Annual Report of **The GNA Biodiversity Action Plan** 2024

GNA
GÁS NATURAL AÇU





BAP
BIODIVERSITY ACTION PLAN



Contents

INTRODUCTION 4
- Presentation 5
- GNA 6
- GNA Natural Gas Thermoelectric ParkA 7

THE BAP 12
- GNA Biodiversity Action Plan 13
- Timeline 18

ENVIRONMENTAL CONSERVATION 24
- Commitments: the 21 mitigation measures 25

ECOSYSTEM: ATLANTIC RAINFOREST – RESTINGA *(SANDBANK)* 27

Impact – Vegetation clearing 28
- Mitigation Measure 1 29
- Mitigation Measure 2 31
- Mitigation Measure 3 52
- Mitigation Measure 4 54

Impact – Loss of habitat 55
- Mitigation Measure 5 55
- Mitigation Measure 6 59

Impact – Bird mortality along transmission lines 60
- Mitigation Measure 7 60

ECOSYSTEM: FRESHWATER 66

Impact – Reduction of water quality and quantity 67
- Mitigation Measure 8 67
- Mitigation Measure 9 69
- Mitigation Measure 10 71
- Mitigation Measure 11 71

ECOSYSTEM: COASTAL 72

Impact – Mortality and decreased reproduction of sea turtles 74
- Mitigation Measure 12 75
- Mitigation Measure 13 76
- Mitigation Measure 14 81
- Mitigation Measure 15 82

Impact – Decline in habitat suitability for all near-shore marine species 90
- Mitigation Measure 16 91
- Mitigation Measure 17 93
- Mitigation Measure 18 95
- Mitigation Measure 19 114
- Mitigation Measure 20 118
- Mitigation Measure 21 119

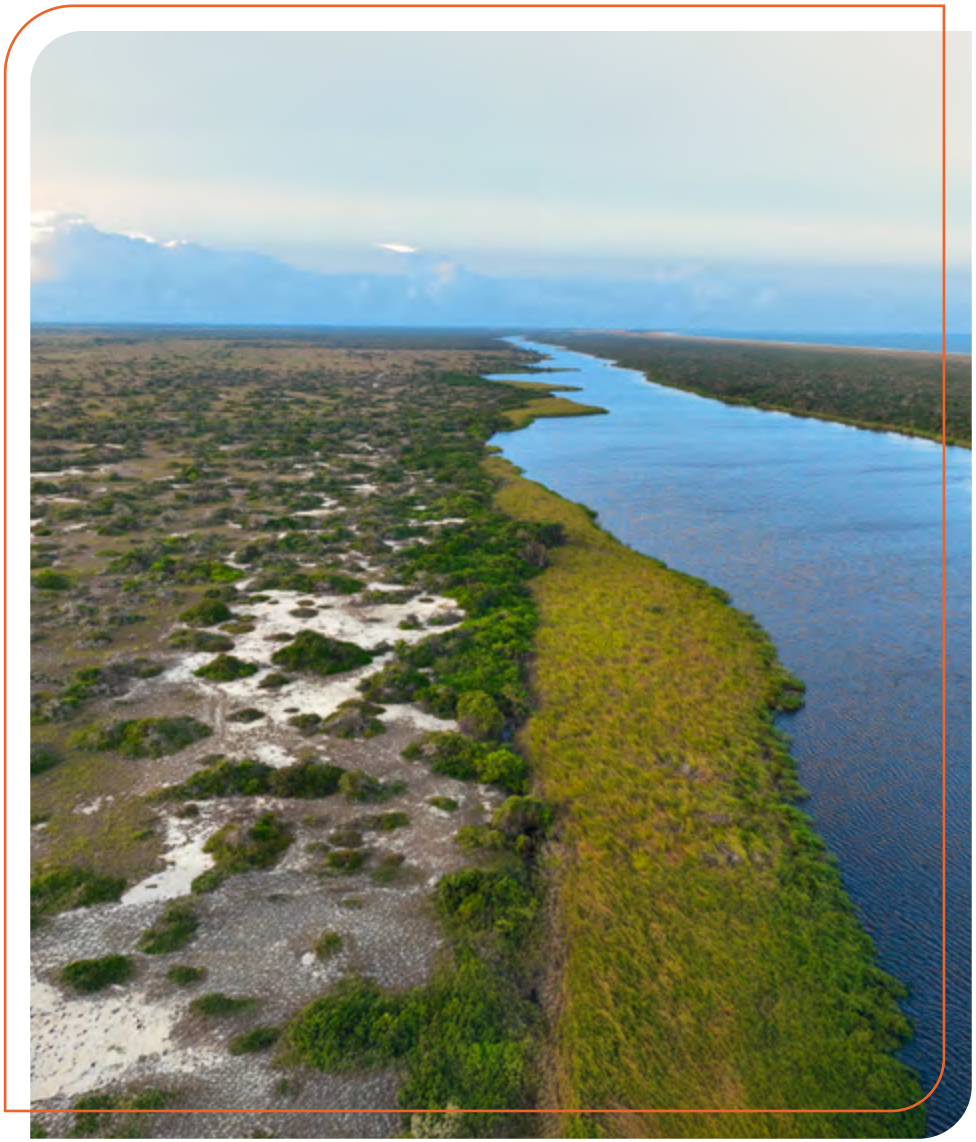
FINAL REMARKS 127

SUMMARY: IMPLEMENTATION OF MITIGATION MEASURES 131

REFERENCES, GLOSSARY AND CREDITS 138

Introduction





Presentation

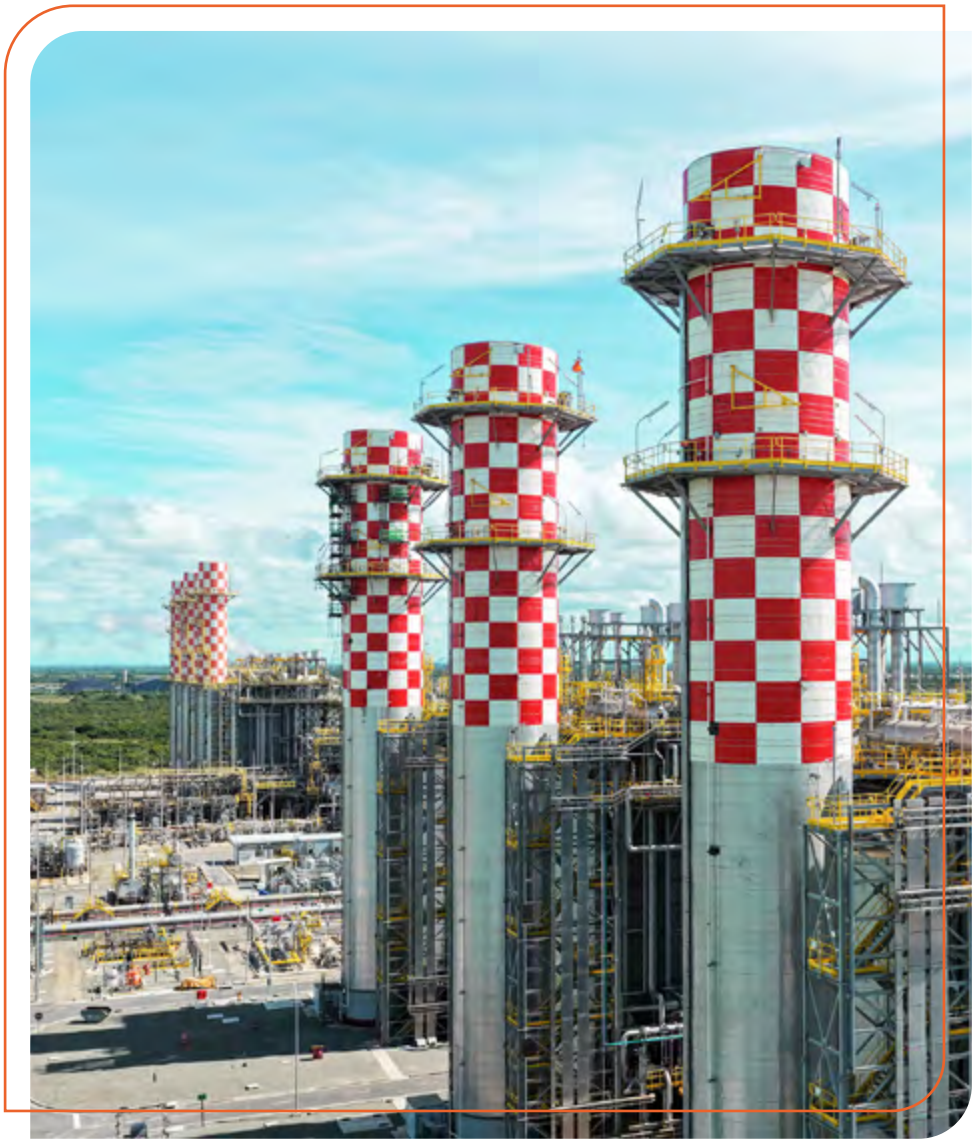
This document provides details on the progress of **GNA's Biodiversity Action Plan** (BAP). It describes the status of conservation, mitigation and compensation measures for **terrestrial (Restinga)**, **freshwater (lagoons)** and **coastal (marine)** ecosystems related to GNA projects under implementation and already in operation located at Port of Açu in the state of Rio de Janeiro, Brazil.

In addition to the activities carried out in 2024, the content combines information from previous reports to offer a comprehensive overview of how the measures have been implemented. This document is a summarized version of the 6th Annual Report of the GNA Biodiversity Action Plan, which was drawn up in February 2025.

GNA

A private power generation company, **GNA** is a joint venture involving leading companies in their respective fields: **bp, Siemens Energy, Siemens AG, SPIC Brasil and Prumo Logística**. Its activities are focused on structural projects that create opportunities and promote local development while respecting people and the environment. With the mission of generating reliable energy and contributing to the country's energy security, **GNA owns the largest Natural Gas Thermoelectric Park in Latin America.**

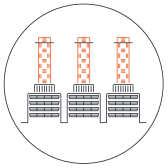
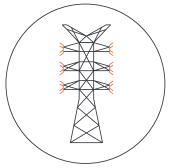
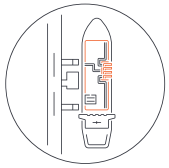
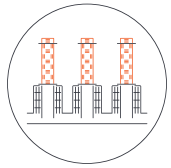
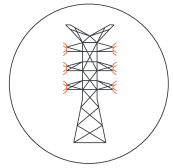




GNA Natural Gas Thermoelectric Park

Located in the **Port of Açu** in the Northern region of the state of Rio de Janeiro, **GNA's Natural Gas Thermoelectric Park** plays a strategic role in the security of energy supply and the diversification of the Brazilian energy matrix. The development involves investments of roughly R$12 billion and involves **two thermoelectric plants** (TPP GNA I and GNA II); **a Liquefied Natural Gas Regasification Terminal** (LNG Terminal – LNGT) and **two transmission lines** (345 kV TL Açu-Campos and 500 kV TL Açu-Campos 2).

Jointly, TPP GNA I and TPP GNA II total more than 3 GW of installed capacity, which is enough energy to serve around 14 million homes, equivalent to the demands of the states of Rio de Janeiro, Minas Gerais and Espírito Santo combined.

TPP GNA I	Transmission Line 345 kV	LNG TERMINAL (LNGT)	TPP GNA II	Transmission Line 500 kV
				
1.338 MW	345 kV connected to the National Interconnected System (SIN)	21 MM m3 of natural gas per day	1.672 MW	500 kV connected to SIN

TPP GNA I

A gas-fired Thermoelectric Power Plant **with an installed capacity of 1,338.3 MW**, TPP GNA I had its Installation License (IL) issued by the State Environmental Institute of Rio de Janeiro (Instituto Estadual do Ambiente do Rio de Janeiro – INEA/RJ, in Portuguese) in March 2018, the same month as the start of its construction, carried out by the Açu Thermal Consortium, made up of the companies Andrade Gutierrez and Siemens. In September 2020, authorization was received from INEA/RJ to carry out pre-operational activities and its Operating License (OL) was issued in December 2020.

The plant obtained authorization from the National Electric Energy Agency (Agência Nacional de Energia Elétrica – Aneel, in Portuguese) to start up commercial operations on September 16, 2021 and has played a fundamental role in the supply of energy to the National Interconnected System (Sistema Interligado Nacional – SIN, in Portuguese) in light of the critical situation the country was facing at the time. Given the lower volume of rainfall recorded in the last 91 years during the rainy season (October 2020 to April 2021), the reservoirs of Brazilian hydroelectric plants indicated extremely low levels. By order of the National Electric System Operator (Operador Nacional do Sistema Elétrico – ONS, in Portuguese), the TPP GNA I was kept on until February 2022, when the supply of energy from hydroelectric plants returned to normal.

During the remainder of 2022 and much of 2023, the TPP GNA I remained off for operational convenience, with no demand for energy dispatch by the ONS. In December 2023, due to the heatwave that affected the country, ONS requested that the TPP GNA I be activated. The plant operated for 7 days, starting on December 18, 2023, after which it was shut down again for operational convenience. In 2024, the plant underwent maintenance on its GT 12 and GT 11 turbines, that was completed in March and May, respectively, which required the turbines to be activated for testing. The plant was shut down again until August 31, 2024, when it operated until November 4 due to a request by the ONS, was restarted on November 8 for an additional 7 days, operated again between November 29 and December 6, 2024, and remained shut down for the rest of the year due to operational convenience.

LNG Terminal (LNGT)

The first Private Use Port Terminal in the Southeast was built to meet the demand for natural gas from GNA plants. In it, the **Floating Storage and Regasification Unit (FSRU)**, FSRU BW Magna, **is moored with a capacity to store and regasify up to 21 million cubic meters/day of LNG** (Liquefied Natural Gas). The FSRU receives the LNG through what is known as a ship-to-ship (STS) transfer operation, during which a LNGC (Liquefied Natural Gas Carriers) ship is positioned next to the floating unit to transfer the natural gas in a liquid state. Whenever there is a need to send natural gas for power generation, the regasification process at the FRSU begins. The LNG is transformed from a liquid to a gaseous state and then transported through a pipeline of approximately 3 km to the plant. The IL of the LNGT was issued by INEA/RJ in December 2018, and the company Acciona was responsible for the construction, assembly and commissioning activities. The OL was issued in May 2020 and its activities are conducted by the company called KN.

345 kV Transmission Line

At 52 km long, the 345 kV Transmission Line consists of a 55 m wide easement and **129 towers** that connect the TPP GNA I to the Furnas Substation connecting the plant to the national grid and enabling the supply of electricity to the National Interconnected System (SIN).

The IL was issued by INEA/RJ in November 2019. The company Alubar was responsible for cabling and commissioning and the company Total Comunicações was responsible for its maintenance. The OL was issued in May 2020. The IL, renewed after transfer of ownership from Porto do Açu Operações (Port of Açu Operations) to GNA, was issued by INEA/RJ in November 2019. The construction and process of preparing and testing the facility were completed by Alubar, after which Engelmig took over responsibility for maintenance. The OL was issued in May 2020.

TPP GNA II

The gas-fired Thermoelectric Power Plant boasting an **installed capacity of 1,672 MW** is controlled by the companies bp, Siemens Energy and SPIC Brasil. Its IL was issued by the INEA/RJ in January 2020. Construction began in September 2021 and is expected to be finished in 2025. It is being carried out by the Consórcio Geração Açu II (Açu II Generation Consortium), made up of the companies Andrade Gutierrez and Siemens. Due to the relevance of the project for the country's energy security, the project was included in the New Growth Acceleration Program (Novo Programa de Aceleração do Crescimento – PAC, in Portuguese), announced by the Federal Government in August 2023. The OL was requested from INEA/RJ in December 2023.

500 kV Açu-Campos 2 TL

At a **length of 37.4 km**, the 500 kV Transmission Line has a 64 m wide right-of-way and **84 towers that connect** the TPP GNA II to the Campos 2 Substation, enabling the supply of electricity to the National Interconnected System (SIN). It had its IL issued by INEA/RJ in November 2021. Construction of the Line began in October 2022 and was completed in November 2023. The construction, cabling and commissioning works were carried out by the companies Railec (500 kV TL) and Cobra Brasil Group (Campos 2 Substation). The OL was requested from INEA/RJ in August 2023, and the commissioning phase began in 2024.



Aerial image of the GNA Natural Gas Thermoelectric Park, highlighting: A – LNGT, B – TPP GNA I, C – Transmission Line 345 kV, D – TPP GNA II, E – TL 500 kV Açu-Campos 2.

A - LNGT **B - TPP GNA I** **C - Transmission Line 345 kV** **D - TPP GNA II** **E - TL 500 kV Açu-Campos 2**

Source: GNA Archive.

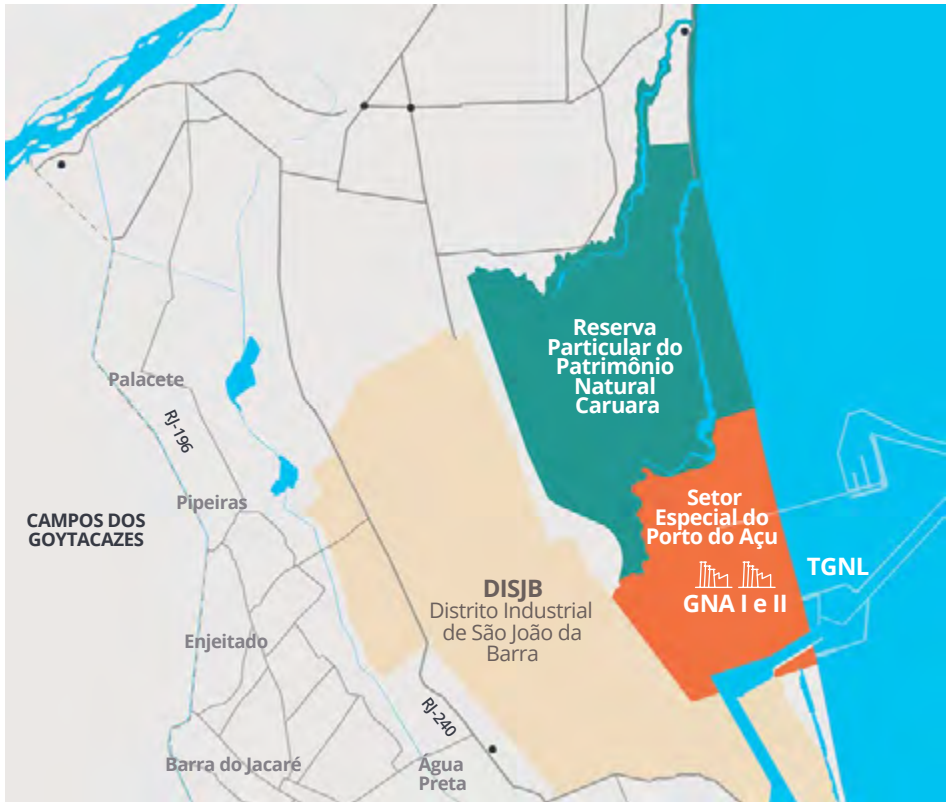
Where we are

GNA Natural Gas Thermoelectric Park is located in the **Port of Açu, municipality of São João da Barra**, in the Northern region of the state of Rio de Janeiro. Our area of influence also includes the municipality of Campos dos Goytacazes, located 50 km from our facilities.



Location of the GNA Natural Gas Thermoelectric Park.

