, D, E) and a list of those of those that require environmental studies.</p> <p>Article 4 of this legal document refers to "licensing of agricultural, forestry, industrial, commercial, housing, tourism, or infrastructure projects which, due to their nature, size, or location, have implications for environmental and social balance and harmony, are subject to a prior Environmental Impact Assessment process, which involves the preparation of an Environmental Impact Assessment</p> <p>(EIA) to be submitted for approval by the competent authority responsible for the environment."</p> <p>The legislation establishes the minimum content for the EIA and Terms of Reference for certain types of projects. For the water sector, this only applies to water supply systems (Decree No. 92/12 of March 1). The issuance of the Environmental Installation License for projects subject to EIA is conditional upon the approval of the EIA.</p>	<p>PO1 - Integrated Environmental and Social Assessment</p> <p>Operational Safeguard 1 establishes different categories of projects in relation to environmental and social impact assessment, highlighting in more detail projects with significant and/or irreversible adverse impacts, or those that significantly affect environmental and social components considered sensitive.</p> <p>It defines the content of the EIAs and establishes specific guidelines for the agriculture sector and associated infrastructure (silos), etc.</p>	<p>Both require prior impact assessment. The AfDB and DFC expand on this with analysis of alternatives and more robust plans.</p> <p>Angolan legislation establishes categories of activity and defines the EIA requirements for projects with significant and reversible.</p> <p>Angolan legislation includes agricultural infrastructure (silos) in the list of activities subject to EIA, categorized as Category B projects, referred to in 38 - other projects.</p> <p>According to the AfDB, agricultural infrastructure projects, if not large in scale, are classified as Category 2 and only require the preparation of an Environmental Management Plan.</p> <p>The DFC shares the same view, and projects of this nature fall under Category B</p>

Item	Angolan Legislation	Integrated Security System (ISS of the AfDB)	Alignment and Complementarity
Environmental and Social Impact Management	<p>The Environmental License is conditional upon the submission of an Environmental Management Plan to be presented with the Environmental Impact Study of compliance (Presidential Decree No. 117/20, of April 1). The Environmental Installation License provides for an environmental audit during the operational phase (Decree No. 1/10, of January 13).</p>	<p>PO1 - Integrated Environmental and Social Assessment</p> <p>The PGAS is a management tool and is carried out during the construction and operation phases,</p> <p>including, among other things, the definition of responsibilities, measures to be implemented, implementation schedule, and budget.</p>	<p>Both provide for informed participation. The AfDB and DFC require formal documentation and complaint mechanisms.</p>
Public Consultations	<p>As part of the EIA process, a public consultation lasting 5 to 10 days is planned, through a meeting conducted by MINAMB (Executive Decree No. 87/12, of February 24). The public consultation report is based on a public hearing.</p>	<p>PO1 - Stakeholder involvement</p> <p>Operational Safeguard 1 establishes the need to hold public consultations from the beginning of the project cycle.</p>	<p>Angolan legislation defines public consultation in a more limited way, without specifying the need for public consultations throughout the project cycle and not limited to the public presentation meeting to discuss the EIA.</p>
Biodiversity	<p>The Basic Environment Law (Environment, Law No. 5/98, of June 19) includes the protection of biodiversity within its scope, and the Aquatic Biological Resources Law (Law No. 6-A/04, of October 8) establishes the principles of rules for the protection of biological and aquatic resources.</p> <p>Angola has acceded to the Convention on Biological Diversity (Resolution No. 23/97, of July 4) and the International Convention on Wetlands which protects these wetland and coastal ecosystems (Resolution No. 27/16, of July 22).</p>	<p>PO3 - Conservation of biodiversity</p> <p>Establishes the need to adopt a mitigation hierarchy to avoid impacts on ecosystem integrity and biodiversity conservation.</p>	<p>Both advocate protection. BAD and DFC require mitigation in critical areas and compensation.</p>

Item	Angolan legislation	Integrated Security System (ISS of the AfDB)	Alignment and Complementarity
Pollution Prevention	The Basic Environment Law includes the principle of pollution prevention. There are legal provisions relating to waste and water quality, but there are no regulations on atmospheric emission limits, noise, and vibrations.	<p>PO4 - Pollution prevention and resource efficiency</p> <p>The BAD and DFC adopt the parameters established by the World Bank.</p>	Good alignment. The AfDB and DFC require international standards and the use of the best technologies.
Resettlement	There are rules, regulations, procedures, and criteria for the resettlement of groups of people (Decree No. 1/01 of January 5 and Presidential Decree No. 117/16 of May 30).	<p>PO2 - Involuntary resettlement</p> <p>A Operational Safeguard establishes the need to carry out of a Resettlement Resettlement Plan, with defined procedures defined, aimed at improving the living conditions of the affected populations.</p>	Both require compensation. BAD reinforces with the restoration of livelihoods and ongoing consultation.
Hygiene, Safety, and Health at work	Angolan legislation regulates the Occupational Safety, Hygiene, and Health System and defines the principles aimed at preventing occupational accidents, occupational diseases, and other risks inherent to the work environment (Decree No. 31/94, of August 5).	<p>PO5 - Working conditions, health, and safety</p> <p>Operational Safeguard 5 requires protection of workers against abuse or exploitation, and hygiene and safety at work.</p>	Both guarantee safe conditions. ISS requires formal HSST plans and continuous supervision.

No discrepancies were identified between Angolan legislation and the Safeguard Guidelines of the African Development Bank (ADB) and the **U.S. International Development Finance Corporation (DFC)**. The distinctions noted in the table above refer to cases where Angolan regulations are more or less restrictive than the guidelines of the African Development Bank and DFC, or to circumstances where national legislation does not set specific limits for certain emissions. In this study, we have chosen to adopt the highest requirement, ensuring compliance with all requirements established by both the Angolan legal framework and the guidelines of the multilateral financial institution.

3.5 Environmental and Social Standards

As a result of the comparative analysis carried out between Angolan legislation and the African Development Bank and DFC Safeguard Guidelines, where some discrepancies were identified, this section aims to set out the Environmental and Social Standards applicable to the Project. These standards serve to complement Angolan regulations or, in the absence of specific national legislation, serve as a reference for the adoption of widely recognized international standards, such as those of the World Bank and the World Health Organization (WHO), in addition to best environmental and social practices.

Finally, it was necessary to include in this section the guidelines relating to Public Consultation, detailing the applicable regulatory procedures. This is due to the differences between Angolan legislation and the Safeguard Policies of the AfDB and DFC, thus ensuring that the Project complies with the guidelines established by the African Development Bank and the DFC.

3.6 Institutional Framework of Stakeholders and Parties Involved in the Environmental and Social Areas

The implementation of projects with environmental and social impact requires coordinated coordination between different government, municipal, and community entities. Within the scope of this project, the institutional framework integrates the bodies and structures responsible for environmental, social, agricultural, and economic management, ensuring that actions are compatible with land use planning instruments, environmental protection standards, and the province's socioeconomic development strategies. Each stakeholder plays a specific role, from supervision and

issuing technical opinions to monitoring environmental studies, dialogue with communities, and logistical and institutional support, ensuring that the process is participatory, transparent, and aligned with local and national priorities.

The table below identifies and describes the most relevant institutions involved in this project.

Table 9: Table of institutions involved in the project

Institutional group	Main entities involved	Role in environmental/social matters
Central authorities (environment)	Ministry of Environment (MINAMB) – approval of EIAs, environmental licenses, coordination of environmental policies	Leads and controls the country's environmental policy; approves environmental impact studies and licenses; leads public consultations
Agricultural and rural sector	Ministry of Agriculture and Forestry (MINAGRIF) – rural development policies, agricultural research, and family farming	Promotes food security and agricultural policies, including climate change mitigation of socio-environmental impacts in grain value chains for grains
Water and sanitation / water resources	Ministry of Energy and Water (MINEA) and National Water Directorate – sustainable management of water resources, licensing of hydraulic works	Regulates and supervises water use for irrigation and water infrastructure construction; involved in environmental plans for water
Planning and regulatory coordination	Ministry of Planning – interministerial coordination and definition de strategies de territorial development	Ensures strategic alignment between ministries in project implementation plans
Cartography and Territory	Angolan Geographic and Cadastral Institute (IGCA) – official cartography, national geographic information system	Supports the delimitation of implementation areas and identification of land use, basis for EIAs and zoning
Agencies of logistics infrastructure	ARCCLA (Cargo and Logistics Certification Regulatory Agency) – national logistics, certification, and agricultural transport	Facilitates access to markets and transportation of stored grains; may be involved in silo logistics
Local/social implementation	Social Support Fund (FAS) and the Crescer Project – implementation of social infrastructure, social safeguard policies, and resettlement mitigation resettlement	Administers Social Components, compensation, community consultations and mechanisms for complaint
Province and municipality	Governor Provincial; Administrations Municipal; Municipal commissions (technicians, traditional leaders, administrators)	Authorizes resettlement actions; coordinates land acquisition processes, community consultations, and local implementation
Local traditional leadership	Soba chiefs and traditional community authorities – participation in municipal commissions and dialogues with communities	Represent community interests, negotiate land use, and participate in public consultation processes

Institutional group	Main entities involved	Role in the environmental/social sphere
Defense of environmental rights	Non-governmental organizations (NGOs)	Provide technical support and advocacy for environmental protection, community rights, and good social practices.
Project implementation	Project promoter	Responsible for preparation and implementation of measures to mitigation and plans for environmental and social management plans.
Financing and investment	African Development Bank (AfDB) and DFC	Financing institution that requires compliance with its Safeguards, including meaningful public consultations and the management adequate of socio-environmental impacts

3.7 NATIONAL PLANS, PROGRAMS, AND STRATEGIES

3.7.1 National Development Plan 2023-2027

Angola's National Development Plan (PND) 2023-2027 is a strategic instrument that guides public policies and investments necessary to promote the country's sustainable socioeconomic development. This plan is aligned with the "**Angola 2050**" **Long-Term Strategy**, which projects the country's future for the coming decades.

General Guidelines and Goals:

The PND 2023-2027 establishes guidelines to accelerate the sustainable socioeconomic impact of public policies, targeting areas that contribute significantly to the country's development.

The main goals include:

- **Human Capital Development:** Strengthening the education and health systems to improve the quality of life of the population.
- **Economic Diversification:** Reduce dependence on the oil sector by promoting other industries and services.

- **Infrastructure and Connectivity:** Improve transportation, energy, and telecommunications infrastructure to facilitate economic growth.
- **Environmental Sustainability:** Implement policies that ensure environmental protection and the sustainable use of natural resources.

Main Axes:

The plan is structured around five priority areas of development:

1. **Human Capital:** Valuing and enhancing human capital, ensuring access to quality basic services.
2. **Economic Diversification:** Promote non-oil economic sectors to ensure inclusive and sustainable growth.
3. **Infrastructure:** Develop modern infrastructure that supports economic growth and regional integration.
4. **Environmental Sustainability:** Ensure efficient management of natural resources and protection of the environment.
5. **Governance and Institutions:** Strengthen public institutions to ensure transparency, efficiency, and citizen participation.

This plan reflects Angola's commitment to achieving balanced and sustainable development, in line with the global goals set out in **the 2030 Agenda** and the **Sustainable Development Goals (SDGs)**.

3.7.2 National Plan for the Promotion of Grain Production

The **National Plan for the Promotion of Grain Production (PLANAGRÃO)** is an initiative of the Government of Angola, approved by Presidential Decree No. 200/22 of July 23, 2022, which aims to significantly increase grain production in the country, contributing to food security, income generation, and the promotion of competitiveness in the agricultural sector.

General Guidelines and Goals:

PLANAGRÃO's main objective is to double annual grain production by 2027, reaching more than six million tons. Specific goals include:

- **Corn:** Increase production to 5,002,282 tons, cultivating 326,030 hectares.
- **Wheat:** Expand the cultivation area to 673,970 hectares.
- **Rice:** Achieve 600,000 hectares of cultivation.
- **Soybeans:** Cultivate 400,000 hectares.

These goals aim to reduce dependence on imports and ensure the country's food self-sufficiency.

Main Axes:

The plan is structured around strategic actions to achieve its objectives:

1. **Financing and Investment:** Make available approximately 1.7 billion kwanzas, operated by the Development Bank of Angola (BDA) and the Angolan Venture Capital Fund (FACRA), to support agricultural companies and producers.
2. **Agricultural Infrastructure:** Develop production support infrastructure, such as irrigation, storage, and transportation systems, especially in the eastern provinces of Angola (Lunda-Norte, Lunda-Sul, Moxico, and Cuando Cubango), which have vast lands and adequate water resources for growing priority grains.
3. **Training and Technology:** Implement training programs for farmers and technicians, promoting the use of modern technologies and sustainable agricultural practices to increase productivity.
4. **Market and Marketing:** Establish mechanisms to ensure the sale of production at fair prices, including the participation of the Strategic Food Reserve (REA) in the purchase of part of domestic production and the promotion of institutional purchases by the State.

The implementation of PLANAGRÃO is essential to transform Angola into the largest grain producer in southern Africa, ensuring food sovereignty and boosting the country's socioeconomic development.

3.7.3 National Food and Nutrition Security Strategy 2024-2034 (ENSAN II)

Angola's National Food and Nutrition Security Strategy 2024-2034 (ENSAN II) is a government initiative aimed at ensuring that all citizens have access to quality food in a sustainable manner, with a view to eradicating hunger and promoting food resilience in the country.

General Guidelines and Goals:

- **Eradication of Hunger:** Ensure that all Angolans have access to adequate food, eliminating hunger throughout the national territory.
- **Sustainability of Natural Resources:** Ensure the preservation of natural resources by promoting practices that maintain environmental integrity and the productive capacity of the land.
- **Strengthening Food Resilience:** Reinforce the country's capacity to face challenges such as climate change, price fluctuations, and other factors that may affect food security.

Main Axes:

1. **Sustainable Production and Marketing:** Promote agricultural and marketing practices that ensure the continued availability of healthy and nutritious food.
2. **Access to Quality Food:** Implement policies that ensure all citizens, regardless of their location or socioeconomic status, have access to safe and nutritious food.
3. **Food and Nutrition Education:** Promote educational programs that encourage healthy eating habits and inform about the importance of a balanced diet.

4. **Research and Innovation:** Encourage scientific research at all stages of the food and nutrition chain, with a view to improving food production, conservation, and distribution techniques.
5. **Governance and Coordination:** Establish effective governance structures, such as the National Council for Food and Nutrition Security (CONSAN), to ensure the implementation and monitoring of proposed policies and actions.

ENSAN II is aligned with the Sustainable Development Goals (SDGs) and the Angola 2050 Long-Term Strategy, reinforcing the country's commitment to building a more sustainable and resilient food system.

3.7.4 National Environmental Quality Program

Angola's National Environmental Quality Program (PNQA), approved by Presidential Decree No. 138/20 of May 19, aims to improve the quality of life of Angolans living in urban, peri-urban, and rural areas, focusing on ensuring air, water, and soil quality.

General Guidelines and Goals:

- **Air Quality:** Collect and update information on sources of atmospheric emissions and their impact on health and the environment, with a view to reducing air pollution.
- **Water Quality:** Implement water quality monitoring systems, ensuring access to drinking water and the protection of water resources.
- **Soil Quality:** Promote sustainable land use practices, preventing degradation and encouraging the recovery of affected areas.

Main Axes:

1. **Legislative Development:** Draft and update legislation regulating the control and preservation of air, water, and soil quality, establishing national environmental quality indices.

2. **Environmental Education:** Promote environmental education at all levels of education, ensuring the involvement of society in the conservation, recovery, and improvement of the environment.
3. **Monitoring and Evaluation:** Implement environmental indicators to monitor the effectiveness of policies and actions, ensuring continuous improvement in environmental quality.

3.7.5 National Water Plan

Angola's National Water Plan (PNA), approved by Presidential Decree No. 126/17 of June 13, establishes guidelines for the sustainable management of the country's water resources, aiming to ensure the availability and quality of water for current and future generations.

General Guidelines and Goals:

- **Integrated Water Resources Management:** Implement an approach that considers the technical, social, economic, and environmental dimensions of water resources management, ensuring a balance between water supply and demand.
- **Infrastructure Development:** Promote the construction and maintenance of water infrastructure, such as dams, supply and sanitation systems, to improve access to drinking water and basic sanitation.
- **Environmental Conservation and Protection:** Adopt measures to preserve aquatic and terrestrial ecosystems, ensuring water quality and the sustainability of natural resources.

Main Axes:

1. **Watershed Planning and Management:** Develop specific plans for each watershed, considering regional particularities and promoting the participation of local communities in water resource management.
2. **Institutional Strengthening:** Empower institutions responsible for water management, ensuring the effective implementation of policies and strategies defined in the NAP.

3. **Education and Awareness:** Promote educational programs and awareness campaigns to raise public awareness of the importance of water conservation and sustainable use of water resources.

The NAP also coordinates with other sectoral plans and national strategies, such as the National Irrigation Master Plan (PLANIRRIGA), which aims to develop irrigated agriculture in the country, contributing to food security and rural development.

3.7.6 National Irrigation Master Plan (PLANIRRIGA)

Angola's National Irrigation Master Plan (PLANIRRIGA) is a strategic initiative designed to promote sustainable agricultural development in the country by identifying and optimizing the irrigation potential of Angolan land.

General Guidelines and Goals:

- **Identification of Potential Areas for Irrigation:** PLANIRRIGA analyzed approximately 17.5 million hectares, of which about 7.5 million were identified as highly suitable for irrigation, with 80% of these areas classified as highly to moderately suitable.
- **Regional and National Development:** The plan aims to support regional and national development by proposing measures and actions in the agricultural hydraulics sector throughout Angola.

Main Axes:

1. **Rehabilitation and Expansion of Irrigation Infrastructure:** The plan proposes the recovery of existing irrigated areas and the construction of new infrastructure to increase the irrigated agricultural area.
2. **Technical and Institutional Capacity Building:** It is expected to strengthen the technical and institutional capacities of those involved in the management and operation of irrigation systems, ensuring the sustainability of projects.

3. **Promotion of Sustainable Technologies:** The adoption of efficient and sustainable irrigation technologies is encouraged, with a view to optimizing water use and conserving natural resources.
4. **Integration with Agricultural Policies:** PLANIRRIGA is aligned with other national agricultural policies and strategies, contributing to food security and reducing food imports.

3.7.7 National Strategy for Climate Change 2022-2035

Angola's **National Strategy for Climate Change 2022-2035 (ENAC 2022-2035)** was established by Presidential Decree No. 216/22 of August 23, 2022, with the aim of coordinating objectives, instruments, and institutions to promote sustained economic growth and sustainable development in the face of climate change.

General Guidelines and Goals:

- **Adaptation and Mitigation:** ENAC 2022-2035 aims to adapt Angola to the impacts of climate change and promote low-carbon development, contributing to the eradication of poverty and improving the quality of life of Angolans.
- **Emissions Reduction:** The plan sets targets for reducing greenhouse gas emissions, aligning with Angola's international commitments under the Paris Agreement.

Main Axes:

1. **Institutional Strengthening:** Strengthen the capacities of national institutions for the effective implementation of climate change policies and measures.
2. **Policy Integration:** Ensure that climate considerations are integrated into sectoral and national development policies, plans, and programs.
3. **Sustainable Management of Natural Resources:** Promote sustainable natural resource management practices aimed at biodiversity conservation and ecosystem resilience.

4. **Promotion of Renewable Energy:** Encourage the use of renewable energy sources to reduce dependence on fossil fuels and decrease greenhouse gas emissions.
5. **Education and Awareness:** Implement public education and awareness programs on climate change, aiming to increase society's awareness and participation in mitigation and adaptation actions.

ENAC 2022-2035 represents Angola's commitment to addressing the challenges of climate change by promoting sustainable and resilient development for future generations.

3.7.8 National Action Program to Combat Desertification (PANCD)

Angola's National Action Program to Combat Desertification (PANCD) was established by Presidential Decree No. 46/14 of February 14, 2014, with the aim of addressing the challenges of desertification and promoting sustainable land management in the country.

General Guidelines and Goals:

- **Poverty Reduction and Social Inequality:** The PANCD seeks to reduce poverty and social inequalities by sustainably increasing productivity in regions subject to drought and soil degradation.
- **Sustainable Management of Natural Resources:** The program aims to improve productive capital, including soil, water, and natural biological resources, as a way to combat desertification and promote environmental sustainability.

Main Axes:

1. **Promotion of Sustainable Agricultural Practices:** Encourage agricultural techniques that conserve soil and water, reducing erosion and improving soil fertility.

2. **Reforestation and Recovery of Degraded Areas:** Implement tree planting and land recovery programs in areas affected by desertification, with a view to restoring native vegetation and biodiversity.
3. **Capacity Building and Awareness Raising among Local Communities:** Develop environmental education and capacity building activities so that communities adopt sustainable practices and actively participate in the conservation of natural resources.
4. **Institutional and Political Strengthening:** Create a favorable institutional environment for actions to combat desertification, including the formulation of public policies and coordination between different government sectors.
5. **Continuous Monitoring and Evaluation:** Establish monitoring systems to assess the effectiveness of the actions implemented and adjust strategies as necessary.

Desertification is a significant concern in Angola, affecting about 31% of the national territory, especially in semi-arid and sub-humid regions along the coast, mining areas, and areas with intense forestry and livestock exploitation.

The PANCD represents the country's commitment to addressing these challenges and promoting sustainable and resilient rural development.

4 JUSTIFICATION OF THE EIAs

The construction of agricultural infrastructure "Silos" to increase grain storage capacity in Caála is a strategic necessity that brings multiple benefits, from reducing losses to improving product quality. Investing in storage infrastructure is essential to strengthen agriculture, increase profitability, and ensure food security, thereby promoting sustainable rural development.

Although these projects are crucial to the efficiency of the food chain, it is imperative to consider the environmental and social impacts associated with their planning, construction, operation, and decommissioning phases.

The construction of the silos is part of the expansion and diversification of the activities of the Carrinho, SA group. This group intends to expand its silo network to various locations across the country to store grain produced in the regions where these infrastructures will be built, in order to facilitate internal distribution and export, as well as to extend the shelf life and quality of the grain.

This Environmental and Social Impact Study aims to assess the potential environmental impacts caused by the construction of silos by Grupo Carrinho, SA, and to propose mitigation measures.

Under the combined provisions of Article 16 of Law No. 5/98 of June (Basic Environment Law), and Article 112(d) and Article 113, both of the Constitutional Law, the Government created the Regulation on Environmental Impact Assessment and Environmental Licensing Procedure (Decree No. 117/20 of April 22).

This decree establishes a set of procedures to be followed in the preparation of Environmental Impact Studies, proceeding to the approval by the competent state body of the project subject to EIA, as well as the rules for its implementation.

These studies should focus on projects which, due to their nature, size, or location, may have implications for environmental and social balance and harmony, so that the EIA can serve as an effective tool for environmental protection and management, as well as for ensuring fair and balanced decisions by public authorities.

This Environmental Impact Study was prepared in accordance with the provisions of Article 4 of Decree No. 117/20 of April 22, which regulates environmental protection during the construction of the Caála Agricultural Infrastructure for Grain Storage "Silos" and requires the preparation of an Environmental Impact Assessment.

We also took into account Executive Decree No. 92/12, of March 1, which approves the Terms of Reference (TOR) for the Preparation of Environmental Impact Studies, establishes the guidelines for the preparation of Environmental Impact Studies necessary for the environmental feasibility analysis of projects subject to environmental impact assessment.

According to Article 2, the Environmental Impact Study must be prepared in accordance with the legislation on Environmental Impact Assessment and strictly comply with the Terms of Reference approved by the Ministry of the Environment, which guides their preparation according to the specific nature of each project.

4.1 OBJECTIVES OF THE EIAS

The purpose of this Environmental and Social Impact Assessment is to conduct baseline studies for the construction of agricultural infrastructure for grain storage "Silos" in the municipality of Caála by the Carrinho, SA group. This includes gathering information and assessing the current environmental and social situation, analyzing and recording the current characteristics and dynamic behavior of its components.

The EIAS must also fully comply with the following objectives:

- **A summary description of the project;**
- **Identification of Potential Impacts:**
 - Analyze the direct and indirect effects of the construction of the Caála silos on the surrounding environment;
 - Assess impacts on soil characteristics, air quality, and water resources, etc.
- **Mitigation and Compensation:**
 - Propose mitigation measures to minimize negative impacts;
 - Identify opportunities for environmental , such as projects for reforestation or preservation of natural areas.
- **Community involvement:**
 - Include the active participation of the local community in identifying concerns and solutions;
 - Promote transparency and effective communication about construction plans and their impacts.
- **Legal Compliance:**
 - Ensure that the project complies with environmental regulations and local standards;
 - Collaborate with relevant authorities to obtain necessary permits and approvals.
- **Propose an environmental monitoring plan for the different phases of project implementation.**

4.2 SCOPE OF THE EIAS

4.2.1 Scope of the project and location

The project is located in the province of Huambo, municipality of Caála. It occupies an area of approximately 6,750 m², which corresponds to the total area of the concession, as shown in the location of the unit below (Figure 1).



Figure 1 - Geographic location of the project implementation area

The project implementation site is bounded by the following coordinates:

Table 10: Geographic coordinates of the project area

POINTS	LATITUDE	LONGITUDE
1	12°50'9.57\"S	15°30'50.35\"E
2	12°50'11.26\"S	15°30'53.57\"E
3	12°50'14.79\"S	15°30'51.55\"E
4	12°50'13.10\"S	15°30'48.39\"E

4.2.2 Boundaries

The project is located within the following boundaries:

- North, East, and West: Vacant land;
- South: National Road 120, as shown in Figure 2.



Figure 2 - Map of boundaries.

4.2.3 Access roads

The area where the project is located has a road network around the project area. The main access road is the EN-120, as shown in Figure 3, with the respective landmarks and other planned streets.



Figure 3 - Access road map.

4.3 THEMATIC SCOPE - DESCRIPTORS UNDER ANALYSIS

Defining the thematic scope of the EIAS is an important requirement for the correct development of the study, as it allows the areas of analysis to be covered to be identified and, above all, their level of detail, depending on the type of impacts that are expected to be induced by the project and the specificity and sensitivity of the environment that will host it. Although the areas of study, as well as the aspects to be included in the analysis, may take into account the provisions of the legislation on Environmental Impact Assessment, it is important to recognize at this stage which environmental descriptors deserve particular attention and, consequently, further study.

Therefore, this EIAS will analyze the following environmental descriptors:

- Climate
- Geology and Geomorphology
- Soils and Land Use
- Surface and groundwater resources
- Flora and fauna

- Landscape
- Air quality
- Noise environment
- Socioeconomic
- Infrastructure
- Land use planning
- Historical and cultural heritage.
- Waste

4.4 EIA METHODOLOGY

The following methodology was used to prepare this environmental impact study:

- For each environmental descriptor, a characterization of the reference situation was made, which fundamentally aims to assess the current environmental situation;
- Based on the characterization of the reference situation and existing knowledge about the project components, the relevant environmental impacts on each environmental descriptor were identified and assessed;
- When impacts resulting from the Project with significant effects on a given component were identified, environmental mitigation measures were defined in order to avoid, mitigate, and compensate for the negative impacts and/or enhance the positive impacts identified;
- If there is still a degree of uncertainty about the importance of a particular environmental impact, or about the effectiveness of the proposed mitigation measures, environmental monitoring programs are proposed;
- Finally, the conclusions of the EIAS are presented, providing a summary assessment of the Project's environmental sustainability, taking into account the current state of the environment, the impacts identified, and the proposed mitigation and monitoring measures.

The structure of this EIAS reflects the general methodology adopted and comprises the following volumes and respective chapters:

Volume I, corresponding to **the Non-Technical Summary**, which summarizes in more accessible language the main aspects analyzed in the EIAS Summary Report.

Volume II, corresponding to **the EIAS Synthesis Report**, subdivided into the following chapters:

- **Chapter 1 - Executive Summary** - presents a concise summary of the EIAS Report in non-technical language, including the environmental and social reference conditions, the alternatives considered, the mitigation measures; the monitoring program, consultations with stakeholders, the technical and institutional capacity of the entities involved in the implementation of the project; and the cost implications;
- **Chapter 2 - Introduction** - this chapter presents the introductory and contextual aspects of the analyses produced in the EIAS;
- **Chapter 3 - Legal Framework** - identifies and analyzes the legal instruments and international conventions to which Angola is a signatory that have an impact on environmental impact assessments, as well as the relevant environmental, climate, and social policies of the African Development Bank;
- **Chapter 4 - Project Justification** - presents the project's objectives and justifies the need for its implementation;
- **Chapter 5 - Project Description** - describes the main characteristics of the project and the construction work, including the characteristics of the structures to be installed;
- **Chapter 6 - Characterization of the Reference Situation** - which characterizes the current state of the environment;
- **Chapter 7 - Environmental and Social Impact Assessment**, which analyzes the potential impacts of the project's implementation on the environment in terms of their value, magnitude, and significance;
- **Chapter 8 - Environmental and Social Mitigation Measures** - in which, depending on the impacts identified, environmental measures will be proposed to minimize or compensate for negative impacts and enhance positive impacts;
- **Chapter 9 - Cumulative Impacts** - Residual Impacts and Environmental Risks, identifies residual impacts, understood as negative impacts that cannot be mitigated.

mitigated. The environmental risks associated with the Project are also analyzed, both in the construction and operation phases;

- **Chapter 10 - Environmental and Social Monitoring and Management** - in which, where applicable, the environmental monitoring and environmental management programs for the various phases of the Project will be defined;
- **Chapter 11 - Environmental and Social Management Plan** - describes the management measures, procedures, functions, responsibilities, schedule, monitoring, and implementation costs presented in the ESMP;
- **Chapter 12 - Institutional Capacity and Strengthening Plan** - describes the level of capacity of the entity responsible for the project in relation to supervising the implementation of the ESMP.
- **Chapter 13 - Technical and Knowledge Gaps** - which aims to identify all missing background information that, if acquired, would complement the analyses carried out;
- **Chapter 14 - Conclusions and Recommendations** - summarizing the main conclusions reached during the study;
- **Chapter 15 - Bibliography and Documentation Consulted** - lists the main sources of information and works consulted.
- **Chapter 16 - Appendices** - Contains all appendices relating to this study.

4.5 ENTITIES CONSULTED

During the course of this EIA, a number of entities were contacted in order to gather information that would allow for a better characterization of the area affected by the implementation of the Project and its environmental impacts. Information was requested from the various entities, and contacts were made in order to obtain the desired information.

- Huambo Provincial Government (Provincial Directorate for the Environment);
- Caála Municipal Administration (municipal department for the environment and basic sanitation).

5 PROJECT DESCRIPTION

5.1 JUSTIFICATION FOR THE PROJECT LOCATION

Carrinho is an Angolan family business committed to developing a fully verticalized value chain in the food sector, managing all stages of the process in an integrated manner: from production at source, through transport, storage, industrial processing, to the final marketing of products.

Recognized as one of the best companies in Angola, Carrinho has invested heavily in the agricultural and industrial sectors, with several manufacturing units strategically distributed throughout the country. One of its most recent investments is the implementation of a grain silo project, which will be installed in a peri-urban area of Huambo, equipped with adequate road infrastructure, facilitating transport and logistics.

With this project, all grains purchased in the municipality of Caála and in rural areas of various municipalities in Huambo province can be efficiently transported to silos, where they will be properly stored in safe conditions. From there, the products will be distributed to different parts of the country, ensuring greater efficiency in the supply chain and contributing to the strengthening of national food security.

The following factors were taken into account when choosing the location for this terminal:

Economic

Protection against deterioration and pests significantly reduces losses, increasing the amount of grain that can be sold.

Storing grain allows producers to sell during periods of high demand, obtaining better prices and increasing profit margins.

Adequate infrastructure facilitates inventory control and management, making the process more efficient and reducing operating costs.

The economic advantages provided by the construction of grain storage silos are significant, directly benefiting farmers and the regional economy. This infrastructure is essential to ensure the sustainability and competitiveness of the agricultural sector.

Social

The project is justified by the generation of jobs and income, an increase in the regional economy due to the provision of services, preference for local labor, and improvement in the quality of life of the population.

Environmental

As this is a rural area with a variety of activities and agricultural fields, the project will have some impact during its implementation. In order to minimize this impact, it is expected that all mitigation and compensation measures will be complied with during the project's implementation, thus mitigating the various impacts resulting from the project's implementation.

Location

The project will be located in a flat rural area with mixed characteristics and covering approximately 6,750 m².

- Potentially industrial zone;
- Within the municipal seat;
- No conflict with land use and occupation;
- Availability of adequate access roads facilitating the transport of goods, also facilitating the arrival of raw materials and necessary inputs;

5.2 LOCATION ALTERNATIVE

5.2.1 Location and technological alternatives for project implementation

Location and technological alternatives were not considered or discussed for the following reasons:

- i) This is an existing project that is currently inactive, for the storage of grain and thus boosting national production;

- ii) It is located in a rural area with great productive potential and in an area with easy access for product distribution;
- iii) There are no urban constraints preventing the location from being chosen;

Several important aspects were taken into account when choosing the most suitable area for the facility:

- Proximity to the municipal seat;
- Presence of access roads in good condition;
- Increase in trade, import, and export of products in various countries by land and rail;

5.2.2 Alternatives to project implementation

The possibility of not implementing the project will have an impact on the economic aspects of the municipalities. In addition, not implementing the project will frustrate the expectations of development that are being created in the municipality and/or province. Another issue concerns the lack of promotion of the regional economy, given that the project will increase youth employment and also the transport of agricultural products to different areas of the country where they will be marketed.

5.3 GEOGRAPHICAL CONTEXT

The proposed project will be implemented in an area corresponding to 6,750 m² and will be constructed of reinforced concrete, mesh, metal structures, and sheet metal, etc.

The project consists of the construction of silos to increase grain storage capacity from 3,999 to 20,000 tons, in which the following products are expected to be stored: corn, wheat, rice, and soybeans.

The silos, with a storage capacity of 120,000 tons, consist of:

- 1 weighbridge with a capacity of 60 tons;
- 1 road reception circuit with a capacity of 270m³/h (200t/h), with straw pre-cleaning;
- 2 conical bottom buffer silos with a total capacity of approximately 2,650 m³, i.e., 1,000 tons capacity for each silo. For example, Ø10.66 m, cylinder height 19.52 m, and total height 22.61 m;
- 1 dryer with an output capacity of 100 t/h for corn;
- 12 flat-bottom silos for storage distributed across 2 lines, with a total capacity of approx. 160,000 m³, i.e., 10,000 tons of capacity for each silo. For example, Ø31.98, cylinder height 13.80 m, and total height 21.99 m;
- Aeration system in storage silos;
- 1 road dispatch circuit with a capacity of 135 m³/h (100 t/h);
- Electrical installation;
- Supervision system.

As illustrated below in the layout of the facilities (Figures 4 and 5).

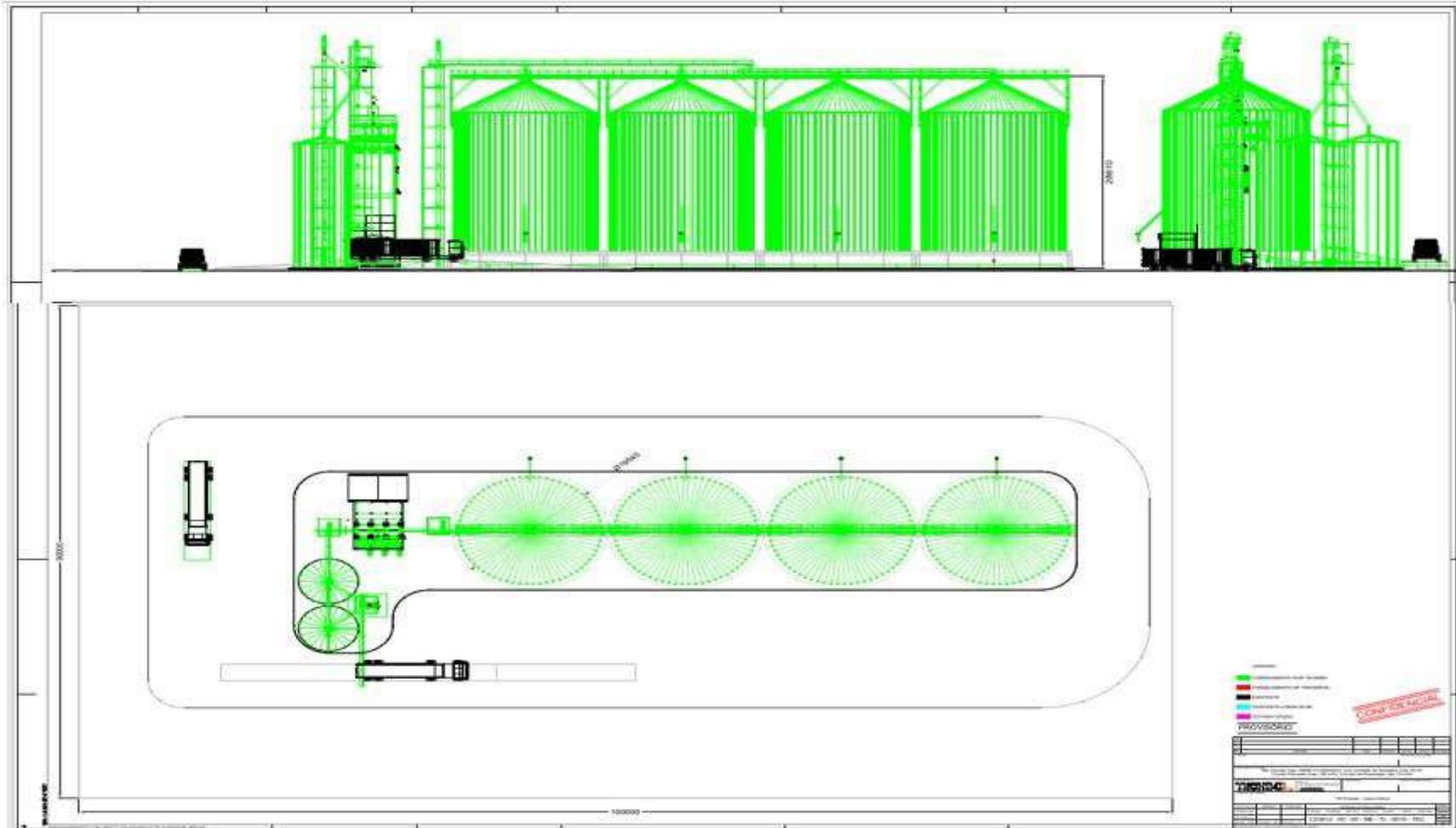


Figure 4 – Flow diagram (1)

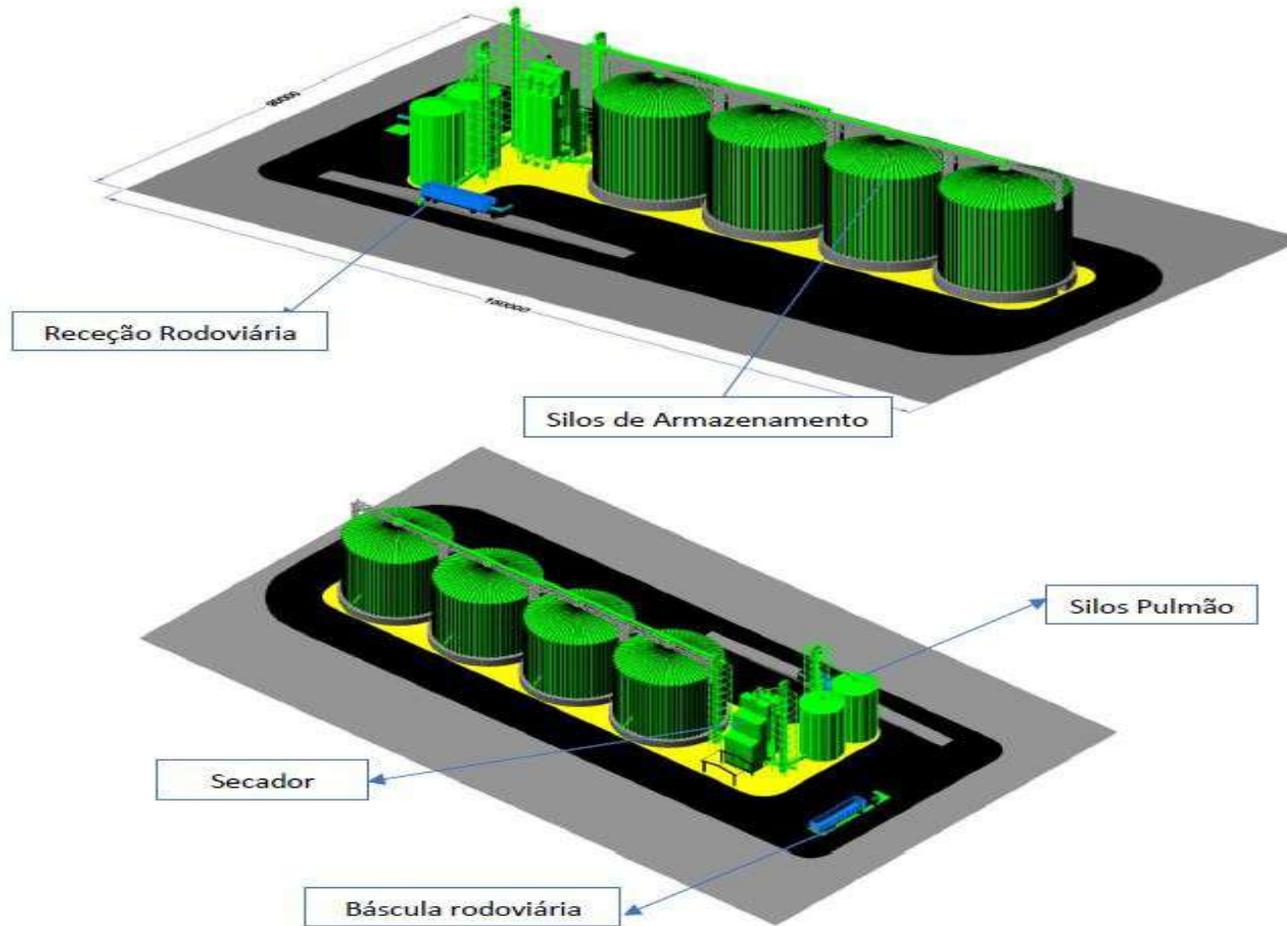


Figure 5 – Flow diagram (2)

5.4 GENERAL CHARACTERISTICS OF EXISTING INFRASTRUCTURE

Located in the municipality of Caála, this complex is situated in a fairly important agricultural production hub, characterized by small and medium-sized farmers.

To this end, the Caála silo complex is located on a site with a total area of 6,750 m² (76,000 ft²). The silos were built in 2011 with a storage capacity of 3,999 tons, but never became operational. Therefore, this group intends to reuse the existing infrastructure, increase storage capacity, and put them into operation, with the aim of facilitating the storage and distribution of grain from various points in the municipality.

The existing building consists of:

- **Foundations for weighbridges:** reinforced concrete ramps with a trapezoidal surface
- **Foundations and infrastructure for installation and operation of silos:** technical corridor (below the base of the silos), technical corridor (in the elevator area – dryer/silos), pit area
- **1 support building**

Capacities:

- Reception and cleaning – 10 t/h
- Drying – 10 t/h (20 °C to 14 °C)
- Storage – 3 silos of 1,330 t

Equipment

The silo complex consists of various interconnected pieces of equipment that ensure the reception, cleaning, drying, and storage of cereals and legumes, allowing them to be preserved over time in appropriate sanitary conditions. These include:

- **Receiving, cleaning, and drying equipment:** 1 corn receiving hopper (60 t), 1 pre-cleaning unit with a processing capacity of 10 t/h, 1 mixed flow column dryer with a processing capacity of 10 t/h (20 °C >14 °C);

- **Storage:** 3 flat-bottom silos with corrugated galvanized sheet metal structure, installed on a concrete base and tunnel;
- **Weighing facilities and equipment:** 1 vehicle scale.

Dimensions

- **Lot:** 6,750 m²
- **Building area:** 1,010 m²



Figure 6 – Caála grain terminal (1)



Figure 7: Caála grain terminal (2)

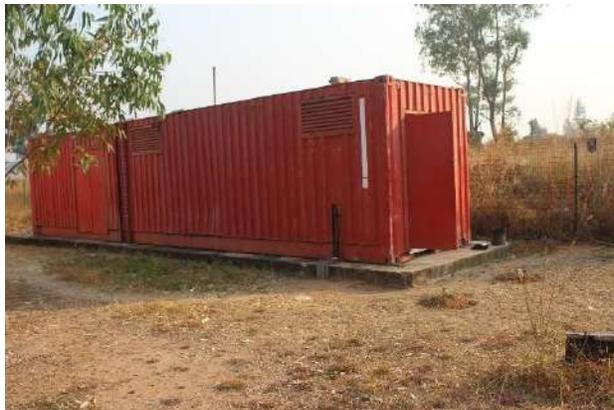


Figure 8: Generator house



Figure 9: Silo operations room



Figure 10: Unloading area



Figure 11: Scale

5.4.1 Access roads

In order to facilitate the circulation and flow of products, the silos will be built close to the EN 120 national road, which connects the cities of Benguela and Huambo.

5.4.2 Pavements

Two types of pavement will be used, depending on their function: rigid pavement and flexible pavement.

Rigid pavement will be used in areas where water and hydrocarbon spills may occur, as it is more resistant.

Flexible pavement will be used in traffic areas.

Both pavements have been designed according to the type of stress they will be subjected to, the bearing capacity of the foundation soils, and the mechanical characteristics of the constituent materials.

5.4.3 Earthworks

According to the topographical survey of the intervention area, the terrain is relatively flat, but excavations will nevertheless be necessary.

Excavation and earthworks will be necessary to secure the foundations, and in certain areas it will be necessary to replace soil for landfill and soil compaction purposes in order to improve the base.

5.4.4 Support infrastructure

For the construction of the new project units, various infrastructures will provide support for its implementation, notably the EN-120 national road to facilitate the movement of vehicles and machinery, transport and distribution of grain, etc. A support yard will also be built for the construction of the silos, which should be built within the boundaries of the project area.

5.4.5 Expected consumption

The estimated consumption for the installation and operation phases of the project is structured as follows:

a) Water Supply

During the construction phase of the project, water will be supplied by tanker trucks. To ensure continuous supply, the unit will have several reservoirs for water storage, allowing adequate supply for construction activities.

During the operational phase, the use of reservoirs is expected to continue, as the project site is not served by the public water supply network. This solution will allow the unit to maintain its water autonomy, ensuring the availability of water for operational processes and other needs.

Measures should be taken to reduce water consumption and avoid waste.

b) Domestic Wastewater Drainage Network

The domestic wastewater drainage network comprises the conveyance of wastewater from buildings through discharge branches, which connect to manholes, giving rise to a collector that conveys wastewater by gravity to secondary treatment facilities (septic tanks).

The domestic wastewater drainage system is of the separate type, consisting of a network for the evacuation of "soapy water" and another for wastewater from toilet bowls.

During the construction and operation of the grain terminal, liquid effluents will be generated mainly from sanitary sewers, effluents resulting from the washing of equipment and materials used in the construction and maintenance of the facilities.

Effluents from sanitary sewers will be sent and stored in septic tanks, while those resulting from equipment maintenance and likely to contain some contamination will be stored in specific, properly identified containers and sent for treatment before disposal and/or reuse.

c) Rainwater drainage network

During the construction phase, the unit will not have a rainwater drainage system, as rainwater will be drained and absorbed naturally by the soil.

For the operational phase, the rainwater drainage system will have two fundamental systems: at roof level and at ground floor level.

d) Electricity

The municipality of Caála is supplied with electricity from the ENDE public grid, but the supply is still insufficient, requiring the use of alternative energy. For the implementation of the project, generators will be installed with a capacity according to the project's needs, powered by diesel or gasoline. The unit will also have fuel storage tanks, adequate for the needs of the project during the construction and operation phases.

The generators have not yet been installed, although the containerized infrastructure for their installation is already in place at the facility.

e) Telecommunications

During the field visit, no public telecommunications network was found. The only telecommunications resource in the project implementation area is private mobile telephony.

f) Air conditioning

The project will be equipped with a ventilation system that will ensure thermal comfort for users throughout the construction and operation phases.

g) Fuel

During the construction and operation phases, the fuel to be used will be diesel and gasoline, depending on the type of equipment, capacity, and technical specifications.

5.4.6 Labor

At the current stage, the facilities are secured by four security guards.

During the assembly phase of the new storage units, there will be several workers, including bricklayers, civil engineers, electricians, plumbers, etc.

For the operational phase, 30 positions are planned for administrative and field technicians.

5.4.7 Schedule

The silo construction project belonging to Grupo Carrinho, SA, will last 36 months, starting in 2025, with completion expected in 2028.

5.4.8 Investment Value

The total investment for the implementation of the project is estimated at USD 4,168,000.00 (four million, one hundred and sixty-eight thousand dollars), or the equivalent in Kwanzas according to the exchange rate on the day.

5.5 GENERAL AND OPERATIONAL CHARACTERISTICS OF SILOS

Silos are storage units characterized by airtight cells or compartments, which allow for minimal exchange between the external environment and the storage environment. They offer storage conditions for longer periods than ordinary warehouses, as they allow for more efficient control of sources of deterioration.

There are different types of vertical silos, depending on the material used for their construction, which can be metal, concrete, masonry, and wood (used for seed storage). The basic differences between structures built with different materials are related to:

- Initial cost, which varies greatly between them;
- Different repair needs over time; and
- Greater or lesser difficulty in eliminating infestations of organisms harmful to grain conservation.

The size of each structure depends on the amount of grain to be stored and the storage time, as well as the number of harvests per year. For large producers, it is better to have more medium-sized silos, i.e., with a capacity to store volumes of two to three thousand tons per silo.

Wooden silos: for small volumes of seeds – 60 to 80 tons;

Masonry silos: can store from 100 to 1,200 tons;

Concrete silos: from one to three thousand tons or more; and

Metal silos: can hold six thousand tons or more.

The most commonly used silos today are those made of concrete and metal.

