



**CARRINHO GROUP, SA**

**ENVIRONMENTAL AND SOCIAL IMPACT  
STUDY OF THE CATETE-LUANDA GRAIN  
TERMINAL "SILOS"**

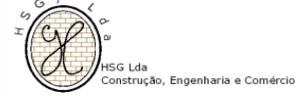
**TECHNICAL REPORT**

**Prepared by: HSG-Construção, Engenharia e Comércio, Lda**



**OCTOBER 2025**

**Luanda-Angola**



## **INITIAL NOTE**

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

Luanda, October 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 - Indirect area of influence
- WB: World Bank
- CFB - Benguela Railway
- 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
- ELISAL-Luanda Cleaning and Sanitation Company
- EPC-Collective Protection Equipment
- PPE-Personal Protective Equipment
- WWTP-Wastewater Treatment Plant
- FAO-United Nations Food and Agriculture Organization
- IDA: Institute for Agricultural Development
- INE-National Statistics Institute
- IPA – Institute of Artisanal Fisheries
- 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

- NDP-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 Icolo e Bengo, district of Catete, province of Luanda.

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.

Catete, located in the municipality of Icolo e Bengo, province of Luanda. According to the 2014 population projections prepared by the National Statistics Institute, it has a population of 23,284 inhabitants and a territorial area of approximately 1,328 km<sup>2</sup>.

It is bordered to the north by Quiminha and Cazengo (Cuanza Norte), to the south by Cabiri and Viana, to the east by Cambambe (Cuanza Norte), and to the west by Funda and Cacuaco. The town is strategically located along National Road No. 230 and the Luanda Railway, which facilitates its connection with Luanda and the interior of the country.

The agricultural sector in Catete is one of the main pillars of the local economy, with an emphasis on subsistence and family farming. The most commonly grown crops include cassava, corn, beans, sweet potatoes, vegetables, and fruits such as bananas and mangoes, etc. The region benefits from fertile soils and a favorable climate, which allows for multiple production cycles throughout the year. Despite its potential, the sector faces challenges such as a shortage of agricultural equipment, poor access to

financing and modern techniques, and difficulties in marketing production. Nevertheless, there are significant opportunities for sustainable agricultural development, particularly through the creation of cooperatives, the promotion of agribusiness, and rural extension programs.

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 project covers an area of 5,500 m<sup>2</sup> and is constructed from reinforced concrete, sun mesh, metal structures, and sheet metal, etc.

The project consists of the exploitation of existing silos for grain storage, expanding their storage capacity from 8,000 tons to 120,000 tons, including drying, in which the following products are expected to be stored: corn 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 270m<sup>3</sup>/h (200t/h), with pre-cleaning of straw;
- 2 conical bottom buffer silos with a total capacity of approximately 2,650 m<sup>3</sup>, 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 approximately 160,000 m<sup>3</sup>, 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 m<sup>3</sup>/h (100 t/h);
- Electrical installation;
- Supervision system.

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

The climate in Catete is tropical dry, characterized by two distinct seasons: a rainy season, which generally occurs between October and April, and a dry season, known as "cacimbo," which runs from May to September. Temperatures are relatively high throughout most of the year, with annual averages between 22°C and 28°C. Relative humidity is moderate to high during the rainy season, while in the dry season there is a significant decrease in humidity and an increase in temperature range. Annual rainfall varies between 800 mm and 1,200 mm, influenced by factors such as proximity to the Atlantic Ocean and local topography. This climate favors agriculture, although the irregularity of rainfall poses a challenge to production.

The soils in the Catete region are predominantly tropical ferruginous, with a significant presence of latosols and argisols. These soils are generally well drained, medium to clayey in texture, and have moderate natural fertility, making them suitable for cassava, corn, beans, and vegetable crops. However, their productivity may be limited by low organic matter concentration and natural acidification, requiring corrective practices with limestone and organic or mineral fertilization for better agricultural use. In areas close to rivers and waterways, there are also alluvial soils, which are more fertile and suitable for intensive horticulture. Water erosion on sloping areas and soil compaction due to inappropriate use are environmental challenges that require attention in soil management and conservation.

The hydrography of Catete is marked by the presence of small and medium-sized rivers and watercourses, which are part of the Bengo River basin, one of the most important in northern Angola. The Zenza River is the closest and most important watercourse for Catete, serving as a major water resource for local supply, agriculture, and livestock. These rivers have seasonal patterns, with higher flow during the rainy season (October to April) and a significant reduction during droughts. The local hydrographic network is essential for aquifer recharge, maintenance of riparian vegetation, and water supply for domestic and productive use, although it faces pressures such as pollution from human activities, silting, and disorderly use of water resources. Integrated management of these waters represents an opportunity to promote environmental sustainability and rural development in the region.

The vegetation of Catete is part of the tropical savanna domain, with areas of dense scrub, tall grass, and scattered shrubs, typical characteristics of regions with a dry tropical climate. In more humid areas and near watercourses, such as along the Zenza River, there is denser and more exuberant vegetation, including riparian galleries with species such as baobabs, palm trees, and fig trees. Natural vegetation has been progressively altered by human activities such as agriculture, deforestation, and urban expansion, resulting in the fragmentation of ecosystems and loss of local biodiversity. Nevertheless, the region still has potential for reforestation and conservation, especially in areas of springs and hillsides, which can support the sustainability of agricultural and livestock uses and the local ecological balance.

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-110 highway. Although the area does not have a high population density or heavy traffic, 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 construction of the silos is not expected to have a significant impact on local biodiversity, as the area is heavily subject to anthropogenic changes. The area where the silos will be built is devoid of vegetation. The surrounding vegetation is sparse and subject to constant burning by local populations, thus reducing its diversity. No endangered or threatened species of fauna or flora were observed in the immediate vicinity of the project.

From a landscape perspective, the intervention area is located in a peri-urban zone characterized by human occupation coexisting with areas of sparse natural vegetation, affected by increasing disorderly occupation and construction of buildings, impacting its visual quality.

The municipality of Icolo e Bengo has a population of around 81,144, of whom 41,865 are male and 39,279 are female. Icolo e Bengo has a young and dynamic population, with more than half of its residents of working age and a youth population that far exceeds the elderly population.

The population of the municipality of Icolo e Bengo has a literacy rate of 60.3%.

The employment rate is 42.7%. Most of the population works in the primary sector (agriculture, animal production, hunting, forestry, and fishing) and the tertiary sector (trade and services).

As part of the EIAS work, the following entities were contacted: Icolo e Bengo municipal administration (municipal department of environment and basic sanitation), Catete district administration (Gêpe)

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 low levels of significance.

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, etc.

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 Catete 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 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 (PM<sub>10</sub>, PM<sub>2.5</sub>) 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.

Table 1: Program implementation costs

Programs	Cost estimate (annual)	
	Construction phase	Operational phase
Monitoring plan for effluents stored in septic tanks plan	3,500 USD	8,200 USD
Worker health and safety plan	8,000 USD	10,000 USD
Atmospheric emissions and air quality monitoring program 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	4,500 USD	8,000 USD
Pest control and eradication plan		12,000 USD
Communication and stakeholder relations program Stakeholder relations program	18,000 USD	22,000 USD
Mechanism for submitting 10,000 USD	10,000 USD	12,000 USD
Environmental and social performance audits		20,000 USD
<b>Total</b>	<b>88,000 USD</b>	<b>156,200 USD</b>

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 the responsibility of Carrinho, SA.

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

It should also be noted that the province of Icolo e Bengo 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 Consultation and Public 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 Icolo e Bengo "Catete," a consultation session was held on June 24, 2025, with seven (7) representatives of the local administration, 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 (7) individuals were present, of whom five (5) were men and two (2) were women.

At the public consultation session in Catete, Icolo, and Bengo, the local administration highlighted the importance of the Carrinho Group's Agricultural Infrastructure Project in improving the lives of rural communities, recognizing benefits such as increased productivity, food security,

job creation for young people and women, promotion of domestic production, and technical training; in response, the group presented its Social Responsibility Strategy based on "Creating Shared Value," clarified points on recruitment, gender equality, waste management, and sustainability, addressed implementation challenges, and reaffirmed its commitment to Angola's agricultural and economic development, expressing its full willingness to engage in dialogue and cooperate with the Provincial Government on corporate social responsibility actions.

On November 19, 2025, a public consultation session was held at the municipal headquarters in Catete on the Carrinho Group's Agricultural Infrastructure Project, aimed at building silos to expand grain storage capacity. The meeting was chaired by the Deputy Administrator for Technical Affairs (Eng. Cardoso A. F. Caolo), representing His Excellency the Municipal Administrator.

After the Carrinho Group presented the project, the Deputy Administrator for Technical Affairs emphasized the need to implement the Carrinho Group's agro-industrial project, encouraging the Catete community to participate by presenting their concerns and suggestions. It should be noted that the installation of silos for grain storage seeks to meet local demands, making community involvement essential to ensure that the project's growth corresponds to real needs, thus strengthening agriculture and boosting the regional economy.

The event, which ended in an atmosphere of consensus and satisfaction, was attended by 104 people, including 71 men and 33 women.

## **Executive Summary**

This report pertains to the Environmental and Social Impact Assessment (ESIA) of the Agricultural Infrastructure Construction Project “Silos,” located in the municipality of Icolo e Bengo, district of Catete, Luanda 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).

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 the 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.

Catete, located in the municipality of Icolo e Bengo, Luanda Province, has, according to the 2014 population projections prepared by the National Institute of Statistics, a population of 23,284 inhabitants and a territorial area of approximately 1,328 km<sup>2</sup>.

It is bordered to the north by Quiminha and Cazengo (Cuanza Norte), to the south by Cabiri and Viana, to the east by Cambambe (Cuanza Norte), and to the west by Funda and Cacucaco. The town is strategically located along National Road No. 230 and the Luanda Railway, which facilitates its connection with Luanda and the country’s interior.

The agricultural sector in Catete is one of the main pillars of the local economy, with emphasis on subsistence and family farming. The most common crops include cassava, maize, beans, sweet potatoes, vegetables, and fruits such as bananas and mangoes. The region benefits from fertile soils and a favorable climate, which allow for multiple production cycles throughout the year. Despite its potential, the sector faces challenges such as a lack of agricultural equipment, limited access to financing and modern techniques, and difficulties in marketing and transporting produce. Nevertheless, there are significant opportunities for sustainable agricultural development,

especially through the creation of cooperatives, the promotion of agro-industries, and rural extension programs.

Taking advantage of the municipality's potential for grain production, the Carrinho Group intends to build agricultural infrastructures ("Silos") aimed at facilitating the storage and distribution of grains from various parts of the municipality and other regions, not only to mitigate and reduce post-harvest losses but also to encourage farmers to increase production, thereby contributing to food security and the economic development of the region.

The project occupies an area of 5,500 m<sup>2</sup>, built with reinforced concrete, wire mesh flooring, metal structures, and metal sheets, among other materials.

The project consists of expanding the existing silo facilities for grain storage, increasing their total storage capacity from 8,000 tons to 120,000 tons, including drying systems. The silos are intended for the storage of maize (corn) and soybeans.

The 120,000-ton storage complex is composed of:

- 1 truck weighbridge with a capacity of 60 tons;
- 1 truck unloading circuit with a capacity of 270 m<sup>3</sup>/h (200 t/h), including pre-cleaning for straw removal;
- 2 conical-bottom buffer silos with a total capacity of approximately 2,650 m<sup>3</sup>, i.e., 1,000 tons per silo (e.g., Ø10.66 m, cylinder height 19.52 m, total height 22.61 m);
- 1 dryer with an output capacity of 100 t/h for maize;
- 12 flat-bottom storage silos, arranged in two rows, with a total capacity of approximately 160,000 m<sup>3</sup>, i.e., 10,000 tons per silo (e.g., Ø31.98 m, cylinder height 13.80 m, total height 21.99 m);
- Aeration system for the storage silos;
- 1 truck loading circuit with a capacity of 135 m<sup>3</sup>/h (100 t/h);
- Electrical installation;
- Supervision system.

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

The climate of Catete is classified as dry tropical, characterized by two well-defined seasons: a rainy season, which generally occurs between October and April, and a dry season, known as the "cacimbo," lasting from May to September. Temperatures remain relatively high throughout most of the year, with annual averages ranging between 22°C and 28°C. Relative humidity is moderate to high during the rainy season, while in the dry season it decreases significantly, leading to greater thermal amplitude. Annual precipitation varies between 800 mm and 1,200 mm, influenced by factors such as proximity to the Atlantic Ocean and local topography. This climate favors agricultural activity, although irregular rainfall poses challenges to production.

The soils in the Catete region are predominantly tropical ferruginous soils, with a significant presence of latosols and argisols. These soils are generally well-drained, with medium to clayey texture, and moderate natural fertility, making them suitable for crops such as cassava, maize, beans, and vegetables. However, productivity can be limited by low organic matter content and natural acidification, requiring corrective practices using lime and organic or mineral fertilizers to improve agricultural performance. In areas near rivers and waterways, alluvial soils can also be found—these are more fertile and well-suited for intensive horticulture. Water erosion on sloped areas and soil compaction caused by improper land use are environmental challenges that demand attention for soil management and conservation.

The hydrography of Catete is characterized by the presence of small- and medium-sized rivers and watercourses that are part of the Bengo River basin, one of the most important in northern Angola. The Zenza River is the closest and most relevant watercourse to Catete, serving as an essential water resource for local supply, agriculture, and livestock. These rivers exhibit seasonal flow patterns, with higher volumes during the rainy season (October to April) and significant reductions during the dry season. The local hydrographic network plays a crucial role in aquifer recharge, maintenance of riparian vegetation, and water provision for domestic and productive uses, although it faces pressures such as pollution from human activities, sedimentation, and unregulated water use. Integrated water resource management represents an opportunity to promote environmental sustainability and rural development in the region.

The vegetation of Catete falls within the tropical savanna domain, featuring areas of dense bush, tall grasses, and scattered shrubs typical characteristics of dry tropical regions. In more humid zones and along watercourses, such as the banks of the Zenza River, denser and more lush vegetation occurs, including riparian gallery forests with species such as baobabs, palm trees, and fig trees. The natural vegetation has been progressively altered by human activities such as agriculture, deforestation, and urban expansion, resulting in ecosystem fragmentation and loss of local biodiversity. Nevertheless, the region retains potential for reforestation and conservation, particularly in spring and hillside areas, which could support the sustainability of agricultural and livestock uses as well as maintain local ecological balance.

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

Regarding noise pollution, it will mainly be caused by construction activities such as excavations, operation of heavy machinery and vehicles, assembly of metal structures, and transport of materials, in addition to the circulation of vehicles along National Road EN-110. Although the area is not densely populated and traffic is relatively low, temporarily elevated noise levels may cause occasional disturbances to nearby communities and construction workers. With appropriate mitigation measures, these impacts can be significantly reduced.

From an ecological perspective, the implementation of the silos is not expected to cause significant impacts on local biodiversity, as the area is already heavily affected by human activities. The site where the silos will be built is devoid of vegetation. The surrounding vegetation is sparse and subject to frequent burning by local populations, thereby reducing its diversity. No species of flora or fauna considered endangered or at risk were observed in the vicinity of the project area.

From a landscape perspective, the intervention area is located in a peri-urban zone characterized by human occupation coexisting with areas of sparse natural vegetation, affected by increasing unplanned development and construction, which impacts its visual quality.

The municipality of Icolo e Bengo has approximately 81,144 inhabitants, of whom 41,865 are male and 39,279 are female. It has a young and dynamic population, with more than half of the residents of working age, and a significantly larger proportion of youth compared to the elderly. The literacy rate in the municipality is 60.3%, while the employment rate is 42.7%. Most of the population works in the primary sector (agriculture, livestock, hunting, forestry, and fishing) and the tertiary sector (commerce and services).

As part of the Environmental and Social Impact Assessment (ESIA) process, the following entities were consulted: the Municipal Administration of Icolo e Bengo (Department of Environment and Basic Sanitation) and the District Administration of Catete (Gêpe). These entities expressed support for the project's implementation, recognizing its potential to significantly stimulate the municipality's economy.

The main negative environmental impacts of the project are expected to occur during the construction phase and are related to noise and dust emissions resulting from the movement of heavy and light vehicles, as well as potential disturbance to nearby populations. However, with the implementation of mitigation measures and monitoring programs, these negative impacts are expected to remain at low levels of significance.

At this stage, a positive impact is also noted: the stimulation of the local economy resulting from construction activities, which will create jobs and boost local commerce, particularly in catering and accommodation, over an estimated period of 36 months.

During the operational phase, the negative impacts are mainly associated with potential risk situations, although their likelihood is low if the proposed measures are adopted. These include accidental spills of pollutants, noise, dust, and possible road accidents involving the local population.

It is during the operation phase that all the project's benefits will materialize, reflected in the improvement of the socioeconomic conditions of the population of Catete and its surroundings. At this stage, it is expected that local farmers will be able to market their grains at competitive prices and receive incentives to increase 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 (PM<sub>10</sub>, PM<sub>2.5</sub>) 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**.

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 USD	8,000 USD
Pest Control and Management Plan		\$12,000
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
<b>Total</b>	<b>88,000 USD</b>	<b>156,200 USD</b>

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.**

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 Icolo e Bengo 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 the Public Consultation and Participation**

Public consultation is a mandatory stage of 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, 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 Icolo e Bengo (Catete), a consultation session was held on June 24, 2025, with seven (7) representatives of the local administration, addressing the project presentation, the main environmental and social impacts, proposed mitigation measures, and collecting contributions, comments, and recommendations from participants. Seven (7) individuals attended, including five (5) men and two (2) women.

During the public consultation session in Catete, Icolo e Bengo, the local administration emphasized the importance of Grupo Carrinho's Agricultural Infrastructure Project in improving the lives of rural communities, recognizing benefits such as increased productivity, food security, job creation for youth and women, promotion of national production, and technical training. In response, the group presented its Corporate Social Responsibility Strategy based on the concept of “Creating Shared Value,” clarified issues regarding recruitment, gender equality, waste management, and environmental and social sustainability, addressed implementation challenges, and reaffirmed its commitment to Angola’s agricultural and economic development, food security, and improved quality of life, expressing full willingness to maintain dialogue and cooperate with the Provincial Government in corporate social responsibility actions.

On November 19, 2025, another public consultation session was held at the municipal headquarters of Catete regarding the Agricultural Infrastructure Project of Grupo Carrinho, aimed at building silos to expand cereal storage capacity. The meeting was chaired by the Deputy Administrator for the Technical Area (Eng. Cardoso A. F. Caolo), representing His Excellency the Municipal Administrator.

After the project presentation by Grupo Carrinho, the Deputy Administrator for the Technical Area highlighted the need to implement the agro-industrial project, encouraging the participation of the Catete community in presenting their concerns and suggestions. It was emphasized that the installation of silos for grain conservation seeks to meet local demands, making community involvement essential to ensure that project growth effectively responds to real needs, thereby strengthening agriculture and boosting the regional economy.

The event, concluded in an atmosphere of consensus and satisfaction, was attended by 104 people, including 71 men and 33 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 network to various locations across the country for the storage of grain produced in the regions where these infrastructures will be built, in order to facilitate internal distribution and export, as well as to extend its shelf life and quality.

To this end, silos will be built to increase grain storage capacity in the district of Catete, commune of Icolo e Bengo, province of Luanda. Silos are infrastructures for protecting and storing grain, minimizing post-harvest losses and ensuring product quality. In addition, with the advent of innovative technologies, silos have become more efficient, offering sustainable solutions that benefit both farmers and producers as well as 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 Catete, belonging to Grupo Carrinho, 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

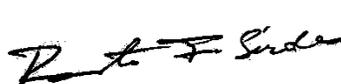
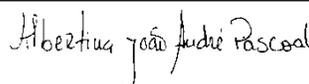
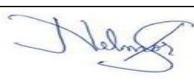
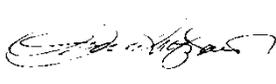
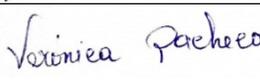
Table 4: Identification of the company responsible for the EIAs

COMPANY IDENTIFICATION	
Company Name	HSG - CONSTRUÇÃO, ENGENHARIA E COMÉRCIO, LDA
MINAMB Registration Number	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	
Verónica 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
<b>General</b>	
Basic Environment Law	Law No. 5/98, of June 19
Law on Environmental Protection Associations	Executive Decree No. 3/06, of January 18
<b>Environmental Impact Assessment</b>	
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 activities auditing and environmental impact studies	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	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, of February 13
Commission for the Evaluation of Environmental Consultants' Resumes 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 38(1) Article 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

<b>Legal framework</b>	<b>Publication</b>
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 for Environmental Impact Assessment and the Environmental Licensing Procedure	Presidential Decree No. 117/20, of April 22
<b>Waste</b>	
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, of August 30
<b>Water and Basic Sanitation</b>	
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
Regulation for the Prevention and Control of National Water Pollution	Executive Decree No. 141/12, of June 21
Regulation on 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 the Tariff of Services of Water Supply and Wastewater Sanitation	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, of June 25

Legal Framework	Publication
<b>Flora and Terrestrial Flora</b>	
Basic Law on Forests and Wildlife	Law No. 6/17, of October 24
Regulations for the protection of flora 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 in 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 Regulation	Presidential Decree No. 171/18, dated July 23
<b>Protected Areas</b>	
Regulation of National Parks	Ordinance No. 10,375/1958, of October 15
Environmental Conservation Areas Law	Law No. 8/20, of April 14
<b>Resettlement</b>	
Rules on the resettlement of displaced populations.	Decree No. 1/01, of January 5
Regulation on Resettlement Operations	Presidential Decree No. 117/16, of May 30
<b>Hygiene, Health, and Safety at Work</b>	
Principles for promoting 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
Regulations 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 Warning Devices, 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

<b>Land Use Planning</b>	
Land Law	Law No. 3/04, of June 25
Political-Administrative Division Law	Law No. 14/24, of September 5
Law on Spatial 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
<b>Cultural Heritage</b>	
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
<b>Natural Disasters</b>	
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	NA Resolution 26-B/9/91, of December 27
International Covenant on Economic, Social and Cultural Rights (1966)	AN Resolution 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)	Approved 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

<b>International Legal Framework</b>	
Convention for the Safeguarding of the 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 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 Waste and its disposal	Resolution No. 29/16, of July 25
Convention for Cooperation on the 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 African Development Bank Integrated Safeguards System**

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

Safeguards are a powerful tool for identifying risks, reducing development costs, and improving the sustainability of projects, 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 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 safeguards 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 available to the AfDB 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 operational 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 a project's environmental and social category 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
<b>Environmental and Social Impact Assessment</b>	<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><b>PO1</b> - 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
<b>Environmental and Social Impact Management</b>	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 environmental auditing during the operational phase (Decree No. 1/10, of January 13).	<b>PO1</b> - Integrated Environmental and Social Assessment  The PGAS is a management tool and is carried out during the construction and operation phases,  including, among other things, the definition of responsibilities, measures to be implemented, implementation schedule, and budget.	Both provide for informed participation. The AfDB and DFC require formal documentation and complaint mechanisms.
<b>Public Consultations</b>	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.	<b>PO1</b> - Stakeholder involvement  Operational Safeguard 1 establishes the need to hold public consultations from the beginning of the project cycle.	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.
<b>Biodiversity</b>	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.  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).	<b>PO3</b> - Conservation of biodiversity  Establishes the need to adopt a mitigation hierarchy to avoid impacts on ecosystem integrity and biodiversity conservation.	Both advocate protection. BAD and DFC require mitigation in critical areas and compensation.

Item	Angolan legislation	Integrated Security System (ISS of the AfDB)	Alignment and Complementarity
<p><b>Pollution Prevention</b></p>	<p>The Framework Law on the Environment includes the principle of pollution prevention. There are laws on waste and water quality, but there are no regulations on atmospheric emissions, noise, and vibration limits.</p>	<p><b>PO4</b> - Pollution prevention and resource efficiency The BAD and DFC adopt the parameters established by the World Bank.</p>	<p>Good alignment. The AfDB and DFC require international standards and the use of the best technologies.</p>
<p><b>Resettlement</b></p>	<p>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>	<p><b>PO2</b> - Involuntary resettlement 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>	<p>Both require compensation. BAD reinforces with the restoration of livelihoods and ongoing consultation.</p>
<p><b>Hygiene, Safety, and Health at work</b></p>	<p>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>	<p><b>PO5</b> - Working conditions, health, and safety Operational Safeguard 5 requires protection of workers against abuse or exploitation, and hygiene and safety at work.</p>	<p>Both guarantee safe conditions. ISS requires formal HSST plans and continuous supervision.</p>

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 are intended 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

<b>Institutional group</b>	<b>Main entities involved</b>	<b>Role in environmental/social matters</b>
<b>Central authorities (environment)</b>	Ministry of Environment (MINAMB) – approval of EIAs, environmental licenses, national coordination of environmental policies	Conducts and controls the the country's environmental policy; approves environmental impact studies and licenses; leads public consultations
<b>Agricultural and rural sector</b>	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
<b>Water and sanitation / water resources</b>	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
<b>Planning and regulatory coordination</b>	Ministry of Planning – interministerial coordination and definition de strategies de territorial development	Ensures strategic alignment between ministries in project implementation plans
<b>Cartography and Territory</b>	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
<b>Agencies of logistics infrastructure</b>	ARCCLA (Cargo and Logistics Certification Regulatory Agency) – national logistics, certification, and agricultural transportation	Facilitates access to markets and transportation of stored grains; can be involved in silo logistics
<b>Local/social implementation</b>	Social Support Fund (FAS) and the Crescer Project – implementation of social infrastructure, social safeguard policies, and resettlement mitigation	Manages Social Components, socioeconomic studies, compensation, community consultations, and complaint mechanisms
<b>Province and municipality</b>	Governor Administration; Administrations Municipal; Municipal commissions (technicians, traditional leaders, administrators)	Authorizes resettlement actions; coordinates land acquisition processes, community consultations, and local implementation
<b>Local traditional leadership</b>	Soba chiefs and traditional community leaders – participation in municipal committees 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
<b>Defense of environmental rights</b>	Non-governmental organizations (NGOs)	Provide technical support and advocacy for environmental protection, community rights and good social practices.
<b>Project implementation</b>	Project promoter	Responsible for developing and implementing mitigation measures and environmental and social management plans.
<b>Financing and investment</b>	Bank Development Bank (AfDB) and DFC	Financing institution that requires compliance with its Safeguards, including meaningful public consultations and the adequate management 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:** Strengthen 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 targets include:

- **Corn:** Increase production to 5,002,282 tons, cultivating 326,030 hectares.
- **Wheat:** Expand the cultivation area to 673,970 hectares.
- **Rice:** Reach 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:** Strengthen the country's capacity to address 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 society's involvement 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 NWP.