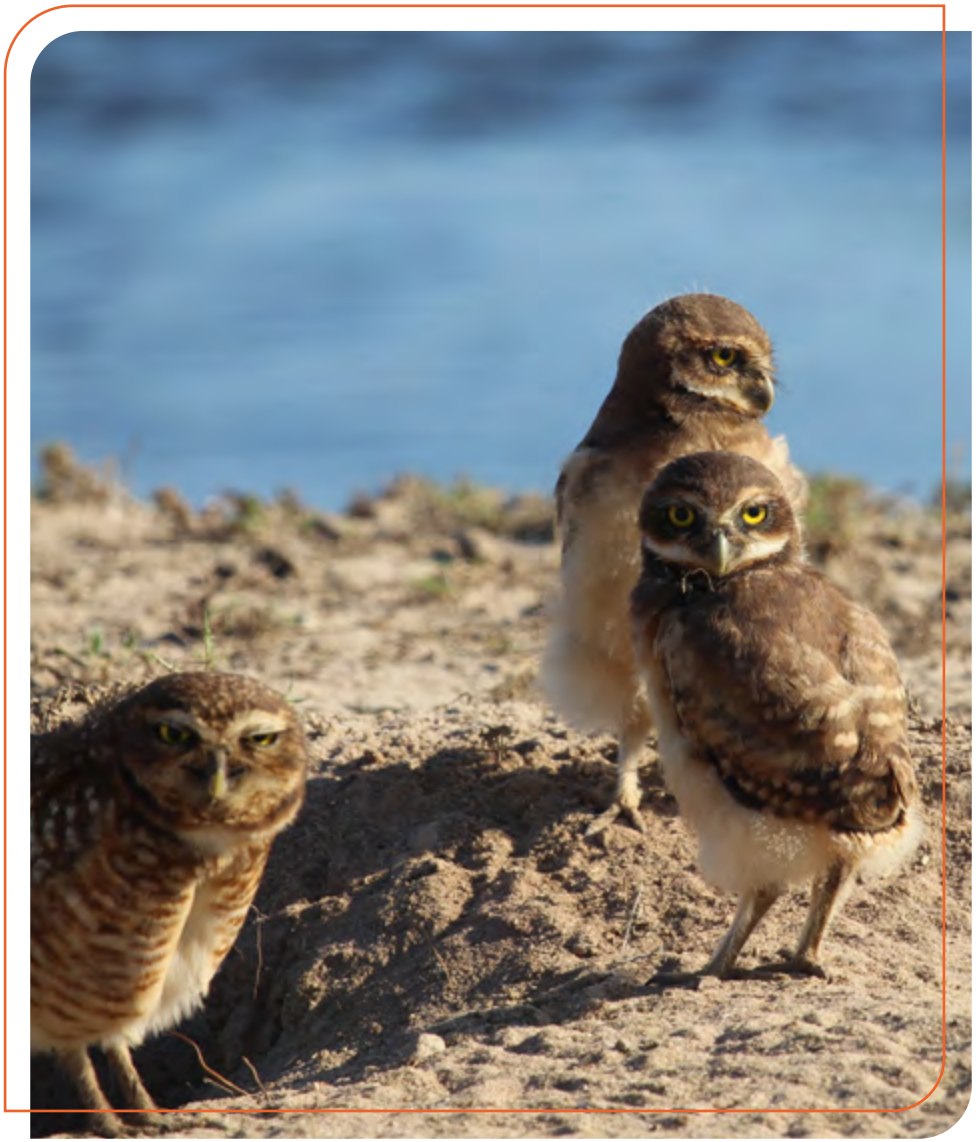
In operation since 2014 and totaling 130 km², the Port of Açu conserves an area of 40 km², the Caruara Private Natural Heritage Reserve (Reserva Particular do Patrimônio Natural Caruara – RPPN Caruara, in Portuguese), the largest private unit dedicated to preserving the restinga ecosystem in Brazil.



Location of the GNA Natural Gas Thermoelectric Park in relation to the Port of Açu Special Sector (Setor Especial do Porto do Açu – SEPA, in Portuguese), Industrial District of São João da Barra (Distrito Industrial de São João da Barra – DISJB, in Portuguese), Caruara Private Natural Heritage Reserve (RPPN Caruara) and municipality of Campos dos Goytacazes.

The BAP





GNA Biodiversity Action Plan

The GNA's Biodiversity Action Plan (BAP) was created in 2018 based on the Performance Standards of the International Finance Corporation (IFC), one of the funders of the projects at the time. These Performance Standards are designed to manage environmental and social risks and impacts and involve eight topics that must be complied with over the duration of the investment. The Performance Standard 6 – Biodiversity Conservation and Sustainable Management of Living Natural Resources (PS6) is applied to developments located in modified natural and critical habitats, which potentially affect or depend on ecosystem services over which the funded development has direct management control (or significant influence) or include the production of living natural resources.

The GNA Thermoelectric Park fits the profile defined for the PS6 because it is located in a region initially occupied by restinga vegetation. According to criterion IV of paragraph 16 of PS6, restinga is considered a critical habitat — a highly threatened ecosystem due to the high rates of deforestation and intense anthropization of the natural environments of the Atlantic Rainforest. Therefore, the BAP was created to define and implement impact management measures on biodiversity to ensure that GNA's facilities are installed and operated without causing a net loss in biodiversity (No Net Loss), in addition to seeking a positive net balance of biodiversity (Net Gain), as referred to in paragraph 10 of PS6. These measures are designed to achieve high sustainability performance and were the basis for the construction of the BAP, being maintained even after the change in the financing structure, which took place in 2021[1].

The BAP initially investigated actions that could be taken to avoid, minimize, restore, and/or compensate for the impacts resulting from the implementation and operation of TPP GNA I, the LNG Terminal, and the 345 kV Transmission Line. The systematization of these actions was structured in the BAP and in the Biodiversity Monitoring and Evaluation Plan (BMEP), which resulted in 21 Mitigation Measures. In December 2022, the BAP and the BMEP were updated to include the impacts of the implementation of TPP GNA II and 500 kV TL, and the same 21 Mitigation Measures that incorporated the new identified impacts were maintained. The main updates include a change in the critical habitat trigger species for fauna and flora; the development of studies conducted to fill in gaps in understanding certain priority values related to biodiversity, the development of a set of management, monitoring and compensation activities to ensure No Net Loss and Net Gain in biodiversity at the RPPN Caruara, including technical justification for losses versus gains, and the creation of biodiversity monitoring programs with metrics for critical habitat triggering species.

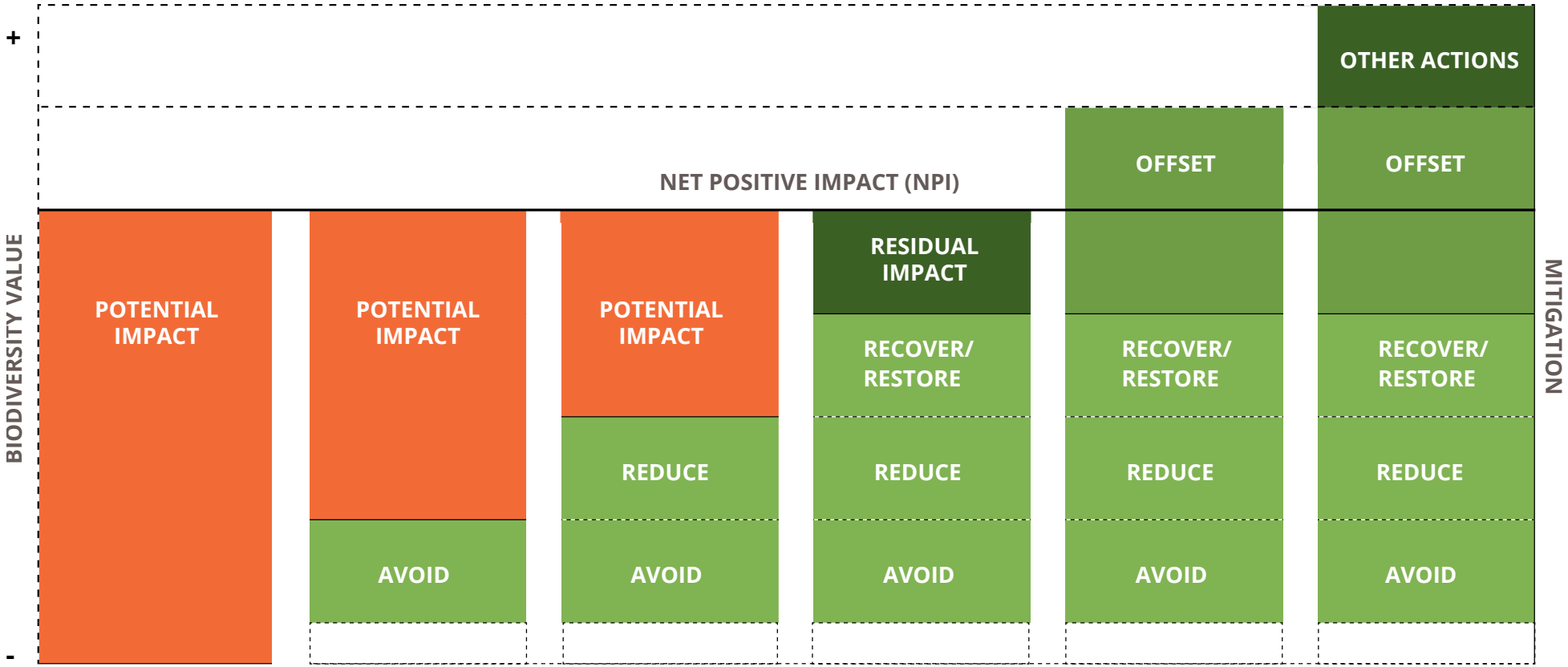
The BMEP details the measures proposed in the BAP to comply with the project's impact mitigation hierarchy. The following are specified for each measure: the baseline values, evaluation indicators, related impacts, possibly affected biodiversity values, trends, expected results of these measures, triggers for adaptive management and their respective documents and programs associated with each step.

Altogether, the BMEP involves 26 indicators that are needed to verify the range of No Net Loss/Net Gain or to be used as supporting information. The indicators are monitored by GNA and comply with the requirements of the environmental licensing processes, and in some situations the monitoring takes place for a longer period than expected by environmental regulations in order to comply with the requirements of the lenders. It is important to note that the monitoring of the reproductive period of sea turtles, which will be seen later, is not required by environmental regulators, and is an initiative voluntarily supported by GNA.

Thereby, this 6th Annual Report of the GNA Biodiversity Action Plan (Year 2024) considers the GNA I and GNA II projects, the updated version of the BMEP, the content disclosed in the previous annual BAP implementation reports, the recommendations provided by the 2023 Environmental and Social Monitoring Report for GNA I and the 2024 Social and Environmental Aspects Report for GNA, prepared by an independent environmental auditor, as well as the new list of trigger species for critical habitat. The document also provides an updated overview of these indicators compared to previous reports. It includes the status of each defined mitigation measure, providing transparency for the 26 indicators monitored by the BMEP.

[1] *Since the beginning of 2021, the implementation of GNA I projects has been financed directly by KFW-IPEX Bank GMBH and the National Bank for Economic and Social Development (Banco Nacional de Desenvolvimento Econômico e Social – BNDES, in Portuguese); while those related to GNA II are financed exclusively by BNDES.*

Mitigation hierarchy scheme implemented by GNA



Species of fauna and flora of critical habitat associated with the restinga

For projects associated with GNA I, the BAP identified certain species as being part of a critical habitat associated with the restinga ecosystem, such as *Cerradomys goytaca*, *Dendropsophus meridianus*, *Rhinella pygmaea*, *Glaucomastix littoralis* and *Xenohyla truncata*.



Cerradomys goytaca



Dendropsophus meridianus

Foto: Henrique Nogueira



Rhinella pygmaea

Foto: Henrique Nogueira



Glaucomastix littoralis



Xenohyla truncata

Foto: Henrique Nogueira

Following the update to the BAP, which was done to also include the projects related to GNA II, the list was revised. Based on the knowledge acquired over five years of implementing the BAP, two mammals of restricted distribution (*Cerradomys goytaca* and *Bradypus crinitus*), one reptile of restricted distribution (*Glaucomastix littoralis*) and six species of plants of restricted distribution (*Inga maritima, Erythroxylum ovalifolium, Melanopsidium nigrum*, *Condalia buxifolia*, *Scutia arenicola* and *Melocactus violaceus*) were considered.


Cerradomys goytaca


Bradypus crinitus Foto: Henrique Nogueira


Glaucomastix littoralis


Inga maritima


Erythroxylum ovalifolium


Melanopsidium nigrum


Condalia buxifolia


Scutia arenicola


Melocactus violaceus

TIMELINE – Implementation of the GNA BAP Mitigation Measures



2018 – 2020

Construction and implementation

TPP GNA I

Implementation

Preparation of the GNA Biodiversity Action Plan (BAP), including the Biodiversity Management Plan (BMP) and the Biodiversity Monitoring and Evaluation Plan (BMEP)

TPP GNA I

BAP

2018

2018 – 2025

Construction of firebreaks

TPP GNA I + TPP GNA II

Mitigation Measure 1

Maintenance of firebreaks

TPP GNA I + TPP GNA II

Mitigation Measure 1

2018
(RECURRING ACTIVITY)



2018 – 2025

Installation of oil-water separators and containment trays

TPP GNA I + TPP GNA II

Mitigation Measure 8

Germplasm Rescue

TPP GNA I + TPP GNA II

Mitigation Measure 2

2018 - 2021



Legend:

TPP GNA I – Refers to the TPP GNA I, TGNL, and 345 kV Transmission Line complex. **TPP GNA II** – Refers to the TPP GNA II and 500 kV Transmission Line complex.

TPP GNA I + TPP GNA II – Refers to actions involving both projects, with GNA II being progressively incorporated from the start of its construction.

LT 345 kV + LT 500 kV – Refers to actions involving both transmission lines, with LT 500 kV being progressively incorporated from the start of its construction.

TIMELINE – Implementation of the GNA BAP Mitigation Measures



2018
(RECURRING ACTIVITY)

Management of target fauna species

TPP GNA I + TPP GNA II

Mitigation Measure 5

Campaigns under the Rescued Flora Monitoring Program

TPP GNA I + TPP GNA II

Mitigation Measure 2

2018 – 2025
(ESTIMATED)

2018 – 2021

Execution of monetary environmental compensation payments

TPP GNA I + TPP GNA II

Mitigation Measures 3 and 11

Dredging activities respecting the nesting period of sea turtles

TGNL Terminal

Mitigation Measure 12

2019





2019

Painting of the FSRU to minimize light reflection

FSRU

Mitigation Measure 14

Preparation of the Ballast Water Control Procedure

Preparation of the Marine Bioinvasion Monitoring Plan

TGNL Terminal

Mitigation Measures 19 and 20

2019

Legend:

TPP GNA I – Refers to the TPP GNA I, TGNL, and 345 kV Transmission Line complex. **TPP GNA II** – Refers to the TPP GNA II and 500 kV Transmission Line complex.

TPP GNA I + TPP GNA II – Refers to actions involving both projects, with GNA II being progressively incorporated from the start of its construction.

LT 345 kV + LT 500 kV – Refers to actions involving both transmission lines, with LT 500 kV being progressively incorporated from the start of its construction.

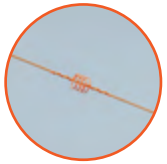
TIMELINE – Implementation of the GNA BAP Mitigation Measures

Installation of anti-collision markers

LT 345 kV + LT 500 kV Transmission Line

Mitigation Measure 7

2019 – 2023





2019 – 2024

Seedling planting for restinga ecosystem restoration

TPP GNA I + TPP GNA II

Mitigation Measures 2, 6, and 10

Installation of anti-drag structures for marine fauna in the water intake system

FSRU

Mitigation Measure 17

2019

2019 - 2020

Construction of the effluent outfall, promoting mixing of waters from the FSRU and the power plants (UTEs)

TPP GNA I + TPP GNA II

FSRU

Mitigation Measure 16

Campaigns under the Marine Monitoring Plan

TGNL Terminal / FSRU

Mitigation Measure 21

2020
(RECURRING ACTIVITY)



2020 - 2021
(RECURRING ACTIVITY)

Monitoring campaigns of nearby freshwater lagoons

TPP GNA I + TPP GNA II

Mitigation Measure 8

Legend:

TPP GNA I – Refers to the TPP GNA I, TGNL, and 345 kV Transmission Line complex. **TPP GNA II** – Refers to the TPP GNA II and 500 kV Transmission Line complex.

TPP GNA I + TPP GNA II – Refers to actions involving both projects, with GNA II being progressively incorporated from the start of its construction.

LT 345 kV + LT 500 kV – Refers to actions involving both transmission lines, with LT 500 kV being progressively incorporated from the start of its construction.

TIMELINE – Implementation of the GNA BAP Mitigation Measures

2020 - 2025

Implementation of lighting design projects

TPP GNA I + TPP GNA II

Mitigation Measure 13



2020
(RECURRING ACTIVITY)

Campaigns under the Light Pollution Monitoring Program

TPP GNA I + TPP GNA II

Mitigation Measure 13

Annual monitoring to assess seedling establishment success

TPP GNA I + TPP GNA II

Mitigation Measures 2, 6 and 10

2020
(RECURRING ACTIVITY)





2021
(RECURRING ACTIVITY)

Monitoring campaigns evaluating the effectiveness of anti-collision and anti-electrocution devices for birds

345 kV Transmission Line

Mitigation Measure 7

Campaigns under the Hydroacoustic Monitoring Program

FSRU

Mitigation Measure 15

2021 - 2023

Legend:

TPP GNA I – Refers to the TPP GNA I, TGNL, and 345 kV Transmission Line complex. **TPP GNA II** – Refers to the TPP GNA II and 500 kV Transmission Line complex.
TPP GNA I + TPP GNA II – Refers to actions involving both projects, with GNA II being progressively incorporated from the start of its construction.
LT 345 kV + LT 500 kV – Refers to actions involving both transmission lines, with LT 500 kV being progressively incorporated from the start of its construction.

TIMELINE – Implementation of the GNA BAP Mitigation Measures

Automatic monitoring of water temperature within the area of influence

TPP GNA I + TPP GNA II
FSRU

Mitigation Measure 16

2021
(RECURRING ACTIVITY)



2021
(RECURRING ACTIVITY)

Biofouling monitoring campaigns

FSRU

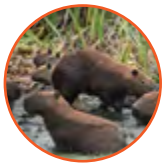
Mitigation Measure 19

Fauna monitoring campaigns in restoration areas and surroundings

TPP GNA I + TPP GNA II

Mitigation Measures 2, 6 and 10

2021
(RECURRING ACTIVITY)





2021
(RECURRING ACTIVITY)

Partnership with the Porto do Açu Sea Turtle Monitoring Program (PMTM)

TPP GNA I + TPP GNA II

Mitigation Measure 15

Start of commercial operation

TPP UTE GNA I

Operation

2021
(SEPTEMBER)



Legend:

TPP GNA I – Refers to the TPP GNA I, TGNL, and 345 kV Transmission Line complex. **TPP GNA II** – Refers to the TPP GNA II and 500 kV Transmission Line complex.
TPP GNA I + TPP GNA II – Refers to actions involving both projects, with GNA II being progressively incorporated from the start of its construction.
LT 345 kV + LT 500 kV – Refers to actions involving both transmission lines, with LT 500 kV being progressively incorporated from the start of its construction.

TIMELINE – Implementation of the GNA BAP Mitigation Measures



2021 – 2025

Construction and implementation

TPP GNA II

Implementation

Completion of construction maintaining 15% of the total occupied area as permeable surface

TPP GNA I + TPP GNA II

Mitigation Measure 9

2021 – 2025
(ESTIMATED)



2022
(DECEMBER)

Update of the BAP and the BMEP

TPP GNA I + TPP GNA II

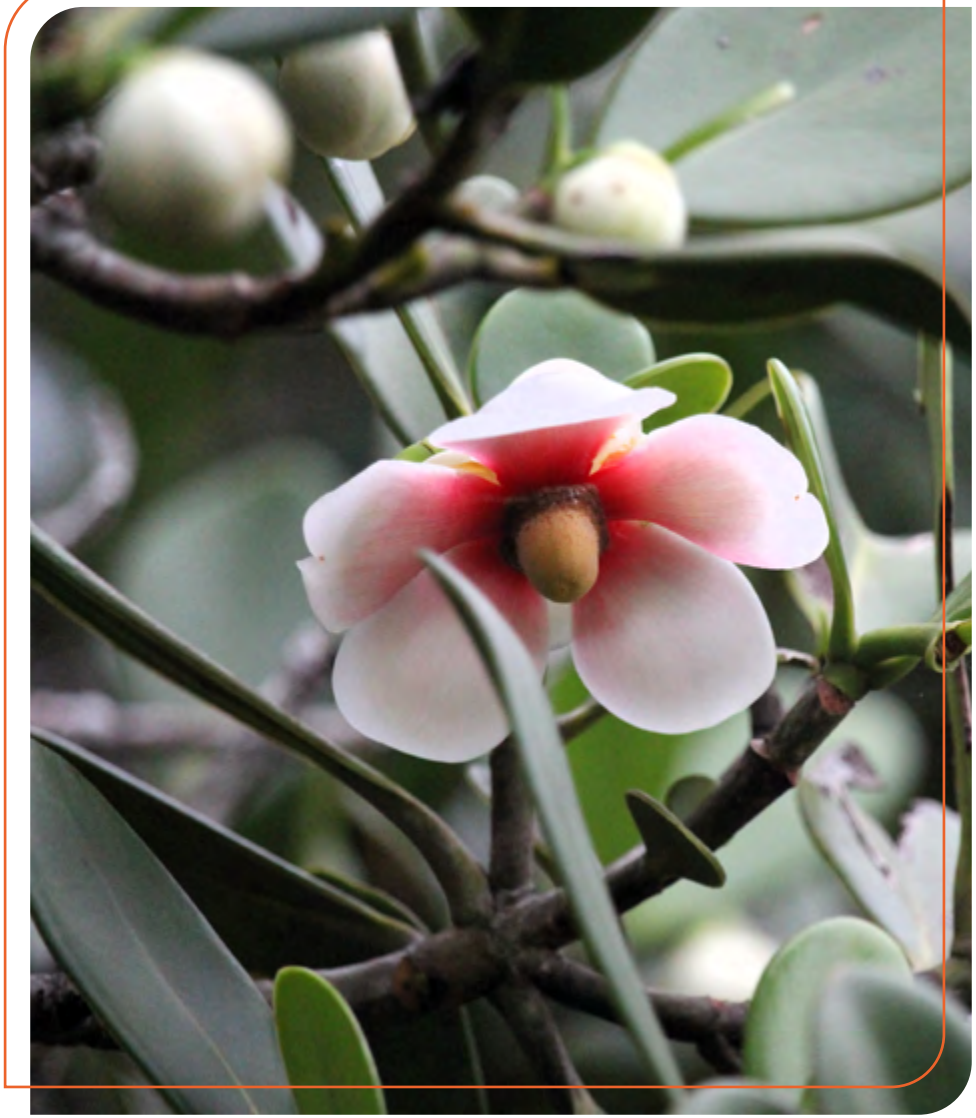
BAP

Legend:

TPP GNA I – Refers to the TPP GNA I, TGNL, and 345 kV Transmission Line complex. **TPP GNA II** – Refers to the TPP GNA II and 500 kV Transmission Line complex.
TPP GNA I + TPP GNA II – Refers to actions involving both projects, with GNA II being progressively incorporated from the start of its construction.
LT 345 kV + LT 500 kV – Refers to actions involving both transmission lines, with LT 500 kV being progressively incorporated from the start of its construction.