Concrete silos

Advantages:

- Less space occupied due to their vertical position;
- Thick walls, which prevent heat transfer to the grain mass; and

- Better grain preservation due to longer storage time. Disadvantages:
- High cost and long installation time;
- High maintenance costs; and
- High incidence of grain breakage due to silo height.

Metal silos

Advantages:

- Simpler and lower-cost foundations;
- Lower cost per ton stored than concrete silos; and
- Medium capacity cell that allows for greater operational flexibility. Disadvantages:
- Possibility of moisture infiltration;
- Possibility of gas leakage during the purging process;
- Heat transfer from the environment into the cell, which may cause condensation; and
- Higher installation cost than grain silos.

5.5.1 Process description

In stored grains, the most important organism is the grain itself. Although its life cycle is temporarily suspended (dormancy stage), it has all the properties of a living organism.

Grains should be harvested immediately after reaching physiological maturity, that is, when their dry matter reaches maximum weight. From that point on, if the product is not harvested, processed, and stored properly, losses will increase.

However, at the point of physiological maturity, the grains have high moisture content, both for harvesting and storage, and may be mixed with seeds from other plants that are still green (invasive or from previous crops). In this case, pre-cleaning, cleaning, and drying processes are necessary before actual storage, according to the harvest conditions, as shown in the following diagram.

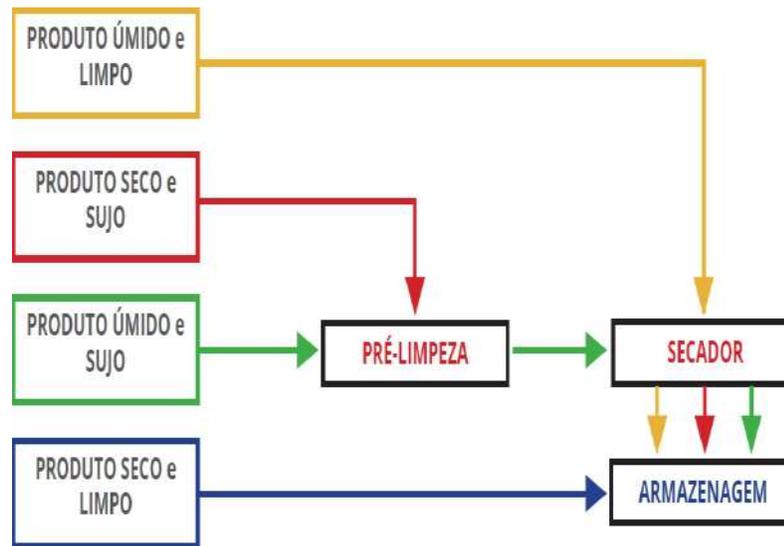


Figure 12 - Diagram of grain storage stages using a conventional system

Losses during storage can occur due to:

- Inadequate unloading of the product in the warehouse, which causes mechanical damage (broken and cracked grains);
- Grain dough with many impurities;
- Grain mass with different water contents;
- Incorrect grain drying; and
- Poor air circulation in the storage area.

Temperature and humidity can be altered to ensure grain quality during storage. Therefore, they must be measured and controlled.



Figure 13 - Factors that most affect grain quality during storage

5.5.2 Importance of water content in stored grains

Water content is an important factor in controlling losses in stored grain. If moisture is kept at low levels, other harmful factors can be easily controlled. Table 1 shows the water content of grain in relation to harvest and storage.

Table 11: Moisture content of some grains in relation to harvest and storage

Percentual de umidade					
Produto	Colheita	Ideal	Armazenamento seguro		
	Máximo	Ótimo	Após secagem	1 ano	5 anos
Café	62	62	12	11	10
Milho	23	20-22	11	11	9-10
Arroz	21	17-19	11	11-12	9-10
Soja	18	16	11	11-12	9-10
Sorgo	26	23-26	9	11-12	9-10
Trigo	23	15-17	8	12-13	10-11

To determine the harvest point for grains, it is necessary to determine their moisture content under field conditions. The result indicates whether they are ready to be harvested and whether or not they will need to have their moisture content reduced through artificial drying for storage.

The recommended moisture contents for manual grain harvesting are shown in Table 2. For most of them, such as rice, beans, and corn, moisture contents range from 18 to 20%.

Produto	Teores de umidade (%)
Arroz	18 a 24
Feijão	16 a 18
Milho	18 a 24
Soja	16 a 18
Sorgo	18 a 20
Trigo	18 a 20
Café	11 a 12

Table 12: Moisture content of grains at harvest

Note: To be stored, harvested grains need to have a moisture content of 12 or 13%, a level achieved by drying in a yard or in a dryer.

5.5.3 Interference of temperature on the quality of stored grains

Temperature increase is another factor that affects grain storage and can be caused by other factors related to quality loss. Therefore, controlling temperature can prevent rapid deterioration.

The heating of stored grain is caused by fungal attack and occurs when the moisture content of the grain is above the correct level for storage, as shown in Table 1.

Note:

1. To control the temperature, it is necessary to have an environment that allows for good air circulation.
2. Grains must be stored with the correct moisture content.

5.5.4 Characteristics of stored grain mass

Grain mass has certain characteristics that can compromise or guarantee its quality and must therefore be observed.

- **Porosity of the mass:** when stored in silos, containers, or bags, grains form a porous mass consisting of themselves and the space occupied by air, which represents around 40 to 45% of the total volume.
- **Thermal conductivity:** grains exchange heat between themselves and their porous mass. Heat passes from a warmer region to a colder one, from grain to grain, as they are in contact (conduction), and through the flow of air passing through the porous mass (microconvection).
- **Grain moisture balance:** Grain moisture remains in balance when there is a positive relationship between relative humidity and temperature. If relative humidity and temperature vary greatly, grains lose or gain moisture according to low or high relative humidity.

Note: To store grain properly, it must be kept under conditions that hinder or prevent the growth of microorganisms and insects that cause loss or damage. To this end, the water content, relative humidity, and temperature must be in balance.

5.5.5 Losses that occur during grain storage

- **Physical loss or breakage:** occurs when the product suffers weight loss due to damage caused mainly by insect attack. Other animals, such as rodents and birds, also cause losses, but these are smaller compared to those caused by insects.



Figure 14 - Grain breakage during unloading

- **Loss of quality:** occurs when the quality of the product changes, mainly due to the action of fungi, which cause fermentation, alter the natural taste and smell of the product, and reduce the nutritional value of the grains.

Contamination by foreign matter and other damage that affects the quality of grains for agribusiness are among the factors that lead to quality losses. Contamination can be biological, physical, or chemical, and can occur alone or in combination.



Figure 15 - Contamination of grains by fungi

5.5.6 Warning signs and damage in grain storage

- Generalized appearance of mold and fermentation;
- Mixture of foreign species harmful to the use of the product; and
- Strange odor, of any nature, inappropriate for the product and harmful to consumption.

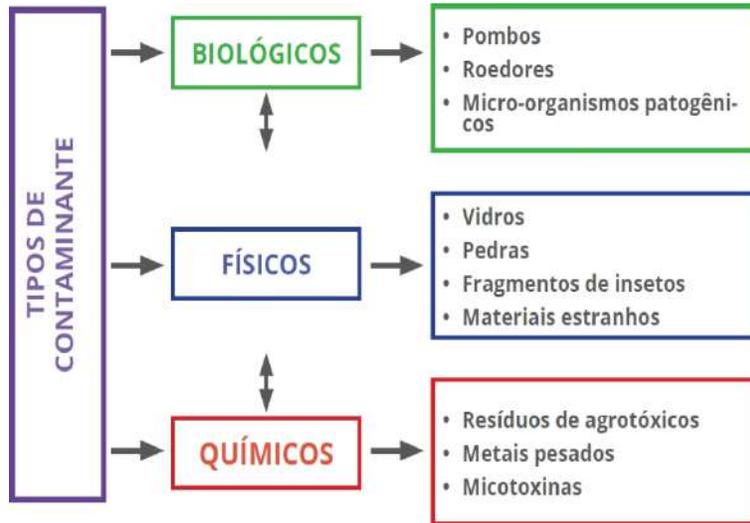


Figure 16 - Biological, physical, and chemical contaminants in stored grains

5.5.7 Contaminants in the external environment of the grain storage unit

It is necessary to identify and control possible contaminants that influence the quality and isolation of stored grains. Therefore, monitoring and control actions must be planned.

Table 13: Identification of biological hazards in post-harvest and grain storage

ÁREA DAS UNIDADES ARMAZENADORAS (Entorno do paiol, solo, galpão etc.)			
PERIGO BIOLÓGICO	<i>Salmonella</i> <i>Coccidiose*</i>	SEVERIDADE MÉDIA	RISCO ALTO
JUSTIFICATIVA - Presença de fezes de aves (pombos*)			
MEDIDAS PREVENTIVAS			
<ul style="list-style-type: none"> • Colocar telas para evitar a entrada de aves na unidade armazenadora • Evitar grãos esparramados no pátio da unidade armazenadora 			
PERIGO BIOLÓGICO	LEPTOSPIROSE	SEVERIDADE MÉDIA	RISCO ALTO
JUSTIFICATIVA - Presença de urina e fezes de ratos			
MEDIDAS PREVENTIVAS			
Controlar insetos e roedores (MIP)			

5.5.8 Insects and pests

Insects that attack grains during storage can be classified as:

- **Primary pests**

Primary pests attack and infest undamaged grains and also feed on damaged ones. Most of them can begin their infestation and attack in the field, before harvest.

- **Secondary pests**

Secondary pests attack the interior of damaged or already attacked grains.

5.5.9 Factors that contribute to insect pest attacks

High temperatures and high humidity increase infestations of primary and secondary pests.

Combined conditions of temperatures between 25 and 34°C and about 70% relative humidity are considered risky.

While the moisture content of stored grain can be a risk for pest attack, it is also important to prevent infestation in the grain mass. Dry grain, with a moisture content of less than 12%, does not allow the development of most insect pest species, with the exception of a few, such as stem borers, which attack exceptionally dry grains with less than 8% moisture.

Table 14: Types of pests that can affect grain

PRIMARY PESTS				
TYPE OF PEST	CHARACTERISTICS	PREFERRED CROPS	DAMAGE	IMAGE
<p>Grain weevil <i>(Sitophilus spp.)</i></p>	<p>This is one of the most dangerous pests for all types of grain. It is characterized by a narrow, pointed snout (rostrum), which is an extension of the head, and has a brown body.</p> <p>nose (rostrum), which is an extension of the head, and has a brown bronze or dark brown body.</p>	<p>They attack cereals, mainly corn, sorghum, rice, and wheat. They do not attack small grains such as millet, as their larvae do not develop well. They also feed on dried cassava and processed food.</p>	<p>Infestation usually begins in the field, when eggs are laid in undamaged grain. After harvest, the infested grain is transported to the warehouse, where the larvae emerge, leaving a characteristic hole. Both the larvae and the adult insects cause damage, but the larvae are responsible for most of the economic losses.</p>	
<p>Grain weevil <i>(Prostephanus truncatus)</i></p>	<p>Native to Central America, this beetle is one of the most important pests that attack stored grain in tropical and subtropical regions. It is dark brown or black in color and also feeds on corn stalks, ear and wood debris, and dry foods.</p>	<p>It is a highly destructive primary pest for corn, especially for the product stored in cobs. Its damage has been so high that storage in cobs is no longer encouraged in some places and has been replaced by straw-free storage, previously treated. The corn borer</p>	<p>Infestation usually begins in the field before harvest and continues during storage, especially in corn still with straw. Both the adult beetle and the larva enter the grain and produce large amounts of dust. On average, losses can reach 30% of stored corn.</p>	

		<p>The beetle can also feed on dried cassava and flour products.</p>		
<p>Grain beetle <i>(Rhyzopertha dominica)</i></p>	<p>Originally from South America, it is now found in all warm and humid climates around the world. This small brown or black weevil is very voracious.</p>	<p>It is a devastating pest of most cereal grains, including millet, although it is not very common in rice.</p> <p>It also feeds on cassava and other starchy products.</p>	<p>The infestation begins in the field and the larva, introduced into storage systems storage systems, attack the interior of the grains, where they develop.</p> <p>Adult insects and larvae pierce the grains and feed on the endosperm. This process causes a lot of dust, which, when present, can be an indication of high infestation. The grain beetle has a long life cycle and destroys a quantity of grains equivalent to its body weight every day.</p>	

<p>Cereal moth <i>(Sitotroga cerealella)</i></p>	<p>This insect attacks crops after harvest and is very common in grain storage facilities, especially right after harvest. It reaches a size of 12 to 14 mm, and the larvae feed and transform inside the grains.</p>	<p>Like the grain beetle, this is a pest that attacks all major grains, including wheat, barley, corn, sorghum, and millet; it also causes great damage to rice in husk, and can cause substantial damage to its germ</p>	<p>It attacks ripening grains while still in the field and is usually transported inside them to storage facilities</p> <p>After incubation, the larva penetrates the grain and completes its development. Infestations produce a lot of heat and moisture, which promote the proliferation of fungi, as well as secondary pests.</p>	
<p>Bean weevil <i>(Callosobruchus maculatus)</i></p>	<p>This is a brownish-red beetle of the dry bean weevil family. Although it is essentially a field pest, the eggs and larvae are transported inside the beans after harvest to the warehouse.</p>	<p>Legumes such as beans, soybeans, chickpeas, and string beans are susceptible to attacks by borers in general and bean weevils in particular.</p> <p>This weevil is also an important pest that infests cereal feed, animal meal, flours, and milling residues with high protein content.</p>	<p>The bean weevil generally attacks dried legumes. Infestation can begin in the field where eggs are laid in pods in the process of ripening. In the larval stage, the damage can affect 90% of stored legume grains. The infestation cycle can be broken by crop rotation, to avoid growing the same species in the same area for consecutive years.</p>	

SECONDARY PESTS

<p>Brown beetle (<i>Tribolium</i> spp.)</p>	<p>Found in the main tropical and subtropical regions.</p> <p>It is a reddish-brown beetle and the larvae are whitish-yellow.</p>	<p>It attacks corn, peanuts, rice, beans, chickpeas, sorghum, and wheat.</p> <p>It prefers damaged grains, but can also attack whole wheat grains.</p>	<p>Both adult beetles and larvae feed first on the germ and then on the endosperm. This pest spreads, generally in storage conditions with uncontrolled uncontrolled temperature and humidity, which are conducive to the proliferation of insects that increase the temperature of the grain mass.</p>	
<p>Flour moth (<i>Epehstia</i> spp.)</p>	<p>This insect is common in stored products and storage facilities in various climates. The upper half of the front is bronze, silver, or dark gray, and the upper half of the rear part is gray with a yellowish tint and a black band at the point where between the two parts.</p>	<p>It attacks all types of dry grains, such as corn, rice, and wheat.</p>	<p>The larva feeds externally on grains, but most damage is caused by contamination with massive amounts of silk threads expelled by the larva, which also accumulates feces, films, and eggshells.</p>	

<p>Termites <i>(Macrotermes sp.)</i></p>	<p>This is a common name for numerous species of social insects that can cause damage to stored grains and wooden structures, such as furniture or wood-covered parts in buildings.</p>	<p>They feed mainly on cellulose. These insects attack various crops such as corn, sorghum, sugarcane, forest plantations, among others. They attack corn crops after sowing, destroying them before germination and causing failures in this process. The roots of corn and sorghum can be attacked, causing the plants to turn yellow, wither, and die.</p>	<p>They are very large because they affect not only the stored product, but also the storage infrastructure itself.</p> <p>Although termites do not specifically seek out grain (they only eat the grain they find in their path), they can seriously damage storage structures built with grass, twigs/branches, wood, or mud, which can collapse and result in significant losses.</p>	
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5.5.10 Integrated Pest Management (IPM) for insect control in storage facilities

IPM considers all available insect pest control techniques, which are combined to reduce pest development and attack. IPM reinforces the application of healthy techniques with the least possible damage to agroecosystems and encourages natural insect pest control techniques.

Pest control may include the use of predators, parasites, sterile male insects, or generating diseases in insects. Pheromones are also used for pest monitoring, to interrupt mating, or as traps.

The wide availability of insecticides often results in their excessive use and dependence on them, detracting from the importance of other pest control and management techniques, such as:

- **Pest management during pre-storage**

Pest control in storage facilities begins when the crop is still in the field. To reduce the risk of transporting primary pests from the field to storage, it is necessary to adopt certain procedures, such as grain drying and quality control, among others.

- **Cleaning and drying**

Try to clean and dry the grains whenever they come out of the fields, especially when they have to be stored for a long period.

- **Quality control of grain to be stored**

Grains must be stored in good quality and sanitary conditions, avoiding those that are infested, mixed (with other species), or damaged.

- **Storage management**

Pest development and control should be monitored by the location of storage units, the storage period, and the quality of stored products.

- **Cultivation of resistant varieties**

The use of resistant varieties generally delays infestation and damage to grains, prolonging the period during which the level of damage remains low.

Corn varieties cover the entire cob, providing good protection against weevils. The use of a particular variety needs to be carefully considered,

as high-yield varieties are more susceptible to damage by insect pests in storage units.

- **Natural insecticides**

Natural insecticides include materials such as abrasive mineral dusts, natural desiccants such as wood ash, plant materials with repellent or insecticidal properties, such as parts of the Indian neem tree (*Azadirachta indica*), or vegetable cooking oils (peanut or coconut oil).

6 CHARACTERIZATION OF ENVIRONMENT AFFECTED BY THE PROJECT

6.1 GENERAL CONSIDERATIONS

This chapter presents a description of the current environmental and social situation in the study area.

The purpose of characterizing the baseline situation is to obtain an adequate information base for assessing the environmental and social impacts caused by the Project.

The following points present analyses of the project's area of influence and characterize the baseline situation for climate, geology and geomorphology, soils and land use, surface and groundwater resources, flora and fauna, Landscape, Air Quality, Sound Environment, Socio-economic, Infrastructure, Land Use Planning, Historical and Cultural Heritage, and Waste.

6.2 DEFINITION OF THE PROJECT'S AREA OF INFLUENCE

The delimitation of the areas of influence of the project is the result of the territorial spatialization of the direct and indirect impacts resulting from its implementation and operation, considering the physical, biotic, and socioeconomic environments.

They are defined as follows:

- **Directly Affected Area (ADA)** - the Directly Affected Area (ADA) is considered to be the area of the project, including its support structures, private access roads, expanded or renovated, as well as all other unit operations associated exclusively with the project's infrastructure, i.e., for the private use of the project.
- **Directly Affected Area (DAA):** area subject to the direct impacts of the preparation and operation stages of the unit where the agricultural infrastructure (silos) will be installed. Its delimitation is based on the social, economic, physical, and biological characteristics of the systems to be studied and the particularities of the project.
- **Indirect Area of Influence (IAI):** the area that is actually or potentially threatened by the indirect impacts of the preparation and operation of the project where the

agricultural infrastructure (silos) will be installed, covering the ecosystems and socioeconomic system that may be impacted by changes occurring in the AID.

- **Regional Area of Influence (RAI):** refers to the geographical space and socioeconomic sectors that are directly or indirectly affected by the planning and management activities of the agricultural infrastructure (silos) project. This concept is fundamental to understanding the scope of the policies implemented and to ensuring an integrated and efficient approach.

The definition of geographical boundaries under the influence of a given activity is one of the requirements for assessing environmental impacts and is a determining factor for the other activities necessary for preparing the environmental diagnosis and prognosis.

The delimitation of study areas is related to the identification of spaces subject to the influences of potential impacts associated with an environmentally modifying project. As a result, the task of delimiting these areas requires preliminary knowledge of the type and nature of the planned project, in order to identify the actions that significantly affect the physical, biotic, socioeconomic, and cultural environmental components during its implementation and operation.

Thus, the identification of study areas guides, first, the environmental diagnosis phase, serving to delimit the scope of work for all disciplines involved in the Environmental and Social Impact Assessment (ESIA). Second, the areas studied allow for the investigation of the spatial extent of the adverse or beneficial effects associated with the project.

6.2.1 Directly Affected Area (DAA)

The Directly Affected Area (DAA) corresponds to the area that suffers the greatest impact from the activity, considering physical, biological, socioeconomic changes, and the particularities of the activity.

The silo construction project will be located mainly in a peri-urban area of the municipality of Caála, in the province of Huambo, Angola.

6.2.2 Area of Direct Influence (ADI)

The Direct Area of Influence is the geographical area that will be affected by the impacts resulting from the project activities and corresponds to the contiguous and expanded territorial space of the ADA, and as this is likely to result in positive or negative impacts. For the physical, chemical, and ecological environments, the DIA is considered. Within a radius of 500 meters, the project covers the north, east, and west by Terreno Baldio, and the south by the EN120.

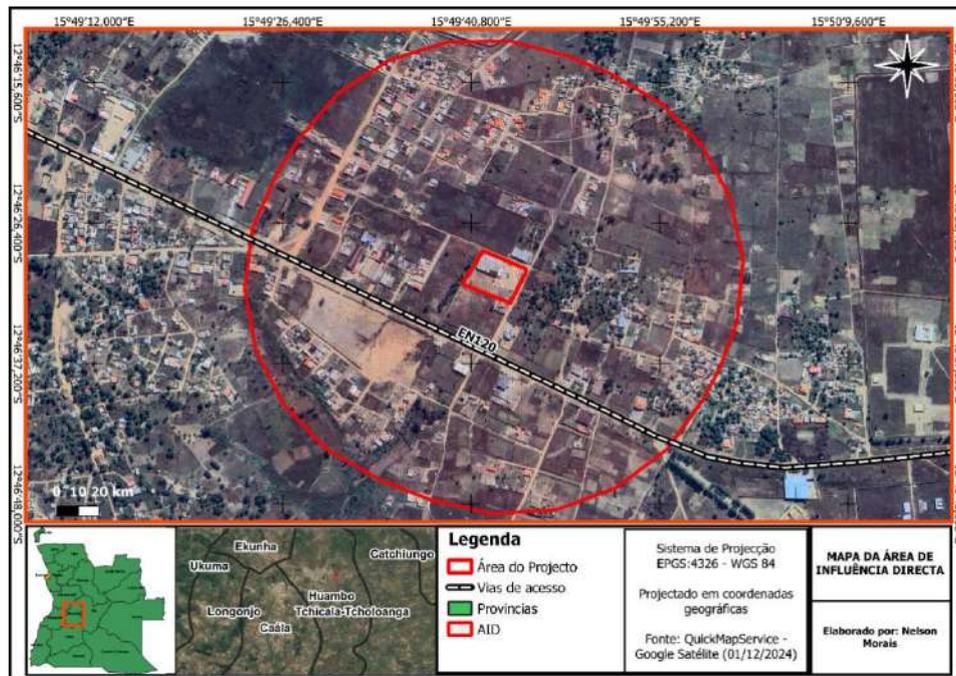


Figure 17 – Map of the direct area of influence.

6.2.3 Indirect Area of Influence (AII)

The Indirect Area of Influence (IAI) is generally a more comprehensive area where the influences of the proposed activities can be felt, not directly, but through the possible secondary effects that may result from the project.

Thus, the IIA includes the accesses to be used and, more generally, at a higher level, the area occupied by the project.

Within a radius of 10 kilometers, the project covers the municipality of Ekunha to the northeast, Baldio land to the south, Baldio land to the east, and the municipality of Longonjo to the west.

Figure 18 illustrates the Direct Influence Area and the Indirect Influence Area.

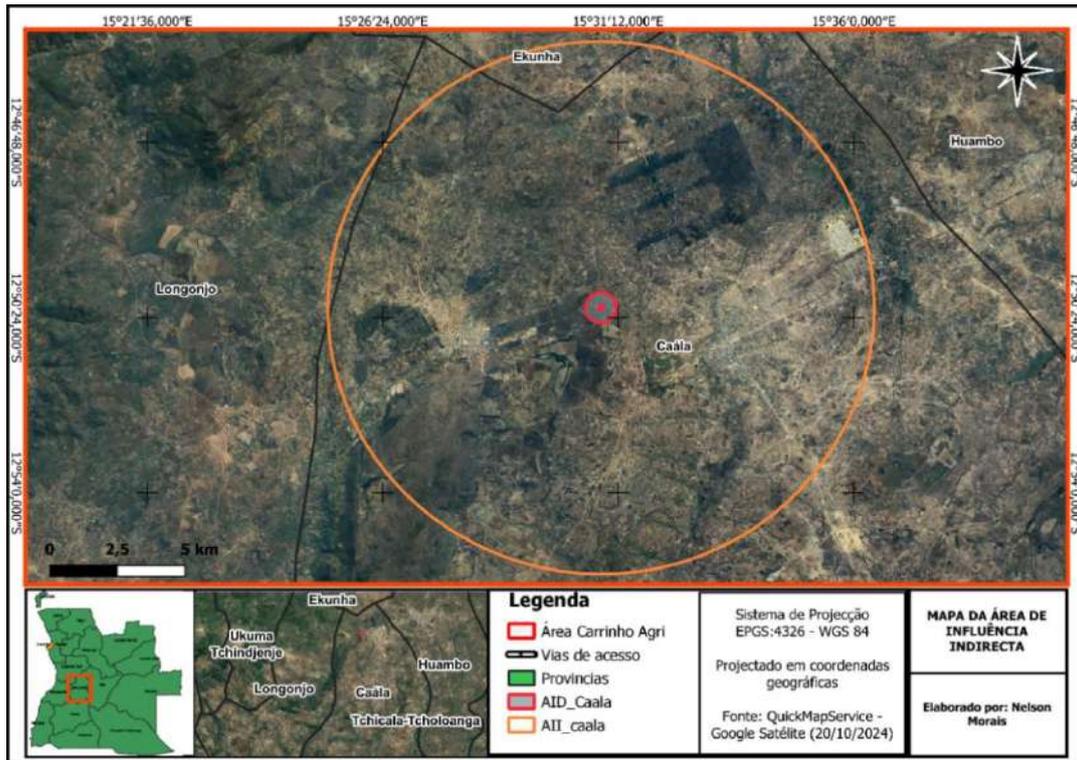


Figure 18 – Map of the indirect area of influence.

6.2.4 Regional Area of Influence (RAI)

The Regional Area of Influence generally refers to the entire geographical area and socio-economic sectors that are directly or indirectly affected by the storage and transport of grain to and from the unit, as well as all locations that will supply this raw material, covering the entire surrounding region of Huambo Province.

6.3 CLIMATE

6.3.1 General Considerations

Angola's climate is characterized by a dry and cool season (cacimbo), from June to the end of September, and a rainy season, from October to the end of May (Ministry of Urban Planning and Environment, 2006).

There is a clear association between rainfall in inland Angola and the southward movement of the equatorial trough from September to January, and also with its northward movement from January to May, bringing unstable tropical air with strong convergence at lower levels over much of the territory. This gives rise to very

with cumulus, cumulonimbus, altocumulus, and altostratus clouds that cause rain in the form of very frequent and intense showers and thunderstorms. Local climatic factors must also be taken into account, such as the relief, which, acting in conjunction with general conditions, determines the specific characteristics of different areas.

The dry season, from May to August, corresponds to the action of the anticyclonic core of the African continent, transporting dry and stable continental air from the Kalahari over Angolan territory, with temperature inversions in the lower layers.

The average annual temperature varies between 15-20 °C in the central plateau and the Namibe desert, and between 25 °C-27 °C in the Congo River basin region and the sub-coastal strip in the north of the country (Ministry of Urban Planning and Environment, 2006).

6.3.2 Climate Classification

Köppen's climate classifications highlight the diversity of climates found in Angola.

According to the Köppen-Geiger climate classification, Angola has several types of climates, which can be distributed according to their representativeness, as illustrated in Table 12.

Table 15: Köppen classification: territorial distribution

CLIMATE TYPE (KÖPPEN)	AREA (km ²)	% TOTAL
Aw – Tropical rainy climate	492,660	39.5
BSh – Dry steppe climate	122,000	9.8
BSh' – Dry steppe climate	69,500	5.6
BWh – Arid desert climate	25,840	2.1
BWh' – Dry desert climate	30,200	2.4
CWa-Mesothermal, humid climate with dry winters	374,930	30.1
CWb – Temperate climate with dry winters and hot summers	131,570	10.5
TOTAL	1,246,700	100

Source: (Azevedo, 1972)

6.3.3 Characterization of the Local Climate

The Köppen climate classification was used for the climate analysis of the implementation area. The Köppen classification directly relates climate classes to

natural vegetation cover, which allows for global climatological mapping, including regions where there are no meteorological observations. The Köppen system defines five main climate regions and several sub-regions. In the Köppen system, the different classes are defined based on the annual cycle of average monthly temperatures. The definition of sub-regions, in turn, uses the annual cycle of precipitation and monthly temperature.

In this context, according to Köppen, the municipality of Caála has a subtropical highland climate, which covers the project area, as shown in the figure below.

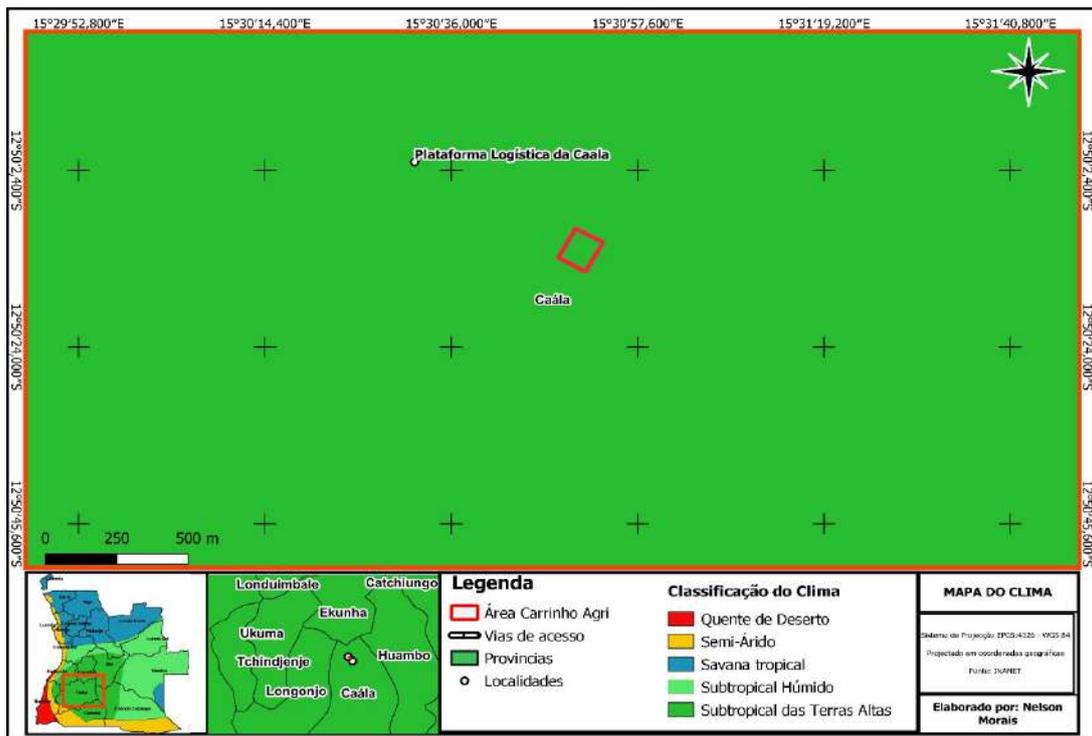


Figure 19 – Climate map.

6.3.4 Temperature

The spatial distribution of air temperature in a region is essentially conditioned by local physiographic factors, which are generally associated with aspects such as relief (altitude and exposure), soil type and cover, proximity to large bodies of water, and wind patterns.

The province of Huambo has average annual temperatures ranging from 18°C to 23°C throughout the year, although the average daily maximum temperatures are between 25 and 27°C and the average minimum temperatures are between 11 and 13°C. The higher and southernmost regions are slightly cooler than other areas of the province. September and October are the hottest months, and June and

July are the coolest. Occasionally, frost occurs in July and August in the lower valleys and depressions.

The project is located in a region with an average annual temperature of 20°C-22°C. The hottest month of the year is March and the coldest month is July, with an average temperature of 19°C.

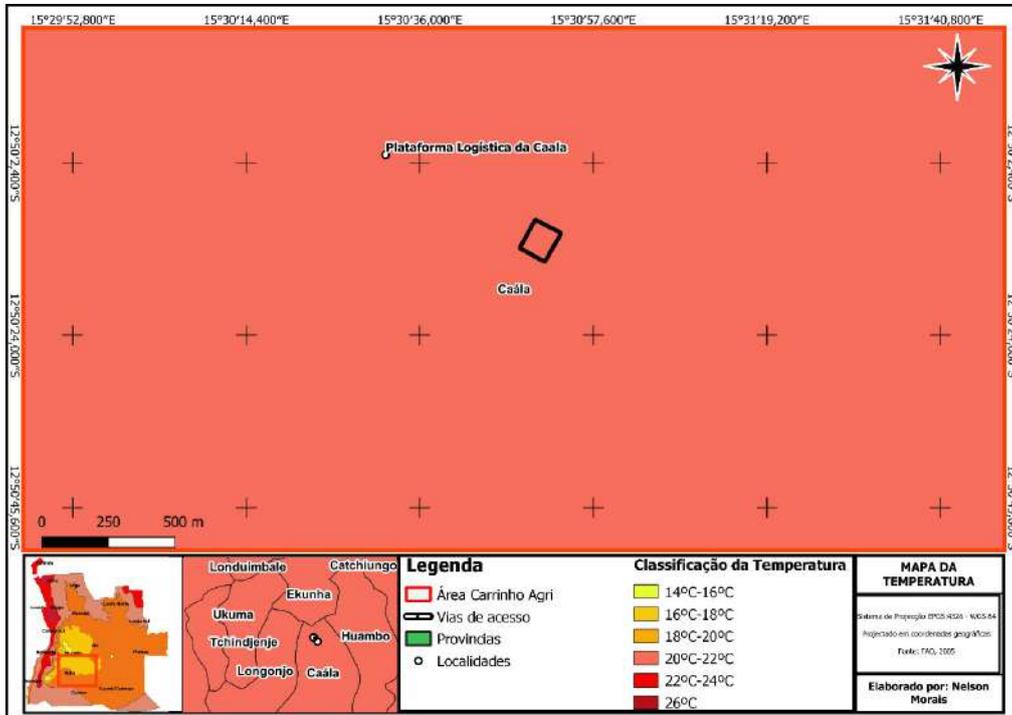


Figure 20 – Temperature map.

6.3.5 Relative air humidity

We base the level of humidity comfort on the dew point, as it determines whether perspiration will evaporate from the skin and consequently cool the body. Lower dew points cause a feeling of greater dryness. Higher dew points cause a feeling of greater humidity. Unlike temperature, which generally varies significantly from day to night, the dew point tends to change more slowly. Thus, while the temperature may drop at night, a muggy day is usually followed by a muggy night.

The relative humidity in the municipality of Caála, Huambo province, shows marked seasonal variations, influenced by the tropical highland climate typical of Angola's central plateau region. During the rainy season (October to April), relative humidity is generally high, with average values between 70% and 90%, due to greater cloud cover

and the frequency of precipitation. This humid environment favors plant growth, but can also contribute to the spread of fungi and agricultural pests.

In the dry season (May to September), especially in the cacimbo months (June to August), relative humidity decreases, ranging between 40% and 60%, with cool mornings and dry, sunny afternoons. This reduction in humidity makes the air drier and can impact both the thermal comfort of the population and the development of agricultural crops that depend on supplemental irrigation.

Relative humidity is therefore an important climatic factor in Caála, directly influencing agriculture, public health, and soil water availability, and it is essential to consider it in agricultural management practices and urban planning.

6.3.6 Precipitation

Precipitation is one of the meteorological variables that shows great temporal and spatial variability. This variable is also interesting because the amount and distribution of precipitation that occurs annually in this region influences the behavior of various environmental parameters.

Precipitation in Angola is influenced by the South Atlantic high pressure center, the cold Benguela Current, and altitude. Average annual precipitation decreases from north to south and increases with altitude and distance from the sea. The highest average annual precipitation is 1,750 mm and occurs on the plateau, and the lowest is 100 mm in the desert region of Namibe.

A day with precipitation is considered to be one with a minimum net precipitation or net equivalent of 1 millimeter. The probability of days with precipitation in Huambo varies markedly throughout the year.

The wet season lasts 6.0 months, from October 11 to April 12, with a probability of over 36% that a given day will have precipitation. The month with the highest number of days with precipitation in Huambo is November, with an average of 20.5 days with at least 1 millimeter of precipitation.

The dry season lasts 6.0 months, from April 12 to October 11. The month with the fewest days of precipitation in Huambo is July, with an average of 0.0 days with at least 1 millimeter of precipitation.

Among the days with precipitation, we distinguish between those with only rain, only snow, or a mixture of both. The month with the most days of rain only in Huambo is November, with an average of 20.5 days. Based on this classification, the most common form of precipitation throughout the year is rain only, with a maximum probability of 71% on November 26.

The precipitation in the project area has an average annual rainfall of 1250 mm – 1500 mm. In terms of monthly precipitation, the month with the highest rainfall is April, with an average of 159 mm, and the dry months are June, July, and August, with 0 mm of precipitation. The variation between the highest and lowest precipitation throughout the year is 159 mm.

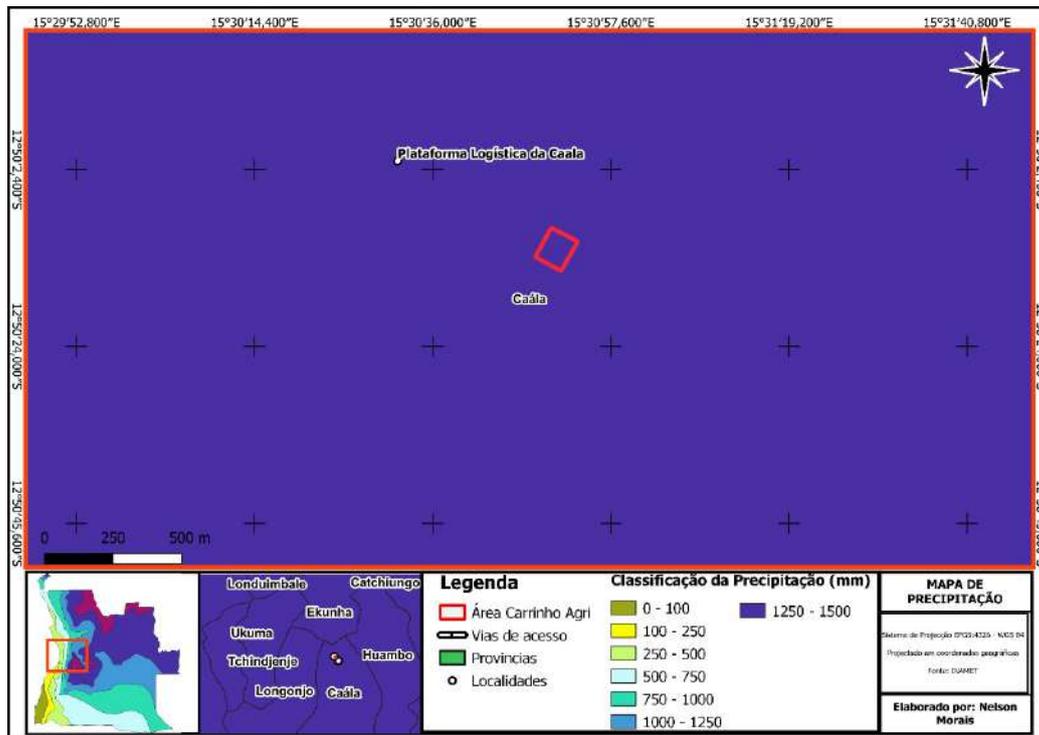


Figure 21 – Precipitation map.

6.3.7 Evaporation and Evapotranspiration

Evaporation is represented in mm, corresponding to the height of water that evaporates from an open tub exposed to the air. Average annual evaporation varies over a given period of time. Evaporation affects local evapotranspiration, which manifests itself through the transfer of water stored in the soil or in water sources to the atmosphere through vaporization and transpiration of plants and water present in the soil.

Evapotranspiration is characterized by two different concepts: actual evapotranspiration—total water loss through evaporation from the soil and transpiration from plants; potential evapotranspiration—maximum water loss from soil with uniform green vegetation cover and assuming a uniform saturation stage.

Evapotranspiration in the municipality of Caála, Huambo province, is mainly influenced by the tropical highland climate, the season, and the local vegetation cover. On average, annual potential evapotranspiration varies between 1,000 mm and 1,400 mm, being more intense during the dry season, especially between May and September, when solar radiation is high, the air is drier, and winds contribute to water loss from the soil and plants.

During the rainy season (October to April), although temperatures are high, actual evapotranspiration tends to be more balanced due to the greater availability of water in the soil and high relative humidity, which slightly reduces water loss. However, even during this period, evapotranspiration continues to play a key role in the water balance, directly affecting the growth of agricultural crops and the flow of watercourses.

6.3.8 Cloud cover

Cloud cover is defined as the fraction of the open sky covered by clouds. Cloud cover is expressed in tenths (by whole numbers from 0 to 10). With 0 representing clear skies and 10 representing completely overcast skies

Cloud cover in the municipality of Caála exhibits seasonal behavior, strongly influenced by the tropical high-altitude climate characteristic of the region. During the rainy season (October to April), cloud cover is high, with the sky often cloudy or overcast due to the constant presence of cumuliform clouds associated with convection and precipitation. During this period, there is a reduction in direct solar radiation and milder average temperatures during the day.

During the dry season (May to September), especially in the rainy months (June to August), cloud cover tends to decrease, although morning fog and partly cloudy skies are common, caused by cold, humid air masses coming from the south. However,

throughout the day, the sky usually becomes clearer, with predominantly clear or slightly cloudy skies.

Variations in cloud cover directly affect the local microclimate, influencing factors such as daytime temperature, photosynthesis of agricultural crops, and solar energy availability. In practical terms, cloud cover has implications for agriculture, urban planning, and energy, especially in systems that depend on solar radiation.

6.4 GEOLOGY AND GEOMORPHOLOGY

6.4.1 General considerations

The purpose of this descriptor is to present the geological and geomorphological framework of the area where the Huambo grain silos are located.

The analysis in this descriptor is based on a field survey of the site, carried out in August 2024.

6.4.2 Geological Framework

The geological framework of the AID was established based on available cartography (Geological Map of Angola at a scale of 1:1,000,000, Sheet 3), photographic records of the terrain, and bibliographic research.

The geology of Angola can generally be divided into sedimentary rocks (usually easily resistant and "soft") and crystalline rocks (usually difficult).

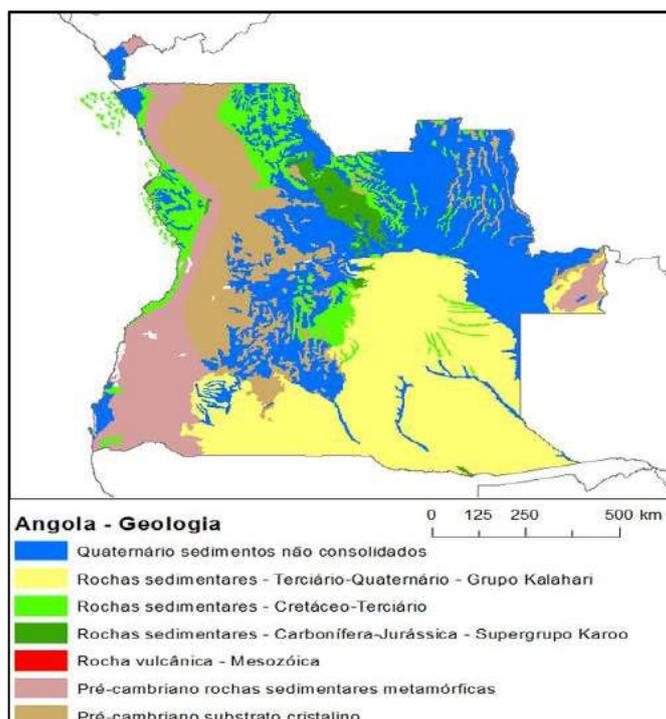


Figure 22 - Geological map of Angola

The municipality of Caála is geologically located in the Angola Shield of the Angolan platform and has formations ranging from the Archean to the Phanerozoic. The Lower Archean was subdivided into two groups: Lower and Upper.

The formations that most commonly outcrop in the municipality of Huambo are:

- Undifferentiated Quaternary;
- Upper Archaic; and
- Lower Archaic.

Based on the Geological Map of Angola, the project area is covered by the Lower Archaic Formation.

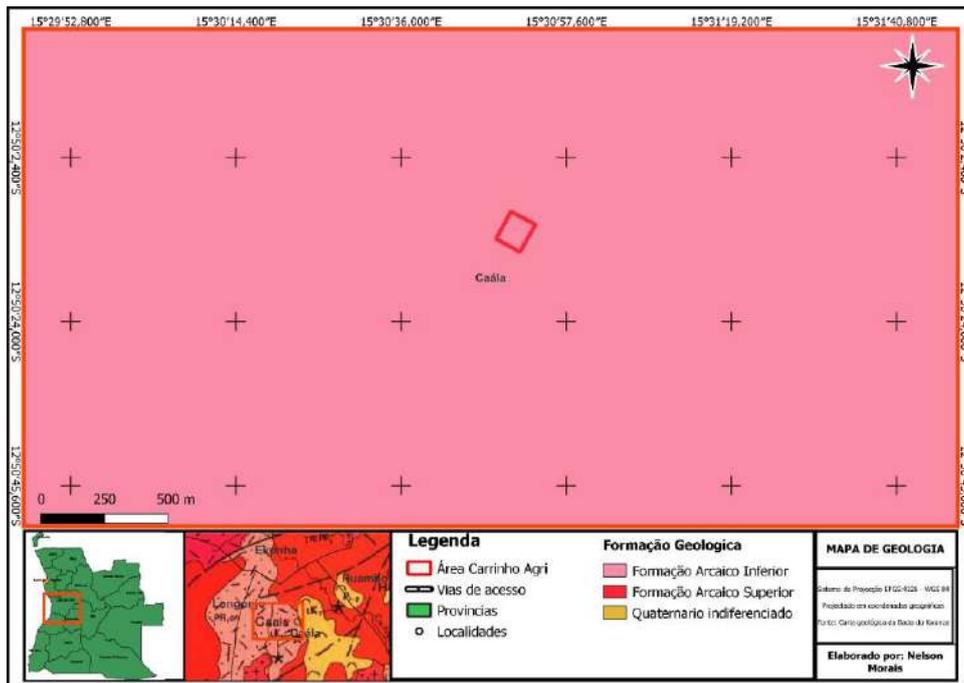


Figure 23 – Geological map.

6.4.3 Geomorphological Context

According to Diniz (1998), in Angolan territory it is possible to consider 11 geomorphological units.



Figure 24 – Main geomorphological units of Angola (according to Diniz)

1. **Coastal Strip.** Encircling the platform, which stretches almost continuously along the coast at average altitudes of 150 m to 250 m, reaching three hundred meters or more at some points in the inner periphery, gently sloping down to the coastline where it ends, for most of its length, in a sea cliff with drops of around 100 to 150 m. The discontinuity of the platform is solely due to the action of rivers that have carved out wide, deep valleys where extensive river plains are found.
2. **Subplateau Strip.** An intermediate surface marking the transition to the plateau interior, which runs from north to south of the territory at average altitudes between 400 and 600 m, from which frequent residual landforms rise, from hill islands, protruding platforms delimited by escarpments, steps or dismantled forms, and even mountain ranges, whose names sometimes reach altitudes of 1000 m.
3. **Marginal Mountain or Marginal Mountain Range.** Marking the western limit of the Angolan interior plateau, it corresponds to a mountainous range of residual levels, whose tops, still somewhat impressive, reach 2100-2200 m, with the highest point at Morro do Môco, at an altitude of 2620 m.
4. **Ancient Plateau.** An extensive plateau reaching an altitude of 1,750-1,800 m, forming a line that defines very gentle slopes on either side, stretching for hundreds of kilometers and through which rivers meander in very wide valleys, almost at the level of flattening. The monotony of the peneplain is only interrupted by the altiplanic platforms and frequent island hills that are residual relics of other older peneplains.
5. **Lower Cunene.** A flattened or gently undulating surface that, in the continuity of the Old Plateau, slopes from 1,400 m to 1,000/1,100 m at the southern border, with the main watercourses converging on the interior basin of Etocha Pan, except for the Cunene, which, thanks to its capture in Ruacaná, has diverted to the Atlantic. Largely filled with recent sediments, the surface is generally poorly drained, with part of the water being retained in a multitude of small inland basins.
6. **Upper Cuanza.** The upper Cuanza basin stands out on the interior plateau, at average altitudes of 1,200 to 1,500 m, as it corresponds to a very slow-flowing hydrographic network, giving rise to large flooded areas during the rainy season that remain flooded for many months.

7. **Malange Plateau.** A flat or gently undulating plateau at medium altitude (1,200 to 1,250 m), which separates the Cuango river system to the east from the rivers of the Atlantic slope on the opposite side. While the Lucala, an important tributary of the Cuanza, flows across the plateau and plunges spectacularly over a hundred meters in height onto the lower sub-plateau surface (Calandula Falls).
8. **Zaire plateau.** Extensive sandy surface that slopes sharply northward, from average altitudes of 1,200 m along its edge to 500 m in Cuango, deeply dissected by deep, roughly parallel valleys, all of which flow into the Zaire basin as they converge on its tributary, the Cassai.
9. **Cassange Lowlands.** An area that is several hundred meters lower than the surrounding plateau, its boundary largely defined by a steep escarpment. On the other hand, the spectacular residual reliefs that rise from the flatness are nothing more than scattered remnants of the primitive plateau peneplain.
10. **Zambezi-Cubango peneplain.** Extensive sandy surface encompassing the Zambezi and Cubango basins, both of which are part of the same peneplain, which slopes gently southward (1,200/1,300 m – 1,000 m), where the rivers, defining very open valleys, are drawn, so to speak, at the level of the flatness, circulating very slowly in winding beds, in addition to interspersing, at times, extensive areas of difficult drainage, where the waters are retained for extended periods.
11. **Upper Zambezi Massif.** A geomorphological unit distinguished by its integration into the Calunda mountain massif, which is notable not for the differences in altitude between the flat area (1,150 m) and the highest points (around 1,612 m), which are relatively modest, but rather because it rises majestically on the horizon, after almost a thousand kilometers of flatness without any other orographic feature breaking the monotony of the landscape.