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 NWP 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 restoration of existing irrigated areas and the construction of new infrastructure to increase the irrigated agricultural area.
2. **Technical and Institutional Capacity Building:** It is planned 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, in line 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, aiming 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 Catete 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 Catete 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 carry out baseline studies for the project to build agricultural infrastructure for grain storage "Silos" in the municipality of Catete 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 Catete silos on the surrounding environment;
  - Assess the 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 the competent authorities to obtain the necessary licenses 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 site designated for the construction of grain storage infrastructure "silos" by Carrinho S.A. is located in the province of Luanda, in the municipality of Icolo e Bengo, district of Catete, neighborhood of Adiamento. It occupies an area of approximately 5,500 m<sup>2</sup>, which corresponds to the total area of the plot granted, as shown in the location of the unit below (Figure 1).

In defining the study area, consideration was given to the area where these activities will be carried out, as well as the entire surrounding area that may be negatively and/or positively affected, according to the analysis of each descriptor involved in the study.



**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	9° 5'11.95" S	13°41'50.81" E
2	9° 5'12.48" S	13th 4152.224" E
3	9th 5'15.76" S	13°41'51.03" E
4	9° 5'15.27" S	13°41'49.67" E

#### 4.2.2 Confrontations

The project is located within the following boundaries:

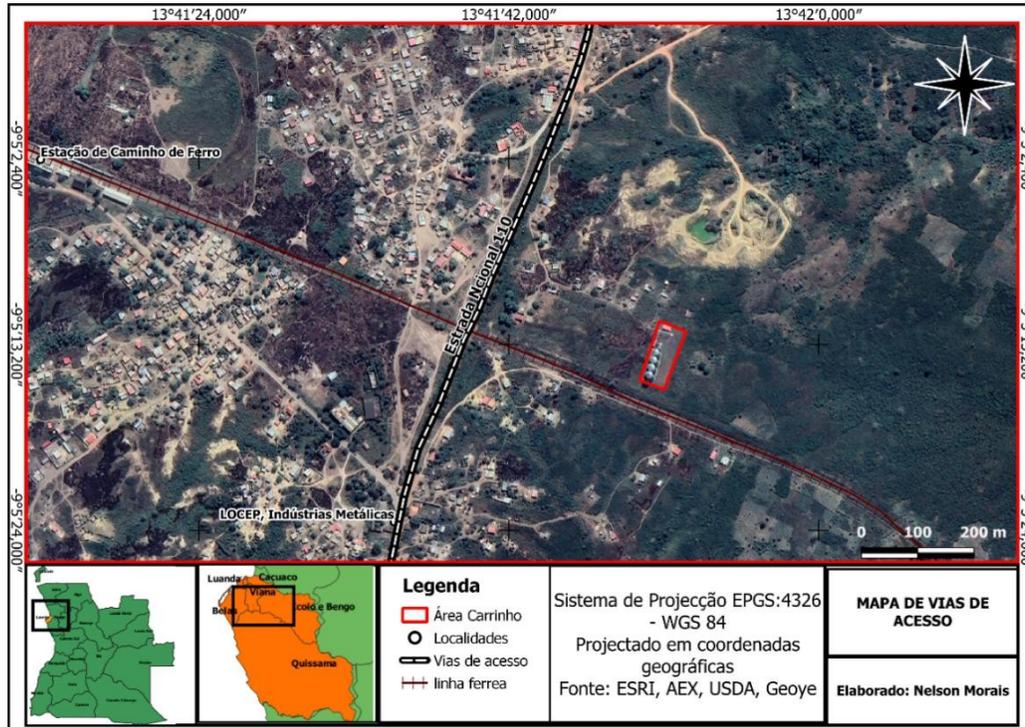
- North: private residences;
- South: Railway line;
- East: vacant lot and;
- West: private land.



Figure 2 - Map of boundaries.

**4.2.3 Access roads**

The area where the project is located has a road network with infrastructure around it. The main access road is the EN-230 or Estrada de Catete and the secondary road is the EN-110, 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. 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** - defines, where applicable, the environmental monitoring and environmental management programs for the various phases of the Project;
- **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.

- Municipal Administration of Icolo and Bengo;
- Catete Municipal Hospital;
- Fire Department;
- Municipal Health Department;
- Municipal Education Department.

## 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 in the district of Catete, equipped with adequate road and rail infrastructure, facilitating transport and logistics.

With this project, all grain purchased in the municipality of Icolo e Bengo and other areas of the country can be efficiently transported to the silos, where it 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 of 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 Catete silo complex is located on a 5,500 m<sup>2</sup> plot of land, equipped with infrastructure such as the EN-230 and EN-110 national roads, and close to the Luanda-Malange railway line.

- Potentially industrial area;
- Within the municipality and district;
- Close to the national road connecting the provincial capital and the eastern part of the country;
- There is no conflict with the type of land use and occupation;
- No urban areas in close proximity to the project;
- Availability of adequate access roads facilitating the transport of goods, as well as the arrival of raw materials and necessary inputs;
- No interference (transmission lines, gas pipelines, oil pipelines, etc.) that would imply restrictions and/or the need for removal for the implementation of the project.

## 5.2 LOCATION ALTERNATIVE

### 5.2.1 Location and technological alternatives for the implementation of the project

No location or technological alternatives were considered or discussed for the following reasons:

- i) This is a grain terminal that was built in 2012 but has never been in operation. Therefore, the reuse of this infrastructure will be beneficial for the recovery of the investment made.
- ii) The fact that these are existing infrastructures reduces the possibility of significant impacts arising during the construction phase of a new project;

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

1. Defined area with characteristics Agricultural infrastructure for grain storage (silos);
2. Presence of a railway line;
3. Increase in trade, import, and export of products in the various countries connected to our road network and by the Luanda–Malange railway.

### 5.2.2 Alternatives to not implementing the project

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 5,500 m<sup>2</sup> and will be constructed of reinforced concrete, mesh, metal structures, and sheet metal, etc.

The project consists of the exploitation of existing silos for the storage of cereals, expanding their storage capacity from 8,000 tons to 120,000 tons, including drying, in which it is planned to store the following products: corn 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 270m<sup>3</sup>/h (200t/h), with straw pre-cleaning;
- 2 conical bottom storage silos with a total capacity of approximately 2,650 m<sup>3</sup>, 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 m<sup>3</sup>, 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 m<sup>3</sup>/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)

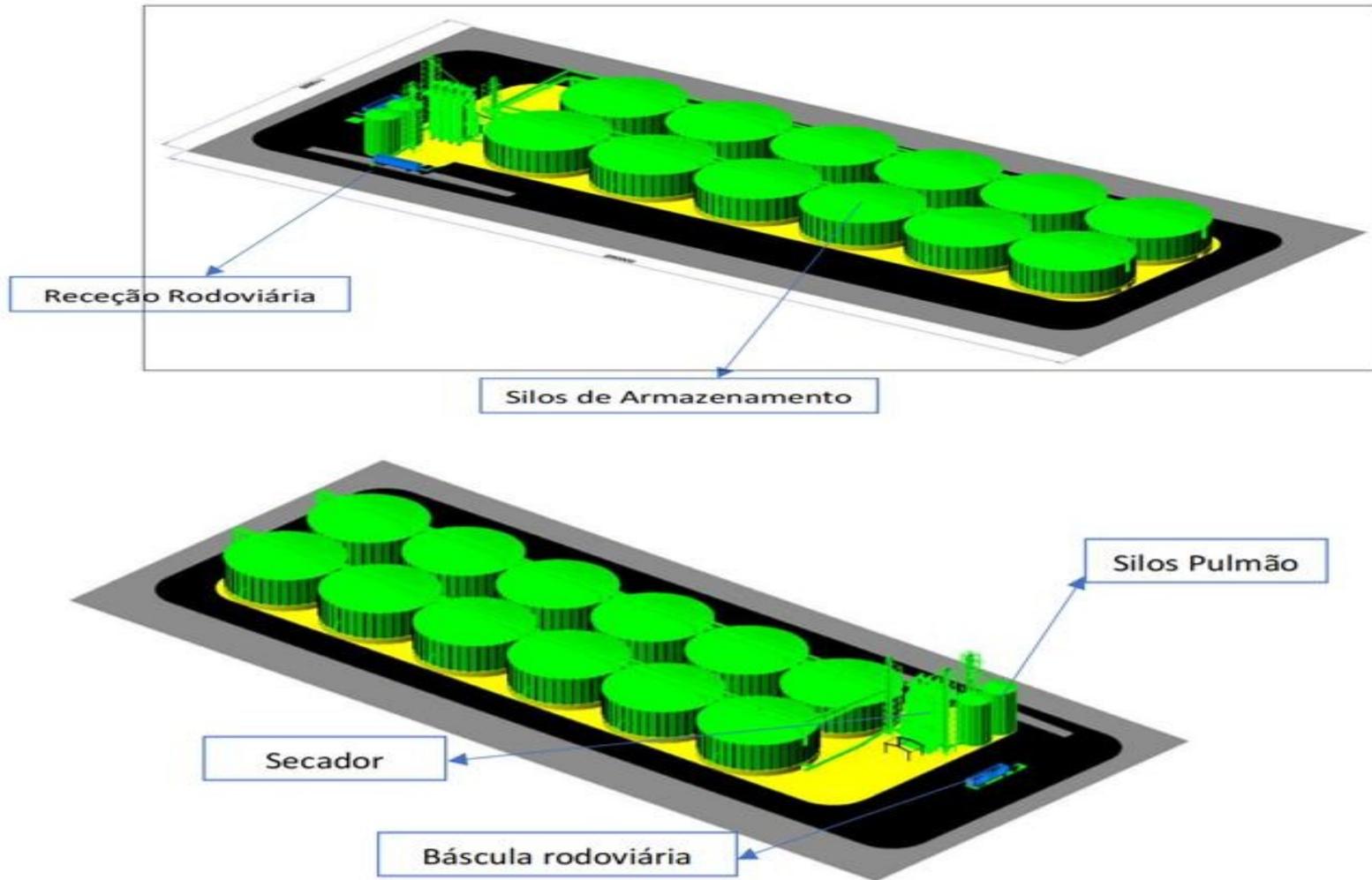


Figure 5 – Flow diagram (2)

## 5.4 GENERAL CHARACTERISTICS OF EXISTING INFRASTRUCTURES

For this purpose, there are silos at the site designated for the project that were built in 2011 with a storage capacity of 8,000 tons, but they never went into operation. 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 and country.

### The existing building consists of:

The existing building consists of:

- **Foundations for weighbridge:** reinforced concrete ramps with 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 – 22 t/h
- Drying – 20 t/h (19 °C to 14 °C)
- Storage – 4 silos of 2,000 t

### Equipment

The Catete silo complex is properly constructed and equipped with equipment suited to the economic activity to be carried out, including:

- **Reception, cleaning, and drying equipment:** 1 reception hopper (reinforced concrete with a discharge area of 4 m x 3.23 m), 1 cleaner (pre-cleaning), 1 dryer, 2 elevators (feeding the cleaner and dryer);
- **Storage:** 4 flat-bottom metal silos, walkway, 1 elevator to feed the silos, 1 conveyor;
- **Weighing facilities and equipment:** 1 vehicle scale.

## Dimensions

- **Lot:** 5,500 m<sup>2</sup>
- **Building area:** n/a

The facilities are located in the Adiamento neighborhood and consist of permanent housing and some shacks.



Figure 6 – Catete Grain Terminal



Figure 7: Grain Storage Infrastructure (Silos)

### 5.4.1 Access roads

The area where the agricultural infrastructure for grain storage (silos) is located is connected to the land transport network via the nearby EN-110 national road, and the municipality is also connected by the Luanda-Malanje railway. This facilitates the efficient transport of goods to the facilities, helping to integrate agricultural infrastructure into the regional and national economy.

### 5.4.2 Administrative and Support Facilities

These include administrative offices to manage agricultural infrastructure operations for grain storage (silos) and other support facilities (3 bedrooms, 1 living room, 2 bathrooms, and 1 guardhouse).



Figure 8: **Building**



Figure 9: **Scale**



Figure 10: **Guardhouse**



Figure 11: **Silo Operations Room**

### **5.4.3 Activities to be carried out and materials**

#### **5.4.3.1 Materials**

The materials to be used in the construction of the grain storage infrastructure include reinforced concrete, wire mesh, coating materials, carpentry, masonry, paint, PVC pipes, ceramic materials, metal and sheet metal, etc.

#### **5.4.3.2 Flooring**

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

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

Flexible flooring will be used in circulation areas.

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

#### **5.4.3.3 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.

#### **5.4.3.4 Support infrastructure**

For the construction of the new project units, various infrastructures will provide support for its implementation, notably the EN-230 and EN-110 national roads, 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 are to be built within the project area.

### 5.4.3.5 Expected consumption

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

#### a) Water supply

At the current stage of the project, the water supply for the security personnel protecting the facilities comes from a fountain located along the access road, just under 300 meters away, and is stored in a container.

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

During the operational phase, the reservoirs are expected to continue to be used, 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.



Figure 12: Fountain

### **b) Domestic Wastewater Drainage Network**

The domestic wastewater drainage network comprises the conveyance of wastewater from offices 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. The treatment of wastewater from toilet bowls will be carried out in a septic tank.

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 to 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**

For the current phase of the project, the rainwater network has two fundamental systems: at roof level and at ground floor level.

The roofs slope towards the gutters, which in turn slope directly to the ground, where the water is absorbed naturally.

At ground level, rainwater from the roofs is naturally directed along the ground level to lower areas, while other water seeps into the ground.

### **d) Electricity**

The municipality of Icolo e Bengo is supplied with energy from the public grid through the National Energy Distribution Company (ENDE). The project facilities do not have public energy. Energy is supplied through alternative sources, using two generator sets with capacities of 127.4 KVA and 14.9 KVA.

Therefore, measures should be taken to reduce energy consumption, avoid waste, and monitor gas emissions.



Figure 13: Generator House

#### **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**

At the current stage of the project, the generators run on diesel fuel, and the tank has a capacity of 10m<sup>3</sup>. During the construction phase to increase storage capacity, the fuel to be used will be diesel and gasoline, depending on the type of equipment, capacity, and technical specifications.

#### **5.4.4 Labor**

Currently, the existing facilities have a total of 4 employees. This number may increase during the construction and operation of the silos.

#### **5.4.5 Schedule**

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

#### **5.4.6 Investment Value**

The total investment for the implementation of the project is estimated at USD 4,826,250.00 (four million, eight hundred and twenty-six thousand, two hundred and fifty 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 cost; 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.

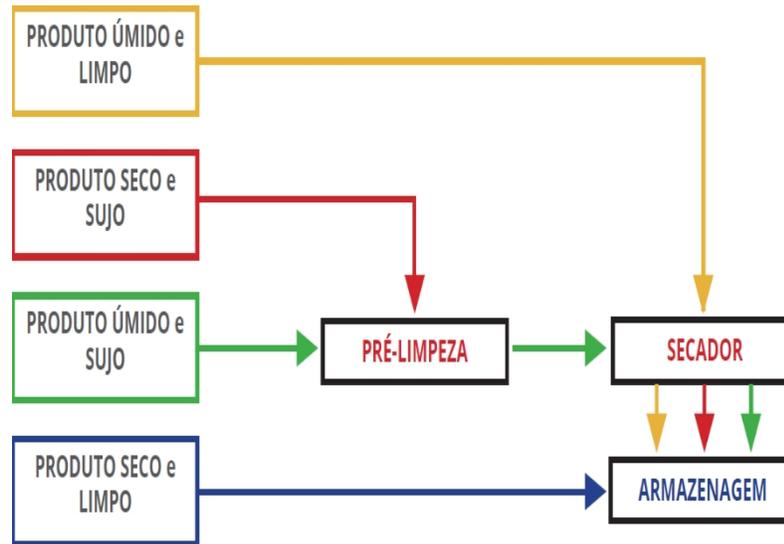


Figure 14 - Diagram of grain storage stages using a conventional system

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 15 - 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

Produto	Percentual de umidade				
	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 vary between 18 and 20%.

**Table 12: Moisture content of grains at harvest**

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

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 attacks. Other animals, such as rodents and birds, also cause losses, but these are smaller compared to those caused by insects.

Figure 16 - 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 17 - 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.

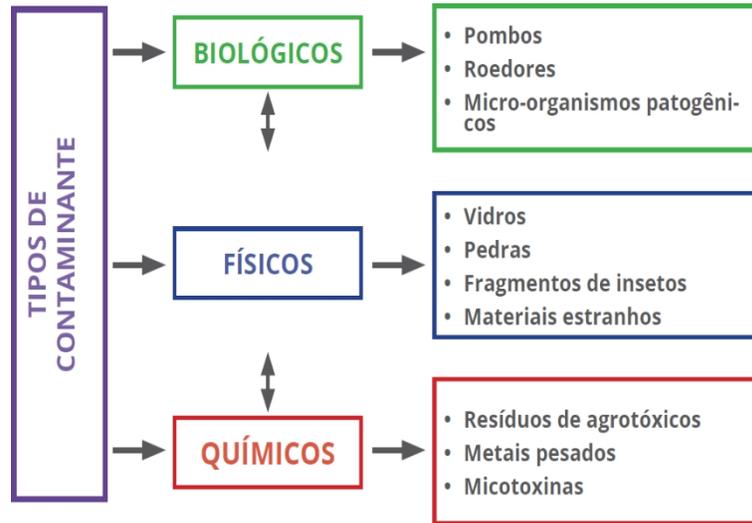


Figure 18 - Biological, physical, and chemical contaminants in stored grains

### 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.)			
<b>PERIGO BIOLÓGICO</b>	<i>Salmonella</i> <i>Coccidiose*</i>	<b>SEVERIDADE MÉDIA</b>	<b>RISCO ALTO</b>
JUSTIFICATIVA - Presença de fezes de aves (pombos*)			
MEDIDAS PREVENTIVAS			
<ul style="list-style-type: none"> <li>• Colocar telas para evitar a entrada de aves na unidade armazenadora</li> <li>• Evitar grãos esparramados no pátio da unidade armazenadora</li> </ul>			
<b>PERIGO BIOLÓGICO</b>	LEPTOSPIROSE	<b>SEVERIDADE MÉDIA</b>	<b>RISCO ALTO</b>
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.

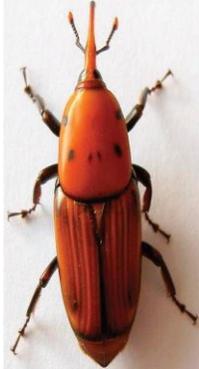
### 5.5.9 Factors that contribute to insect pest attacks

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
<b>Grain weevil</b> <i>(Sitophilus spp.)</i>	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.  nose (rostrum), which is an extension of the head, and has a brownish-bronze or dark brown body  bronze or dark brown body.	They attack cereals, mainly corn, sorghum, rice, and wheat. They do not  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.	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.	
<b>Grain weevil</b> <i>(Prostephanus truncatus)</i>	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.	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	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>The beetle can also feed on dried cassava and flour products.</p>		
<p><b>Grain beetle</b> <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><b>Cereal moth</b>  <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><b>Bean weevil</b>  <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><b>Brown beetle</b>  <i>(Tribolium spp.)</i></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><b>Flour moth</b>  <i>(Epehstia spp.)</i></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><b>Termites</b>  <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. 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 the storage units, the storage period, and the quality of the 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 palm 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 DAI.

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 enterprise. 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 grain storage infrastructure project is located in the municipality of Icolo e Bengo, in the province of Luanda, 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 to be within a radius of 500 meters. The project covers the northwest (NW) by the EN-110, the southwest (SW) by the railway line, and the east by vacant land.

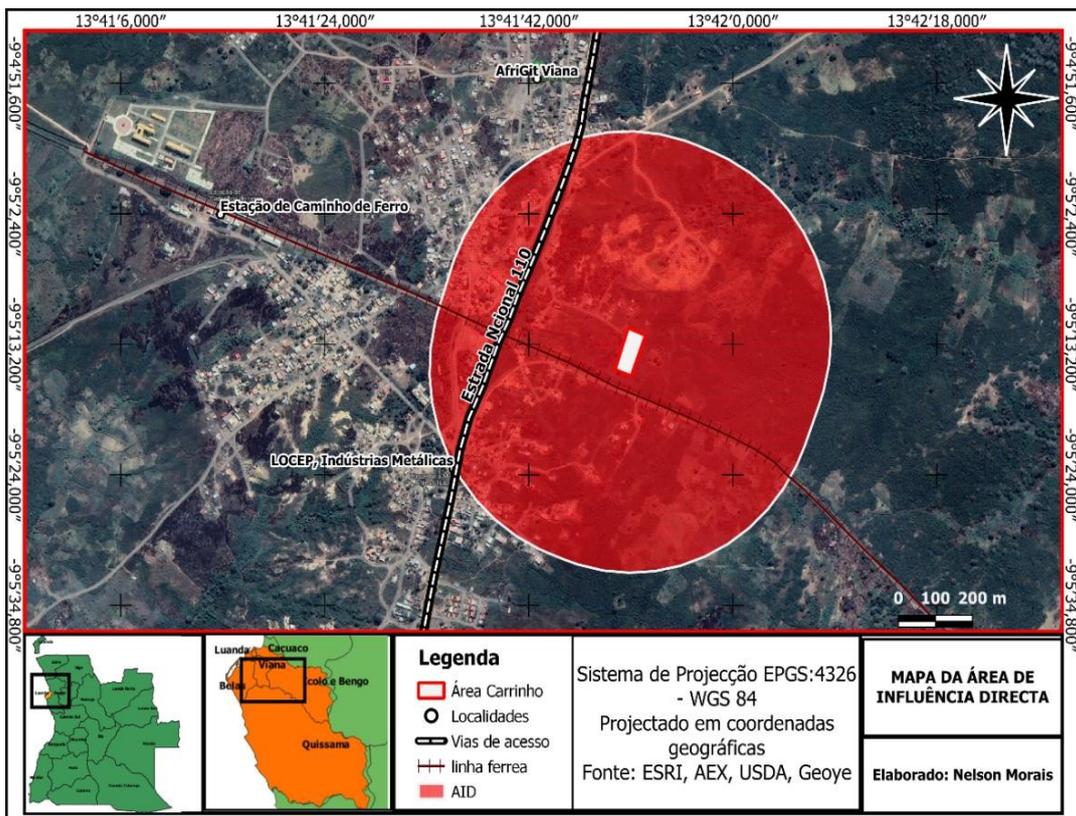


Figure 19 – Map of the direct area of influence.

**6.2.3 Indirect Area of Influence (IAI)**

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, access routes to be used and, more generally, at a higher level, the area occupied by the project were included in the IIA. Within a radius of 10 km, the project covers the southwest (SW) by the Guimbe neighborhood and the northwest by the EN-110.

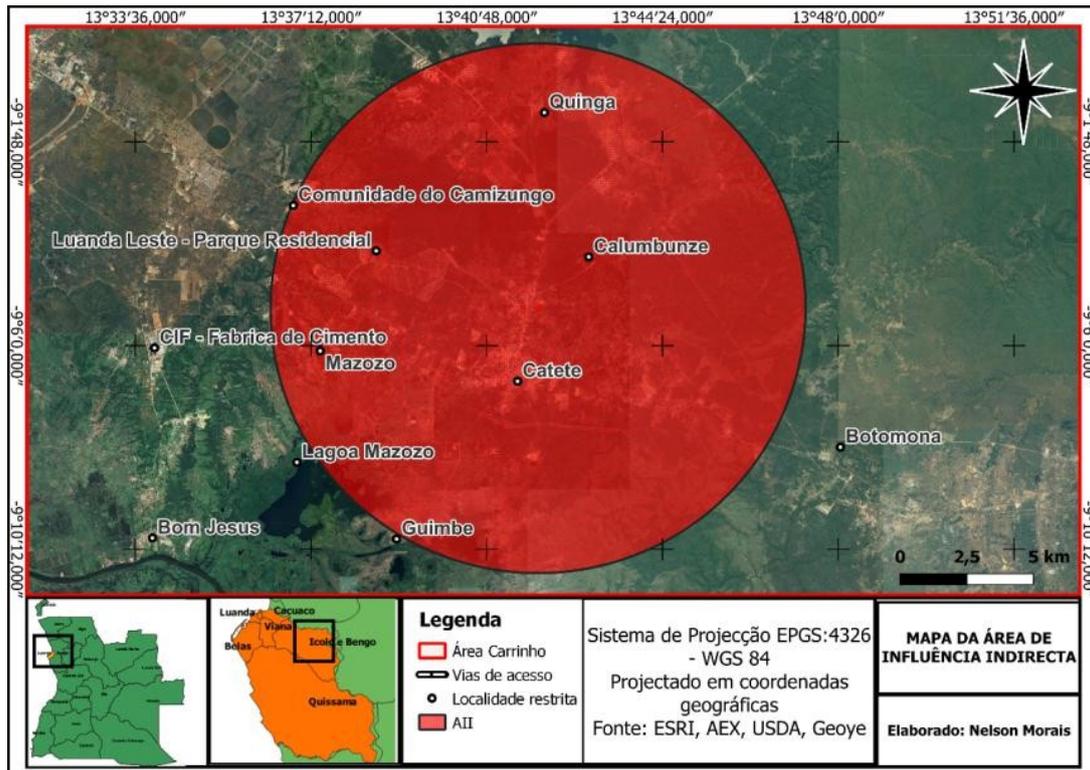


Figure 20 – Map of the area of indirect influence.