Environmental Conservation



Commitments: the 21 mitigation measures

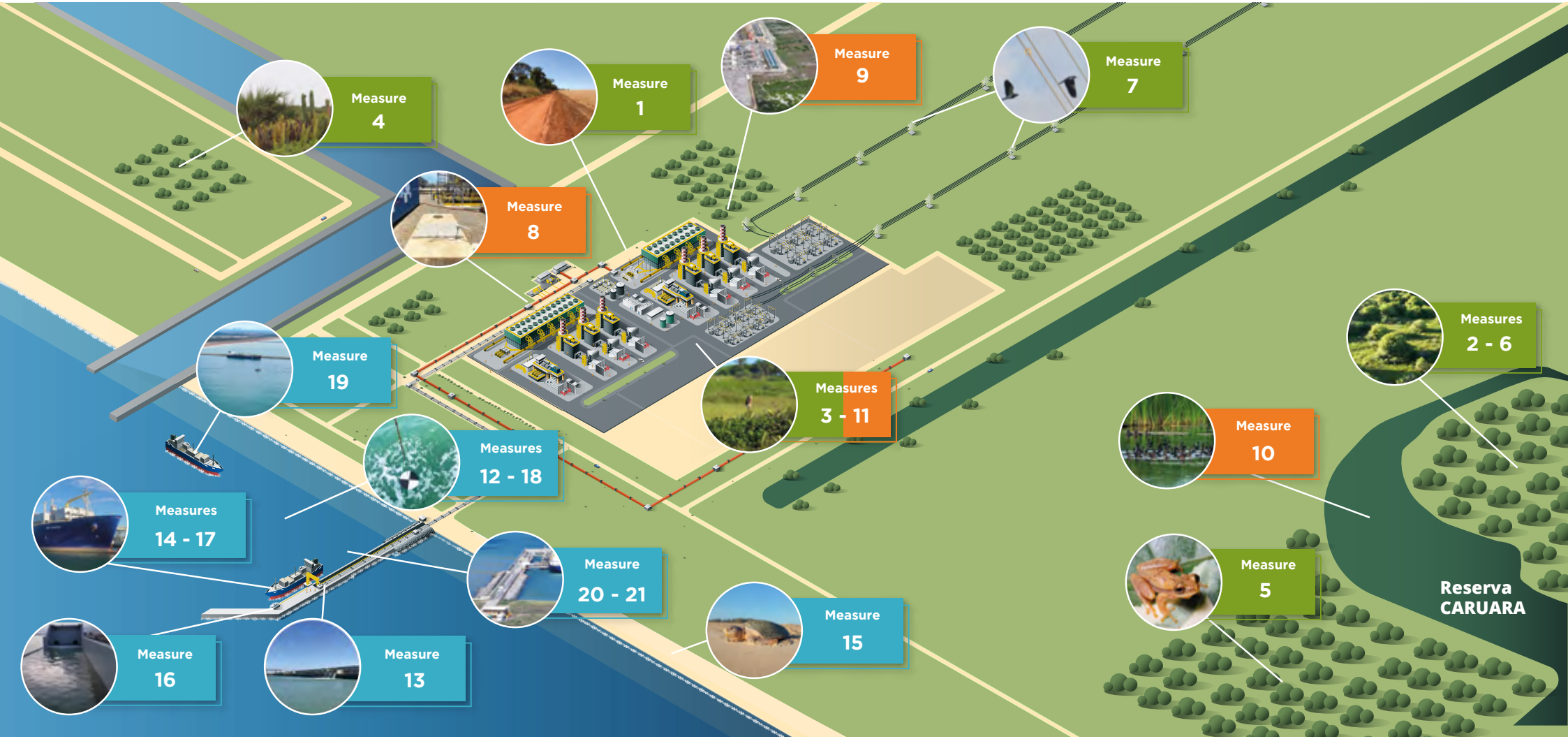
Status in Dec/2024

The implementation status of the 21 Mitigation Measures established under the BAP at the end of 2024 indicates: **the impact to be mitigated, the indicator(s) of its implementation and desired result(s), and the status, including respective evidence**. It also states whether the measure has helped to avoid a net loss of biodiversity or represents a net gain. Associated management and monitoring plans or documents are also listed.

The reported evidence is based on the data generated by the different monitoring programs, each of which adopts its own methodologies while following best practices. The methodological criteria adopted are detailed in the documentation of each program. The documents are public and stakeholders or interested parties can access them upon request to INEA/RJ.

Commitment: The 21 Mitigation Measures

ECOSYSTEM: **ATLANTIC RAINFOREST – RESTINGA (SANDBANK)** | ECOSYSTEM: **FRESHWATER** | ECOSYSTEM: **COASTAL**



- ATLANTIC RAINFOREST - RESTINGA
- FRESHWATER
- COASTAL

ECOSYSTEM:

ATLANTIC RAINFOREST RESTINGA

The Restinga Ecosystem is part of the Atlantic Rainforest biome, recognized as one of the most threatened biodiversity hotspots in the world. Although they are mainly located in areas that have been anthropized to produce sugar cane and livestock, the implementation of GNA projects required the vegetation clearing with the potential for direct and indirect impacts on the restinga habitat.

Some aspects were considered to evaluate these impacts and establish mitigation measures, including the Restinga habitat, Critical Habitat (CH) trigger species and bird species associated with the Restinga. Three possible impacts were identified, resulting in seven mitigation measures.



Impact:

VEGETATION CLEARING

Mitigation Measures:

- Installation of firebreaks
- Restoration and conservation, in the RPPN Caruara, of native restinga vegetation, at a minimum proportion of 1:1
- Payment of monetary environmental compensation
- Participation in the “Green Belt” program

Impact:

LOSS OF HABITAT

Mitigation Measures:

- Relocation of fauna species of interest to a suitable habitat
- Restinga habitat restoration

Impact:

BIRD MORTALITY ALONG TRANSMISSION LINES

Mitigation Measures:

- Installation of bird flight diverters

Impact

Vegetation clearing

Vegetation clearing, which is necessary for the implementation of GNA's projects, could lead to a net loss of critical habitat. This is why compensation measures were mandated.

The total vegetation clearing allowed by the Vegetation Clearing Authorizations (Autorização de Supressão de Vegetação – ASV, in Portuguese) obtained for the first stage of the GNA's projects in the Port of Açu was 11.01 ha. However, the clearing actually carried out was 10.78 ha. This total includes 9.50 ha to house the TPP GNA I, the LNG Terminal, the 345 kV TL and the macro-drainage system (in this case, serving both the TPP GNA I and the TPP GNA II), plus 1.28 ha for the creation of a corridor that would run the length of the LNGT gas pipeline system to prevent the spread of possible forest fires[2].

The reduction between what was authorized and what was carried out is due to a change in the layout of part of the transmission line related to the TPP GNA I, eliminating the need to clear 0.07 ha of the Restinga and the fact that 0.16 ha of the area indicated to form the LNGT firebreaks consists of soil that has already been exposed (without vegetation). It is worth noting that the actual clearing of native vegetation is even less than 10.78 ha, considering that part of these areas had already been anthropized and were no longer characterized as natural environments (for example, 2.02 ha of the area designated for the LNGT).

For the second stage, the total authorized for clearing was 21.63 ha, considering the areas included in the TPP GNA II and 500 kV TL projects.



[2] The creation of this corridor was a recommendation resulting from an analysis carried out using the HAZOP methodology (Hazards and Operability Study).

Mitigation Measure 1

INSTALLATION OF FIREBREAKS

Impact to be mitigated

Burning of vegetation due to the spread of fire in the event of fires along the roads surrounding the project. The lack of firebreaks can make it difficult to control any accidental fires, affecting the restinga habitat around the GNA and the Caruara Private Natural Heritage Reserve (RPPN Caruara).

Implementation indicator

Firebreaks constructed. There are no limits or reference values applicable to this measure.

Desired outcome

Firebreaks preventing flames from spreading in the event of fires. No adaptive management was required.

Status and evidence

GNA I: Measure fully complied with, in accordance with the guidelines of GNA's Environmental Works Management Program and Environmental Inspection Program.

GNA II: The firebreaks are currently in the construction phase, following the same procedures adopted for the TPP GNA I.



Fire control firebreaks implemented in GNA I projects. Source: GNA.



Firebreaks to control wildfire. Source: GNA.

Recurring activity: maintenance of built firebreaks

The Firebreak Implementation and Maintenance Procedure, produced by GNA, establishes the criteria and assumptions used to implement and ensure the maintenance of firebreaks throughout the duration of the company's projects (implementation, operation, closure and post-closure). Inspections are routinely performed to assess the conditions of the firebreaks and the maintenance activities that are needed, such as the clearing and removal of vegetation. With the support of contracted specialized consulting services, maintenance activities in 2024 were carried out in January, May and October.

It is important to mention that the firebreaks located at RPPN Caruara also receive periodic maintenance, according to the Port of Açu's schedule.

Recurring activity: training and awareness sessions

In order to make members of the team more mindful about the causes of forest fires and the methods of prevention and firefighting, GNA has created educational initiatives that include informational materials and lectures organized by the Emergency Brigade. In order to keep the Emergency Brigade and team of volunteer brigade members prepared to respond to occurrences, specific training and drills are carried out periodically. In 2024, five specific firefighting drills were conducted.



Photo of the firefighting training area. Source: GNA.

No Net Loss/Net Gain (NNL/NG)

Not applicable.

Associated management and monitoring plans or documents

- Implementation and Maintenance Plan for Firebreaks (GNA)
- Forest Fire Prevention and Control Plan (Port of Açu)
- RPPN Caruara Management Plan

Mitigation Measure 2

RESTORATION AND CONSERVATION, IN THE RPPN CARUARA, OF NATIVE RESTINGA VEGETATION, AT A MINIMUM PROPORTION OF 1:1

Impact to be mitigated

Net loss of Restinga area, a critical habitat, due to the vegetation clearing necessary for the installation of GNA projects. This measure was required by INEA/RJ and adopted to achieve a net gain in biodiversity. Restoration activities were focused on degraded areas of the RPPN Caruara, created by Porto do Açu Operações and recognized as a sustainable use conservation unit by INEA/RJ in 2012.

Implementation indicators

In addition to the "planted area" indicator (hectares planted at the RPPN Caruara), important indicators were included to check on the efficiency of the restoration, such as the richness of plant species, diversity and equitability indexes, measurement of phytosociological parameters, fauna species using the area, written analysis (performed by a specialist) of the effectiveness and legal protection of the restoration area.

Desired outcomes

For each indicator, a target result was defined:

1. Hectares planted at the RPPN Caruara, certified by regulatory agencies. There are no limits for this indicator and the desired result is to achieve an area greater than the total hectares cleared.

2. Planted species (by quantity, percentage of native species, average plant height and percentage of canopy cover). There are no limits for this indicator and the baseline is missing restinga habitats, because, in the restoration area, the original restinga was replaced by pasture area in the past. The desired outcome is to obtain a variety of more than 25 restinga native species, and for the average height of the plants and the percentage of canopy to improve by the 10th year of restoration, confirmed by statistical analysis and aerial or satellite images.

3. Fauna species (number of mammals, birds and herpetofauna from the restinga). The comparative basis for the indicator is the previous results of fauna monitoring campaigns. The desired result is the normal occurrence, throughout the RPPN Caruara, of native species associated with the restinga, evaluated with statistical comparisons over time between the monitoring campaigns conducted.

4. Specialized written analysis on the effectiveness of restoration activities. The expected result is a written expert analysis confirming that the planted hectares are on the proper path towards restoration, supported by evidence of the composition and structure of the fauna and flora species. If

the target areas are not able to satisfy the requirements for compensation, restoration techniques will have to be adapted.

5. Legal protection of the restoration area. The expected result is to ensure that the restoration takes place in a legally protected area, allowing conservation efforts for the restinga ecosystem to continue.

Status and evidence

Results: Restoration of the Restinga

A specific plan was produced to provide guidance on the restoration of the restinga (The Restinga Recovery and Conservation Plan) including goals, a baseline, methodology, indicators, monitoring of progress and adaptive management. It is worth noting that the definition of restoration compensation requirements is different for each type of vegetation and is based on varied definitions of laws, while also depending on assessments by the relevant environmental agency. All compensation related to GNA's projects complies with the legal requirements.

GNA I: The restinga restoration activities at the RPPN Caruara began in October 2019. Despite the minimum proportion recommended in the BMEP to offset vegetation clearing being 1:1, GNA has developed restoration projects that exceed the total cleared. In July 2022, when the plantings pertaining to the GNA I projects were completed, we reached 57.72 ha, which represents more than five times the area of 10.78 ha of cleared vegetation. 37,318 seedlings were planted. Considering only the clearing of native vegetation, excluding areas that have already been anthropized, the recovery is almost 6.5 times the cleared area.

GNA II: The restinga restoration activities at RPPN Caruara began in January 2023. As with the GNA I, the restoration plan exceeds the 1:1 ratio recommended by BMEP. A total of 44,336 seedlings were planted and the area under restoration totaled 62.90 ha, about three times greater than the 21.63 ha of cleared vegetation.





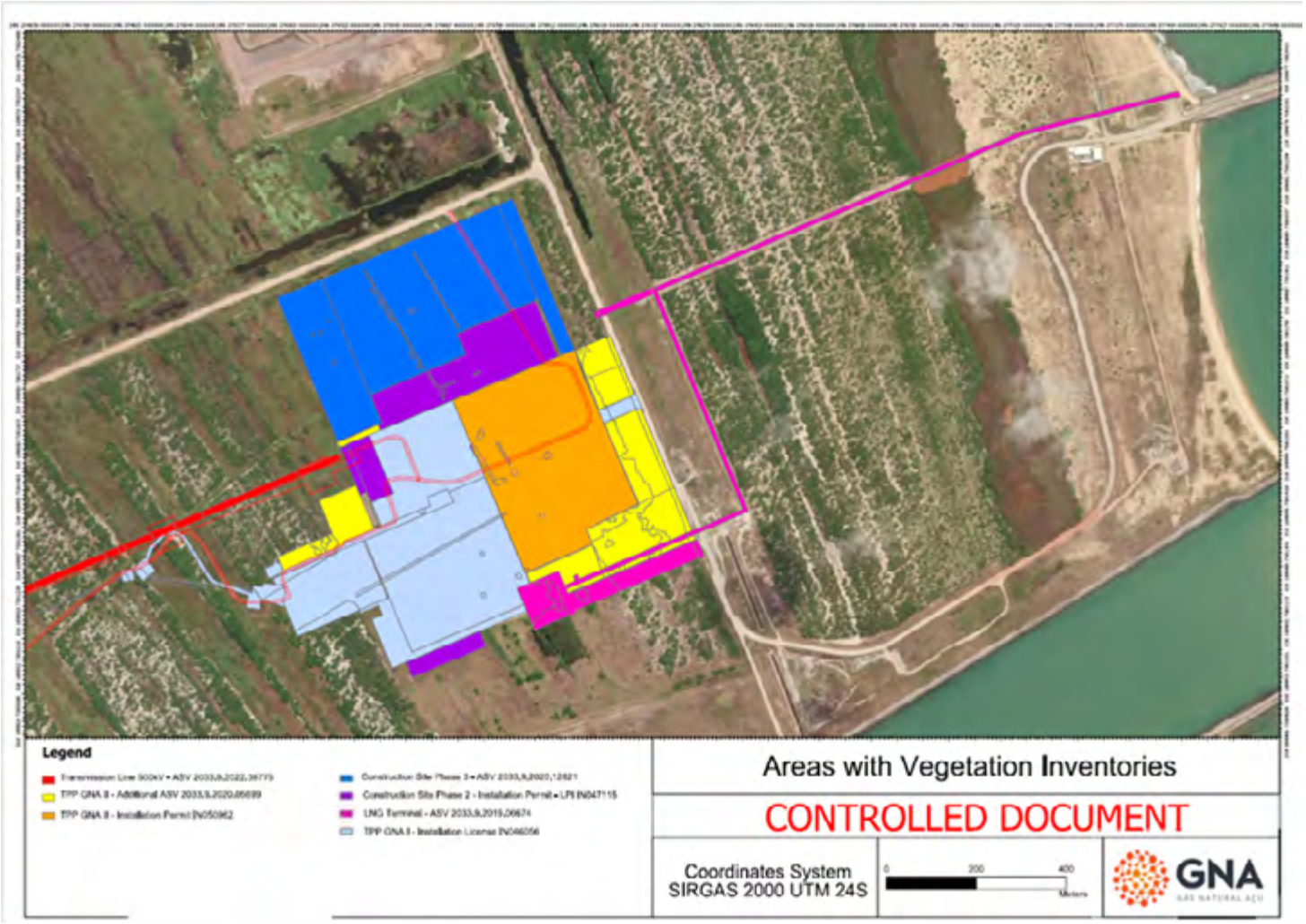
SUMMARY OF GNA VEGETATION CLEARING AND FOREST RESTORATION ACTIVITIES BY EACH COMPONENT OF THE PROJECT.

PROJECT	APPLICABLE ENVIRONMENTAL LICENSES	VEGETATION CLEARING AREA (ha)	COMPENSATION INDEXES BASED ON AREAS OF NATIVE VEGETATION CLEARED	AREA REQUIRED FOR RESTORATION (ha)	PLANTING STATUS
TTP GNA I	n° IN044379	1,14*	0,91 x 3 = 2,71 ha 0,03 x 2 = 0,07 ha	2,57	**100%** (4,47 ha/4,47 ha)
	IL n° IN046056	0,35	0,27 x 3 = 0,81 ha 0,08 x 2 = 0,16 ha	0,97	
	ASV n° 203339201904559	0,31	0,31 x 3 = 0,93 ha	0,93	
	Subtotal	1,80 (1,73*)	-	4,47	
CONSTRUCTION SITE (GNA I)	IL n° IN047115	277 individuals	277 x 6 m^2 = 0,17 ha	0,17	**100%** (0,17 ha/0,17 ha)
	Subtotal	-	-	0,17	
LNGT	IL n° IN047687	3,29	3,29 x 10 ha	32,90	**100%** (35,60 ha/35,60 ha)
	ASV n° 20339201906674	0,96	0,78 x 3 = 2,34 ha 0,18 x 2 = 0,36 ha	2,70	
	Subtotal	4,25	-	35,60	
	ASV n° 20339202015567	1,44*	0,94 x 3 = 2,8 ha 0,35 x 10 = 3,5 ha	6,30	**100%** (6,3ha/6,3ha)
	Subtotal	1,44 (1,28*)	-	6,30	
345 kV TL	LI n° IN019365	1,42	-	1,00	**100%** (9,92 ha/9,92 ha)
	ASV n° 20339201905965	2,10	1,31 x 5 = 6,55 ha 0,79 x 3 = 2,37 ha	8,92	
	Subtotal	3,52	-	9,92	
MACRO-DRAINAGE (50% OF THE FORECAST FOR GNA I AND GNA II)	ASV n° 20339202005699	0,42	0,42 x 3 = 1,26 ha	1,26	**100%** (1,26 ha/1,26 ha)
	Subtotal	0,42	-	1,26	