6.4.4 Local Geomorphology

From a geological point of view, the municipality is characterized by Proterozoic eruptive rocks, with medium and acidic composition. The dominant soils have variable fertility, which decreases as one moves inland, especially in the easternmost area.

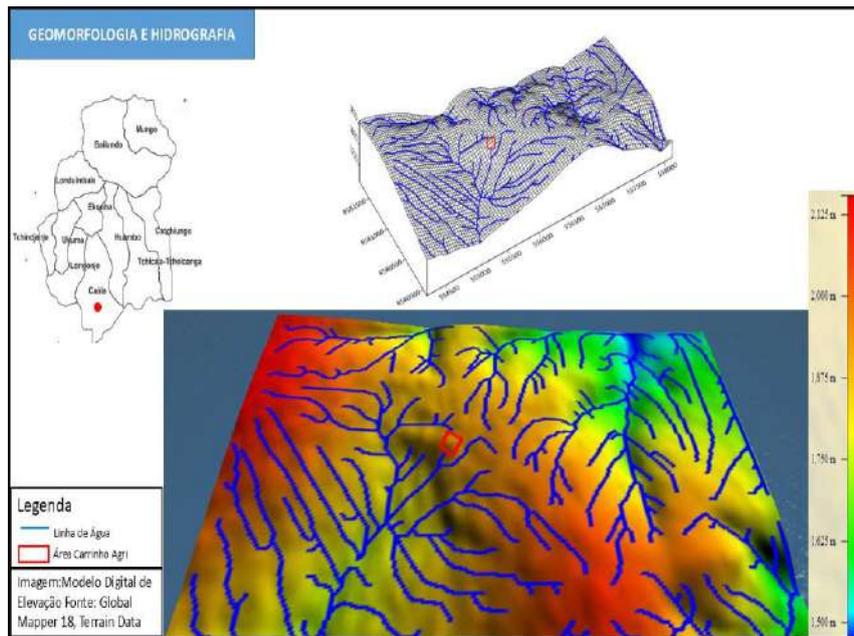


Figure 26 – Geomorphology and hydrography map.

6.5 SOILS AND LAND USE

6.5.1 General Considerations

The purpose of this descriptor is to characterize the soil at the site where the grain silo project will be implemented, hereinafter referred to as the study area.

The analysis of this descriptor was based on a field survey of the site, carried out in August 2024.

6.5.2 Soil Characterization

Angola's soils are characterized by a high percentage (around 50%) of soils that are constantly or periodically subject to erosion processes.

Soil erosion in Angola causes a total loss of soil of around 20 million tons per year, equivalent to the loss of the possibility of feeding 50,000 people per year. According to the same source, the amount of plant nutrients lost annually is around 1,200,000 tons of organic matter, 60,000 tons of nitrogen, 4,500 tons of potassium, and 500 metric tons of phosphorus. Soil erosion causes the denudation of mountains and hilltops, reduces soil depth and alters its structure, and decreases organic matter in the soil, thus reducing water retention capacity with consequent silting of nutrients and associated soil acidification. Rainfall often causes serious erosion

and subsequent sedimentation of soil in streams and rivers, which eventually flow into the Indian and Atlantic oceans (Source: UNDP-AngolaLDCSIDS-SLM-draft of November 12, 2007-PORTUGUESA).

In dry regions with a desert climate, soils are generally very thin and infertile. In large sedimentary basins, climatic conditions of precipitation and temperature, and the lithology of the materials, are conducive to the development of thick soils.

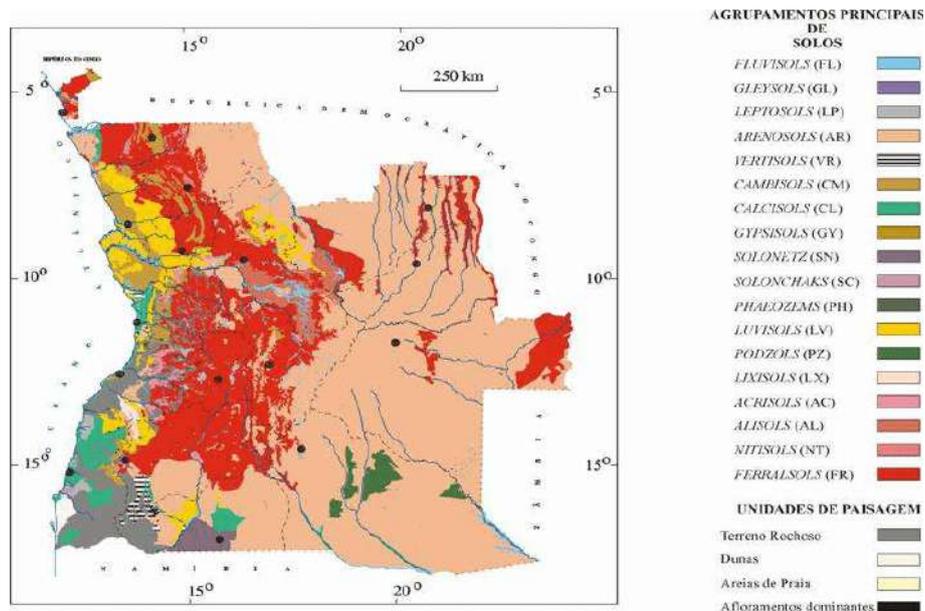


Figure 27 - Generalized map of Angola's soils

6.5.3 Characterization of local soil

Angola's territory has different soil conditions and is influenced by several factors, namely: climate, relief, lithology, and human activity. The soils of the different regions have specific characteristics, as well as features that are unique worldwide.

There are two dominant soil types in Huambo: ferralitic soils at higher elevations and alluvial fluvial soils at lower elevations, mainly along drainage lines. However, most of the alluvial soil pockets are small and too localized to be mapped. Ferralsols are derived from the aging of underlying rocks, but they also originate from Kalahari sediments deposited here by wind and water many years ago.

Ferralsols dominate the province, but produce little in agricultural terms because the soils are permeable, with low water retention capacity. This permeability combined with high rainfall results in leaching with the consequent rapid loss of mineral nutrients and organic matter from the soil.

Despite the low nutrient levels and poor water retention that limit the potential of ferralsols for agricultural production, average yields can be achieved with the appropriate use of fertilizers, manure, and other measures to increase the organic and mineral content of the soil.

But without such interventions to improve the soil, the average corn yield on Huambo's ferralsols is only about 300 kilograms per hectare.

The higher concentration of organic matter means that soils along rivers have a high capacity to retain water, and farmers use various irrigation techniques to manage these water levels during the dry and rainy seasons. However, some areas of alluvial soils are poorly drained and therefore too waterlogged for agriculture. Corn yields on alluvial soils can reach 1,000 kilograms per hectare, about three times more than on ferral soils.

There are several other types of soils in Huambo. Phaeozem soils are characterized by surface layers rich in humus or decomposed plant material, making them very suitable for agriculture and pastoralism.

The upper layers of Umbrisol soils are dark as a result of accumulated organic matter, and these soils also have high potential for agriculture. In contrast, shallow leptosols have a high gravel or stone content, which limits their potential for agriculture. Just west of Ussoque there is an area of acrissols, which are rich in clay and typically occur in humid tropical environments, as can be seen in the figure below.

Soil is the surface layer of the Earth's crust and is a complex mixture of mineral and organic matter resulting from the decomposition of rocks by physical, chemical, or biological agents that give rise to the mineral components of the soil.

The predominant soils in the project implementation area are ferralitic and para-ferralitic, as can be seen in the figure below.

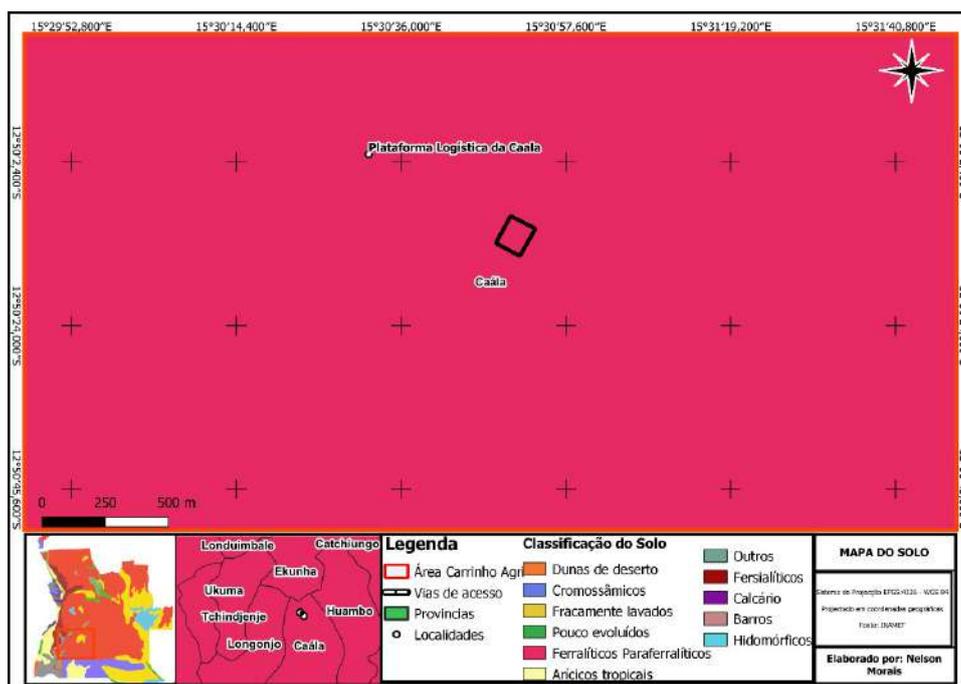


Figure 28 – Soil map.

6.6 SURFACE AND GROUNDWATER RESOURCES

6.6.1 General considerations

The purpose of this descriptor is to identify and characterize the water resources existing in the area where the grain silo project is to be implemented and its surroundings.

6.6.2 Surface Water Resources

Angola has significant water potential, consisting of a dense hydrographic network directly related to the relief of the territory, as most of it descends from the plateau and mountainous areas to the lower regions.

The average surface water availability at the national level is 4,598 m³/s, equivalent to an annual mass of 145,002 Hm³. This represents an average annual surface runoff of 116,300 m³/km² of Angolan territory and 11,809 m³/inhabitant.

Angolan territory has 77 river basins, 47 of which are main basins and the rest are coastal basins that form the following five main drainage areas:

- Atlantic slope (40.1% of the country's total area): Chiloango, Zaire or Congo, Bengo, Kwanza, Queve or Cuvo, Catumbela, and Cunene rivers, among others;

- Zaire Basin (23.2% of the country's total area), which includes most of the rivers in northern Angola, such as the Cuango, Cassai and their tributaries, Cuilo, Cambo, Lui, Tchicapa, Luachimo, among others;
- Etosha-Pan watershed – Namibia (4.5% of the country's total area);
- Kalahari Basin (12.5% of the country's total area): has many intermittent rivers, notably the Cubango River, which flows into the Okavango wetlands (Botswana) and has the Cuchi and Cuito as its main tributaries;
- The Zambezi basin (19.7% of the country's total area), which includes the eastern rivers and tributaries of the Zambezi, such as the Luena, Lungué-Bungo, and Cuando, which flows into the Zambezi via the Chobe River.

The following is a list of river basins ordered according to their drainage areas:

Table 16: River basins and their respective areas

BASIN	AREA (KM ²)	BASIN	AREA (KM ²)
1-Zaire	285,206	6-Cunene	92,400
2-Cubango	156,122	7-Central West	89,496
3-Cuanza	152,520	8-Southwest	84,327
4-Zambezi	148,377	9-Northwest Angola	76,732
5-Cuando	96,360	10-Cuvelai	52,158

Angola river basins:



Figure 29 - Angola's river basins

6.6.3 Local Hydrography

Angola has 47 river basins, divided into five main watersheds. The project area is located in the central part of the province of Huambo.

The plateaus of central Angola act as the country's main watersheds. Most rivers originate in this region, flowing west to the Atlantic, north to the Congo River, or southeast where they infiltrate the interior of the continent.

The province of Huambo is part of the Queve or Cuvu river basin, which belongs to the coastal basins of central-western Angola. Its longest source is located near Boas Águas/Vila Nova—where the Benguela railway passes—45 km east of the city of Huambo. The river has a length of 505 km, corresponding to a hydrographic basin of 23,870 km². It flows into the sea south of Porto Amboim. It develops along two axes, the first in a northwesterly direction for 340 km and the second in a westerly direction for 165 km. The basin occupies about 1.8% of Angola's territory, which covers 1,246,700 km².

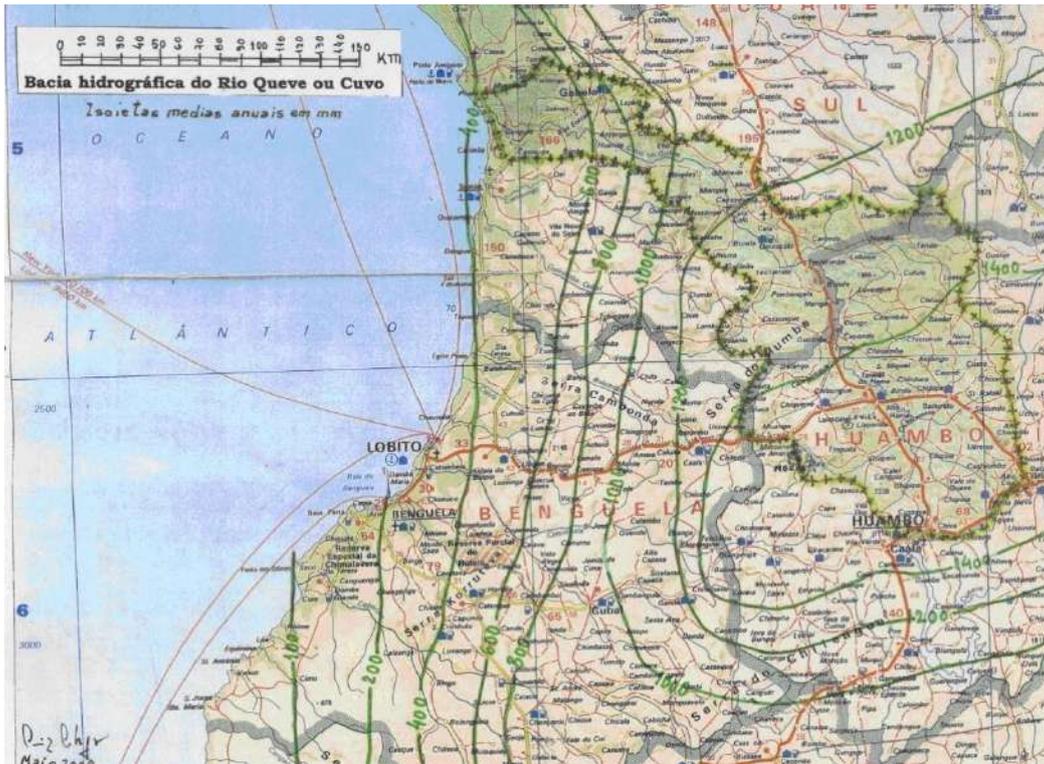


Figure 30 – Map of the Queve River watershed

The river closest to the project area is the source of the Calai River, which is less than 300 meters away.



Figure 31: Source of the Calai River

6.6.4 Water uses

In the project's surroundings, the nearest river is the Cuvo-Queve River, which is approximately 4.2 km.

Among the common uses of fresh water in this municipality are collection for human consumption, through the collection and distribution center next to the river, collection for crop irrigation, artisanal fishing using a rod, line, and net, sanitation, and recreation.

6.7 UNDERGROUND WATER RESOURCES

6.7.1 Hydrogeological Context

According to FAO data, the availability of groundwater in Angola is estimated at around 58 km³/year, of which 95% directly feeds rivers, with the remaining 5% flowing into the sea (www.fao.org, 2010).

Angola's groundwater resources are located in coastal aquifers, with an average depth of 5 to 30 m; in aquifers in the central plateau region, with an average depth ranging from 10 to 30 m; and in aquifers in the semi-arid regions of the south and southeast, with average depths of 200 m or more (Ministry of Urban Planning and Environment, 2006).

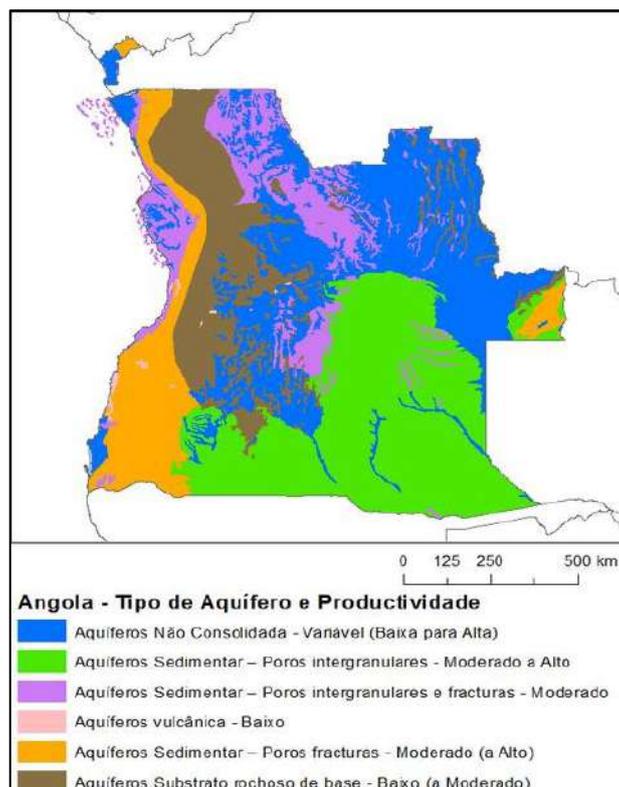


Figure 32 - Type of aquifers and productivity

As for groundwater, the system is estimated to be very productive, with existing wells between 5 and 8 meters deep.

6.7.2 Vulnerability

The vulnerability of geological formations to pollution is intrinsically linked to their lithological composition, morphology, permeability, depth of the aquifer zone, fracturing, among other characteristics.

In general, the table below shows the vulnerability indicators according to geological formation and lithological or morphological compositions.

Table 17: Aquifer vulnerability classes

AQUIFER	VULNERABILITY TO POLLUTION	INDICATOR
Aquifer in highly karstified carbonate rocks	High	V1
Aquifer in carbonate rocks with medium to high karstification high	Medium to High	V2
Aquifer in unconsolidated sediments with hydraulic connection hydraulic connection to surface water	High	V3
Aquifer in unconsolidated sediments without hydraulic connection hydraulic connection to surface water	Medium	V4
Aquifer in carbonate rocks	Medium to Low	V5
Aquifer in fractured rock	Low and variable	V6
Aquifer in consolidated sediments	Low	V7
No aquifers	Very low	V8

Due to the probable existence of an aquifer at the site with a water connection to surface waters, the degree of vulnerability is estimated to be high (V3).

6.8 FLORA AND FAUNA

6.8.1 General Considerations

Biodiversity is crucially important to the human species, since approximately 40% of the world economy and 80% of people's needs depend on biological resources.

The Convention on Biological Diversity (CBD) and the Basic Environment Law (Law 5/98) define biodiversity or biological diversity as the variability among living organisms from all sources, including those in terrestrial, marine, and aquatic ecosystems, as well as

the ecological complexes of which they are part. It encompasses diversity within species, between species, and of ecosystems.

Biological diversity is of crucial importance to the human species, since approximately 40% of the world economy and 80% of people's needs depend on biological resources.

Angola therefore has a rich and varied heritage of flora and fauna, both in quantitative and qualitative terms, which, if exploited sustainably, can form the basis for the country's economic, social, and environmental development.

In addition to its enormous scientific, spiritual, and cultural value, biodiversity offers undeniable advantages for maintaining human well-being and ensuring health and food security, combating disease, economic growth, and providing livelihoods, among other aspects.

The cataloging of species that make up a given environment is essential for assessing the risks of environmental impacts in a certain area of the country, in order to ensure a balance between human activities and the natural environment, since biodiversity (fauna and flora) plays a fundamental role that is of great importance not only for the maintenance of life, but also for the socioeconomic development of the country.

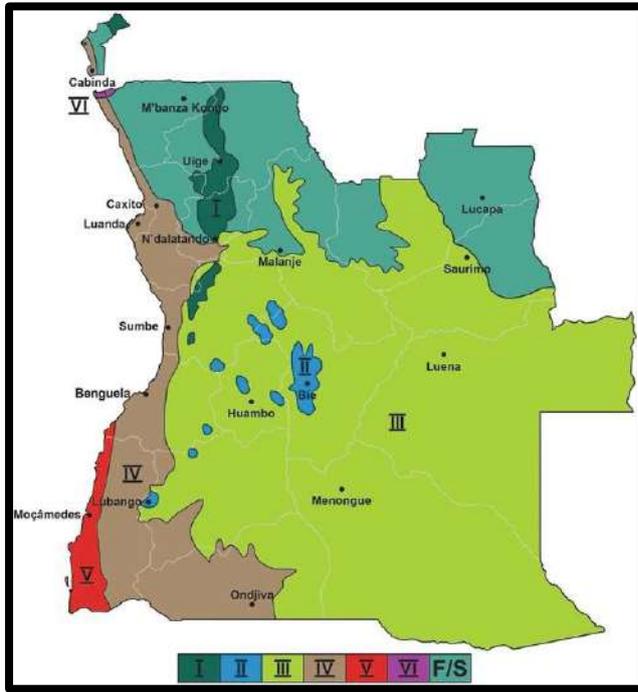
From an ecological point of view, species are the living components of ecosystems and are responsible for producing oxygen (in the case of plants and algae), maintaining water and air quality, producing and maintaining soil fertility, mitigating floods, pollinating plants, and providing food, among other services.

Economically, species have direct and indirect value, generating income and employment for the local, national, and international communities of the country, thus contributing to social and economic development.

Angola has an extraordinarily wide range of biomes and ecosystems, associated with the diversity of climates and physiography of the territory. In total, there are seven (7) **biomes** and fifteen (15) **ecoregions**, making Angola the African country with the highest number of biomes and the second with the highest number of ecoregions.

Angola's biomes and mosaics comprise the following zones: Guinean-Congolese tropical forest (I); Afromontane forests and grasslands (II); Mesic savanna (III); Arid savanna (IV);

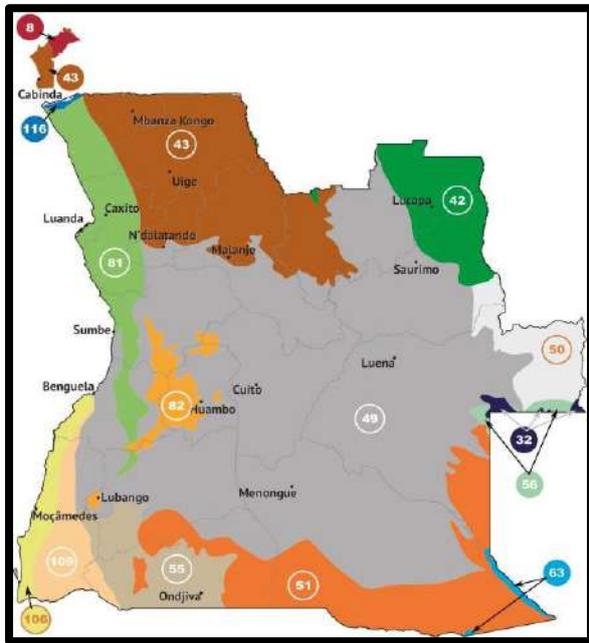
Desert (V); Mangroves (VI) and Guinean-Congolese tropical forest/mesic savanna transition mosaic (VII) (Figure 1) (HUNTLEY, 2023).



Biomes of Angola

- I - Guinean-Congolese rainforest
- II - Afro-montane forests and grasslands
- III - Mesic savanna
- IV - Arid savanna
- V - Desert
- VI - Mangroves
- VII - Guinean-Congolese tropical forest/mesic savanna transition mosaic

Figure 33 - Biomes of Angola | Source: HUNTLEY (2023)



Ecoregions of Angola
(According to Burgess *et al.*, 2004)

- 8 - Atlantic Equatorial Coastal Forest
- 32 - Zambeian *Cryptosepalum* Dry Forest
- 42 - Southern Congolese Forest-Savanna Mosaic
- 43 - Western Congolese Forest-Savanna Mosaic
- 49 - Angolan Miombo Forest
- 50 - Central Zambezi Miombo Forest
- 51 - Zambezi *Baikiaea* Forest
- 55 - Angolan Mopane Forest
- 56 - Western Zambezi Grassland
- 63 - Zambezi Flooded Grasslands
- 81 - Angola Escarpment Savanna and Forest
- 82 - Angolan Mountain Forest-Grassland Mosaic
- 106 - Kaokoveld Desert
- 109 - Namibian Escarpment Forests
- 116 Central African Mangroves.

Figure 34 - Ecoregions of Angola | Source: HUNTLEY (2023)

6.8.2 Methodology

The collection of primary information focused on the project's Area of Direct Influence (ADI). Reconnaissance visits were carried out during July and August 2024, with the aim of conducting a survey of the flora and fauna during 8.6 hours of sampling.

The collection of secondary information (literature review) was directed at a much larger area, covering all areas of the project. One of the main objectives of the bibliographic information search was to compile a list of potential species in the study area. Information provided by *the International Union for Conservation of Nature* (IUCN), the phytogeographic map of Angola, the description of biomes for Angola provided by *the World Wide Fund for Nature* (WWF), the Red List of Angola, and the List of species included in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), as well as other sources cited in this section. The potential list was supplemented by information collected in the field.

In terms of flora and fauna characterization, particular emphasis was placed on the potential presence of species that are most relevant in terms of nature conservation and biodiversity, i.e., those that are classified as threatened according to the IUCN and/or that are included in the categories of the Red List of Species of Angola, pursuant to Executive Decree No. 258/18. In this context, particular attention was also paid to any habitats with which these species may be associated.

Biotic information was sampled mainly based on the method of active search observation in potential habitats (GODOI *et al.*, 2019), although all supplementary information obtained was recorded, namely between trips to and from the study area and between sampling sites.

Secondary and primary information was further supplemented by conducting questionnaires with the population on the flora and fauna of the study area.

The specific methodological details relating to the sampling of flora, vegetation, and fauna are described below:

6.8.3 Flora and vegetation

The composition and description of the vegetation in the study area was based on direct *in situ* observation, data provided by the phytogeographic map of Angola, and information on Angola's ecoregions provided by the WWF.

Sampling of flora and vegetation was carried out mainly using the transect method. The transects were covered in a zigzag pattern, identifying the species present. Specimens or population centers of note, such as invasive species or possible endangered species, were geolocated using GPS and photographed.

The vegetation units present were recorded along the transects, including the start and end points of the patch, if relevant, as well as the main species present. The floristic surveys focused on the different vegetation units identified. The results of these surveys were subjected to a phytogeographic analysis using the Phytogeographic Map of Angola. This classification analysis allowed for the segregation of the plant formations present.

6.8.4 Characterization of the Biotic Environment of the Project Area

6.8.4.1 Biogeographic and phytosociological context

The study area has vegetation characteristic of the central plateau region, where savanna formations and miombo forests predominate. This vegetation falls within the mixed savanna, forest, and grassland biome and is dominated by the Angolan humid miombo.

Phytogeographically, it is dominated by savannas, which are the most common formation composed of grasses and scattered trees of the genera *Brachystegia*, *Julbernardia*, and *Isoberlinia*. The open savanna has a lower density of trees and shrubs, with a predominance of grasses.

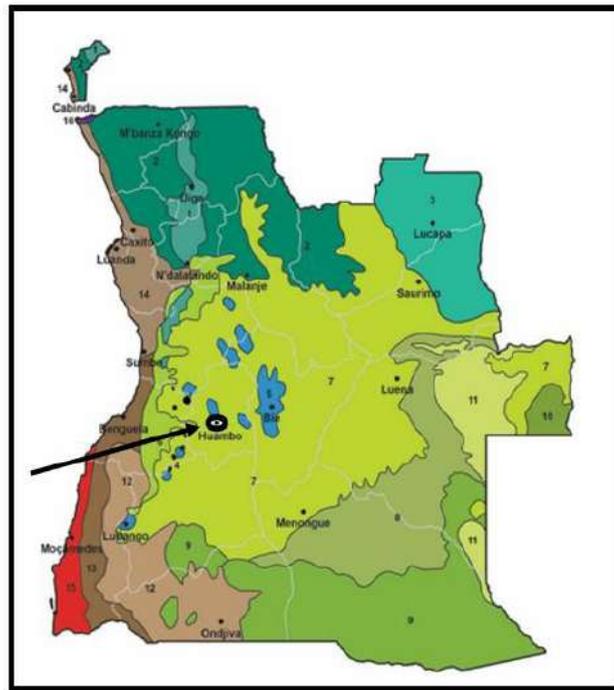


Figure 35 - Ecoregions of Angola with indication of the study area.

6.8.4.2 Characterization of flora and vegetation

5.7.4.2. Characterization of flora and vegetation

The study area is characterized by open forest and savanna woodland vegetation types. Species of the genera *Brachystegia*, *Isoberlinia*, and *Julbernardia* are typically found. The open forest is of the low-growing mata panda type.

The following species were identified in the study area: *Crotalaria caudata*, *Helichrysum sp.*, *Ananas comosus*, *Eucalyptus sp.*, *Epilobium sp.*, *Cajanus cajan*, and *Persea americana*. The tree species *Monotes caloneurus*, *Parinari curatellifolia*, and *Pterocarpus angolensis* are also described for this area. The shrub layer is generally sparse or weakly expressed with species such as *Bobgunnia madagascarensis* and *Protea petiolaris*.

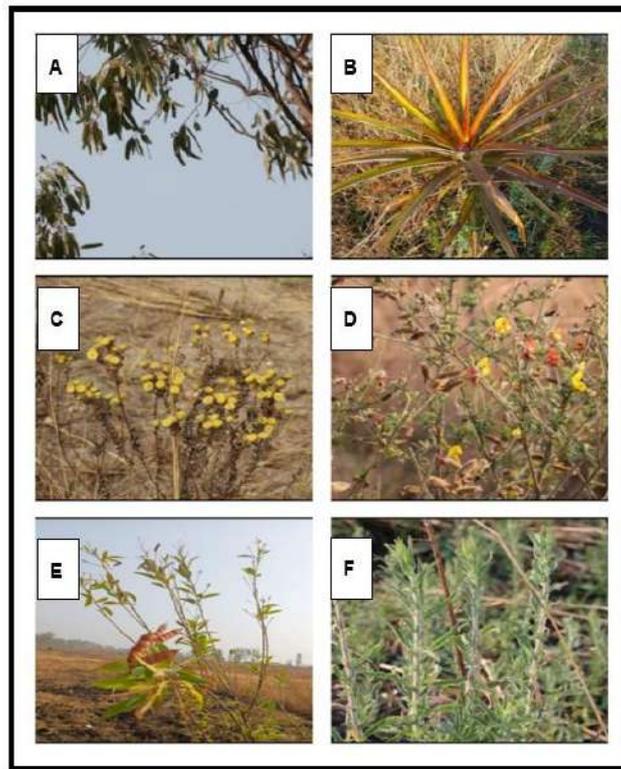


Figure 36 – Main species identified. *Eucalyptus sp.* (A); *Ananas comosus* (B); *Helichrysum sp.* (C); *Crotalaria caudata* (D); *Cajanus cajan* (E); *Epilobium sp.* (F).



Figure 37: *Persea americana* (avocado tree) – a species resulting from agricultural activity in the area.

Table 18: Main botanical groups in the immediate project area. LC - Least Concern, NA-Not Assessed, VU- Vulnerable, DD – Data Deficient

COMPOSITION OF THE FLORA IN THE DIRECT PROJECT AREA - CAÁLA

Taxonomic groups			Species			Conservation status			Ecological behavior		
Division	Class	Family	Scientific name	Common name	Habit	IUCN status	National status		Exotic	Invasive	Native
							LVEA	Costa <i>et al</i> (2018)			
Tracheophyta	Magnoliopsida	Asteraceae	<i>Helichrysum sp</i>	/	Tree	NA	NA	NA			x
Tracheophyta	Magnoliopsida	Fabaceae	<i>Crotalaria caudata</i>	/	Tree	NA	NA	NA			x
Tracheophyta	Liliopsida	Bromeliaceae	<i>Ananas comosus</i>	/	Shrub	NA	NA	NA	x		
Tracheophyta	Magnoliopsida	Fabaceae	<i>Cajanus cajan</i>	/	Shrub	NA	NA	NA	x		
Tracheophyta	Magnoliopsida	Myrtaceae	<i>Eucalyptus sp</i>	/	Tree	NA	NA	NA	x		
Tracheophyta	Magnoliopsida	Onagraceae	<i>Epilobium sp</i>	/	Subshrub	NA	NA	NA			x
Tracheophyta	Magnoliopsida	Lauraceae	<i>Persea americana</i>	/	Tree	LC	NA	NA	x		
Tracheophyta	Magnoliopsida	Chrysobalanaceae	<i>Parinari curatellifolia</i>	/	Tree	LC	NA	NA			x
Tracheophyta	Magnoliopsida	Fabaceae	<i>Bobgunnia madagascariensis</i>	/	Tree	LC	NA	NA			x
Tracheophyta	Magnoliopsida	Proteaceae	<i>Protea petiolaris</i>	/	Tree	LC	NA	NA			x

6.8.5 Fauna

Fauna sampling in the study area was based on a bibliographic review of the fauna composition of the area and questionnaires conducted among the local population. Fauna specimens observed in the field were recorded and analyzed from the point of view of endemism and conservation status.

6.8.5.1 Characterization of fauna

Angola has a richly diverse fauna, with more than 117 amphibians, 278 reptiles, 940 birds, and 291 native mammal species.

The assessment of the fauna occurring in an area is a fundamental parameter for evaluating the impacts that projects may have on biodiversity in the short, medium, and long term.

The main faunal groups that are biological indicators for the project in question are: herpetofauna (reptiles and amphibians), avifauna (birds), and mastofauna (mammals).

6.8.5.2 Herpetofauna

Angolan herpetofauna is very rich and diverse, especially in the southern part of the country, with lizards and amphibians being particularly noteworthy.

There are 117 species of amphibians described in Angola, all of them anurans, from 13 different families, distributed across 25 genera, of which around 18 species are endemic.

According to biogeographical surveys conducted by the team and IUCN data for the Caála area, the amphibians potentially present in the project's area of influence are mainly species with wide distribution and no unfavorable conservation status, nor any status assigned by the Red List of Species of Angola. According to Conradie *et al.* (2023), the main genera of amphibians in the area are *Ptychadena*, *Arthroleptis*, *Leptopelis*, *Breviceps*, *Sclerophrys*, *Sclerophrys*, and *Hyperolius*, with rare, endemic, and quasi-endemic species for the country.

With regard to reptiles, the dominant taxonomic groups in the study area are from the suborder Sauria (lizards), with the genera *Gerrhosaurus*, *Trachylepis*, and *Agama* being the most common, none of which are listed as threatened with extinction.



Figure 38: Angolan tree agama (*Acanthocercus cyanocephalus*). A lizard representative of the Agamidae family recorded in the project area.

6.8.5.3 Avifauna

Birds are one of the most important groups in terms of conservation among the main fauna groups in southern Angola, as they represent one of the main clades of species endemic to the country and are therefore animals of conservation importance.

Birds are, above all, sensitive environmental indicators of biological richness, fulfilling several important ecological roles in the places where they occur. In addition, published knowledge about birds tends to be much more detailed, up-to-date, and accessible than that for other fauna groups and is therefore more easily comparable, and generally includes data on threatened, migratory, rare, and endemic species.

For the project area, the main birds of conservation importance are the Angolan batis (*Batis minulla*), the grey-striped francolin (*Pternistis griseostriatus*) and the mountain francolin (*Pternistis swierstrai*), as they are endemic and the latter is threatened with conservation as vulnerable (VU). The other species are not endangered and are classified as abundant in the area (see Table 16).



Figure 39: White-bellied crow (*Corvus albus*), recorded during field surveys in the project area.



Figure 40: Velvet-backed drongo (*Dicrurus modestus*), recorded during field surveys in the project area.

6.8.5.4 Mammals

Mammals are one of the groups that serve as environmental indicators. Around 291 species of mammals have been described for Angola, 12 of which are endemic, meaning that they are relevant groups for conservation.

No wild terrestrial mammal species were identified in all study areas during direct surveys, mainly because it is an area that is already heavily anthropized and has a large human population. Most of the mammals that were sighted in the area are those used for agriculture and livestock, such as cattle, pigs, and goats.

Bibliographic data indicate more than 20 species of mammals in the project area, none of which are threatened with extinction or belong to groups of invasive alien species in Angola. The most abundant groups in the area appear to be those of the orders Carnivora and Rodentia. In the first group, we have mainly species from the *Herpestidae* (mongooses) and *Viverridae* (genets and civets) families. In the second group, we have species from the *Muridae* family (Table 16).

Table 19: Main fauna species in the project area: LC - Least Concern, NA-Not Assessed, NE - Not Evaluated by IUCN, Category B (AEx) - Threatened with extinction, Category C - Vulnerable, Category D - Invasive, CITES - Convention on International Trade in Endangered Species of Wild Fauna and Flora

COMPOSITION OF THE FAUNA IN THE DIRECT PROJECT AREA - CAÁLA

Taxonomic groups	Species				Conservation status		Ecological behavior	
	Family	Scientific Name	Common name	Confirmed	IUCN status	National status	Migratory	Congregator
Avifauna	Phasianidae	<i>Pternistis swierstrai*</i>	Mountain francolin		VU	VU		x
	Corvidae	<i>Corvus albus</i>	White-bellied crow	x	LC	NA	x	x
	Estrildidae	<i>Fringilla griseostriatus*</i>	Gray-striped Francolin	x	LC	NA		x
	Weaverbirds	<i>Euplectes hordeaceus</i>	Black-winged red bishop		LC	NA		x
	Ploceidae	<i>Euplectes macroura</i>	Yellow-mantled widow		LC	NA		x
	Platysteiridae	<i>Batis minulla*</i>	Angolan batis		LC	NA		x
	Bucerotidae	<i>White-tailed Hornbill</i>	Brown hornbill		LC	NA		x
	Meropidae	<i>Merops bullockoides</i>	White-fronted Bee-eater	x	LC	NA		x
	Meropidae	<i>Merops pusillus</i>	Little bee-eater	x	LC	NA		x
	Meropidae	<i>Merops variegatus</i>	Blue-breasted bee-eater		LC	NA		
	Numididae	<i>Numida meleagris</i>	Guinea fowl	x	LC	NA		x
	Lybiidae	<i>Pogoniulus subsulphureus</i>	Yellow-throated barb		LC	NA		
	Cisticolidae	<i>Yellow-throated Prinia</i>	Tawny-flanked Prinia		LC	NA		x
	Columbidae	<i>Red-necked Turtle Dove</i>	Red-eyed Dove	x	LC	NA	x	
	Accipitridae	<i>Circaetus cinerascens</i>	White-tailed Eagle		LC	NA		
	Accipitridae	<i>Melierax metabates</i>	Dark-singing goshawk		LC	NA	x	
Accipitridae	<i>Circaetus cinereus</i>	Short-toed eagle		LC	NA	x		

	Accipitridae	<i>Micronisus gabar</i>	Talking hawk		LC	NA	x	
	Accipitridae	<i>Accipiter tachiro</i>	African goshawk		LC	NA	x	
	Accipitridae	<i>Accipiter ovampensis</i>	Ovambo Hawk		LC	NA	x	
	Accipitridae	<i>Gypohierax angolensis</i>	Angolan Palm-nut Vulture		LC	NA	x	
	Pandionidae	<i>Osprey</i>	Osprey		LC	NA	x	
	Columbidae	<i>Spilopelia senegalensis</i>	Senegalese Dove		LC	NA	x	x
	Columbidae	<i>Chalcospilos turtle dove</i>	Emerald dove		LC	NA	x	x
	Columbidae	<i>Oena capensis</i>	Long-tailed Quail		LC	NA	x	x
	Cuckoo family	<i>Centropus cupreicaudus</i>	Copper-tailed cuckoo		LC	NA		x
	Estrildidae	<i>Angolan Greenfinch</i>	Blue-breasted Roller	x	LC	NA		x
	Viduidae	<i>Vidua macroura</i>	Pincushion widow	x	LC	NA		x
Herpetofauna	Agamidae	<i>Agama agama</i>	Common agama	x	LC	NA	x	x
	Agamidae	<i>Blue-headed tree lizard</i>	Angolan tree agama	x	LC	NA		
	Agamidae	Schacki's agama*	Schack's rock agama		NE	NA		
	Agamidae	<i>Agama aculeata</i>	Ground agama		LC	NA		
	Scincidae	<i>Trachylepis varia</i>	Variable skink	x	NE	NA	x	x
	Lamprophiidae	<i>Boaedon angolensis*</i>	Angolan house snake	x	NE	NA	x	
	Lacertidae	<i>Ichnotropis bivittata bivittata</i>	Angolan rough-scaled lizard	x	NE	NA	x	x
	Testudinidae	<i>Kinixys spekii</i>	Spek's tortoise		NE	NA		
	Gekkonidae	<i>Afroedura wulfaackei*</i>	Angolan flat gecko		NE	NA		

Gekkonidae	<i>Pulitzer's gecko</i>	Pulitzer gecko		NE	NA		
Gekkonidae	<i>Hemidactylus mabouia</i>	Tropical house gecko		NE	NA		
Gekkonidae	<i>Angolan house gecko</i>	Angolan dwarf day gecko		NE	NA		
Gerrhosauridae	<i>Black-lined gerrhosaurus</i>	Black-lined-plate lizard		NE	NA		
Gerrhosauridae	<i>Trachylepis albopunctata</i>	Angolan variable lizard		NE	NA		
Gerrhosauridae	<i>Trachylepis sulcata</i>	Western rock gecko		NE	NA		
Gerrhosauridae	<i>Trachylepis wahlbergii</i>	Wahlberg's striped lizard		LC	NA		
Chamaeleonidae	<i>Chamaeleo dilepis quilensis</i>	Common chameleon		NE	NA	x	
Lamprophiidae	<i>Boaedon angolensis</i>	Angolan house snake		NE	NA		
Lamprophiidae	<i>Psammophis mossambicus</i>	Olive snake		NE	NA		
Lamprophiidae	<i>Psammophis leopardinus</i>	Sand leopard snake		NE	NA		
Lamprophiidae	<i>Hemirhagerrhis viperina</i>	Western bush snake		NE	NA		
Lamprophiidae	<i>Lycophidion multimaculatum</i>	Spotted wolf snake		LC	NA		
Lamprophiidae	<i>Psammophylax tritaeniatus</i>	Skaapsteker's striped snake		NE	NA		
Elapidae	<i>Naja nigricollis</i>	Black-necked spitting cobra		NE	NA		
Colubridae	<i>Crotaphopeltis hotamboeia</i>	Red-lipped snake		LC	NA		
Colubridae	<i>Dasypeltis scabra</i>	Common egg-eating snake		NE	NA		
Colubridae	<i>Dispholidus typus punctatus</i>	Spotted-throated snake		NE	NA		
Viperidae	<i>Bitis arietans</i>	Surucucu		LC	NA		
Pipidae	<i>Xenopus petersii</i>	Peter's clawed frog		LC	NA		
Bufonidae	<i>Sclerophrys pusilla</i>	Flat-backed frog		LC	NA		

	Bufo	<i>Sclerophrys regularis</i>	African common toad		LC	NA		
	Ptychocheilichthys	<i>Ptychadena oxyrhynchus</i>	Pointed-snouted rocket frog		LC	NA		
	Ptychocheilichthys	<i>Ptychadena porosissima</i>	Grass frog		LC	NA		
	Hyperolius	<i>Hyperolius angolensis angolensis</i>	Angolan red frog		LC	NA		
	Hyperolius	<i>Hyperolius benguellensis</i>	Long-tailed skink of Benguela		LC	NA		
	Hyperolius	<i>Hyperolius cinereus*</i>	Monard spider		LC	NA		
	Hyperolius	<i>Kasina kuvangensis</i>	Kasina do kuvango		LC	NA		
	Leptopelis	<i>Leptopelis anchietae*</i>	Anchieta tree frog		LC	NA		
	Leptopelis	<i>Leptopelis bocagii</i>	Bocage's tree frog		LC	NA		
	Phrynobatrachus	<i>Phrynobatrachus parvulus</i>	Dwarf pool frog		LC	NA		
	Phrynobatrachus	<i>Phrynobatrachus natalensis</i>	Common pool frog		LC	NA		
	Pyxicephalus	<i>Angolan frog</i>	Angola frog		LC	NA		
	Pyxicephalus	<i>Tomoptera tuberculosa</i>	Rough-skinned sand frog		LC	NA		
Mastofauna	Canis	<i>Canis adustus</i>	Striped-flanked jackal		LC	NA	x	
	Felis	<i>Felis silvestris</i>	Wildcat		LC	NA		x
	Herpestes	<i>Atilax paludinosus</i>	Marsh gourami		LC	NA		x
	Herpestes	<i>Herpestes ichneumon</i>	Mongoose		LC	NA		x
	Herpestes	<i>Herpestes sanguineus</i>	Small red mongoose		LC	NA		x
	Herpestes	<i>Mongoose mongoose</i>	Striped mongoose		LC	NA		
	Viverridae	<i>Civettictis civetta</i>	African civet		LC	NA	x	

	Viverridae	<i>Angolan genet</i>	Angolan genet		LC	NA	x	
	Viverridae	<i>Genetta maculata</i>	Red-meshed genet		LC	NA	x	x
	Bovidae	<i>Sylvicapra grimmia</i>	Common bushbuck		LC	NA	x	x
	Rhinolophidae	<i>Rhinolophus fumigatus</i>	Rüppell's horseshoe bat		LC	NA	x	x
	Vespertilionidae	<i>Neoromicia capensis</i>	Cape pipistrelle		LC	NA		
	Procaviidae	<i>Heterohyrax brucei bocagei*</i>	Bocage's rock hyrax		LC	NA		
	Leporidae	<i>Lepus victoriae</i>	African hare		LC	NA	x	
	Macroscelididae	<i>Elephantulus brachyrhynchus</i>	Short-snouted elephant shrew		LC	NA		x
	Cercopithecidae	<i>Papio kindae</i>	Yellow baboon		LC	NA	x	x
	Bathyergidae	<i>Mechow's mole rat</i>	Mechow's mole rat		LC	NA	x	x
	Hystricidae	<i>Hystrix africae australis</i>	Southern porcupine		LC	NA	x	x
	Muridae	<i>Dasymys incommutus</i>	Swamp Rat		LC	NA	x	x
	Muridae	<i>Gerbilliscus leucogaster</i>	Peter's gerbil		LC	NA	x	x
	Muridae	<i>Gerbilliscus validus</i>	Savannah gerbil		LC	NA	x	x
	Muridae	<i>Grammomys dolichurus</i>	Forest mouse		LC	NA	x	x
	Muridae	<i>Mastomys natalensis</i>	Multiple-nipple rat		LC	NA	x	x
	Petromuridae	<i>Funisciurus congicus</i>	White-striped squirrel		LC	NA		x

6.8.6 Conservation areas

Angola is a country with exceptional biodiversity, home to a wide range of ecosystems ranging from tropical forests and savannas to deserts and wetlands. This diversity of habitats supports a rich and varied fauna, including several endemic and endangered species, such as the giant sable antelope (*Hippotragus niger variani*), one of the country's rarest and most iconic antelope species. Other endangered species include elephants, rhinos, and big cats, whose populations have been impacted by poaching and habitat loss.

Starting in the 1930s, legally protected areas (national parks and game reserves) were created, and by the time of independence in 1975, these occupied 6% of the country's land area. As a result of prolonged war, conservation areas were exposed to severe neglect, poaching, and land encroachment. Many habitats of biogeographical importance and many rare and endemic species were put at risk. In April 1998, the Republic of Angola ratified its accession to the Convention on Biological Diversity, and in May 2006, it approved the National Biodiversity Strategy and Action Plan, committing itself before the international community and in light of the provisions of the Constitution of the Republic of Angola to "promote environmental protection and reflect strategies for the protection of the country's natural resources," a concern expressed in multiple approved documents (NBSAP, p. 3).

The recently strengthened administration is cause for optimism, signaling that a new era for biodiversity conservation is approaching. The conservation area system was greatly expanded in 2011, and more and more resources are being made available to ensure its effective management.



Figure 41: Conservation areas in Angola: • 1 Maiombe • 2 Quiçama • 3 Cangandala • 4 Cameia • 5 Iona • 6 Bicular • 7 Mupa • 8 Luengue-Luiana • 9 Luando • 11 Chimalavera • 12 Búfalo • 13 Namibe. (Mavinga is not shown on this map due to a lack of complete data regarding the boundaries of its classification)

There are no formally designated conservation areas crossed by the route proposed for this project. Only Morro do Moco, about 58 km south of the project area, is worth mentioning.

This region contains important fragments of Afromontane forest, naturally restricted to narrow gorges and steep mountain valleys of the highest peaks, typically above 2000 m altitude.

Morro do Moco has been considered the most important site in Angola for bird conservation, particularly for three endemic species, the mountain francolin (*Pternistis swierstrai*), the Angolan flycatcher (*Dioptrornis brunneus*), and the mountain hummingbird (*Cinnyris ludovicensis*).

6.9 LANDSCAPE

6.9.1 General considerations

The purpose of this descriptor is to characterize the landscape of the area where the silo is located and its surroundings, in order to determine the potential visual disturbances caused by the use of the space.

6.9.2 Landscape Units

The landscape should be understood as the visual image of the surrounding space, which always presupposes an interaction between potential observers and the observed territory.

The morphology of the territory and its occupation are the aspects that contribute most clearly and directly to the different types of landscape. These types, which include the presence of living elements, do not behave in a static manner, but vary throughout the day and, above all, throughout the year. Therefore, the landscape can be defined as a complex and dynamic system.