### 6.2.4 Regional Area of Influence (RAI)

The area of regional influence generally refers to the entire geographical area and socio-economic sectors that are directly or indirectly affected by grain storage and transport activities to and from the unit, as well as all locations that will supply this raw material, covering the entire surrounding region of Luanda Province and the municipality of Icolo e Bengo.

## 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 Urbanism 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 air of tropical origin with strong convergence in the lower levels over much of the territory.

tropical origin with strong convergence at lower levels. This gives rise to very cloudy skies 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 the general conditions, determines the specific characteristics of the 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 the table below.

**Table 15: Köppen classification: territorial distribution**

CLIMATE TYPE (KÖPPEN)	AREA (km2)	% 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 Icolo and Bengo has a hot semi-arid climate, which covers the project area.

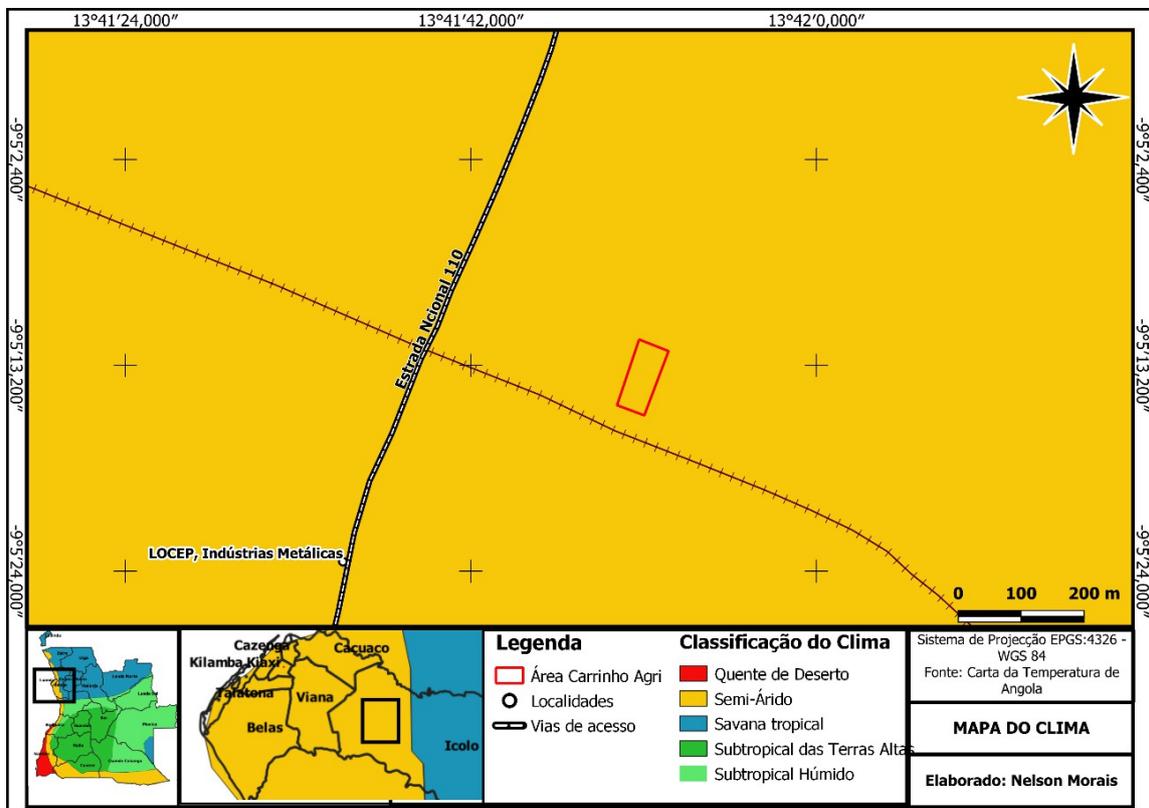


Figure 21 – Climate map.

### 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), the nature of the soil and its cover, the proximity of large quantities of water, and the wind regime.

The project is located in a region with an average annual temperature of 26°C. The hottest month of the year is March and the coldest month is July, with an average temperature of 19°C.

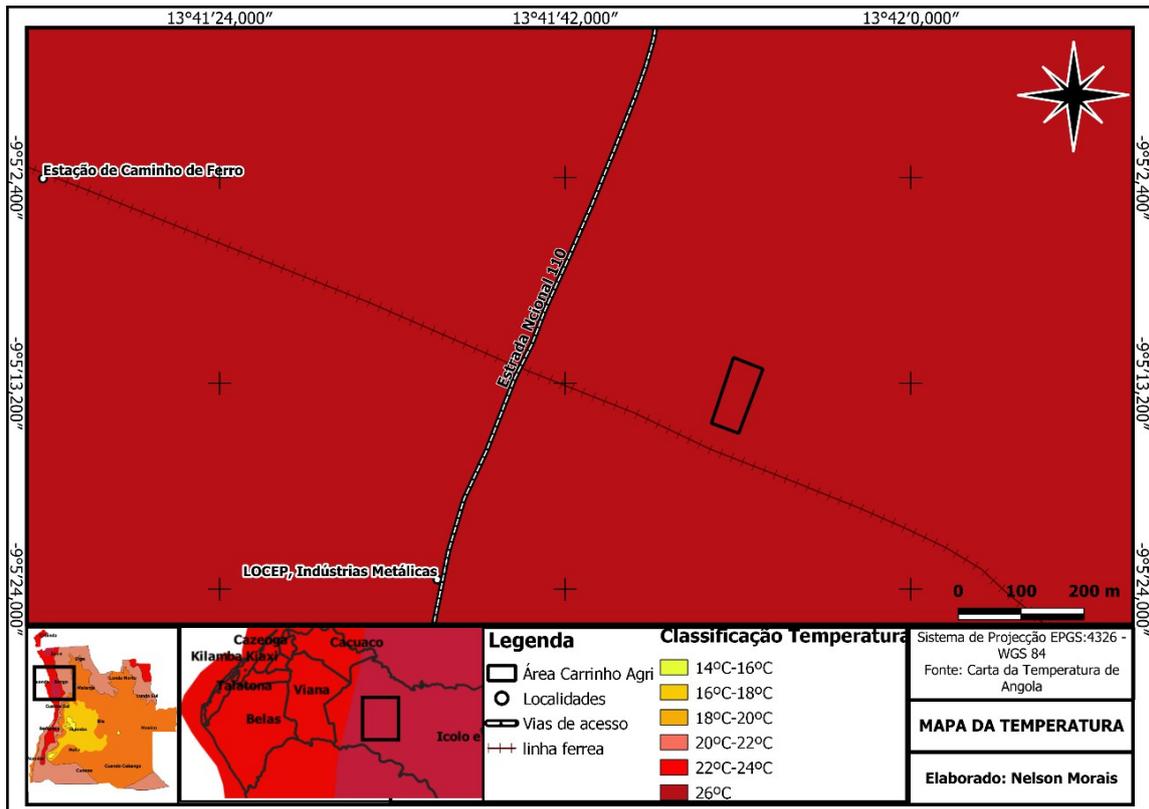


Figure 22 – Temperature map.

### 6.3.5 Relative air humidity

Relative air humidity is one of the climatic elements that define the hygrometric state of the air. This climatic element has a major influence on potential evapotranspiration (PEV) values, as the higher the air humidity values, the lower the PEV.

Relative air humidity in the Catete region shows marked seasonal variations, influenced by the dry tropical climate with a rainy season.

During the rainy season (October to April), relative humidity tends to be high, often between 70% and 90%, due to increased evaporation and the constant presence of clouds and precipitation.

cloud cover and precipitation. This level of humidity contributes to a feeling of stuffiness, especially on days with high temperatures.

In the dry season (May to September), relative humidity decreases, varying between 40% and 65%, and is lowest in the months of June to August, when the cacimbo prevails, with cloudy skies, morning fog, and drier air. During these months, although temperatures are milder, the wind chill factor can be influenced by dry air and moderate winds.

This variation in humidity has a direct impact on agriculture, human health, and thermal comfort, making it important to consider adaptation measures during periods of low humidity (risk of dehydration and soil dryness) and high humidity (proliferation of fungi and respiratory diseases).

### **6.3.6 Precipitation**

Precipitation is the amount of water transferred from the atmosphere to the Earth in liquid or solid form as rain, drizzle, snow, hail, or sleet, per unit area of a horizontal surface, during a given period of time. It is expressed in mm.

The precipitation in the project area has an average annual rainfall of 500 mm – 750 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.

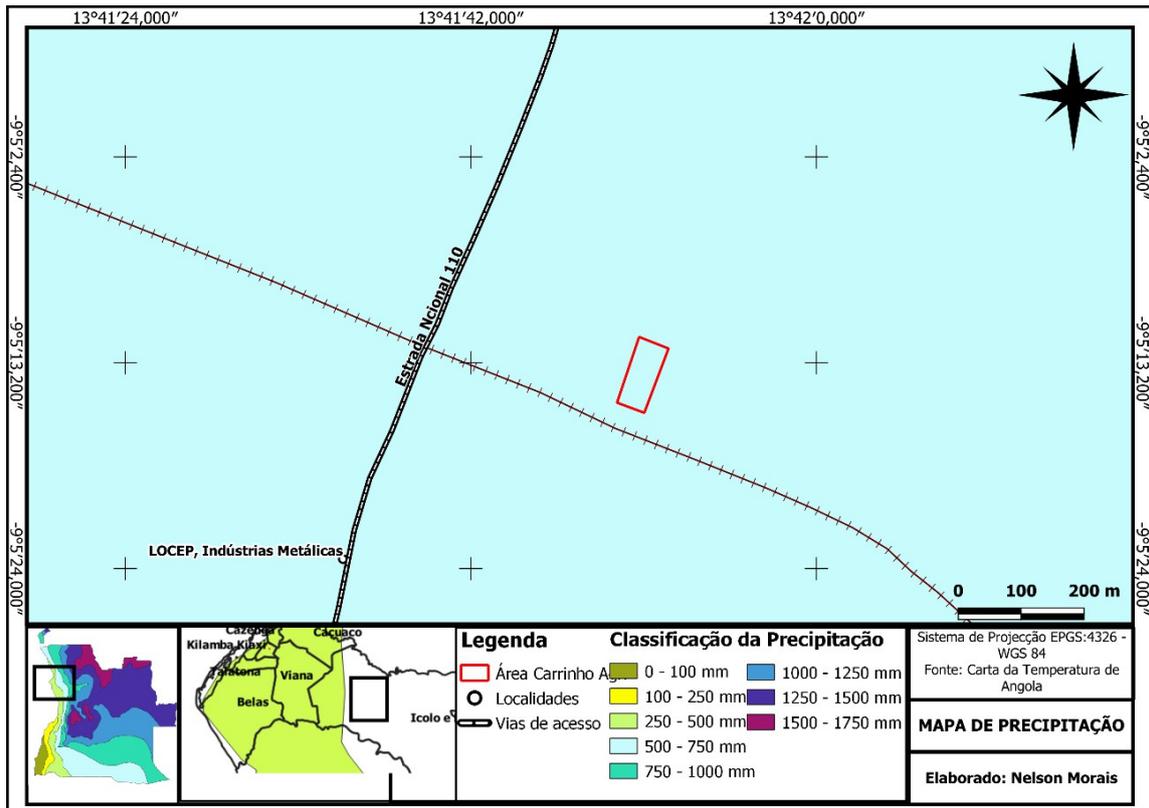


Figure 23 – Precipitation map.

### 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.

### 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 Catete region has a seasonal pattern, influenced by the dry tropical climate with maritime influence (dry subtropical with a rainy season).

During the rainy season (October to April), cloud cover tends to be more frequent and dense, especially in the peak months of rainfall (November to March), when the sky is often partly to completely overcast, favoring the occurrence of convective rainfall. The presence of cumulonimbus clouds is common during these periods, associated with thunderstorms and intense precipitation in short periods.

During the dry season (May to September), cloud cover decreases significantly, with generally clear or slightly cloudy skies. During this period, especially from June to August, fog or dry fog (cacimbo) may occur in the mornings, resulting from the influence of the cold Benguela Current and drier air, which temporarily reduces visibility but does not generate precipitation.

In general, cloud cover varies from moderate to high in the rainy season and low in the dry season, directly influencing solar radiation, daytime temperature, and the availability of light for agriculture.

## **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 grain silos are located in Catete.

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).

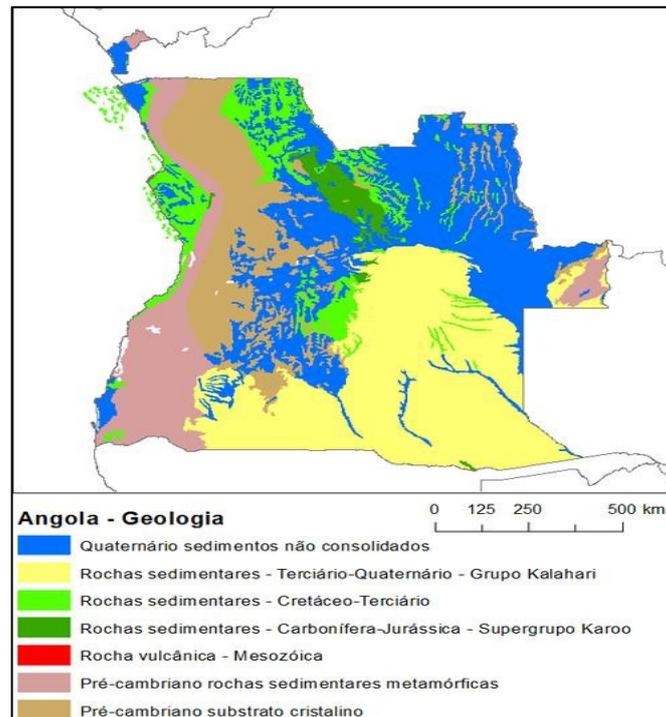


Figure 24 - Geological map of Angola

The relief of Luanda Province can be divided into several morphological units: coastal strip, coastal plain, undulating pre-mountainous plateau in areas further away from the coastal strip. This area belongs to a largely flattened zone completely covered with black sand, with signs of surface drainage, water lines, and wells, with soils (musseques) of predominantly coarse texture. Currently, several plots of land that were previously used for cultivation and grazing have been transformed into commercial and residential areas.

From a regional geological perspective, the municipality of Icolo e Bengo is part of Angola's coastline and is located in the western part of the Kwanza Basin. The sedimentary edge of the Kwanza extends from the northern and southern parts of the Kwanza River, reaching its maximum width in Dondo and narrowing both to the north (N'zento region) and to the south (Benguela region, Ponta das Limagens).

Based on the Kwanza Basin map (Total 1987), the district of Catete has formations dating from the Oligocene to the Miocene.

- Quifangondo Formation: limestone, dolomite, sand, marl, conglomerates – Oligocene-Miocene age;
- Quelo Formation: Sand, clay, and laterite – Pliocene-Pleistocene age;

- Luanda-Cacuaco Formation: sand, clay, calcareous marl, and sandstone – Middle Miocene age, among other formations.

The area where the unit is located is part of the Quifangondo Formation, as shown in the figure below.

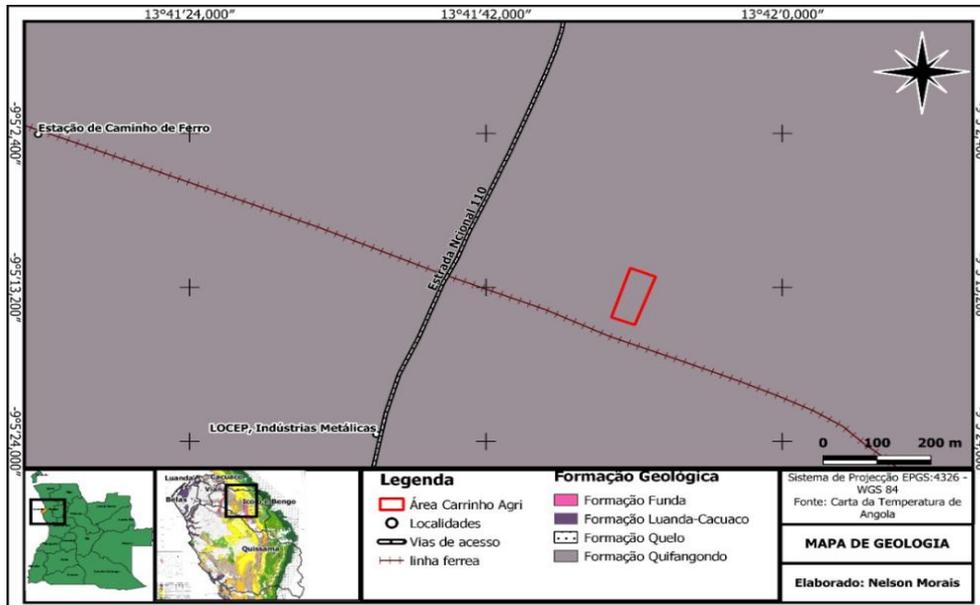


Figure 25 – Geological map.

### 6.4.3 Geomorphological context

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

consider 11



**Figure 26 – Main geomorphological units of Angola (according to Diniz)**

1. **Coastal Strip.** Encompassing the platform that runs 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 interior periphery, gently sloping down to the coast 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 formed.
2. **Subplateau Belt.** An intermediate surface marking the transition to the plateau interior, stretching from north to south 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.

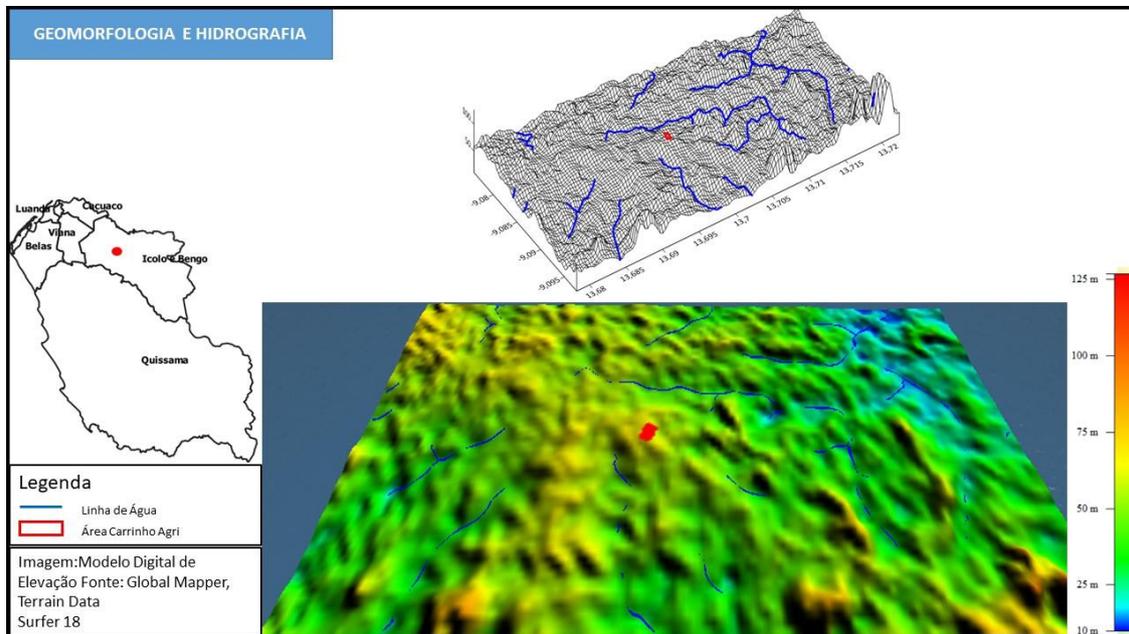
4. **Ancient Plateau.** An extensive plateau reaching an altitude of 1,750-1,800 m, forming a ridge line that defines very gentle slopes on either side, stretching for hundreds of kilometers and through which rivers meander in very wide valleys, almost at the level of the plateau. The monotony of the 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 to the south (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 meandering 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**

The regional geomorphology of the unit is relatively flat, with the lowest point at 10 meters and the highest point at 125 meters. The project area is located at an altitude of 75-100 meters, which rules out the possibility of flooding or water accumulation in the project area. As for the hydrography of the area, there are lines running north and southwest (SW) of the project area, as shown in the figure below.



**Figure 27 – 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.

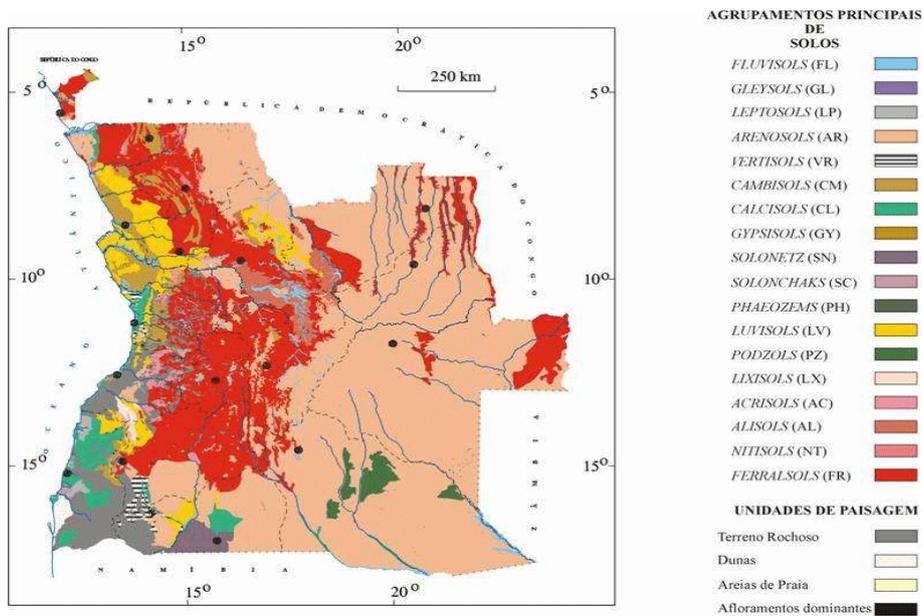
The analysis of this descriptor was based on a field survey of the site, carried out in August 2024.

### 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 nutrient silting 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 28 - 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.

Soil is the surface layer of the earth's crust, 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 calcareous, as can be seen in Figure 29.

Limestone soils are essentially formed by particles of limestone rock. They are a type of soil that contains a lot of calcium or lime, a material widely used in the construction of houses, and contain more than 30% limestone.

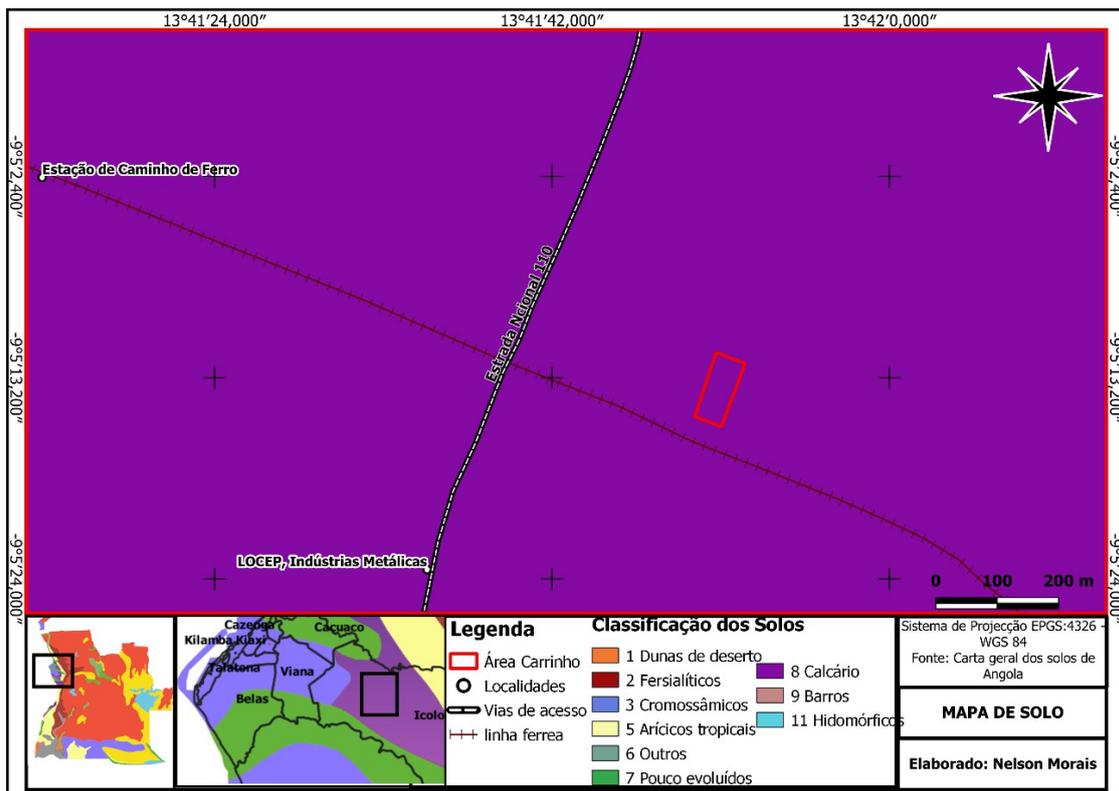


Figure 29 – Soil map.