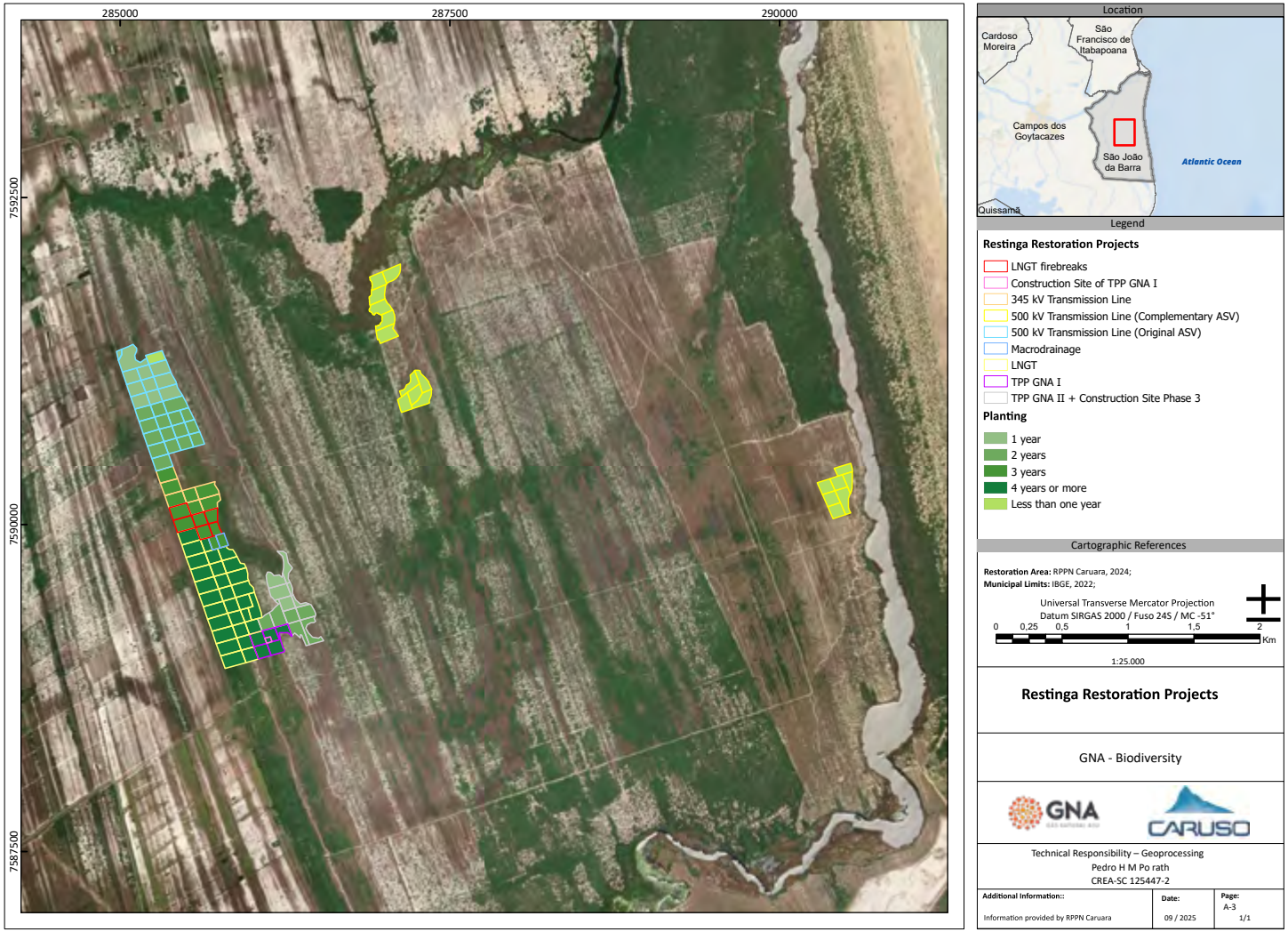
** Area actually cleared*

TPP GNA II + 50% OF THE MACRO-DRAINAGE PLANNED FOR GNA I AND GNA II AND CONSTRUCTION SITE (GNA II)	ASV n° 20339202005699 (TPP GNA II and 50% of macro-drainage)	4,27	4,27 x 3 = 11,55 ha**	11,55	**100%** (12,15 ha/12,15 ha)
	ASV n° 20339202012821 (Construction Site GNA II)	0,28	0,28 x 2 = 0,60 ha	0,6	
	Subtotal	4,55	-	12,15	
500 kV TL	ASV n° 20339202238775	9,14	0,8 x 5 = 4,00 ha 0,03 x 10 = 0,30 ha 1,88 x 2 = 3,76 ha 4,4 x 3 = 13,20 ha 2,03 x 5 = 10,15 ha	31,50**	**100%** (31,50 ha/31,50 ha***)
	Subtotal	9,14	-	31,50***	
500 KV TL COMPLEMENTARY DUE TO THE ADAPTION OF THE LAYOUT OF THE TPP GNA II	ASV n° 20338202289642	7,94	0,06 x 5 = 0,3ha 2,70 x 2 = 5,4ha 4,18 x 3 = 12,54 hectares 0,83 x 1 = 0,83ha 0,17 x 1 = 0,17ha	19,24	**100%** (19,24 ha/19,24 ha)
	Subtotal	**7,94**	**-**	**19,24**	
	TOTAL (GNA I and GNA II)	**33,06**		**120,60*** **	**100%** (120,60 ha/120,60 ha***)

*** Corresponding to 50% of the macro-drainage, volume has already been restored in the projects for GNA I*
****Rounded amount*

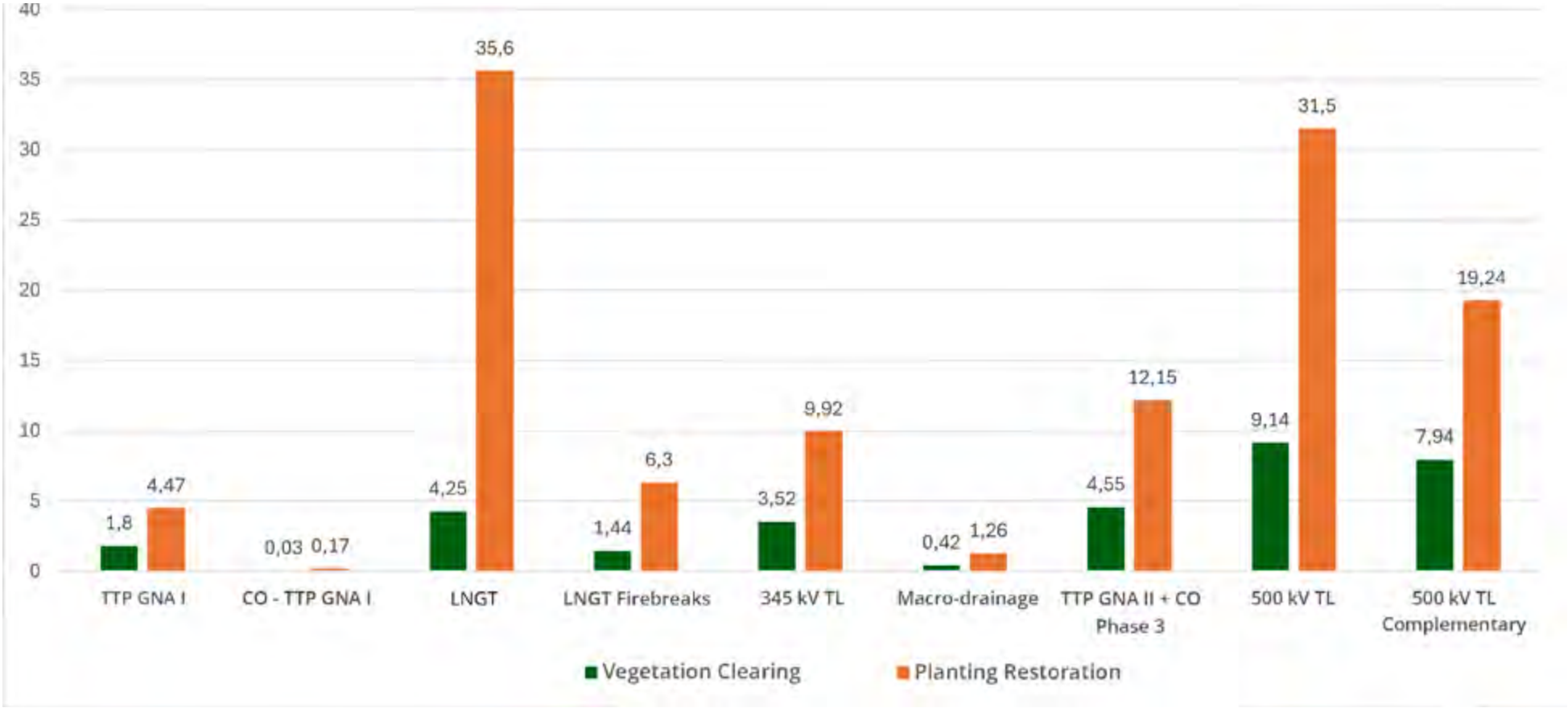


Schematic map of the areas associated with Vegetation Clearing Authorizations (ASV) for GNA I and GNA II projects. Source: GNA.



Schematic map of the progress of restinga restoration associated with GNA I and GNA II projects.

SUPPRESSED VOLUME X TOTAL RESTORED AREA (ha)



Monitoring of the restoration

Although 100% of the restoration efforts have been carried out, totaling 81,654 seedlings planted, the indicator for success can only be considered achieved after a minimum of four years of maintenance, with annual monitoring. This period is required to ensure that the planted seedlings successfully establish themselves in the environment. Once satisfactory results are achieved, an environmental agency will issue a certificate of fulfillment for the restoration obligations.

The fact that the total restored area is greater than the cleared area contributes to a Net Gain in biodiversity and will likely also favor the connectivity of native vegetation fragments.

To date, adaptive management has not been triggered due to the progress of restoration. Some of the planted specimens have shown continuous flowering and fruiting, suggesting that they have adapted well to the area. In addition, fauna interactions to the restoration area have also been confirmed since 2022, proving that planted specimens are establishing a new ecological balance by providing food and shelter for fauna species.

In compliance with the requirements of the environmental agency (INEA/RJ), GNA submits annual reports monitoring its restoration projects. The documents describe the activities conducted throughout the year, the performance indexes and indicators of the restoration project (density, species richness, average height, and more), as well as the challenges faced during the period and the actions planned for the following year. The actions that are planned as part of the annual monitoring process are designed to assess the success of tree planting and maintenance activities for forest restoration in degraded areas, such as irrigation, weeding around the seedlings, the use of mulch, replanting (when and if necessary), control of invasive alien species, fencing and maintenance of firebreaks for controlling wildfires.



Maintenance weeding performed in the area under restoration for the 500 kV TL (November 2024). Source: GNA.



Restoration area for the LNGT (May 2024). Source: GNA.



Collection of data related to the ongoing monitoring of the species Cecropia pachystachya (August 2024). Source: GNA.



The Schinus terebinthifolia, planted in the planting area referring to the 345 kV TL, is expected to bear fruit (August 2024). Source: GNA.



Results: Plant species

79 species have been planted, 100% of which are native.

Remote sensing for biomass was carried out in 2021, which showed positive results in relation to the increase in biomass and significant development in the restoration areas. This activity will be performed again in a few years, in addition to the annual monitoring of plantations. The baseline for this data is a pasture area (a completely degraded restinga), which represents the state of the areas before any compensatory actions or interventions began.

PLANTED SPECIES	
Scientific name	**Brazilian common name**
Allophylus puberulus (Cambess.) Radlk	Fruto-Do-Café
Andira fraxinifolia Benth	Angelim
Annona glabra L	Mololo
Aspidosperma spruceanum Benth. ex Müll.Arg	Guatambu
Bactris setosa Mart	Coco-Tucum
Balfourodendron riedelianum (Engl.) Engl	Pau-Marfim
Bixa orellana L	Urucum
Byrsonima sericea DC	Murici
Calophyllum brasiliense Cambess	Jacareúba, Guanandi
Campomanesia schlechtendaliana (O.Berg) Nied	Gabiroba
Cassia grandis L.f	Canafístula
Cecropia pachystachya Trécul	Embaúba
Ceiba speciosa (A.St.-Hil.) Ravenna	Paineira-Rosa
Cestrum axillare Vell	Canema
Chrysobalanus icaco L	Abajurú
Clusia hilariana Schltdl	Abaneiro
Coccoloba alnifolia Casar	Bolo
Cordia taguahyensis Vell	Muchila (Ou Mochila)
Crateva tapia L	Catoré
Cupania emarginata Cambess	Fruto-De-Guaxo
Cynophalla flexuosa (L.) J.Presl	Juramento
Diospyros inconstans Jacq	Fruta-Cor
Erythroxylum ovalifolium Peyr	Arco-De-Pipa
Eugenia astringens Cambess	Aperta-Cú, Apertão, Aperta
Eugenia bahiensis DC	Apertão
Eugenia dichroma O.Berg	Pitanga-Lagarto Ii

PLANTED SPECIES	
Scientific name	**Brazilian common name**
Eugenia pluriflora DC	Folha-Miúda
Eugenia pruniformis Cambess	Azeitona
Eugenia punicifolia (Kunth) DC	Cambucazinho
Eugenia uniflora L	Pitanga
Ficus cestrifolia Schott ex Spreng	Figueirinha
Ficus crocata (Miq.) Miq	Figueira-Vermelha
Ficus organensis (Miq.) Miq	Figueirinha
Garcinia brasiliensis Mart	Bacupari
Guapira pernambucensis (Casar.) Lundell	Maria-Mole
Handroanthus heptaphyllus (Vell.) Mattos	Ipê-Roxo
Handroanthus ochraceus (Cham.) Mattos	Ipê-Amarelo
Inga laurina (Sw.) Willd	Ingá-Mirim Ii
Inga maritima Benth	Ingá-Mirim I
Inga subnuda subsp. luschnathiana (Benth.) T.D.Penn	Ingá-Pau
Jacaranda caroba (Vell.) DC	Caroba
Jacquinia armillaris Jacq	Pimenta-Da-Praia
Licania tomentosa (Benth.) Fritsch	Oitizeiro
Luehea divaricata Mart	Açoita-Cavalo
Machaerium lanceolatum (Vell.) J.F.Macbr	Bico-De-Pato
Manilkara subsericea (Mart.) Dubard	Maçaranduba
Maytenus obtusifolia Mart	Papagaio
Melanopsidium nigrum Colla	Pau-Ferro
Myrcia loranthifolia (DC.) G.P.Burton & E.Lucas	João-Branco
Myrsine parvifolia A.DC	Capororoquinha
Myrsine rubra M.F.Freitas & Kin.-Gouv	Capororoca-Do-Brejo
Myrsine umbellata Mart	Capororoca-Folha-Larga

PLANTED SPECIES	
Scientific name	**Brazilian common name**
Neomitranthes obscura (DC.) N.Silveira	Cambucá
Ocotea cf. indecora (Schott) Mez	Canela-Preta
Ocotea notata (Nees) Mez	Canelinha
Pera glabrata (Schott) Poepp. ex Baill	Calombo
Piptadenia gonoacantha (Mart.) J.F.Macbr	Pau-Jacaré
Psidium cattleianum Sabine	Araçá-Casca-Grossa
Psidium guineense Sw	Araçá-Pedra
Protium heptaphyllum (Aubl.) Marchand	Almescla
Psychotria carthagenensis Jacq	Cafezinho
Pseudobombax grandiflorum (Cav.) A.Robyns	Paina
Pouteria psammophila (Mart.) Radlk	Aguapeba
Sapium glandulosum (L.) Morong	Burra-Leiteira
Schinus terebinthifolia Raddi	Aroeira
Scutia arenicola (Casar.) Reiss	Quixabinha
Simarouba amara Aubl	Marupá
Syagrus romanzoffiana (Cham.) Glassman	Coco-Catarro
Tabebuia aurea (Silva Manso) Benth. & Hook.f. ex S.Moore	Ipê-Amarelo
Tabebuia cassinoides (Lam.) DC	Caxeta
Tabebuia heptaphylla (Vell.) Toledo	Ipê-Roxo
Tapirira guianensis Aubl	Micume
Ternstroemia brasiliensis Cambess	Pinta-Moça
Tocoyena bullata (Vell.) Mart	Genipabinho, Genipabinho-Da-Areia
Tocoyena sellowiana (Cham. & Schltdl.) K.Schum	Genipabinho-Do-Brejo
Vochysia haenkeana Mart	Quaresmeira
Xylosma sp.	Agulha
Zollernia glabra (Spreng.) Yakovlev	Mocitaíba

Results: Recorded fauna species

Monitoring includes sampling units in reference areas, with conserved restinga, in areas under restoration, and areas around GNA projects. Fauna monitoring allows comparison between results to obtain complementary evidence of the progress of restinga restoration. It is important to point out that, up to 2024, the fauna results refer to the RPPN Caruara planting areas in general and not specifically to the GNA restoration areas, since it was necessary to use areas with older plantations versus newly planted areas for more robust comparisons. As of 2025, GNA's planting areas will be included in the monitoring program.

Statistical analyses are performed in order to offer useful and comparable results, such as species rarefaction curve and cluster analyses. In addition, ecological indexes (diversity, equitability, dominance and diversity) are also the focus of the monitoring program.

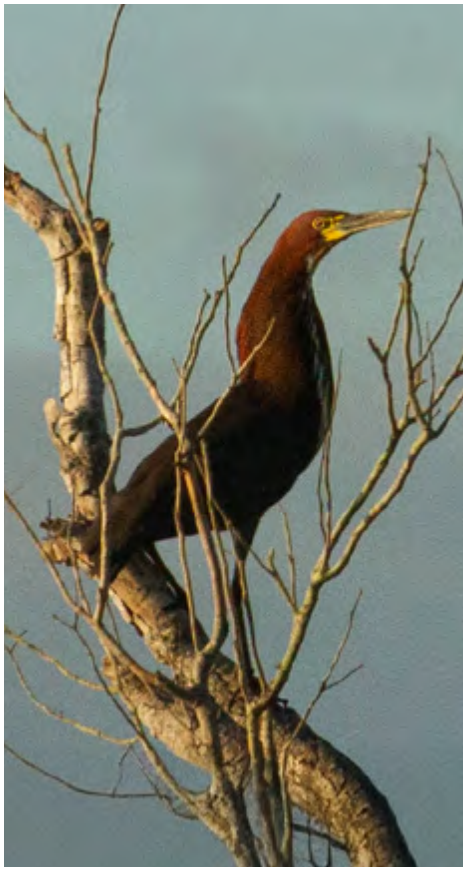
It should be pointed out that four species of migratory birds were documented in our monitoring: *Charadrius semipalmatus, Pandion haliaetus, Hirundo rustica* and *Pluvialis squatarola* as well as five unpublished records: *Pipraeidea melanonota, Bubo virginianus, Tringa solitaria, Haematopus palliatus and Colibri serrirostris*[3].

The presence of *Glaucomastix littoralis*, an endangered species and herpetofauna, was also logged, which led to the creation of a specific monitoring program (find out more **here**).

In terms of mammals, we have documented *Herpailurus yagouaroundi*, and two endangered species: one small rodent (*Cerradomys goytaca* – EN – Endangered and endemic) and the sloth (*Bradypus crinitus* – VU – Vulnerable), both considered critical habitat trigger species.

[3] GNA intends to publish a scientific note on these new distribution records.

Specifically, regarding flying mammals (bats), twice as many species were recorded using bioacoustic sampling than by using mist nets. This is another example of adaptive management with solid results.



Tigrisoma lineatum



Cerradmys goytaca

FAUNA SPECIES RECORDED BY MONITORING CAMPAIGNS*

FAUNA GROUP	MONITORING CAMPAIGN	AREAS AROUND GNA	RPPN CARUARA	RPPN CARUARA RESTORATION AREA
Herpetofauna species	Aug/Sep 2021	23	41	18
	Feb/2022	27	43	27
	Aug/2022	18	34	12
	Feb/2023	16	38	17
	Oct/2023	14	24	15
	Mar/2024	11	24	9
	Sep/2024	12	22	11
Bird species	Aug/Sep 2021	64	101	63
	Feb/2022	69	83	60
	Aug/2022	76	93	65
	Feb/2023	64	90	48
	Oct/2023	52	88	51
	Mar/2024	64	82	64
	Sep/2024	61	80	52
Mammal species**	Aug/Sep 2021	14 (8 Terrestrial, 6 Chiropterans)	24 (12 Terrestrial, 12 Chiropterans)	16 (4 Terrestrial, 12 Chiropterans)
	Feb/2022	15 (7 Terrestrial, 8 Chiropterans)	24 (11 Terrestrial, 13 Chiropterans)	15 (6 Terrestrial, 9 Chiropterans)
	Aug/2022	15 (8 Terrestrial, 7 Chiropterans)	26 (13 Terrestrial, 13 Chiropterans)	15 (5 Terrestrial, 10 Chiropterans)
	Feb/2023	10 (6 Terrestrial, 4 Chiropterans)	31 (14 Terrestrial, 17 Chiropterans)	19 (5 Terrestrial, 14 Chiropterans)
	Oct/2023	13 (8 Terrestrial, 5 Chiropterans)	29 (14 Terrestrial, 15 Chiropterans)	9 (5 Terrestrial, 4 Chiropterans)
	Mar/2024	12 (7 Terrestrial, 5 Chiropterans)	17 (6 Terrestrial, 11 Chiropterans)	14 (5 Terrestrial, 9 Chiropterans)
	Sep/2024	17 (10 Terrestrial, 7 Chiropterans)	21 (9 Terrestrial, 12 Chiropterans)	17 (6 Terrestrial, 11 Chiropterans)

**Important: the indicators for this measure comprise only the sampling units in areas in the process of restoration (different planting ages). However, GNA performs other monitoring activities for terrestrial fauna in the vicinity of its developments and in conserved areas of the RPPN Caruara. The results are displayed in this table as a way of enriching the information in this document.*

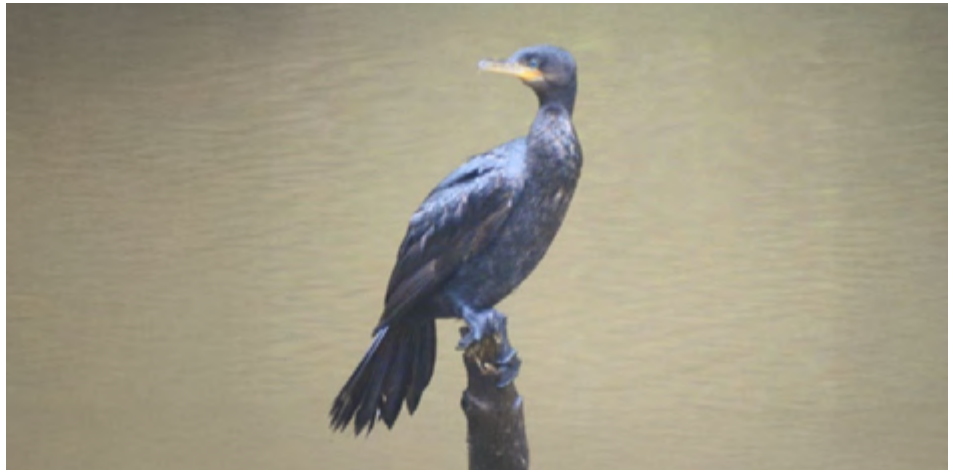
***As of the 2021 campaigns, as recommended, the methodology for chiropterans was adjusted with the inclusion of an ultrasound detector method.*





Herpetofauna recorded during a monitoring campaign carried out in September 2024 at RPPN Caruara: Rhinella pygmaea and Nyctimantis brunoi. Source: GNA.