In addition to the factors mentioned above, "*understanding the landscape involves knowledge of factors such as climate, geology, soils, flora and fauna, ecological structure, land use, and all expressions of human activity over time, as well as understanding their interrelationships, constituting a multifaceted reality.*" The visual expression of these interactions at a given moment constitutes the landscape that can be seen by each observer, according to their perception and specific interests (Pinto-Correia et al., 2001).

When defining the Landscape Units present in the study area, it is important to take into account the concept of Landscape and Landscape Unit.

According to (Forman, R. T and Godron, M; 1986), Landscape is understood as the global, dynamic, and evolving image of "*a heterogeneous area of territory composed of a set of interacting ecosystems that repeat themselves throughout it in a similar way*" and that is "*the result of the combination of nature, techniques, and human culture*" (Pitte, J.R. T; 1983).

A Landscape Unit is considered to be not only "*areas bounded by relief or other elements, within which all points are mutually visible,*" but also those in which the landscape has a certain homogeneity in terms of relief, geology, and

humanization. These correspond to areas with relatively homogeneous landscape characteristics, whose interconnection creates a specific pattern that is repeated, differentiating a given unit from the surrounding area. In addition to this pattern, there should be internal coherence and a character specific to the unit, which facilitates its identification.

Unique Landscape Elements are understood to be *"elements that are small in terms of surface area, but which stand out in the landscape unit as a whole due to their difference, their intrinsic quality (or, conversely, because they create a disqualifying dissonance) and/or the impact (sensory, cultural, or ecological) they have on the unit."*

6.9.3 Landscape Characterization

For the characterization of the landscape, a Visual Influence Area of the project was defined, which was considered adequate for a good perception of the surroundings, taking into account the characteristics of the territory under analysis and seeking to cover the visual basin directly influenced by the set of existing structures, based on parameters related to observation conditions, namely access roads, existing scenic points, and human occupation.

It is considered that the grain terminal will be visible from the following observation points:

- Calai Brita neighborhood;
- EN-120 National Highway;
- MM Farm and Maria Tchissola Farm.

As a methodological approach for better characterization and assessment of the landscape of the study area, landscape units were considered. These are individualized by grouping relatively homogeneous landscape features, whose interconnection creates a specific pattern that repeats itself, differentiating a given unit from the surrounding area.

Taking into account the characteristics of the project's visual impact area, namely the relief, occupation, and vegetation cover, three distinct landscape units were identified and defined: UPH1 Semi-natural Area, UHP2 Calai Brita Neighborhood, and UHP3 MM Farm.

UHP 1 - Semi-natural zone

UHP1 is characterized by the absence of dominant occupation, with human and natural occupation coexisting. It has a relatively flat and rugged relief, with natural vegetation interspersed with fields, characteristic of subsistence agricultural areas. The vegetation cover consists of herbaceous elements, shrubs, and some trees. It is marked by the presence of temporary and permanent natural thalwegs.

The land on which the agricultural infrastructure (silos) is located is part of UHP1.



Figure 42: Natural area (surrounding the project)

UHP1-Peri-urban area

This UHP is characterized by residential and/or mixed use (residential, informal commerce, and infrastructure), which develops along the EN 120 and on the outskirts of the city of Caála. It comprises a low to medium density agglomeration, with some degree of planning, which is organized along the paved road leading to the site where the agricultural infrastructure (silos) is located.

This UHP is part of the Calai Brita neighborhood.



Figure 43: Calai Brita neighborhood

UHP3 MM Farm

UHP3 comprises a private farm in the vicinity of the project, dedicated to fruit growing.



Figure 44: MM Farm

6.9.4 Landscape Assessment

The characterization of the landscape included the definition of landscape units, which correspond to areas with more or less homogeneous characteristics in terms of their structuring elements

structure, functioning, and participation in the space (namely geology, climate, water resources, soils, vegetation, and land use).

For each landscape unit, an assessment is carried out based on an objective characterization and a subjective characterization, which results from the assessment of the following parameters:

Visual quality, which corresponds to the result of the presence of the main structural elements of the space (relief, vegetation cover, water resources, and built structures) and the dynamics between these elements;

Visual absorption, which refers to the capacity to absorb, integrate, or visually disguise human activities while maintaining its characteristics and visual quality, assessed based on its greater or lesser capacity to withstand visual impact, depending on the relief, the existence of vegetation screens, and the existence of human occupation;

Sensitivity, a parameter that indicates the degree to which a landscape is affected by the alteration/introduction of a particular external action, varies in inverse proportion to the capacity for visual absorption, which means that a particular landscape will be more sensitive if it has high visual quality and low visual absorption capacity (integration of changes in the landscape).

Table 20: Landscape sensitivity matrix

CAPACITY FOR ABSORPTION	VISUAL QUALITY		
	High	Average	Low
High	High	Medium	Reduced
Medium	Very high	Average	Reduced
Low	Very high	High	Average

The combination of the application of the concepts of absorption and visual quality to the Landscape Units according to the matrix for landscape sensitivity resulted in the Landscape Sensitivity classification presented in the table below.

Table 21: Characteristics of landscape units

LANDSCAPE UNITS VISUAL	VISUAL QUALITY	ABSORPTION CAPACITY SENSITIVITY	LANDSCAPE LANDSCAPING
UHP1- Semi-natural	High	High	High
UHP2 Calai neighborhood Gravel	Low	High	Reduced
UHP3- MM Farm	High	High	High

Thus, with regard to UHP1 and UHP3, their high visual quality, combined with their high absorption capacity, results in high landscape sensitivity.

UHP3 areas, which are characterized by some dominant human occupation, featuring population clusters with consolidated but low-density occupation, have reduced landscape sensitivity.

Based on a visual analysis of the landscape, situations that represent high landscape and scenic value are identified, due to their unique character, expression, and quality, and are preferred and/or valued by the user.

As visual quality is a characteristic that depends on subjective factors, its assessment is based primarily on qualitative criteria, and it is not possible to obtain an absolute estimate of this parameter.

6.10 AIR QUALITY

6.10.1 General Considerations

This descriptor was developed based on elements collected during the field visit carried out in August 2024, on the local and surrounding analysis of potential sources of air pollution, and on bibliographic research.

6.10.2 Air Characterization

The purpose of this descriptor is to characterize the air quality of the area where the silos will be installed and its surroundings. To this end, potential sources of atmospheric emissions and sensitive receptors were identified and inventoried during a site visit in February 2024.

In the absence of an Ambient Air Quality Measurement Network, qualitative methods were used to assess air quality. Atmospheric dispersion conditions were also assessed, based on meteorological parameters that determine the transport and dispersion of pollutants and local morphological characteristics.

With the aim of providing guidelines to protect human health from harmful effects and to support national and local authorities in air quality management, the World Health Organization (WHO) recommends the guideline values for atmospheric pollutants shown in the table below.

Table 22: WHO recommended guideline values

POLLUTANT	EXPOSURE DURATION	GUIDELINE VALUE (MG/M3)
Carbon monoxide	15 min	100,000
	30 min	60,000
	1 hour	30,000
	8 hours	10,000
Lead	1 year	0.5
Nitrogen dioxide	1 hour	200
	1 year	40
Ozone	8 hours	100
Sulfur dioxide	10 min	500
	24 hours	20
PM10	24 hours	50 (value that should not be exceeded for more than 3 days per year)
PM2.5	24 hours	50 (value that should not be exceeded for more than 3 days per year)

Source: (WHO, 2006)

6.10.3 Characterization of Air Quality

The main sources of pollution in the immediate vicinity of the study area are associated with atmospheric emissions. According to observations made, air quality in the study area will be mainly affected by greenhouse gases emitted by vehicles and machinery operating in the area, as well as the use of fuel-powered generators, particle emissions (dust), and the burning of waste and biomass.

In terms of sensitive receptors, the vegetation around the project area stands out as it may be affected by vehicle traffic, mainly due to the emission of particles from vehicles traveling on the unpaved road that provides access to the facilities. There are no other potential sensitive receptors in the vicinity of the project area, namely schools, hospitals, and recreational and leisure areas.

The atmospheric emissions characteristic of burning and fuel-powered machinery include, among other pollutants, carbon monoxide (CO), methane (CH₄), carbon dioxide (CO₂), particulate matter (PM₁₀ - particles with an aerodynamic diameter <10 µm), nitrogen oxides (NO_x/NO₂), sulfur oxides (SO_x/SO₂), nitrous oxide (N₂O),

non-methane volatile organic compounds (NMVOCs), heavy metals, polycyclic aromatic hydrocarbons (PAHs), dioxins and furans (PCDD+PCDF), and benzene.

Since the surveys were conducted prior to the project's implementation, and given that air quality data for the study area and surrounding area are not available, it is not possible to state with certainty whether the concentration of the aforementioned pollutants exceeds the WHO recommended guideline values. However, these values may be known once the environmental monitoring plan for monitoring atmospheric emissions during the different phases of the project's implementation has been implemented.

6.11 SOUND ENVIRONMENT

6.11.1 General Considerations

This descriptor was prepared based on information gathered during the field visit carried out in August 2024, on the analysis of the local area and surrounding area for potential sources of noise pollution, and on bibliographic research.

6.11.2 Noise Levels and Effects of Noise on Health

Noise is generally defined as unwanted sound, which implies a subjective classification of sound. A sound signal may have different characteristics, but it is only classified as "noise" when it is directly or indirectly correlated with adverse physiological or psychological effects on humans or is perceived negatively (as useless, intrusive, or unpleasant).

When a sound source vibrates, it causes variations in the pressure of the surrounding air, which overlap with the air pressure. Compared to air pressure (in Pascals), the variation in sound pressure is perceptible to the human ear, for an average individual with full hearing ability, in the range of 20 mPa to 100 Pa.

It is customary to express sound pressure levels in decibels, dB. A decibel is a logarithmic ratio between the measured sound pressure and the reference value. The scale of sound pressure levels ranges from 0 dB (hearing threshold) to 140 dB (pain threshold). The ear is most sensitive to mid-range frequencies, which is where the human voice is expressed.

In environmental acoustics, the most commonly used descriptor for assessing discomfort is the equivalent continuous sound level, LAeq, defined as the constant sound pressure level which, integrated over the analysis time interval T, has the same sound energy

as the signal under analysis, varying over time, where LAp is the sound pressure level, weighted by the A-scale.

Noise pollution is now treated as atmospheric contamination through energy (mechanical or acoustic energy), causing effects throughout the body and not just on the auditory system. Noise is now considered a serious public health problem.

Continuous exposure to high noise levels can cause serious health effects that manifest themselves primarily at the physiological, psychological, and social levels. The degree of resulting impairment depends on the characteristics of the source itself, the frequency and intensity of the noise, the sensitivity of the receiver, and the duration of exposure to the noise.

Some of the most common effects of noise are psychological disturbances or physiological changes associated with *stress* and fatigue, resulting in sleep disturbances and lack of concentration.

The World Health Organization (WHO) has stipulated that the discomfort threshold for continuous noise should be below 50-55 dB(A) LAeq day. At night, to avoid sleep disturbances, ambient noise should not exceed 30 dB(A) LAeq night.

Table 23: Exposure limit values (ELVs)

	LEX, 8h db (A)	LCpeak db (C)
Limit Values	87	140
Upper action level	85	137
Lower action level	80	135

6.11.3 Characterization of the Acoustic Reference Framework

The main sources of noise in the immediate vicinity of the study area are associated with road traffic on access roads, generator use, workers, and other instruments used in the execution of the works.

As mentioned above, the WHO has stipulated that the nuisance threshold for continuous noise is 50 dB (A) at the daytime LAeq level. At night, noise levels should be between 5 dB and 10 dB below daytime values to ensure a balanced sound environment.

As mentioned above, the characterization of the reference acoustic framework included the identification of noise emission sources and sensitive receivers in the study area.

Table 24: Details of noise measurement survey

Reference of equipment used	Pulsar Model 33	
Height of equipment above ground	1.5 m	
Measurement interval	23-140 db	
Weighting	A	
Measurement duration	10 minutes	
Atmospheric conditions: Equipment: Testo 410-2	Humidity	41
	Temperature	19 °C
	Wind speed	2.2 m/s
	Clear skies	Cloudy
Equipment positioning surface	Compacted soil	

Table 25: Results obtained

Measured parameters	Results	Location	Coordinates
L _{Aeq}	39.1 db	Caála Grain Terminal	12°50'10.59"S 15°30'50.65"E
L ₉₅	43.6 db		
L ₅₀	34.4 db		
L ₅	31.9 db		
L _{cpeak}	87.0 db		



Figure 45 – Noise measurement at the site

The sound levels obtained are 39.1 db, which does not exceed the noise limit recommended by the WHO, since it is intermittent during the daytime, corresponding to natural noise levels when no noisy activities are observed, or with noise generated by distant road traffic. The continuous noise annoyance threshold (LAeq) may be sporadically exceeded during the daytime when machinery, vehicles, and/or other equipment that may cause noise are in use. It is estimated that these will exceed 50 dB(A), so specific measures should be taken to control them.

6.12 SOCIOECONOMICS

6.12.1 General Considerations

This descriptor was prepared based on information gathered during a field visit in August 2024, a local and regional analysis of the environment, potential socioeconomic development factors, and bibliographic research.

The socioeconomic characterization of the study area aims to identify and characterize the main demographic, economic, and social aspects likely to be influenced by the development of the grain silo project and, thus, highlight the potential direct and indirect impacts associated with it.

6.12.2 Administrative Framework

Huambo is one of Angola's 18 provinces, located in the central region of the country. Its capital is in the city and municipality of Huambo. The province of Huambo covers an area of 35,771 km², which represents a significant area that is home to diverse communities and ecosystems.

Huambo is bordered by the provinces of Cuanza Sul to the north, Bié to the east, Huíla to the south, and Benguela to the west.

The province is divided into 11 municipalities: Huambo, Bailundo, Ecunha, Caála, Cachiungo, Londuimbale, Longonjo, Mungo, Chicala-Choloanga, Chinjenje, and Ucuma.

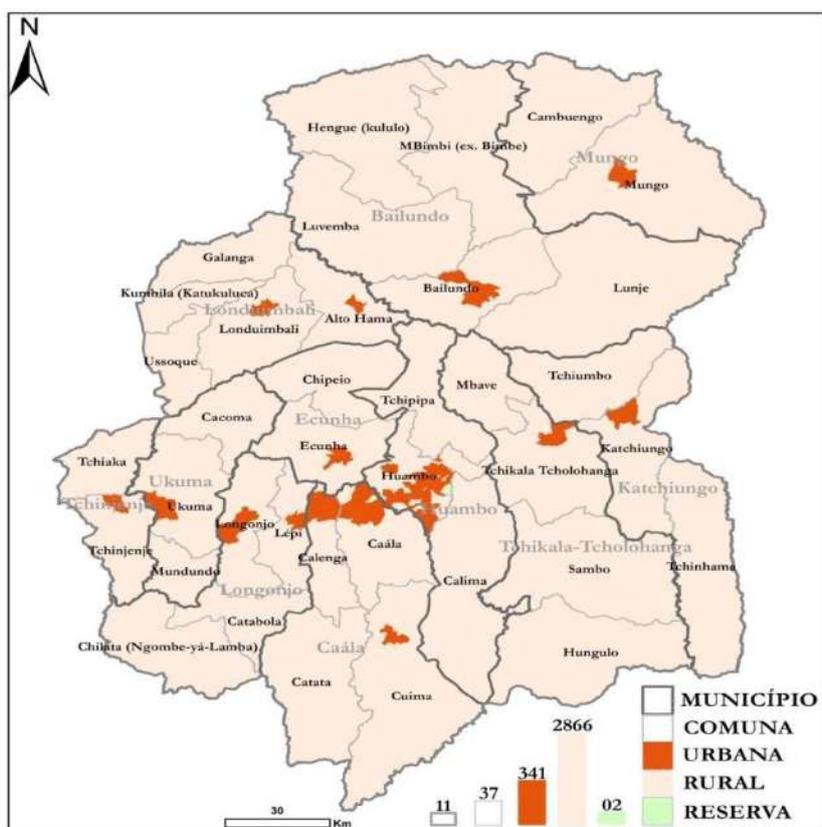


Figure 46 - Administrative division of Huambo

Table 26: Municipalities, area, and administrative division

No.	Municípios	Superfície (km ²)	Comunas	Ombalas	Aldeias
1	Bailundo	7.065	5	79	573
2	Caála	3.680	4	68	399
3	Ecunha	1.677	2	33	209
4	Ucuma	1.600	3	33	209
5	Mungo	5.400	2	37	392
6	Cachiungo	2.947	3	38	203
7	Huambo-Sede	2.609	3	37	279
8	Chinjenje	800	2	16	116
9	Longonjo	2.915	4	27	203
10	Londumbali	2.698	5	40	293
11	Chicala Choloanga	4.380	4	75	392
	TOTAL	35.771	37	483	3268

Source: Data from the Huambo population census. INE, 2014.

6.12.3 Demographics and settlement

According to the Final Results of the 2014 Census, the population of Huambo province was 2,019,555 inhabitants on the date of the census (May 16, 2014). This population is

distributed between urban (48%) and rural (52%) areas, reflecting a significant division that may impact the socioeconomic dynamics of the region.

Table 27: Population by area of residence, by sex, 2014

Província e área de residência	Total		Homens		Mulheres	
	Nº	%	Nº	%	Nº	%
Huambo	2 019 555	100	958 140	100	1 061 414	100
Urbana	963 203	47,7	460 720	48,1	502 483	47,3
Rural	1 056 352	52,3	497 420	51,9	558 931	52,7

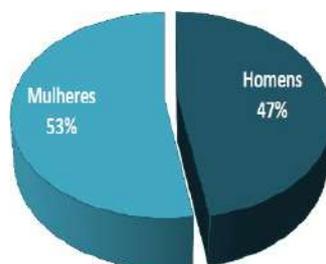
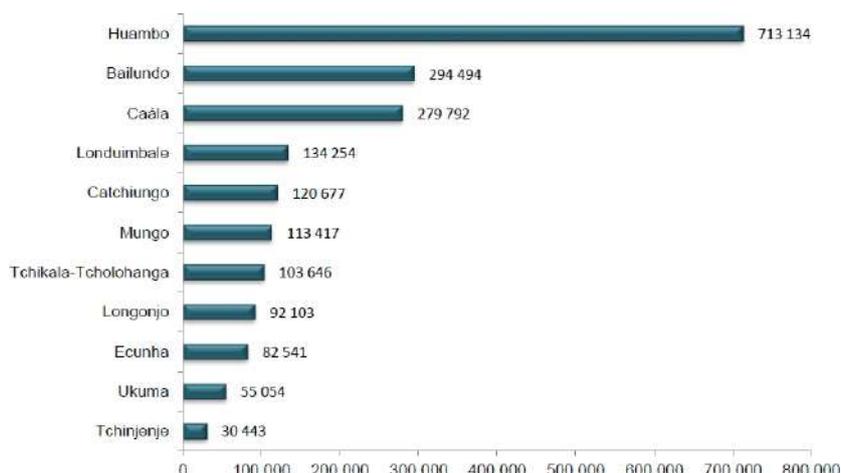


Figure 47 - Population, by sex, 20

Among the resident population, 1,061,414 are women, corresponding to 53%, while the male population is 958,140, representing 47%.

The municipality of Huambo is the most populous with 713,134 people, representing about one-third of the province's population (35%). With less than 100,000 inhabitants each are the municipalities of Longonjo (92,103), Ecunha (82,541), Ukuma (55,054), and Tchinjenje (30,443).

Graph 1: Population by municipality, 2014



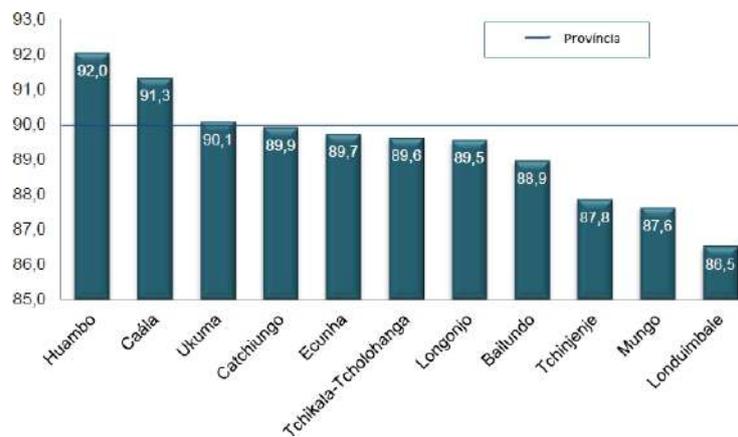
Caála is a city and municipality in the province of Huambo, covering an area of 3,680 km² and with a population of around 279,792. The municipality of Caála is located in the central part of the province of Huambo, bordered to the north by the municipality of Ecunha, to the east by the municipality of Huambo, to the south by the municipality of Chipindo, and to the west by the municipalities of Longonjo and Caconda.

The municipality consists of the main commune, corresponding to the city of Caála, and the communes of Cuíma, Calenga, and Catata.

The masculinity index expresses the ratio between men and women. The masculinity index at the provincial level is 90, meaning that in Huambo there are on average 90 men for every 100 women.

The municipalities of Huambo and Caála have masculinity indices above 90, with 92 and 91 men for every 100 women, respectively. The municipality of Londumbale has the lowest value, with 87 men for every 100 women.

Graph 2: Sex ratio by municipality, 2014



6.12.4 Employment

The unemployment rate in Angola rose to 32.4% in the first quarter of 2024, with young people being the hardest hit by unemployment, which affects 63.5% of young people between the ages of 15 and 24. According to data from the Angolan National Statistics Institute (INE), the unemployment rate among the population aged 15 to 24 rose by 9.1% in the first three months of 2024 compared to the previous quarter (58.3%), while the unemployment rate among the population over 15 years of age saw a less significant increase in quarterly terms (from 31.9% to 32.4%). In the first quarter of this year, an additional 181,368 Angolans aged 15 or over (working-age population) became unemployed, for a total of 5,646,659 people (a quarterly change of 3.3%).

Among Angolans aged 15 to 24, the unemployed population increased to 3,737,150 people, with an additional 286,183 young people unemployed. Within the working-age population (17,414,877), 11,768,218 people were employed, with an estimated employment rate of 60.2%, which was slightly higher in rural areas and among the male population (61.6% compared to 59% for women).

The 35-44 and 45-54 age groups account for the largest number of employed people, according to the Angola Employment Survey (IEA).

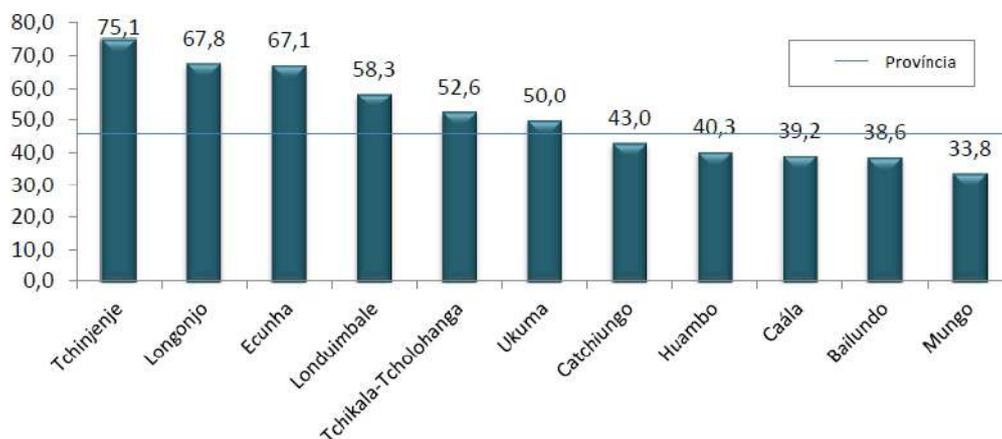
Almost half of the people (47.5%) work in agriculture, hunting, and fishing, followed by trade with 22.6%. Most of the employed people (79.8%) are in the informal sector, of which 70.7% are men and 88.5% are women.

The IEA is a sample survey of households residing in Angola. Each quarter, a total of 10,944 households are selected, 6,036 in urban areas and 4,908 in rural areas.

In Huambo, a large part of the working population is involved in the informal sector, working in activities such as street vending, subsistence farming, small family businesses, and manual labor, where a lack of regulation and social security is a constant. Although the informal sector helps sustain the local economy, it does not offer many opportunities for improving quality of life or developing professional skills.

In 2014, the employment rate in Huambo was 45%, with men having a higher rate than women. The employment rate is the ratio of the employed population aged 15 and over to the total population aged 15 and over. This important indicator measures the capacity of a province's economy to provide employment for its growing population.

Graph 3: Employment rate by municipality, 2014



The municipalities of Tchinjenje and Longonjo have the highest employment rates, at 75% and 68% respectively. At the opposite end of the scale is the municipality of Mungo, with 34%.

Graph 4: Employed population by main activities



Fonte: INE-Censo, 2014

The employment sector in the municipality of Caála is dominated by agriculture, commerce, and services as the main sources of employment. Agriculture, especially the cultivation of corn, beans, and potatoes, employs a large part of the rural population, while informal trade and small businesses are the main sources of income in urban areas. Civil construction also plays an important role, mainly due to urbanization projects and improvements in local infrastructure.

Despite these activities, the labor market in Caála faces several challenges. The lack of formal jobs leads many workers to seek employment in the informal sector, which lacks security and social benefits. The low skill level of the workforce exacerbates the situation, making it difficult to find employment in areas that require specialization, such as industry and technical services. In addition, dependence on a few economic sectors leaves the local economy vulnerable to crises, such as climate variations that affect agriculture.

Another significant challenge is unequal access to the labor market for women and young people, who face additional barriers to finding quality jobs. Infrastructure problems, such as poor roads and limited access to electricity, also hinder economic growth and restrict job creation in sectors such as agribusiness and small industries, which could diversify the municipality's economy.

To improve employability, initiatives are needed that invest in technical and vocational education, as well as public policies that encourage the formalization of work and the strengthening of agribusiness. Measures such as entrepreneurship support programs and incentives for hiring young people and women can contribute to creating a more dynamic and inclusive labor market, promoting the sustainable development of Caála.

6.12.5 Economic activities

6.12.5.1 Agriculture

In 2014, 70% of households in Huambo province were engaged in some form of agricultural activity.

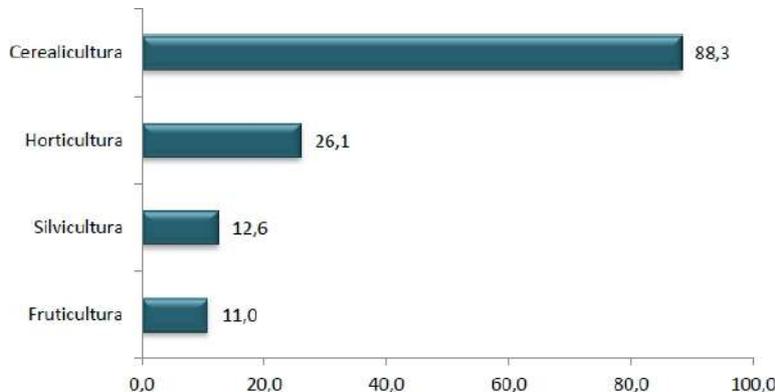
Table 28: Households engaged in agriculture. 2014

Província	Nº	%
Huambo	304 794	70,2

The province of Huambo has high agricultural potential resulting from its unique soil structure and favorable climate diversity, combined with an enviable hydrographic network. The province has around one million hectares of arable land, which reflects the potential for agricultural development in this area.

The province offers favorable conditions for the development of an impressive variety of crops.

Graph 5: Households, by type of agricultural activity, 2014



The agricultural sector in the municipality of Caála is the main source of livelihood and income for the majority of the population. Benefiting from fertile soils and a favorable climate, the municipality stands out in the production of crops such as corn, beans, and potatoes, which are essential for the local diet. In addition, vegetables such as tomatoes, onions, and carrots, as well as coffee and some fruits, have gained relevance, both for domestic consumption and for sale in regional markets.

Despite its productive potential, the sector faces several challenges. The lack of mechanization makes agriculture predominantly manual, limiting productivity. Farmers also face difficulties in accessing modern inputs, such as quality seeds and fertilizers, which compromises agricultural performance. Another significant problem is poor infrastructure, such as roads in poor condition, which hinders the transport of production to urban markets, increasing costs and losses.

Agricultural cooperatives and associations have played an important role in strengthening the sector, helping small producers to purchase inputs and market their surplus production. However, the coverage of these organizations is still limited, and they do not serve all farmers who could benefit from greater organization and technical support. Modernizing these structures is essential to boost productivity and generate better economic conditions for producers.

To overcome these challenges, it is necessary to invest in mechanization, expand access to inputs, and improve rural infrastructure. In addition, technical training programs and greater government support, through agricultural policies and financing, are essential to transform the sector into a more competitive and sustainable activity. With these improvements,

agriculture in Caála can increase its contribution to the regional economy and improve the quality of life of the local population.



Figure 48: Agriculture using traction (project surroundings)



Figure 49: Agriculture (project surroundings)

6.12.5.2 Fishing

In 2014, 6% of households in Huambo province were engaged in some form of fishing activity.

Table 29: Households engaged in fishing activities, 2014

Província	Nº	%
Huambo	26 278	6,1

The fishing sector in the municipality of Caála is a small-scale activity, but it is important for the subsistence of some riverside communities and for local supply. Fishing is predominantly artisanal, carried out in the main rivers of the region, such as the Calai River and its tributaries. These waterways provide species such as catfish, tilapia, and small fish, which are consumed locally or sold in informal markets.

Although there are some fishing cooperatives and associations, their presence is limited and does not reach all professionals in the sector. These organizations aim to support fishermen with basic equipment and facilitate the marketing of fish, but most fishermen still operate independently. Strengthening and expanding these cooperatives is essential to ensure better working conditions and organize the sector more efficiently.

The sector faces several challenges that compromise its productivity and sustainability. Infrastructure is poor, with a lack of modern equipment such as adequate nets and fish storage facilities. In addition, fishermen lack technical training, which hinders the adoption of sustainable fishing practices. Climatic factors, such as periods of drought that reduce river levels, also negatively affect fish availability, while informal marketing limits financial gains.

To overcome these challenges, it is essential to invest in training fishermen, providing better equipment, and creating structured markets for fish. Sustainable water resource management and the strengthening of cooperatives can increase the sector's productivity and organization. With these efforts, fishing in Caála has the potential to become a more efficient, sustainable, and economically viable activity, benefiting local communities and contributing to food security in the region.

6.12.5.3 Livestock

Livestock farming is a key sector for the subsistence of Angola's rural population and is strategically important for the economy and food and nutritional security of the population through the production and trade of animals and their products. Animal production plays a major role in the socioeconomic life of our country, not only because of the percentage of the population engaged in this activity, but mainly because of the resources it provides.

Livestock farming in the country focuses mainly on information about the agricultural and aquaculture enterprises that practice this activity, whose data is limited to the structure of the farms that raise animals, the species raised, their numbers and classes, production systems, animal vaccination, and animal health status, among other things. The RAPP (Agricultural and Fisheries Census) found that there are 773 specialized companies in the country that practice livestock farming as their main activity and 2,341 that practice livestock farming as at least one of the company's activities.

The main livestock species raised by Agricultural and Aquaculture Enterprises are cattle, goats, pigs, sheep, and poultry, particularly chickens. The results show that the number of animals in the EEs is 259,640 cattle, 136,216 goats, 69,846 pigs, and 58,951 sheep.

The table below illustrates the data on livestock numbers according to the main species raised in Angola.

Table 30: Livestock numbers by EE per province

PAÍS/PROVINCIA	BOVINOS	CAPRINOS	OVINOS	SUÍNOS
Angola	259 640	136 216	58 951	69 846
Cabinda	1 092	551	439	1 229
Zaire	1 173	2 101	640	2 814
Uíge	12 623	5 386	4 598	7 423
Luanda	16 701	16 102	14 710	8 528
Cuanza Norte	13 444	4 877	2 197	1 811
Cuanza Sul	30 663	22 937	10 042	21 921
Malanje	9 633	4 518	1 504	2 558
Lunda Norte	19 370	5 089	1 489	1 577
Benguela	35 077	16 267	5 634	4 189
Huambo	10 441	10 894	4 382	6 715
Bie	4 087	4 305	1 460	1 125
Moxico	913	1 644	78	534
Cuando Cubango	968	506	60	80
Namibe	30 907	10 031	2 144	856
Huíla	33 385	8 938	1 671	828
Cunene	25 178	11 705	1 764	916
Lunda Sul	6 342	3 985	1 304	1 965
Bengo	7 643	6 380	4 835	4 777

Fonte : INE-RAPP 2019-2020

Table 31: Poultry stocks raised by EEs by province (continued)

PAÍS/PROVÍNCIAS	GALINHAS		FRANGAS DE CORTE		FRANGAS POEDEIRAS		PATOS		PERUS	
	TOTAL	MÉDIA	TOTAL	MÉDIA	TOTAL	MÉDIA	TOTAL	MÉDIA	TOTAL	MÉDIA
Angola	60 986	1 799	104 254	11 043	551 219	51 529	12 796	659	544	114
Cabinda	115	12,8	7 042	320,1	1 069	213,8	567	31,5	2	2
Zaire	313	39,1	1 739	82,8	404	33,7	251	17,9		
Uige	2 355	84,1	162	23,1	5 033	2516,5	329	20,6		
Luanda	9 253	298,5	17 157	2451	99 627	9057	2 020	91,8	27	4,5
Cuanza Norte	656	46,9	894	81,3	13 576	969,7	242	22	5	2,5
Cuanza Sul	1 356	30,8	23 552	305,9	52 581	1877,9	1 443	23,3	233	14,6
Malanje	5 583	164,2	2 055	158,1	13 487	749,3	241	13,4	21	5,3
Lunda Norte	11 765	273,6	442	88,4	80	40	2 107	84,3		0
Benguela	991	17,7	11 272	150,3	71 305	5485	944	15,7	39	5,6
Huambo	7 991	44,9	253	28,1	57 143	5714,3	1 027	18,7	34	3,8
Bie	3 313	77	3 661	114,4	29 493	3277	207	13,8	10	3,3
Moxico	4 495	179,8	521	57,9	10 741	1790,2	231	19,3	1	1
Quando Cubango	151	25,2	210	42	290	41,4	47	9,4		
Namibe	2 355	181,2	280	280	6 194	2064,7	339	48,4	12	12
Huíla	749	68,1	30 450	6090	39 700	7940	312	52	47	9,4
Cunene	1 531	45	78	39			124	12,4		
Lunda Sul	6 248	63,1	400	50	5 640	705	750	30	38	12,7
Bengo	1 766	147,2	4 086	681	144 856	9053,5	1 615	134,6	75	37,5

Fonte : INE-RAPP 2019-2020

As illustrated in Tables 27 and 28, livestock farming in Huambo is practiced on a large scale by the business sector. On the other hand, local communities are also involved in raising various types of animals, which is crucial for the subsistence of these communities, as well as for the economic development of the region.

Livestock farming in the municipality of Caála is a significant economic activity, practiced in a traditional way, with an emphasis on the raising of cattle, goats, sheep, pigs, and domestic poultry. Cattle are the most important species, used for meat, milk, and as agricultural labor. Goat and sheep farming is common in areas with more limited pastureland, while poultry and pig farming complement production, contributing to family food supplies and generating surpluses for sale.

Despite its importance, the sector faces structural challenges that limit its development. Production is largely traditional, with low use of technology and restricted access to veterinary services, which increases the vulnerability of herds to disease. Poor infrastructure for transporting and storing products, combined with a shortage of pasture and water during periods of drought, compromises the efficiency and expansion of the activity. In addition,

limited access to credit and insufficient government support hinder modernization and strengthening of the sector.

To overcome these barriers, it is essential to invest in technical training, modernize breeding practices, and strengthen livestock cooperatives. Public policies focused on vaccination,

Improvements to pastures and expansion of rural infrastructure can help boost the sector. With these measures, livestock farming in Caála has the potential to become more productive and sustainable, contributing even more to local economic development.



Figure 50 – Presence of cattle (surrounding the project)

6.12.5.4 Industry

Currently, the Huambo industry sector has more than 182 industrial units, 52% of which are in the food sector (bakeries, pastry shops, ice cream parlors), 30% in heavy industry (tire factories, plywood factories, sawmills) 14% light industry (cereal mills, metal goods, block factories), and 4% extractive industry (quarrying). The province is striving to regain its position as the country's second largest industrial park, provided that its entire industrial capacity receives further investment.

The industrial sector in the municipality of Caála is still limited, but plays an important role in the local economy. Its main areas of activity include agro-industry, with the processing of agricultural products such as corn and cassava, and the manufacture of construction materials such as cement blocks and ceramics. In addition, there are small industries focused on the production of consumer goods, such as handmade soap, and metalworking and carpentry workshops, which meet local demands in a traditional way.

Stagnant for a long time, the light manufacturing industry is slowly resurging, albeit timidly. At present, the people of Caal have 60 carpentry and joinery workshops,

45 sawmills, five seamstresses, two shoe shops, four photographic studios, two

photographic studios, two ceramics workshops, a soap factory, and three service companies. The small food industry consists of 50 mills, eight bakeries, a liqueur factory, three pastry shops, 39 home ovens, and 90 stone mills.

Caála once had a considerable industrial park, which included units such as Salsicharia, Codume (specializing in metal cutting), Fábrica de Linha Coroas, Confeitaria Beleza, and others, which contributed to its development.

Currently, the Caála Industrial Hub is growing, with some industries already operating in the area and others setting up, such as the school bag factory (FERPLAS), the pasta factory, the corn flour processing factory, among others that are setting up within the Caála Industrial Hub.

Agribusiness is the most important industrial activity, taking advantage of the region's abundant agricultural production to supply food products to both the domestic market and neighboring areas. The manufacture of construction materials has also gained prominence, driven by demand from the local real estate sector. These activities demonstrate the municipality's industrial potential, especially in sectors that take advantage of local resources and meet the immediate needs of the population.

Caála is one of the national highlights in wheat and sorghum production. The rivers that cross the municipal territory are sources of safe fishing and drive an important popular economy, mainly in the south of the municipality, where there is the lake of the Gove Hydroelectric Power Plant.

Despite its potential, the sector faces significant challenges. Poor infrastructure, including unstable electricity supply and transportation difficulties, limits the full operation of industries. In addition, restricted access to financing hinders the modernization and expansion of activities. The low skill level of the local workforce and dependence on external inputs also affect the sector's efficiency and competitiveness, hindering industrial growth and diversification.

To overcome these barriers, it is necessary to invest in basic infrastructure, technical training for the workforce, and the creation of policies to encourage industrialization. The establishment of industrial parks and the strengthening of public-private partnerships can attract new ventures and boost the sector. With these measures, the municipality of Caála has the potential to develop a more diversified and efficient industrial base, contributing to economic growth and job creation.

Caála logistics platforms

December 9, 2023, marked the start of this ambitious project, which aims to be the major logistics and transport hub connecting the Port of Lobito to the Democratic Republic of Congo and later to Zambia.

This platform, scheduled to start operating in 2025, is the first of six Logistics Platforms to be built, in a first phase, at strategic points in the country, with a view to the storage, conservation, and distribution of agricultural, mineral, forestry, food industry, fisheries, energy, tourism, and hydrocarbon industry products.

The objectives of this project include replacing imports of basic consumer goods with local production, boosting small businesses and the activity of agricultural producers, creating more than 2,000 jobs, promoting well-being, and ensuring the development and equitable distribution of income throughout the national territory.

Its purpose is to play an important role in the Executive's vision of replacing imported raw materials with local production and connecting to global markets through the Port of Lobito and to neighboring countries through the Lobito Corridor, in order to make the project a fundamental axis. Located between National Roads 120 and 260 and the Lobito Corridor – municipality of Caála, province of Huambo.



Figure 51: Advertising sign for the Caála logistics platform

6.12.5.5 Trade

The trade sector, subdivided into rural and urban trade, has weaknesses:

In the rural trade subsector, there is no adequate system for marketing livestock and agricultural products that stimulates the supply of agricultural inputs and consumer goods; there is a lack of specific incentives for agents who may be involved in this sector; lack of a functional network; difficulties on the part of central bodies in implementing approved rural marketing programs; lack of technicians with the sensitivity and capacity to address the problems; lack of interest among traders in this business sector due to the low purchasing power of rural populations; lack of private investment; and lack of establishments in municipalities capable of supplying agricultural equipment and tools, seeds, pesticides, livestock medicines, and others.

In the urban trade subsector, weaknesses stem from the excessive concentration of commercial activities in the municipal capital; poor product quality and lack of control entities; poor enforcement of legislation and standards in the area of food quality; insufficient implementation of rural trade promotion programs; excessive bureaucracy and delays in the commercial licensing process; insufficient measures to protect domestic production; the exodus of traders and the rural population to urban centers and market computerization; poor information on the connection between food quality and public health; insufficient storage and preservation infrastructure; lack of regular surveys of commercial activities; municipal markets with poor hygiene and sanitation conditions; weakness in the marketing system for domestic goods; poor use of newly built markets; and the resulting weak purchasing power of the population; weak competitiveness of domestic production and constraints throughout the value chain.

The trade sector in the municipality of Caála is vital to the local economy, notable for the diversity of activities that encompass both formal and informal trade. Informal trade predominates, with street vendors and markets selling agricultural products, food, and basic utensils. However, formal trade is also growing in importance, represented by stores, supermarkets, and small establishments that meet the demand for consumer goods, construction materials, and manufactured products.

The main trading locations include the Caála market, which is the center of commercial activity in the municipality. In this market, agricultural and horticultural products, meat, fish, and

handicrafts are widely traded. The proximity to agricultural areas favors the supply of fresh products, while formal stores are concentrated in the urban area, selling clothing, appliances, and other essential goods. Smaller markets in rural areas complement the sector, focusing on the exchange of local products.

However, trade faces several challenges that limit its growth. Commercial infrastructure is poor, with informal markets lacking adequate conditions for sellers and consumers. Small traders have difficulty accessing credit, which prevents investment and modernization of their businesses. In addition, there is unfair competition between formal and informal trade, exacerbated by a lack of effective regulation. Fluctuating product prices, especially for agricultural products, also negatively impact the sector, hindering stability and profits for traders.

To strengthen the sector, improvements in market infrastructure and incentives for formal trade are needed, such as accessible credit lines and training programs for entrepreneurs. The formalization of informal trade and the creation of policies to stabilize agricultural prices can contribute to a more favorable environment. With adequate investment, trade in Caála has the potential to grow in an organized manner, expanding its contribution to the municipality's economic development.

6.12.5.6 Financial, Banking, and Insurance System

The National Bank of Angola (BNA), Angola's central bank, is the supervisory institution for all financial institutions in the country, having licensed twenty-three banks to offer banking services in the domestic market.

The financial sector in the municipality of Caála plays an important role in the local economy, offering banking and insurance services to traders, farmers, and small business owners. Banks such as Banco de Fomento Angola (BFA), Banco de Poupança e Crédito (BPC), and Banco Sol, etc., are the main ones present in the region, providing deposit, credit, and transfer services. However, the presence of insurance companies is still limited, offering only basic products such as vehicle and business insurance.

Despite its importance, the sector faces significant challenges, including limited access to financial services for the population, especially in rural areas. Lack of financial education prevents many from taking advantage of available services, while poor infrastructure and unstable energy supplies hinder the efficient operation of

institutions. In addition, bureaucracy and high credit and insurance costs make services inaccessible to small entrepreneurs and farmers.

To overcome these barriers, it is necessary to expand the network of branches, especially in remote areas, and adopt technological solutions such as mobile banking to increase reach. Investing in financial education and creating incentive policies, such as accessible credit lines and subsidies, can promote financial inclusion and stimulate the sector's growth. With these measures, the financial sector can play a more effective role in Caála's economic and social development.



Figure 52 – BFA bank branch in Caála

6.12.5.7 Hospitality and Tourism

Its climate only complements the magnificence of its nature and its people. The first Portuguese settlers fell in love with this land, even naming it "Nova Lisboa" (New Lisbon) because of its environment, which, according to some studies, is very similar to the Portuguese capital.

On a tour of the 11 municipalities, tourists will see a variety of mountains, as it is a territory with an altitude above sea level, and Mother Nature has given it a beauty that makes any traveler want to repeat the tour. It is an excellent place to take family and friends to visit the province's 116 tourist attractions. A must-see is Morro do Moco, the roof of Angola, where visitors can enjoy rappelling, hang gliding, and canoeing.



Figure 53: **Morro do Moco**

Huambo has a diverse fauna, with rhinos, hippos, giraffes, lions, crocodiles, and elephants welcoming you alongside hundreds of birds, reptiles, and antelopes that roam the area in search of better pastures.

Seeing these animals in the wild makes for unforgettable photos and is the real reason why Africa attracts people from other continents.

You can also find various species of plants, most of which are used to combat diseases, and beauty recipes for women.

In the city center, you will find one of the most important landmarks, the statue of Agostinho Neto, Angola's first president. Further ahead is the Huambo Municipal Anthropological Museum, which houses a large number of local handicrafts, traditional Huambo clothing, utensils, and works of art.

One of the city's architectural symbols is the Huambo Cathedral, an intact colonial heritage site that is a must-see.

But after this, be sure to visit Ilha dos Amores, Monte Halavala, Ilha do Cuile, the rock figures of Caninguili, and the source of the Cubango River, which will make your trip worthwhile.

The hotel and tourism sector in the municipality of Caála has great potential due to its strategic location and rich natural landscapes. Although still under development, the region already has establishments such as the Hotel Ekuikui and the

Residencial Sol Nascente, which offer basic accommodation for business travelers and tourists. These establishments have contributed to the initial consolidation of tourism in the municipality, serving both local and national visitors.

Among the main tourist attractions are the region's mountainous landscapes and natural areas, ideal for hiking and ecological activities. Places such as the Kunene River, in nearby areas, and the forests around Caála provide experiences of contact with nature and tranquility. The cultural richness of the municipality is also a highlight, with local traditions, typical dances, and a cuisine that arouses the interest of visitors.

However, the sector faces significant challenges, such as poor transport infrastructure, with roads in poor condition that make access to tourist sites difficult. Accommodation options are limited and lack complementary services, such as tour guides and organized packages. In addition, the lack of promotion of local attractions and the low qualifications of workers in the sector compromise the municipality's potential as a competitive tourist destination.

To overcome these challenges, it is necessary to invest in infrastructure, such as road improvements and the creation of tourism support services. Training workers in the sector, combined with campaigns to promote attractions, can boost tourism in the region. With these efforts, the municipality of Caála is in a position to develop a more structured tourism sector, capable of generating jobs, diversifying the local economy, and attracting a growing number of visitors.

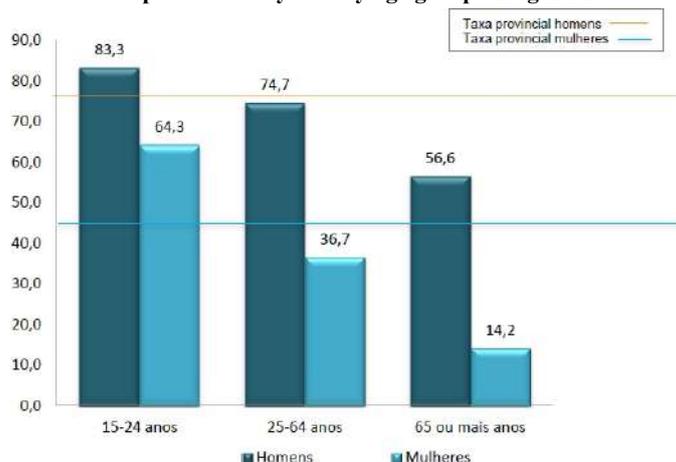
6.12.6 Social Facilities

6.12.6.1 School network

The education sector in Huambo province has been working to develop an educational system that meets the technical, scientific, and professional requirements necessary for training new generations.

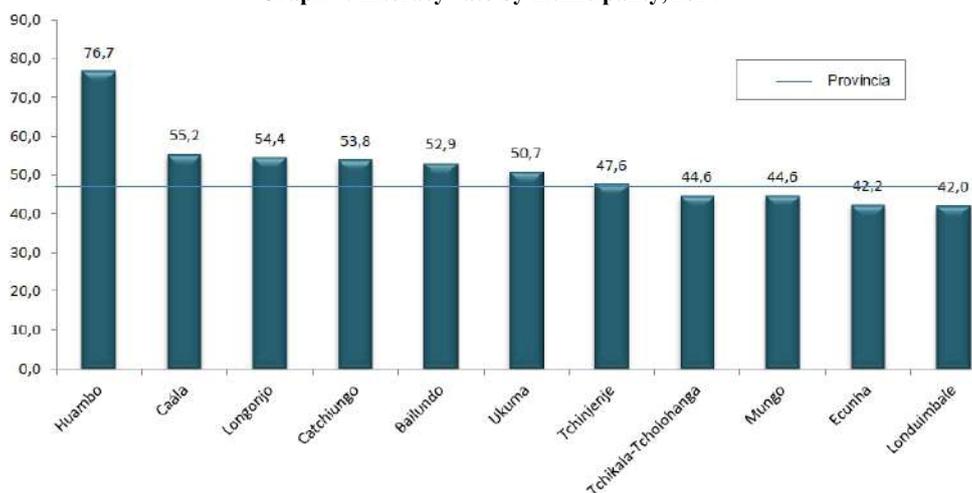
According to data from the 2014 Census, the literacy rate in Huambo province is 60%, with 77% in urban areas and 44% in rural areas. In terms of gender, 77% of men can read and write, compared to 45% of women.

Graph 6: Literacy rate by age group and gender



Analysis by municipality indicates that, in Huambo province, the lowest rate is found in the municipalities of Ecunha and Londumbale, where only about 4 in 10 people can read and write (42%).

Graph 7: Literacy rate by municipality, 2014



In 2014, only 8% of the population aged 18 or over had completed the second cycle of secondary education (had completed 12th or 13th grade). On the other hand, 19% of the population aged 18 or over had completed primary education (had completed 6th grade).