### 6.5.3.1 Characterization of land occupation and use

The area occupied by the agricultural infrastructure for grain storage (silos) covers approximately 5,500 m<sup>2</sup>, and the project is located in a potentially commercial and agro-industrial area, bordered to the north by private residences, to the south by the railway line, to the east by vacant land, and to the west by private land.

In terms of road access, the main access road is the EN-230 or Catete road and the secondary road is the EN-110, with the other planned streets as reference points.

In morphological terms, the area of occupation is relatively flat, with few significant variations in natural relief. The terminal area is relatively flat, as it has undergone earthworks in the past, while the downstream part is characterized by a relatively steep relief due to the existence of a temporary thalweg.

In terms of built-up areas, the zone is located in an area conducive to the development of agro-industrial and commercial projects. The neighborhood of Adiamento is located in the area directly affected by the project.

Adoimento neighborhood. In the areas bordering the grain terminal, there are the Calambuzo 1 and 2 neighborhoods and Estação, which have low to medium population density and consist of permanent and temporary residences.

The remaining area is occupied by natural and semi-natural zones, whose vegetation cover consists mainly of herbaceous and shrub species and some trees.



Figure 30: Shacks in the Adoimento neighborhood



Figure 31: Residents' committee (Estação neighborhood)

## 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 m<sup>3</sup>/s, equivalent to an annual mass of 145,002 Hm<sup>3</sup>. This represents an average annual surface runoff of 116,300 m<sup>3</sup>/km<sup>2</sup> of Angolan territory and 11,809 m<sup>3</sup>/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, 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 swamp (Botswana) and has the Cuchi and Cuito as its main tributaries;
- Zambezi Watershed (19.7% of the country's total area), which includes the rivers of the east 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 <sup>2</sup> )	BASIN	AREA (KM <sup>2</sup> )
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 32 - Angola's river basins**

**6.6.3 Local hydrography**

In hydrological terms, the study area falls within the Atlantic watershed.

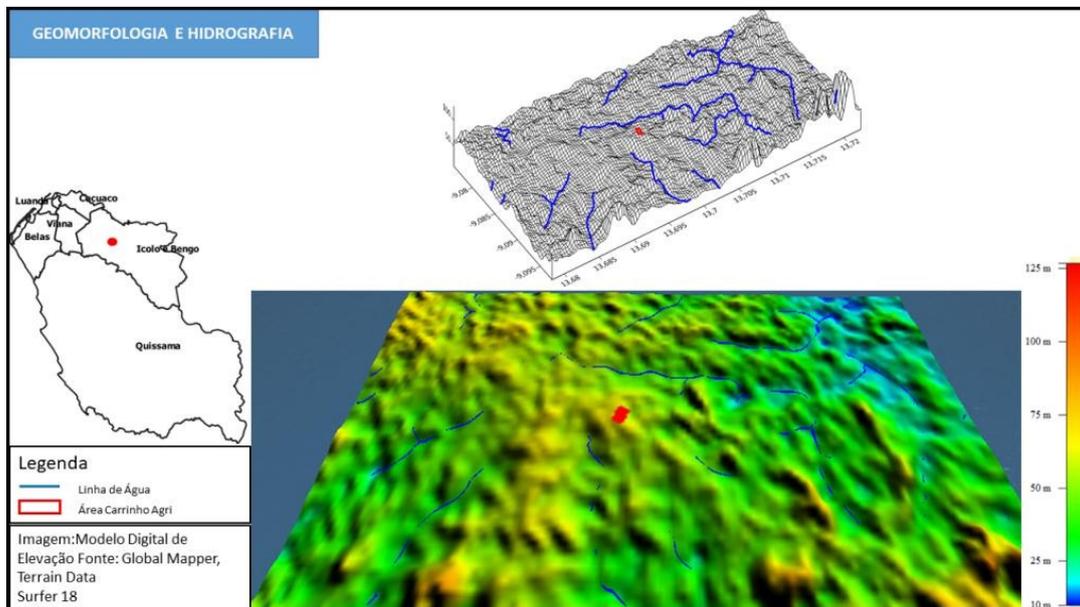
The hydrology of Catete, located in the municipality of Icolo e Bengo, is part of the Bengo River Basin, one of the most important in northern Angola. This basin plays a key role in supplying drinking water to the city of Luanda and for agricultural and livestock activities in the region.

The Bengo River is the main watercourse in the basin and flows west of Catete, fed by several seasonal and permanent tributaries, such as the Lufu and Zenza rivers. The basin is characterized by

a hydrographic network with wide valleys and relatively permeable soils, allowing infiltration and the existence of accessible aquifers, which benefits the local population with groundwater through wells and boreholes.

During the rainy season (October to April), there is greater recharge of rivers and groundwater tables, but in the dry season (May to September) there is a significant reduction in the flow of smaller rivers, which can affect the continuity of water supply for domestic and agricultural uses.

Despite its good water potential, the region faces challenges such as water pollution caused by domestic and agricultural waste and the degradation of riverbanks. However, there are opportunities for the implementation of sustainable collection systems, modern irrigation, and protection of springs, which are essential to ensure the rational use of water from the Bengo Basin in Catete and its surroundings.



**Figure 33 – Geomorphology and Hydrography Map**

**6.6.4 Water uses**

There are no rivers in the area directly affected.

In the Catete region, water is mainly used for domestic consumption, agriculture, and livestock farming. The population depends on various sources such as rivers in the Bengo basin, artesian wells, boreholes, and fountains to meet their daily needs for drinking water, hygiene, and

cleaning. However, in many areas, access is still limited and water is not always properly treated, which can pose risks to public health.

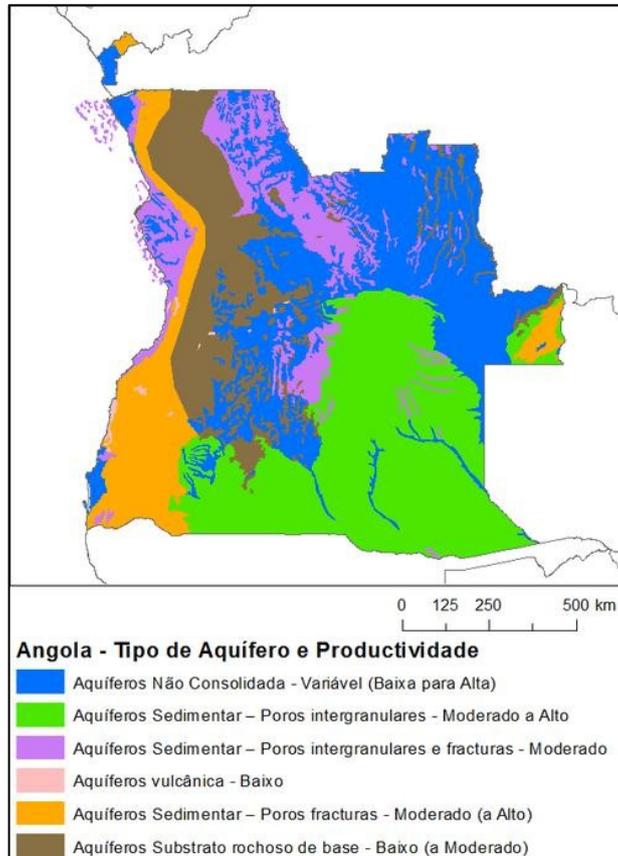
Agricultural activity, which is very common in Catete, uses water to irrigate crops such as corn, beans, cassava, and vegetables. Livestock farming, including cattle, poultry, and pigs, also requires constant water availability. Small farmers and breeders use manual methods and, to a lesser extent, motorized systems for irrigation and water supply to animals, especially in areas close to rivers and ponds.

## 6.7 UNDERGROUND WATER RESOURCES

### 6.7.1 Hydrogeological Framework

According to FAO data, the availability of groundwater in Angola is estimated at around 58 km<sup>3</sup>/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 34 - Type of aquifers and productivity**

As for groundwater, the system is estimated to be very productive, with existing wells between 8 and 11 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 in carbonate rocks, the degree of vulnerability is estimated to be (V5).

## 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 among 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.

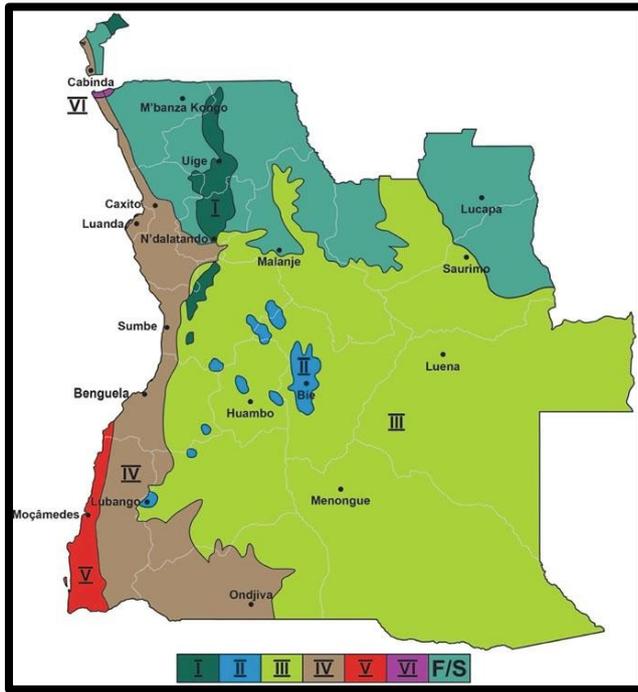
The cataloging of species that make up a given environment is essential for assessing the risks of environmental impacts in a certain area of the country, in order to ensure a balance between human activities and the natural environment, since biodiversity (fauna and flora) plays a fundamental role that 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.

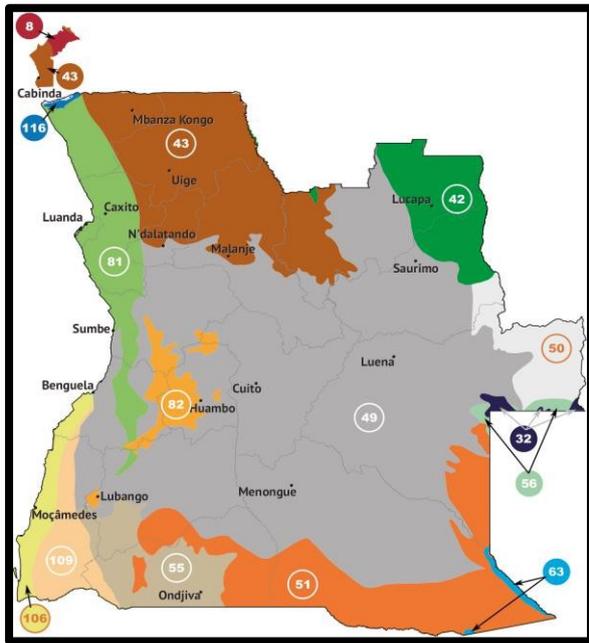
Angola's biomes and mosaics comprise the following zones: Guinean-Congolese tropical forest (I); Afromontane forests and grasslands (II); Mesic savanna (III); Arid savanna (IV); Desert (V); Mangroves (VI) and Guinean-Congolese tropical forest/mesic savanna transition mosaic (VII) (Figure 1) (HUNTLEY, 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 35 - Biomes of Angola | Source: HUNTLEY (2023)**



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

- 8 - Atlantic Equatorial Coastal Forest
- 32 - Zambezan *Cryptosepalum* Dry Forest
- 42 - Southern Congolese Forest-Savanna Mosaic
- 43 - Western Congolese Forest-Savanna Mosaic
- 49 - Angolan Miombo Woodland
- 50 - Central Zambezan Miombo Woodland
- 51 - *Baikiaea* Zambeziana Forest
- 55 - Angola 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 36 - 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, under the terms of 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**

Knowledge about the spatial distribution of vegetation and the composition of its species is fundamental to any type of natural resource management and conservation planning.

Vegetation serves as habitat for other groups of organisms and is the energy source of an ecosystem. As such, it integrates many ecological processes and reflects patterns of topography, geology, soil, hydrology, and climate.

##### **6.8.4.2 Characterization of flora and vegetation**

The project area in Catete has vegetation predominantly consisting of plants from the Malvaceae, Verbenaceae, Poaceae, and Fabaceae families.

These plants are mostly shrubs, notably the species *Calotropis gigantea* (madar), *Vernonia amygdalina* (mululu), *Opuntia stricta* (prickly pear), and *Ipomoea ochracea* (morning glory). These plants make up about 40 to 50% of all vegetation, accompanied by the grass species that make up the savanna.

There are also other groups of plants, including trees such as *Azadirachta indica* (neam), *Adansonia digitata* (baobab), and *Delonix regia* (red acacia), and herbaceous plants, notably *Datura metel* (kapassarinho) and *Cymbopogon citratos* (Chá-caxinde).

None of the species identified in the area are endangered, with most falling within the "least concern" (LC) category of the IUCN. However, there are species listed as invasive on Angola's red list, such as *Opuntia stricta* and *Calotropis gigantea*, which represent about 60% of the invasive exotic species present

in the area. The vegetation types of open forest and savanna woodland are described. The vegetation consists mainly of sparse trees and a dense layer of grasses.

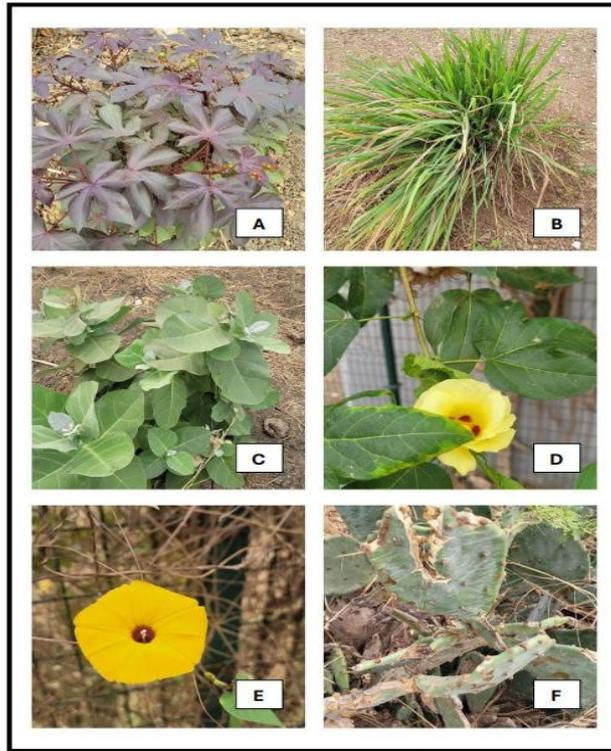


Figure 37 - Main Plant Groups in the Study Area: *Ricinus Communis* (A); *Cymbopogon Citratos* (B); *Calotropis Gigantea* (C); *Gossypium Herbaceum* (D); *Ipomoea Ochracea* (E) and *Opuntia Stricta* (F).

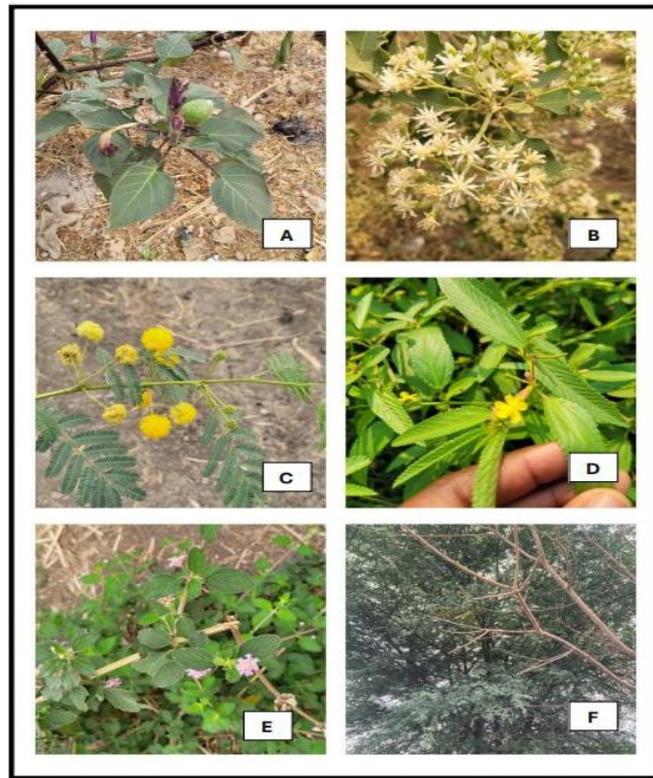


Figure 38: *Datur Metel* (A); *Vernonia Amygdalina* (B); *Vachelia Nilotica* (C); *Waltheria Indica* (d); *Lippa sp.* (E) and *Azadirachta Indica* (F)

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

Taxonomic groups			Species			Conservation Status		Ecological Behavior	
Division	Class	Family	Scientific name	Common name	Size	IUCN status	National status	Exotic	Invasive
Tracheophyta	Magnoliopsida	Meliaceae	<i>Azadirachta indica</i>	Neam	Arborea	LC	NA	x	x
Tracheophyta	Magnoliopsida	Malvaceae	<i>Adansonia digitata</i>	Baobab	Arboreal	LC	NA		
Tracheophyta	Liliopsida	Poaceae	<i>Lemongrass</i>	Chá-caxinde	Herbaceous	LC	NA		
Tracheophyta	Magnoliopsida	Verbenaceae	<i>Lippia javanica</i>	Capungo-pungo	Shrub	NA	NA		
Tracheophyta	Magnoliopsida	Solanaceae	<i>Datura metel</i>	Kapassarinho	Herbaceous	LC	NA		
Tracheophyta	Magnoliopsida	Convolvulaceae	<i>Ipomoea ochracea</i>	Morning glory	Shrub	LC	NA	x	x
Tracheophyta	Magnoliopsida	Malvaceae	<i>Gossypium herbaceum</i>	Cotton plant	Arboreal	LC	NA		
Tracheophyta	Magnoliopsida	Cactaceae	<i>Opuntia stricta</i>	Prickly pear	Shrub	LC	Category D	x	
Tracheophyta	Magnoliopsida	Fabaceae	<i>Delonix regia</i>	Red acacia	Arboreal	LC	NA		
Tracheophyta	Magnoliopsida	Asteraceae	<i>Vernonia amygdalina</i>	Mululu	Shrub	NA	NA		
Tracheophyta	Magnoliopsida	Euphorbiaceae	<i>Ricinus communis</i>	Castor bean	Shrub	NA	NA		
Tracheophyta	Magnoliopsida	Fabaceae	<i>Vachellia nilotica</i>	Acacia	Arboreal	LC	NA		
Tracheophyta	Magnoliopsida	Apocynaceae	<i>Calotropis gigantea</i>	Madar	Shrub	LC	Category D	x	x
Tracheophyta	Magnoliopsida	Verbenaceae	<i>Lippia</i> sp.	Lemon verbena	Shrub	NA	NA		

## 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 Terrestrial Invertebrates

Studies on terrestrial invertebrates in Angola are extremely scarce. However, the publication by HUNTLEY *et al.* (2019) on Angola's biodiversity, which compiles existing information on most flora and fauna groups, points to a very high diversity of some invertebrate groups in the country.

126 species of terrestrial invertebrates are described as potential for the Project's area of influence, all belonging to the Class Insecta (Order Odonata). All these species have a conservation status of Least Concern (IUCN, 2020).

### 6.8.5.3 Herpetofauna

According to the IUCN (2020) and HUNTLEY (2019), the amphibians potentially present in the project's area of influence belong mainly to species with wide distribution and no unfavorable conservation status, nor status assigned by the Red List of Species of Angola.

In terms of reptiles, three species were confirmed as occurring in the area through observation in the study area, two of which were lizards (suborder Sauria) and one was a snake (suborder Ophidia). The lizards confirmed in the study area were *Agama agama*, better known

as the common agama lizard, and *Gerrhosaurus multilineatus*, known as the keeled lizard. The snake sighted in the area was *Boaedon angolensis* (Angolan house snake).



Figure 39: *Gerrhosaurus Multilineatus* (A); *Boaedon Angolemsis* (B); *Agama Agama* (C)

#### 6.8.5.4 Avifauna

Avifauna is one of the groups vulnerable to changes in their habitat.

The main birds described as occurring in the study area are mainly of the order Passeriformes (birds), with emphasis on the species *Corvus albus* (white-collared crow), *Streptopelia semitorquata* (red-eyed dove), *Uraeginthus angolensis* (blue-breasted roller), *Numida meleagris* (guinea fowl), and *Estrilda astrild* (waxbill).

These species are mainly found in open savanna fields and miombo forests, and are all classified as Least Concern (LC) by the

IUCN, and are fundamental to the balance of ecosystems and serve as indicators of environmental quality.

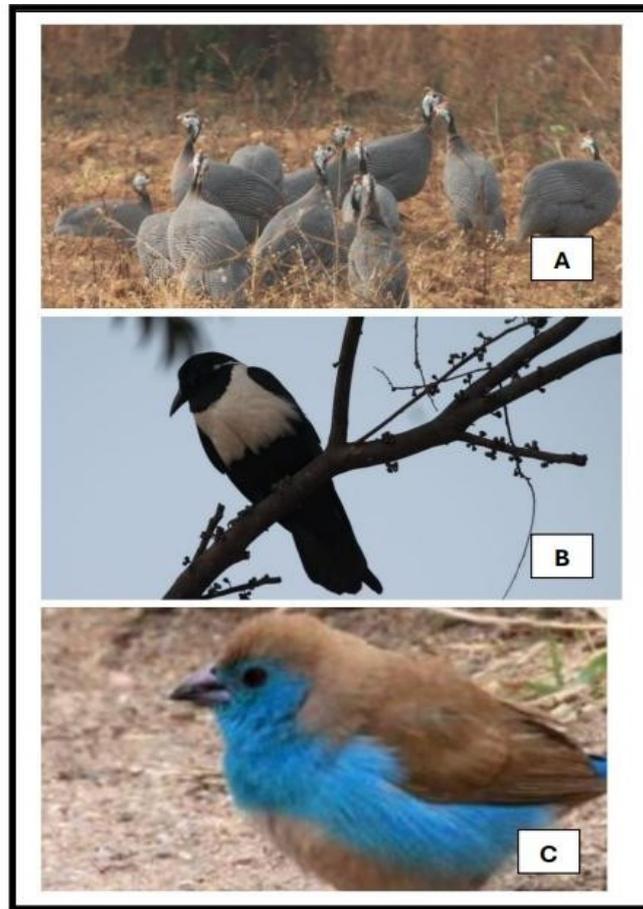


Figure 40: **Main Birds in the Study Area: *Numida Meleagris* (A); *Corvus Albus* (B); *Uraeginthus Angolensis* (C)**

#### 6.8.5.5 Mastofauna

Mastofauna represents the faunal group used as environmental indicators in the areas where they occur. Approximately 291 species of mammals have been described for Angola, 12 of which are endemic.

During the field survey phase, no species of non-flying wild terrestrial mammals were identified in all areas of the study zone.

As this is an area that is already heavily anthropized and has a large human population, most of the mammals that occur in the area are those used for agriculture and livestock, such as cattle, pigs, and goats.

Individuals of the order *Chiroptera* (bats) were recorded in the study area. These are flying mammals and are described as the most abundant group of mammals in Angola, accounting for one-third of all mammals in the country. They are an important conservation group, as they represent Angolan fauna, and most of these animals are considered endemic or quasi-endemic to Angola.



Figure 41: *Chiroptera* (bats) in the Study Area

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 FAUNA IN THE DIRECT PROJECT AREA CAT ETE

Taxonomic groups	Species				Conservation status		Ecological behavior	
	Family	Scientific Name	Common name	Confirmed	Status IUCN	Status National	Migratory	Congregator
Avifauna	Cisticolidae	<i>Cisticola juncidis</i>	Reed Bunting		LC	NA	x	
	Corvidae	<i>Corvus albus</i>	White-bellied crow	x	LC	NA		x
	Estrildidae	<i>Estrilda astrild</i>	Waxbill	x	LC	NA		
	Ploceidae	<i>Euplectes hordeaceus</i>	Black-winged red bishop		LC	NA		
	Ploceidae	<i>Yellow-mantled Widow</i>	Yellow-mantled widow		LC	NA		x
	Accipitridae	<i>Gypohierax angolensis</i>	Angolan Palm-nut Vulture		LC	NA	x	
	Bucerotidae	<i>Lophoceros alboterminatus</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 yellow		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	
	Estrildidae	<i>Angolan Greenfinch</i>	Blue-breasted Roller	x	LC	NA		x
	Viduidae	<i>Vidua macroura</i>	Pincushion widow	x	LC	NA		x
<b>Herpetofauna</b>	Agamidae	<i>Agama agama</i>	Common agama	x	LC	NA	x	x
	Agamidae	<i>Agama mucosoensis</i>	Mucous agama	x	LC	NA	x	x
	Lamprophiidae	<i>Boaedon angolensis</i>	Angolan house snake	x	LC	NA	x	
	Lacertidae	<i>Gerrhosaurus multilineatus</i>	Keeled lizard	x	LC	NA	x	x
	Pythonidae	<i>Python sebae</i>	African python		NT	NA	x	
<b>Mastofauna</b>	Pedetidae	<i>Pedetes capensis</i>	Jumping hare	x	LC	NA		x
	Bovidae	<i>Philantomba monticola</i>	Mountain goat	x	LC	NA	x	x
	Hipposideridae	<i>Macronycteris gigas</i>	Giant round-leaved bat round		LC	NA		x
	Molossidae	<i>Chaerephon pumilus</i>	Pale free-tailed bat		LC	NA		x
	Molossidae	<i>Otomops martiensseni</i>	Free-tailed bat big-eared		NT	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 variiani*), 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 42: Conservation areas in Angola: • 1 Maiombe • 2 Quiçama • 3 Cangandala • 4 Cameia • 5 Iona • 6 Bicuar • 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)

The area or environmental conservation unit closest to the project zone is the Quiçama National Park, which is approximately 91 km from the project zone. Therefore, the actions developed for its implementation would not have a negative impact on the nearest conservation unit, as the minimum boundary for considering an impact on conservation areas is 5 km (IUCN, 2020).