Bird species recorded during a monitoring campaign carried out in September 2024 at RPPN Caruara: Amazonetta brasiliensis and Nannopterum brasilianus. Source: GNA.

Monitoring of the species

Glaucomastix littoralis (green-tailed lizard, from its common name in Portuguese, lagarto-da-cauda-verde)

During the licensing and financing process of the 500 kV TL, a specific program was recommended to monitor the presence of *Glaucomastix littoralis*, an endangered species. **14 campaigns** were carried out between September 2022 and December 2024.

It is important to note that, as an adaptive management measure triggered by the low number of records, the active search sampling effort was doubled based on the monitoring performed in November 2023. As such, the studies totaled 154 records. The active search methodology was responsible for 75.97% of the records (177) while 21.42% of the records (33) were obtained via the transect method. In addition, four records were not part of a regular, structured process, but occurred sporadically during these transitional moments.

Based on the data gathered from the 14 monitoring campaigns, a heat map was prepared to plot the regions with the highest concentration of *Glaucomastix littoralis* and thus identify areas that are preferred by that species. A study was conducted to verify the possibility of changing the monitoring method and, as of 2025, the survey will aim to confirm certain aspects related to the use of microhabitats, activity patterns, and the abundance and density of species records both in the RPPN and around Port of Açu. As a result, some of the data and collection points will be altered to make monitoring more efficient.



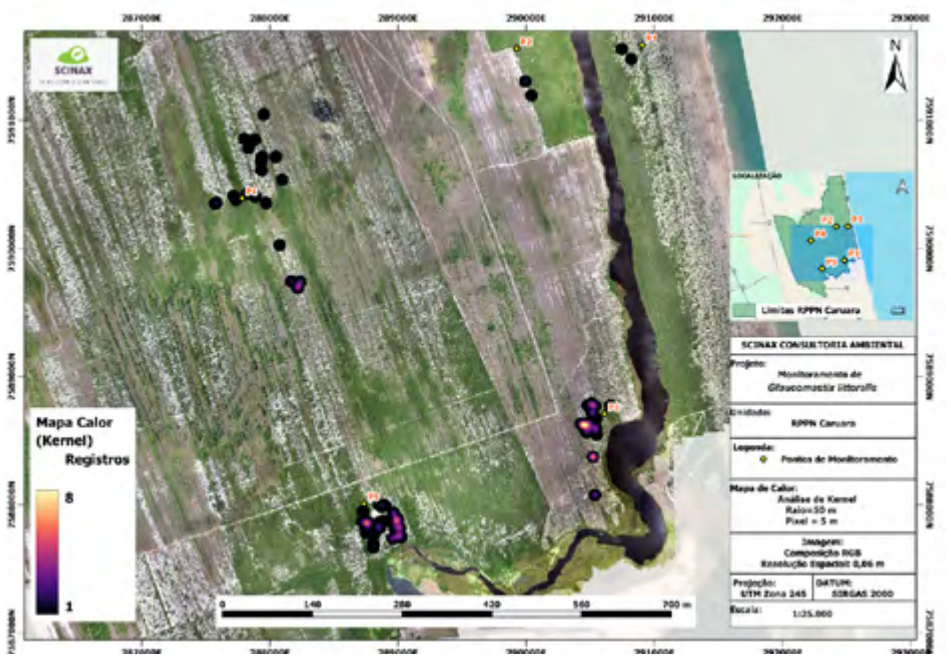
Glaucomastix littoralis. Photo by Carlos Henrique Nogueira, Aiuká.







Area for monitoring the presence of Glaucomastix littoralis. Source: GNA Archive.



A heat map, based on density, showing the spatial distribution of the records of the species Glaucomastix littoralis in the RPPN Caruara. Source: GNA.

Germplasm rescue

During the vegetation clearing process, threatened flora species and species of conservation interest were rescued and transplanted to RPPN Caruara. The rescued specimens are planted in the restoration areas within the RPPN Caruara and monitored for a minimum period of two years or until proof of their proper establishment in the area.

The monitoring demonstrated that the relocation of specimens was carried out in line with the parameters defined in the specific programs. For some of these species, the results indicate good survival rates after two years of transplantation (e.g., *Aechmea nudicaulis*, *Bromelia antiacantha*, *Cereus fernambucensis*, *Hylocereus setaceus*, *Pilosocereus arrabidae* and *Tillandsia stricta*).

For other shrub and more lignified species, despite having low survival rates (such as, for example, specimens of the species *Melanopsidium nigrum* and *Scutia arenicola*), the morphometric data showed an increase in the height and diameter of the canopy of surviving plants, demonstrating the successful development of living specimens. It is also important to note that low survival rates were expected due to their ecological characteristics, the greater complexity of transplantation and the lack of specific techniques for these species.

GNA I – The specimens transplanted from the areas where vegetation needed to be cleared for the implementation of the TPP GNA I project, which involves LNGT and a 345 kV TL, generally achieved great success in their new locations. Therefore, after 2 to 3 years of gathering data as recommended by experts, the monitoring concluded, with the last round of monitoring taking place in January 2023.



GNA II – The rescue and transplantation activities related to vegetation clearing for the TPP GNA II project and 500 kV TL ended in the first half of 2024. Specimens are being monitored and the results show an overall positive outcome and the recommendation is that the monitoring be terminated after the January 2025 campaign.

SURVIVAL RATE BY SPECIES, ACCORDING TO THE FLORA RESCUE PROGRAMS OF EACH GNA PROJECT

GNA PROJECTS		MONITORING STATUS	SPECIES	RESCUED SPECIMENS	DEATHS	SURVIVAL	SURVIVAL RATE %
GNA I	LNGT Firebreaks	Completed	*Melanopsidium nigrum*	36	-27	9	25%
			Scutia arenicola	11	-11	-	0%
			Inga maritima	5	-4	1	20%
			Erythroxylum ovalifolium	1	-1	-	0%
	LNGT Firebreaks	Completed	*Melanopsidium nigrum*	21	-3	18	86%
			Scutia arenicola	12	-1	11	92%
	345 kV TL – External	Completed	*Dalbergia nigra*	2	0	2	100%
	345 kV TL – Internal	Completed	*Melanopsidium nigrum*	64	-53	11	17%
			Scutia arenicola	12	-10	2	17%
			Manilkara subsericea	8	-7	1	13%
	Macro-drainage	Completed	*Melanopsidium nigrum*	47	-34	13	28%
			Vanilla chamissonis	1	-1	0	0%
	LNGT	Completed	*Melanopsidium nigrum*	271	-184	87	32%
			Scutia arenicola	42	-41	1	2%
			Inga marítima	5	-4	1	20%
			Vanilla chamissonis	1	0	1	100%
			Vriesea sp.	3	-1	2	67%
	TPP GNA I	Completed	*Melanopsidium nigrum*	9	-7	2	22%
			Manilkara subsericea	16	-16	-	0%
			Melocactus violaceus	1	0	1	100%
			Aechmea nudicaulis	229	-43	186	81%
			Bromelia antiacantha	84	-25	59	70%
			Cereus fernambucensis	82	-37	45	55%
			Hylocereus setaceus	3	-1	2	67%
			Pilosocereus arrabidae	150	-56	94	63%
			Tillandsia stricta	13	-2	11	85%

SURVIVAL RATE BY SPECIES, ACCORDING TO THE FLORA RESCUE PROGRAMS OF EACH GNA PROJECT

GNA PROJECTS		MONITORING STATUS	SPECIES	RESCUED SPECIMENS	DEATHS	SURVIVAL	SURVIVAL RATE %
GNA II	TPP GNA II (phase 1)	Completed	*Melanopsidium nigrum*	5	-4	1	20%
			Bromelia antiacantha	13	0	13	100%
			Erythroxylum ovalifolium	13	-13	0	0%
			Aechmea nudicaulis	13	0	13	100%
	TPP GNA II (phase 2)	Completed	*Aechmea nudicaulis*	5	-1	4	80%
			Bromelia antiacantha	2	0	2	100%
			Erythroxylum ovalifolium	3	-3	0	0%
			Inga marítima	3	-3	0	0%
			Scutia arenicola	3	-2	1	33%
			Melanopsidium nigrum	37	-27	10	27%
	500 kV TL	Completed	*Allagoptera arenaria*	9	-9	0	0%
			Aechmea nudicaulis	5	0	5	100%
			Bromelia antiacantha	3	0	3	100%
			Tillandsia stricta	12	0	12	100%
			Hylocereus setaceus	4	-1	3	75%
			Melocactus violaceus	15	-2	12	86%
			Pilosocereus arrabidae	1	-1	0	0%
			Epidendrum denticulatum	9	-1	8	89%
			Neoregelia cruenta	1	0	1	100%
			Vanilla chamissonis	2	0	2	100%
			Vriesea procera	4	-1	3	75%
			Melanopsidium nigrum	15	-13	2	13%
	500 kV TL Complementary	*Recommendation to be finalized*	*Melanopsidium nigrum*	15	-8	7	47%

Study of the vegetative propagation of *Melanopsidium nigrum*

GNA is developing a strategy to increase the survival rate of the species *Melanopsidium nigrum*, through the development of the research project **"Vegetative Propagation of Melanopsidium nigrum via induction of adventitious roots"**, conducted in partnership with the Universidade Estadual do Norte Fluminense Darcy Ribeiro (UENF). The first phase has been completed and the results were published in a scientific article (M. DE MENEZES DE ASSIS GOMES et al., 2022). The same researchers are now conducting the second phase of their study, aiming to establish a protocol to improve the methods for rescuing and planting this species.



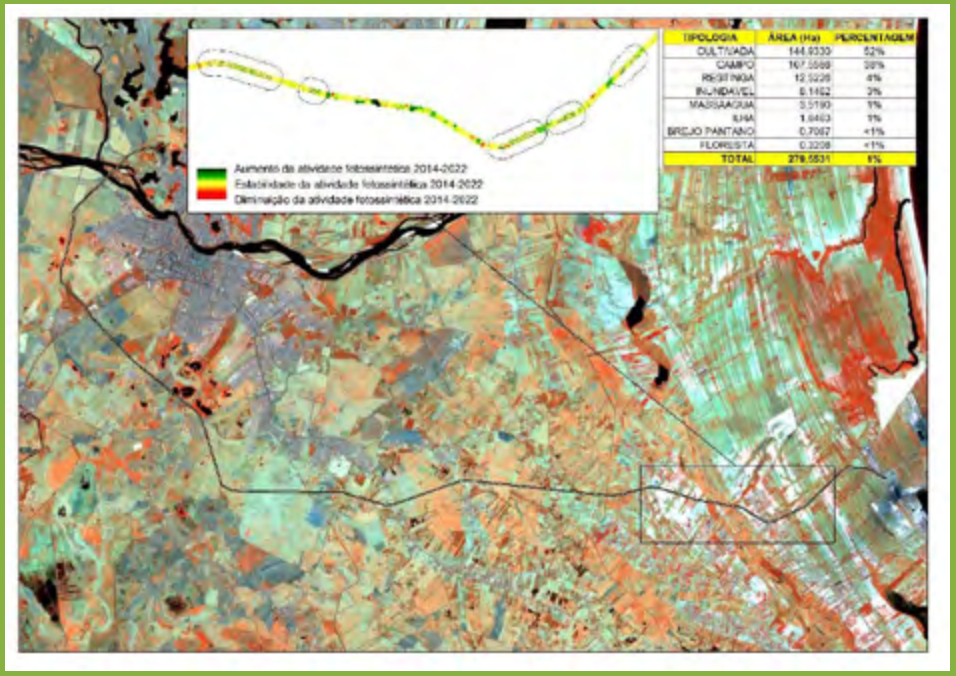


Management of exotic species

To ensure the success of restoration measures, GNA developed maintenance activities in the planting areas. One of the key actions is the removal of invasive alien species that pose a threat to the development of the restinga. The identification and planning for removal of alien species is established in the Control Procedure for Invasive Alien Species of Flora. To better understand and document the occurrence of exotic species, we analyzed, in conjunction with the RPPN Caruara team, the occurrence of 10 exotic species, drawing up maps according to their location and intensity of invasion in the RPPN Caruara. In 2025, control efforts focused on *Megathyrsus maximus* (Guinea grass) and young specimens of *Syzygium cumini* (jamelão).

Vegetation cover found in the right-of-way area designated for a 345 kV TL

The analysis of the change in vegetation cover along the 345 kV TL easement corridor was included as a BAP indicator, in light of the finding that its maintenance (rather than the planned vegetation clearing) could contribute to the Net Gain associated with the projects. Thus, a qualitative and quantitative assessment of the change in vegetation cover along the easement corridor was performed. The study was carried out based on the comparison of satellite images from 2014 and 2022, seeking to analyze and pinpoint the areas in which there was a decrease, increase or stability in vegetation cover. The results show that, in the eastern part of the TL, there is a predominance of conditions where the area is stable or where there is even a recovery of plant areas. The western part was characterized by fluctuations, probably due to the predominance of areas dedicated to seasonal crops, which indicates that the variability is more linked to anthropic dynamics than environmental change.



Vegetation coverage along the 345 kV TL easement line (2014-2022). Source: GNA.

Results: Written expert analysis of the effectiveness of restoration efforts

To be carried out 10 years after the plantations have been completed.

Results: Legal protection of the restoration area

RPPN Caruara continues to be legally protected as a Conservation Unit.

No Net Loss/Net Gain

The actions planned to prove the indicators defined to identify the **"No Net Loss" (NNL) and "Net Gain"** (NG) criteria for biodiversity are still underway. It is important to emphasize that any habitat restoration (especially restinga) requires medium/long term maintenance efforts until satisfactory levels of recovery and biomass are achieved. However, it can be pointed out that the measures to obtain Net Gain have been done properly.

The evidence includes:

- A total of 120.60 ha planted, which exceeds the area of cleared vegetation (33.06 ha) for the implementation of the projects by approximately 3.65 times
- The development of plants, evidenced by flowering, fruiting and the occurrence of interactions between fauna and flora species in areas under restoration
- Research to increase the survival rate of Melanopsidium nigrum

Associated management and monitoring plans or documents

1. Biomass Enhancement Study

2. INEA Resolution No. 143 of June 14, 2017

3. The RPPN Caruara Management Plan

4. Terrestrial Fauna Monitoring Plan

5. Restinga Recovery and Conservation Plan

6. Procedure for Controlling Exotic and/or Invasive Species of Flora

7. Germplasm Rescue Program

8. Forest Restoration Projects of the TPP GNA I, Construction Site of TPP GNA I, LNGT and LNGT Firebreaks, Macro-drainage, 345 kV TL, TPP GNA II and 500 kV TL (original and complementary)

9. Executive Summary of the Restinga Restoration Workshop at the RPPN Caruara



Mitigation Measure 3

PAYMENT OF MONETARY ENVIRONMENTAL COMPENSATION

Impact to be mitigated:

Vegetation clearing. Federal Law No. 9,985/2000, which established the National System of Conservation Units (Sistema Nacional de Unidades de Conservação – SNUC, in Portuguese), establishes, in its article 36, the payment of monetary environmental compensation for the implementation of projects with significant environmental impact. SNUC is regulated by Decree No. 4,340/2002, State Law No. 6,572/2013 (amended by State Law No. 7,061/2015) and Joint Resolution SEA/INEA No. 638/2016. The legislation establishes that the Environmental Compensation Chamber (Câmara de Compensação Ambiental – CCA, in Portuguese) defines the allocation and supervises the correct application of the funds resulting from monetary environmental compensation.

To comply with this measure, five Environmental Compensation Commitment Terms (Termos de Compromisso de Compensação Ambiental – TCCA, in Portuguese) were signed with INEA/RJ and SEAS/RJ, one for each licensing process, managed separately: TCCA No. 03/2012, referring to the implementation of 345 kV TL; TCCA No. 01/2018, required by the installation license of the TPP GNA I; TCCA No. 07/2018, required by the installation license of the LNGT; TCCA No. 03/2020 for the TPP GNA II and TCCA No. 01/2021 for the 500 kV TL.

Implementation indicator

Payments made.

Desired outcome

Correct allocation and application of funds in protected regional areas. It should be noted that GNA formally expressed a desire for the financial support to be applied in areas that are directly and indirectly influenced by the projects, including suggesting the protection of freshwater bodies with similar ecological characteristics that exist in the region. It is important to emphasize, however, that this decision is up to the CCA and the State is responsible for executing the projects approved by the CCA. From 2018 to 2021, the Operational Manager was the Institute of Development and Management (Instituto de Desenvolvimento e Gestão – IDG, in Portuguese), a role which, since 2022, has been carried out by the São Francisco de Assis Biodiversity Assistance and Support Foundation (Fundação Assistencial e de Apoio à Biodiversidade São Francisco de Assis – FSFA, in Portuguese).

Status and evidence

GNA I & II: Measure fully complied with. Payments totaling R$31.8 million (GNA I) and R$34.2 million (GNA II) were made as agreed in the TCCAs.

No Net Loss/Net Gain (NNL/NG)

As the use of resources is not part of GNA's management, a detailed report was requested of the funds that were spent using the resources obtained from monetary environmental compensation payments. If it is presented, it will be possible to carry out this verification.

Associated management and monitoring plans or documents

- Cooperation agreement between GNA and the Government of the State of Rio de Janeiro.
- Environmental Compensation Commitment Terms (TCCA).
  - TCCA No. 03/2012 was signed to compensate for the impacts related to the implementation of the 345 kV TL. Item 1.1 set an amount of R$568,308.57, specifically with regard to investing in environmental conservation units, corresponding to 0.56% of the declared investment amount for implementing the project.
  - TCCA No. 01/2018 established environmental compensation relating to the implementation of the TPP GNA I. Item 2.1 determined a deposit of R$28,736,387.54 (1.06% of the total investment amount) into a bank account.
  - TCCA No. 07/2018 was signed with the objective of establishing environmental compensation due to the implementation of the LNGT. Item 2.1 ordered the deposit of R$2,495,492.37 (0.88% of the total investment amount) into a bank account.
  - TCCA No. 03/2020 established environmental compensation relating to the implementation of the TPP GNA II. Item 2.1 determined a deposit of R$34,222,237.68 (1.06% of the total investment amount) into a bank account.
  - TCCA No. 01/2021 was signed with the objective of establishing environmental compensation due to the implementation of the 500 kV T Line. Item 2.1 determined a deposit of R$383,065.05 (0.36036% of the total investment amount) into a bank account.

Mitigation Measure 4

VOLUNTARY PARTICIPATION IN THE "GREEN BELT" PROGRAM

Impact to be mitigated

Vegetation clearing for implementing the Port of Açu Complex, where GNA is located. This is a voluntary measure that is not related to any GNA environmental compensation, but associated with the premise adopted by the company of, whenever possible, seeking opportunities for Net Gain in biodiversity. Created by the Porto do Açu Operações company, which is the owner and operator of the Complex, the "Green Belt" Program's primary objective is to create a transition zone of native habitat between the Complex and the surrounding region.

Implementation indicator

To be determined.

Desired outcome

Participation in the project to create a vegetation transition zone between the industrial development area and the natural landscape, thereby providing the possibility of connecting fragments of restinga in the region.

Status and evidence

Awaiting resumption of the project by Porto do Açu Operações. The program was suspended after seedlings were planted in some test modules. For this reason, GNA has not yet participated in any way in the initiative.

No Net Loss/Net Gain (NNL/NG)

Given that the program has not been resumed, it is not possible to carry out this verification.



Impact

Loss of *habitat*

In addition to the impact on plant species, GNA considers that the vegetation clearing needed to implement their projects also represents a potential impact on fauna. This was a precautionary approach taken in the GNA's BAP, since the fragments of restinga that occur in the areas of the developments could no longer provide viable and sustainable habitat for most species of fauna due to the forest fragmentation that already existed, even before the implementation of the GNA Thermoelectric Park. As such, GNA understands that the loss of any restinga habitat would be harmful to these species and has included mitigation measures for this impact.



Mitigation Measure 5

RELOCATION OF FAUNA SPECIES OF INTEREST TO A SUITABLE *HABITAT*

Impact to be mitigated

Impact caused due to vegetation clearing to fauna species that are considered triggers for critical habitat related to the restinga.

Implementation indicator

Specimens of each species of interest found. If specimens from these species are found during vegetation clearing activities, they should be relocated to a suitable habitat in the RPPN Caruara, where ecological niches are not fully occupied.