Table 32: Population aged 18 or over, by level of education completed, 2014

Província	Nunca frequentou	Nenhum nível	Ensino primário	I ciclo do ensino secundário	II ciclo do ensino secundário	Ensino superior
Huambo	29,0	29,9	18,8	13,2	8,0	1,0

The province of Huambo has 1,214 schools, covering primary education and cycles I and II, with a total of 400 classrooms. The number of educational institutions indicates an effort

to meet the educational demands of the population. One of the main objectives of the provincial education department has been to ensure that children in rural areas have access to schools as soon as they finish the previous cycles. This is crucial to promoting educational equity and combating illiteracy.

In the 2023/2024 academic year, the education sector in Huambo enrolled 916,500 students, 70% of whom were in primary education. More than 15,000 young people and adults also attended literacy classes, in different modules, in the 11 municipalities of the province.

Huambo is also home to the Huambo Higher Institute of Education Sciences (ISCED-HBO), a public higher education institution. ISCED-HBO was originally linked to Agostinho Neto University, but became fully autonomous in 2008 and 2009.

In terms of higher education, the province of Huambo has other important institutions located in the municipality of Huambo, as listed below:

- UAN's Higher Institute of Education Sciences of Huambo;
- UJES Higher Polytechnic Institute of Huambo;
- EKUIKUI II Higher Polytechnic Institute of Humanities and Technologies;
- JGM Higher Polytechnic Institute;
- Lusíadas Higher Polytechnic Institute;
- Sol Nascente Higher Polytechnic Institute;

Caála is currently considered an academic city, with a large number of educational establishments ranging from preschool to higher education. Due to this academic reality, Caála attracts people from other parts of the country and beyond, who come from other places in search of knowledge. The municipality has an estimated 91 schools, and the education sector has grown significantly as a result of investments made by the Provincial Government of Huambo. The number of schools built has allowed more than 125,000 students to be enrolled in the normal education system, supported by a total of 2,000 teachers in various education subsystems. (Caála Municipal Administration, 2023).

Despite the presence of schools and institutes, the sector still suffers from a lack of adequate infrastructure. Many schools face problems such as overcrowding, lack of

teaching materials and basic equipment, as well as a shortage of qualified teachers, especially in technical and scientific subjects. These limitations compromise the quality of teaching and hinder access to education, particularly in rural areas of the municipality.

Another significant challenge is the low enrollment rate at certain levels, particularly in secondary and technical-vocational education, due to the lack of nearby institutions or difficulty in accessing existing ones. School dropout rates are also a concern, often caused by adverse socioeconomic conditions, such as child labor and the need for financial support for families, as well as cultural factors that still devalue education in some communities.

To improve the sector, investments are needed in school infrastructure, continuing education for teachers, and expanded access to teaching materials. The creation of new schools in rural areas and programs to encourage school retention can help reduce dropout rates. With more comprehensive educational planning, the municipality of Caála can advance the education of its population, contributing to the sustainable development of the region.

The municipality of Caála has several primary and secondary schools, both public and private, as illustrated in the figure below showing Compão Primary School No. 16.



Figure 54: Compão Primary School No. 16.



Figure 55: Polytechnic secondary school (Rainha do Milho)

6.12.6.2 Hospital network

According to the Multiple Indicator Cluster Survey (MICS, 2015-2016), malaria is one of the main public health problems in Angola and is the leading cause of demand for health services, absenteeism from work and school, and death. It is also one of the main causes of miscarriage, premature birth, low birth weight, anemia in pregnant women, and maternal and perinatal mortality. It accounts for about 35% of demand for curative care, 20% of hospital admissions, 40% of perinatal deaths, and 25% of maternal mortality.

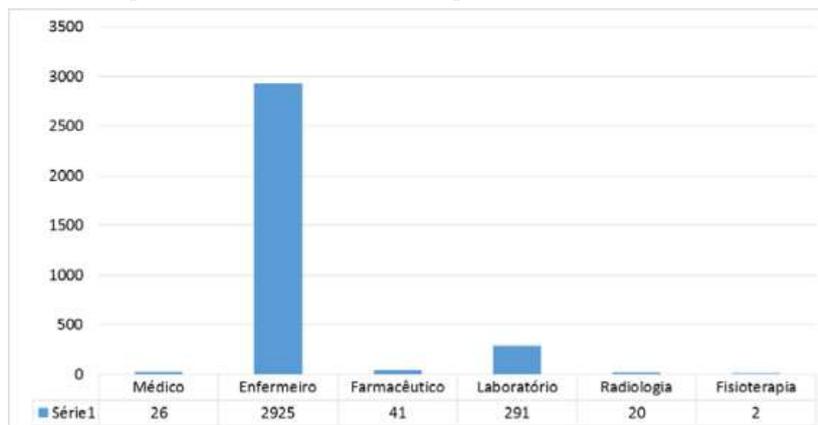
The health network is characterized by insufficient infrastructure, equipment, and specialized workforce, which translates into a low level of service provision to the population.

The municipality of Huambo has 57 health facilities, including a municipal hospital, a maternal and child health center, and health centers and clinics. The municipality of Huambo has several hospitals, notably the Huambo Municipal Hospital.



Figure 56: Huambo General Hospital

Graph 8: Human resources in the hospital sector. Source: (usaid.gov)



Healthcare has undergone significant developments. For example, before independence, the municipality of Caála had only three health centers, but today the healthcare network covers the entire municipality and includes a municipal hospital, five health centers, and 12 health posts. The epidemiological situation in the municipality is characterized by the incidence of acute respiratory diseases. Malaria is the most common disease and the cause of most deaths. Despite the main shortcomings in their operation, health centers have been the main resource for treating diseases among the population.

The central government has done everything possible to expand the municipality's health network, and several projects are in the pipeline, which will allow the people of Caála to benefit from new health infrastructure in the near future.

In 2017, the Municipal Hospital of Caála, in the province of Huambo, now offers improved services with better medical and pharmaceutical care to the population after being renovated and expanded. It currently has 200 beds, twice as many as before, for hospitalization. Every day, the health facility provides pediatric, medical, maternity, surgical, and orthopedic services to 140 patients from the municipalities of Caála, Ekunha, Longonjo, Ukuma, and Tchindjendje, in the province of Huambo, Chipindo.

Problems such as the lack of basic sanitation aggravate public health conditions, contributing to the spread of waterborne diseases. In addition, chronic diseases such as hypertension and diabetes are on the rise, reflecting changes in the population's lifestyle.

The sector faces major challenges, such as a shortage of health professionals, a lack of basic medicines and equipment, and inadequate infrastructure, often without electricity. To improve care, investments are needed in training professionals, improving hospital infrastructure, and access to medicines. In addition, actions focused on basic sanitation and health education can reduce the burden of preventable diseases, contributing to a more efficient and accessible health system.



Figure 57 – Caála municipal hospital.

6.13 INFRASTRUCTURE

6.13.1 General Considerations

This descriptor comprises an analysis of the infrastructure in the project area, namely the electricity and water supply networks, road network, etc.

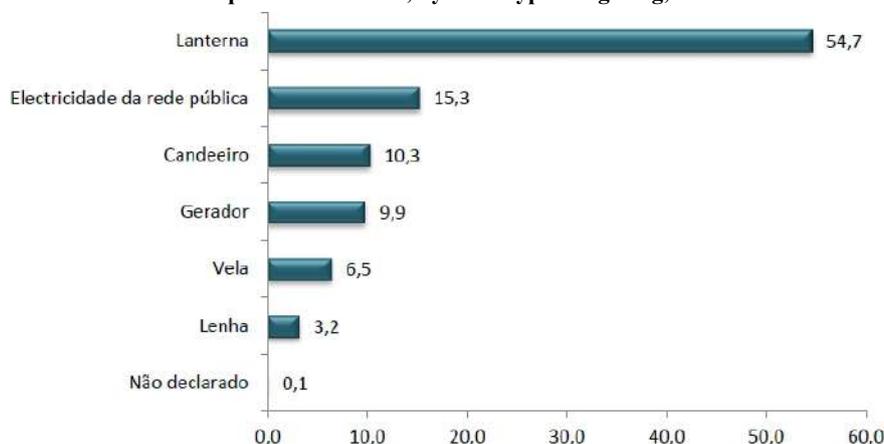
6.13.2 Electricity Supply Network

Data from the 2014 census indicated that only 15% of households in Huambo province have access to electricity from the public grid.

Table 33: Households with access to electricity from the public grid by area of residence, 2014

Província e área de residência	Nº	%
Huambo	66 389	15,3
Urbana	64 932	34,0
Rural	1 456	0,6

Graph 9: Households, by main type of lighting, 2014



The electricity supply network in the municipality of Caála is essential for economic and social activities, but still has significant limitations. The company responsible for managing energy supply is ENDE (Empresa Nacional de Distribuição de Electricidade), which operates in partnership with the interconnected system in the central region of the country. Although the distribution network is expanding, coverage is not yet universal, especially in rural areas.

The municipality has thousands of residential, commercial, and institutional connections, but much of the population in remote areas relies on alternative solutions, such as diesel generators and solar panels. In urban areas, electrification is more widespread, allowing essential services such as hospitals, schools, and small businesses to function, although frequent interruptions in supply hamper the continuity of these services.

The main challenges in the sector include insufficient distribution infrastructure, which cannot meet growing demand, and unstable supply quality, characterized by blackouts and voltage fluctuations. The expansion of the electricity grid is limited by logistical difficulties and high installation costs in regions that are difficult to access. In addition, the use of obsolete equipment and lack of adequate maintenance aggravate the situation.

To improve the sector, it is necessary to invest in the modernization of the distribution network and in renewable energy sources, such as solar mini-grids, which can serve remote communities. Expanding access to electricity also requires subsidy and financing programs for low-income families. With a more stable and comprehensive supply, the electricity grid will be able to meet the municipality's demands, boosting economic development and the population's quality of life.

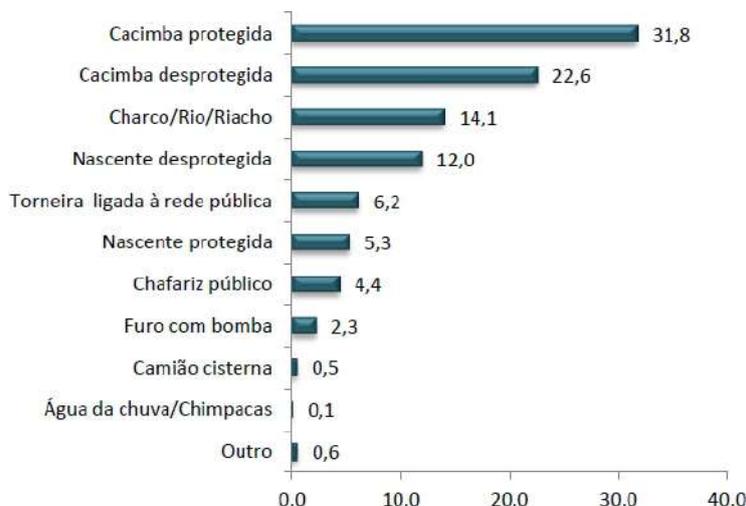
6.13.3 Water Supply Network

According to the results of the 2014 Census, half of households have access to appropriate sources of drinking water. The population often resorts to other supply alternatives.

Table 34: Households with access to appropriate drinking water by area of residence, 2014

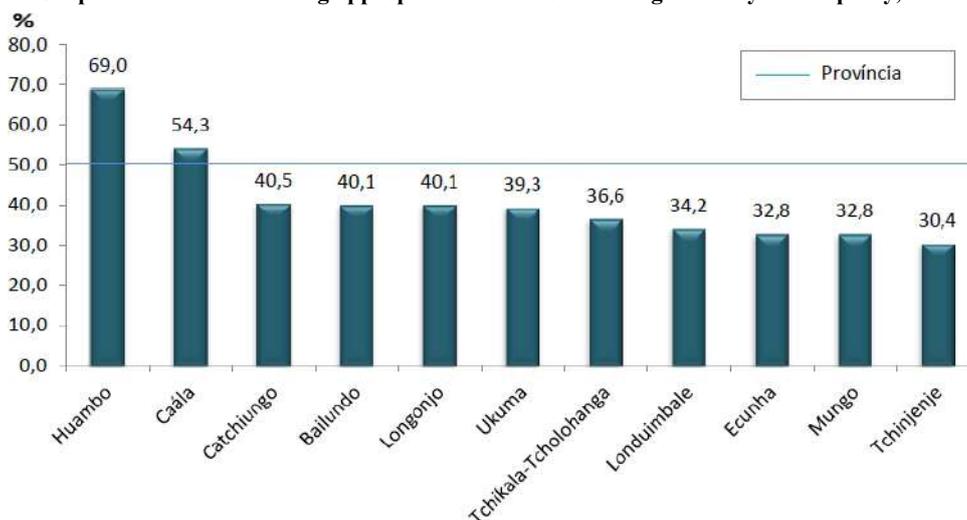
Província e área de residência	Nº	%
Huambo	217397	50,1
Urbana	137453	72,1
Rural	79943	32,8

Graph 10: Households by main sources of drinking water supply, 2014



There are significant differences in access to appropriate drinking water between the municipality of Huambo and the others. The municipality of Tchinjaenje has the lowest figure compared to the other municipalities, where only 30% of households have access to appropriate drinking water (twice as low as the municipality of Huambo).

Graph 11: Households using appropriate sources of drinking water by municipality, 2014



The Huambo Water and Sanitation Company (EASH) is also responsible for domestic wastewater and storm drainage in the municipality.

The water supplied to the population comes mainly from underground sources, such as artesian wells and springs, and to a lesser extent from rivers and other catchment areas. The supply network mainly covers the urban area, with thousands of household connections, but coverage is still insufficient, especially in rural areas.

Although part of the population has access to treated water, a significant number of people in peripheral and rural communities depend on alternative sources, such as rivers, untreated wells, and cisterns, exposing themselves to health risks. Consumption of untreated water can lead to the spread of waterborne diseases such as cholera, diarrhea, typhoid fever, and hepatitis A, negatively impacting public health, especially among children.

The challenges facing the sector include insufficient expansion of the distribution network, limited capacity to treat collected water, and significant losses due to leaks in the existing infrastructure. The lack of investment in maintenance and modernization of the system aggravates the situation, as does inefficient management and a lack of public awareness about the preservation of water sources and the rational use of water.

To overcome these challenges, investments in infrastructure are needed, such as the construction of new treatment systems and the expansion of the distribution network to rural areas. Education campaigns on the safe use of water and the preservation of sources are also essential. The implementation of subsidy programs for the supply of treated water to the most vulnerable populations can help reduce health risks and promote universal access to this resource.



Figure 58: Water well (Calai Brita neighborhood)

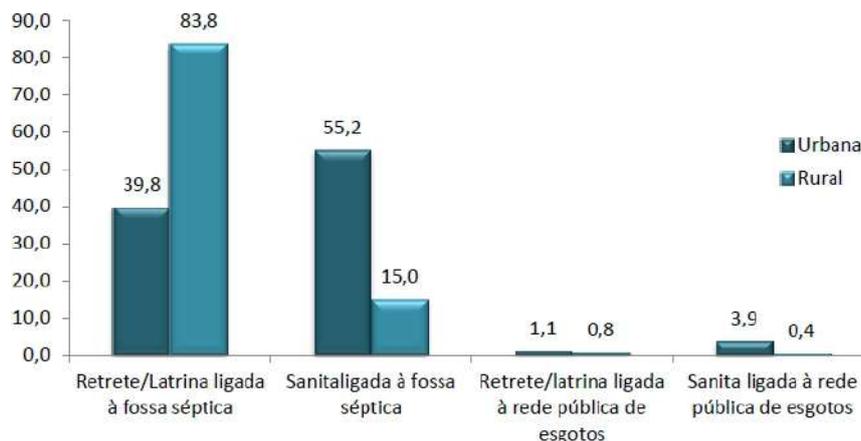
6.13.4 Basic sanitation

Data from the 2014 Census indicate that at the provincial level, about 77% of households use an appropriate place to defecate. However, this figure is only 65% in rural areas, compared to 91% in urban areas.

Table 35: Households using appropriate facilities for defecation by area of residence, 2014

Província e área de residência	Nº	%
Huambo	332 243	76,5
Urbana	173 883	91,1
Rural	158 360	65,0

Graph 12: Households using appropriate sanitation facilities by area of residence, 2014



The Huambo Water and Sanitation Company (EASH) is also responsible for domestic wastewater and storm drainage in the municipality.

The basic sanitation sector in the municipality of Caála faces significant challenges in terms of infrastructure and adequate access to services. Basic sanitation involves the treatment and proper disposal of wastewater, garbage collection, and the provision of sanitary facilities, areas in which Caála still lacks adequate resources and investment. Although there are some drainage and solid waste disposal systems in urban areas, many areas, especially rural ones, still do not have access to these essential services.

The sewage system and waste collection in many areas of the city are inadequate, contributing to the accumulation of open waste and pollution of waterways, putting public health at risk. Access to adequate sanitation facilities is also limited in many communities, leading to the use of makeshift latrines or the practice of improper waste disposal. The health risk is high, with the spread of diseases such as

cholera, diarrhea, typhoid fever, hepatitis, and parasitic infections, especially among children and people with weakened immune systems.

The main challenges in the sector include the lack of adequate infrastructure for sewage collection and treatment, inadequate solid waste management, and insufficient educational campaigns on the use of sanitation facilities and the importance of sanitation. In addition, the scarcity of financial and technical resources hinders the implementation of effective solutions, such as the expansion of sewage networks and the construction of wastewater treatment plants.

To improve the situation, it is necessary to invest in basic sanitation infrastructure projects, with the construction of sewage systems and wastewater treatment plants. The implementation of solid waste collection and management programs, as well as awareness campaigns on hygiene and the importance of adequate sanitation facilities, are essential to reduce health risks and improve the living conditions of the population.

6.13.5 Road Network and Transportation

The road and rail network in the municipality of Caála plays an essential role in the mobility of people and the transport of goods. The main roads are the EC-343 (Caála-Ecunha), EN-120 (Huambo-Caála-Cuíma), and EN-260 (Caála-Calenga). These roads are vital for the movement of goods and passengers, but the secondary and rural road infrastructure is still poor, which limits access to some areas, especially during the rainy season.

In addition to roads, railways are also strategically important, with the Benguela Railway connecting Caála to the coast, passing through other important cities in the region. This railway facilitates the transport of goods, especially agricultural and mineral products, but its use is still limited due to lack of maintenance and the need to modernize its infrastructure and equipment. The Robert Williams Railway Station is located in this city.

The main challenges facing the transport sector include the deterioration of roads, especially in rural areas, where the lack of paving and drainage causes transportation difficulties and increased costs. The railroad also faces difficulties due to the obsolescence of its infrastructure, which reduces the efficiency and safety of rail transport. In addition, the

lack of integration between road and rail modes limits the capacity to transport goods.

To improve the situation, it is necessary to invest in road rehabilitation and railway modernization, as well as to promote integration between different modes of transport. The expansion and maintenance of these infrastructures are essential to increase economic competitiveness, improve the mobility of the population, and facilitate access to markets, boosting the development of the municipality of Caála and the province of Huambo.



Figure 59: Main means of transport (EN-120)



Figure 60: Caála railway station

6.14 LAND USE PLANNING

6.14.1 General Considerations

The purpose of this descriptor is to identify the land management instruments approved and/or in force in the province of Huambo, based on information gathered from local authorities and bibliographic research.

6.14.2 Municipal Master Plan

The Municipal Master Plan for Caála, Huambo Province, with all its written and drawn parts, was ratified by Presidential Decree No. 124/22 of May 31.

The Municipal Master Plan of Caála, hereinafter referred to as PDM, is applicable to the entire Municipality of Caála, Land Classification and Qualification, on a scale of 1: 100,000, and a total area of approximately 3,680 km².

The Caála Master Plan aims at the sustainable and orderly development of the municipality, focusing on improving infrastructure, promoting social welfare, and economic growth. The main objective is to create a more organized, accessible, and safe city, capable of meeting the needs of the population and fostering local development. Among the main objectives are the expansion of basic infrastructure, such as drinking water, sanitation, electricity, and transportation, as well as promoting the quality of life of residents and environmental preservation.

One of the plan's key strategies is the decentralization of services to facilitate the population's access to essential resources and services, especially in rural and peripheral areas. Improving the road network, with the construction of new roads and paving of existing ones, is one of the priorities, as is investment in housing and health. The plan also proposes actions to develop the agricultural sector, encourage local trade, and promote job creation, seeking to reduce dependence on informal activities.

In addition, the Caála Master Plan seeks to encourage education and training for the population, with an emphasis on training young people and women to integrate them into the labor market. Another important strategy is the modernization of public management, with the implementation of more effective and transparent policies. The plan also aims to ensure environmental sustainability through the efficient management of natural resources, preservation of green areas, and the use of renewable energy.

Finally, the Caála Master Plan proposes a participatory development model, involving local communities in decision-making and strategy implementation. Partnerships with international organizations, private companies, and other government entities are also key to achieving the proposed objectives and ensuring that the municipality develops in an integrated and sustainable manner over time.

6.15 HISTORICAL AND CULTURAL HERITAGE

6.15.1 General considerations

The purpose of this descriptor is to identify and characterize the historical and cultural heritage that may exist at the project site and in its immediate surroundings.

The characterization of the heritage was based on fieldwork carried out on site in August 2024 and on bibliographic research.

6.15.2 Inventory of Existing Heritage Sites

There is no classified heritage in the municipality of Caála, and Articles 28 and 29 of the PDM state the following:

Article 28 Properties of historical and cultural interest

1. *There are no classified properties or properties in the process of being classified in the municipality of Caála.*
2. *The properties listed in the Constraints Plan correspond to properties of cultural, social, historical, or architectural interest that are granted protection and enhancement status, namely through:*
 - a) Preservation of characteristics and elements of identity, without prejudice to their adaptation to new uses arising from contemporary life
 - b) *Restrictions on the occupation of areas covered by the respective protection perimeters.*
3. *For listed properties, a precautionary protection zone of 50 meters is established, measured from the outside of their boundaries, in which disposals, demolition, installation, construction, and reconstruction works, the creation or transformation of green areas, earthworks, and changes in use are subject to the opinion of the entity responsible for protecting heritage, and architectural projects must be signed by an architect.*

Although unclassified, the municipality of Caála is rich in historical and cultural heritage, with great linguistic diversity and traditions rooted in local life. The predominant languages are **Umbundu** and **Ngangela**, which represent the ethnic diversity of the region. In addition, traditional rituals, such as initiation ceremonies, weddings, and religious festivals, play an essential role in preserving cultural practices and are important for social cohesion and the continuity of traditions.

In terms of material heritage, Caála has monuments and historical sites of great importance, such as the **Caála Municipal Museum**, which preserves the history of the region, and the **Cemetery of the Heroes of the Liberation Struggle**, a place of reverence for those who fought for Angola's independence. These spaces are fundamental to the historical memory of the community, even though the region does not have major historical monuments like other parts of the country.

The population of Caála originates from the Ovimbundu peoples. Ovimbundu is the name given to the peoples who inhabited the south of the Kwanza River, specifically in the central plateau of Angola, settling in the following provinces: Huambo, Bié, Benguela, the southern part of Kuanza-Sul, and the northern part of Huíla. During the 20th century, and especially during the period of the "effective occupation" of Angola, which began in the mid-1920s, most of the Ovimbundu became Christians, joining either the Catholic Church or Protestant churches, mainly the Evangelical Congregational Church of Angola (I.E.C.A), promoted by American missionaries. This Christianization had, among others, two significant consequences. One was the establishment of separate Catholic, Protestant, and non-Christian villages throughout the Central Plateau. The other was a relatively high level of literacy and schooling, and consequently also knowledge of Portuguese, among the Ovimbundu, especially the Protestants.

Caála was one of the settlements whose development was directly linked to the construction of the Benguela Railway. At the end of the 19th century, it was a transit point for the rubber trade, with a few Portuguese traders scattered throughout the area. In the 1902 campaign, violent fighting took place in the large rocky strongholds (Nganda la Kawe). This marked the beginning of effective colonial occupation. The military post established in Caála became civilian in 1920, depending on Lepi until 1934, when it ceded the county seat to Caála. It had an official primary school since 1919. The train, the road network, and the trade in corn (but also wax and vegetables) made it prosper. In the 1940s

almost all commercial establishments had new or renovated buildings, and there was already piped water, electricity, a hospital, and a cinema. In 1970, it had nearly 9,000 inhabitants, who could also benefit from the education and services available in Huambo, less than thirty kilometers away. At the same time, there were two somewhat interrelated processes. On the one hand, a social identity (a sense of belonging) slowly formed, encompassing all Ovimbundu, and not just subgroups such as the M'Balundu and M'Bieno. On the other hand, there was a cultural, including linguistic, "umbundization" of some neighboring peoples who had had (and to some extent retained) characteristics somewhat distinct from the Ovimbundu. The Ovimbundu were greatly affected by both the anti-colonial war in Angola and the Angolan civil war. (Jornal de Angola 2023).

During the first phase, in the late 1960s and early 1970s, the colonial state imposed a system of "concentrated villages" in the Central Plateau (as well as in other parts of the territory). This system consisted of bringing together two or three different villages, often of different religions, in a single location. The locations of these "concentrated villages" were chosen by the colonial authorities according to criteria considered strategic from a security point of view. Due to a lack of knowledge, these criteria rarely corresponded to the requirements of the adaptive agriculture practiced (out of necessity, not choice) by the Ovimbundus. The inhabitants of the locality of Cangola are presumed to be from the Ovimbundu ethnolinguistic subgroup, with their own habits and customs. (Jornal de Angola 2023).

However, the preservation of cultural and historical heritage faces significant challenges. The lack of resources for the maintenance of monuments, increasing urbanization, and the absence of adequate public conservation policies threaten the integrity of these assets. To ensure the preservation of this legacy, it is essential to invest in projects that enhance its value, train local cultural managers, and promote historical and cultural tourism.



Figure 61: Colonial architecture of the municipal administration building in Caála

6.16 PROJECTION OF CURRENT CURRENT IN ABSENCE OF THE PROJECT

The identification of the evolution of the state of the environment without the Project or projection of the current situation is based on the perspective of the continuation of the characteristics and trends that are felt at the time this projection is made.

The project under review is located in an area that is strategically positioned for grain storage and distribution, as it is in a potentially agro-industrial zone and has several access roads and a CFB railway line that facilitate the transport of stored grain for export and import.

Therefore, if the project is not built, it is expected that the current state of the environment will evolve in the long term, with this area being occupied by industrial and/or commercial activities due to the soil characteristics mentioned above.

It should also be noted that the province of Huambo has been the target of various investments and interventions in the agricultural and industrial sectors, in order to foster and promote the role of the private business sector and end regional asymmetries, contributing to the development of the province and the country.

Based on the above, it is not expected that, from the point of view of the evolution of the current situation, there will be any substantial changes in the state of the environment that would justify a different analysis from the characterization of the current situation now carried out.

7 ENVIRONMENTAL IMPACT ASSESSMENT

7.1 METHODOLOGY AND EVALUATION CRITERIA

This chapter presents the identification and assessment of the relevant environmental and social impacts resulting from the construction, operation, and decommissioning phases of the agricultural infrastructure (silos) of the Carrinho, SA grain terminal.

The impact assessment process is a predictive exercise based on comparing the foreseeable environmental and social effects of the Project, based on knowledge of its characteristics, with the baseline situation of the environment in the study area. The identification of impacts also benefits from existing knowledge about the environmental and social impacts generated by projects similar to the Project under analysis, as well as from the technical team's previous experience in conducting environmental and social impact studies. The prediction of environmental and social impacts allows for the assessment of the environmental and social sustainability of the Project and provides a basis for proposing environmental and social mitigation measures to enhance this sustainability.

Environmental and social impact is understood to mean a change in the current state of the environment that results directly or indirectly from the Project under analysis. Each potential impact identified is assessed in terms of its value, magnitude, and significance.

In addition, and whenever necessary, the assessment of impacts can also be systematized according to the following classification criteria:

- **Signal** - negative, positive, depending on whether the impact degrades, enhances, or does not affect the current state of a given environmental component;
- **Spatial dimension (Incidence)** - local, extended, regional, according to the extent of the area in which the effects of the impact are felt;
- **Probability of occurrence** - certain, probable, improbable, and uncertain. The probability assigned to impacts took into account knowledge of the characteristics of each of the actions and each environmental factor, as well as existing knowledge about the impacts of similar projects;
- **Duration** - temporary or permanent, depending on whether the effects of the impact occur only during a specific and identifiable period of time, or whether they persist indefinitely;

- **Reversibility** - reversible or irreversible, according to the potential for restoring the environmental component to its pre-project situation, either passively (with the cessation of the cause of the impact) or actively (through recovery measures);
- **Time dimension:** immediate, when the impact occurs during or immediately after the action that causes it; medium-term (approximately up to five years) or long-term;
- **Type of occurrence:** direct or indirect, depending on whether they are directly determined by the project or induced by related activities;
- **Magnitude:** low, moderate, or high, depending on the degree of impact on the environmental values in question;
- **Capacity for minimization or compensation:** refers to the measures and actions implemented to reduce the severity of negative impacts caused by a project on the environment;
- **Significance:** insignificant, significant, or very significant. The significance of an impact is considered to be the most important descriptive criterion of the impact, and its degree is influenced by the assessment of all other assessment criteria, with particular emphasis on the magnitude, duration, and reversibility of the impact. The degree of significance attributed to an impact is also influenced by compliance with current legal provisions. Significance thus represents an overall assessment of the importance of the environmental impact produced by the impact.

For the assessment of impacts, and in order to provide an overall picture of them, a classification scale based on the following parameters will be used to calculate the significance of the impact, as illustrated in the table below.

Table 36: Summary of criteria used for impact assessment

Classification criterion	Scale	Value (for calculating the significance of the impact)
Nature (Sign)	Positive (+) or Negative (-)	Not applicable
Incidence	Local/Direct	1
	Extended	2
	Regional/National/International	3
Probability of occurrence	Unlikely	1
	Uncertain	2
	Likely	3
	Certain	4
Duration	Temporary	1
	Permanent	2
Reversibility	Reversible	1
	Irreversible	2
Dimension	Immediate	1
	Medium term	2
	Long term	3
Type of occurrence	Direct or Indirect	Not applicable
Magnitude	Reduced	1
	Moderate	2
	High	3
Significance	Not very significant	1
	Significant	2
	Very significant	5
Minimization or compensation capacity	Minimizable and/or compensable	1
	Not minimizable or compensable	2

The classification regarding the **significance of environmental and social impacts** will be obtained by multiplying the following criteria: Probability (P), Incidence (I), Magnitude (M), and Duration (D), using the following formula.

$$S=P \times I \times M \times D$$

The significance of environmental and social impacts is assigned according to the intervals of the score values on the following scales:

- **Not significant** if the score is between 1 and 11 points;
- **Significant** if the score is higher than 12 and equal to 23 points;
- **Very significant** if the score is equal to or exceeds 24 points;

Table 37: Acronyms used in the impact assessment scale

CRITERIA	SCALE			
Duration	Temporary (T)	Permanent (P)		
Magnitude	Reduced (R)	Moderate (M)	High (H)	
Probability	Uncertain (U)	Unlikely (UNL)	Likely (LIK)	Certain (C)
Occurrence	Indirect (IN)	Direct (DIR)		
Incidence	Local (L)	Extended (E)	Regional (RE)	
Reversibility	Irreversible (IR)	Reversible (RV)		
Nature (Signal)	Positive (+)	Negative (-)		
Capacity minimization or compensation	Minimizable and/or compensable (MC)	Not minimizable or compensable (NMC)		

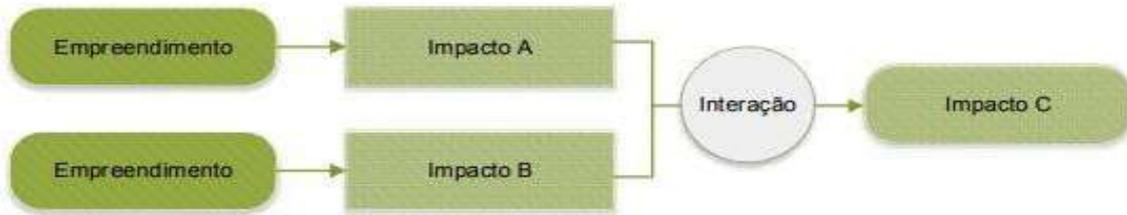
Table 38: Identification of significance according to colors

Not Significant		Negative, not very significant	
Significant		Significant negative	
Very Significant		Very Significant Negative	

Cumulative: a cumulative environmental impact is derived from the sum of other impacts or chains of impacts that add up, generated by one or more isolated but contiguous projects in the same environmental and social system.

Synergy: refers to the ability of a specific effect to induce a new impact when interacting with another, not necessarily associated with the same project or activity.

Example:



7.2 MAIN ACTIONS AND POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS

The main actions that generate negative environmental and social impacts during the construction, operation, and decommissioning phases are identified below (Tables 36, 37, and 38).

It should be noted that the project under evaluation does not involve the displacement of populations.

Table 39: Main project actions generating negative impacts during the construction phase

Main actions generating impacts	Main direct negative impacts
Setup of the construction site and other support areas, including the presence of workers, equipment, and materials	Generation of noise and dust, emission of atmospheric pollutants, disturbance to the neighborhood, and risk of work-related accidents
General circulation of vehicles, machinery, equipment, and workers involved in the construction process	Generation of noise and dust, and emission of atmospheric pollutants
Transportation of aggregates to the construction site	Generation of noise and dust, and emission of atmospheric pollutants
Cleaning, excavations for opening foundations	Generation of noise and dust, and emission of atmospheric pollutants
Assembly of silos	Generation of noise and dust, and emission of atmospheric pollutants, disturbance of the neighborhood, and risk of work-related accidents
Demobilization and dismantling of the construction site	Noise and dust generation, emission of atmospheric pollutants and production of waste
Final cleaning of the construction site.	Noise and dust generation, emission of pollutants emissions and production of waste

During the **operational phase**, the following actions are considered likely to generate negative impacts on the environment:

Table 40: Main project actions generating negative impacts during the operational phase

Main actions generating impacts	Main direct negative impacts
Silo handling	Generation of noise and dust, disturbance to the neighborhood, and risk of work-related accidents
Handling of cereals	Risk of pest proliferation
Light and heavy vehicle traffic	Noise generation and atmospheric pollutant emissions and disturbance to the surrounding population
Fuel supply	Risks of environmental contamination
Water and electricity consumption and effluent generation	Pressure on urban infrastructure
Operation of generators	Noise and air pollutant emissions
Cleaning, pest control, and facility maintenance	Risks of environmental contamination, waste generation, noise, and atmospheric pollutant emissions
Grain transportation	Pressure on urban infrastructure, noise generation and pollutant emissions, disturbance to the population, and accident risks

During the **decommissioning phase**, the following actions are considered likely to have an impact on the environment:

Table 41: Main project actions generating negative impacts during the decommissioning phase

Main actions generating impacts	Main direct negative impacts
Demolition of infrastructure and removal of silos and other equipment	Generation of noise, dust, and atmospheric pollutant emissions; risks of work-related accidents
Demobilization and dismantling of support areas	Noise, dust, and air pollution, work-related accident risks, environmental contamination risks
Permanent decommissioning of facilities	Decrease in employment and standard of living of the population, and decline in the local socio-economy, etc.
Final cleanup	Generation of noise and dust, emission of pollutants emissions and production of waste

The actions resulting from the construction, operation, and decommissioning of agricultural silo infrastructure may have not only negative but also positive environmental and social impacts, assessed according to the classification criteria identified in section 7.1. These will have an impact on the following descriptors:

7.3 CLIMATE

7.3.1 Construction phase

Change in evapotranspiration and temperature at ground level

During the construction phase, actions related to excavation and soil sealing for the creation of new areas for the assembly of silos may have an impact on evapotranspiration and ground temperature.

The impacts on the climate will be negative, of reduced magnitude, direct, probable, localized, temporary, reversible, and insignificant.

7.3.2 Operation phase

Increased perception of heat discomfort

During the operational phase, actions resulting from the waterproofing of surfaces and the installation of equipment and buildings will temporarily alter the conditions of solar radiation absorption and reflection, as well as air circulation, contributing to an increase in the perception of heat discomfort.

The impacts on the climate, although negative, will be of reduced magnitude, direct, probable, localized, temporary, reversible, and insignificant.

7.3.3 Deactivation phase

Change in evapotranspiration and ground temperature

During this phase, changes may occur mainly after the decommissioning work has been completed. However, changes in evapotranspiration and ground-level temperature may be observed.

These are positive impacts, of reduced magnitude, direct, probable, localized, permanent or temporary, reversible, and insignificant.

7.4 LOCAL GEOLOGY AND GEOMORPHOLOGY

7.4.1 Construction phase

Change in local geomorphology

During the construction phase, actions related to excavation, waterproofing, and soil modeling for the creation of new areas for the assembly of silos, parking lots, and other buildings may have an impact on the local geomorphology.

The impacts on this descriptor will be negative, of reduced magnitude, direct, certain, localized, temporary, reversible, and insignificant.

7.4.2 Operational phase

Changes to local geomorphology

In general, for geology and geomorphology, the impacts result from the artificialization of landforms due to the presence of the grain terminal. The impact is considered to be negative, direct, localized, irreversible, certain, permanent, of reduced magnitude, and insignificant.

generated is negative, direct, localized, irreversible, certain, permanent, of reduced magnitude, and insignificant.

7.4.3 Decommissioning phase

Change in local geomorphology

During this phase, changes may occur in terms of the artificialization of the relief and erosion of the upper formations and upper substrate due to the excavations carried out to remove the structural foundations.

In this phase, the impacts are expected to be negative, direct, temporary, localized, probable, immediate, irreversible, and insignificant.

7.5 SOILS

7.5.1 Construction phase

Soil compaction, contamination, and erosion

With regard to soils, it is considered that actions related to the installation of silos and the movement of machinery and vehicles may cause soil compaction, sealing, contamination, and erosion.

The impacts on this descriptor will be negative, of reduced magnitude, direct, probable, localized, temporary, reversible, and insignificant.

7.5.2 Operation phase

Soil compaction

During the project's operational phase, the main impacts are related to the area occupied by the grain terminal infrastructure, which may be subject to soil compaction due to vehicle and pedestrian traffic.

Therefore, impacts on the soil are expected during this phase and are classified as negative, direct, localized, reversible, permanent, probable, of reduced magnitude, and insignificant.

Accidental contamination

During the project's operational phase, the main impacts are related to the area occupied by the grain terminal infrastructure and unpaved areas exposed to the risk of spills (fuel and oil leaks) and wastewater.

Therefore, impacts on the soil are expected during this phase and are classified as negative, direct, localized, reversible, temporary, probable, of reduced magnitude, and insignificant.

7.5.3 Decommissioning phase

Soil compaction, contamination, and erosion

At this stage, erosion of exposed soils, soil compaction, and removal or alteration of soil at the site may cause an impact.

However, these are negative impacts of reduced magnitude, direct, probable, local, temporary, reversible, immediate, and insignificant.

During site recovery, the return of the soil to its undisturbed state is a positive impact, of reduced magnitude, direct, probable, localized, permanent, reversible, medium and long term, and insignificant.

7.6 LAND USE

7.6.1 Construction phase

Change in land use

With regard to this indicator, during the construction phase, the impacts are considered to be related to the construction of infrastructure, the risk of spills and soil contamination during the supply of machinery, generators, and preventive maintenance.

The impacts on this descriptor will be negative, low in magnitude, direct, probable, localized, temporary, reversible, and insignificant.

7.6.2 Operation Phase

Change in land use

In this phase, it is considered that the occupation of land by the grain terminal infrastructure will induce negative impacts that are of reduced magnitude, direct, certain, localized, permanent, irreversible, immediate, and insignificant.

7.6.3 Decommissioning phase

Land use change

In this phase, after the decommissioning of the infrastructure, the area may return to its natural state prior to the implementation of the terminal. However, soil compaction and removal or alteration of the soil at the site may cause an impact.

However, these are negative impacts of low magnitude, direct, probable, local, temporary, reversible, and insignificant.

During site recovery, the return of the soil to its undisturbed state is a positive impact, of reduced magnitude, direct, probable, localized, permanent, reversible, medium and long term, and insignificant.

7.7 WATER RESOURCES

7.7.1 Construction phase

Contamination of surface water

At this stage, it is considered that earthworks (landfills and excavations), accidental spills, and waste production during the installation of the silos could cause these materials to be washed away by rain.

In general, this impact is considered to be negative, temporary, reversible, of reduced magnitude, probable, localized, and insignificant.

Groundwater contamination

During the movement of machinery and vehicles assigned to the works, accidental spills (oils and fuels) may occur, which may cause pollution of any existing groundwater and surface water. The impacts are considered negative, insignificant, reversible, of reduced magnitude, indirect, unlikely, localized, and temporary, with the adoption of mitigating measures.

7.7.2 Operation phase

Surface water contamination

In the area where the grain terminal is located, there is a fuel storage facility in the service area for the operation of generators. In the event of an accidental leak in this tank contaminating the waterways, the impact is considered to be negative, direct, localized, temporary, reversible (taking into account the removal of pollutants), short-term, probable, of reduced magnitude, and insignificant.

The effluents generated at the grain terminal are domestic and industrial in nature. After being collected and treated, they will be discharged into the receiving environment. In the absence of *on-site* treatment conditions, they must be sent to a specialized unit for proper treatment.

Impact on surface drainage patterns

At this stage, actions resulting from the waterproofing of surfaces and roofing may affect surface water drainage patterns and increase runoff during the rainy season.

This will generate probable, localized, permanent, reversible, direct, minor, and insignificant negative impacts.

Contamination of groundwater

In the event of disruptions or failures in the conveyance and treatment of effluents, spills, and waste runoff, and if these are discharged into waterways or infiltrate the groundwater, they may cause contamination.

This will generate negative, uncertain, localized, temporary, reversible, immediate, direct impacts of reduced magnitude and little significance.

Decrease in the local water table

In the event of supplying the facilities with groundwater resources through a borehole and pump, this action may affect the water table, causing negative, uncertain, widespread, permanent, irreversible, long-term, indirect, minor, and insignificant impacts.

7.7.3 Decommissioning phase

Contamination of surface and groundwater

At this stage, impacts may occur due to spills of products such as fuel, oils, and wastewater effluents during the dismantling of equipment, which may affect groundwater quality. However, this is unlikely to happen, as the equipment will only be dismantled after it has been emptied. In the event of an incident, there will be negative impacts of reduced magnitude, direct, probable, local, temporary, reversible, and insignificant.

A gradual return to undisturbed surface water drainage patterns may also be observed.

These are positive impacts, of reduced magnitude, direct, probable, local, temporary, reversible, and insignificant.

7.8 FLORA

7.8.1 Construction phase

Disturbance and destruction of flora

With regard to flora, it is considered that the main impacts will have occurred during the clearing of the land and deforestation. Therefore, no further deforestation is planned during the assembly phase of the new silos. However, actions related to excavation and leveling of the implementation area and vehicle traffic may cause dusting of the surrounding flora and interfere with plant photosynthesis.

The impacts on this descriptor will be negative, of reduced magnitude, direct, probable, localized, temporary, reversible, and insignificant.

7.8.2 Operation phase

Disturbance and destruction of flora

During the operational phase, the impacts caused during the construction phase will continue, particularly in terms of destruction, compounded by dusting of the vegetation cover due to the emission of particulate matter from the circulation of machinery and vehicles assigned to the facilities, with effects on the surrounding flora.

The cleaning of silos using suction during the operational phase and traffic on the access road to the terminal may contribute to increased levels of dust and particulate matter emissions.

These impacts are considered to be negative, direct, of reduced magnitude, localized, long-term, probable, reversible, temporary, minimizable, and insignificant.

7.8.3 Decommissioning phase

Disturbance and destruction of flora

During the decommissioning phase, the expected impacts are similar to those of the construction phase, in that most of the actions are similar in nature, not involving the construction or implementation of infrastructure, but rather its demolition or dismantling. However, given that the areas to be intervened will already be devoid of vegetation, the expected impacts are assessed as less significant compared to the construction phase. Thus, the impacts on flora and vegetation at this stage are assessed as negative, direct, localized, temporary, immediate, certain, reversible (if a landscape recovery plan appropriate to the area in question is implemented), of reduced magnitude, minimizable (if the limits of the intervention area are respected, without occupying surrounding areas and using existing accesses) and insignificant.

As in the construction phase, actions involving the movement of earth and other materials, the circulation of vehicles and heavy machinery on unpaved access roads will result in the dispersion of dust which, when deposited on the surrounding vegetation, may affect its development. This impact is assessed as negative, direct, temporary, localized, probable, reversible, of reduced magnitude, minimizable, and insignificant.

The last action in this phase will be the implementation of a redevelopment plan, which includes the renaturalization of the affected areas after the land has been cleared. These actions will reverse the negative effects observed in the previous phases, since their impacts are assessed as: positive, certain, direct, permanent, localized, long-term, reversible, of reduced magnitude, and insignificant.

The recovery of local flora may also occur during this phase, which translates into a gradual return to an undisturbed state after decommissioning work. This is a positive impact, of reduced magnitude, direct, certain, localized, temporary, reversible, and insignificant.

7.9 FAUNA

7.9.1 Construction phase

Scaring away fauna

With regard to fauna, it is considered that the main impacts will have occurred during excavation and land leveling, since the area has already been subject to deforestation in the past. Therefore, at this stage, it is considered that the movement of machinery and vehicles, and increased noise during the construction and assembly of the silos, may cause species to flee.

These impacts are considered to be negative, direct, of reduced magnitude, localized, probable, reversible, temporary, minimizable, and insignificant.

Running over and/or killing of species

It is considered that the circulation of machinery and vehicles may cause the running over or death of species.

These impacts are considered negative, direct, of reduced magnitude, widespread, uncertain, reversible and irreversible (in the case of species death), temporary, minimizable, and insignificant.

7.9.2 Operation phase

Scare away wildlife

During the operation phase, the impacts originating in the construction phase will continue, namely in terms of habitat affectation, either due to the destruction of vegetation cover or to the disturbance induced by the normal operation of the terminal and lighting projection, causing the scaring away of species.

These impacts are considered to be negative, of reduced magnitude, direct, uncertain, localized, permanent, irreversible, and reversible, and insignificant.

Running over and/or killing of species

It is considered that the circulation of vehicles assigned to the facilities may cause the running over or death of species.

These impacts are considered to be negative, direct, of reduced magnitude, localized, uncertain, reversible and irreversible (in the case of species death), permanent, minimizable, and insignificant.

7.9.3 Decommissioning phase

Frightening away of wildlife

During this phase, species may be scared away by the noise during demolition. In any case, the impacts generated will be negative, moderate in magnitude, direct, certain, local, temporary, reversible, immediate, but insignificant.

After decommissioning work, there may also be a gradual return of fauna to an undisturbed state during this phase. These impacts are positive, of reduced magnitude, direct, probable, localized, temporary, reversible, and insignificant.

Running over and/or death of species

It is considered that the circulation of machinery and vehicles may cause the running over or death of species.

These impacts are considered negative, direct, of reduced magnitude, localized, probable, reversible and irreversible (in the case of species death), temporary, minimizable, and insignificant.

7.10 LANDSCAPE

7.10.1 Construction phase

Landscape alteration

At this stage of the project, the impacts on the landscape resulting from the implementation of new infrastructure that may contrast with existing infrastructure are considered.

At this stage, the impacts on the landscape are considered to be negative, moderate in magnitude, direct, certain, temporary, localized, reversible, and insignificant.

7.10.2 Operational phase

Landscape change

During the operation phase, the impacts felt during the construction phase relating to functional and visual changes to the landscape will continue during the operation phase, where the following will occur

process of adapting the landscape to the new reality, i.e., the presence of grain terminal infrastructure in a semi-natural, topographically flat area with a significant visual basin due to its proximity to the main road (EN-120) that passes close to the facilities and residential areas, namely the Calai Brita neighborhood.

The visual presence of the grain terminal infrastructure will contrast with the landscape, causing negative impacts of moderate magnitude that are direct, certain, localized, permanent, irreversible, and significant.

7.10.3 Decommissioning phase

Landscape change

During this phase, there may be a visual impact during the decommissioning of the grain terminal, altering the character of the landscape, and if abandoned, it may result in possible misuse and vandalism of the infrastructure.

These are considered to be negative impacts on the landscape of low and high magnitude (in the case of abandonment), direct, certain, local, temporary, and permanent (in the case of abandonment), reversible, immediate, and insignificant.

However, during the recovery of the landscape, it is possible to observe the gradual return of the landscape to its undisturbed state.

These are positive impacts, of reduced magnitude, which are direct, probable, localized, temporary, reversible, and insignificant.

7.11 AIR QUALITY

7.11.1 Construction phase

Emissions of pollutants and particulate matter

At this stage of the project, it is considered that the impacts are generated due to the emission of pollutants and particulate matter from the circulation of vehicles, machinery, and excavations.

In view of the above, the impacts on air quality are negative, direct, temporary, reversible, certain, localized, of reduced magnitude, and insignificant.

7.11.2 Operation phase

Emissions of pollutants and particulate matter

During the project's operational phase, actions likely to cause changes in air quality are due to new sources of pollutants originating from the operations taking place, namely, the circulation of heavy vehicles accessing the infrastructure, loading and unloading of grain, the circulation of machinery associated with the movement of grain, heavy and light vehicle traffic, fuel supply, and the operation of electric generators.

Air pollutants are usually divided into three broad categories: greenhouse gases (GHGs), eutrophication and acidifying substances, and precursors of tropospheric ozone.

The main eutrophication and acidifying gases resulting from anthropogenic activity are sulfur dioxide (SO₂), nitrogen oxides (NO_x), ammonia (NH₃), and particulate matter (PM).

In high concentrations, these gases can cause damage not only to human health and cultural heritage, but also to the environment, contributing to the degradation of ecosystems and the eutrophication and acidification of soil and water.

The precursor substances of tropospheric ozone include polluting gases such as nitrogen oxides (NO_x), non-methane volatile organic compounds (NMVOCs), carbon monoxide (CO), and methane (CH₄). Ozone can cause health problems in humans, particularly affecting the respiratory system, even at low concentrations and after short-term exposure, with the most vulnerable groups such as children, the elderly, and people with a history of lung problems being particularly affected.