## 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 which 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 limited by relief or other elements, within which all points are mutually visible,"* but also those in which the landscape presents 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 with a small 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:

- Adiamento neighborhood;
- Calambuzo 1 and 2 neighborhoods;
- National Road EN-110;
- CFL railways, etc.

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, land use, and vegetation cover, three distinct landscape units were identified and defined: UPH1-Semi-natural, UHP2-Peri-urban, UHP3-Consolidated urban

#### **UPH1-Semi-natural**

UPH1 is characterized by the absence of dominant occupation, with human and natural occupation coexisting. It has a relatively flat relief and 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 natural thalwegs.

The site for the Catete grain terminal is located within UHP1. The area has already been deforested.



Figure 43: Semi-natural area



Figure 44: Shacks in the project area

### UHP2-Peri-urban zone

This UHP is characterized by residential and/or mixed use (residential, informal commerce, and infrastructure), which extends along the EN 110 and on the outskirts of the village of Catete. It comprises a low-density settlement, with some degree of planning, which is organized along the paved road leading to the site where the agricultural infrastructure (silos) will be built.



Figure 45: National Road 110/Calambuzo neighborhood 1

### UHP3-Consolidated Urban

UHP3 comprises the consolidated urban fabric in the areas bordering and in the center of the town of Catete, which has a mixed occupation, characterized by a medium to high-density agglomeration, crossed by the paved EN-110 road network and intermediate unpaved and paved roads. This UHP includes the administrative center of the town of Catete.

#### 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 structural elements, their functioning, and their 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 evaluation 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 inversely with visual absorption capacity, which means that a given 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**

ABSORPTION CAPACITY ABSORPTION	VISUAL QUALITY		
	High	Medium	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 QUALITY	ABSORPTION CAPACITY	LANDSCAPE SENSITIVITY
UHP1- Semi-natural	High	High	High
UHP2-Peri-urban area	Low	High	Reduced
UHP3-Consolidated Urban Area	Reduced	High	Reduced

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

UHP2 and UHP3, which are characterized by some dominant human occupation, characterized by population clusters with consolidated and densified occupation, have reduced landscape sensitivity.

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

With regard to visual quality, which is a characteristic dependent on subjective factors, its assessment is based fundamentally 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 and particle emissions (dust).

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 caused by traffic. 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 (CH<sub>4</sub>), carbon dioxide (CO<sub>2</sub>), particulate matter (PM<sub>10</sub> - particles with an aerodynamic diameter <10 µm), nitrogen oxides (NO<sub>x</sub>/NO<sub>2</sub>), sulfur oxides (SO<sub>x</sub>/SO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), 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 and the air quality data for the study area and surrounding area are not known, it is not possible

to say 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 NOISE ENVIRONMENT

### 6.11.1 General Considerations

This descriptor was developed based on information gathered during a field visit in August 2024, on a local analysis and close examination of 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 pressure in 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 in full possession of their hearing abilities, 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 sound pressure level scale 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,  $L_{Aeq}$ , 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  $L_{Ap}$  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 impact 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 the 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: <b>Testo 410-2</b>	Humidity	58
	Temperature	25.5 °C
	Wind speed	1.5 m/s
	Clear skies	Cloudy
Equipment positioning surface	Dirt road	

Table 25: Results obtained

Measured parameters	Results	Location	Coordinates
LAeq	40.3 db	Catete Silos	9° 5'11.95" S 13°41'50.81" E
L95	27.7 db		
L50	33.1 db		
L5	45.5 db		
Lcpeak	84.8 db		



Figure 46 – Noise measurement at the site

The sound level values obtained are 40.3 db, which does not exceed the noise limit recommended by the WHO for mixed areas. The discomfort threshold for continuous noise (LAeq) may be exceeded sporadically during the daytime when machines, vehicles, and/or other equipment that may cause noise are in use. It is estimated that these will exceed (50 dB(A)).

## **6.12 SOCIOECONOMICS**

### **6.12.1 General Considerations**

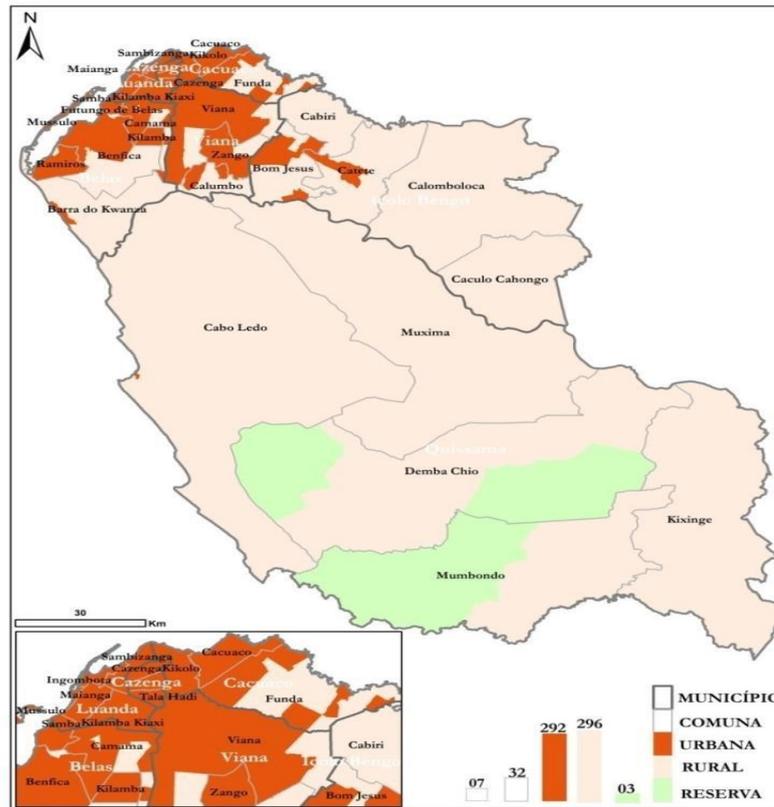
This descriptor was developed based on elements collected during the field visit carried out in August 2024, on the local analysis of the surrounding area and region, on potential socioeconomic development factors, and on bibliographic research.

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**

The municipality of Icolo e Bengo is located on the west coast of Angola, in the province of Luanda, bordering the municipality of Dande to the north, Cambambe to the east, Viana and Cacucaco to the west, and Quissama to the south. The municipality is subdivided into two (2) districts, Bela Vista Catete, and five communes, namely: Bom Jesus do Kwanza, Cabiri, Caculo Cahango, and Cassoneca.

The municipality of Icolo e Bengo has 204 neighborhoods, and the city covers an area of 3,819 km<sup>2</sup>, with approximately 126,935 inhabitants, according to 2018 population projections, which corresponds to a population density of 33.23 inhabitants/km<sup>2</sup>.



**Figure 47 - Administrative division of Luanda**

**Table 26: Number of municipalities, communes, and localities in Luanda (Census, 2014)**

Província e municípios	Comuna	Localidades		Total
		Urbana	Rural	
<b>Luanda</b>	<b>32</b>	<b>292</b>	<b>296</b>	<b>588</b>
Luanda	6	98	0	98
Cazenga	3	28	0	28
Cacuaco	3	35	17	52
Viana	3	39	14	53
Belas	7	76	29	105
Icolo e Bengo	5	14	114	128
Quissama	5	2	122	124

\* Não constam 3 (Três) localidades cadastradas como reservas por constituírem áreas desabitadas

**Source: Luanda population census data. INE, 2014.**

Catete, located in the municipality of Icolo e Bengo, province of Luanda. According to 2014 population projections by the National Statistics Institute, it has a population of 23,284 inhabitants and a territorial area of approximately 1,328 km<sup>2</sup>.

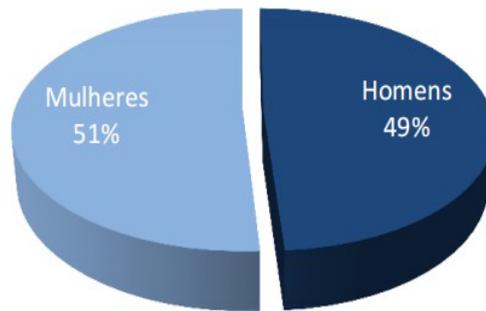
It is bordered to the north by Quiminha and Cazengo (Cuanza Norte), to the south by Cabiri and Viana, to the east by Cambambe (Cuanza Norte), and to the west by Funda and Cacuaco. The town is strategically located along National Road No. 230 and the Luanda Railway, which facilitates its connection with Luanda and the interior of the country.

**6.12.3 Demographics and population**

According to the Final Results of the 2014 Census, the population of Luanda on the census date, May 16, 2014, was 6,945,386. Ninety-seven percent reside in urban areas and 3% in rural areas.

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

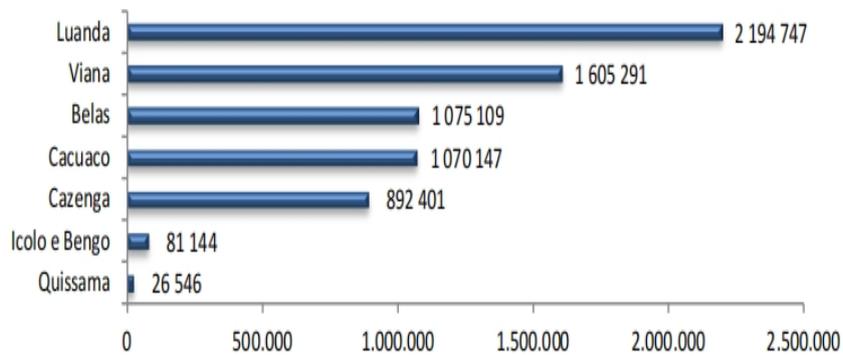
Província e área de residência	Total		Homens		Mulheres	
	Nº	%	Nº	%	Nº	%
<b>Luanda</b>	<b>6 945 386</b>	<b>100,0</b>	<b>3 401 996</b>	<b>100,0</b>	<b>3 543 390</b>	<b>100,0</b>
Urbana	6 760 444	97,3	3 308 218	97,2	3 452 227	97,4
Rural	184 942	2,7	93 778	2,8	91 163	2,6



**Figure 48 - Population, by sex, 2014**

In the province of Luanda, 3,543,390 of the resident population are women, corresponding to 51% of the total, while the male population is 3,401,996, representing 49% of the total resident population in Luanda.

**Graph 1: Population by municipality, 2014**



Luanda is the richest and most developed province in the nation, home to large industrial, commercial, and service conglomerates, and also the one with the most infrastructure resources.

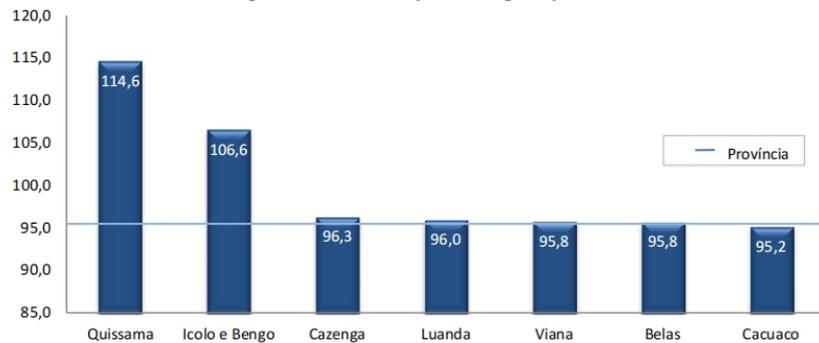
The municipality of Luanda is the most populous with 2,194,747 people, representing about one-third of the province's population (32%). With less than 100,000 inhabitants are the municipalities of Icolo and Bengo (81,144 inhabitants) and Quissama (26,546 inhabitants).

Approximately 369 people live in each square kilometer of Luanda province. The municipality of Cazenga has the highest population density in the province with 24,435 inhabitants per square kilometer, about 66 times higher than the provincial average. It is followed by the municipality of Luanda with 18,654. The municipalities of Icolo e Bengo and Quissama have an average of 27 and 2 inhabitants per square kilometer, respectively.

The sex ratio expresses the ratio between men and women. The sex ratio at the provincial level is 96, meaning that in Luanda there are on average 96 men for every 100 women.

The municipalities of Quissama and Icolo e Bengo have a sex ratio above 100, meaning that in these municipalities there are on average 115 and 107 men for every 100 women, respectively. The municipality of Cacuaco has the lowest ratio, with 95 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).

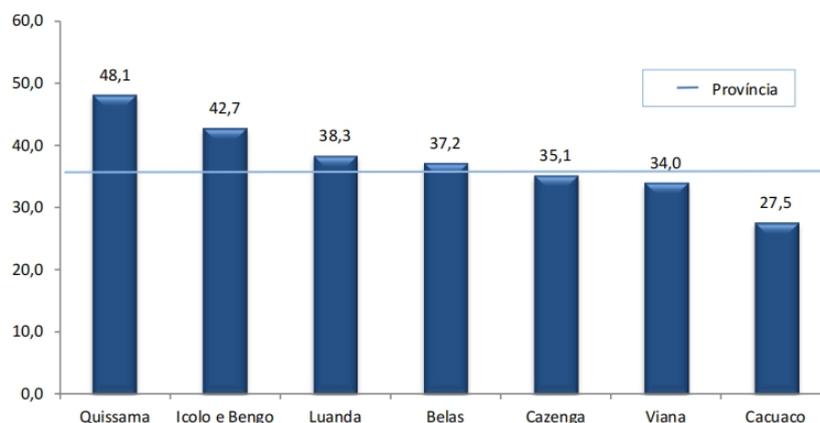
The 35-44 and 45-54 age groups account for the largest number of employed people, according to the Angola Employment Survey (IEA).

Almost half of the population (47.5%) works in agriculture, hunting, and fishing, followed by commerce with 22.6%. Most of the employed population (79.8%) works 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.

For the province of Luanda, the calculation of unemployment rates using ILO definitions of unemployment tends to underestimate unemployment in developing countries, where there is a high intensity of informal economic activities. Most people are self-employed and most people, even if they do not have a job, engage in some activity to support themselves and their households. In this context, Angola has used the flexible concept, which removes the third criterion. The unemployment rate is the ratio between the number of unemployed and the number of economically active people. This indicator represents the size of the available and unused labor force in the province.

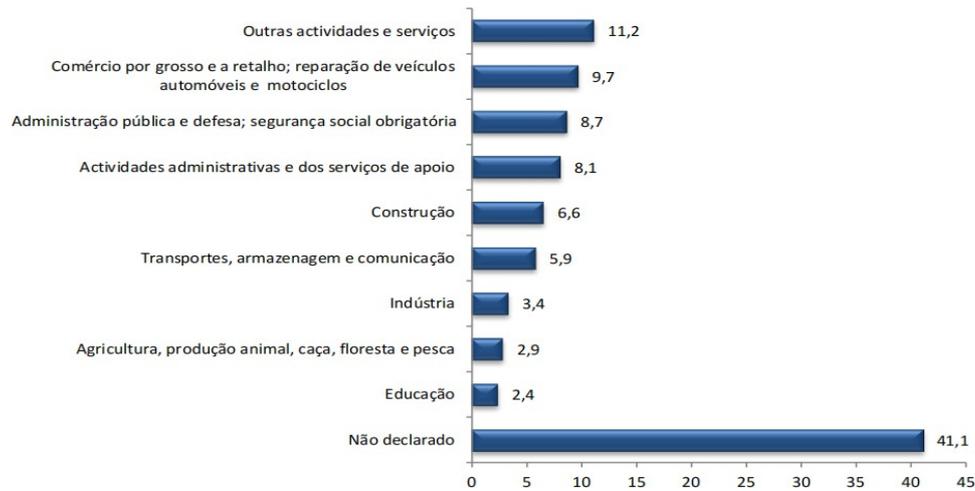
**Graph 3: Employment rate by municipality, 2014**



The municipalities of Quissama and Icolo e Bengo have the highest employment rates, with 48% and 43%, respectively. At the opposite end of the spectrum is the municipality of Cacucos, with 27%.

Wholesale and retail trade are among the most represented economic activities in the province, accounting for 10%.

Graph 4: Employed population by main activities



The employment sector in the municipality of Icolo e Bengo, including the district of Catete, reflects the socioeconomic characteristics of the region, which is undergoing development, with emphasis on the primary and tertiary sectors. The local economy is based mainly on agriculture and construction, which employ a large part of the working population. Agriculture, especially the cultivation of cassava, corn, beans, and vegetables, is an important source of employment, as are cattle raising and other livestock-related activities.

The construction and infrastructure sector also represents a significant area of employability, driven by urban growth and demand for new housing and basic infrastructure, such as roads and water supply systems. This sector has attracted both skilled and unskilled labor.

In addition, the service sector has gained importance, with the growing presence of small businesses, local commerce, and administrative services, particularly related to the proximity to Luanda. Tourism and hospitality also offer employment opportunities, especially with the appreciation of the region's historical and cultural heritage. However, the labor market faces challenges such as a lack of professional qualifications, informal employment, and unequal access to opportunities, making it necessary to invest in education and technical training to meet the growing demands of the productive sectors and improve local employability.

Although the commune has several services available that can offer a considerable number of jobs, the exact unemployment rate is unknown, but it is estimated to be high, according to the data presented above, which reflect the reality of the country today.

**6.12.5 Economic activities**

**6.12.5.1 Agriculture**

The agricultural sector in the province of Luanda is characterized by small and medium-scale activities, mainly focused on supplying local markets and the capital, given the rapid population growth and demand for fresh food. Agriculture is practiced both in peri-urban areas and in rural areas of the municipalities that make up the province, such as Icolo e Bengo and Quissama, which have more fertile land suitable for cultivation.

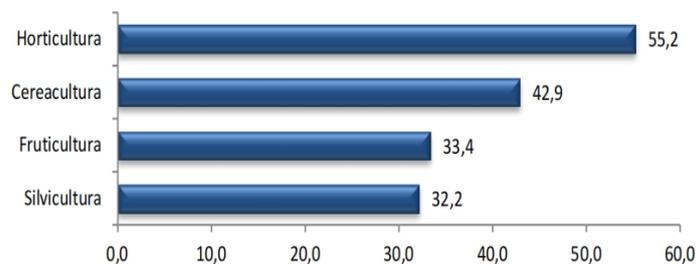
The main crops grown include vegetables such as tomatoes, lettuce, onions, and cabbage, as well as cassava, corn, and sweet potatoes. These products are in high demand in Luanda's urban markets and contribute to the food security of the population. Fruits such as bananas, pineapples, and mangoes are also grown and are common on small farms and plantations.

In 2014, about 12% of households in the province of Luanda were engaged in some form of agricultural activity.

**Table 28: Households engaged in agriculture. 2014**

Província	Nº	%
Luanda	176 767	11,9

**Graph 5: Households, according to the type of agricultural activities practiced (Census, 2014)**



Local agriculture in Catete plays an essential role in the subsistence of communities and in supplying agricultural products to the capital city. Agricultural practice is predominantly

family-based and traditional, although there are some cooperatives and private farms that seek to modernize production.

The main crops grown in the region include corn, cassava, beans, sweet potatoes, bananas, vegetables (such as tomatoes, cabbage, onions), and tropical fruits. These crops are favored by the fertility of the soil and the presence of waterways such as the Zenza River, which allow for irrigation, especially in riverside gardens.

Despite its agricultural potential, the sector faces several challenges, such as limited access to improved seeds, fertilizers, agricultural technologies, technical support, and rural credit. Soil degradation, pests, lack of modern irrigation systems, and production distribution infrastructure also limit the productivity of small farmers.

On the other hand, there are significant opportunities, including increased demand for fresh produce in Luanda, proximity to consumer markets, interest in investment in the agricultural sector, and the possibility of training local cooperatives. With adequate technical support and incentive policies, agriculture in Catete could become a strong pillar of the local and regional economy.

#### 6.12.5.2 Fishing

According to the 2014 census, about 2% of households in Luanda province are engaged in fishing activities.

Table 29: Households engaged in fishing, 2014

Província	Nº	%
Luanda	31424	2,1

The fishing sector in Catete is still limited in scope, being practiced in an artisanal and subsistence manner, mainly in rivers and lagoons in the region, such as the Zenza River, a tributary of the Bengo River. The activity is carried out by local fishermen, many of whom are organized informally or in small community associations and cooperatives, still in the early stages of development.

The main species caught include freshwater fish such as tilapia (cacusso), catfish (mussulo), mullet, etc., as well as crustaceans and mollusks on a smaller scale. Fishing is practiced with

nets, traditional traps, and simple boats, using rudimentary methods that limit productivity and fish conservation.

Among the challenges facing the sector are the lack of support infrastructure (such as cold storage and processing centers), restricted access to adequate equipment, lack of technical training, and environmental pressure on water resources, which can affect the availability and quality of species. The absence of enforcement also favors unsustainable practices in some cases.

However, the sector offers significant opportunities, such as strengthening artisanal fishing cooperatives, investing in aquaculture (fish farming in tanks or ponds), and promoting local fishing to supply regional markets, especially Luanda. With supportive policies, the sector can generate employment, income, and food security for the riverside communities of Catete.

At the municipal level, there are six cooperatives listed.

### **6.12.5.3 Livestock**

Livestock farming is a key sector for the subsistence of the Angolan 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
<b>Angola</b>	<b>259 640</b>	<b>136 216</b>	<b>58 951</b>	<b>69 846</b>
Cabinda	1 092	551	439	1 229
Zaire	1 173	2 101	640	2 814
Uige	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
Quando Cubango	968	506	60	80
Namibe	30 907	10 031	2 144	856
Huila	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: Number of birds 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
<b>Angola</b>	<b>60 986</b>	<b>1 799</b>	<b>104 254</b>	<b>11 043</b>	<b>551 219</b>	<b>51 529</b>	<b>12 796</b>	<b>659</b>	<b>544</b>	<b>114</b>
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
Huila	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 the tables above, livestock farming in Luanda is not practiced on a large scale by the business sector. On the other hand, local communities are also not 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.

The livestock sector in Luanda: there is a lot of cattle farming in Luanda. Many people are unaware of this because they think Luanda is just concrete (real estate), when in fact livestock farming is growing exponentially. The number of livestock farmers are grouped into cooperatives and are working with the support of various institutions to present concrete figures in the coming years on meat production in the province of Luanda.

The livestock sector in the municipality of Icolo e Bengo, particularly in the district of Catete, is an important economic activity that contributes both to the livelihood of local families and to the supply of regional markets. The raising of cattle, goats, pigs, and poultry is the main form of livestock farming practiced in the region, conducted on small and medium-sized rural properties, generally using traditional methods.

Cattle farming is mainly for meat and milk production, while goat and pig farming is for local consumption and sale in neighboring markets. Poultry farming, with the raising of chickens and other types of birds, is also significant, providing eggs and meat for the local economy. These products are sold in the markets of Icolo and Bengo and, to a lesser extent, in Luanda, given its proximity to the capital.

However, the livestock sector faces significant challenges, such as a shortage of adequate pasture, limited access to veterinary care, and traditional management practices that limit productivity. For the sector to grow and become more sustainable, investment would be needed in technical training, genetic improvement of livestock, and support infrastructure, such as irrigation systems and animal health centers. Modernizing this sector would help increase production and improve the quality of livestock products, boosting the region's economic development.

#### **6.12.5.4 Industry**

The industrial sector in Catete is in its infancy but has strategic potential due to its proximity to Luanda and the natural resources available in the region. Industrial activities are mostly small and medium-scale, focusing on agri-food processing, baking, block and brick production, carpentry, and artisanal metalworking.

The main industrial sectors include food processing (such as mills, corn and cassava flour production), construction (with block factories and concrete production), and artisanal production of furniture and construction materials. Some private initiatives and cooperatives have been investing in agricultural processing, adding value to local production, albeit to a limited extent.

Among the challenges faced by the sector are the lack of reliable electricity, scarcity of financing, difficulties in accessing industrialized raw materials, poor infrastructure (such as roads and water supply systems), and lack of specialized technical training. The weak link between rural producers and small industrial units also limits the integrated growth of the sector.

However, there are clear opportunities for local industrial development, including the establishment of small agro-processing industries, support for locally based enterprises, and the creation of planned industrial zones with incentives to attract investment. The use of young labor and its strategic location in relation to Luanda could make Catete a promising hub for light and agro-industrial manufacturing in the future.

The development of industrial zones and improvements in infrastructure, such as roads and electricity, are necessary to drive industrial growth in a more accelerated and sustainable manner.

#### **6.12.5.5 Trade**

The trade sector, which is 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 Catete plays a key role in the local economy, dominated by informal and small-scale activities. Trade is mainly carried out in local markets, warehouses, canteens, and small family establishments, with a strong presence of street vendors. Informality characterizes much of the sector, with low regulation but broad participation by the population.

Among the well-known commercial areas are the Catete Municipal Market, several neighborhood canteens, small wholesale warehouses, and some private mini-markets, usually located along the national highway and in areas of higher population density. The presence of large stores or commercial chains is still very limited, although there is growing private interest due to the proximity to Luanda.

The main products sold include foodstuffs (flour, rice, oil, salt, dried fish, vegetables), clothing, footwear, household items, beverages, construction materials, and fuel on a small scale. Most of these products are purchased in Luanda and resold in Catete, with some local agricultural production also supplying the markets.

Challenges in the sector include a lack of adequate market infrastructure, poor access to credit, widespread informality, price instability, and a deficient logistics chain. However, there are significant opportunities, such as the regulation of informal trade, the improvement

commercial infrastructure, the promotion of merchant cooperatives, and the potential for growth in local consumption driven by proximity to expanding urban areas.