Desired outcome

Specimens relocated to suitable (unoccupied) habitat in the RPPN Caruara and relocated specimens enriching populations in the RPPN Caruara.

Status and evidence

GNA I:

Measure fully complied with. The rescue and relocation efforts were carried out in parallel with the vegetation clearing activities planned for each project, tracking its progress. In terms of the critical *habitat* trigger species, one specimen of *Glaucomastix littoralis* (lagarto-da-cauda-verde) and four specimens of *Cerradomys goytaca* (ratinho-goitacá), both endemic species from restinga areas in the state of Rio de Janeiro. All were relocated to a suitable habitat in the RPPN Caruara. As the relocation of specimens was successful, no adaptive management action was required.

GNA II:

Measure fully complied with. The rescue and relocation efforts were carried out in parallel with the vegetation clearing activities planned for each project (areas for macro-drainage, TPP GNA II, construction sites and 500 kV TL), completed in 2023. No critical habitat species were found.

DISPLACEMENT OF WILDLIFE DURING VEGETATION CLEARING ACTIVITIES

For the other species of fauna found during the vegetation clearing stage, whenever possible, they were removed or relocated to a safe environment as close as possible to where they were recorded in areas adjacent to the project, or released into the RPPN Caruara.

In the activities associated with the implementation of GNA I, 3,308 specimens of fauna were removed/relocated, with reptiles being the largest group. During the vegetation clearing related to GNA II, the removals/relocations involved 1,054 specimens, with a higher prevalence of amphibians.

NUMBER OF EACH ACTIVITY PERFORMED DURING CLEARING IN GNA II PROJECTS

PROJECT GNA II	RESCUE/ RELEAS	VETERINARY TREATMENT	DISPLACEMENT	NEST ISOLATION	DEATH	TOTAL
MACRO-DRAINAGE	21	-	-	-	-	**21**
TPP GNA II	245	3	6	4	1	**259**
CONSTRUCTION SITE (PHASE 3)	294	-	-	7	-	**301**
500 KV TL	163	10	219	69	12	**473**
TOTAL	**723**	**13**	**225**	**80**	**13**	**1.054**

NÚMERO DE INDIVÍDUOS DE CADA GRUPO ANIMAL REGISTRADOS NAS ATIVIDADES DE SUPRESSÃO DE VEGETAÇÃO RELACIONADAS AOS PROJETOS GNA II

PROJECT GNA II	MAMMALS	AMPHIBIANS	REPTILES	BIRDS	INSECTS*	TOTAL
MACRO-DRAINAGE	-	09	12	-	-	**21**
TPP GNA II	15	164	76	4	-	**259**
CONSTRUCTION SITE	7	206	81	7	-	**301**
500 KV TL	26	164	67	215	6	**473**
TOTAL	**48**	**543**	**224**	**226**	**6**	**1.054**



Recurring activity: rescues and relocation of fauna of interest during the construction and operation phases

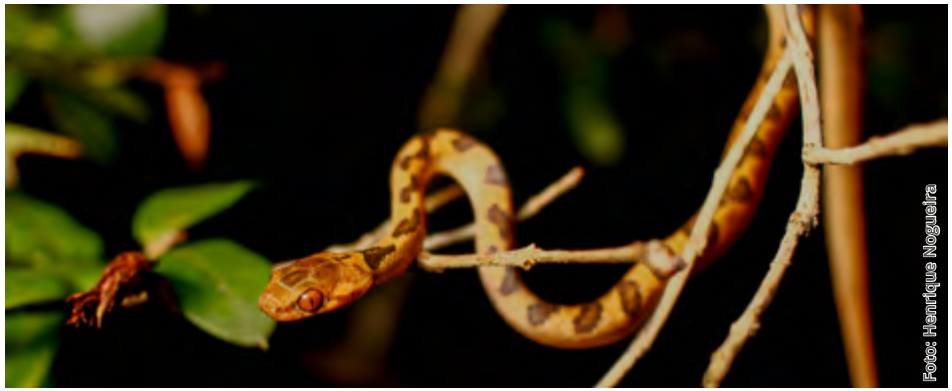
The practices of rescuing and relocating fauna of interest are ongoing and consistently implemented, when necessary, during the construction phase of GNA II (as occurred during the construction of GNA I and continues in its operation) and in the maintenance activities for firebreaks and vegetation control along the 345 kV and 500 kV transmission lines. These actions will be maintained throughout the operational phase of the GNA Natural Gas Thermoelectric Park and will be a daily activity of the Emergency Brigade team. In 2024, no interactions with critical-habitat trigger species were recorded, either in connection with the construction activities of GNA II or the operational phase of GNA I.

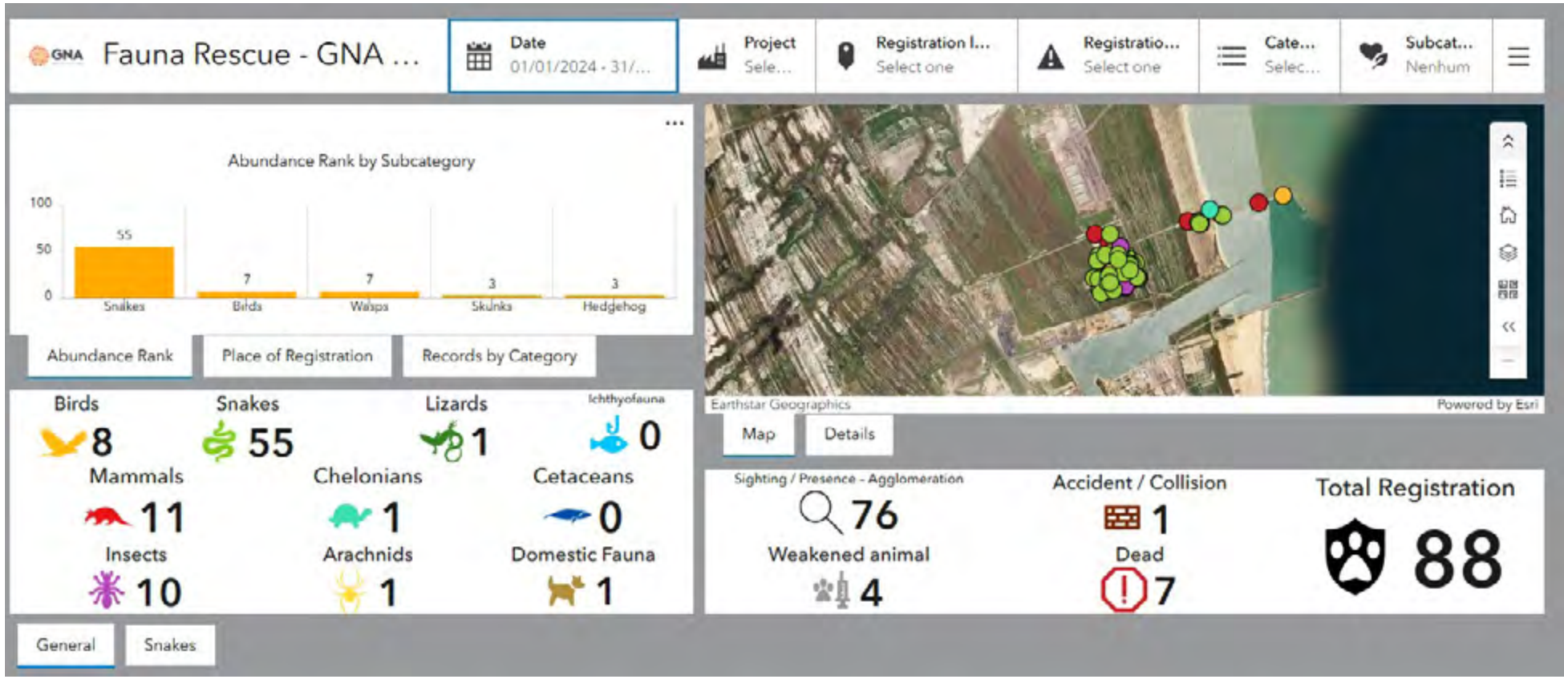
CARE FOR FAUNA DURING ALL PHASES

GNA maintains care for the existing fauna in the surroundings of their projects also during construction and operational phases. The Procedure for the Synanthropic, Domestic and Wild Fauna Displacement and Rescue provides for fauna sighting record sheets and establishes protocols for various situations, with the GNA's Emergency Brigade and environmental team conducting the actions provided for in day-to-day activities. There is also an agreement for the veterinary treatment of wild animals if accidents happen with the fauna at the company's facilities.

In 2024, interactions with 88 animals were documented. The most representative group was reptiles (56, of which 55 were snakes), followed by mammals (11), insects (10) and birds (8), among others.

GNA maintains a dashboard with real-time updates to support monitoring, consolidating detailed data on interactions with fauna.





Dashboard displaying numbers of fauna registries in the daily operation of GNA I and GNA II projects during 2024. Source: GNA.

No Net Loss/Net Gain (NNL/NG)

The indicator for this measure is supporting information and is not applicable to verify Net Gain (NG). However, this could be verified by monitoring the creation of new habitats in restoration areas and the maintenance of ecosystems in the RPPN Caruara through specific monitoring programs. In turn, the action contributes to achieving the projects' No Net Loss (NNL) target.

Associated management and monitoring plans or documents

- RPPN Caruara Support Capacity Study
- Fauna Accident Prevention Program for the 345 kV TL
- Fauna and Flora Management during the implementation of the 500 kV TL
- Fauna and Flora Management during the implementation of the LNGT
- Fauna Management in the 345 kV TL cabling phase
- Fauna and Flora Management during the implementation of the Internal TL; (part of the 345 kV TL located within the boundaries of the Port of Açu Special Sector) of the TPP GNA I
- Fauna and Flora Management during the implementation of the TPP GNA I
- Fauna and Flora Management during the implementation of the TPP GNA II
- Procedure for Synanthropic, Domestic and Wild Fauna Displacement and Rescue

Mitigation Measure 6

RESTORING THE RESTINGA HABITAT



Impact to be mitigated

Impact caused to species of restinga flora due to vegetation clearing.

This particular action is applied for more than one impact, and is recognized in the BMEP as a measure to address both the impacts related to habitat loss and those associated with vegetation clearing. This measure is fully described in Mitigation Measure 2.

Impact

Bird mortality along transmission lines

The installation of transmission lines and associated structures poses a risk of injury and death of birds, either through a collision during flight or electrical discharges when landing on the cable. This led to the creation of the Birdlife Management Plan, and a specific mitigation measure was defined to reduce this impact.

Mitigation Measure 7

INSTALLATION OF BIRD FLIGHT DIVERTERS

Impact to be mitigated

Mortality and injuries of birds caused by collision during flight or electrocutions when landing on the 345 kV TL and the 500 kV TL.

Implementation indicator

Bird flight diverters in areas that have a high risk of bird collisions.

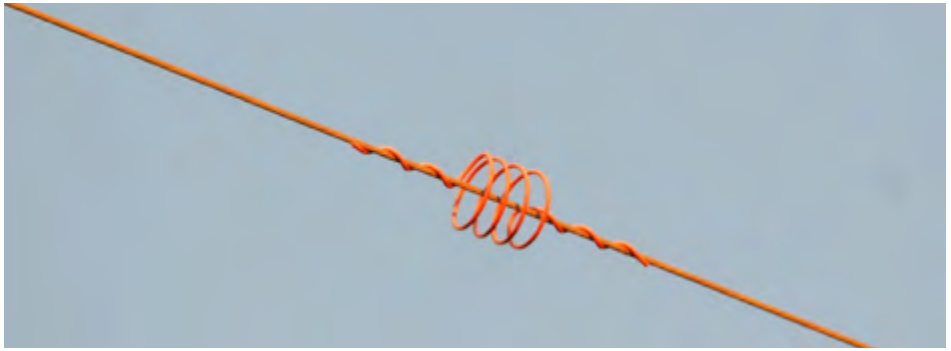
Desired outcome

Bird flight diverters installed in areas with high risk of bird collisions and monitoring of bird interactions with the 345 kV TL and the 500 kV TL.

Status and evidence

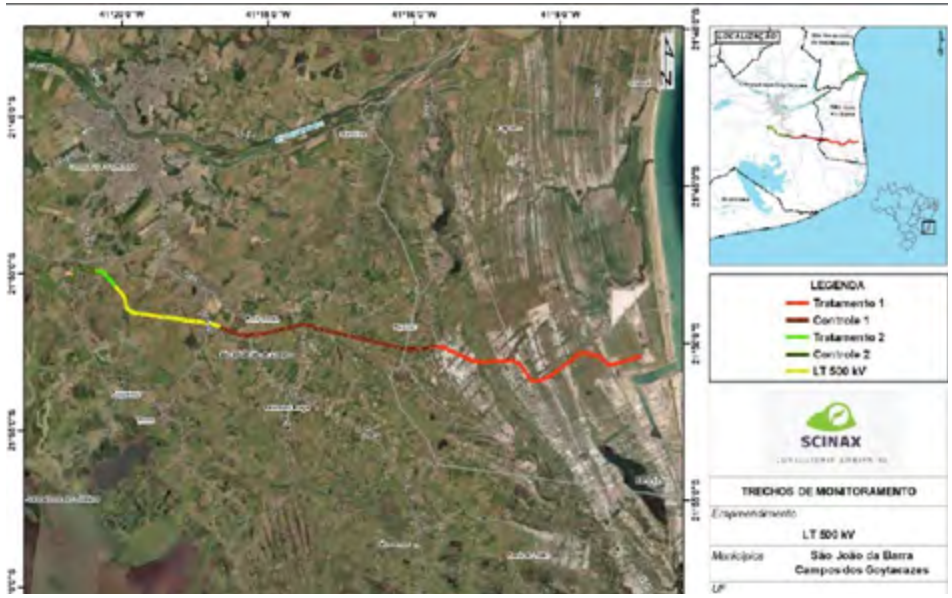
GNA I & GNA II:

Measure fully implemented. The cabling phase of the 345 kV TL took place from August to October 2019, during which 776 bird flight diverters were installed, while for the 500 kV TL, 723 bird flight diverters were installed between August and November 2023. In total, 1,499 devices were installed in the areas identified by the Birdlife Management Plan according to their relevance in protecting birdlife species. It is important to note that a Cumulative Impact Assessment was carried out in order to analyze the effect of the construction of the 500 kV TL adjacent to the 345 kV TL, and to target the ideal locations for the inclusion of the devices.

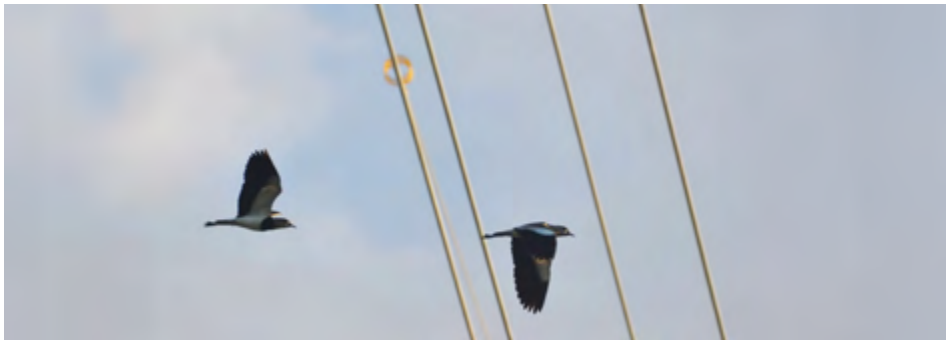




Areas where the bird flight diverters were installed in the 345 kV TL. Source: 1st BAP Annual Report, JGP 2020.



Areas where the bird flight diverters were installed in the 500 kV TL. Source: GNA.



Recurrent activity: monitoring the effectiveness of the bird flight diverters

Monitoring campaigns were set up in order to verify the effectiveness of the bird flight diverters. The campaigns recorded information, such as:

- Bird species and number of specimens observed in the area of influence of the transmission line
- Highest flight estimate of each specimen recorded
- Flight behavior
- Recorded collision events
- Carcasses and other evidence of collisions with transmission lines
- Species that use the 345 kV TL structure for nesting
- Weather conditions during the campaign
- Vegetation and terrain characteristics
- Date and time of recorded events



345 kV TL

The methodology for monitoring the effectiveness of the devices installed on the 345 kV TL comprises eight sections along the transmission line. Four are without flight diverters (control sections) and four with flight diverters installed (treatment sections). The first campaign took place in February 2021 and, after the first six monitoring campaigns, an adaptive management measure was conducted, expanding the sampling effort and establishing a new frequency for this monitoring program, which resulted in more monitoring hours per campaign and more robust outcomes to meet the program's objectives. All sections were monitored for 400 minutes daily (versus 50 minutes initially dedicated per day), totaling 3,200 minutes per campaign. In addition, in order to optimize the time spent in the field and take advantage of the birds' activity, the experts spent 50 uninterrupted minutes observing the birds' interactions with the 345 kV TL. As the sampling efforts were escalated, there was a greater possibility of recording collisions and finding carcasses, and analyses are being conducted to determine if there is a statistically significant difference among the sections.

In 2024, four monitoring campaigns were conducted (January, April, July and October), thus totaling 24 campaigns executed since February 2021.

RESULTS COMPILED FROM THE 24 MONITORING CAMPAIGNS

Interactions*	
Treatment sections	3.871
Control sections	3.194
Total	**7.065**

**Interactions – related to the number of specimens observed interacting with the line*
Note: According to the applied statistical analysis, there was no significant difference between the treatment and control sections.

Type of flight*	
Crossing	5.904
In a circle	1.185
Heterodimensional scan	156 (100 in the treatment sections and 56 in the control sections)

**Refers to the behavior of specimens observed in relation to the line.*

Collisions	
Total collisions	40
Total fatalities due to collisions	5*

**Five carcasses were found, three from species with a high degree of risk associated with their susceptibility to collision (Coragyps atratus and Patagioenas picazuro) and two with a low degree of risk (Ramphocelus bresilia and Crotophaga ani).*

Discovery of carcasses after 12 hours	
Treatment sections	0
Control sections	0
Total	**0**

Note: Result possibly related to the fact that the carcasses were removed very quickly by necrophagous species.



Pandion haliaetus

Recorded species

Throughout the 24 monitoring campaigns conducted, 7,048 specimens of 66 species were recorded. The most abundant species was *Coragyps atratus*, with 856 records. The only record of a threatened species occurred during the 1st monitoring campaign and involved the species *Busarellus nigricollis* (gavião-belo), classified as Vulnerable in the state of Rio de Janeiro, according to the state's regional list. The only migratory species recorded was *Pandion haliaetus* (águia-pescadora), sighted during the 1st, 3rd and 17th monitoring campaigns. Species endemic to the Brazilian territory were not recorded.

500 kV TL

After the installation of the bird flight diverters and the completed construction of the 500 kV Transmission Line in December 2023, monitoring campaigns were planned to check on the efficiency of these devices, starting in January 2024. The methodology involves four sections along the transmission line: two of them without beacons (control sections) and two with the beacons installed (treatment sections).

In 2024, the six planned monthly monitoring campaigns (January, February, March, April, May and June) were conducted. Subsequently, following the same approach adopted for the 345 kV TL, the monitoring frequency was changed to quarterly, with the next campaign taking place in September. After review and analysis in collaboration with the National Environmental Institute (INEA), the campaign that was supposed to take place in December 2024 was postponed to January 2025. The intention was to align the monitoring activities of the two TLs, which will now be conducted together, on a quarterly basis, over the next two years.



RESULTS COMPILED FROM THE SEVEN MONITORING CAMPAIGNS

Interactions*	
Treatment sections	1.288
Control sections	900
Total	**2.278**

**Interactions – related to the number of specimens observed interacting with the line*
Note: According to the applied statistical analysis, there was no significant difference between the treatment and control sections.

Type of flight*	
Crossing	1.803
In a circle	364
Heterodimensional scan	84

**Refers to the behavior of specimens observed in relation to the line.*

Collisions	
Total collisions	27
Total fatalities due to collisions	0

Discovery of carcasses after 12 hours	
Treatment sections	0
Control sections	0
Total	**0**

Note: Result possibly related to the fact that the carcasses were removed very quickly by necrophagous species.



Guira guira

Recorded species

Throughout the seven monitoring campaigns conducted, 2,278 specimens of 60 species were recorded. The most abundant species was *Coragyps atratus*, with 318 records. There was no record of species classified in threat categories The only migratory species recorded was *Pandion haliaetus* (águia-pescadora), sighted during the 7th monitoring campaign. There was a record of an endemic species, *Ramphocelus bresilia*, with a total of 5 specimens.

No Net Loss/Net Gain (NNL/NG)

The indicator of this measure is supporting information and does not apply to verify No Net Loss/Net Gain (NNL/NG). Despite this, the measure indirectly contributes to the achievement of No Net Loss by reducing the impacts of projects on birdlife. The campaigns that have been conducted are providing more accurate information about bird collision mortality, helping in the assessment of the No Net Loss target.