CO₂, a greenhouse gas (GHG), is a product of combustion and as such is released in exhaust gases. Consequently, both individual transport and road freight contribute to the release of greenhouse gases and contribute to climate change.

The suspended particles released contain small amounts of sulfates, nitrates, metals, and other trace elements, which are also toxic. Nitrogen oxides and suspended particles are the most relevant constituents due to their higher presence in exhaust gases.

Gaseous emissions from heavy goods vehicles powered by diesel, the fuel generally used in freight transport, include carbon dioxide (CO₂), oxygen (O₂), water vapor, nitrogen (N₂), carbon monoxide (CO), nitrogen compounds (NO_x), sulfur compounds (SO_x), and volatile organic compounds (VOCs).

During the operational phase, negative impacts on air quality are expected to be moderate in magnitude, direct, certain, localized, permanent, reversible, and insignificant.

7.11.3 Decommissioning phase

Emissions of pollutants and particulate matter

At this stage, air quality will be negatively impacted by gas emissions (smoke) and dust from the movement of machinery, vehicles, excavations, and equipment in general during decommissioning, as well as possible unpleasant odors. These impacts are considered negative at this stage, but they are minor, direct, probable, local, temporary, reversible, and insignificant.

Once decommissioned, the impacts caused by the infrastructure in terms of this descriptor are reduced. This is a positive impact, of reduced magnitude, direct, certain, localized, temporary, reversible, and insignificant.

7.12 SOUND ENVIRONMENT

7.12.1 Construction phase

Increase in noise levels.

During the construction phase of the silos, it is considered that activities related to the movement of machinery, vehicles, generators, employees, and the assembly of the silos will cause an increase in noise levels.

In general, the impacts can be classified as negative, direct, moderate in magnitude, temporary, certain, widespread, reversible, and insignificant.

7.12.2 Operation phase

Increase in noise levels.

During the terminal's operation phase, the main actions likely to generate impacts on the sound environment stem from the activities and operations of the aforementioned facilities,

namely grain logistics, transport and distribution, maintenance, generator operation, workers, etc.

The noise levels emitted by road transport are essentially composed of emissions from the propulsion system and the movement of vehicles on the road surface. Factors contributing to noise levels include, in addition to driving speed, vehicle type, tire type, pavement type, vehicle maintenance, vehicle age, road gradient, the presence or absence of noise barriers, and driving patterns.

The impacts on the sound environment will be felt to a greater extent during the night and are mainly associated with road traffic.

Therefore, it is expected that road traffic resulting from the terminal's operation will lead to negative impacts of moderate magnitude that are direct, probable, localized, permanent, reversible, and insignificant if mitigation measures are adopted.

On the other hand, at the start of normal operation, a campaign to monitor noise levels should be carried out in order to assess the significance of the impact generated and/or the need to apply mitigation measures (e.g., noise barriers).

7.12.3 Decommissioning phase

Increase in noise levels.

During this phase, the movement of vehicles, machinery, and workers, as well as the noise caused during demolition, will have an impact. These impacts are considered negative, moderate in magnitude, direct, certain, local, temporary, reversible, and insignificant at this stage of the work.

Once deactivated, they reduce the impacts caused at the level of this descriptor. It is a positive impact, of moderate magnitude, direct, certain, local, temporary, reversible, and insignificant.

7.13 SOCIOECONOMICS

7.13.1 Construction phase

Job creation

To carry out the work, it will be necessary to use external and internal labor, which will constitute the workforce for the terminal's construction. Although this poses a risk of

Although the probability is very low, all situations of labor exploitation, discrimination at work, or use of child labor must be prevented in order to avoid serious violations of the provisions of international conventions on the protection of the rights of children and workers to which Angola is a signatory through the International Labor Organization (ILO).

In this context, it is important to comply with the provisions of the AfDB's Integrated Safeguard System, namely Operational Safeguard 5.

The hiring of labor will have positive, direct, temporary, widespread, reversible, certain, small, and insignificant impacts.

Boosting related sectors

In general, at the socioeconomic level, the main impacts associated with the construction phase will result from the revitalization of associated sectors in the provision of raw material supply, construction, transportation, etc.

These impacts are positive, direct and indirect, temporary, widespread, reversible, probable, of reduced magnitude, and insignificant.

Nuisance to the population

Vehicle traffic and noise caused during the construction and assembly of the silos may cause some inconvenience to the population living in the surrounding area. This impact can be classified as negative, of reduced magnitude, direct, probable, local and widespread, temporary, reversible, and insignificant.

Risks of accidents involving the population

Vehicle traffic during the construction and assembly of the silos may increase the risk of accidents involving the population living in the surrounding area. This impact can be classified as negative, moderate, direct, uncertain, local and widespread, temporary, reversible and irreversible (in the event of death), insignificant to very significant (in the event of death).

7.13.2 Operation phase

Job creation

The main positive impacts of the project will be felt with the start of the operation phase and, given the nature of the investment in the region's infrastructure, will extend beyond the municipal and provincial levels.

The operation of the terminal will require the use of external and internal labor to constitute the workforce. Although the probability of this happening is very low, all situations of labor exploitation, discrimination at work, or the use of child labor must be prevented in order to avoid serious violations of the provisions of the international conventions on the protection of the rights of children and workers to which Angola is a signatory through the International Labor Organization (ILO).

In this context, it is important to comply with the provisions of the AfDB's Integrated Safeguard System, namely Operational Safeguard 5.

Thus, it is expected that the hiring of labor will create a positive, direct, certain, broad, permanent, immediate, moderate, irreversible, and significant impact (due to the lack of local employment).

Boosting related sectors

The operation of the grain terminal will boost local economic development and the creation of indirect jobs associated with economic activities complementary to the terminal's activities.

In general, at the socioeconomic level, the main impacts associated with the silos' operational phase will generate benefits and will be related to the use of service providers, transport companies, and suppliers of locally and nationally produced foodstuffs. The impacts are considered to be positive, moderate in magnitude, indirect (stimulation of associated sectors), probable, widespread (grain distribution and export), irreversible, temporary and permanent, and significant.

Nuisance to the population

Vehicle traffic and noise caused during product distribution and the acquisition of various inputs may cause some inconvenience to the population living in the vicinity

where these vehicles circulate. This impact can be classified as negative, moderate in magnitude, direct, uncertain, local and widespread, permanent, reversible, and insignificant.

Risks of accidents involving the population

The circulation of vehicles and motorcycles during the distribution of products and acquisition of various inputs may increase the risk of accidents involving the population. This impact can be classified as negative, moderate, direct, uncertain, localized and widespread, permanent, reversible and irreversible (in the event of death), immediate, insignificant, and significant (in the event of death).

7.13.3 Decommissioning phase

Reduced dynamism of associated sectors and unemployment

During this phase, there may be an increase in unemployment and a decrease in income for the community and all those who depended on these facilities to conduct their business. This is a negative impact of moderate magnitude, direct and indirect, certain, local and regional, permanent, reversible, and significant.

Job creation

To carry out the work, it will be necessary to resort to external and internal labor, which will constitute the workforce for the terminal decommissioning works. Although the risk is very low, all situations of labor exploitation, discrimination at work, or the use of child labor must be prevented in order to avoid serious violations of the provisions of international conventions on the protection of the rights of children and workers to which Angola is a signatory through the International Labor Organization (ILO).

In this context, it is important to comply with the provisions of the AfDB's Integrated Safeguard System, namely Operational Safeguard 5.

The decommissioning of these infrastructures could create job opportunities or potential employment in their reuse.

This is a positive impact, of reduced magnitude, direct, certain, local, temporary, reversible, and insignificant.

Risks of accidents involving the population

Vehicle traffic during the decommissioning and dismantling of the silos may increase the risk of accidents involving the population living in the surrounding area. This impact can be classified as negative, moderate, direct, probable, local and regional, temporary, reversible and irreversible (in the event of death), insignificant to significant.

7.14 URBAN INFRASTRUCTURES

7.14.1 Construction phase

Pressure on the road network

With regard to this descriptor, it is considered that the impacts during the construction phase will mainly affect the road network, specifically the EN-120 national road, due to the transport of construction support equipment, and tertiary roads, due to the movement of machinery, vehicles, and workers.

However, it is considered that this impact, although negative, is of low magnitude, direct, uncertain, localized, temporary, reversible, and insignificant.

Pressure on the energy, water, and sanitation supply network

At this stage, it is considered that there will be no impact on these sectors, as the facilities will have their own autonomous systems.

7.14.2 Operational phase

Pressure on the road network

Due to the transport of inputs and distribution of stored grain, it is considered that there will be impacts due to the use of the EN-120 national road network and tertiary roads. It is not considered that the normal operation of the terminal will generate significant traffic on the access roads, and as such no significant impacts are expected.

The impacts are considered to be negative, of low magnitude, direct, uncertain, widespread, permanent, reversible, and insignificant.

Pressure on the energy, water, and sanitation supply network

It is also expected that, during the operational phase, activities related to the consumption of electricity and water and the generation of solid and liquid waste may put pressure on the

public distribution network infrastructure (if the terminal is connected to the network). However, the production of liquid effluents and consumption of drinking water is not expected to put pressure on public infrastructure, as the facilities will have their own autonomous effluent and drinking water storage system.

Negative impacts are considered to be of reduced magnitude, direct, unlikely, local, permanent, reversible, and insignificant.

Reduction in grain transport time due to proximity to the EN-120

At this stage, it is considered that the location of the grain terminal near the EN-120 could reduce grain reception and transport time.

These are considered to be positive impacts, of moderate magnitude, direct, probable, regional, permanent, irreversible, and very significant.

7.14.3 Decommissioning phase

Pressure on the road network

During this phase, there will be an increase in traffic intensity on the roads serving the area where the grain terminal is located, with a consequent increase in the likelihood of road accidents and road degradation during decommissioning due to the transport of equipment and waste resulting from demolition and excavation.

This is considered a negative impact of low magnitude, direct, certain, widespread, permanent, reversible, and significant.

Once decommissioned, it reduces the impacts caused by the grain terminal in terms of this descriptor. It is a positive impact, of low magnitude, direct, certain, local, temporary, reversible, and insignificant.

7.15 WASTE PRODUCTION, CONTROL, AND MANAGEMENT

7.15.1 Construction phase

Waste production

It is considered that during the construction of the metal silos, various types of waste will be generated, including inert waste such as rubble and scrap metal, hazardous waste such as oils, greases, paints, and solvents, organic waste from workers' food scraps, and recyclable waste such as plastics, cardboard, and packaging.

There may also be liquid waste resulting from the use of changing rooms and the maintenance and cleaning of the facilities.

At this stage, these are considered negative, of reduced magnitude, direct, certain, localized, permanent, reversible, and insignificant.

Risks of environmental contamination

It is considered that the incorrect storage and disposal of solid and liquid waste may cause a risk of environmental contamination.

At this stage, these risks are considered to be negative, of reduced magnitude, direct and indirect, probable, localized, temporary, reversible, and insignificant.

Proper management of this waste will be essential to minimize environmental impact during construction.

7.15.2 Operation phase

Waste production

During this phase, various types of waste will be produced as a result of grain deterioration, office waste, cafeteria waste, maintenance area waste, facility cleaning waste, etc.

This will mainly consist of cardboard, plastic packaging, cans, plastic bottles, food scraps, PETs, lubricating oils, damaged parts, effluents from the changing rooms, etc.

The impacts considered in this phase are negative, of reduced magnitude, direct, certain, localized, permanent, irreversible, and significant to slightly significant, subject to the adoption of mitigation measures.

Risks of environmental contamination

It is considered that the incorrect storage and disposal of solid and liquid waste may cause a risk of environmental contamination. At this stage, these risks are considered negative, of reduced magnitude, direct and indirect, probable, localized, permanent, reversible, and insignificant.

The development and implementation of the Waste Management Plan is essential to prevent incidents.

7.15.3 Decommissioning phase

Waste production

At this stage, large quantities of waste may be produced, whether solid, liquid, etc. Therefore, very specific measures must be taken regarding its collection and final destination. At this stage, they are considered negative, moderate in magnitude, direct, certain, localized, temporary, reversible, immediate, and significant.

Once deactivated, it reduces the impact caused by the terminal in terms of waste production. It is a positive impact, of reduced magnitude, direct, certain, localized, permanent, reversible, and insignificant.

Risks of environmental contamination

It is considered that the incorrect storage and disposal of solid and liquid waste may cause a risk of environmental contamination. At this stage, these risks are considered negative, of reduced magnitude, direct and indirect, probable, localized, temporary, reversible, and insignificant.

Proper management of this waste will be essential to minimize environmental impact during construction.

7.15.4 LAND USE PLANNING

7.15.5 Construction phase

The actions necessary for the construction of the silos are compatible with the provisions of the Spatial Planning and Urban Development Law (Law No. 3/2004 of June 25), namely with the provisions of Article 42(b). They are also compatible with the provisions of the Land Law (Law No. 9/04 of November 9), namely in its Article 68, paragraph a.

7.15.6 Operational phase

The project ensures compliance with the various land management instruments in force in the area of implementation.

However, there will only be a negative impact if authorization has not been requested from the municipal or communal administration regarding the project's framework.

7.15.7 Decommissioning phase

The actions necessary for the decommissioning of the terminal must comply with the provisions of the Law on Spatial Planning and Urban Development (Law No. 3/2004, of June 25), as well as other related laws.

7.16 HISTORICAL AND CULTURAL HERITAGE

Given that no classified heritage sites have been identified in the area directly affected and in the immediate vicinity of the site, no impacts are expected to directly affect this descriptor, either during the construction, operation, or decommissioning phases.

7.17 ANALYSIS OF THE VULNERABILITY OF THE "SILOS" PROJECT TO THE EFFECTS OF CLIMATE CHANGE

The project falls under Category 2 according to the Bank's Climate Safeguards system. This indicates that the project has moderate vulnerability to climate change, requiring an analysis of the risks associated with climate change and the implementation of adaptation measures.

Climate change has been a global concern, with significant effects on food security, water availability, and increased frequency of extreme weather events. Angola, due to its geographical location and dependence on agriculture, is particularly vulnerable to these impacts. Among the main challenges facing the country are prolonged drought, soil erosion, changes in rainfall patterns, and rising temperatures, factors that directly affect agricultural production and the food security of the population.

Angola, despite its low contribution to global warming, is among the nations most impacted by climate change due to the vulnerability of its ecosystems. The effects include increased aridity and recurrence of droughts, intensification of saline intrusion and deterioration of underground water reserves, soil degradation and loss of biodiversity, as well as an increase in the frequency and intensity of tropical storms, among others.

The project to build a grain terminal in Caála aims to improve the conservation and storage of cereals, reducing post-harvest losses and ensuring greater stability in food supply. However, to ensure its effectiveness and sustainability, it is essential to analyze its vulnerability to climate change:

- **Water security:** Water scarcity can affect the grain drying process and storage efficiency, especially during prolonged periods of drought.
- **Impact on infrastructure:** High temperatures and heavy rainfall can compromise the structure of silos, accelerating material degradation and increasing maintenance costs.

- **Effects on agricultural production:** Reduced production of corn, rice, beans, soybeans, and other types of grains due to climate change can impact the use of silos, reducing the operational efficiency of the project.
- **Need for adaptation:** Measures such as the construction of rainwater harvesting systems, the use of heat-resistant materials, and the adoption of climate monitoring systems are essential to mitigate the impacts.

To address these challenges, Angola is committed to several international agreements on climate change, including:

- Paris Agreement (2015): Angola has made commitments to reduce greenhouse gas emissions and adapt to climate change by promoting the resilience of agricultural systems.
- United Nations Framework Convention on Climate Change (UNFCCC): The country has developed national climate adaptation plans to mitigate negative impacts.
- United Nations Environment Programme (UNEP): Angola participates in initiatives for the sustainable use of natural resources and protection of biodiversity.

With regard to other extreme weather events, such as temperature variations, heat islands, heavy rains, tropical storms, landslides, and periods of severe drought, there are still no studies that allow for concrete predictions, and there is great uncertainty about these projections.

All efforts to build sustainable infrastructure were a fundamental requirement to ensure the absorption, reduction, or prevention of emissions that this project seeks to achieve in the operational phase.

The Caála grain terminal project is essential to ensure food security, but it faces risks due to climate change. To ensure its viability and longevity, it is crucial to integrate climate adaptation measures, such as infrastructure improvement, flood control, water harvesting, wastewater treatment and reuse, and constant monitoring of environmental and social impacts. Adherence to international commitments reinforces the need for sustainable strategies that ensure the project's resilience in the face of climate challenges.

7.18 SUMMARY OF ENVIRONMENTAL IMPACTS

The following table presents a summary of environmental and social impacts, consisting of a final assessment that summarizes and classifies the main impacts identified during the environmental and social impact assessment (ESIA). At this stage, the negative and positive impacts on the environment resulting from the project activities are analyzed according to environmental factors, in relation to the criteria used to assess the impacts (magnitude, duration, incidence, probability, etc.) and their scale (section 7.1), without assigning a numerical value to their significance. Climate change not caused by the project, but rather globally by potential climate change that could have impacts at the national level, was also included in this summary.

Table 42: Summary of environmental impacts (construction phase)

Descriptor	Impact	Phase	Activity/area affected	Impact characteristics
Climate	Change in evapotranspiration at ground level	Construction	Clearing and earthmoving (blasting), installation and use of the construction site, construction of the grain terminal.	Negative, direct, reduced magnitude, temporary and permanent operation), reversible and irreversible operation), unlikely, localized and insignificant.
Geology/ geomorphology	Changes to local geomorphology (caused by excavation and landfill works)	Construction	Clearing and earthmoving (blasting), installation and use of the construction site, construction of the grain terminal.	Negative, direct, low magnitude, temporary, irreversible, certain, localized, and insignificant.
Soils	Risk of soil contamination (concrete, oil, and fuel resulting from accidental spills) Soil compaction (due to the movement of machinery, equipment, and personnel)	Construction	Clearing of land, soil movement, and handling of hazardous products and effluents.	Negative, direct, low magnitude, temporary, reversible, probable, localized, and insignificant.
Land use	Change in land use	Construction	Project area	Negative, direct, reduced magnitude, temporary, reversible, certain, local, and insignificant.
Groundwater resources	-Contamination of the aquifer by accidental spills and/or runoff of waste -Decreased recharge of surface aquifers	Construction	Clearing and earthmoving (blasting), installation and use of the construction site	Negative, direct and indirect, low magnitude, temporary, reversible, unlikely, localized, and insignificant.
Surface water resources	-Impact on surface water drainage patterns (resulting from soil compaction and sealing); -Contamination of watercourses by accidental spills and/or runoff of waste.	Construction	Construction of buildings and infrastructure, transportation of people and materials	Negative, direct, low magnitude, temporary (contamination) and permanent, reversible, probable (contamination) and uncertain (alteration of runoff), local and insignificant.
Flora and Fauna	-Disturbance and dusting of surrounding flora; -Running over and killing of species; -Disturbance of local fauna	Construction	Cleaning, excavation, and earthworks; installation and use of construction sites; construction of buildings and infrastructure; transportation of people and materials	Negative, direct and indirect, low magnitude, temporary (construction), reversible and irreversible (in the case of wildlife death), certain, localized, and insignificant.
Landscape	Change in the character of the landscape with the introduction of buildings (spatial and functional disorganization of the territory, introduction of "foreign" elements)	Construction	Project area and surroundings	Negative, direct, moderate magnitude, temporary, irreversible, certain, localized, and insignificant.

Descriptor	Impact	Phase	Activity/area affected	Impact characteristics
Air Quality	Emissions of gases and particulate matter (dust) from excavation and landfill activities	Construction	Cleaning and stripping of soil, earthworks; blasting; Installation and use of the construction site; construction of the building and infrastructure; transportation of people and materials	Negative, direct, low magnitude, temporary, reversible, certain, local, and insignificant.
	Increase in CO and NOx concentrations from road traffic	Construction	Area surrounding the project	Negative, indirect, low magnitude, temporary, reversible, uncertain, localized, and insignificant.
Noise environment	Increased noise levels (from traffic vehicles, mostly heavy vehicles assigned to the construction site, and from the operation of machinery and equipment)	Construction	Cleaning and stripping of the soil, earthworks, demolition, installation and use of the construction site, construction of the building and infrastructure, transport of people and materials, etc.	Negative, direct, moderate, temporary, reversible, certain, widespread, and significant.
Socioeconomic	Nuisance to the local population (caused by noise and dust emissions, disruption to traffic flow)	Construction	Cleaning and stripping of soil, earthworks, clearing, installation and use of the construction site, construction of the building and infrastructure, transportation of people and materials, etc.	Negative, indirect, small in scale, temporary, reversible, probable, widespread, and insignificant.
	Job creation	Construction	Project surrounding area and area of direct and indirect influence	Positive, direct, small in scale, temporary, reversible, certain, widespread, and insignificant.
	Boosting of associated sectors of activity	Construction	Project area and area of direct and indirect influence	Positive, direct and indirect, low magnitude, temporary, reversible, probable, widespread and insignificant.
	Risk of accidents (accidents involving workers and the population)	Construction	Project surroundings and area of direct and indirect influence	Negative, direct and indirect, low to moderate magnitude, temporary, reversible, uncertain, widespread and insignificant.
	Increased population retention, especially among the working-age population	Operation	Project surrounding area and area of direct influence	Negative, indirect, small in scale, temporary, reversible, probable, localized, and insignificant.
	Gender inequality in the workplace, sexual harassment, gender-based violence	Construction	Project surrounding area and area of direct influence	Negative, indirect, low magnitude, temporary, reversible, probable, localized, and insignificant.
Infrastructure	Pressure on the EN 120 road network	Construction	Project area	Negative, direct, low magnitude, temporary, reversible, unlikely, local and widespread, insignificant.
	Pressure on the energy, water, and sanitation supply network	Construction	Project area	Negative, direct, reduced magnitude, temporary, reversible, unlikely, localized, and insignificant.
Waste	Waste production	Construction	Project area	Negative impact, direct, low magnitude, temporary, reversible, certain, localized, and insignificant.
	Risks of environmental contamination	Construction	Project area and surroundings	Negative impact, direct, low magnitude, temporary, reversible, probable, localized, and insignificant.
Climate change	Temperature variations, heat islands, rise in average sea level, heavy rainfall, storms, floods, landslides, and extreme drought events (not caused by the project, but by potential climate change)	Construction	Project area and surroundings	Negative impact

Table 43: Summary of environmental impacts (operation phase)

Descriptor	Impact	Phase	Activity/area affected	Impact characteristics
Climate	Increased perception of heat discomfort	Operation	Grain terminal operation.	Negative, direct, reduced magnitude, permanent, irreversible operation, unlikely, localized, and insignificant.
Geology/ Geomorphology	Changes in local geomorphology	Operation	Grain terminal operation	Negative, direct, low magnitude, permanent, irreversible, certain, localized, and insignificant.
Soils	Risks of soil contamination (oils and fuels resulting from accidental spills) Soil compaction (due to the movement of trucks, equipment, and personnel)	Operation	Handling of hazardous products and effluents, transport of grain and personnel	Negative, direct, low magnitude, permanent, reversible, probable, localized, and insignificant.
Land use	Change in land use	Operation	Project area	Negative, direct, reduced magnitude, permanent, irreversible, certain, local, and insignificant.
Groundwater resources	-Contamination of the aquifer by accidental spills and/or runoff of waste -Decreased recharge of surface aquifers	Operation	Compaction due to light and heavy vehicle traffic, impermeable areas during construction	Negative, indirect, low magnitude, temporary, reversible, unlikely, localized, and insignificant.
Surface water resources	-Impact on surface water drainage patterns (resulting from soil compaction and sealing); -Contamination of watercourses by accidental spills and/or runoff of waste.	Operation	Circulation of light and heavy vehicles, poor management of chemicals	Negative, direct, reduced magnitude, temporary (contamination) and permanent, reversible, probable (contamination) and uncertain (alteration of runoff), local and insignificant.
Flora and Fauna	-Disturbance and dusting of surrounding flora; -Running over and killing of species; -Disturbance of local fauna	Operation	Cleaning and maintenance of facilities, circulation of light and heavy vehicles, operation of facilities	Negative, direct and indirect, reduced magnitude, permanent, reversible and irreversible (in the case of fauna death), certain, localized, and insignificant.
Landscape	Change in the character of the landscape	Operation	Project area and surroundings	Negative, direct, moderate magnitude, permanent, irreversible, certain, localized, and significant.
Air quality	Emissions of gases and particulate matter	Operation	Use of generators, cleaning of facilities, circulation of light and heavy vehicles.	Negative, direct, low magnitude, temporary and permanent, reversible, certain, local, and insignificant.
	Increased concentration of CO and NOx from road traffic	Operation	Area surrounding the project	Negative, indirect, low magnitude, permanent, reversible, uncertain, localized, and insignificant.

Descriptor	Impact	Phase	Activity/area affected	Impact Features
Noise Noise	Increased noise levels	Operation	Silo operation, facility maintenance, vehicle and employee traffic	Negative, direct, moderate, temporary, reversible, certain, widespread, and significant.
Socioeconomic	Nuisance to the local population (caused by noise and dust emissions, traffic flow constraints)	Operation	Silo operation, facility maintenance, vehicle and employee traffic	Negative, indirect, reduced magnitude, temporary, reversible, probable, widespread, and insignificant.
	Job creation	Operation	Project surrounding area and area of direct and indirect influence	Positive, direct, low magnitude, temporary, reversible, certain, widespread, and insignificant.
	Boosting of associated sectors of activity	Operation	Project area and area of direct and indirect influence	Positive, direct and indirect, low magnitude, temporary, reversible, probable, widespread and insignificant.
	Risk of accidents (accidents involving workers and the general public)	Operation	Project surrounding area and area of direct and indirect influence	Negative, direct and indirect, moderate magnitude, temporary, reversible and irreversible (in case of death), uncertain, widespread and insignificant.
	Increased population retention, especially among the working-age population	Operation	Project surrounding area and area of direct influence	Negative, indirect, low magnitude, temporary and permanent, reversible, probable, localized, and insignificant.
	Gender inequality in the workplace, sexual harassment, gender-based violence	Operation	Project surrounding area and area of direct influence	Negative, indirect, low magnitude, permanent, reversible, probable, localized, and insignificant.
Infrastructure	Pressure on the road network	Operation	Project area	Negative, direct, low magnitude, permanent, reversible, unlikely, local and widespread, insignificant.
	Pressure on the energy, water, and sanitation supply network	Operation	Project area	Negative, direct, low magnitude, permanent, reversible, unlikely, localized and widespread, and insignificant.
	Reduction in grain transport time due to proximity to the EN-120	Operation	Project area	Positive, direct, moderate magnitude, permanent, irreversible, probable, regional and very significant.
Waste	Waste production	Operation	Project Area	Negative impact, direct, low magnitude, permanent, irreversible, certain, localized, and insignificant.
	Risks of environmental contamination	Operation	Project area and surroundings	Negative impact, direct, low magnitude, temporary, reversible, probable, localized, and insignificant.
Climate change	Temperature variations, heat islands, rising sea levels, heavy rainfall, storms, floods, landslides, and extreme drought events (not caused by the project, but by potential climate change)	Construction and operation	Project area and surroundings	Negative impact

Table 44: Summary of environmental impacts (decommissioning phase)

Descriptor	Impact	Phase	Activity/area affected	Impact characteristics
Climate	Change in evapotranspiration at ground level	Decommissioning	Restoration of degraded areas after decommissioning	Positive, reduced magnitude, direct, probable, localized, permanent or temporary, reversible, and insignificant.
Geology/geomorphology	Changes in local geomorphology (caused by excavation and landfill works)	Decommissioning	Cleaning and earthmoving, excavations for the removal of structural foundations	Negative, direct, temporary, localized, probable, immediate, irreversible, and insignificant.
Soils	Risks of soil contamination (oils, fuels, and effluents) resulting from accidental spills	Decommissioning	Cleaning and earthmoving, excavations for the removal of structural foundations, movement and handling of hazardous products and effluents.	Negative, magnitude reduced, direct, probable, local, temporary, reversible, immediate, and insignificant.
	Soil compaction (due to the movement of machinery, equipment, and personnel)			
	Return of the soil to its undisturbed state			Positive, magnitude reduced, direct, probable, localized, permanent, reversible, medium and long term, and insignificant.
Land use	Change in land use (return to its natural state prior to the terminal's implementation)	Decommissioning	Project area	Positive, magnitude reduced, direct, probable, localized, permanent, reversible, medium and long term, and insignificant.
Groundwater resources	-Contamination of the aquifer by accidental spills and/or runoff of waste	Decommissioning	Cleaning and earthmoving, excavations for the removal of structural foundations, movement and handling of hazardous products and effluents.	Negative, reduced magnitude, direct, probable, local, temporary, reversible, and insignificant
	-Decreased recharge of surface aquifers			
	Gradual return to undisturbed surface water drainage patterns.		Recovery of degraded areas	Positive, reduced magnitude, direct, probable, local, temporary, reversible, and insignificant
Surface water resources	-Impact on surface water drainage patterns	Decommissioning	Cleaning and earthmoving, excavations for the removal of structural foundations, movement and handling of hazardous products and effluents.	Negative, reduced magnitude, direct, probable, local, temporary, reversible, and insignificant
	-Contamination of watercourses by accidental spills and/or runoff of waste.			
	Gradual return to undisturbed surface water drainage patterns.		Recovery of degraded areas	Positive, reduced magnitude, direct, probable, local, temporary, reversible, and insignificant
Flora and Fauna	-Disturbance and dusting of surrounding flora;	Decommissioning	Cleaning and earthmoving, demolition, and excavation for the removal of structural foundations	Negative, direct and indirect, reduced magnitude, temporary, reversible and irreversible (in the case of fauna death), certain and probable, localized and insignificant.
	-Running over and killing of species;			
	-Disturbance of local fauna			
	Gradual return to undisturbed patterns of fauna and flora		Recovery of degraded areas and reforestation	Positive, reduced magnitude, direct, certain and probable, localized, temporary, reversible, and insignificant

Descriptor	Impact	Phase	Activity/area affected	Impact characteristics
Landscape	Change in the character of the landscape (spatial and functional disorganization)	Deactivation	Project area and surroundings	Negative, low and high magnitude (in the case of abandonment), direct, certain, local, temporary and permanent (in the case of abandonment), reversible, immediate, and insignificant
	Gradual return of the landscape to its undisturbed state			Positive, low magnitude, direct, probable, localized, temporary, reversible, insignificant
Air quality	Emissions of gases and particulate matter (dust) from excavation and landfill activities	Decommissioning	Cleaning and earthmoving, demolition, and excavation for the removal of structural foundations	Negative, low magnitude, direct, probable, local, temporary, reversible, and insignificant.
	Increased concentration of CO and NOx from road traffic		Project area and surroundings	
	Elimination of sources of air pollution			Positive, magnitude reduced, direct, certain, localized, temporary, reversible, and insignificant
Noise environment	Increased noise levels (from vehicle traffic, mostly heavy vehicles involved in the construction work)	Deactivation	Cleaning and earthmoving, demolition, and excavation for the removal of structural foundations	Negative, moderate magnitude, direct, certain, local, temporary, reversible, insignificant.
	Elimination of noise sources		Project area and surroundings	Positive, moderate magnitude, direct, certain, local, temporary, reversible, and insignificant.
Socioeconomic	Nuisance to the local population (caused by noise and dust emissions, traffic flow constraints)	Decommissioning	Cleaning and earthmoving, demolition, and excavation for the removal of structural foundations	Negative, reduced magnitude, direct, probable, local and widespread, temporary, reversible, and insignificant.
	Job creation	Decommissioning	Project surrounding area and area of direct and indirect influence	Positive, direct, small in scale, temporary, reversible, certain, widespread, and insignificant.
	Boosting of associated sectors of activity	Decommissioning	Project surrounding area and area of direct and indirect influence	Negative, moderate magnitude, direct and indirect, certain, local and regional, permanent, reversible, and significant.
	Risk of accidents (accidents involving workers and the population)	Decommissioning	Project surrounding area and area of direct and indirect influence	Negative, moderate, direct, probable, local and regional, temporary, reversible and irreversible (in case of death), insignificant to significant.
	Increase in the number of unemployed people	Decommissioning	Project surrounding area and area of direct and indirect influence	Negative, direct, low magnitude, permanent, reversible, certain, widespread, and insignificant.
	Return gradual to unaffected of of populations			Positive, direct, small in magnitude, temporary, reversible, probable, widespread, and insignificant.
Infrastructure	Pressure on the EN 120 road network	Deactivation	Project area and surroundings	Negative, reduced magnitude, direct, uncertain, extended, temporary, reversible, and insignificant.
	Reduced pressure on the EN 120 road network, energy supply, water, and sanitation	Deactivation	Project area and surroundings	Positive, reduced magnitude, direct, certain, widespread, permanent, reversible, and insignificant

Descriptor	Impact	Phase	Activity/area affected	Impact characteristics
Waste	Waste production	Decommissioning	Cleaning and earthmoving, demolition, and excavation for the removal of structural foundations	Negative, moderate magnitude, direct, certain, localized, temporary, reversible, immediate, and significant.
	Risks of environmental contamination	Decommissioning	Cleaning and improper storage of waste, movement and handling of hazardous products and effluents.	Negative, moderate magnitude, direct, certain, localized, temporary, reversible, immediate, and significant.
	Elimination of impacts caused by the terminal in terms of waste production	Decommissioning	Project area and surroundings	Positive, low magnitude, direct, certain, localized, permanent, reversible, and insignificant
Climate change	Temperature variations, heat islands, rise in average sea level, heavy rainfall, storms, floods, landslides, and extreme drought events (not caused by the project, but by potential climate change)	Decommissioning	Project area and surroundings	Negative impact

7.19 CLASSIFICATION OF ENVIRONMENTAL AND SOCIAL IMPACTS IN TERMS OF THEIR SIGNIFICANCE

The classification of the significance of environmental and social impacts is obtained by multiplying the criteria Probability (P), Incidence (I), Magnitude (M), and Duration (T) established in section 7.1.1, taking into account the values assigned to them in Table 36.

The following section presents summary tables of the classification of environmental and social impacts for each impact described, and their assessment, with mitigating or enhancing measures. The indication of general and specific measures is in accordance with the code indicated in Chapter 8.

The tables do not exhaust the assessment of impacts, but are intended only to present, in a systematic and expeditious manner, the impacts that were considered, the significance values assigned, and the measures proposed, considering the construction and operation phases.

It should be noted that the impacts caused by the location of the construction site were not taken into account, as its location is unknown, nor were the impacts generated during the decommissioning phase, as they will be similar to those expected to occur during the construction phase.

Table 45: Classification of the environmental and social impacts of the project (construction phase)

DESCRIPTION	IMPACT	NATURE	OCCURRENCE	MAGNITUDE	DURATION	REVERSIBILITY	PROBABILITY	INCIDENCE	MITIGATION MEASURES	SIGNIFICANCE
Climate	Change in evapotranspiration and temperature at ground level	-	D	R	T	RV	PR	L	MGC 1/ MMC 1	-3
Geology and Geomorphology	Changes in local geomorphology	-	D	R	T	IR	C	L	MGC 1/MMC 2	-8
Soil	Soil compaction, contamination, and erosion	-	D	R	T	RV	PR	L	MGC 1/MMC 3,4,5	-3
Land use	Land use change	-	D	R	T	RV	PR	L	MGC 1	-3
Surface water resources	Contamination of waterways by accidental spills and/or waste runoff	-	D	R	T	RV	PR	L	MGC1/MMC 6,7,8	-3
Underground water	Contamination of the aquifer by accidental spills and/or waste runoff	-	IND	R	T	RV	IMP	L	MGC 1/MMC 9,10,11	-1
Flora	Disturbance and destruction of flora	-	D	R	R	RV	PR	L	MGC 1/MMC 12,13,14	-3
Wildlife	Risks of species being run over and killed	-	D	R	T	IR	IC	A	MMC 16	-8
	Disturbance of local fauna	-	D	R	T	RV	PR	L	MMC 15	-3

	Barrier effect on the circulation of terrestrial fauna	-	D	R	P	IR	IMP	L	SM	-2
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DESCRIPTION	IMPACT	NATURE	OCCURRENCE	MAGNITUDE	DURATION	REVERSIBILITY	PROBABILITY	INCIDENCE	MITIGATION MEASURES	SIGNIFICANCE
Landscape	Landscape change	-	D	M	T	RV	C	L	MGC 1/MMC 17,18,21	-8
Air quality	Emissions of gases and particulate matter	-	D	R	T	RV	C	L	MGC 14:11 MMC 20:21,22,23	-4
Noise environment	Increased noise levels	-	M	R	T	RV	C	A	MGC 11.14 MMC 24:25,26	-16
Socioeconomics	Job creation	+	D	R	T	RV	C	A	MGC 6.8/MMC 27	8
	Dynamization of sectors of activity	+	IND	R	T	RV	PR	A	MGC 2,6,8/MMC 28	6
	Nuisance to local residents (vehicle traffic, noise, dust)	-	D	R	T	RV	PR	A	MGC 2,6,8/MMC 29	-6
	Accident risks	-	D	M	T	RV	IC	A	MGC 4,6,8,12,14 MMC 30,31	-8

DESCRIPTION	IMPACT	NATURE	OCCURRENCE	MAGNITUDE	DURATION	REVERSIBILITY	PROBABILITY	INCIDENCE	MITIGATION MEASURES	SIGNIFICANCE
Infrastructure	Pressure on the road network	-	D	R	T	RV	IC	A	MMC 32, 33, 34, 35	-4
Waste	Waste production	-	D	R	P	RV	C	L	MGC 3.10/MMC 39	-8
	Risks of environmental contamination	-	IND	R	T	RV	PR	L	MGC 3 MMC 36, 37, 38	-3

Nature: Positive (+), Negative (-)

Occurrence: Direct (D), Indirect (Ind)

Magnitude: Low (L), Moderate (M), High (H) **Incidence:** Local

(L), Widespread (W), Regional (R) **Duration:** Temporary (T),

Permanent (P) **Reversibility:** Reversible (Rv.), Irreversible (Ir)

Probability of occurrence: Unlikely (IMP), Uncertain (INC), Likely (PR), Certain (C)

Significance: Very Significant (VS), Significant (S), Not Significant (NS) GCM-general measures

for the construction phase

MMC-specific mitigation measure for the construction phase

SM-No measure

Table 46: Identification and assessment of the project's environmental impacts (operation phase)

DESCRIPTION	IMPACT	NATURE	OCCURRENCE	MAGNITUDE	DURATION	REVERSIBILITY	PROBABILITY	INCIDENCE	MITIGATION MEASURES	SIGNIFICANCE
Climate	Increased perception of heat discomfort	-	D	R	P	R	IMP	L	MMO 1	-2
Geology and Geomorphology	Changes in local geomorphology	-	D	R	P	IR	C	L	MMO 2.3	-16
Soil	Risk of soil contamination from accidental spills	-	D	R	T	RV	PR	L	MGO 2/MMO 5.6	-3
	Compaction due to the movement of people and vehicles	-	D	R	P	RV	PR	L	MMO 3	-6
Land use	Land use change	-	D	R	P	IR	C	L	SM	-16
Resources Surface water	Contamination of waterways by accidental spills and/or waste runoff	-	D	R	T	RV	PR	L	MGO 2/MMO 7.8	-3
	Impact on surface water drainage patterns and increased runoff	-	D	R	P	RV	PR	L	MMO 9	-6

DESCRIPTION	IMPACT	NATURE	OCCURRENCE	MAGNITUDE	DURATION	REVERSIBILITY	PROBABILITY	INCIDENCE	MITIGATION MEASURES	SIGNIFICANCE
Water resources Ground water	Contamination of aquifer by accidental spills and/or runoff of waste	-	IND	R	T	RV	IC	L	MGO 2/MMO 11	-2
	Possible decrease in local water table	-	IND	R	P	IR	IMP	L	SM	-8
Flora	Disturbance and dusting of surrounding flora	-	D	R	P	RV	PR	L	MGO 1/ MMO 12, 13, 14, 15, 16	-6
Wildlife	Roadkill and death of species	-	IND	R	P	IR	IC	L	MGO 1/ MMO 6, 20, 21, 22	-8
	Disturbance of local fauna	-	IND	R	P	IR	IC	L	MGO 1.10/MMO 17, 18, 21, 22	-8
Landscape	Change in the character of the landscape with the introduction of buildings and landscaping	-	D	M	P	IR	C	L	MMO 23, 24, 25, 26	-32
Air quality	Emissions of gases and particulate matter	-	D	M	P	RV	C	L	MGO 7.9/MMO 27, 28, 29, 30, 31, 32	-16
Noise environment	Increased noise levels	-	D	M	P	RV	PR	L	MGO 7.9/MMO 33, 34, 35, 36	-12

DESCRIPTION	IMPACT	NATURE	OCCURRENCE	MAGNITUDE	DURATION	REVERSIBILITY	PROBABILITY	INCIDENCE	MITIGATION MEASURES	SIGNIFICANCE
Socioeconomics	Job creation	+	D	M	P	---	C	A	MGO 8/MMO 39	32
	Revitalization of sectors of activity	+	IND	M	P	RV	PR	R	MMO 38, 37, 40	36
	Nuisance to the population (vehicle traffic, noise, dust)	-	D	M	P	RV	PR	L	MGO 8/ MMO 41	-12
	Risks of accidents involving the population	-	D	M	P	RV	IC	A	MGO 2/MMO 43,44,45	-16
Infrastructure	Pressure on the road network	-	D	R	P	RV	IC	A	MMO 49	-8
	Pressure on the energy, water, and sanitation supply network	-	D	R	P	RV	IC	A	MMO 50,51,52	-8
	Reduction in grain flow time due to proximity to the EN-120	+	D	M	P	IR	PR	R	SM	72

DESCRIPTION	IMPACT	NATURE	OCCURRENCE	MAGNITUDE	DURATION	REVERSIBILITY	PROBABILITY	INCIDENCE	MITIGATION MEASURES	SIGNIFICANCE
Waste	Waste production	-	D	R	P	IR	C	L	MGO 3.7.9/MMO 53.55	-16
	Risks of environmental contamination	-	D	R	P	RV	PR	L	MGO 2,3,7,9/MMO 54,55,56	-6

Nature: Positive (+), Negative (-)

Occurrence: Direct (D), Indirect (Ind)

Magnitude: Low (L), Moderate (M), High (H) **Incidence:** Local

(L), Widespread (W), Regional (R) **Duration:** Temporary (T),

Permanent (P) **Reversibility:** Reversible (Rv.), Irreversible (Ir)

Probability of occurrence: Unlikely (IMP), Uncertain (INC), Likely (PR), Certain (C)

Significance: Very Significant (VS), Significant (S), Not Significant (NS) MGO-general

measures for the operational phase

MMO-specific mitigation measure for the operation phase

SM-No measure

8 MITIGATION MEASURES

8.1 GENERAL CONSIDERATIONS

Mitigation, in the environment, consists of human intervention with the aim of reducing or remedying a specific harmful environmental and social impact. It also means reference to a specific act.

According to the *National Environmental Policy Act*, mitigation measures include:

- Preventive measures (aimed at avoiding an impact);
- Minimizing measures (which aim to reduce an impact);
- Compensatory measures (which aim to compensate for an unavoidable impact) (CEQ, 1987).

Mitigation measures may consist of specific actions to be implemented during the preparation/construction and operation phases of the Project. This EIA suggests several generic mitigation measures to be implemented by the end of the preparation/construction phase and some specific mitigation measures for the negative impacts identified at the level of the different descriptors in both phases, thus aiming to reduce the impacts in a comprehensive manner and covering all descriptors.

The changes caused by the activities planned in the project can be minimized, prevented, compensated for, monitored, or improved through the adoption of measures and programs aimed at improving the environmental and social quality of the project and adapting its integration into the environment.

The first level of mitigation measures applies to the Implementation Project, which will be developed by the winner of the tender for the construction of the Grain Terminal. This project will be prepared based on the Base Project analyzed in this EIAS report. The measures to be implemented in the Implementation Project focus on the technical specifications of the project elements and the construction methodologies to be adopted by the Contractor.

The second level of mitigation measures refers to preventive actions, whose main objective is to avoid the emergence of negative impacts and reduce the environmental risks of certain activities of the construction or operation phase of the project.

In addition to the hierarchical approach, the presentation of mitigation measures is also structured according to the project phases (execution, construction, and operation) and organized by thematic areas.

The proposed measures focus on impact prevention and mitigation. However, as the project is located in an area of critical habitats, it will be necessary, in accordance with Operational Safeguard 3 of the AfDB, to adopt compensatory measures. This issue is detailed in the Biodiversity Action Plan, a document complementary to this EIA, which will describe the proposed compensatory measures, with an emphasis on the conservation of the region's fauna and flora.

The mitigation measures presented follow the guidelines of the African Development Bank's Integrated Safeguards System, particularly Operational Safeguards (OS) 1, 3, 4, and 5, as well as the regulations and standards established by international conventions.

Six complementary initiatives are presented aimed at supporting local organizations, as well as capacity building and awareness raising actions for the community in the region.

These measures are directly related to the effects that will be caused by the construction and operation of the grain terminal owned by the Carrinho Group, SA.

8.2 GENERAL AND SPECIFIC MEASURES

The proposed general and specific measures will be implemented during the construction and operation phases.

As presented in Tables 47, 48, 49, and 50.