#### 6.12.5.6 Financial, Banking, and Insurance System

The banking and insurance sector in the district of Catete is developing in line with the region's economic growth and modernization. Its proximity to Luanda has facilitated the expansion of financial and insurance services, providing support for both local commerce and industrial and agricultural activities.

In the banking sector, some of the main institutions include Banco de Fomento Angola (BFA), Banco de Poupança e Crédito (BPC), Banco Angolano de Investimento (BAI), etc., which offer a variety of banking services, such as checking accounts, savings accounts, agricultural and business loans, as well as transfers and payments. These banks play an essential role in financing small and medium-sized businesses, as well as in providing access to credit for the population.

In the insurance sector, the presence of insurance companies is still limited compared to the capital, but some of the main companies operating in the region include ENSA - Seguros de Angola, Nossa Seguro, Fidelidade, etc., which offer products such as life, health, and property insurance. Insurance companies, still in the expansion phase, seek to meet both individual needs and the demands of local companies, especially with regard to health insurance and asset protection.



Figure 49: Banking institution, Catete district

### 6.12.5.7 Hospitality and Tourism

Tourism has the potential to become a sector of strategic importance for the Angolan economy, given the country's tourism potential and its capacity to generate wealth and employment through its development. The country's natural, climatic, historical, and economic characteristics place it in a privileged position compared to other countries in the region in terms of tourism potential, so it is essential to leverage this potential.

Tourism is the "green oil" that Angola should define as a strategic commitment to diversify the national economy. Integrating Angola into the international tourism route should follow the stages of regional tourism development (SADC) and the initial stage of creating the necessary conditions for the consolidation of domestic tourism, as a starting point for boosting the sector.

The tourism and hospitality sector in Catete is still in its early stages of development, but it has significant potential due to its proximity to Luanda, the presence of natural resources, and its historical and cultural value. The region attracts visitors mainly for weekend tourism, ecotourism, and cultural tourism.

Among the main tourist attractions are the Memorial to President António Agostinho Neto, the birthplace of Angola's first president, and natural areas along the Zenza River, which offer attractive landscapes for leisure, fishing, and sightseeing. There are also cultural traditions and local events of tourist value, including dances, typical cuisine, and community rituals.

The hotel network is limited, consisting of small inns, guesthouses, and local lodgings, many of which have modest infrastructure. Modestly, some hotels or resorts of reference are emerging, as well as some tourist farms and private leisure spaces, which welcome visitors seeking tranquility outside the capital.

The challenges facing the sector include a lack of investment, poor tourism infrastructure, limited human resource capacity, damaged road access, and weak promotion of the region as a tourist destination. However, there are promising opportunities, such as the development of rural and ecological tourism, the enhancement of historical heritage, and the creation of tourist itineraries linked to Angola's political and cultural history, which can boost the local economy and generate jobs.



Figure 50 – Hotel Network – Hotel Sivam

**6.12.6 Social Facilities**

**6.12.6.1 School Network**

The current municipal education network is the result of significant developments over the last decade, both in terms of the construction of educational establishments and the hiring of teachers, in order to respond to the needs of the resident population and, above all, to focus on the inclusion of children who are outside the education system.

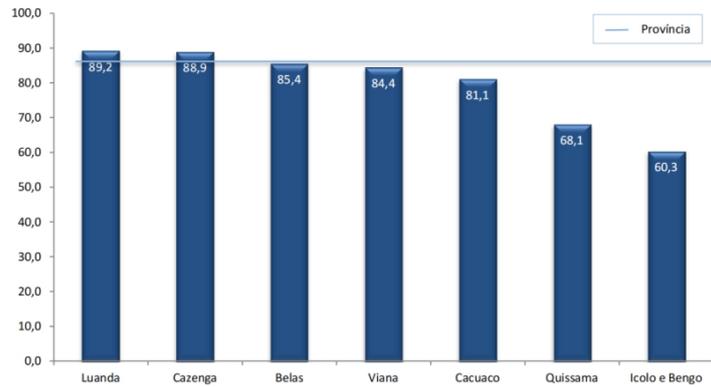
According to data from Cesso 014 (INE, 2016), the literacy rate in the province of Luanda is 86% in urban areas and 63% in rural areas. In terms of gender, 94% of men can read and write, compared to 78% of women. An analysis by municipality shows that in Icolo e Bengo, only 6 out of 10 people can read and write (60%).

Table 32: Literacy rate by area of residence, by gender (2014 census)

Província e área de residência	Total	Homens	Mulheres
<b>Luanda</b>	<b>85,9</b>	<b>93,9</b>	<b>78,3</b>
Urbana	86,5	94,3	79,1
Rural	63,2	80,0	45,5

Analysis by municipality indicates that, in Luanda province, the lowest rate is found in the municipality of Icolo e Bengo, where only 6 out of 10 people can read and write (60%).

**Graph 6: Literacy rate by municipality, 2014**



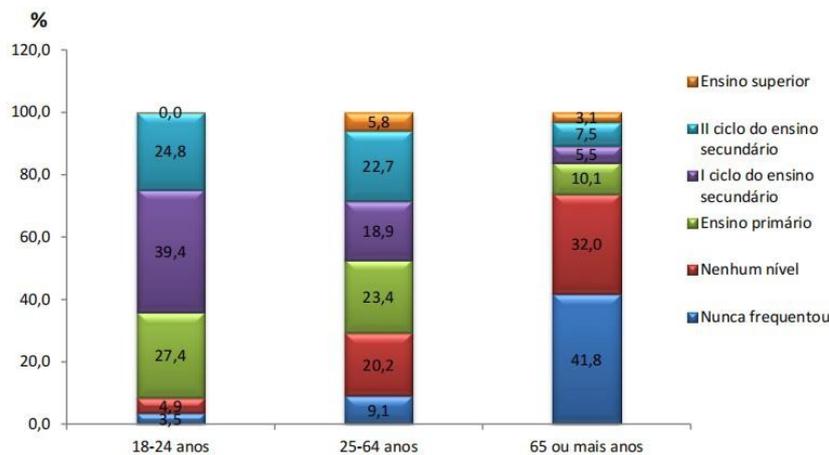
In 2014, only 23% of the population aged 18 or over had completed the second cycle of secondary education (had completed 12th or 13th grade). On the other hand, 24% of the population aged 18 or over had completed primary education (had completed 6th grade).

**Table 33: 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
Luanda	8,6	16,5	24,0	23,9	22,8	4,2

Analysis by age group shows that only 25% of the population aged 18-24 completed upper secondary education, compared to 23% of the population aged 25-64 and 7% of the population aged 65 or over.

**Graph 7: Population aged 18 or over by age group, according to level of education completed (census, 2014)**



According to the results of the 2014 Census, 13% of the population aged 5-18 was outside the education system.

Table 34: Population aged 5-18 outside the education system, by gender (2014 census)

Província	Fora do sistema de ensino					
	Total		Homens		Mulheres	
	Nº	%	Nº	%	Nº	%
<b>Luanda</b>	<b>321 688</b>	<b>12,9</b>	<b>149 717</b>	<b>12,5</b>	<b>171 972</b>	<b>13,4</b>

In all age groups, there is a predominance of girls outside the education system, however, the significant difference between girls and boys is seen in the 15-18 age group

In 2014, the proportion of the population aged 24 or over with completed higher education was 5%. Men lead with 6%, compared to 5% for women.

Table 35: Population aged 24 or over who have completed higher education, by sex (2014 census)

Província	Total		Homens		Mulheres	
	Nº	%	Nº	%	Nº	%
<b>Luanda</b>	<b>146 792</b>	<b>5,4</b>	<b>84 571</b>	<b>6,3</b>	<b>62 222</b>	<b>4,6</b>

The municipality of Belas has the highest proportion of the population with completed higher education, at 10%, followed by the municipality of Luanda, at 7%. The municipality of Quissama has the lowest proportion, at less than 1% (0.3%).

The school network in the district of Catete offers an educational structure that caters to different levels of education, with a focus on primary and secondary education. The network consists of public and private schools, which seek to meet the growing demand of the local population for access to quality education.

Among the best-known institutions is the Catete Primary School, which offers primary education to children in the region, covering the first six years of formal education. This school plays a key role in the literacy and initial training of students. The Agostinho Neto First Cycle School offers first cycle secondary education, corresponding to grades 7, 8, and 9, and is one of the main references for adolescents in the area.

In addition to these, there are some private schools that complement the public network, such as the Sagrada Esperança Private School, which offers both primary and secondary education

secondary education, with a focus on offering quality teaching and a more personalized education. Technical and vocational education is still in its expansion phase, but it is a sector with potential for growth in the region, aiming to prepare young people for the job market in areas such as agriculture, construction, and commerce.

According to local authorities, the municipality of Icolo e Bengo has 76 schools, including 2 institutes, 2 high schools, 2 school complexes, and 54 primary schools, 8 of which are first cycle and 3 are second cycle, with 1,209 teachers.



Figure 51: Primary school

#### 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, work and school absenteeism, 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 Ministry of Health, abbreviated as MINSA, is the ministerial department whose mission is to define and implement the National Health Policy, promote the execution

the Executive's health program and exercising the corresponding regulatory and monitoring functions, with a view to achieving universal health coverage in the country and contributing to social and economic development. Other notable diseases are diarrhea, chronic malnutrition, and acute respiratory infections, all of which are related to environmental sanitation and water supply conditions.

The health sector in the Catete district is developing, with a network of hospitals and health centers providing primary and specialized care services to the local population. Although basic, health infrastructure plays an important role in meeting the needs of the community, with ongoing efforts to improve the quality of services and the availability of resources.

Among the main health facilities, the Catete Municipal Hospital stands out as the main referral unit in the region. This hospital offers emergency services, outpatient care, and some medical specialties. In addition, the Cassoneca Health Center is another important facility that provides primary care, focusing on basic consultations, vaccinations, maternity, and prenatal care, which is essential for the prevention and treatment of common diseases in the community.

The health sector in Catete faces challenges such as a lack of specialist doctors, a shortage of medicines, and limited infrastructure to meet growing demand. In addition, there is a need for greater investment in medical equipment and training for professionals to improve care for the population. Expanding the health network and strengthening existing facilities are essential to ensure broader and more effective access to healthcare in the region.

According to sector authorities, the municipality of Icolo e Bengo has 28 health facilities, with a high degree of complexity. These include 23 medical posts and 5 health centers.

**Table 36: Hospital network in Icolo e Bengo**

Province	Hospital Network				No.		
	Unit Health	Hospital Municipal	Health Medical	Health Health	Medical	Health Health	Technicians Medium
Municipality of Icolobengoa	28	1	23	5	22	25	221



**Figure 52 – Icolo and Bengo Municipal Hospital (Catete)**

**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**

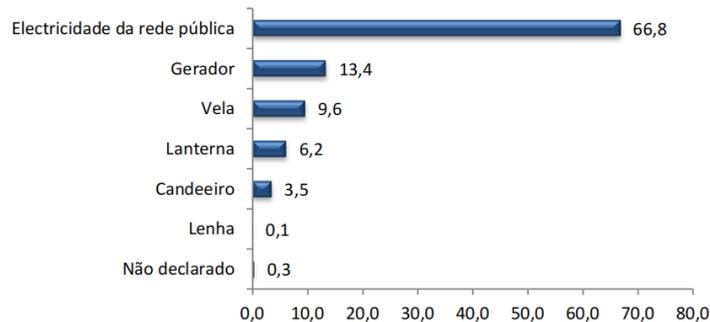
Distribution networks ensure a constant supply of electricity to homes, businesses, industries, and other consumers, enabling various activities that depend on electricity, such as industrial production, public lighting, communications, among others. Access to electricity for families in Luanda is 67%, with 68.6% for urban families and 1.9% for rural families, according to the 2014 census. The

distribution network is operated by the National Electricity Distribution Company (ENDE).

**Table 37: Households with access to electricity from the public grid by area of residence, 2014**

Província e área de residência	Nº	%
<b>Luanda</b>	<b>991 722</b>	<b>66,8</b>
Urbana	985 673	68,6
Rural	6 050	12,9

**Figure 8: Households, by main type of lighting, 2014**



The municipality of Icolo e Bengo has an electricity network supplied by the public utility Empresa Nacional de Distribuição de Electricidade (ENDE).

The Catete electricity network is part of the national electricity system and is supplied by high-voltage lines from hydroelectric power stations such as Cambambe. The Cambambe–Catete/Luanda transmission line is one of the main infrastructures that guarantee the supply of energy to the region. However, the network faces significant challenges, such as the presence of landmines along the route, remnants of the armed conflict, which pose risks to maintenance teams and the continuity of service.

In addition, vandalism of electrical infrastructure has been a constant concern. Cases of sabotage and theft of equipment in areas such as Catete, Camama, and Kilamba threaten the stability of medium and high-voltage substations, compromising the energy supply to the city of Luanda. These actions not only cause service interruptions but also lead to economic losses and risks to public safety.

Despite the challenges, there are opportunities for the development of the electricity sector in Catete. The expansion of the distribution network, the implementation of renewable energy systems, such as solar parks, and the modernization of existing infrastructure are initiatives that can

significantly improve access to electricity in the region. Rural electrification programs and investments in modern technologies, such as smart grids, also represent promising avenues for ensuring a more efficient and sustainable energy supply.

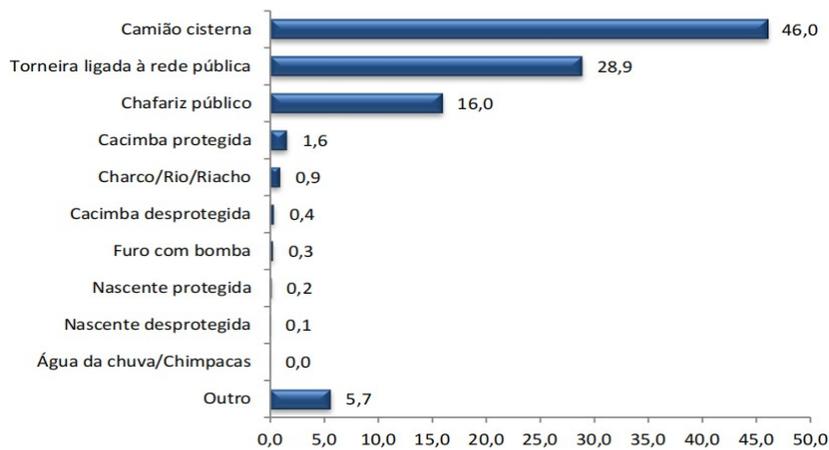
**6.13.3 Water Supply Network**

According to the results of the 2014 Census, only 47% of households in Luanda have access to appropriate sources of drinking water.

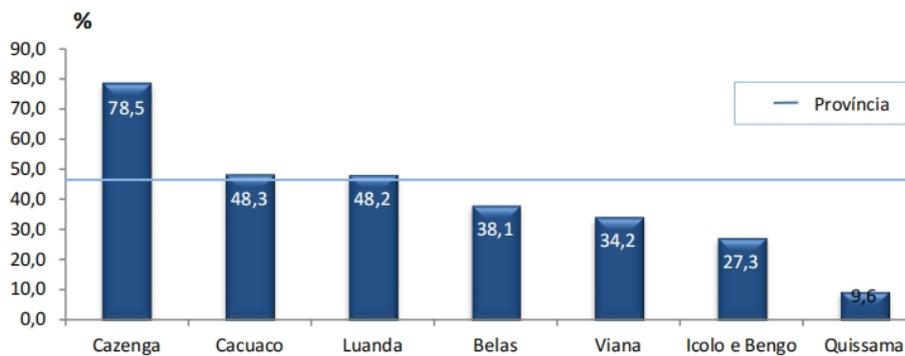
**Table 38: Households with access to appropriate drinking water by area of residence, 2014**

Província e área de residência	Nº	%
<b>Luanda</b>	<b>695 946</b>	<b>46,9</b>
Urbana	688 525	47,9
Rural	7 422	15,8

**Graph 9: Households by main sources of drinking water supply, 2014**



**Figure 10: Households using appropriate sources of drinking water by municipality, 2014**



There are significant differences in access to safe drinking water between the municipality of Cazenga and the others. The municipality of Quissama has the lowest rate compared to the

other municipalities, where only 10% of households have access to appropriate drinking water (8 times lower than the municipality of Cazenga and 5 times lower than the average for the province of Luanda).

The municipality of Icolo e Bengo is located on a large fertile plain between the Bengo River (to the north) and the Kwanza River (to the south). It is particularly abundant in water sources, being bathed by many rivers, lakes, and lagoons, and has even been called the Mesopotamia of Angola. Among the rivers, the Quilunda, Quiminha, Tôa, Cauigia, and Cabemba stand out. The municipality of Icolo e Bengo is supplied by a water collection system, with water treatment plants (ETAs), which are extremely important for the distribution of quality water to the population.

The water supply network in the district of Catete is a vital component for public health and community development. Water infrastructure has been a priority for the local government, aiming to ensure access to drinking water for the population. Water is mainly collected from underground sources, and the distribution system seeks to serve both urban and rural areas.

Water management in Catete is carried out by the Luanda Public Water Company (EPAL), which is responsible for water distribution in the region. The supply network includes several collection points and a treatment system that aims to ensure that the water distributed meets the required quality standards. However, drinking water coverage is still insufficient in some areas, and many residents depend on alternative sources, such as wells and springs.

Among the main challenges faced by the water supply sector are the lack of adequate infrastructure, such as pipes and treatment systems, as well as problems related to network maintenance and expansion. There are also sustainability issues, such as water resource management and the need to preserve water sources. To improve water supply, it is essential to invest in infrastructure, treatment and maintenance technologies, and implement water conservation awareness programs.

The supply of drinking water is one of the main problems. Water supply network coverage is limited, with only a portion of the urban population having access to household connections. In rural and peri-urban areas, the population depends on alternative sources, such as artesian wells, natural springs, etc. However, these alternatives do not always guarantee water quality, increasing vulnerability to water-related diseases.

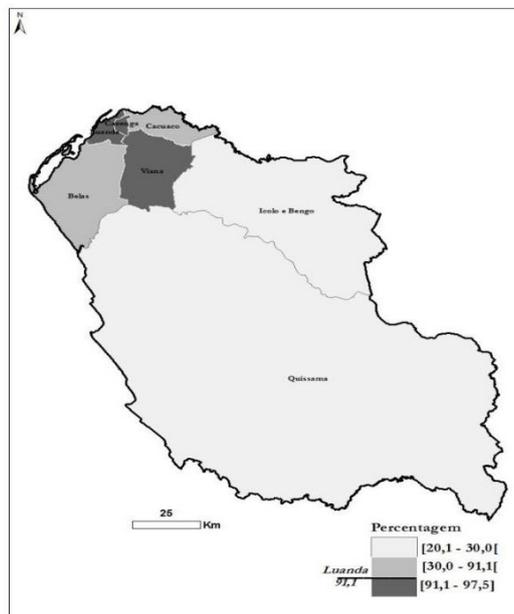
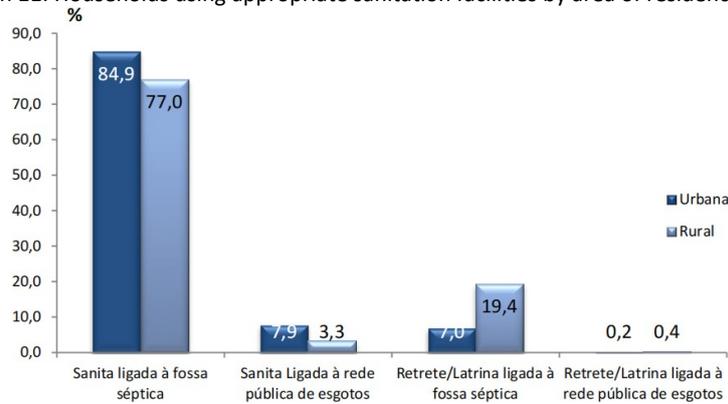
**6.13.4 Basic sanitation**

At the provincial level, 91% of households use an appropriate place to defecate. However, this figure is only 33% among rural residents, compared to 93% among urban residents.

**Table 39: Households using appropriate facilities for defecation by area of residence, 2014**

Província e área de residência	Nº	%
<b>Luanda</b>	<b>1 352 121</b>	<b>91,1</b>
Urbana	1 336 425	93,0
Rural	15 696	33,4

**Graph 11: Households using appropriate sanitation facilities by area of residence, 2014**



**Figure 53: Households using appropriate sanitation facilities by municipality, 2014**

There are differences between municipalities in terms of access to adequate sanitation facilities. The municipality of Cazenga has the highest rate, at 97%. The municipalities of Icolo e Bengo and Quissama have the lowest rates, at 20% and 28%, respectively.

Basic sanitation in the district of Catete is a critical issue for public health and the well-being of the population. Although there has been progress in improving sanitation conditions in recent years, significant challenges remain. Access to adequate sanitation systems is essential to prevent disease and ensure a healthy environment.

Currently, most homes in Catete do not have access to adequate sanitary sewage systems, often relying on septic tanks or latrines. This lack of basic sanitation infrastructure contributes to public health problems such as waterborne diseases and soil contamination. Solid waste management is also an important issue, with many neighborhoods facing difficulties in the collection and proper disposal of garbage, which exacerbates urban hygiene problems.

The impact of a poor sanitation and hygiene system causes increased environmental contamination and, as a result, outbreaks of diseases (cholera, yellow fever, and malaria), which can lead to high mortality and morbidity rates.

Cleaning and sanitation are carried out by the Luanda Cleaning and Sanitation Company (Elisal).

To improve basic sanitation in the region, initiatives are needed that include the construction of sewage networks, the promotion of good hygiene practices, and raising awareness among the population about the importance of adequate sanitation. In addition, investments in infrastructure and human resources are essential for the maintenance and operation of sanitation systems, aiming to provide a healthier and more sustainable environment for the inhabitants of Catete. The implementation of integrated sanitation projects that consider both sewage treatment and solid waste management can contribute significantly to improving living conditions in the community.

### 6.13.5 Road Network and Transportation

The road and transportation network in the district of Catete is a fundamental element for the mobility of the population and the economic development of the region. The transportation infrastructure includes roads, paths, and highways that connect the various localities in the district, facilitating access to services, markets, and urban centers.

The main access routes in Catete are the roads connecting the municipality to Luanda, the country's capital, and other areas of Luanda province. Although some roads are in reasonable condition, many still face challenges such as potholes, lack of paving, and inadequate maintenance, especially during the rainy season. The quality of the roads can directly impact the transport of goods and the mobility of residents, making it difficult to access essential services such as health and education.

In terms of transportation, the region is served by a combination of road transport, including buses, taxis, and cargo vehicles, which operate on the main routes. Public transportation, although available, can be irregular, and private transportation services are growing. However, the lack of quality public transportation alternatives and adequate infrastructure, such as bus terminals and stops, poses a challenge to the population's mobility.

The road axes that enable regional connections are designed to link with surrounding regions and strengthen intra-regional cohesion and territorial coordination.

#### Rail

The Hia, Catete, and Barraca railway stations are located within the municipal territory and are served by medium and long-distance suburban trains from the Luanda Railway. In addition, there are plans to operate the Airport Branch Line and the Airport Railway Station.

#### Highways

The main highway in Icolo e Bengo is the EN-230 (Luanda-Catete road), which connects it to both Luanda and the rest of the country. Another important highway is the EN-110, which connects the municipality to Cacuaco (to the northwest) and Quissama (to the south).

To improve the road and transport network in Catete, it is necessary to invest in road improvements, promote public transport, and develop integrated mobility planning that meets the needs of the community.



Figure 54: Bus and motorcycle stop



Figure 55: Catete 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 Luanda, based on information gathered from local authorities and bibliographic research.

### 6.14.2 Coastal Zone Management Plan (PNOOC)

The National Coastal Zone Management Plan was drawn up in 2010 but not published in the Official Gazette. However, it may provide some macro-level guidance on future land use, which will be detailed in the Plans.

The Luanda Province Coastal Zone Management Plan aims to organize and promote the sustainable use of coastal areas, ensuring environmental protection and economic development in the region. This plan seeks to reconcile the preservation of marine and coastal ecosystems with the growth of urban, tourist, and commercial activities, setting clear guidelines for land use, occupation, and construction on the coast.

The main objectives include the protection of natural areas such as mangroves and beaches, the regulation of new construction and infrastructure, and the promotion of sustainable tourism. The plan also aims to improve the quality of life of the local population by ensuring public access to beaches and recreational areas, as well as mitigating environmental risks such as coastal erosion and pollution.

In terms of scope, the plan covers all coastal areas in the province of Luanda, defining environmental protection zones, residential areas, and leisure and tourism zones, as well as regulating industrial and commercial activities to minimize environmental impact. By integrating urban planning, sustainability, and conservation, the plan aims to ensure that coastal development occurs in a balanced manner, preserving natural heritage for future generations.

### 6.14.3 Municipal Master Plan

The Icolo e Bengo Municipal Master Plan is a strategic document that aims to regulate land use and organize the region's territorial development, ensuring sustainable and balanced growth. This plan seeks to harmonize urban, rural, and environmental activities, taking into account the social, economic, and cultural characteristics of the municipality.

*“a) Ensure conditions for the development of economic activities, generating employment and income in order to meet the needs of the population in terms of water and electricity, basic sanitation and solid waste collection, road networks and communication systems, social facilities (education, health, social assistance, culture, recreation, and sports), and housing.”*

*The following classes are found in the intervention area:*

- *Residential space (space to be consolidated, low-density space to be renovated, space to be structured, residential tourist space);*
- *Equipment or structuring infrastructure space (Existing equipment, Luanda railways, Airport, Existing infrastructure);*
- *Economic activity space (business area: industrial/warehouses, business area: extractive industry);*
- *Economic activity space (Business area: Industry and Warehouses, Commerce/Services and Hospitality, Reserve);*
- *Space for equipment or structural infrastructure (proposed equipment, planned infrastructure);*
- *Residential area (developable land, planned developable land) (Low-density residential area (Type II), Medium-density residential area);*
- *Leisure and recreation space (Green Leisure and Recreation Space (urban park));*
- *Space for Protection space (Environmental Protection) Environmental (Green Green ).*

## 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 a field survey carried out on site in August 2024 and on bibliographic research.