Associated management and monitoring plans or documents

- Birdlife Management Plan
- Cumulative Impact Assessment of 345 kV and 500 kV TL
- Actions to improve bird collision records with 345 kV TL

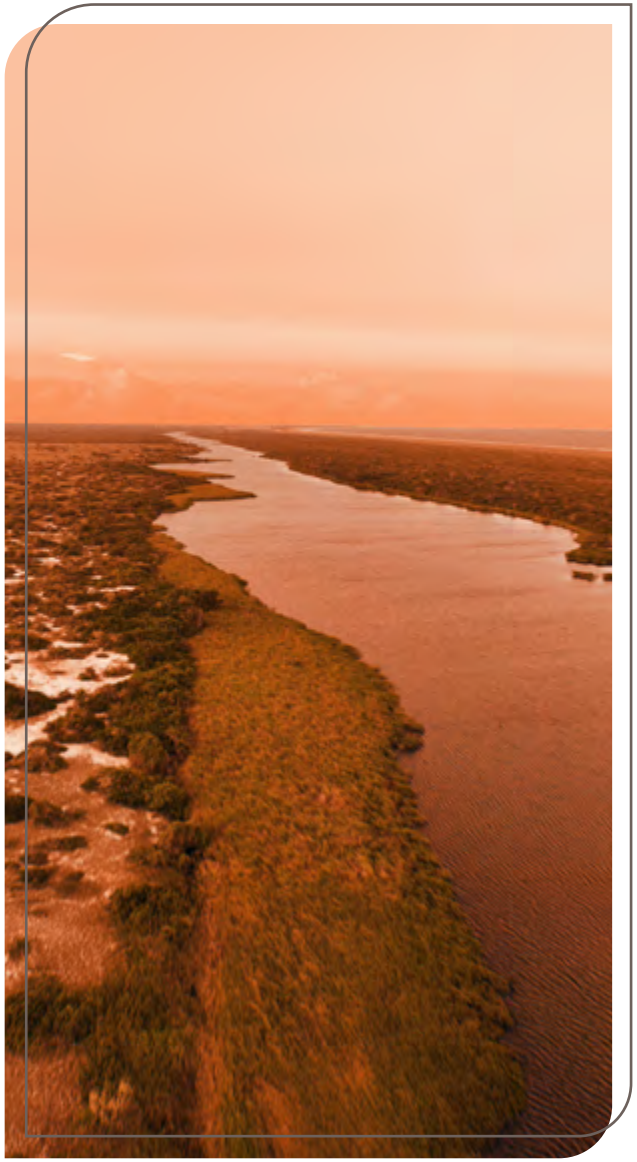


Athene cunicularia

ECOSYSTEM:

FRESHWATER

Alterations or degradations in lakes, wetlands and ephemeral ponds existing in the area of implementation of GNA projects can directly affect the restinga habitat. This is because these freshwater bodies maintain hydrological and ecological connections with this ecosystem and are home to important faunal groups, which include benthic macrofauna, phytoplankton, zooplankton, and ichthyofauna. As a result, BAP identified a potential impact that led to four mitigation measures.



Impact:

REDUCTION OF WATER QUALITY AND QUANTITY

Mitigation Measures:

- Installation of oil-water separators
- Maintaining a permeable surface
- Restoring the restinga habitat
- Payment of monetary environmental compensation

Impact

Reduction of water quality and quantity

The risk of oil spills, installation of structures in ponds, water abstraction activities, discharge of thermal waters, and waterproofing of surface areas represent potential threats to water availability and quality in the area of GNA projects. Considering this, four mitigation measures were defined with the aim of preventing biodiversity loss associated with the reduction in quality or quantity of water resources.



Mitigation Measure 8

INSTALLATION OF OIL-WATER SEPARATORS

Impact to be mitigated

Reduction in water quality due to contamination from possible oil leaks.

Implementation indicator

Oil-water separators installed.

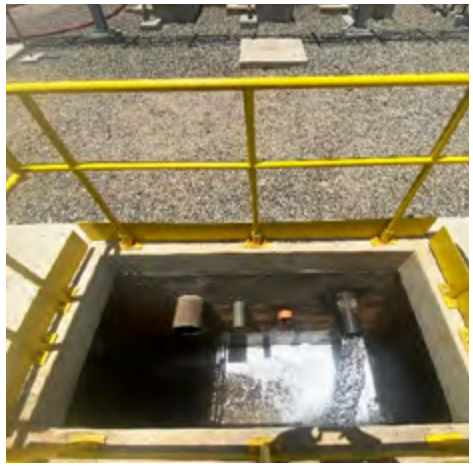
Desired outcome

Zero oil discharge to freshwater bodies.

Status and evidence:

GNA I & II:

Measure fully implemented. The installation of oil-water separators and containment trays in all facilities of the project is reported in the Installation License Request Reports of both projects, and in the monitoring reports from the Construction Site Environmental Management Program demonstrate that they have been effectively installed. It is worth noting that the drainage project was developed including operational and rainwater drainage systems, with a catchment system via an extensive drainage network that covers a large part of the TPPs GNA I & II area. All effluent is diverted to the separation tanks. The waste is removed by the appropriate trucks and sent for treatment to a specific facility by specialized companies licensed for this activity.





An oil-water separator has been installed in an area of the TPP GNA II.



Monitoring of the region's lagoons

To analyze the effectiveness of the measure, monitoring campaigns were launched for the lagoons in the region. After four campaigns (between 2020 and 2021), it was clear that the lagoons had not been impacted because of GNA's activities, and then monitoring was completed and efforts were redefined and redirected towards conducting studies on the lagoons of the RPPN Caruara (Iquipari and Grussaí).

In 2023, a study carried out by a specialized consultancy aimed to define a planialtimetric and orthomosaic profile of the RPPN Caruara region. The objective was to incorporate an updated altimetric model of the RPPN Caruara area on a large scale, since the relief component is a fundamental factor to be understood, especially in terms of events associated with water dynamics. The survey focused on comprehensively analyzing the areas upstream of the RPPN Caruara, mainly between the Estrada do Galinheiro and RJ-240 highways, where situations of damming or plumbing of surplus surface water could occur, altering the supply of the drainage network within the reserve. Active sensor surveys (laser scan), photogrammetric restitution and other techniques were used. The findings are providing valuable insights into the next steps in understanding the dynamics of the RPPN Caruara lagoons and their ecosystem services, in addition to supporting the fauna monitoring program.

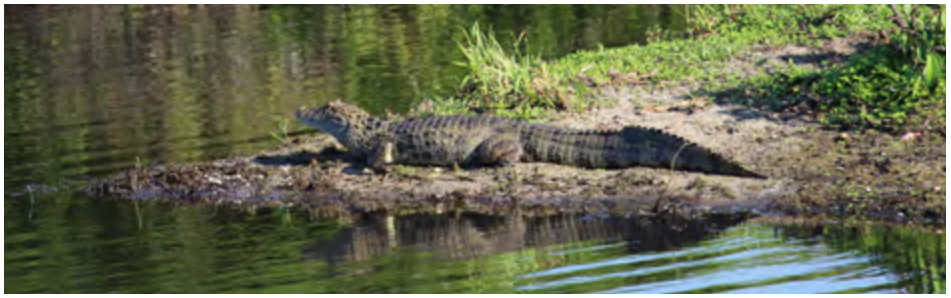
No Net Loss/Net Gain (NNL/NG)

The indicator of this measure is supporting information, and it does not apply to verify No Net Loss/Net Gain (NNL/NG). Despite this, the measure helps reduce impacts on bodies of freshwater and to achieving No Net Loss (NNL) by avoiding pollution in an important ecosystem related to the restinga.

Associated management and monitoring plans or documents

- Liquid Effluent Management Procedure
- General Drainage Concept of the TPP GNA I
- Remote sensing and planialtimetric and orthomosaic profile of the RPPN Caruara region

Mitigation Measure 9



MAINTAINING A PERMEABLE SURFACE

Impact to be mitigated

Reduction of rainwater absorption into the soil, impacting the region's aquifers.

Implementation indicator

Percentage of the area occupied by the Port of Açu with a permeable surface.

Desired outcome

Maintaining a permeable surface corresponding to 15% of the total area occupied by GNA projects, helping to preserve the region's aquifers and ensuring their levels of underground water storage remain normal.

Status and evidence

GNA I:

This measure is fully met. In compliance with a regulation by the Industrial Development Company of the State of Rio de Janeiro (Companhia de Desenvolvimento Industrial do Estado do Rio de Janeiro – CODIN, in Portuguese), a hydrological engineering study identified the percentage of the total area of Port of Açu as 15% to be maintained as a permeable surface to ensure that normal levels of the region's aquifers are preserved. Thus, TPP GNA I maintains an area of 2.77 hectares (which represents 15.23% of the total area licensed for the construction of TPP GNA I) with its original vegetation to ensure the minimum permeable area required by Porto do Açu Operações. In addition, the built-up areas have high permeability coefficients, with points reaching 70% of the original permeability.



Area of TPP GNA I, highlighting the area maintained with permeable coverage (outlined polygon in the lower-left corner). Source: BAP Annual Report, JGP 2020.

GNA II:

Percentage will be calculated after the end of the construction phase.

No Net Loss/Net Gain (NNL/NG)

The indicator of this measure is supporting information and does not apply to verify No Net Loss/Net Gain (NNL/NG). However, the action helps maintain groundwater at an acceptable level, providing a secure environment for local biodiversity and playing a role in achieving the goal of No Net Loss (NNL) in freshwater bodies in the restinga habitat of GNA's projects.

Associated management and monitoring plans or documents

- Master Plan of the Industrial and Logistics Complex of the Port of Açu (Clipa)
- Effluent Management Procedure
- Remote Sensing Monitoring of Coastal Lagoons

Mitigation Measure 10



RESTAURAÇÃO DO *HABITAT* DE RESTINGA

Impact to be mitigated

Impact caused to the quality and quantity of water in freshwater bodies due to vegetation clearing.

This measure is applied to more than one impact, and is considered in the BMEP as an action to both mitigate impacts relating to the quantity and quality of water in freshwater bodies and those associated with habitat loss and vegetation clearing. It is fully described in Mitigation Measure 2. It should be pointed out that the restoration and maintenance of the native vegetation cover of the RPPN Caruara play an important role in preserving the quantity and quality of water in the freshwater bodies of the region, mainly in the Iquipari Lagoon.

Mitigation Measure 11

PAYMENT OF MONETARY ENVIRONMENTAL COMPENSATION

Impact to be mitigated

Reduction of water quality and quantity in the region's freshwater bodies.

This measure is applied for more than one impact, and is fully described in Mitigation Measure 3. In this case, the payment of monetary environmental compensation (carried out by the five Environmental Compensation Commitment Terms signed with INEA/RJ and SEAS/RJ) may also involve the protection of freshwater bodies with similar ecological characteristics in the region (such as the areas originally indicated: Parque Estadual da Lagoa do Açu and Parque Nacional Restinga de Jurubatiba).



ECOSYSTEM:

COASTAL

The GNA Natural Gas Thermoelectric Park is located in a coastal area. While the physical infrastructure of the projects in this environment is minimal, consisting mostly of pipelines, the implementation and operation of the thermoelectric complex can have potential impacts on this ecosystem due to the lighting used for construction activities and daily operations. This also includes the effluents, resulting from running the facilities, and the increase in ship traffic.

The beaches and adjacent marine areas are recognized by the Brazilian Institute of Environment and Renewable Natural Resources (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis – IBAMA, in Portuguese) and the Chico Mendes Institute for Biodiversity Conservation (Instituto Chico Mendes de Conservação da Biodiversidade – ICMBio, in Portuguese) for their crucial role in nesting and feeding threatened sea turtles. Most notably are the Caretta caretta (IUCN: Vulnerable; MMA: Vulnerable), which are responsible for approximately 85% of the nests created in the region. In fact, these areas are especially important for the birth of males of the species in the South Atlantic. While the high temperatures on the beaches of the north coast of Brazil predominantly favor the birth of females, the beaches located further south — due to their milder temperatures — are essential for producing males, which helps maintain the population balance of the species.

The region has also witnessed, in smaller numbers, nesting of the species Eretmochelys imbricata (IUCN: Critically Endangered; MMA: Endangered), Lepidochelys olivacea (IUCN: Vulnerable; MMA: Vulnerable) and Dermochelys coriacea (IUCN: Vulnerable; MMA: Critically Endangered).

Even though they are not categorized as a critical environment trigger species in the BAP, sea turtles are a priority biodiversity value for which GNA maintains, voluntarily, a monitoring program.

In order to assess the impacts and set up mitigation measures, certain aspects were considered such as mortality and the decline in reproduction of sea turtles and decline in habitat suitability. Two possible impacts were identified, resulting in ten mitigation measures.



Impact:

MORTALITY AND DECREASED REPRODUCTION OF SEA TURTLES

Mitigation Measures:

- Dredging carried out considering the sea turtles' nesting season
- Lighting of GNA structures designed to reduce impacts from illumination caused to the sea turtles' reproduction
- The paint color of the FSRU was designed to minimize artificial light reflection to accommodate sea turtles' reproduction
- Ongoing and structured actions for the conservation of sea turtles

Impact:

DECLINE IN HABITAT SUITABILITY FOR ALL NEAR-SHORE MARINE SPECIES

Mitigation Measures:

- Mixing the FSRU cooling water with the hot water output from TPPs to manage water temperatures prior to discharge into the ocean
- Installation of an anti-entrainment structure for marine life (sea chest) in the cooling water intake system for the FSRU operation
- Water quality management
- Ship ballast offshore exchange to minimize the risk of introducing invasive alien species
- Removal of invasive marine species from port area and FSRU BW Magna
- Construction of the pier using rock increases habitat availability for hard-bottom marine species



Impact

Mortality and decreased reproduction of sea turtles

Actions from human activities impact all stages of the sea turtles' life cycle, from the loss of nesting areas and feeding habitat to mortality on the coast and in the high seas due to the intense practice of both artisanal and industrial fishing. According to the National Action Plan for the Conservation of Sea Turtles (2011), the key threats are: coastal development, such as photopollution, extraction of sand and landfill, transit of vehicles on the sand strip, presence of humans on the beach, construction of ports, berths and jetties; ocean pollution, causing diseases; fishing activities; climate change; consumption and use of meat and eggs; and predation by animals.

During the installation and operation of the LNGT, certain situations with potential impacts on sea turtles were identified, including lighting associated with nighttime activities and/or the maintenance of safety lights overnight, dredging activities required for the terminal's construction, and the potential involvement of animals in the water intake system used for cooling the FSRU.

A potential increase in vessel traffic, necessary for the operation of GNA's projects, was also considered. However, it should be noted that the number is small, as there is one LNGC vessel and four support tugs, with entry and exit scheduled for every 12 days, in case of 100% demand for the TPPs GNA I and II. As such, the indirect impact of this increase in traffic, which could result in collisions with sea turtles and cetaceans or interference with fishing, is unlikely. In the case of collisions or interactions with specific groups of marine animals, such as dolphins, GNA follows the protocol and guidelines established by the administrator of the navigation channel of Port of Açu.



Mitigation Measure 12

DREDGING CARRIED OUT CONSIDERING THE SEA TURTLES' NESTING SEASON

Impact to be mitigated

Mortality of sea turtles due to collision with boats (or other elements) used in dredging, in addition to reduced reproduction of sea turtles due to dredging activities.

Implementation indicator

Time of dredging.

Desired outcome

Dredging schedule adapted to the reproductive period for sea turtles, helping to reduce potential impacts caused to their reproduction.

Status and evidence

This measure is fully complied with. The dredging activities near the GNA area have already been completed. The dredging schedule has been adapted to accommodate the reproductive period of sea turtles in the region. Qualified professionals were also on-site to monitor chelonians and marine cetaceans on board the dredgers, with direct access to the vessel's commander to determine the immediate stoppage of dredging activities, until the sea turtles observed in the vicinity of the dredger moved away. Sea turtle deflectors attached to the dredge heads were also used as a preventive measure. Dredging was needed for the installation of the LNGT, beginning on February 5, 2019 and continuing up to August 2019[4]. In September 2019, there was the lowering of high points of the sea bottom with the use of a "Plough" type vessel. New dredging in the port as a whole is expected to follow the defined schedule and the Port of Açu Dredging Plan, with authorization from the relevant environmental agency.

There was no need to carry out maintenance dredging in 2024; the next one is scheduled to take place in 2025, under the responsibility of Porto do Açu Operações.

[4] In the period from April 12 to July 24, 2019, a second dredger was added to the dredging activities.

No Net Loss/Net Gain (NNL/NG)

The indicator for this measure is supporting information and it is not applicable in verifying No Net Loss/Net Gain (NNL/NG). However, the measure helps to achieve the No Net Loss (NNL) target, considering the objectives of mitigating the mortality rate of sea turtles.

Associated management and monitoring plans or documents

- Technical Environmental Control Instructions for Dredging Activities
- Dredging Management Plan of Port of Açu



Mitigation Measure 13

LIGHTING OF GNA STRUCTURES DESIGNED TO REDUCE IMPACTS OF ILLUMINATION TO THE SEA TURTLES' REPRODUCTION

Impact to be mitigated

Damage to the reproduction of sea turtles due to artificial lighting systems.

Implementation indicator

Lighting installed in accordance with Brazilian legislation (Resolution No. 10 of the National Environment Council [CONAMA] in October 24, 1996) and as detailed in the specific procedure for photomitigation (PO. MA.039 Photopollution Mitigation).

Desired outcome

The desired outcome is that lighting for GNA structures is within the specifications for protecting sea turtles, so the reproduction process can happen as close to normal as possible.

Status and evidence

GNA I:

This measure is fully implemented and has been carried out since the design of the lighting systems for the GNA I structures, and continues during the implementation and operational phases. As a result, the installation and maintenance of artificial lighting systems used in the offshore areas that are close to the coast, as well as those in the onshore terminal, complied with current regulations, thereby preventing impacts from spotlights (direct and indirect) on the beach, and also attenuating the generation of a luminous horizon.

GNA II:

Temporary lighting and lighting projects comply with the same photomitigation criteria provided for GNA I.

Recurrent activity: photopollution monitoring campaigns

To verify the effectiveness of the measure, a photopollution monitoring program was established that included day and night inspections involving a network made up of eight data collection stations (four in the north and four in the south), with the origin point located in the LNGT. The methodology adopted complies with Brazilian regulations (Ordinance No. 11/95 of IBAMA/MMA) as well as the Biodiversity Action Plan.

Between 2020 and 2024, 13 campaigns of the program were carried out. The first, done shortly after the lighting was installed, took place in October 2020. After that, three monitoring campaigns were conducted in 2021 (February, May and September), three in 2022 (January, May and September), three in 2023 (January, May and September) and then three in 2024 (January, May and September).



Study area for the photopollution monitoring campaign. Source: Environmental photomitigation procedure of GNA – 2023.

In addition, since 2022, a specific dashboard for photomitigation actions has been added to GNA's biodiversity data management system. The dashboard is updated in real time, according to the activities carried out.



Photomitigation dashboard. Source: GNA internal data.



The inspections confirmed that the lighting of the GNA structures remains consistent with the guidelines of the Photomitigation Program and in accordance with the CONAMA Resolution. Across the different stations analyzed, the most significant light contributions varied considerably in both direction and intensity. Elements that played a considerable role in the variations in measurements were: nighttime activities in the back area of the Port, the presence of offshore structures and the FSRU, activities at Terminal 1 of the Port and GNA II construction activities.

Accounting for the technical instructions and photomitigation recommendations needed for implementing the TPP GNA II, actions are being taken during nighttime work at the job sites, focusing on photomitigation and the operational safety of activities. As for GNA I, there is an assessment being conducted on changing the position of some reflectors to check for operational safety. In the case of the FSRU, the importance of maintaining lighting conditions throughout the operation was considered to ensure the safety of operators, which is why the initial photomitigation plan established continues to be applied.

It should be pointed out that GNA's structures are in an industrial area within the Port of Açu, with a number of projects that contribute significantly to the light intensity that reaches the monitoring sites. For situations like this, we cannot apply adaptive management measures.

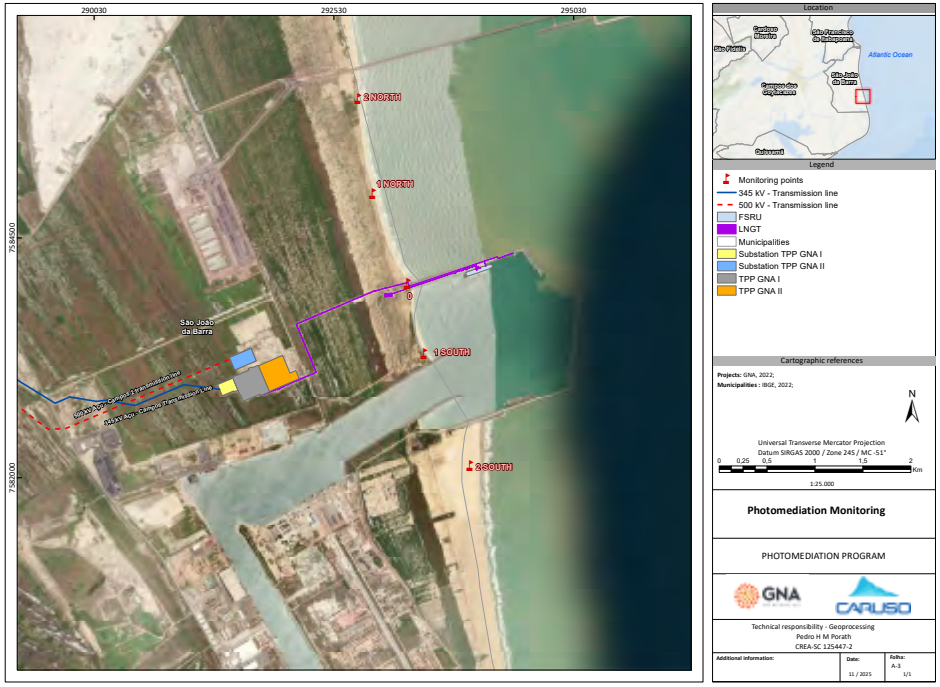
In January 2024, the photopollution monitoring program was revised with the participation of the TAMAR Project Foundation (Fundação Projeto TAMAR).