Table 47: General mitigation and enhancement measures for environmental and social impacts (construction phase)

ID	ACTION/ACTIVITY	MITIGATION MEASURES	RESPONSIBILITY	COSTS (USD)
MGC 1	Construction	Develop and implement a construction site management program	Contractor	(included in the installation cost of the shipyard)
MGC 2	Construction	Development and Implementation of a Complaint Resolution Mechanism.	Contractor	USD 2,000/month
MGC 3	Construction	Monitoring Plan for Stored Effluents	Contractor	3,500 USD
MGC 4	Construction	Development and implementation of the Worker Health and Safety Plan	Contractor	8,000 USD
MGC 5	Construction	Preparation and implementation of an Emergency Plan	Contractor	8,000 USD
MGC 6	Construction	Preparation and implementation of the Environmental and Social Management Plan	Contractor	5,500 USD/month
MGC 7	Construction	Develop and implement an Environmental Education Program	Contractor	1,000 USD/month
MGC 8	Construction	Develop and implement a Communication and Stakeholder Relations Plan	Contractor	3,000 USD/month
MGC 9	Construction	Preparation and implementation of an environmental and social monitoring plan on the progress of the works, including the impacts caused and the measures taken to mitigate and/or compensate for them, which must be submitted to MINAMB.	Contractor	3,500 USD/per report
MGC 10	Construction	Preparation and implementation of a Waste Management Plan	Contractor	4,500 USD
MGC 11	Fencing installation	In order to reduce noise, dust, and exhaust emissions to the outside, the construction site will be fenced around its entire perimeter with opaque hoardings at least 2 m high.	Contractor	(included in the site installation cost)
MGC 12	Safety signage	The terminal construction area and access roads must be properly signposted and marked to avoid and prevent any type of incident and/or accident involving workers and/or the public.	Contractor	(included in the cost of setting up the construction site)
MGC 13	Construction	Install adequate sanitary facilities for workers	Contractor	(included in the cost of setting up the site)
MGC 14	PPE	Provide personal and collective protective equipment appropriate to the type of activities to be carried out	Contractor	(included in the cost of setting up the site)
MGC 15	Appointment of a person responsible for implementing mitigation measures	The contractor shall appoint a qualified environmental technician who shall be solely responsible for coordinating the implementation of environmental impact mitigation measures and monitoring programs. This professional shall act as an intermediary between the person responsible for executing the work and the teams in charge of implementing the established monitoring programs.	Contractor	(included in the cost of the contract)



ID	ACTION/ACTIVITY	MITIGATION MEASURES	RESPONSIBILITIES	COSTS (USD)
MGC 16	Supply of aggregates to the construction site	Whenever feasible, materials from the quarry should be supplied directly from the quarry to the work areas in order to minimize the space occupied by construction materials at the construction site and reduce the frequency of loading and unloading operations.	Contractor	(included in the cost of setting up the site)
MGC 17	Origin of aggregates	All aggregates used on site must be of legal origin, i.e., they must be purchased from quarries authorized by the competent authority and duly licensed by the Ministry of the Environment.	Contractor	(included in the cost of the contract)
MGC 14	Transport of aggregates	Ensure the proper storage of construction materials and waste from the work, especially those of a powdery or particulate nature, in order to prevent their dispersion and fall on public roads during transport to the work area or final disposal site.	Contractor	(included in the cost of the contract)

Table 48: Specific mitigation and enhancement measures for environmental and social impacts (construction phase)

ID	DESCRIPTION	ENVIRONMENTAL IMPACT	MITIGATION MEASURES	RESPONSIBILITIES	COSTS (USD)
MMC 1	Climate	Change in evapotranspiration and ground-level temperature	Limit excavation and waterproofing to areas where strictly necessary.	Contractor	(Included in the work to be carried out by the Contractor)
MMC 2	Geology and geomorphology	Change in local geomorphology	Limit excavations to areas where strictly necessary.	Contractor	(Included in the work to be carried out by the Contractor)
MMC 3	Soils	Reduction in water infiltration capacity	The movement of machinery and other equipment involved in the work must be strictly confined to the designated areas;	Contractor	(Included in the work to be performed by the Contractor)
MMC 4	Soils	Soil erosion	Avoid prolonged exposure of soils	Contractor	(Included in the work to be carried out by the Contractor)
MMC 5	Soils	Contamination by spillage	Keep equipment and machinery in good working order; maintenance must be carried out in a safe and waterproof location;	Contractor	(included in the cost of setting up the construction site)
MMC 6	Surface water resources	Contamination of waterways by accidental spills and/or runoff of waste and solid sediments	Keep machinery and vehicles in good working order, do not perform maintenance in unsealed areas that are unsafe;	Contractor	(included in the cost of setting up the construction site)
MMC 7	Surface water resources	Contamination of waterways by accidental spills and/or runoff of waste and solid sediments	Properly store waste resulting from construction work;	Contractor	(included in the cost of setting up the construction site)

ID	DESCRIPTION	IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COSTS (USD)
MMC 8	Surface water resources	Contamination of watercourses by accidental spills and/or runoff of waste and solid sediments	Identify probable temporary watercourses or streams that may influence the dynamics of surface water flow;	Contractor	(included in the cost of setting up the construction site)
MMC 9	Groundwater resources	Contamination of the aquifer by accidental spills and/or runoff of waste	Keep machinery and vehicles in good working order, do not perform maintenance in inappropriate locations;	Contractor	(included in the cost of setting up the construction site)
MMC 10	Groundwater resources	Contamination of the aquifer by accidental spills and/or runoff of waste	Restriction to the strictly necessary number of temporary accesses and movement of vehicles assigned to the work;	Contractor	(Included in the work to be carried out by the Contractor)
MMC 11	Groundwater resources	Contamination of the aquifer by accidental spills and/or runoff of waste	Restrict the waterproofing of areas, thereby facilitating greater infiltration of rainwater into the soil and reducing runoff	Contractor	(Included in the work to be performed by the Contractor)
MMC 12	Flora	Disturbance and destruction of native flora	Avoid degradation of existing vegetation cover by restricting vehicle traffic areas;	Contractor	(Included in the work to be carried out by the Contractor)
MMC 13	Flora	Disturbance and destruction of native flora	No burning of surrounding vegetation and implementation of fencing around natural areas where endemic and endangered species occur.	Contractor	(Included in the work to be performed by the Contractor)
MMC 14	Flora	Disturbance and destruction of native flora	Raise awareness among workers and communities about the importance of the areas created and the species that inhabit them, especially endemic and endangered species.	Contractor and NGOs	(included in the cost of the contract)
MMC 15	Fauna	Disturbance of local fauna	Raise awareness among workers and communities about the importance of preserving endemic or endangered species;	Contractor and NGOs	(included in the cost of the contract)
MMC 16	Fauna	Risks of species being run over and killed	Reduce the speed of machinery and vehicles to prevent species being run over and killed. Monitoring and relocation of wild species, especially endangered or endemic species.	Contractor	(Included in the work to be carried out by the Contractor)

ID	DESCRIPTION	IMPACT	MITIGATION MEASURES	LIABILITY	COSTS (USD)
MMC 17	Landscape	Landscape alteration	Support infrastructure, materials, and equipment should be established in appropriately selected areas to avoid dispersion.	Contractor	(included in the cost of the contract)
MMC 18	Landscape	Landscape alteration	Respect for the construction typology of the work;	Contractor	(included in the cost of the contract)
MMC 19	Air quality	Degradation of air quality (particulate and gas emissions)	Avoid high-speed traffic and machinery, complying with the established speed limits (60 km/h and 30 km/h) near and within towns;	Contractor	(Included in the work to be carried out by the Contractor)
MMC 20	Air quality	Air quality degradation (particulate and gas emissions)	Moisten areas where dust may be generated;	Contractor	(included in the cost of the contract)
MMC 21	Air quality	Degradation of air quality (particulate and gas emissions)	Keep machinery and vehicles in good technical condition and use them strictly when necessary;	Contractor	(included in the cost of the contract)
MMC 22	Air quality	Degradation of air quality (particulate and gas emissions)	Avoid burning waste and vegetation;	Contractor	(Included in the work to be performed by the Contractor)
MMC 23	Air quality	Degradation of air quality (particulate and gas emissions)	In order to reduce the emission of dust and exhaust gases to the outside, the construction site will be fenced off around its entire perimeter with opaque hoardings at least 2 m high.	Contractor	(included in the cost of setting up the construction site)

ID	DESCRIPTION	IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COSTS (USD)
MMC 24	Noise environment	Increased noise levels	Prevent vehicles from traveling at high speeds, obeying the established limits (60 km/h and 30 km/h) near and within localities;	Contractor	(Included in the work to be carried out by the Contractor)
MMC 25	Noise environment	Increased noise levels	In order to reduce noise emissions to the outside, the construction site will be fenced off around its entire perimeter with opaque hoardings at least 2 m high.	Contractor	(included in the cost of setting up the construction site)
MMC 26	Noise environment	Increased noise levels	Perform regular maintenance on equipment and machinery, and use them only when strictly necessary.	Contractor	(included in the cost of the contract)
MMC 27	Socioeconomics	Job creation	The creation of new unskilled jobs should primarily benefit the populations living in the immediate vicinity of the infrastructure; All labor employed by the terminal will comply with the provisions of international conventions on the protection of the rights of children and workers to which Angola is a signatory through the International Labor Organization (ILO), as well as the provisions of the AfDB's Integrated Safeguards System, namely Operational Safeguard 5.	Contractor	(included in the cost of the contract)
MMC 28	Socioeconomics	Revitalization of economy and associated sectors	Materials to support this phase should preferably be purchased on the local market;	Contractor	(included in the cost of the contract)
MMC 29	Socioeconomics	Increased inconvenience for the local population	Vehicles must comply with the speed limits (60 km/h and 30 km/h) in and around built-up areas, avoiding the use of audible signals that disturb the population;	Contractor	(Included in the work to be performed by the Contractor)

ID	DESCRIPTION	IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COSTS (USD)
MMC 30	Socioeconomics	Accident risks	Vehicles must comply with the speed limits (60 km/h and 30 km/h) near and within towns;	Contractor	(Included in the work to be carried out by the Contractor)
MMC 31	Socioeconomics	Accident risks	Training and awareness campaigns on defensive driving	Contractor	USD 2,000/month
MMC 32	Infrastructure	Pressure on the road network and urban infrastructure (water, energy, and sanitation)	Comply with the established speed limits (60 km/h and 30 km/h) near and within towns, and reduce speed on unpaved roads;	Contractor	(Included in the work to be carried out by the Contractor)
MMC 33	Infrastructure	Pressure on the road network and urban infrastructure (water, energy, and sanitation)	Training and awareness campaigns on defensive driving	Contractor	(included in the cost of the contract)
MMC 34	Infrastructure	Pressure on the road network and urban infrastructure (water, energy, and sanitation)	Water abstraction must be preceded by authorization from the competent authority, and specific measures must be adopted for its management;		(included in the cost of the contract)
MMC 35	Infrastructure	Pressure on the road network and urban infrastructure (water, energy, and sanitation)	Wastewater must be properly stored in appropriate containers in a safe area, and its collection, treatment, and disposal must be carried out by a company duly licensed for this purpose.	Contractor	(included in the cost of the contract)
MMC 36	Waste	Risks of environmental contamination	Non-hazardous waste must be disposed of by a company duly licensed for this purpose; All polluting substances used must be stored in appropriate locations with restricted access and properly waterproofed to reduce the risk of accidental spills. In the event of an accidental spill of any polluting substance, measures to contain the contamination must be implemented immediately, including immediate cleaning of the site, stripping and removal of the affected soil layer, where applicable, and transport of the resulting waste to an appropriate final destination.	Contractor	(included in the cost of the contract)

ID	DESCRIPTION	IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COSTS (USD)
MMC 37	Waste	Risks of environmental contamination	All hazardous waste resulting from machine maintenance and other activities must be stored in a suitable location and sent to a licensed company for final disposal.	Contractor	(included in the cost of the contract)
MMC 38	Waste	Risks of environmental contamination	Prohibit the burning of any type of waste in the open air and/or its disposal in landfills.	Contractor	(Included in the work to be performed by the Contractor)
MMC 39	Waste	Waste production	<p>The contractor shall adopt a Waste Management Plan based on the following guidelines. To ensure efficient management of waste generated on site and its temporary storage, a specific area for selective waste disposal will be created on the site, which will be covered and equipped with big bags and metal or plastic containers properly identified according to the type of waste to be disposed of.</p> <p>Metal containers/drums shall be available for at least the following types of waste: wood, iron and steel, concrete, plastics/PVC, paper/cardboard, and packaging, among others.</p> <p>Hazardous waste, such as that containing hydrocarbons, solvents, batteries, and contaminated fabrics, must be stored in specific containers, properly identified and protected by a cover.</p> <p>This approach will promote the separation of all waste at source, preventing mixing and contamination, as well as facilitating its recovery when transferred to waste management operators duly licensed by the competent authorities. This measure follows the guidelines established in Presidential Decree No. 190/12, of August 24, which defines the general regime applicable to waste prevention, generation, and management, in addition to regulating the licensing and concession of waste management activities.</p> <p>The disposal of construction waste must comply with the provisions of Executive Decree No. 17/13 (Management of Construction and Demolition Waste).</p> <p>This action complies with the requirements of Operational Safeguard 4, which the contractor is required to comply with.</p>	Contractor	(included in the contract cost)

Table 49: General mitigation and enhancement measures for environmental and social impacts (operation phase)

ID	ACTION/ACTIVITY	MITIGATION MEASURES	RESPONSIBILITY	COSTS (USD)
MGO 1	Preparation of a Manual of Good Environmental Practices	To ensure that the grain terminal's activities do not pose unnecessary pollution risks, the facilities must have a Manual of Good Environmental Practices, which establishes the environmental management procedures to be followed by both employees and service providers when accessing the facilities. This manual must ensure that waste generated is properly disposed of, stored, and transported to authorized and regulated locations, in accordance with the provisions of Presidential Decree No. 190/12 of August 24, which defines the general regime applicable to waste prevention, generation, and management, in addition to regulating the licensing and concession of waste management activities.	Proponent	USD 3,500
MGO 2	Preparation of an Emergency Plan	The grain terminal must have a pollution control system that is compatible with the scale of the activities carried out there, allowing for the rapid and safe removal of potentially polluting substances, such as hydrocarbons and others, that may be accidentally spilled and could affect the soil or air. This measure complies with the provisions of the AfDB's Integrated Safeguard System, namely Operational Safeguard 4.	Proponent	USD 16,000/year
MGO 3	Preparation of a Waste Management Plan	Carrinho, Sa, will adopt a Waste Management Plan based on the following guidelines. To ensure the selective collection of waste generated during terminal operations, appropriate containers will be installed for the temporary storage of the different types of waste expected, including those produced by terminal users (municipal solid waste), those resulting from the loading and unloading of goods, and a specific area for the disposal of hazardous waste. All containers will be properly identified with an indication of the type of waste that can be disposed of in each one. The storage, transport, and final disposal of waste will be carried out in accordance with Presidential Decree No. 190/12 of August 24, which defines the general regime applicable to waste prevention, generation, and management, as well as the rules for licensing and concession of waste management activities. This measure complies with Operational Safeguard 4, which the contractor is required to comply with.	Proponent	(included in facility operating costs)
MGO 4	Conducting Drills	The grain terminal must have a plan for conducting accident drills involving spills of hydrocarbons and other polluting substances. This plan should enable the assessment and supervision of the technical resources available at the terminal, ensuring that they are in good operating condition. Evidence of the implementation and compliance with the plan must be accessible to the authorities during inspection and enforcement actions.	Proponent	(included in facility operating costs)
MGO 5	Workplace Accidents	Development and implementation of the Worker Health and Safety Plan	Proponent	(included in facility operating costs)

ID	ACTION/ACTIVITY	MITIGATION MEASURES	RESPONSIBILITY	COSTS (USD)
MGO 6	Infrastructure operation	Implementation of the Environmental and Social Management Plan	Proponent	(included in facility operating costs)
MGO 7	Legal compliance	Preparation of monitoring reports to be submitted to MINAMB	Proponent	(included in facility operating costs)
MGO 8	Conflicts with the community	Implementation of a Complaints Resolution Mechanism.	Proponent	(included in facility operating costs)
MGO 9	Legal compliance and continuous improvement	Implementation of external audits	Proponent/Minamb/ Local administration	22,000 USD/year
MGO 10	Pest proliferation	Pest control and eradication plan	Proponent	12,000 USD/year

Table 50: Specific mitigation and enhancement measures for environmental and social impacts (operation phase)

ID	DESCRIPTION	IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COSTS (USD)
MMO 1	Climate	Increased perception of heat discomfort	Promote the restoration of intervened areas by planting gardens and trees that are suited to the area;	Proponent	(included in facility operating costs)
MMO 2	Geology and geomorphology	Change in local geomorphology	Take into account the micro-basin of the region in order to effectively direct rainwater;	Contractor/proponent/supervision	(included in facility operating costs)
MMO 3	Geology and geomorphology	Change in local geomorphology	Circulation of machinery and vehicles only in designated areas;	Proponent	(included in facility operating costs)
MMO 4	Geology and geomorphology	Change in local geomorphology	Avoid exposing areas that will not be used in the short term;	Contractor/Proponent	(included in facility operating costs)
MMO 5	Soils	Soil contamination due to accidental spills	Keep equipment and machinery in good working order; maintenance should be carried out in a safe, waterproof location.	Proponent	(included in facility operating costs)
MMO 6	Soil	Soil contamination due to accidental spills	Develop an internal spill management and response plan.	Proponent	(included in facility operating costs)
MMO 7	Surface water resources	Contamination of waterways by accidental spills and/or runoff of waste and solid sediments	Maintenance of generators and other equipment must be carried out in a specific, waterproofed area with the necessary safety conditions (spill emergency kit);	Proponent	(included in facility operating costs)
MMO 8	Surface water resources	Contamination of waterways by accidental spills and/or runoff of solid waste and sediments	When installing urban and industrial wastewater treatment systems, they must comply with current legislation regarding discharge standards;	Proponent	(included in facility operating costs)

ID	DESCRIPTION	IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COSTS (USD)
MMO 9	Surface water resources	Impact on surface water drainage patterns and increased runoff	Installation of appropriately sized storm drainage networks.	Contractor/Supervision/Proponent	(included in facility operating costs)
MMO 10	Groundwater resources	Contamination of the aquifer by accidental spills and/or runoff of waste	Maintenance of generators and other equipment must be carried out in a specific, waterproofed area with the necessary safety conditions (spill emergency kit);	Proponent	(included in facility operating costs)
MMO 11	Groundwater resources	Contamination of the aquifer by accidental spills and/or runoff of waste	Store waste and other products in suitable containers and store them on spill containment basins;	Proponent	(included in facility operating costs)
MMO 12	Flora	Disturbance and destruction of native flora	Avoid degradation of existing vegetation cover by restricting vehicle traffic areas;	Proponent	(included in facility operating costs)
MMO 13	Flora	Disturbance and destruction of native flora	Prohibit the burning of any type of waste, as well as surrounding vegetation, and implement fencing around natural areas where endemic and endangered species occur.	Proponent	(included in facility operating costs)
MMO 14	Flora	Disturbance and destruction of native flora	Raise awareness among workers and communities about the importance of preserving endemic and endangered species.	Proponent/NGOs/Administration	USD 10,000/year
MMO 15	Flora	Disturbance and destruction of native flora	Vehicles and machinery must be driven at moderate speeds, especially on unpaved areas.	Proponent	(included in facility operating costs)
MMO 16	Flora	Disturbance and destruction of native flora	Support local associations focused on research and preservation of flora.	Proponent	(included in facility operating costs)
MMO 17	Fauna	Disturbance of local fauna	Raise awareness among workers and communities about the importance of preserving endemic or endangered species;	Proponent/NGOs/Administration	(included in facility operating costs)

ID	DESCRIPTION	IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COSTS (USD)
MMO 18	Fauna	Disturbance of local fauna	Avoid noisy activities at night;	Proponent	(Included in the work to be carried out by the operator)
MMO 19	Fauna	Disturbance of local fauna	Direct lighting in the facilities downward, thus preventing the disturbance and/or accidental death of birds against fixed objects;	Contractor/Proponent	(included in facility operating costs)
MMO 20	Fauna	Risks of species being run over and killed	Reduce the speed of machinery and vehicles to prevent species being run over and killed. Monitoring and relocation of wild species, especially endangered or endemic species.	Proponent/Service providers	(Included in the work to be carried out by the operator)
MMO 21	Fauna	Species preservation	Raising awareness among workers not to kill animals that invade the premises; to this end, they should always be captured and returned to their natural habitat.	Proponent	(Included in the work to be carried out by the operator)
MMO 22	Fauna	Species preservation	Support local associations focused on wildlife research and preservation.	Proponent	10,000 USD
MMO 23	Landscape	Landscape change	Maintain facilities in good condition;	Proponent	(included in facility operating costs)
MMO 24	Landscape	Landscape alteration	Create a specific area for parking machinery and vehicles;	Contractor/Proponent	(included in facility operating costs)
MMO 25	Landscape	Landscape alteration	Night lighting should be directed downward;	Contractor/Proponent	(included in facility operating costs)
MMO 26	Landscape	Landscape alteration	Do not use colors that contrast significantly with the surroundings.	(included in facility operating costs)	(included in facility operating costs)

ID	DESCRIPTION	IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COSTS (USD)
MMO 27	Air quality	Degradation of air quality (particulate and gas emissions)	Avoid high-speed traffic and machinery, obeying the speed limits (60 km/h and 30 km/h) near and within towns;	Operator/Grain transporters	(Included in the work to be performed by the operator)
MMO 28	Air quality	Degradation of air quality (particulate and gas emissions)	Moisten areas where dust may be generated;	Operator	(included in facility operating costs)
MMO 29	Air quality	Degradation of air quality (particulate and gas emissions)	Keep machinery and vehicles in good technical condition and use them strictly when necessary;	Operator	(included in facility operating costs)
MMO 30	Air quality	Degradation of air quality (particulate and gas emissions)	Avoid burning any type of waste and surrounding vegetation;	Operator	(Included in the work to be performed by the operator)
MMO 31	Air quality	Degradation of air quality (odor emissions)	All waste must be properly stored in suitable containers to mitigate odor emissions.	Operator	(included in facility operating costs)
MMO 32	Air quality	Degradation of air quality (particulate and gas emissions)	When disinfecting the facilities, avoid spraying insecticides during very dry and windy periods.	Operator	(Included in the work to be performed by the operator)
MMO 33	Noise environment	Increased noise levels	Avoid high-speed vehicle traffic, complying with the established limits (60 km/h and 30 km/h) near and within localities;	Operator/Grain transporters	(Included in the work to be performed by the operator)
MMO 34	Noise environment	Increased noise levels	Implement a noise monitoring program.	Operator	(included in facility operating costs)
MMO 35	Noise environment	Increased noise levels	Perform regular maintenance on equipment and machinery, and use them only when strictly necessary.	Operator	(included in facility operating costs)

ID	DESCRIPTION	IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COSTS (USD)
MMO 36	Noise environment	Increased noise levels	Whenever possible, noisy equipment should be enclosed or installed in closed areas to mitigate the noise levels generated.	Operator	(included in facility operating costs)
MMO 37	Socioeconomics	Revitalization of economy and associated sectors	Materials to support the facilities at this stage should preferably be purchased on the local market;	Operator	(included in facility operating costs)
MMO 38	Socioeconomics	Revitalization of economy and associated sectors	Set fair and competitive prices for grain purchases, which encourage increased production by individual farmers and existing cooperatives	Operator/Local administration	(included in facility operating costs)
MMO 39	Socioeconomics	Job creation	The creation of new unskilled jobs should primarily benefit the populations living in the immediate vicinity of the infrastructure; All labor employed by the terminal will comply with the provisions of international conventions on the protection of the rights of children and workers to which Angola is a signatory through the International Labor Organization (ILO), as well as the provisions of the AfDB's Integrated Safeguards System, namely Operational Safeguard 5.	Operator	(included in facility operating costs)
MMO 40	Socioeconomics	Revitalization of economy and associated sectors	Provide technical support and knowledge of good agricultural practices to the most disadvantaged populations, in order to obtain higher yields and strengthen crops, thus contributing to the fight against poverty.	Operator/NGOs/Local administration	USD 20,000/month
MMO 41	Socioeconomics	Increased inconvenience for the local population	Vehicles must comply with the speed limits (60 km/h and 30 km/h) near and within towns, avoiding the use of audible signals that disturb residential areas;	Grain operator/transporters	(Included in the work to be carried out by the operator)
MMO 42	Socioeconomics	Increased food availability	Food must be made available in accordance with quality standards to promote the health and well-being of consumers;	Operator/Grain transporters	(included in facility operating costs)

ID	DESCRIPTION	IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COSTS (USD)
MMO 43	Socioeconomics	Accident risks	Vehicles must comply with the speed limits (60 km/h and 30 km/h) near and within towns;	Grain operators/transporters	(Included in the work to be performed by the operator)
MMO 44	Socioeconomics	Accident risks	Training and qualification in occupational health and safety, and availability of PPE and CPE.	Operator	(included in facility operating costs)
MMO 45	Socioeconomics	Accident risks	Training and awareness campaigns on defensive driving	Grain operators/transporters	(included in facility operating costs)
MMO 46	Socioeconomics	Increased value of agricultural land in the region	Local authorities should guard against land price speculation;	Operator/Local administration	(Included in the work to be carried out by the operator)
MMO 47	Infrastructure	Pressure on the road network	Comply with the established speed limits (60 km/h and 30 km/h) near and within towns, and reduce speed on unpaved roads;	Operator/Grain transporters	(Included in the work to be carried out by the operator)
MMO 48	Infrastructure	Pressure on the road network	Training and awareness campaigns on defensive driving	Operator/Grain transporters	(included in facility operating costs)
MMO 49	Infrastructure	Pressure on the road network	Transport goods at pre-established times, avoiding congested routes whenever possible;	Grain operator/transporters	(Included in the work to be performed by the operator)
MMO 50	Infrastructure	Pressure on urban infrastructure (water, energy, and sanitation)	Water abstraction must be preceded by authorization from the competent local authority, and specific measures must be adopted for its management;	Proponent	(included in facility operating costs)
MMO 51	Infrastructure	Pressure on urban infrastructure (water, energy, and sanitation)	Wastewater must be properly stored in appropriate containers in a secure area, and its collection, treatment, and disposal must be carried out by a company duly licensed for this purpose.	Proponent	(included in facility operating costs)

ID	DESCRIPTION	IMPACT	MITIGATION MEASURES	LIABILITY	COSTS (USD)
MMO 52	Infrastructure	Pressure on urban infrastructure (water, energy, and sanitation)	Monitor water and energy consumption and waste production, drawing up a plan to reduce them;	Proponent	(included in facility operating costs)
MMO 53	Waste	Risks of environmental contamination	Develop and implement a waste management plan	Proponent	(included in facility operating costs)
MMO 54	Waste	Risks of environmental contamination	All hazardous waste resulting from machine maintenance must be stored in a suitable location and sent to a licensed company for final disposal.	Proponent	(included in facility operating costs)
MMO 55	Waste	Risks of environmental contamination	Install equipment (recycling bins) that facilitates waste segregation and reuse in accordance with the waste management plan (WMP), and encourage practices aimed at reducing waste production;	Proponent	(included in facility operating costs)
MMO 56	Waste	Risks of environmental contamination	Prohibit the burning of any type of waste in the open air and/or its disposal in landfills.	Proponent	(Included in the work to be carried out by the operator)

9 CUMULATIVE IMPACTS

The cumulative effects of the project refer to the combined impact of Caála Grain Terminal activities over time, added to the impacts of other developments and activities in the region. These effects can be synergistic, when they interact and amplify each other, or additive, when they simply add to existing impacts.

This section summarizes the significant residual impacts that were identified for the construction and operation phases of the infrastructure in Chapter 7. Thus, residual impacts are those that remain significant after the application of the mitigation and enhancement measures proposed in Chapter 8.

Given the nature of the terminal, the main cumulative effects include changes in air quality due to atmospheric emissions and particle dispersion, impacts on water resources resulting from consumption and effluent disposal, and possible consequences for local biodiversity. In addition, the intensification of heavy vehicle traffic and increased economic activity may generate additional challenges related to noise, road safety, and urban infrastructure.

The assessment of cumulative effects is essential to ensure that the implementation and operation of the project occur in a sustainable manner, preventing irreversible impacts and promoting effective mitigation measures. To this end, an integrated approach to environmental monitoring, emissions control, waste management, and dialogue with local communities will be adopted, ensuring a balance between economic development and environmental conservation.

Table 51: Summary of cumulative impacts

Project phase	Type of cumulative impact	Description	Accumulation factors	Mitigation measures
Construction	Increase of traffic and road congestion	Construction work causes an increase in truck and heavy machinery traffic in already congested areas	Proximity to urban roads, other projects under construction.	Define specific transport routes; adequate signage; coordination of schedules to avoid peak hours.
	Noise generation	Machinery and demolition increase noise in an already noisy environment.	Urban traffic, other civil works.	Limit noisy activities to daytime hours; use machines with silencers; install temporary acoustic barriers.
	Air pollution (dust and emissions)	Dust and gas emissions from excavations and vehicles.	Urban traffic , nearby industrial activities	Daily watering of roads and exposed areas; covering trucks; restrict movement on windy days.
	Pressure on urban infrastructure	Additional consumption of water, energy, and road use.	Interconnection with the existing urban network	Use of efficient systems; water reuse; renewable energies whenever possible.
	Construction waste	Accumulation of solid waste, rubble, and packaging.	Other construction sites and nearby developments.	Segregation and proper packaging; shipment to final destination licensed; maximize the reuse of materials.
Operation	Continuous heavy traffic	Frequent entry and exit of trucks for loading/unloading grain.	Proximity to other warehouses/logistics facilities.	Plan of management traffic traffic; maintenance of roads; schedules scheduled for loading/unloading outside peak hours.
	Visual impact and urban land use	Large structures alter the landscape and land use in urbanized areas.	Verticalization and construction density.	Landscaping and tree planting; painting and aesthetic maintenance of structures.
	Risks of infestation (pests, rodents)	Poor grain management can attract vectors, affecting nearby residential areas.	Proximity to dwellings, lack of integrated pest control	Implement integrated pest control program; regular inspections; sealing of cracks.
	Generation of continuous operational noise	Engines, fans, forklifts operating in shifts.	Residential residential in the vicinity	Install soundproofing; limit nighttime operation nighttime operation; periodic maintenance to reduce vibration.
	Odor (in case of grain deterioration)	Poor storage can cause noticeable odors in urban areas	Accumulation of organic waste and lack of adequate ventilation	Selective collection system; licensed disposal destination licensed final destination; composting of organic waste.

10 PROGRAM FOR MONITORING AND TRACKING ENVIRONMENTAL AND SOCIAL IMPACTS

Monitoring consists of establishing discrete or continuous measurements of the numerical attributes of each impact. Follow-up consists of observing environmental quality after a given action. The frequency of actions varies for each impact and for each phase of the project. The objectives of these actions are to verify the efficiency of each mitigation measure established for each impact, and the maintenance and/or restoration of environmental balance.

This EIA encourages the business group to adopt and develop measures aimed at improving environmental and social performance in the execution of its activities, in order to achieve excellence in its environmental policy, following the exemplary model that has been implemented in the other units of this business group.

Thus, the following monitoring and follow-up programs were proposed:

- 1) Program for monitoring effluents stored in septic tanks
- 2) Worker health and safety program
- 3) Atmospheric emission and air quality monitoring program
- 4) Noise level monitoring program
- 5) Environmental education program
- 6) Waste monitoring and management program.
- 7) Biodiversity monitoring program
- 8) Emergency plan
- 9) Pest Control and Management Plan
- 10) Communication and stakeholder relations program.
- 11) ESIA monitoring report submission mechanism
- 12) Environmental and social performance audits

11 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

11.1.1 General considerations

The Environmental and Social Management Plan (ESMP) for the Caála Grain Terminal establishes guidelines, preventive measures, and corrective actions to ensure that the construction and operation of the project are conducted in an environmentally sustainable and socially responsible manner.

The main objective of this plan is to mitigate the potential environmental and social impacts resulting from the installation and operation of the terminal, ensuring compliance with current legislation and international best practices in environmental management. In addition, it seeks to promote worker safety, the quality of life of local communities, and the conservation of the region's natural resources.

The implementation of the PGAS involves a set of programs and measures aimed at monitoring environmental quality, controlling atmospheric emissions, proper waste management, protecting biodiversity, occupational safety and health, and strengthening dialogue with stakeholders. The integrated approach of this plan will minimize environmental and social risks, contributing to the sustainability of the project and the socioeconomic development of the region.

This chapter details the main components of the PGAS, including institutional responsibilities, monitoring and reporting mechanisms, and environmental mitigation and compensation strategies. Strict adherence to these guidelines will ensure that the Caála Grain Terminal operates in accordance with the principles of sustainability, promoting a balance between economic growth, environmental preservation, and social well-being.

11.2 MONITORING PROGRAM FOR EFFLUENTS STORED IN SEPTIC TANKS

11.2.1 Objective

- Ensure that effluents stored in septic tanks comply with environmental standards;
- To reduce environmental impacts and protect water resources and public health;
- Assess the efficiency of the facility's sanitary sewage treatment system;
- Identify possible contamination and propose corrective measures.

11.2.2 Justification

- Improper storage of effluents can result in soil infiltration and groundwater contamination;
- Inadequate decomposition of organic matter can generate odors and proliferation of disease vectors;
- Compliance with environmental and health regulations avoids penalties and protects the local community.

11.2.3 Parameters to be analyzed and monitoring frequency

The following parameters should be analyzed regularly:

Table 52: Parameters to be analyzed and monitoring frequency

Parameter	Unit	Frequency	
		Construction phase	Operational phase
PH	-	Monthly	Quarterly
BOD (Biochemical Oxygen Demand)	mg/L	Monthly	Quarterly
COD (Chemical Oxygen Demand)	mg/L	Monthly	Quarterly
Total Suspended Solids (TSS)	mg/L	Bimonthly	Quarterly
Nitrates and Nitrites	mg/L	Bimonthly	Semiannual
Thermotolerant Coliforms	NMP/100mL	Monthly	Quarterly
Oils and Greases	mg/L	Quarterly	Semiannual

11.2.4 Monitoring methods

- Sample collection: Use of sterilized bottles in accordance with environmental standards;
- Laboratory analysis: Samples must be analyzed by a certified laboratory, applying standardized methodologies, such as:
 - Potentiometric method for pH;
 - Winkler method for BOD;
 - Spectrophotometry for COD and nitrates/nitrites;
 - Filtration and incubation technique for coliforms.
- On-site measurements: Checking effluent levels and observing odors and signs of leakage. Installing high-level alarms can also alert you when the tank is about to reach its maximum capacity.
- Periodic cleaning of the septic tank, usually every 1-3 years, is essential to remove accumulated sludge.

11.2.5 Responsibilities

Contractor: Responsible for monitoring during the construction phase. **Carrinho, SA:** Responsible for implementing the program during the operational phase. **Local environmental agency:** Conduct periodic inspections and audits.

Accredited laboratory: Analysis of samples and issuance of technical reports.

11.3 WORKER SAFETY AND HEALTH PLAN

11.3.1 Objective

- Ensure the physical and mental integrity of workers during the construction and operation phases of the silos;
- Prevent workplace accidents and minimize occupational risks;
- Ensure compliance with current occupational health and safety standards;
- Promote a safe and healthy work environment.

11.3.2 Justification

The construction and operation of silos involve risks such as falls, exposure to dust, high noise levels, inhalation of toxic gases, and handling of heavy machinery.

- The adoption of preventive measures reduces accidents and absences due to occupational illnesses;
- Compliance with labor and environmental legislation to avoid penalties and ensure the well-being of workers.

11.3.3 Parameter to be analyzed and monitoring frequency

Table 53: Parameters to be analyzed and monitoring frequency

Parameters	Unit/indicator	Frequency	
		Construction phase	Operation phase
Work accidents	Number of occurrences	Monthly	Quarterly
Absenteeism rate	%	Monthly	Semiannual
Ergonomic conditions	Qualitative assessment	Quarterly	Semiannual
Noise level	dB(A)	Monthly	Quarterly
Air quality (dust, gases)	mg/m ³	Monthly	Half-yearly
Use of personal protective equipment (PPE)	% compliance	Monthly	Monthly
Safety training	Number of training sessions held	Bimonthly	Semester

11.3.4 Monitoring method

- Periodic inspections of workplaces to identify risks;
- Laboratory analyses of air and noise to assess environmental quality;
- Reports on occupational accidents and illnesses for control and continuous improvement;
- Training and awareness-raising for workers on safe practices;
- Use of PPE such as masks, gloves, ear protectors, and safety belts;
- Implementation of safety signage in hazardous areas;
- Regular occupational medical examinations to monitor workers' health.

11.3.5 Responsibilities

Contractor: Responsible for worker safety during the construction phase.

Carrinho, SA: Responsible for implementing the plan during the operational phase.

Occupational Safety Technician: Monitoring, training, and enforcement of safety standards.

Supervisors and managers: Ensuring compliance with preventive and corrective measures.

Workers: Follow safety guidelines, use PPE, and report risks.

Regulatory authorities: Conduct inspections and audits in accordance with current legislation.

11.4 ATMOSPHERIC EMISSIONS AND AIR QUALITY MONITORING PROGRAM

11.4.1 Objective

- To assess and control atmospheric emissions from silo construction and operation activities.
- Ensure that air quality is within legal and recommended limits for public health and the environment;
- Identify sources of pollution and implement mitigation measures to minimize negative impacts;
- Prevent respiratory risks to workers and nearby communities.

11.4.2 Justification

During the construction phase, activities such as soil movement, material transport, and machinery use generate airborne particles (dust) and polluting gases (CO₂, NO_x, SO₂).

During the operational phase, grain handling, exhaust from transport engines, and silo ventilation processes can release particulate matter and gases that affect air quality.

Regular monitoring allows pollution patterns to be detected and operational practices to be adjusted to reduce impacts.

11.4.3 Parameter to be analyzed and monitoring frequency

Table 54: Parameters to be analyzed and monitoring frequency

Parameters	Unit/indicator	Frequency	
		Construction phase	Operation phase
Particulate matter (PM ₁₀ , PM _{2.5})	µg/m ³	Monthly	Quarterly
Sulfur dioxide (SO ₂)	ppm	Monthly	Semiannual
Nitrogen oxides (NO _x)	ppm	Monthly	Semiannual
Carbon monoxide (CO)	ppm	Monthly	Semiannual
Carbon dioxide (CO ₂)	ppm	Monthly Quarterly	Semiannual
Volatile organic compounds (VOCs)	ppm	Monthly Quarterly	Semiannual
Odors (grain decomposition)	Qualitative assessment	Whenever necessary	Quarterly

11.4.4 Monitoring method

- Direct measurements with portable equipment for CO, NO₂, SO₂, and VOCs;
- Sampling with air filters for laboratory analysis of particulate matter;
- Continuous monitoring at strategic points in and around the facility to assess pollutant dispersion;
- Use of fixed sensors for automatic real-time measurements (if applicable);
- Periodic reports for trend analysis and operational adjustments.

11.4.5 Responsibility

Contractor: Responsible for implementing control measures during the construction phase.

Cart, SA: Responsible for continuous monitoring and application of mitigation measures during the operational phase.

Environmental Technician: Sample collection, data analysis, and report preparation.

Environmental and Regulatory Agencies: Conducting audits and enforcing compliance with environmental standards.

11.5 NOISE LEVEL MONITORING PROGRAM

11.5.1 Objective

- To assess and control the noise levels generated by the construction and operation of the silos;
- Ensure that noise levels are within legal and recommended standards for public health and community well-being;
- Identify sources of excessive noise and adopt mitigation measures to reduce negative impacts;
- Prevent occupational risks for workers exposed to high noise levels.

11.5.2 Justification

During the construction phase, activities such as soil movement, use of heavy equipment, transportation of materials, and assembly of structures can generate high noise levels, affecting workers and nearby residents.

During the operational phase, the operation of fans, exhaust fans, engines, and truck traffic can result in noise levels above acceptable limits. The project intervention area, which is characterized as a residential area, is 55 dB(A) during the daytime (7:00 a.m. to 10:00 p.m.) and 45 dB(A) at night.

Continuous monitoring will allow trends to be assessed and corrective actions to be implemented to reduce noise impacts.

11.5.3 Parameter to be analyzed and monitoring frequency

Table 55: Parameters to be analyzed and monitoring frequency

Parameters	Unit/Indicator	Frequency	
		Construction phase	Operating phase
Sound pressure level (Leq)	dB(A)	Weekly	Quarterly
Maximum Noise Peak (Lmax)	dB(A)	Weekly	Quarterly
Background Noise (L90)	dB(A)	Monthly	Semiannual
Noise Perceived by Workers	Qualitative assessment	Whenever necessary	Whenever necessary

11.5.4 Monitoring method

- Measurements with sound level meters at strategic points inside and around the facility;
- Continuous monitoring in sensitive areas (nearby residential areas, administrative offices);
- Use of portable equipment for spot measurements at different times of the day (daytime and nighttime);
- Comparison with legal limits established by environmental and occupational safety standards;
- Periodic reports for trend analysis and operational adjustments.

11.5.5 Responsibility

Contractor: Responsible for monitoring and controlling noise during the construction phase.

Carrinho, SA: Responsible for monitoring and mitigating noise levels during the operational phase.

Environmental and Occupational Safety Technician: Collection of samples, data analysis, and preparation of reports.

Environmental and Regulatory Agencies: Conducting audits and enforcing compliance with noise standards.

11.6 ENVIRONMENTAL EDUCATION PROGRAM

11.6.1 Objective

- Raise awareness among workers and local communities about good environmental practices;
- Reduce environmental impacts associated with the construction and operation of silos;
- Promote the sustainable use of natural resources;
- Strengthen the culture of environmental safety and sustainability;
- Ensure compliance with environmental legislation and best practices.

11.6.2 Justification

During the construction phase, it is essential to train workers on waste management, emissions control, and environmental safety.

During the operational phase, environmental education will help maintain sustainable practices, prevent pollution, and involve the community in environmental actions.

11.6.3 Parameter to be analyzed and monitoring frequency

Table 56: Parameters to be analyzed and frequency of monitoring

Parameters	Indicator	Frequency	
		Construction phase	Operation phase
Number of training sessions conducted	Number of sessions/month	Monthly	Quarterly
Worker participation	% of participation	Monthly	Quarterly
Topics covered	Content checklist	Semester	Annual
Community awareness actions	Number of events	Quarterly	Semiannual
Adoption of good environmental practices	Qualitative assessment	Quarterly	Semi-annual

11.6.4 Monitoring method

- Training and lectures on waste, water use, pollution, and environmental conservation;
- Distribution of educational materials (booklets, videos, banners);
- Practical training on waste segregation, prevention of environmental accidents, and workplace safety;
- Community actions such as tree planting and cleaning of public areas;
- Periodic evaluation through forms and interviews.

11.6.5 Responsibility

Contractor: Implementation of the program during construction.

Carrinho, SA: Continuation of the program during the operational phase.

Environment and Safety Technician: Coordination of activities and evaluation of results.

Local Environmental Agencies: Monitoring of compliance with environmental standards.

11.7 COMMUNICATION AND STAKEHOLDER RELATIONSHIP PROGRAM

11.7.1 Objectives

- Establish effective channels of communication between Carrinho, SA and stakeholders;
- Ensure transparency in the construction and operation of silos;
- Prevent and mitigate conflicts with local communities and regulatory bodies;
- Promote community involvement in the environmental and social management of the project;
- Respond quickly and efficiently to stakeholder concerns.

11.7.2 Justification

During the construction phase, it is necessary to provide information on temporary impacts such as noise, vehicle traffic, and waste management.

During the operational phase, ongoing dialogue will help manage expectations, prevent conflicts, and keep the community informed about environmental measures and socioeconomic opportunities.

11.7.3 Parameter to be analyzed and monitoring frequency

Table 57: Parameter to be analyzed and frequency of monitoring

Parameters	Indicator	Frequency	
		Construction phase	Operational phase
Meetings with stakeholders	Number of meetings held	Quarterly	Semiannual
Active communication channels	Number of channels implemented (telephone, email, meetings)	Continuous	Continuous
Complaints received and resolved	Number of records and resolution rate (%)	Monthly	Quarterly
Community involvement actions	Number of events or social projects developed	Quarterly	Semiannual
Dissemination of project information	Number of press releases or newsletters published	Semiannually	Semiannual

11.7.4 Methods

- Creation of communication channels (telephone, email, public meetings, information panels);
- Regular meetings with local authorities, communities, and other stakeholders;
- Disclosure of reports and bulletins on impacts and mitigation measures;
- Recording and analysis of complaints with structured responses and proposed solutions;
- Service platform for community questions and suggestions.

11.7.5 Responsibility

Carrinho, SA: Implementation and supervision of the program.

Community Relations Manager: Mediation between the company and stakeholders.

Environmental and Municipal Agencies: Monitoring and oversight of communication actions.

Community and Workers: Active participation in communication channels.

11.8 WASTE MONITORING AND MANAGEMENT PROGRAM.

11.8.1 Objective

- Ensure that solid and liquid waste is managed in an environmentally sound manner and in accordance with applicable legislation;
- Minimize environmental and health impacts resulting from the generation, storage, transportation, and final disposal of waste;
- Promote recycling, reuse, and proper disposal of waste, reducing the amount sent to landfills;
- Prevent soil, water, and air contamination associated with poor waste management;
- Monitor the effectiveness of waste segregation and disposal practices throughout the project's life cycle.

11.8.2 Justification

During the construction phase, debris, construction waste, packaging, hazardous waste (paints, solvents, oils), and organic waste from the work team will be generated. Proper segregation and disposal are essential to avoid environmental and social impacts.

During the operational phase, the silos will produce organic waste (spoiled grain), packaging from inputs, hazardous waste (lubricants, oils), and municipal solid waste from employees. Monitoring the management of this waste will prevent contamination and ensure environmental compliance.

11.8.3 Parameter to be analyzed and monitoring frequency

Table 58: Parameter to be analyzed and monitoring frequency

Parameters	Unit/indicator	Frequency	
		Construction phase	Operation phase
Volume of waste generated	kg/month	Monthly	Quarterly
Percentage of recyclable waste	%	Monthly	Quarterly
Amount of hazardous waste	kg/month	Monthly	Quarterly
Final disposal of waste	Documentary verification	Monthly	Quarterly
Storage conditions	Visual inspection	Biweekly	Monthly

11.8.4 Monitoring method

- Segregation at source: Implementation of identified containers for different types of waste;
- Record of waste generated: Documentary analysis of the quantities and types of waste collected;
- Regular inspections: Verification of correct storage and transport of waste;
- Final destination analysis: Checking manifests and licenses of treatment and disposal operators;
- Periodic reports: Preparation of documents with monitoring data for internal control and environmental audits.

11.8.5 Responsibility

Contractor: Responsible for waste management during the construction phase, including segregation and disposal.

Carrinho, SA: Responsible for waste management during the operational phase, ensuring environmental compliance.

Environmental and Occupational Safety Technician: Responsible for monitoring and reporting.

Regulatory Agencies: Monitoring compliance with applicable environmental legislation.

11.9 BIODIVERSITY MONITORING PROGRAM

11.9.1 Objectives

- Assess the impacts of the construction and operation of the silos on local fauna and flora;
- Monitor possible changes in the region's ecosystems due to the project's activities;
- Identify and mitigate impacts on protected or endemic species;
- Ensure compliance with national and international environmental regulations;
- Promote biodiversity conservation and the sustainability of the project.

11.9.2 Justification

The construction and operation of silos can cause environmental disturbances, such as habitat loss, soil changes, and impacts on local wildlife;

- Monitoring biodiversity allows for the mitigation of negative impacts and the adoption of corrective measures to prevent environmental degradation;
- Meets legal requirements and good environmental practices required by regulatory agencies;
- Enables early detection of adverse impacts and the adoption of adaptive measures.

11.9.3 Parameters to be analyzed and monitoring frequency

Table 59: Parameters to be analyzed and monitoring frequency

Parameters	Unit/indicator	Frequency	
		Construction phase	Operation phase
Vegetation cover	% of vegetation removed vs. compensated areas	Semiannual	Annual
Terrestrial fauna	Record of species sighted and number of roadkill	Semiannual	Annual
Habitat quality	Degree of degradation of areas adjacent to the development	Quarterly	Annual
Presence of protected species	Occurrence of endangered species in the area of influence	Semiannual	Annual
Land use and habitat fragmentation	Extent of the impacted area	Semester	Annual

11.9.4 Methods

- Inventory of fauna and flora, comparing with data prior to the project;
- Monitoring using camera traps to identify mammals and birds in the area of influence;
- Analysis of vegetation cover using satellite images and drones to detect changes in vegetation;
- Interviews with local with and experts to assess changes in biodiversity;
- Monitoring of ecological corridors to verify impacts on wildlife movement;
- Periodic reports with recommendations for corrective actions.

11.9.5 Responsibility

Carrinho, SA: Responsible for implementing and financing the program.

Environmental Management Team: Coordinates the execution of monitoring and the implementation of mitigation measures.

Specialized Environmental Consulting: Can be hired to conduct independent surveys and audits.

Local Environmental Agencies (Ministry of the Environment, Conservation Institutes, etc.):

They oversee and validate the monitoring results.

Local Community and Environmental NGOs: Can contribute observations and information about changes in biodiversity.

11.10 EMERGENCY PLAN

11.10.1 Objectives

- Ensure the safety of workers, neighboring communities, and the environment in the event of incidents or disasters.
- Minimize the impacts of emergencies such as fires, hazardous product spills, explosions, structural collapses, and extreme weather events.
- Define clear procedures for rapid and effective response in emergency situations.
- Ensure compliance with national and international safety and environmental regulations.
- Train workers and stakeholders to respond effectively in emergencies.

11.10.2 Justification

- Grain storage can pose risks such as dust explosions, fires, environmental contamination, and structural collapse.
- The presence of heavy machinery and vehicles during construction and operation increases the likelihood of accidents.

- Compliance with environmental and safety regulations requires the implementation of emergency response plans.
- Proper preparation reduces financial, operational, and social risks arising from serious incidents.

11.10.3 Parameters to analyze and monitoring frequency

Table 60: Parameters to be analyzed and monitoring frequency

Parameters	Unit/indicator	Frequency	
		Construction phase	Operation phase
Fire risk	Storage conditions for flammable materials	Monthly	Quarterly
Explosion risk	Levels of suspended dust in silos	Monthly	Quarterly
Emergency training	Number of training sessions conducted and worker participation	Semiannual	Annual
Alert and response system	Alarm and firefighting system tests fire	Quarterly	Quarterly
Evacuation plan	Evacuation drills conducted	Semiannual	Annual
First aid	Verification of emergency kit availability	Monthly	Quarterly

11.10.4 Methods

- Preparation of an emergency response plan, detailing actions for each type of incident;
- Periodic training and simulations for workers and emergency response teams;
- Regular safety inspections to ensure that firefighting equipment, emergency exits, and ventilation systems are operational;
- Monitoring of air quality and airborne dust to reduce explosion risks;
- Continuous review of the plan to incorporate improvements based on audits and simulations;

- Coordination with local authorities and emergency services, ensuring a prompt response in case of need.

11.10.5 Responsibility

Carrinho, SA: Responsible for implementing and financing the plan.

Safety and Environment Team: Coordinates training, simulations, and maintenance of emergency equipment.

Local Emergency Services (Fire Department, Police, Health): Support incident planning and response.

Environmental and Safety Regulatory Agencies: Oversee implementation of the plan and compliance with current legislation.

Workers and Community: Must be aware of the plan's guidelines and participate in training and simulations.

11.11 PEST CONTROL AND EXTERMINATION PLAN

11.11.1 Objectives

- Establish preventive and corrective measures to minimize pest infestation in grain storage silos.
- Ensure the quality and safety of stored products, preventing economic losses and risks to public health.
- Comply with health and environmental standards applicable to grain storage.

11.11.2 Justification

The presence of pests, such as insects, rodents, and fungi, can compromise grain quality, causing losses due to contamination, deterioration, and disease transmission. Continuous monitoring

allows for early detection and the adoption of effective measures to prevent the proliferation of these pests.

11.11.3 Parameters to be analyzed and monitoring frequency

Table 61: Parameter to be analyzed and monitoring frequency

Parameters	Unit/indicator	Frequency	
		Construction phase	Operational phase
Pest identification	Insects, rodents, and fungi	Biweekly inspections	Biweekly inspections
Storage conditions	Humidity, temperature, and ventilation	-----	Continuous monitoring
Effectiveness of control measures	Application of biocides and traps	-----	Monthly assessment
Incident log	Occurrence of infestations and corrective actions	-----	Quarterly reports

11.11.4 Methods

- Regular visual inspections of silos and adjacent areas.
- Use of traps and baits to capture and monitor pests.
- Laboratory analysis of samples to identify fungi and insects.
- Application of preventive measures, such as humidity control and sealing off access points.
- Use of pesticides and integrated pest management, prioritizing less toxic alternatives.

11.11.5 Responsibilities

Contractor: will be responsible for implementing pest prevention measures on organic materials and waste that may attract infestations.

Carrinho, SA: responsible for implementing the plan during the operational phase, including hiring specialized pest control services and training workers in identification and proper handling.

Health and Environmental Authorities: Periodic inspection of compliance with standards and good storage practices.

11.12 MECHANISM FOR REPORTING AND MONITORING THE EIAS

11.12.1 Objectives

- Ensure the environmental and social compliance of the project as defined in the Environmental and Social Impact Assessment (ESIA);
- Ensure transparency and accountability to regulatory authorities and stakeholders;
- Monitor the effectiveness of mitigation measures implemented during the construction and operation phases;
- Identify possible deviations and propose corrective actions to minimize environmental and social impacts.

11.12.2 Justification

During the construction phase, it is essential to monitor the implementation of environmental and social measures to mitigate temporary impacts.

During the operation phase, reports will enable the continuous assessment of environmental and social impacts, ensuring the sustainability of the project.

Continuous monitoring and reporting are legal and regulatory requirements that must be complied with by Carrinho, SA.

11.12.3 Parameter to be analyzed and monitoring frequency

Table 62: Parameter to be analyzed and monitoring frequency

Parameters	Indicator	Frequency	
		Construction phase	Operation phase
Implementation of mitigation measures	% of measures implemented in accordance with the EIAS	Quarterly	Semiannual
Waste management	Volume and type of waste managed Correctly	Monthly	Quarterly
Water quality	Laboratory analysis results	Quarterly	Semiannual
Air quality	Atmospheric emission levels compared to legal standards	Quarterly	Semiannual
Noise levels	Comparison with limits established in legislation	Monthly	Quarterly
Stakeholder engagement	Number of meetings and consultations held	Quarterly	Semiannual
Worker safety and health	Number of incidents and accidents	Monthly	Quarterly

11.12.4 Method

- Field data collection, including environmental and social measurements;
- Laboratory analysis of effluents, atmospheric emissions, and air quality;
- Photographic and documentary records to demonstrate compliance;
- Documentary review of waste records, complaints, and community services;
- Preparation of periodic reports detailing monitoring results and recommendations;
- Presentation of reports to environmental authorities and regulatory agencies, as well as relevant stakeholders.