### 6.15.2 Inventory of Existing Heritage Sites

Across the country, there are currently 278 classified monuments and sites. There are many more waiting to be classified. However, this depends greatly on the dynamics and participation of provincial governments in the processes of inventorying and documenting the heritage existing in their territories.

The inventory of heritage sites in the province of Luanda covers a wide range of cultural and historical assets that are fundamental to the preservation of the region's identity and collective memory. The province, which is the political and economic center of Angola,

has a rich architectural, historical, and cultural heritage, with assets ranging from colonial buildings to monuments from the independence era.

Among the notable heritage sites is the Fortaleza de São Miguel, one of Luanda's most important historical landmarks, built in the 16th century and now home to the Armed Forces Museum. Another notable heritage site is the National Museum of Anthropology, which preserves artifacts and exhibitions on traditional Angolan cultures. Also noteworthy are the Church of Nossa Senhora dos Remédios, one of the oldest religious buildings in the city, and the Iron Palace, a unique architectural structure attributed to Gustave Eiffel that symbolizes the colonial period, etc.

In addition to monuments and buildings, the inventory of heritage in Luanda includes intangible cultural manifestations, such as traditional dances and rhythms (e.g., kizomba and kuduro), and festivities that celebrate Angolan culture. This inventory process is essential for creating a database that supports the planning of conservation and restoration actions, promoting cultural tourism, and strengthening knowledge and appreciation of Angolan cultural heritage.

The historical and cultural heritage in the district of Catete is rich and diverse, reflecting the history and traditions of the region. Catete is especially known for being the birthplace of Agostinho Neto, the first president of Angola, and this historical heritage is an important cultural attraction.

One of the main sites of interest is the Agostinho Neto House Museum, located in the residence where the leader lived. This museum preserves Neto's memory and legacy, displaying documents, photos, and objects that tell the story of his life and his struggle for Angola's independence. The museum is an important tourist attraction and serves as a center for education and promotion of Angolan culture.

In addition to the house museum, the district is home to monuments and memorials that celebrate local history, such as the Monument to the Heroes of the Struggle for Independence, which honors Angolans who fought for the country's freedom. Cultural heritage is also reflected in local traditions, such as dances, music, and festivals that celebrate the region's indigenous cultures, including rituals and festivities involving traditional dances and other cultural expressions.

The heritage inventory also covers the documentation of cultural manifestations, such as rituals, dances, and local languages, which are part of the region's cultural wealth. This inventory process

inventorying is essential for the conservation and enhancement of heritage, as it creates a database that facilitates the planning of preservation and restoration actions, in addition to promoting cultural tourism and educating the population about the importance of their cultural heritage.

The preservation of Catete's historical and cultural heritage is fundamental to promoting local identity and fostering tourism, but it faces challenges such as a lack of investment in conservation and the need for greater awareness of the importance of this legacy. Investing in the promotion and conservation of these sites can not only strengthen the cultural identity of the region, but also attract visitors interested in Angolan history and culture.



Figure 56: Dr. António A. Neto Cultural Center

## 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 analysis is located in an area that is strategically located for the storage and distribution of grain, as it is in a zone that has arable land for crop growth and also has access roads that facilitate the transport of production.

Therefore, in a scenario where the Project is not built, it is expected that the current state of the environment will evolve in the long term towards the occupation of this area by agricultural activities due to the soil characteristics mentioned above.

It should also be noted that the municipality of Icolo e Bengo, in the province of Luanda, has been the target of various investments and interventions in the agricultural sector, 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.

In view of 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 evaluation 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 effect 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 40: 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 41: Acronyms used in the impact assessment scale**

CRITERIA	SCALE			
	Temporary (T)	Permanent (P)		
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 for minimization or compensation	Minimizable and/or compensable (MC)	Not minimizable or compensable (NMC)		

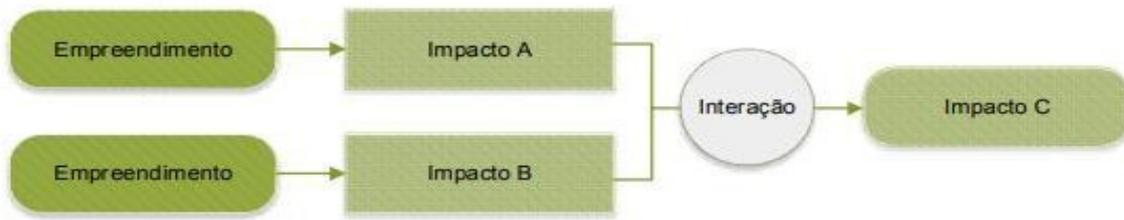
**Table 42: Identification of significance according to colors**

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 43, 44, and 45).

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

Table 43: 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
Transport 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 44: 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 45: 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 living standards 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 temperature at ground level.

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 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 occurrence, 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 dust from 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

#### **Disruption 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 landscape change 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 into the operation phase, where there will be a

process of adaptation of the landscape to the new reality, i.e., the presence of grain terminal infrastructure in a semi-natural, topographically flattened area with a significant visual basin due to its proximity to the main road (EN-110) that passes close to the facilities and residential areas, namely the Andeamento and Kalumbunze neighborhoods.

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 alteration**

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, a gradual return of the landscape to its undisturbed state can be observed.

These are positive impacts, of low magnitude, 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 Operational 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 tropospheric ozone precursor substances.

The main eutrophication and acidifying gases resulting from anthropogenic activity are sulfur dioxide (SO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), ammonia (NH<sub>3</sub>), 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.

Tropospheric ozone precursor substances include polluting gases such as nitrogen oxides (NO<sub>x</sub>), non-methane volatile organic compounds (NMVOCs), carbon monoxide (CO), and methane (CH<sub>4</sub>). Ozone can cause health problems, 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.

CO<sub>2</sub>, a greenhouse gas (GHG), is a product of combustion and as such is released in exhaust gases. Consequently, both private 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 (CO<sub>2</sub>), oxygen (O<sub>2</sub>), water vapor, nitrogen (N<sub>2</sub>), carbon monoxide (CO), nitrogen compounds (NO<sub>x</sub>), sulfur compounds (SO<sub>x</sub>), 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**

During this phase, air quality will be negatively impacted by gas (smoke) and dust emissions from the movement of machinery, vehicles, excavations, and equipment in general during decommissioning, as well as possible odors. These impacts are considered negative, of reduced magnitude, direct, probable, local, temporary, reversible, and insignificant.

Once decommissioned, the impacts caused by the infrastructure in terms of this descriptor will be 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 Operational 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 pavement. Factors contributing to noise levels include, in addition to driving speed, the type of vehicle, the type of tires, the type of pavement, the condition of the vehicles, the age of the vehicles, the slope of the road, the presence or absence of noise barriers, and driving patterns.

The impacts on the sound environment will be felt most strongly during the night and are mainly associated with road traffic.

Thus, 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 decommissioned, the impacts caused by this descriptor are reduced. This is a positive impact, of moderate magnitude, direct, certain, local, temporary, reversible, and insignificant.

### **7.13 SOCIOECONOMICS**

#### 7.13.1 Construction phase

##### **Job creation**

In order to carry out the work, it will be necessary to resort to external and internal labor, which will constitute the workforce for the terminal's construction. Although this constitutes a very low risk

very low probability, 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 hiring of labor will have positive, direct, temporary, widespread, reversible, certain, small, and insignificant impacts.

### **Boosting associated 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.

### **Disruption to local communities**

Vehicle traffic and noise caused during the construction and assembly of 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.

For the terminal to operate, it will be necessary to resort to external and internal labor, which will constitute the workforce. 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.

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 leverage local economic development and the creation of indirect jobs associated with economic activities complementary to the Terminal's activity.

In general, at the socioeconomic level, the main impacts associated with the operation phase of the silos will generate benefits and will be related to the use of service providers, transportation, and the supply 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 lead to an increased 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

### **Reduction in the dynamism of associated sectors and unemployment**

At this stage, 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 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.

The decommissioning of these infrastructures may create employment opportunities or possible 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-110 and EN-230 national roads, 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, there is considered to be no impact on these sectors, since 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-110 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 electricity and water consumption and the generation of solid and liquid waste may place 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.

The impacts are considered to be negative, of low magnitude, direct, unlikely, local, permanent, reversible, and insignificant.

### **Reduction in grain transport time due to proximity to the EN-110 and EN-230**

At this stage, it is considered that the location of the grain terminal near the EN-110 and EN-230 may 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 a 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, probable, 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 expand the grain terminal in Catete 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 Catete grain terminal expansion 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 improvements, 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 46: Summary of environmental impacts (construction phase)

Descriptor	Impact	Phase	Activity/area affected	Impact characteristics
<b>Climate</b>	Change in evapotranspiration at ground level	Construction	Cleaning and earthmoving (demolition), 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.
<b>Geology/geomorphology</b>	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.
<b>Soils</b>	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.
<b>Land use</b>	Land use change	Construction	Project area	Negative, direct, low magnitude, temporary, reversible, certain, local, and insignificant.
<b>Groundwater resources</b>	-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.
<b>Surface water resources</b>	-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, reduced magnitude, temporary (contamination) and permanent, reversible, probable (contamination) and uncertain (change in runoff), local and insignificant.
<b>Flora and Fauna</b>	-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.
<b>Landscape</b>	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 the soil, earthworks; demolition; Installation and use of the construction site; construction of the building and infrastructure; transportation of people and materials	Negative, direct, reduced magnitude, temporary, reversible, certain, local and insignificant.
	Increased concentration of CO and NOx 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, transportation 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 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, reduced to moderate magnitude, temporary, reversible, uncertain, widespread, and insignificant.
	Increased population settlement, especially among the working-age population	Operation	Project surrounding area and area of direct influence	Negative, indirect, low magnitude, 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-110 and EN-230 road network	Construction	Project area	Negative, direct, reduced magnitude, temporary, reversible, unlikely, local and widespread, insignificant.
	Pressure on the energy, water, and sanitation supply network	Construction	Project area	Negative, direct, low 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 47: Summary of environmental impacts (operation phase)

Descriptor	Impact	Phase	Activity/affected area	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, low 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, reduced 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	Light and heavy vehicle traffic, poor management of chemicals	Negative, direct, reduced magnitude, temporary (contamination) and permanent, reversible, probable (contamination) and uncertain (change in 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, reduced 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 characteristics
<b>Environment</b> <b>Noise</b>	Increased noise levels	Operation	Silo operation, facility maintenance, vehicle and employee traffic	Negative, direct, moderate, temporary, reversible, certain, widespread, and significant.
<b>Socioeconomic</b>	Nuisance to the local population (caused by noise and dust emissions, traffic flow constraints)	Operation	Operation of silos, maintenance of facilities, movement of vehicles and employees	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 related sectors of activity	Operation	Project surrounding 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)	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 settlement, especially among the working-age population	Operation	Project surrounding area and area of direct influence	Negative, indirect, reduced 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.
<b>Infrastructure</b>	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-110 and EN-230 roads	Operation	Project area	Positive, direct, moderate magnitude, permanent, irreversible, probable, regional and very significant.
<b>Waste</b>	Waste production	Operation	Project Area	Negative impact, direct, small in 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.
<b>Climate change</b>	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 and operation	Project area and surroundings	Negative impact

Table 48: Summary of environmental impacts (decommissioning phase)

Descriptor	Impact	Phase	Activity/area affected	Impact characteristics
Climate	Change in evapotranspiration at ground level	Deactivation	Restoration of degraded areas after decommissioning	Positive, reduced magnitude, direct, probable, localized, permanent or temporary, reversible, and insignificant.
Geology/geomorphology	Changes to 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 effluent) 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;	Deactivation	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 wildlife death), certain and probable, localized and insignificant.
	-Roadkill and death 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/affected area	Impact characteristics
<b>Landscape</b>	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
<b>Air quality</b>	Emissions of gases and particulate matter (dust) originating 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
<b>Noise environment</b>	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.
<b>Socioeconomic</b>	Nuisance to the local population (caused by noise and dust emissions, traffic flow disruption)	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, reduced magnitude, 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	Deactivation	Project surrounding area and area of direct and indirect influence	Negative, direct, reduced 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.
<b>Infrastructure</b>	Pressure on the EN-110 and EN-230 road network	Deactivation	Project area and surroundings	Negative, reduced magnitude, direct, uncertain, extended, temporary, reversible, and insignificant.
	Reduced pressure on the road network, energy supply, water, and sanitation	Deactivation	Project area and surroundings	Positive, low magnitude, direct, certain, extensive, permanent, reversible, and insignificant

Deskriptor	Impact	Phase	Activity/affected area	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	Inadequate cleaning and 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, reduced 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 40.

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 49: 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 Surface water	Contamination of waterways by accidental spills and/or waste runoff	-	D	R	T	RV	PR	L	MGC1/MMC 6,7,8	-3
Underground Ground water	Contamination of the aquifer by accidental spills and/or runoff of waste	-	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 wildlife	-	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

DESCRIPTION	IMPACT	NATURE	OCCURRENCE	MAGNITUDE	DURATION	REVERSIBILITY	PROBABILITY	INCIDENCE	MITIGATION MEASURES	SIGNIFICANCE
Landscape	Landscape alteration	-	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:** Improbable (IMP), Uncertain (INC), Probable (PR), Certain (C)

**Significance:** Very Significant (VS), Significant (S), Not Significant (NS) MGC-general measures

for the construction phase

MMC-specific mitigation measure for the construction phase

SM-No measure

**Table 50: Identification and assessment of the project's environmental impacts (operational 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
Surface water 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 the 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 EN-110 and EN-230	+	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 (RE) **Duration:** Temporary (T),

Permanent (P) **Reversibility:** Reversible (Rv.), Irreversible (Ir)

**Probability of occurrence:** Improbable (IMP), Uncertain (INC), Probable (PR), Certain (C)

**Significance:** Very Significant (VS), Significant (S), Not Significant (NS) MGO-general

measures for the operation phase

MMO-specific mitigation measure for the operation phase

SM-No measure

## 8 MITIGATION MEASURES

### 8.1 GENERAL CONSIDERATIONS

**Mitigation**, in the environmental context, consists of human intervention aimed at reducing or remedying a specific harmful environmental and social impact. It also refers to a specific action.

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 constitute concrete actions to be implemented during the preparation/construction and operation phases of the Project. This EIA suggests several generic minimization measures to be implemented by the end of the preparation/construction phase and some specific minimization measures for the negative impacts identified at the level of the different descriptors in both phases, thus aiming to reduce impacts in a comprehensive manner and covering all descriptors.

The changes caused by the activities planned for the project can be minimized, prevented, compensated for, monitored, or improved upon by adopting measures and programs designed to improve the environmental and social quality of the project and adapt 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 prevention and mitigation of impacts. 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 training and awareness-raising actions for the community in the region.

These measures were directly related to the effects to 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 51, 52, 53, and 54.

**Table 51: 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 construction site installation cost)
MGC 2	Construction	Develop and implement 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	USD 8,000
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 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	USD 3,500 per report
MGC 10	Construction	Preparation and implementation of a Waste Management Plan	Contractor	4,500 USD
MGC 11	Installation of fencing	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 installation cost of the yard)
MGC 12	Safety signage	The terminal construction site 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 general 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	The supply of material from the quarry to the construction site should be carried out, whenever feasible, directly from the quarry to the work areas, in order to minimize the occupation of space with construction materials in the construction area, in addition to reducing the frequency of loading and unloading operations of aggregates.	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 52: Specific mitigation and enhancement measures for environmental and social impacts (construction phase)**

ID	DESCRIPTION	ENVIRONMENTAL IMPACT	MITIGATION MEASURES	RESPONSIBILITIES	COSTS (USD)
MMC 1	<b>Climate</b>	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	<b>Geology and geomorphology</b>	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	<b>Soils</b>	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	<b>Soils</b>	Soil erosion	Avoid prolonged exposure of soils	Contractor	(Included in the work to be carried out by the Contractor)
MMC 5	<b>Soils</b>	Contamination by spillage	Keep equipment and machinery in good working order; maintenance must be carried out in a safe, waterproof location.	Contractor	(included in the cost of setting up the construction site)
MMC 6	<b>Surface water resources</b>	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	<b>Surface water resources</b>	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	<b>Surface water resources</b>	Contamination of waterways 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	<b>Groundwater resources</b>	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	<b>Groundwater resources</b>	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	<b>Groundwater resources</b>	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	<b>Flora</b>	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	<b>Flora</b>	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	<b>Flora</b>	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	<b>Fauna</b>	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	<b>Fauna</b>	Risk 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	<b>Landscape</b>	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	<b>Landscape</b>	Landscape alteration	Respect for the construction typology of the work;	Contractor	(included in the cost of the contract)
MMC 19	<b>Air quality</b>	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	<b>Air quality</b>	Air quality degradation (particulate and gas emissions)	Moisten areas where dust may be generated;	Contractor	(included in the cost of the contract)
MMC 21	<b>Air quality</b>	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	<b>Air quality</b>	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	<b>Air quality</b>	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, complying with 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 towns, avoiding the use of audible signals that disturb residential areas;	Contractor	(Included in the work to be carried out by the Contractor)

ID	DESCRIPTION	IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COSTS (USD)
MMC 30	<b>Socioeconomics</b>	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	<b>Socioeconomics</b>	Accident risks	Training and awareness campaigns on defensive driving	Contractor	USD 2,000/month
MMC 32	<b>Infrastructure</b>	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	<b>Infrastructure</b>	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	<b>Infrastructure</b>	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	<b>Infrastructure</b>	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	<b>Waste</b>	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 taken 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 53: General mitigation and enhancement measures for environmental and social impacts (operation phase)**

ID	ACTION/ACTIVITY	MITIGATION MEASURES	RESPONSIBILITY	COSTS (USD)
MGO 1	<b>Preparation of a Manual of Good Environmental Practices</b>	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	<b>Preparation of an Emergency Plan</b>	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	<b>Preparation of a Waste Management Plan</b>	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	<b>Conducting Drills</b>	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	<b>Workplace Accidents</b>	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	<b>Infrastructure operation</b>	Implementation of the Environmental and Social Management Plan	Proponent	(included in facility operating costs)
MGO 7	<b>Legal compliance</b>	Preparation of monitoring reports to be submitted to MINAMB	Proponent	(included in facility operating costs)
MGO 8	<b>Conflicts with the community</b>	Implementation of a Complaints Resolution Mechanism.	Proponent	(included in facility operating costs)
MGO 9	<b>Legal compliance and continuous improvement</b>	Implementation of external audits	Proponent/Minamb/ Local administration	22,000 USD/year
MGO 10	<b>Pest proliferation</b>	Pest control and eradication plan	Proponent	12,000 USD/year

**Table 54: Specific mitigation and enhancement measures for environmental and social impacts (operation phase)**

ID	DESCRIPTION	IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COSTS (USD)
MMO 1	<b>Climate</b>	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	<b>Geology and geomorphology</b>	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	<b>Geology and geomorphology</b>	Change in local geomorphology	Circulation of machinery and vehicles only in designated areas;	Proponent	(included in facility operating costs)
MMO 4	<b>Geology and geomorphology</b>	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	<b>Soils</b>	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	<b>Soil</b>	Soil contamination due to accidental spills	Develop an internal spill management and response plan.	Proponent	(included in facility operating costs)
MMO 7	<b>Surface water resources</b>	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	<b>Surface water resources</b>	Contamination of watercourses 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	<b>Fauna</b>	Disturbance of local fauna	Avoid noisy activities at night;	Proponent	(Included in the work to be carried out by the operator)
MMO 19	<b>Fauna</b>	Disturbance of local fauna	Direct lighting in the facilities downward, thus preventing the accidental disturbance and/or death of birds against fixed objects;	Contractor/Proponent	(included in facility operating costs)
MMO 20	<b>Fauna</b>	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	<b>Fauna</b>	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	<b>Fauna</b>	Species preservation	Support local associations focused on wildlife research and preservation.	Proponent	10,000 USD
MMO 23	<b>Landscape</b>	Landscape change	Maintain facilities in good condition;	Proponent	(included in facility operating costs)
MMO 24	<b>Landscape</b>	Landscape alteration	Create a specific area for parking machinery and vehicles;	Contractor/Proponent	(included in facility operating costs)
MMO 25	<b>Landscape</b>	Landscape alteration	Night lighting should be directed downward;	Contractor/Proponent	(included in facility operating costs)
MMO 26	<b>Landscape</b>	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	<b>Air quality</b>	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;	Grain operator/transporters	(Included in the work to be performed by the operator)
MMO 28	<b>Air quality</b>	Degradation of air quality (particulate and gas emissions)	Moisten areas where dust may be generated;	Operator	(included in facility operating costs)
MMO 29	<b>Air quality</b>	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	<b>Air quality</b>	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	<b>Air quality</b>	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	<b>Air quality</b>	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	<b>Noise environment</b>	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	<b>Noise environment</b>	Increased noise levels	Implement a noise monitoring program.	Operator	(included in facility operating costs)
MMO 35	<b>Noise environment</b>	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	<b>Socioeconomics</b>	Accident risks	Vehicles must comply with the speed limits (60 km/h and 30 km/h) near and within towns;	Grain operator/transporters	(Included in the work to be performed by the operator)
MMO 44	<b>Socioeconomics</b>	Accident risks	Training and qualification in occupational health and safety, and availability of PPE and CPE.	Operator	(included in facility operating costs)
MMO 45	<b>Socioeconomics</b>	Accident risks	Training and awareness campaigns on defensive driving	Grain operators/transporters	(included in facility operating costs)
MMO 46	<b>Socioeconomics</b>	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	<b>Infrastructure</b>	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	<b>Infrastructure</b>	Pressure on the road network	Training and awareness campaigns on defensive driving	Operator/Grain transporters	(included in facility operating costs)
MMO 49	<b>Infrastructure</b>	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	<b>Infrastructure</b>	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	<b>Infrastructure</b>	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	<b>Infrastructure</b>	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	<b>Waste</b>	Risks of environmental contamination	Develop and implement a waste management plan	Proponent	(included in facility operating costs)
MMO 54	<b>Waste</b>	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	<b>Waste</b>	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	<b>Waste</b>	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 the Catete Grain Terminal's 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 55: Summary of cumulative impacts

Project phase	Type of cumulative impact	Description	Accumulation factors	Mitigation measures
<b>Construction</b>	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 work 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; restricting 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, debris, and packaging.	Other construction sites and nearby developments.	Proper segregation and packaging; shipment to licensed final destination; maximizing reuse of materials.
<b>Operation</b>	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 building density.	Landscaping and tree planting; regular 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; periodic 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 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 to maintain and/or restore environmental balance.

This EIAS encourages the business group to adopt and develop measures aimed at achieving better environmental and social performance in the execution of its activities, in order to achieve excellence in relation to 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 Catete 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 Catete 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

- To ensure that effluents stored in septic tanks comply with environmental standards;
- 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;
- Improper 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 56: 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 using 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. The installation of high-level alarms can also alert when the septic 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 safety and health 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 worker welfare.

### 11.3.3 Parameter to be analyzed and monitoring frequency

Table 57: Parameters to be analyzed and frequency of monitoring

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 <sup>3</sup>	Monthly	Half-yearly
Use of personal protective equipment (PPE)	% compliance	Monthly	Monthly
Safety training	Number of training courses held	Bimonthly	Semester

### 11.3.4 Monitoring method

- Periodic inspections at 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 for 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 (CO<sub>2</sub>, NO<sub>x</sub>, SO<sub>2</sub>).

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 58: Parameters to be analyzed and monitoring frequency

Parameters	Unit/indicator	Frequency	
		Construction phase	Operation phase
Particulate matter (PM <sub>10</sub> , PM <sub>2.5</sub> )	µg/m <sup>3</sup>	Monthly	Quarterly
Sulfur dioxide (SO <sub>2</sub> )	ppm	Monthly	Semiannual
Nitrogen oxides (NO <sub>x</sub> )	ppm	Monthly	Semiannual
Carbon monoxide (CO)	ppm	Monthly	Semiannual
Carbon dioxide (CO <sub>2</sub> )	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, NO<sub>2</sub>, SO<sub>2</sub>, 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) during the nighttime.

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 59: 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 60: 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 61: 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	Semiannual	Semiannual

### 11.7.4 Methods

- Creation of communication channels (telephone, email, public meetings, information panels);
- Regular meetings with local authorities, communities, and other stakeholders;
- Dissemination 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 62: 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 63: 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	Semiannual	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 supervise 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 be analyzed and Monitoring Frequency

Table 64: Parameters to be analyzed and monitoring frequency

Parameters	Unit/indicator	Frequency	
		Construction phase	Operational 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	Quarterly	Quarterly
Evacuation plan	Evacuation drills conducted	Semiannual	Annual
First aid	Verification of availability of emergency kits kits	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 65: 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 SUBMITTING THE EIAS MONITORING REPORT

### 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 66: 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 67: 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 68: Program implementation costs

Programs	Estimated costs (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
Pest control and eradication plan		12,000 USD
Communication and stakeholder relations program	18,000 USD	22,000 USD
mechanism presentation of reports EIAS monitoring reports	10,000 USD	12,000 USD
Environmental and social performance audits		20,000 USD
<b>Total</b>	<b>88,000 USD</b>	<b>156,200 USD</b>

## 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 district of Catete, Icolo e Bengo, 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 district of Catete and the province of Icolo and Bengo.