11.12.5 Responsibility

Carrinho, SA: Responsible for preparing and presenting reports.

Environmental and Social Management Team: Collects data, performs analyses, and structures reports.

Regulatory Bodies (Ministry of the Environment, Municipal Authority, Financiers, etc.):

Receive and analyze reports.

Third-party environmental monitoring companies: Support in performing laboratory analyses.

Community and Workers: Contribute relevant information through communication channels.

11.13 ENVIRONMENTAL AND SOCIAL PERFORMANCE AUDITS

11.13.1 Objectives

- Assess the project's compliance with the environmental and social requirements established in the Environmental and Social Impact Assessment (ESIA);
- Identify non-compliance and propose corrective and preventive measures;
- Verify the effectiveness of the mitigation measures and monitoring programs implemented;
- Ensure compliance with current environmental and social legislation, as well as applicable international standards;
- Continuously improve the environmental and social management of the project.

11.13.2 Justification

During the construction phase, it is essential to ensure that activities are aligned with best environmental and social practices, minimizing negative impacts.

During the operational phase, audits enable continuous assessment of environmental and social performance, ensuring the sustainability of the project.

Periodic audits are a legal requirement and a good practice to ensure transparency and credibility in project management.

11.13.3 Parameters to be Analyzed and Monitoring Frequency

Table 63: Parameter to be analyzed and monitoring frequency

Parameters	Indicator	Frequency	
		Construction phase	Operational phase
Legal and regulatory compliance	Percentage of compliance with environmental and social standards	Semiannual	Annual
Implementation of mitigation measures	Degree of execution of actions proposed in the EIAS	Quarterly	Semiannual
Waste management	Volume and type of waste managed correctly	Quarterly	Semi-annual
Water and effluent quality	Compliance of analyzed parameters with environmental standards environmental	Quarterly	Semiannual
Air quality and emissions	Atmospheric emission levels compared to legal standards	Quarterly	Semiannual
Noise levels	Comparison with limits established in legislation	Quarterly	Semiannual
Relationship with the community	Number of complaints and mitigation measures adopted	Half-yearly	Annual
Occupational health and safety	Number of accidents and compliance with safety standards	Quarterly	Semi-annual

11.13.4 Methods

- Field inspections to verify the implementation of environmental and social measures;
- Interviews with workers and stakeholders to assess perceptions and identify problems;
- Laboratory analyses of water quality, atmospheric emissions, and effluents;
- Document review of waste management, occupational safety, community outreach, and environmental monitoring records;
- Application of audit checklists based on legal and regulatory requirements;
- Preparation of audit reports containing conclusions, recommendations, and corrective action plans.

11.13.5 Responsibility

Cart, SA: Responsible for conducting audits and implementing corrective actions.

Environmental and Social Management Team: Coordinates audits and ensures that recommendations are implemented.

External Environmental Consultant: May be hired to conduct independent and impartial audits.

Regulatory Bodies (Ministry of the Environment, Municipal Authority, financiers, etc.):

Supervise and monitor reports and actions implemented.

Community and Workers: Can contribute information on observed environmental and social impacts.

11.14 COSTS OF IMPLEMENTING MONITORING PROGRAMS

The presentation of the costs associated with the implementation of the Monitoring Programs proposed in this environmental and social impact assessment (ESIA) is structured in two phases: Construction Phase and Operation Phase.

The financial costs related to the implementation of the monitoring programs during the construction phase will be borne by the contractor.

The costs of implementing the monitoring programs during the operational phase will be borne by Carrinho, SA.

Table 64: Program implementation costs

Programs	Cost estimate (annual)	
	Construction phase	Operational phase
Monitoring plan for effluents stored in septic tank	3,500 USD	8,200 USD
Worker health and safety plan	8,000 USD	10,000 USD
Program for monitoring emissions and air quality	12,000 USD	15,000 USD
Noise level monitoring program	4,500 USD	6,000 USD
Environmental education program	12,000 USD	18,000 USD
Biodiversity monitoring program	7,500 USD	9,000 USD
Emergency plan	8,000 USD	16,000 USD
Waste monitoring and management program	4,500 USD	8,000 USD
Pest control and eradication plan		12,000 USD
Communication and stakeholder relations program stakeholders	18,000 USD	22,000 USD
Mechanism for submission of reports and monitoring of the EIAS	10,000 USD	12,000 USD
Environmental and social performance audits		20,000 USD
Total	88,000 USD	156,200 USD

12 INSTITUTIONAL CAPACITIES AND STRENGTHENING PLAN FOR THE IMPLEMENTATION OF PGAs

This chapter presents the Institutional Capacity Strengthening Plan, designed as a strategic tool to support the implementation of the Agricultural Infrastructure Construction Project for Grain Storage (Silos), to be executed in the municipality of Caála, Huambo province, by the company Carrinho, S.A..

The relevance of this plan stems from the need to ensure that local, provincial, and national institutions, as well as the community actors directly involved, have the appropriate technical, administrative, and operational skills to guarantee the effectiveness, sustainability, and positive impact of the project. Institutional strengthening is therefore a cross-cutting theme of the Environmental and Social Management Plan (ESMP), contributing to good governance, compliance with environmental and agricultural legislation, and the creation of synergies between the different stakeholders.

In this context, the plan is geared towards:

- **Strengthen the technical and management capacities** of public and private entities linked to the agricultural and environmental sector;
- **Promoting institutional coordination** between the proposing company, supervisory bodies, local administrations, and beneficiary communities;
- **Ensuring knowledge transfer** through training, workshops, and continuous monitoring mechanisms;
- **Consolidate the operational sustainability of the silos**, ensuring that their use contributes to the socioeconomic development of the region and to national food security.

This chapter outlines the priority capacity-building actions, coordination mechanisms, and monitoring indicators that will enable not only the effective implementation of the

project, but also the creation of a lasting institutional legacy for the municipality of Caála and the province of Huambo.

12.1 Identification of institutions involved and responsibilities

The Angolan government, through its food security, economic diversification, and agricultural production promotion policies, has been encouraging investment in grain storage silo infrastructure as an essential measure to ensure strategic reserves, reduce post-harvest losses, and improve the competitiveness of the agricultural sector. Therefore, we can affirm that the investments to be made in this sector by the Carrinho, SA group are in line with the Angolan government's main objectives in this sector.

This framework is part of instruments such as the National Development Plan (PND), the National Food and Nutrition Security Plan, the Program to Support Production, Diversification of Exports, and Import Substitution (PRODESI), and provincial agriculture and logistics strategies.

Among the strategic operational objectives for grain storage, the following stand out:

- 1. Ensuring food security and reducing post-harvest losses:**
 - Increase storage capacity in areas of high agricultural production.
 - Reduce crop losses caused by a lack of adequate infrastructure.
 - Ensuring the quality and preservation of grains over long periods.
- 2. Strengthen the resilience of the agricultural sector to climate change and production crises:**
 - Build strategic reserves for periods of scarcity (drought, floods, pests).
 - Integrate silos into climate change adaptation and mitigation policies.
 - Ensure stability in domestic supply and support exports in times of surplus.
- 3. Improve the efficiency of agricultural value chains:**
 - Coordinate grain production, transport, storage, and marketing.
 - Integrate silos into logistics platforms that support local, national, and international markets.

- Foster public-private partnerships public-private to the financing and management infrastructure.
4. **Promote the environmental sustainability of silo operations:**
 - Implement good pest control practices without negative environmental impact.
 - Use energy-efficient technologies and, where possible, renewable energy.
 - Ensure proper management of waste and effluents resulting from operations.
 5. **Encourage innovation, research, and agricultural information:**
 - Create digital systems for monitoring agricultural stocks.
 - Support research into grain drying, ventilation, and preservation technologies.
 - Maintain records and inventories up to date on the storage .
 6. **Strengthen governance and institutional effectiveness in the agricultural sector:**
 - Clarify the responsibilities of state entities, cooperatives, and private operators.
 - Define management models that ensure the financial sustainability of silos.
 - Promote mechanisms for price regulation and balance between supply and demand.
 7. **Ensure the participation of local producers and communities:**
 - Involve farmers' associations and cooperatives in the management and use of silos.
 - Promote technical training programs for post-harvest management.
 - Improve coordination between central, provincial, and municipal levels to ensure territorial effectiveness.

The institutional framework below shows the main entities involved in policy-making, regulation, monitoring, and execution of activities related to the construction and operation of grain storage silos in Huambo province. The framework is organized by level: national, provincial, and local, highlighting roles and responsibilities.

Table 65: Main entities involved at the national level

Entity	Responsibilities
Ministry of Agriculture and Forestry (MINAGRIF)	National agricultural policy, post-harvest programs, and food security; oversees the extension system extension system and the IDA.
Institute for Agricultural Development (IDA)	Rural development and extension, technical support for storage, and training for producers.
Ministry of the Environment (MINAMB)	Environmental regulations and licensing (EIA/PGAS); coordination of INGA.
Ministry of Economy and Planning (PRODESI)	Programs and financing lines for agro-industry and storage.
INIQ – National Institute for Quality Infrastructure	Standardization, metrology, and conformity assessment of silos and equipment.
National logistics infrastructure (Port/CFB/Lobito Corridor)	Grain transport and reception; port-railway-road integration.

Table 66: Main institutions involved at the provincial level

Entity	Responsibilities
Huambo Provincial Government	Policy coordination and intersectoral articulation.
Provincial Office of Agriculture, Livestock, and Fisheries	Sectoral planning and support for storage projects
Provincial Environment Office	Monitoring of environmental licenses and supervision of the PGAS.
Angolan National Roads Institute (INEA)	Management, maintenance, and conservation of national roads
Benguela Railway – E.P. (CFB)	Railway operation for grain flows and connection to the Lobito Corridor.

Table 67: Main institutions involved at the local level

Entity	Responsibilities
Municipal administrations	Land use planning, construction licensing, and public participation.
Local authorities and communities.	Oversee and collaborate in the implementation of silo projects, ensuring transparency, social inclusion, and the resolution of any conflicts of interest.
Civil society organizations.	Promote citizen participation, defend the interests of affected communities, and collaborate in the independent monitoring of silo project implementation.
Municipal commissions for monitoring and supervising projects	Monitor the local execution of silo projects, ensuring compliance with technical, environmental, and social standards, as well as coordination between the promoter, authorities, and communities.
EDAs / Agricultural Extension (IDA)	Direct technical assistance to producers (post-harvest, pests, loss management).
Private operators/Cooperatives	Investment, silo operation, and compliance with quality, safety, and environmental standards.

12.2 Assessment of the institutional capacity of the body responsible for implementing the project.

Technical training is a strategic element for the sustainability of the grain silo construction and operation project, ensuring that the human resources involved have the necessary skills to effectively manage agricultural infrastructure. Continuous training and strengthening local capacities are crucial to ensuring operational efficiency, the quality of stored products, and compliance with environmental, safety, and public health standards.

In this context, grain silo management requires a multidisciplinary team of specialized technicians, notably:

Table 68: Human resources assigned to the cart group

Training area	Total	Academic level	Experience
Civil engineers	2	Engineer	Yes
Mechanical	4	Engineer	Yes
Electricians	4	Engineer	Yes
Agricultural engineers	6	Technician	No
Environmental and Safety Technicians	3	Technical	Yes
Logistics and Operations Technicians	8	Technical	No
Food Quality Technicians	2	Technician	Yes
Financial and Administrative Managers	17	Higher	Yes
Operators	40	Technical	No
General Services	24	Basic	No

- **Civil and Mechanical Engineers** – responsible for the construction and maintenance of structures and ventilation, drying, and internal transportation systems;
- **Agricultural Engineers** – specialists in post-harvest, quality, and grain conservation;
- **Environmental and Safety Technicians** – focused on compliance with the Environmental and Social Management Plan (ESMP), occupational risk prevention, and emergency management;
- **Logistics and Operations Technicians** – dedicated to the efficient reception, dispatch, and handling of grains;
- **Food Quality Technicians** – responsible for product inspection, fumigation, and certification;
- **Financial and Administrative Managers** – responsible for economic viability, cost control, and contract management, etc.

Strengthening these technical skills, combined with training programs and knowledge transfer, is essential to ensure that the project achieves its objectives in an efficient, safe, and sustainable manner.

12.3 Technical Capacity Building Plan

This technical capacity building plan aims to ensure that the promoter and partner institutions have the knowledge, tools, and skills necessary to ensure effective management, sustainability, and maximization of the socioeconomic and environmental benefits of the silo implementation project. Capacity building involves technical, operational, financial, and governance training, to be implemented at different stages of the project cycle.

Table 69: Training and capacity building plan

Training Area	Target Audience	Main Content	Frequency	Supporting Entity
Infrastructure Management and Maintenance	Civil and mechanical engineers, maintenance technicians	Operation of ventilation, drying, and transportation systems; preventive, and corrective maintenance corrective	Semiannual	Proponent + Professional Technical Institutes
Post-Harvest and Grain Quality	Agricultural engineers, technicians of quality food	Food quality of preservation, fumigation, classification and certification of grains	Quarterly	IDA / INAQ
Environmental Management and Safety	Environmental responsible for safety and health	Implementation of the PGAS, risk prevention, emergency response	Annual	MINAMB / Environment Office Environment
Logistics and Operations	Technical of logistics, warehouse operators	Management of incoming/outgoing of products, traceability, logistics contracts	Quarterly	Port of Lobito / CFB / Logistics Companies
Financial and Administrative Management	Financial and administrative managers	Economic Planning Economic financial planning, cost analysis, budget control	Annual	Commercial Banking / PRODESI
Governance and Community Participation Community	Local community representatives, NGOs	Transparency in management, community dialogue, resolution of conflict	Annual	Municipal administrations / NGOs

12.3.1 Training plan within the scope of the PGAS

The training plan is an essential tool to ensure that everyone involved in the implementation and operation of the agricultural silo construction and management project is properly trained. The objective is to ensure compliance with the Environmental and Social Management Plan (ESMP), promote good environmental practices, strengthen occupational safety, and increase technical and operational efficiency. This training program will be targeted at different audiences, with appropriate frequency and support from competent institutions, in order to ensure the sustainability of the project.

Table 70: Training plan

Type of Training	Main Content	Target Audience	Frequency	Supporting Entities
Environmental and PGAS	Impact mitigation, waste management, monitoring, good practices	Environmental technicians, construction workers, silo operators	Initial + Annual recycling	MINAMB, Provincial Environment Office, Proponent
Occupational Health and Safety	PPE, firefighting, first aid, evacuation	All workers, HSE team	Initial + Annual refresher + Quarterly simulations quarterly	INSS, Fire Department, HSE
Silo Operation and Maintenance	Ventilation, drying, and transportation systems transport, preventive maintenance	Mechanical engineers, operators of silos, maintenance technicians	Initial + Refresher semester	Equipment manufacturers, IDA
Post-harvest management and quality	Grain classification, pest control, conservation and certification	Eng. agronomists, quality technicians, operators	Initial + Annual refresher training	INAQ, IDA
Community and social management	Communication, management of complaints, conflict resolution	Community community representatives, NGOs, social managers	Annual workshops	Municipal administrations, NGOs
Logistics and Warehouse Management	Traceability, entry/exit of products, logistics contracts	Logistics technicians, warehouse managers	Initial + Annual retraining	Port of Lobito, CFB, logistics operators
Governance and Ethics	Transparency, accountability, legal compliance	Managers of project, administrative managers	Initial + Annual refresher	MINFIN, PRODESI, NGOs

13 PUBLIC CONSULTATION AND PARTICIPATION

13.1 GENERAL CONSIDERATIONS

Public consultation is a mandatory step in the Environmental Impact Assessment process, as established by the Basic Environment Law (Law No. 5/98, of June 19), Presidential Decree No. 117/20, of April 22, and Executive Decree No. 87/12, of February 24, which regulate public participation in environmental matters. This procedure aims to ensure transparency, inclusion, and participation of communities, local authorities, and other stakeholders in the analysis of projects with potential environmental and social impact.

13.2 PURPOSE OF PUBLIC CONSULTATIONS

In the context of this project for the Construction of Agricultural Infrastructure "Silos," the public consultations have the following objectives:

- Inform local communities, administrative authorities, and other stakeholders about the objectives, nature, location, and potential impacts of the project;
- Gather opinions, concerns, suggestions, and local knowledge that can contribute to the improvement of mitigation measures and the design of the project itself;
- Promote dialogue and inclusive involvement of all relevant actors in order to strengthen social acceptance of the project and prevent future conflicts.
- Compliance with operational safeguard 1 of the bank financing the projects, etc.

13.3 LEGAL FRAMEWORK

Public consultations in the Environmental Impact Assessment (EIA) process are legally supported by Angolan law and are a mandatory and essential step to ensure the democratic and informed participation of communities and other stakeholders in the assessment of projects with potential environmental impact.

The main legal instrument governing this matter is Presidential Decree No. 117/20 of April 22, Regulation on the Environmental Impact Assessment Procedure

This decree establishes the principles, phases, and requirements of the EIA procedure and clearly defines the role of public consultations as a mechanism for participation and social inclusion. The following relevant points are noteworthy in this regard:

- **Article 20 (Public Participation):**

It establishes that the EIA process must ensure effective public participation, particularly by communities directly affected by the project, through appropriate consultation and communication mechanisms.

- **Article 21 (Public Consultation):**

Defines that public consultation must be carried out during the preparation of the Environmental Impact Study and/or during the technical analysis by the licensing authority. Responsibility for its organization and implementation lies with the project proponent, in coordination with the competent environmental authority.

- **Article 22 (Documentation and Dissemination of Public Consultation):**

Requires the proponent to prepare a **Non-Technical Summary of the EIA**, in clear and accessible language, to be made available to the public. The consultation must be widely publicized **at least 15 days in advance**, using effective means such as local radio stations, public notices, community networks, among others.

- **Article 23 (Public Consultation Report):**

Requires the preparation of a report containing the main comments, questions, and suggestions gathered during the process, as well as the responses given and any changes to the project or study based on the contributions received. This report must be included in the assessment process and submitted to the Ministry of the Environment.

In addition to Decree No. 117/20, the **Basic Environment Law** (Law No. 5/98 of June 19), in its Article 10, also enshrines the principle of **public participation** as a right of citizens

and a duty of the State, guaranteeing access to information and the involvement of citizens in the protection and management of the environment.

13.4 METHODOLOGY

The methodology adopted for conducting public consultations within the scope of this Environmental Impact Assessment (EIA) aims to ensure inclusion, transparency, access to information, and effective participation of stakeholders, as established in **Article 21** of Presidential Decree No. 117/20 of April 22.

1. Identification of Stakeholders

The process begins with the identification and mapping of stakeholders, including:

- Local communities potentially affected;
- Traditional and administrative authorities (communal and municipal administrations);
- Civil society organizations (agricultural, environmental associations, etc.);
- Representatives of vulnerable groups (women, youth, the elderly);
- Relevant technical entities and government institutions.

2. Preparation and Dissemination of Information

A non-technical summary of the EIA was prepared in clear and accessible language. It was disseminated through:

- Announcements on community radio stations and social media accounts of the respective administrations;
- Communication with local authorities and community leaders;
- Delivery of physical copies of the summary to easily accessible locations (municipal administration)

3. Holding of Public Consultation Sessions

The sessions will be held in person in the communities covered by the project's area of influence, with the following structure:

- Presentation of the project and its objectives;
- Presentation of the main environmental and social impacts identified;
- Discussion of the proposed mitigation measures;
- Opportunity for questions, comments, and recommendations from participants.

During the sessions, representatives of the proponent and the team will be present.

EIA technique, local authorities and, where applicable, representatives of the Ministry of the Environment or delegated body.

4. Recording and Processing of Contributions

All contributions from participants will be recorded in writing or on audio/video, with the appropriate consent.

A Public Consultation Report will be prepared, containing:

- List of participants and entities represented;
- Summary of issues raised;
- Responses provided by technical experts;
- Analysis of the integration of suggestions into the final version of the EIA.

5. Submission of the Report to the Competent Authorities

The public consultation report will be submitted together with the complete Environmental Impact Assessment to **the Ministry of the Environment** as part of the licensing process, in compliance with national legislation.

13.5 SUMMARY OF EVENTS HELD

13.5.1 Presentation of the Project to Administrative Entities

As part of the consultation process with the various stakeholders in the Agricultural Infrastructure Construction Project "Silos" in Huambo province, on June 16, 2025, the various local government entities associated with the municipalities where the projects will be implemented (Huambo, Caála, and Bailundo) were consulted, each with specific interests, in accordance with the AfDB requirements set out in Operational Safeguard 1.

Among the local government institutions, the following were present:

- Director of the Provincial Office for the Environment, Waste Management, and Community Services, representing His Excellency the Vice-Governor P.S.P.S.E;
- Director of the Provincial Office for Agriculture, Livestock, and Fisheries;
- Director of the Provincial Office for Economic Development;
- Advisor to His Excellency the Governor for Economic and Financial Affairs;
- Advisor for Economic Affairs to His Excellency V.G.P.S.P.S.E.;
- Deputy Municipal Administrator for Infrastructure and Technical Services for the Municipality of Bailundo;
- Deputy Municipal Administrator for Infrastructure and Technical Services for the Municipality of Caála;
- Municipal Director of Agriculture, Livestock, and Fisheries representing the Municipal Administrator of Huambo

The provincial environment department is a stakeholder in the project, acting as a supervisory body that will monitor the project's development, especially during the construction and operation phases.

The administrators, as the entity responsible for municipal administration and therefore representing the population of Huambo, Caála, and Bailundo, will be interested in learning about and monitoring the development of the construction and operation of agricultural infrastructure.

However, to facilitate the discussions, the proposed topics were presented concisely, adding the importance of sharing environmental and social safeguard documents related to the potential risks and impacts of the project.

Considering the interest of the participants, some concerns and contributions arose, which are summarized below:

Observation (1): Director of the Provincial Office for the Environment, Waste Management, and Community Services

- 1) Make official the request for space for the implementation of infrastructure (silos), for the engagement of municipal administrations, for comfort in light of the PDMs, preserving existing water lines and bimbos;
- 2) Add to the service teams for environmental studies that the Provincial Government should participate in them, through the Provincial Office for the Environment, Waste Management, and Community Services and the municipal administrations of the municipalities benefiting from the infrastructure;
- 3) Willingness to engage in ongoing dialogue and provide the necessary institutional support, with a view to implementing the projects and the subsequent positive externalities for the communities in the context of promoting agricultural activity at the provincial level.

Suggestions (2): Director of the Provincial Office of Agriculture, Livestock, and Fisheries

- 1) That a well-defined schedule of activities be shared, directing the tasks that require some engagement from the bodies supervised by the Provincial Government, in order to speed up the process;

Suggestion (3): Director of the Provincial Office for Economic and Integrated Development

- 2) Greater attention should be paid to the municipalities of Caála and Bailundo, due to their local production capacity, considering the cereal triangle and the level of production and their proximity to the different provinces in the center-south of the country;
- 3) Incorporation of a complaints mechanism into the project to maintain ongoing dialogue with communities

Suggestion (4): Advisor for the Economic and Financial Area of H.E. GPHBO

- 1) Expand the target audience or users of the infrastructure in order to meet the demand for services from different producers;
- 2) Constant sharing of statistical data with related services of the Provincial Government of Huambo.

Once the discussions had been concluded and the issues raised clarified, the Carrinho, SA Group Team (i) reaffirmed its willingness to continue dialogue with the Provincial Government and the Municipal Administrations concerned; (ii) shared the presentation and other supporting documents; and (iii) noted the need to work with the Huambo Provincial Government in a timely manner on the action plan within the framework of its social responsibility;

13.5.2 Record of Dialogue and Complaints (public consultation)

Following the presentation of the project on June 16, 2025, to the municipal administration of Huambo, including all representatives of the administrations where the projects will be implemented, each representative committed to sharing the information with the local community.

Accordingly, on October 9, 2025, at the municipal headquarters in Caála, a meeting was held with members of the community consultation council to present the Carrinho group's Agricultural Infrastructure project, which aims to build silos to increase the storage and packaging capacity for cereals in this municipality. The meeting was chaired by Her Excellency **Felismina Ussombo Marcolino**, Deputy Municipal Administrator for Political, Social, and Community Affairs, accompanied by **Dr. Venâncio Jorge Janeiro Lopes**, Director of Tourism and Culture.

When given the floor, members of the community and traditional authorities expressed their support for the implementation of the project, highlighting the job creation for young people in the municipality and thanking the company for its initiative. However, they requested that the project be expanded to also benefit more remote locations.

In turn, the Municipal Director of Tourism and Culture, **Dr. Venâncio Jorge Janeiro Lopes**, took the floor, welcoming the company's initiative and calling for greater attention to local content when implementing and operating the project.

With nothing further to consider, Her Excellency the Deputy Municipal Administrator for Political and Social Affairs delivered the closing speech of the meeting, which ended in a spirit of satisfaction and agreement among those present.

A total of **69** (sixty-nine) individuals were present, of whom **63** (sixty-three) were male and **6** (six) were female.

Note 1: The public consultation sessions will continue to be comprehensive and inclusive in all phases and areas where the projects will be implemented. The results of the public consultations will be sent in reports to the parties interested in the approval of the aforementioned projects, as well as updating this section in the EIS.

Note: For proof of the activity described, see Annexes V, VI, and VII.

14 TECHNICAL GAPS

In general, the difficulties encountered during the preparation of this study are related to the lack of detailed information on some environmental descriptors (fauna, flora, and socio-economics), which are fundamental for determining the environmental and social impacts of the project's implementation.

Another factor is that, on many occasions during the preparation and construction phase, deviations from the original project occur that cannot be taken into account during the preparation of the Environmental and Social Impact Study. All these reasons contribute to the estimation of the degree of uncertainty, the magnitude of which is frankly difficult to assess.

Despite the difficulties mentioned above, this Environmental and Social Impact Study of the Caála grain terminal was prepared with rigor and objectivity in assessing the potential impacts resulting from its construction and operation, as well as the potential environmental and social factors to be affected, and mitigation measures were defined to avoid and mitigate adverse impacts and enhance positive impacts.

15 CONCLUSIONS AND RECOMMENDATIONS

The construction and operation of silos are fundamental to the efficient storage of grains and other bulk materials, playing an essential role in the agricultural production chain. Well-designed and constructed silos ensure the preservation of product quality, minimizing losses and ensuring food safety. In addition, the efficient operation of these silos, which involves the implementation of advanced technologies and appropriate management practices, is crucial for optimizing product flow and reducing costs.

The challenges faced, such as the need for maintenance and initial investments, can be overcome with strategic planning and innovation. Thus, the construction and operation of silos not only meet the growing demand for storage but also contribute to the sustainability of the agricultural sector by promoting a more responsible use of resources. Therefore, it is clear that the effective construction and operation of silos are indispensable pillars for the modernization and security of food supply chains.

In terms of the environment, this environmental and social impact study focused mainly on analyzing the descriptors that may be affected by the actions resulting from the construction, operation, and decommissioning phases, either directly or indirectly, and mitigating and compensatory measures were taken to minimize or enhance the impacts.

During the construction phase, most of the impacts are considered to be negative and insignificant, with the most notable being those resulting from the installation and use of the construction site, vehicle traffic, building construction, and equipment assembly, etc. Positive direct and indirect impacts are also expected, resulting from job creation and the revitalization of associated sectors of activity.

During the terminal's operational phase, the negative impacts identified will also be insignificant and will relate to soil sealing and its allocation, visual impact due to the presence of the grain terminal in contrast to the surrounding area, degradation of air quality due to greenhouse gas emissions, alteration of the natural landscape, and pressure on the electricity supply network and accessibility, etc.

Significant positive impacts are also expected in terms of socio-economics, job creation, the provision of various types of services, and the revitalization of associated sectors.

During the decommissioning phase, although insignificant negative impacts similar to those that will occur during the construction phase have been identified, the positive impacts in this phase outweigh them. This is because once the terminal is decommissioned, the impact or pollution in the different descriptors analyzed is reduced and the probability of the environment returning to its undisturbed state increases.

According to the analyses carried out during this Environmental and Social Impact Study, the project is adequate in terms of environmental quality. The aspects identified as most vulnerable can be mitigated, requiring environmental control measures to be included in the executive project and correctly implemented.

It is recommended that those responsible for implementing the measures mentioned in this study apply them with the utmost rigor.

In short, the construction of this grain terminal is not only a practical solution, but an essential basis for food security and economic development in rural communities and beyond. Investing in grain storage infrastructure is investing in the future of agriculture.

Based on the study presented, no impact was identified that, in the opinion of the team that prepared this EIAS, questions the environmental feasibility of the project under normal operating conditions, considering the implementation of the proposed mitigation measures. The positive impacts remain throughout the entire period of operation of the project.

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17 APPENDICES

- I. Business License;
- II. Publication in the Official Gazette;
- III. Location sketch;
- IV. Consulting Company Certificate Issued by the Ministry of the Environment.
- V. Minutes of the Public Consultation meeting
- VI. Public Consultation Attendance List
- VII. Record of Dialogue and Complaints (Public Consultation)

ANNEX IV-CONSULTANCY CERTIFICATE

 REPÚBLICA DE ANGOLA GABINETE JURÍDICO E INTERCÂMBIO CERTIFICADO DE CONSULTORIA AMBIENTAL N.º 14110503250	
<p>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 HSG - CONSTRUCAO, ENG. E COMERCIO ,LDA, nos termos do Decreto Executivo nº 86/12, de 23 de Fevereiro de 2012, que aprova o Regulamento sobre o Registo Técnico de Sociedade de Consultoria Ambiental.</p>	
Emitida em, 29 de Abril de 2025	Válida até, 29 de Abril de 2026
<p>Assinatura</p> MIRANDA GOMBIDO KIALA (DIRECTOR DO GABINETE JURÍDICO E INTERCÂMBIO)	
<p>A autenticidade deste documento poderá ser verificada através dos passos a seguir:</p> <ol style="list-style-type: none">1. Aceda ao Portal MINAMB (https://sia.minamb.gov.ao/validacaodocumentos)2. Introduza o código RCONST-OTI2NTYxNTg= no campo "Código de Validação"3. Clique em "Pesquisar" <p>Número do Certificado: 14110503250</p>	

ANNEX V-MEETING MINUTES

	<p>ACTA DE REUNIÃO CONSULTA PÚBLICA: PROJECTO DE INFRA-ESTRUTURAS AGRÍCOLAS</p>	 <p>GOVERNO DE ANGOLA huambo.gov.ao Governo Provincial de Huambo</p> 
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REUNIÃO DE CONSULTA PÚBLICA PARA APRESENTAÇÃO DO PROJECTO E INSTRUMENTOS AMBIENTAIS E SOCIAIS			
Província: Huambo	Municípios: Huambo, Bailundo e Caála		
1. OBJECTIVOS			
<ul style="list-style-type: none"> o Dar a conhecer o Projecto e as suas actividades associadas; o Recolher contribuições (feedback) e as eventuais sugestões, bem como eventuais preocupações sobre o projecto. 			
2. INFORMAÇÕES/TEMAS APRESENTADOS NA CONSULTA PUBLICA			
<ul style="list-style-type: none"> ▪ Apresentação dos instrumentos Ambientais e Sociais relevantes no Projecto; ▪ Componentes e respectivos objectivos do Projecto; ▪ Riscos e Impactos, Ambientais e Sociais referentes ao Projecto; ▪ Expectativas e Preocupações relativas a Projecto. 			
Local da Reunião:	Governo Provincial Do Huambo	Huambo	
Data: 16/06/2025	Hora Início: 15h:00	Hora Termina: 16h:40min	
3. SOBRE OS PARTICIPANTES			
<p>Entidades/Orgãos Consultadas</p> <ul style="list-style-type: none"> ▪ <i>Director do Gabinete Provincial do Ambiente, Gestão de Resíduos e Serviços Comunitários, em Representação de S.E Vice-Governador P.S.P.S.E – Dr. João Calão Figueiredo, que orientou o referido encontro, em presença do Director do Gabinete Provincial da Agricultura, Pecuária e Pescas - Dr. João Lara Macuva Hotalala, Director do Gabinete Provincial para o</i> 	<p>Nº de participantes desagregados por sexo: 7 (Homens 6 e 1 Mulheres)</p>	Dono do Projecto – Carrinho, SA	
		Nome	Função
		Rui Carrinho	Vice-CEO
		Samuel Candundo	Executive Board (ESG Committee Member)
		Lissandro Filipe	Administrative Director (ESG Committee Member)
Maria Filomena Silva Melo	Director of Quality and Corporate Affairs (ESG Committee Member)		
Euclides Calenga	Environmental, Social, Manager		

A selecção dos Municípios teve em conta as bases do Grupo Carrinho ao longo do Corredor do Lobito (linha ferroviária), com beneficiários de forma geral nas comunidades sedeadas na vizinhança do local de implementação.

No entanto, para facilitar os debates, foram apresentados, concisamente, as abordagens dos temas propostos, adicionado da importância da partilha dos documentos de salvaguardas ambientais e sociais, relacionados com os potenciais riscos e impactos do projecto.

Considerando o interesse dos participantes, surgiram algumas preocupações e contribuições das quais, de forma resumida, se apresentam a seguir:

Os **Órgãos da Administração** destacaram os seguintes elementos:

- **Observação (1):** *Director do Gabinete Provincial do Ambiente, Gestão de Resíduos e Serviços Comunitários*
 1. Oficializar a solicitação dos espaços para a implantação das infraestruturas (silos), para o engajamento das Administrações Municipais, para o conforto devido a luz dos PDM'S, conservando as linhas de águas e dos bimbos existentes.
 2. Que se adicione nas equipas de serviços para os estudos ambientais, que o Governo Provincial deve participar dos mesmos, por via, do Gabinete Provincial do Ambiente, Gestão de Resíduos e Serviços Comunitários e as Administrações Municipais dos Municípios beneficiários das infra-estruturas.
 3. Disponibilidade para o diálogo permanente e o apoio institucional requerido, visando a implementação dos projectos e as subsequentes externalidades positivas para as comunidades no quadro do fomento da actividade agrícola a nível da Província.
- **Sugestões (2):** *Director do Gabinete Provincial da Agricultura, Pecuária e Pescas*
 1. Que seja partilhado o cronograma de actividades, bem definido, direccionando com as tarefas que necessitam de algum engajamento dos Órgãos Tutelados pelo Governo Provincial, no sentido de tornar o processo mais célere;
- **Sugestão (3):** *Director do Gabinete Provincial para o Desenvolvimento Económico e Integrado*
 1. Que se devesse ter maior atenção ao Municípios da Caála e do Bailundo, em razão da capacidade de produção local, olhando pelo triângulo dos cereais e pelo nível de produção e a sua proximidade com as diferentes províncias do Centro – Sul do País;
 2. Incorporação no projecto de um Mecanismo de Reclamações, para a manutenção do diálogo permanente com as comunidades
- **Sugestão (4):** *Assessor para a Área Económica e Financeira de S.E GPHBO*

	<p>Environmental and Social Impact Study of the Caála-Huambo Grain Terminal "Silos"</p> <p>Technical Report</p>	 <p>HSG Lda Construção, Engenharia e Comércio</p>
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	<p>ACTA DE REUNIÃO</p> <p>CONSULTA PÚBLICA: PROJECTO DE INFRA-ESTRUTURAS AGRÍCOLAS</p>	 <p>GOVERNO DE ANGOLA huambo.gov.ao Governo Provincial do Huambo</p> 
<ol style="list-style-type: none"> 1. Alargar o público-alvo ou utentes das infra-estruturas, de modo a atender a procura pelos serviços dos distintos produtores; 2. Partilha constante de dados estatísticos com os serviços afins do Governo Provincial do Huambo. 		
<p>5. ENCONTROS DE CONSULTAS PÚBLICAS COM REPRESENTANTES DO GOVERNO DA HUAMBO: REGISTO FOTOGRÁFICO (SE AUTORIZADO)</p>		
<p>Em anexo.</p>		
<p>6. EQUADRAMENTO LEGAL DO PROJECTO: LEGISLAÇÃO ANGOLANA RELEVANTE NESTA CONSULTA PÚBLICA</p>		
<ul style="list-style-type: none"> o Decreto Presidencial nº 200/22 de 23 de Julho de 2022 – O Plano Nacional de Fomento para a Produção de Grãos (PLANAGRÃO). o Decreto Presidencial nº 117/20 de 22 de Abril de 2020 – Regulamento Geral de Avaliação de Impacte Ambiental e do Procedimento de Licenciamento Ambiental. o Decreto Executivo n.º 87/12 de 24 de Fevereiro de 2012 – Regulamento de Consultas Públicas dos Projectos Sujeitos à Avaliação de Impacte Ambiental. 		
<p>7. DOCUMENTO PARTILHADOS PELO DONO DA OBRA COM AS PARTES INTERESSADAS NA CONSULTA PÚBLICA</p>		
<ol style="list-style-type: none"> 1) Apresentação do Projecto Carrinho “<i>Infra-Estruturas Agrícolas</i>”. 2) Políticas Grupo Carrinho – ESMS. 3) Standards (Procedimentos) “Chave” Grupo Carrinho – ESMS (Consulta Pública). 4) Resumo dos Relatórios Não Técnicos dos Estudos de Impacto Ambiental e Social (Subprojectos: Infraestruturas Agrícolas – Silos de Grão), referentes aos Municípios: Huambo, Bailundo e Caála 5) Consulta Pública – Registo de Diálogo e Reclamação. 		
<p>8. CONSIDERAÇÕES FINAIS</p>		
<ol style="list-style-type: none"> 1) Esgotadas as discussões e clarificadas as questões colocadas, a Equipa do Grupo Carrinho, SA (i) reafirmou a sua disponibilidade de continuar a dialogar com o Governo Provincial e as Administrações Municipais abrangidas; (ii) partilha da apresentação e demais documentos de base e (iii) anotação sobre a necessidade de oportunamente trabalhar com o Governo da Província do Huambo, no caderno de ações no quadro da sua responsabilidade social; 		

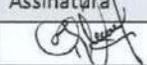
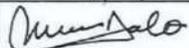
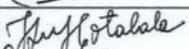
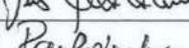
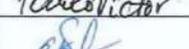


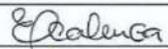
ACTA DE REUNIÃO
CONSULTA PÚBLICA: PROJECTO DE INFRA-ESTRUTURAS AGRÍCOLAS



- 2) Disponibilidade de cooperar com as instituições de ensino técnico-profissional e articular com o Governo da Província no estudo e desenvolvimentos de boas práticas agrícolas, conducentes a transformação da base agrícola familiar.

9. ASSINATURAS DOS PARTICIPANTES

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Rui Carrinho	Vice-CEO	923 787 280	rui.carrinho@carrinho-sa.com	

Lissandro Filipe	Administrative Director (ESG Committee Member)	936 696 909	lissandro.filipe@carrinho-sa.com	
Maria Filomena Silva Melo	Director of Quality and Corporate Affairs (ESG Committee Member)	946 651 181	filomena.melo@carrinho-sa.com	
Euclides Calenga	Environmental, Social, Manager	923 454 635	euclideskid1@hotmail.com	
Alede da Cunha	Compliance – Legal Affairs Environmental and Social Requirements Specialist (Agriculture)	923 506 499	alede.dacunha@carrinho-sa.com	
Dilva Manuel	Environmental, Social, Manager	924 574 949	dilva.manuel@carrinho-sa.com	

ANEXO: ENCONTRO DE CONSULTA PÚBLICA COM REPRESENTANTES DO GOVERNO DA HUAMBO: REGISTO FOTOGRÁFICO



ANEXO: ENCONTRO DE CONSULTA PÚBLICA COM REPRESENTANTES DO GOVERNO DA HUAMBO: REGISTO FOTOGRÁFICO





ACTA DE REUNIÃO
CONSULTA PÚBLICA: PROJECTO DE INFRA-ESTRUTURAS AGRÍCOLAS

ANEXO: ENCONTRO DE CONSULTA PÚBLICA COM REPRESENTANTES DO GOVERNO DA HUAMBO: REGISTO FOTOGRÁFICO



ANEXO: ENCONTRO DE CONSULTA PÚBLICA COM REPRESENTANTES DO GOVERNO DA HUAMBO: REGISTO FOTOGRÁFICO



Projecto Estratégico - Infraestruturas Agrícolas

Governo Provincial - Huambo

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ACTA DE REUNIÃO
CONSULTA PÚBLICA: PROJECTO DE INFRA-ESTRUTURAS AGRÍCOLAS

ANEXO: ENCONTRO DE CONSULTA PÚBLICA COM REPRESENTANTES DO GOVERNO DA HUAMBO: REGISTO FOTOGRÁFICO



ANNEX VI-ATTENDANCE LIST

RESERVADO



REPÚBLICA DE ANGOLA

Governo da Província do Huambo
Secretaria-Geral

16/06/2025

Item	Nome Completo	Função	N.º Telefone	E-mail	Assinatura
01	Euclides Calunga	GESTOR AMB.	923454635		[Signature]
02	Alede Eduardo da Cunha	Depto. Jurídico-CARR	923506499	alede.dacunha@	[Signature]
03	Rui Filipe de Sá	Dir. Qualidade, Arg. Grp.	946631181	filipe.rui@	[Signature]
04	Guimarães Jansen Furtado Filho	Dir. Administrativa	936676707	luisjansen@	[Signature]
05	Rui Churinho	Vice - CEO	938676373		[Signature]
06	Samuel Canduando	Administrador ex.	927132013	samuel.canduando@	[Signature]
07	João Caluá Espinho	GPA GRSC	92361248	jcaluas@	[Signature]
08	Alberto Bela-Vista João	Adm. N. Adj. P/A.T.I.sc	923527494	avistar@	[Signature]
09	Abraão Vitor Alves de Sousa	Assessor AEF. SE/GRHBO	925557546	abraov@	[Signature]
10	Augusta Almeida José Domingos	Dir. N. Adj. Assistência-M-HBO	931844800	augustaalmeida@	[Signature]
11	Benjamin Espinosa	Adm. Adj. A.T.I.S. Cálculo	928501841	benjamin@	[Signature]
12	Gilberto P. M. Manuel	Gestor AMB	924574969		[Signature]
13	Paulo Victor da Costa	Assessor VGP/PSSE	924606357	victorcosta@	[Signature]
14	António Salgado Moisés Salgado	Director GPDEI	923677706	moises.salgado@	[Signature]
15	João Sara M. Apolulala	Director do GPAPP	922013334	joaosara@	[Signature]

ANNEX VII- DIALOGUE AND COMPLAINTS REGISTER (PUBLIC CONSULTATION)

	<p>REGISTO DE DIÁLOGO E RECLAMAÇÕES CONSULTA PÚBLICA</p>	 
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FORMULÁRIO PARA REGISTO DE DIÁLOGO E RECLAMAÇÕES

Identificação do Projecto/Actividade: <u>Projecto de Infra-estruturas Agrícolas</u>	
Nome: <u>Carrinho SA</u>	
Nº de Telefone: <u>926-539-878</u> Outro meio de contacto: _____ _____	Género: <input type="checkbox"/> M <input type="checkbox"/> F Idade: _____
Comunidade: <u>Caála</u>	Posto Administrativo: _____
Comuna: <u>Sede</u>	Província: <u>Huambo</u>
Data de Recepção: <u>9/10/2025</u>	Data de Recepção: <u>9/10/2025</u>

RESUMO DO CONTÉUDO

Aos nove dias do mês de Outubro de dois mil e vinte e cinco, pelas 9 horas, sob Presidência de Sua Excelência **Felismina Ussombo Marcolino**, Administradora Municipal Adjunta para área Política, Social e das Comunidades, ladeada do **Dr. Venâncio Jorge Janeiro Lopes**, Director do Turismo e Cultura, realizou-se um encontro com os membros do Conselho de Auscultação das Comunidades para a apresentação do Projecto de Infraestruturas Agrícolas do Grupo Carrinho, que visa a construção de silos e armazéns para aumentar a capacidade de acondicionamento e armazenamento de cereais no município.

Dada a palavra aos membros da Comunidade, as autoridades tradicionais manifestaram o seu apoio à implementação do Projecto, destacando a geração de empregos para os jovens do município e agradecendo a iniciativa da empresa. No entanto, solicitaram maior abrangência do Projecto, de modo a beneficiar também as localidades mais recônditas, tendo de igual modo apelado à redução dos preços praticados pela empresa na venda dos insumos agrícolas.

Por sua vez, tomou a palavra o Director Municipal do Turismo e Cultura, Dr. Venâncio Janeiro Jorge Lopes, que saudou a iniciativa da empresa e pediu maior atenção ao conteúdo local no momento da execução e operacionalização do Projecto.

Não havendo mais nada a considerar, Sua Excelência Administradora Municipal Adjunta para área Política, Social e das Comunidades, proferiu o discurso de encerramento do encontro que terminou num espírito de satisfação e concordância dos presentes, às 12h30.

Anexa-se a lista dos participantes,



REPÚBLICA DE ANGOLA
GOVERNO DA PROVÍNCIA DO HUAMBO
ADMINISTRAÇÃO DO MUNICÍPIO DA CAÁLA

LISTA DE PRESENÇA

ACTIVIDADE	ENCONTRO COM AS AUTORIDADES TRADICIONAIS/2025.
DATA	9/10/2025
INÍCIO	08H:00
LOCAL	CASA DE PASSAGEM

N/O	NOME	INSTITUIÇÃO/DIRECÇÃO	FUNÇÃO	CONTACTO
1.				
2.	Juarez Jorge Lopes	ADM.	D. M. Cultura	94000063
3.	José Kelungo	Soba	Chipadiva	948637016
4.	Flamisco Bango	Secalo	Basaco	933307034
5.	Cecília Jauca Tchivita	D. M. S	Assistente Social	933238661
6.	Arleino Banganga	D. M. S	Confermeiro	930361283
7.	Imácio Dumbo Brito	D. M. R.	chefe de secção	925844286
8.	Santa Francisca Gusse	D. M. Integração	chefe de secção	924235155
9.	Sofia Bassengo	Soba	Bansa	924928997
10.	Francisco Bambuta	Soba	Abandenda	928299342
11.	Martinho Samandjolo	Regedor	Muanganda	928783984
12.	Severino Maria Mlamamba	regedor	Nzumbé	938265360
12.	Januário Inacio	Secalo	balaiuta	937103781
13.				

14.	Gabriel Luanda	Seculo	Chandanda	938757506
15.	Adriano Sobral	"	CRC III	948697940
16.	Jurlio Triota	"	CRC I	931865701
17.	Mauricio Antonio	Soba	Chicalo	936163472
18.	Martinho Samangito	Sobol:	W. Noda II	
19.	Jornate Kafalico	Seculo	Comfao	
20.	Tomando Epalanga	"	Ussambo	931844676
21.	Abel João	"	S. Teresa	932519634
22.	Yoaquim Daniel	Kambuandi		976030234
23.	Antonio Manuel	Saba de	Langalat	936078515
24.	Eliseu Daniel	Sekulu	Dankani	927976046
25.	Abel Uhombe	Sekulu	R. Xeia	92306894
26.	Armado Epalanga	Sekulu	U Somba	
27.	Marcelino Joaquim	Seculo	Wamiquiminto	925979721
28.	Gloria Epimbili	Seculo	Salungaji	973577512
29.	José Senfoga	Soba	Laungula	
30.	Mario D. Matias	Seculo	Racombila	927026409
31.	José Massuro	Seculo	Vissongue	954635567
32.	Ventura Nidia	Soba	Tinguita	937633807
33.	Fernando Afonso	— " —	Lua-Chica II	925638791
34.	Manuel Rafael	— " —	Catalanga	989847972
35.	Alino Kabela	Soba	Mangula	929309950
36.	Luca Singuimbigo	Soba	Kalalyala	
37.	Agostinho Kapungala	Soba	Wunakamba	
38.	Belino Tchilala	Seculo	Crangoti	
39.	Pedro Gabriel Costa	Sisalflita	Centro Akula	92470759
40.	XAVIL DELE S.C.	VIR INKALOT	Centro Paula	

41.	Albano Balitangui	Resedra	Sacramento	928979966
42.	Eduardo Tinonje Adriano		CM/Boila	923064739
43.	Gabiele Simões		Jalanão	933545081
44.	Antonino Chivasske	--	Ngumbe	949331809
45.	Alberto Sapala Ubirara		Bo. Conombo	928301903
46.	Domingos Kasimbe		Ngumbe	996576558
47.	Américo Sabela		Sacramento	920803084
48.	Américo Bondia		Sacramento	9285737269
49.	Bonifácio Zibanga		Sacramento	947680738
50.	Alberto Ammonda		Sacramento	963550753
51.	Francisco Sapala		Sacramento	921562619
52.	marino caruba		Sacramento	
53.	Bartolomeu Loui	Seculo	lantas-gave	936057599
54.	Lucaz Kayombe	seculo	katetele	934667622
55.	David Pumbuangue	u u	Angola II	927247381
56.	Pipriano Zambeata	u y	Kaluyo	
57.	Gonçalo Kayamba	u y	buquissa	946916969
58.	Elzario Ilhimulo	u y	Karinria	92791848
59.	Bernabe António	u u	louranga	
60.	Gerardo Fesela	u u	S. Marcos II	
61.	Vassinda		Ngumbe	
62.	Mario deaurindo		Ngumbe	
63.	Armando cecor		Kalulilili	
64.	Avelino Tchipundo	u	Tchiculandanga	929517630
65.	João B. Salmitata	u	Caesonia	927647047
66.	Gastão Huambo	u	Kalulolo	
67.	Pimenta Angelo	y	lantas-patata	

68.	Amélia Bamyala	Adm. M. Baly	Chefe de Secção	9261141183
69.	Fabio Jimor Estácio	Adm. M. Corals	Chefe de Secção	935469238
70.	António M. Guesião	Adm. M. Baly	Chefe de Secção	941176165
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