## 12.1 Identification of institutions involved and responsibilities

Through its food security, economic diversification, and agricultural production promotion policies, the Angolan government 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:

- Increasing storage capacity in areas of high agricultural production.
- Reducing crop losses caused by a lack of adequate infrastructure.
- Ensuring the quality and preservation of grain 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, transportation, storage, and marketing.
- Integrate silos into logistics platforms that support local, national, and international markets.
- Foster public-private financing and public-private management to the 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 sources.
  - 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 registers 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.
  - Encourage 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 Catete. The framework is organized by level: national, provincial, and local, highlighting roles and responsibilities.

Table 69: 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 and the IDA.
Institute for Agricultural Development (IDA)	Promotion and rural support technical for storage and training of producers.
Ministry of the Environment (MINAMB)	Environmental rules 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 assessment of silos and equipment.
National logistics infrastructure (Port/CFL)	Grain transport and reception; port-railway-highway integration.

Table 70: Main institutions involved at the provincial level

Entity	Responsibilities
Provincial Government of Icolo and Bengo	Coordination of policies and intersectoral coordination.
Provincial Office of Agriculture, Livestock, and Fisheries	Sectoral planning and support for storage projects
Provincial Office for the Environment	Monitoring of environmental and PGAS inspection.
Angolan National Roads Institute (INEA)	Management, maintenance, and conservation of national roads
Luanda Railway – E.P. (CFL)	Railway operation for grain flows and connection to the Port of Luanda.

Table 71: 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 committees for monitoring and supervising projects.	Monitor the local implementation of silo projects, ensuring compliance with technical, environmental, and social standards, as well as coordination between the developer, 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 of 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 72: 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 73: Training and capacity building plan

<b>Training Area</b>	<b>Target Audience</b>	<b>Main Content</b>	<b>Frequency</b>	<b>Supporting Entity</b>
Infrastructure Management and Maintenance	Civil and mechanical engineers, maintenance technicians	Operation of ventilation, drying, and transportation systems; preventive and corrective maintenance	Semiannual	Proponent + Technical Professional Institutes
Post-Harvest and Grain Quality	Agricultural engineers, food quality technicians	Techniques for preservation, fumigation, classification, and certification of grains	Quarterly	IDA / INAQ
Environmental Management and Safety	Environmental technicians, safety and health managers	Implementation of the PGAS, risk prevention, emergency response	Annual	MINAMB / Office Environment
Logistics and Operations	Logistics technicians, warehouse operators	Product entry/exit management, traceability, logistics contracts	Quarterly	Port of Luanda/ CFL / Logistics companies
Financial and Administrative Management	Financial and administrative managers	Economic and financial planning, financial planning, cost analysis, budget control	Annual	Commercial Banking / PRODESI
Governance and Participation Community	Local authorities, community representatives, NGOs	Transparency in management, community dialogue, conflict resolution	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 74: Training plan**

<b>Type of Training</b>	<b>Main Content</b>	<b>Target Audience</b>	<b>Frequency</b>	<b>Supporting Entities</b>
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, 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, complaint management, complaints, conflict resolution	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 Luanda, CFL, logistics operators
Governance and Ethics	Transparency, accountability, legal compliance	Managers of project, administrative managers	Initial + Annual refresher training	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 improving mitigation measures and the project design itself;
- Promote dialogue and inclusive engagement of all relevant stakeholders in order to strengthen social acceptance of the project and prevent future conflicts.
- Compliance with operational safeguard 1 of the project financing bank, 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 law establishes the principles, stages, and requirements of the EIA procedure and clearly defines the role of public consultations as a mechanism for participation and social inclusion. The following points are particularly relevant in this regard:

- **Article 20 (Public Participation):**

Establishes that the EIA process must ensure the effective participation of the public, particularly 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):**

It 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 collected 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 integrated into 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, ensuring 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:

- Potentially affected local communities;
- 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:

- Advertisements 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 proposed mitigation measures;
- Opportunity for participants to ask questions, make comments, and offer recommendations.

During the sessions, representatives of the proponent, the EIA technical team, local authorities, and, where applicable, representatives of the Ministry of the Environment or delegated body will be present.

EIA technical team, 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 necessary 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 Study 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 the province of **Icolo e Bengo**, in Catete, on June 24, 2025, various local government entities 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:

- Provincial Director of the Environment representing His Excellency the Governor of the Province of Icolo e Bengo;
- Deputy Administrator for Technical Affairs of the Municipality of Catete;
- Municipal Director for Infrastructure for the Municipality of Catete;
- Municipal Director for the Environment and Basic Sanitation Area of the Municipality of Catete;
- Head of the Environment Department of the Municipality of Catete;
- Representative of the Directorate for Media Affairs of the Municipality of Catete;

The provincial environment directorate 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 administration of Icolo and Bengo, as the entity responsible for municipal administration and therefore representing the population of Catete, 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:

- Location of the Grain Silo Infrastructure facility with a storage capacity of 120,000 tons of legumes in the municipality of Catete. The Carrinho Delegation clarified that the project will be implemented at the existing Catete Silo Complex site, which currently has a storage capacity of 8,000 tons, close to the Luanda-Malange railway line, and that the space will be subject to expansion for the implementation of the new infrastructure, as defined in the project.
- During the preliminary analyses and studies carried out in the project design process, questions were raised about the potential number of farmers in the province who would benefit from this project, considering the positive impact it would have on their quality of life and surrounding communities.
- The Provincial Government Bodies consulted conducted a survey of the Carrinho Group Delegation on the initiative of the Agricultural Infrastructure Project to be implemented in the province and municipality of Catete, highlighting the following positive aspects:
  - Increased agricultural productivity, guaranteed nutrition and food security, helping populations to combat hunger and poverty;
  - Creation and promotion of local employment/self-employment, with a special focus on young people and women in rural areas;
  - Creating a culture of learning and human capital training (promoting technical and vocational education);
  - Adding value to national production, reducing production losses, improving family income, adding value to local production in the Province of Icolo and Bengo/Municipality of Catete, since it is a new province in the development phase.
- The Carrinho Group Delegation shared its Policies and Priorities regarding the company's Social Responsibility Strategy, based on the concept of "*Shared Value Creation*," and the programs that will be developed under the "Agricultural Infrastructure Project" with the communities where it operates in terms of Agricultural and Rural Development.

*Shared Value,"* and the programs that will be developed under the *"Agricultural Infrastructure Project"* in the communities where it operates in terms of Agricultural and Rural Development.

- The Carrinho Group Delegation clearly clarified some issues related to the following areas of the company's activities, which are reflected in its Policies, Processes, and Procedures in terms of ensuring Environmental and Social sustainability:
- Recruitment management, guaranteeing fairness, equal opportunities for development and career progression in relation to gender;
- Recruitment Management, main requirements to be applied, in particular the need for Skilled Labor (Human Resources, Nationals, and Expatriates);
- Waste Management.

In addition, the Provincial Government Bodies consulted requested that the Carrinho Delegation share the main challenges they identified and barriers to be overcome in the various stages of implementation of this project, given that this project aims to:

- Promote the development of agriculture in Angola and Africa in general, based on knowledge transfer, fostering innovation, and ensuring environmental and social sustainability throughout its value chain.
- Contribute to ensuring food security and nutrition in Angola and Africa through the transformation of agriculture (growth and development of processing), creating opportunities for rural communities, especially women and young people. Improve productivity by strengthening agricultural value chains and developing input supply chains.
- Improve the quality of life of Angolan populations: Focusing on improving the standard of living of Angolans, especially women and young people, so that they can realize their potential.

- Contribute to the country's economic growth, particularly with regard to the creation and enhancement of logistics infrastructure to meet the needs of agribusiness and its sustainability.

Once the discussions were 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 Administration of Catete; (ii) shared the presentation and other background documents; and (iii) noted the need to work with the Provincial Government of Icolo and Bengo in a timely manner on the action plan within the framework of its social responsibility;

### **13.5.2 Dialogue and Complaints Register (public consultation)**

Following the presentation of the project on June 24, 2025, to the municipal authorities of Catete, each representative agreed to share the information with the local community.

Therefore, at 9:15 a.m. on November 19, 2025, at the Municipal Administration building, a meeting was held with the community and representatives of the Carrinho Group.

Representing His Excellency the Municipal Administrator, the Deputy Administrator for Technical Affairs (Eng. Cardoso A. F. Caolo) began by introducing himself to those present, as well as the other members of the presiding table (Head of the Municipal Section for Agriculture, Nicolau Mateus, and representatives of the Carrinho Group).

The Deputy Administrator then spoke about the Carrinho Group and the Agroindustrial project, which aims to gather information from the population to align local needs. He emphasized the importance of listening to the community.

Representing the Carrinho Group, Samuel Chupindula and Jackson Máquina presented the silo project, highlighting that the silos are intended to store and preserve grain for the community, benefiting small farmers. They also said that the Catete silos

have a capacity of up to 8 tons, and that an expansion to 120 tons is planned, which will make them one of the largest in the country.

Mr. Jackson explained the operation, treatment, and storage of corn and soybeans, and the importance of silos for economic balance, support for local production, agricultural sustainability, and stabilization of market price variations.

The Deputy Administrator for Technical Affairs highlighted the need to implement the project, encouraging the community to express their concerns and suggestions about the Carrinho Group's agro-industrial project.

In summary, the importance of the agro-industrial project led by the Carrinho Group, which seeks to integrate the needs of the Catete community through the implementation of silos for grain conservation. Community involvement is crucial to ensure that the project's growth effectively meets their demands. This collaboration can strengthen agriculture and the region's economy.

The deputy administrator closed the meeting at 11:40 a.m. with words of thanks for everyone's attendance.

A total of 104 (one hundred and four) individuals were present, of whom 71 (seventy-one) were male and 33 (thirty-three) were female.

**Note 1:** Public consultation sessions will continue to be comprehensive and inclusive during the implementation process of the different phases of the project. 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 phases, 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 Assessment of the Catete 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 grain 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 to 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 arising 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 impacts resulting from the installation and use of the construction site, vehicle traffic, construction of buildings, and assembly of equipment, etc., being noteworthy. Positive direct and indirect impacts are also expected, resulting from the creation of jobs 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 its surroundings, 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 Assessment, 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 viability 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
- VI. Attendance list for the public consultation
- 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

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,</p> <p>29 de Abril de 2025</p>	<p>Válida até,</p> <p>29 de Abril de 2026</p>
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Assinatura



MIRANDA CÂNDIDO KALA  
( DIRECTOR DO GABINETE JURÍDICO E INTERCÂMBIO )





A autenticidade deste documento poderá ser verificada através dos passos a seguir:

1. Aceda ao Portal MINAMB (<https://sia.minamb.gov.ao/validacao/documentos>)
2. Introduza o código RCONST-OTI2NTYxNTg= no campo "Código de Validação"
3. Clique em "Pesquisar"

Número do Certificado: 14110503250





## ANNEX V-MEETING MINUTES

	<b>ACTA DE REUNIÃO</b> <b>CONSULTA PÚBLICA: PROJECTO DE INFRA-ESTRUTURAS AGRÍCOLAS</b>	 <b>GOVERNO DE ANGOLA</b> MINISTÉRIO DO AMBIENTE  
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REUNIÃO DE CONSULTA PÚBLICA PARA APRESENTAÇÃO DO PROJECTO E INSTRUMENTOS AMBIENTAIS E SOCIAIS			
<b>Província: Icolo e Bengo</b>		<b>Município: Catete</b>	
<b>1. OBJECTIVOS</b>			
<ul style="list-style-type: none"> <li>○ Dar a conhecer o Projecto e as suas actividades associadas;</li> <li>○ Recolher contribuições (opiniões) e as eventuais sugestões, bem como eventuais preocupações sobre o projecto.</li> </ul>			
<b>2. INFORMAÇÕES/TEMAS APRESENTADOS NA CONSULTA PUBLICA</b>			
<ul style="list-style-type: none"> <li>▪ Apresentação dos instrumentos Ambientais e Sociais relevantes no Projecto;</li> <li>▪ Componentes e respectivos objectivos do Projecto;</li> <li>▪ Riscos e Impactos, Ambientais e Sociais referentes ao Projecto;</li> <li>▪ Expectativas e Preocupações relativas a Projecto.</li> </ul>			
<b>Local da Reunião:</b>	Governo Provincial de Icolo e Bengo	Icolo e Bengo	
<b>Data: 24/06/2025</b>	<b>Hora Inicio: 12h:30</b>	<b>Hora Termina: 14h:00</b>	
<b>3. SOBRE OS PARTICIPANTES</b>			
<b>Entidades/Orgãos Consultadas</b>		<b>Dono do Projecto – Carrinho, SA</b>	
<ul style="list-style-type: none"> <li>▪ <b>Director Provincial do Ambiente em representação da Sua Excelência Governador da Província de Icolo e Bengo, Jorge Mondo;</b></li> <li>▪ <b>Administrador Adjunto para Área Técnica do Município de Catete, Cardoso Caholo;</b></li> </ul>	<b>Nº de participantes desagregados por sexo: 7</b> (Homens 5 e 2 Mulheres)	<b>Nome</b>	<b>Função</b>
		<b>Samuel Candundo</b>	<i>Executive Board (ESG Committee Member)</i>
		<b>Lissandro Filipe</b>	<i>Administrative Director (ESG Committee Member)</i>
		<b>Maria Filomena Silva Melo</b>	<b>Director of Quality and Corporate Affairs (ESG Committee Member)</b>
		<b>Alede da Cunha</b>	<b>Compliance – Legal Affairs Environmental and Social Requirements Specialist (Agriculture)</b>

<ul style="list-style-type: none"> <li>▪ <b>Director Municipal para a Área de Infraestruturas do Município de Catete</b>, Celso da Costa Venceslan;</li> <li>▪ <b>Director Municipal para a Área de Ambiente e Saneamento Básico do Município de Catete</b>, Bruno Constantino;</li> <li>▪ <b>Chefe de Departamento da Área de Ambiente do Município de Catete</b>, Gerson Costa;</li> <li>▪ <b>Representante da Direcção para a Área de Comunicação Social do Município de Catete</b>, Sara Henda;</li> <li>▪ <b>Representante da Direcção para a Área de Comunicação Social do Município de Catete</b>, Cardina Célia;</li> </ul>		<p align="center"><b>Dilva Manuel</b></p>	<p align="center"><b>Environmental, Social, Manager</b></p>
		<p align="center"><b>Euclides Calenga</b></p>	<p align="center"><b>Environmental, Social, Manager</b></p>
		<p align="center"><b>Almerindo Samuel Chilindula</b></p>	<p align="center"><b>Responsável da Área de Expansão – Carrinho Agri</b></p>

**4. RESUMO DA ACTIVIDADE E PRINCIPAIS CONTRIBUTOS**

Com intuito de dar a conhecer o Projecto de Infra-estruturas Agrícolas e suas respectivas componentes, bem como recolher sugestões inerentes á sua implementação, participaram os órgãos públicos do Governo Provincial e da Administração Municipal (Catete), conforme as datas acima referenciadas, de modo presencial.

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:



ACTA DE REUNIÃO  
CONSULTA PÚBLICA: PROJECTO DE INFRA-ESTRUTURAS AGRÍCOLAS



Os **Órgãos do Governo Provincial do Icolo e Bengo e da Administração Municipal de Catete**, destacaram os seguintes elementos:

- Localização da instalação das Infraestruturas de Silos de Grãos com capacidade para o armazenamento de 120.000 toneladas de cereais de leguminosas no Município de Catete, tendo sido clarificado pela Delegação da Carrinho, que o Projecto será implementado no local já existente do Complexo de Silos de Catete, com capacidade actual de armazenamento de 8.000 toneladas, próximo da linha de caminho-de-ferro Luanda-Malange, e que o espaço será sujeito a ampliação de área para implantação das novas infraestruturas, conforme definido em projecto.
- Foi questionado no âmbito das análises e estudos prévios que foram realizadas, no processo de concepção do Projecto, o potencial de número de agricultores existentes ao nível da Província, que serão beneficiados com este Projecto, considerando o impacto positivo que haverá na sua qualidade de vida e comunidades envolventes.
- Foi realizado um reconhecimento por parte dos Órgãos do Governo Provincial Consultados, à Delegação do Grupo Carrinho pela iniciativa do Projecto de Infra-estruturas Agrícolas a ser implementado na Província e no Município de Catete, salientando-se os seguintes aspectos positivos:
  - Aumento da produtividade agrícola, a garantia da Nutrição e da Segurança Alimentar, ajudando as populações a combater a fome e a pobreza;
  - A criação e a promoção de emprego/auto-emprego local, com especial enfoco para jovens e mulheres em zonas rurais;
  - Criar uma cultura de aprendizagem e de capacitação do Capital Humano (promover a educação técnica e profissional);
  - Agregar valor à produção nacional, reduzindo as perdas da produção, melhorando a renda das famílias, acrescentando valor à produção local da Província de Icolo e Bengo/Município de Catete, uma vez que se trata de uma Província nova em fase de desenvolvimento.
- Foi partilhado pela Delegação do Grupo Carrinho, as suas Políticas e Prioridades, referentes à Estratégia de Responsabilidade Social da empresa, baseada com conceito de **“Criação de Valor Partilhado”**, e os programas que serão desenvolvidos no âmbito do **“Projecto de Infra-estruturas Agrícolas”**, junto das comunidades onde actua em termos de Desenvolvimento da Agricultura e Meio Rural;



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- Foram esclarecidas claramente pela Delegação do Grupo Carrinho, algumas questões relacionadas com os seguintes âmbitos de actuação da empresa, que se encontram traduzidas nas suas Políticas, Processos e Procedimentos em termos da garantia da sustentabilidade Ambiental e Social:
  - Gestão de Recrutamento, garantia da equidade, igualdade de oportunidades de desenvolvimento e progressão na carreira, relativamente a género;
  - Gestão de Recrutamento, principais requisitos a aplicar, em particular necessidade de Mão de Obra Especializada (Recursos Humanos, Nacionais e Expatriados);
  - Gestão de Resíduos.
- Adicionalmente, foi solicitado pelos Órgãos do Governo Provincial Consultados, que a Delegação da Carrinho, partilha-se, quais foram os principais desafios que identificaram e barreiras a superar no âmbito das diversas etapas de implementação deste projecto, uma vez que este projecto visa:
- Promover o desenvolvimento da agricultura em Angola e África no geral, baseada na transferência de conhecimento, potenciando a inovação e garantindo a sustentabilidade ambiental e social em toda a sua cadeia de valor.
  - Contribuir para a garantia da segurança alimentar e nutrição em Angola e África por meio da transformação da agricultura (crescimento e desenvolvimento do processamento), criando oportunidades para comunidades rurais, especialmente mulheres e jovens. Melhorar a produtividade, fortalecendo as cadeias de valor agrícolas, bem como desenvolvimento de cadeias de fornecimento de insumos.
  - Melhorar a qualidade de vida das populações angolanas: Concentrando-se na melhoria do padrão de vida dos angolanos, especialmente das mulheres e dos jovens, para que possam realizar o seu potencial.
  - Contribuir para o crescimento económico do País, nomeadamente no que diz respeito à criação e potencialização de infraestruturas logísticas para atender às necessidades do Agronegócio e à sua sustentabilidade.



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CONSULTA PÚBLICA: PROJECTO DE INFRA-ESTRUTURAS AGRÍCOLAS



5. ENCONTROS DE CONSULTAS PÚBLICAS COM REPRESENTANTES DO GOVERNO DO ÍCOLO BENBO: REGISTO FOTOGRÁFICO (SE AUTORIZADO)





ACTA DE REUNIÃO  
CONSULTA PÚBLICA: PROJECTO DE INFRA-ESTRUTURAS AGRÍCOLAS



	<p align="center"><b>Environmental and Social Impact Study of the Catete Grain Terminal "Silos"</b>  <b>– Luanda</b></p> <p align="center"><b>Technical Report</b></p>	 <p>HSG Lda Construção, Engenharia e Comércio</p>
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	<p align="center"><b>ACTA DE REUNIÃO</b>  <b>CONSULTA PÚBLICA: PROJECTO DE INFRA-ESTRUTURAS AGRÍCOLAS</b></p>	 
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<p><b>6. EQUADRAMENTO LEGAL DO PROJECTO: LEGISLAÇÃO ANGOLANA RELEVANTE NESTA CONSULTA PÚBLICA</b></p>
<ul style="list-style-type: none"> <li>o Decreto Presidencial nº 200/22 de 23 de Julho de 2022 – O Plano Nacional de Fomento para a Produção de Grãos (PLANAGRÃO).</li> <li>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.</li> <li>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.</li> </ul>
<p><b>7. DOCUMENTO PARTILHADOS PELO DONO DA OBRA COM AS PARTES INTERESSADAS NA CONSULTA PÚBLICA</b></p>
<ol style="list-style-type: none"> <li>1) Apresentação do Projecto Carrinho “<i>Infra-Estruturas Agrícolas</i>”.</li> <li>2) Políticas Grupo Carrinho – ESMS.</li> <li>3) Standards (Procedimentos) “Chave” Grupo Carrinho – ESMS (Consulta Pública).</li> <li>4) Resumo dos Relatórios Não Técnicos dos Estudos de Impacto Ambiental e Social (Subprojectos: Infraestruturas Agrícolas – Silos de Grão), referentes aos Municípios: Catete</li> <li>5) Consulta Pública – Registo de Diálogo e Reclamação.</li> </ol>
<p><b>8. CONSIDERAÇÕES FINAIS</b></p>
<ol style="list-style-type: none"> <li>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 a Administração Municipal do Catete; (ii) partilha da apresentação e demais documentos de base e (iii) anotação sobre a necessidade de oportunamente trabalhar com o Governo da Província do Icolo e Bengo, no caderno de acções no quadro da sua responsabilidade social;</li> </ol>
<ol style="list-style-type: none"> <li>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.</li> </ol>



ACTA DE REUNIÃO  
CONSULTA PÚBLICA: PROJECTO DE INFRA-ESTRUTURAS AGRÍCOLAS



9. CONTACTOS DOS PARTICIPANTES

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ANNEX VI-ATTENDANCE LIST



REPÚBLICA DE ANGOLA  
GOVERNO PROVINCIAL DO ICULO E BENGO  
Gabinete Provincial do Ambiente, Gestão de Resíduos e Serviços Comunitários

LISTA DE PRESENÇA DA REUNIÃO

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12	Quelider Caluça	HSG CONS.	GESTOR AMB		
13					
14					

## ANNEX VII- DIALOGUE AND COMPLAINTS REGISTER (PUBLIC CONSULTATION)

	<b>REGISTO DE DIÁLOGO E RECLAMAÇÕES</b> <b>CONSULTA PÚBLICA</b>	 GOVERNO DE ANGOLA MINISTÉRIO DO AMBIENTE  
<b>FORMULÁRIO PARA REGISTO DE DIÁLOGO E RECLAMAÇÕES</b>		
Identificação do Projecto/Actividade: <u>Projecto de Infraestruturas 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>Catete</u>	Posto Administrativo: <u>Administração Municipal</u>	
Comuna: <u>Sede</u>	Província: <u>Icolo e Bengo</u>	
Data de Recepção: <u>19/ 11/ 2025</u>	Data de Recepção: <u>19/11/2025</u>	
<b>RESUMO DO CONTÉUDO</b>		
<p>Às nove horas e quinze minutos da dia dezanove de Novembro de dois mil e vinte e cinco, no jango da Administração Municipal, reuniu-se com a comunidade e os representantes do Grupo Carrinho.</p> <p>Em representação da S. Ex<sup>ã</sup>. Sr. <b>Administrador Municipal</b>, o <b>Administrador Adjunto para a Área Técnica (Eng<sup>o</sup> Cardoso A. F. Caolo)</b>, começou por apresentar-se aos presentes, bem como, os demais integrantes da mesa de presidium (<b>Chefe de Secção Municipal para Agricultura, Nicolau Mateus e representantes do Grupo Carrinho</b>).</p> <p>Em seguida, o Administrador Adjunto falou sobre o Grupo Carrinho, e o projecto Agroindustrial, que visa reunir informações da população para alinhamento das necessidades locais. Dando ênfase na importância de auscultar a comunidade.</p> <p>Em representação do Grupo Carrinho, <b>Samuel Chupindula e Jackson Máquina</b>, apresentaram o projecto de silos, enaltecendo que os silos visam armazenar e conservar grãos para a comunidade, beneficiando pequenos agricultores. Disseram ainda, que o funcionamento dos silos de Catete, possuem uma capacidade de até 8 toneladas, e que prevê uma ampliação de até 120 toneladas, o que representará um dos maior do país.</p> <p>O <b>Sr. Jackson</b> explicou sobre o funcionamento, tratamento e armazenamento do milho e soja, e da importância dos silos para o equilíbrio econômico, suporte à produção local, sustentabilidade agrícola, e estabilização das variações de preço no mercado.</p>		

Em modo de Conclusão, o **Administrador Adjunto para Área Técnica**, destacou a necessidade da implementação do projecto, incentivando à comunidade para expressar às suas inquietações e sugestões, sobre o projecto agroindustrial do Grupo Carrinho.

Em síntese, a importância do projecto agroindustrial liderado pelo Grupo Carrinho, que busca integrar as necessidades da comunidade de Catete, por meio de implementação de silos para conservação dos grãos. O envolvimento da comunidade é crucial para garantir que o crescimento do projecto, efectivamente às suas demandas. Essa colaboração pode fortalecer a agricultura e a economia da região.

O administrador adjunto deu por encerrada a reunião às onze horas e quarenta minutos, com palavras de agradecimento pela presença de todos.

**ENCONTRO DO CONSELHO MUNICIPAL DE AUSCULTAÇÃO DAS COMUNIDADES DE ICOLO E BENGU - CATETE: REGISTO FOTOGRÁFICO**





Projecto Estratégico - Infraestruturas Agrícolas

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