Changes were recommended and will be implemented as of 2025:

- Reducing the current eight sampling points to four (two to the north

and two to the south of the current point of origin located in the LNGT), separated by at least one kilometer from each other.

- Conducting an annual monitoring and photographic campaign in June/July to assess changes in light emissions in the region over time and to identify any potential non-conformities. Where required, corrective measures will be implemented, and a subsequent campaign in August to evaluate the effectiveness of the corrective actions.



New configuration of the study area for the photopollution monitoring campaign. Source: GNA 2024.

No Net Loss/Net Gain (NNL/NG)

This measure is a contributor to the No Net Loss (NNL) target, due to the mitigation of impacts on the spawning and reproduction of sea turtles. The Sea Turtles Monitoring Program tracks the effectiveness of the implemented measure.

Associated management and monitoring plans or documents

- Photopollution Mitigation Procedure
- Environmental Photomitigation Criteria for LNGT
- Sea Turtles Monitoring Procedure
- Port of Açu Sea Turtles Monitoring Program
- Monitoring Reports on Photomitigation Activities

Mitigation Measure 14

THE PAINT COLOR OF THE FSRU WAS DESIGNED TO MINIMIZE ARTIFICIAL LIGHT REFLECTION TO ACCOMMODATE SEA TURTLES' REPRODUCTION

Impact to be mitigated

Damage to sea turtles nesting due to light reflectance on the hull and deck of the FSRU.

Implementation indicator

Paint colors used on the hull and deck of the FSRU comply with specifications for low light reflection.

Desired outcome

The color of the paint satisfies the specifications for reducing the reflectance effect of the FSRU in the water, helping to enable turtle nesting as close to normal as possible.

Status and evidence

This measure is fully complied with. In 2019, the FSRU, originally painted light green with blue accents, received new colors. The hull was painted navy blue, and the deck was painted gray.



FSRU with hull in the original paint. Source: GNA.



FSRU with navy blue-painted hull and gray deck: reduction of light reflectance on the water. Source: GNA.

No Net Loss/Net Gain (NNL/NG)

This measure plays a role in preventing No Net Loss (NNL) due to the mitigation of impacts on the spawning and reproduction of sea turtles. The ongoing assessment of photopollution and the Sea Turtles Monitoring Program monitor the effectiveness of the implemented measure.

Associated management and monitoring plans or documents

- Procedure for Mitigating Photopollution
- Criteria of the Environmental Photomitigation for the LNGT
- Procedure for Monitoring Sea Turtles
- Port of Açu Sea Turtles Monitoring Program
- Monitoring Reports of Photomitigation Actions

Mitigation Measure 15

ONGOING AND STRUCTURED ACTIONS FOR THE CONSERVATION OF SEA TURTLES

Impact to be mitigated:

Decline in reproduction and increase in mortality rates of sea turtles due to the installation and operation of GNA facilities (it is considered a cumulative impact with other projects already underway in the Port of Açu Complex).



Implementation indicator

Total number of nests, total number of eggs, total number of hatchlings, hatching rate.

Desired outcome

Stability or improvement of nesting and productivity on the spawning beach, according to the baseline. If there is a decline, Port of Açu is responsible for determining response measures. GNA may, however, support sea turtles' conservation projects in other regions if it believes that the measures are not effective.

BASELINE – SEA TURTLE NESTING		
Nesting season	**Nests**	**Hatching rate (%)**
2011 - 2012	1.225	66,6%
2012 - 2013	1.244	70,3%
2013 - 2014	1.676	73,4%
2014 - 2015	1.484	70,6%
2015 - 2016	2.339	73,37%
2016 - 2017	1.928	70,99%

[5] GNA voluntarily provides financial support for monitoring.

Status and evidence

The measure is implemented through GNA's support for the various actions carried out by Port of Açu to conserve the sea turtles species found in the region, including monitoring, protection of nests and hatchlings, engagement with local communities and provision of veterinary services whenever necessary.

The initiatives are part of the Sea Turtles Monitoring Program (Programa de Monitoramento de Tartarugas Marinhas – PMTM, from its acronym in Portuguese), maintained by four companies doing business in Port of Açu, including GNA, a partner in the program since September 2021[5]. The idea is to increase the success of the turtles' nesting and, consequently, their reproduction rates.

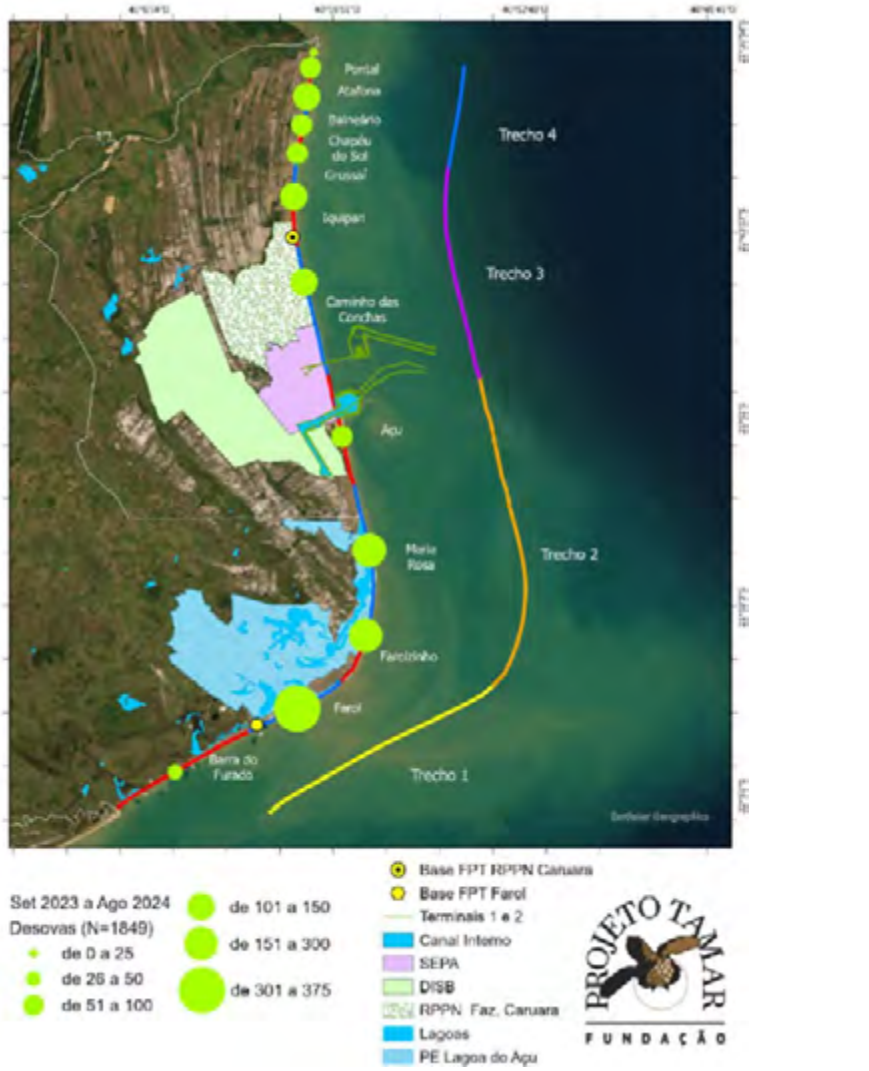
The PMTM methodology is used to monitor the reproductive and non-reproductive events of sea turtles, evaluating the causes of mortality and any possible changes observed in the patterns of reproductive occurrences. As of 2021, monitoring was done by the TAMAR Project Foundation.

Every day, roughly 62km of the coast is monitored, divided into sections, and toured by monitors of the program early in the morning. Reproductive records are made by locating and identifying females, nests and tracks from hatchlings. Once logged, the nest is monitored until it hatches. Non-reproductive logs refer to occurrences of live (but non-nesting) or dead animals arriving on beaches. Activities performed through the program also include the provision of veterinary care for debilitated sea turtles and necropsy, when necessary and possible, to ascertain the cause of death. Logs detailing stranding and necropsies have helped us understand the

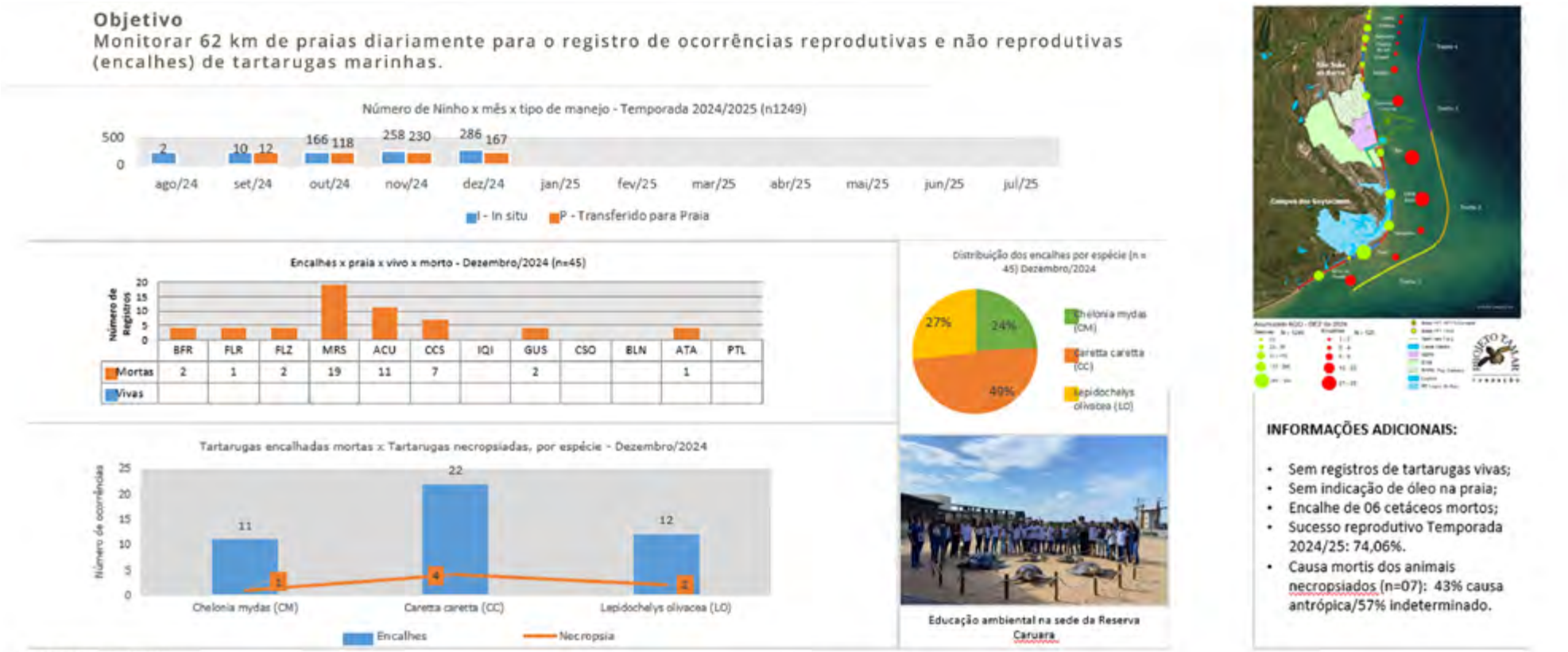
seasonal distribution of species and the causes of death in sea turtle specimens.

Also, a dashboard for monitoring was created at the very start of the program and has been used to track the main indicators of the program, updating them according to the activities carried out.





Monitoring area of the Sea Turtles Monitoring Program. Source: TAMAR. Semiannual Technical Report – September 2023 to August 2024.



Specific sustainability dashboard for the PMTM, showing the main data from August to December 2024. Source: GNA.

The TAMAR Project Foundation releases a full yearly report with the data collected, providing detailed information about the PMTM activities over the period. In the 2023-2024 season, 1,878 nests were registered, with 192,039 eggs in total. The hatching rate was 69.55% totalizing 133,579 hatchlings.

Sea turtle nesting, total number of eggs, hatching rate and number of hatchlings between 2017-2018 and 2023-2024 and preliminary data from 2024-2025.

Season	Nests	Total Number of Eggs	Hatching rate	Hatchlings
2017 - 2018	973	101.326	66,08%	66.959
2018 - 2019	1.118	130.891	70,20%	91.892
2019 - 2020	1.388	132.321	68,31%	90.396
2020 - 2021	908	68.562	66,47%	45.574
2021 - 2022	1.273	108.778	73,47%	79.923
2022 - 2023	1.267	123.060	74,69%	91.915
2023 - 2024	1.878	192.039	70,0%	133.579
2024 - 2025*	1.249	21.837	69,13%	15.096

** Preliminary data – season ongoing at the time the Report was finalized.*

Over the period, 168 non-reproductive events were also registered. Across the entire study area, the highest number of strandings was recorded at Açu beach, with 33 occurrences (20.7%), followed by Maria Rosa beach, with 31 occurrences (19.4%). 92 necropsies were performed. The results allowed the cause of death to be determined for 19 animals, which involved interaction with fishing activities (4 cases), vessel collision (1 case), infectious process (1 case), starvation (1 case), parasitosis (1 case), interaction with dredging equipment (2 cases), collision with machinery and equipment (1 case) and anthropogenic trauma (8 cases). For 38 animals, due to lack of evidence, it was only possible to suggest the presumed cause of death, which appeared to be related to of natural causes, interaction with fishing activities, or collisions involving vessels, machinery, and equipment. In the remaining 35 necropsies, the cause of death remained undetermined due to the advanced stage of decomposition.

The data presented concludes that, throughout the monitoring period, the number of nests and the hatching rate remained within the normal range of variation. Generally, the report containing the PMTM results provides enough information to conclude that there were no significant changes in the reproductive patterns of sea turtles and, thus far, there is no evidence that GNA's projects have had any impact on the behavior and life cycle of these animals.

THE 2023-2024 SEASON PROTECTED 133,579 SEA TURTLE HATCHLINGS. SINCE THE BEGINNING OF THE PROGRAM IN 2011, 1,330,354 HATCHLINGS HAVE BEEN PROTECTED.

RAISING AWARENESS AMONG FISHERMEN

GNA also hired the TAMAR Project Foundation to run a project intended to educate local fishermen on contributing to the conservation of sea turtles. From September 2021 to September 2022, the initiative involved engaging with fishermen, theoretical and practical workshops and lectures on techniques for conservation, resuscitation of turtles weakened by accidental fishing, use of the Turtle Excluder Device (TED) — which allows turtles caught in shrimp trawling nets to escape — and other techniques to prevent the accidental deaths of these animals.

During the 2023-2024 season, a collaborating fisherman handed over a live sea turtle to the TAMAR Project monitors. The turtle was subsequently tagged and returned to the sea. This turtle was part of 14 others also rescued by fishermen since the beginning of this campaign, which demonstrates the establishment of a relationship of trust between the community and the project that will contribute to the conservation of sea turtles.

HYDROACOUSTIC MONITORING

GNA has implemented a hydroacoustic monitoring program aimed at verifying the influence of noise on marine life, with a focus on cetaceans. However, the program can also assess impacts on other animals in the marine group, including sea turtles. This monitoring program can therefore be applied as a complementary measure to sea turtles' conservation initiatives.



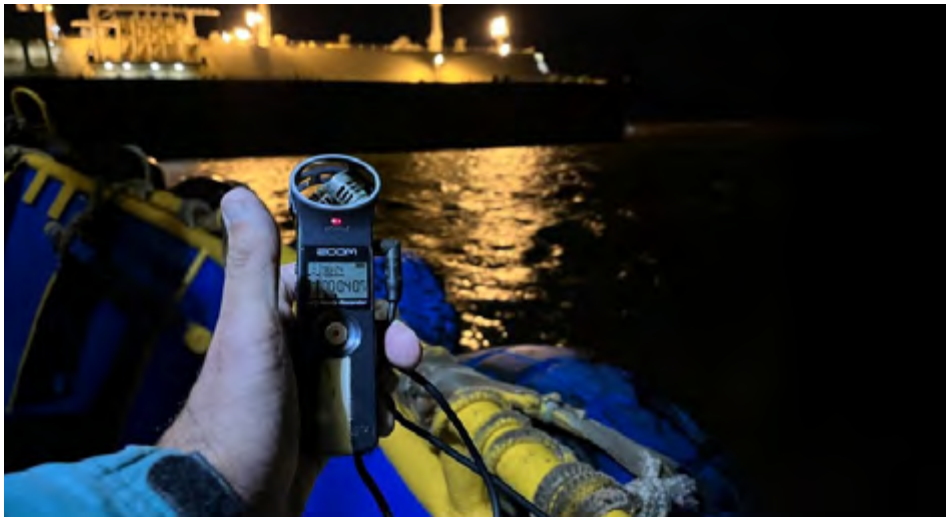
Sampling points (orange circles) for the Hydroacoustic Monitoring Program (2023). Source: GNA 2023.

Four different scenarios were established in the Hydroacoustic Monitoring Program to evaluate the various operational conditions: **1) No operation; 2) Only regasification operation; 3) Only ship-to-ship operation; 4) Regasification and ship-to-ship operations simultaneously.**

Six campaigns were conducted in the operational phase (between February 2021 and July 2023) and, in all surveys, the records did not exceed the limit established by the National Oceanic and Atmospheric Administration (NOAA) for cetaceans and marine chelonians in any of the four operational scenarios. In fact, they were well below them, as the monitoring reports show, even at the points closest to the sources of the noise. No changes were noted in the behavior of dolphins, seabirds and sea turtles sighted during the monitoring. The distribution of the registration points and the method used were satisfactory for the proposed goals.



Hydroacoustic monitoring campaign carried out in July 2023, during ship-to-ship operations. Source: Econservation, 2023.



Closest sampling point to the FSRU for the hydroacoustic monitoring campaign. Source: Econservation, 2023.

So, considering the location of the LNGT activities, with the FSRU moored within the navigation channel built by the Port of Açu, the low probability of recording cetaceans within the channel, the records below the limit accepted by NOAA at all monitoring points (inside and outside the navigation channel, including those closest to the noise source) and the reduction of sound intensity as the sound waves travel, the program provides sufficient elements to assess that the underwater noise generated during the different processes of the GNA operation does not negatively impact the local marine fauna. As such, according to a technical opinion, having completed all the necessary scenarios, hydroacoustic monitoring was discontinued because the most intense noises (even if below the limits established by NOAA) are not generated by the terminal itself, but by the movement of vessels coming in and out of Port of Açu.

Support for the **"De Olho no Mar"** (Eye on the Sea) project

In 2024, GNA became a partner of the "De Olho no Mar" project, an environmental education initiative by VAST Infraestrutura aimed at training water workers and fishermen working in the vicinity of Port of Açu.

The project is intended to support the conservation of cetaceans, with an emphasis on endangered species, such as franciscana dolphins (Pontoporia blainvillei), humpback whales (Megaptera novaeangliae) and Guiana dolphins (Sotalia guianensis). Professionals are trained to observe and register these animals in a conscious and responsible manner.

The observations preferably take place during routine cruises or with moored vessels, without interfering with operations. The captured images and sighting data are documented in logbooks and consolidated into a single database. This ongoing monitoring allows us to monitor the presence of cetaceans in the region and assess potential impacts on these populations.

No Net Loss/Net Gain (NNL/NG)

The actions play an important role in achieving the No Net Loss (NNL) target associated with the impacts of GNA's projects on marine life. In addition, tracking the reproductive period of sea turtles plays a role in generating Net Gain, considering conservation actions.

Associated management and monitoring plans or documents

- Sea Turtles Monitoring Program
- Marine Monitoring Plan
- Technical Opinion on Underwater Noise Monitoring during the operation of the GNA LNG Terminal in Port of Açu-RJ

Impact

Decline in *habitat* suitability for all near-shore marine species

The TPP GNA I operation influences the marine environment, as it requires seawater for the cooling tower and desalination plant for internal use, in addition to generating effluents, which are disposed of through a single return line. However, this influence could be considered to be indirect and these impact-generating aspects associated directly with the operation of the LNGT. Both the water intake for the LNGT and TPP GNA I activities, as well as the disposal of effluents, take place through structures associated with LNGT (FSRU water intake system and spillway, respectively).

During the operation phase, potential changes in the quality of water and marine sediments surrounding the project could occur mainly due to the release of effluents from the LNG regasification process at the FSRU, from the cooling system for the TPP GNA I and other associated processes, such as wastewater, after biological treatment. The disposal of effluents occurs jointly — LNGT + TPP GNA I and later TPP GNA II— at the disposal point on the north jetty, potentially influencing the water and marine sediments at the site. Changes in the physical compartment can also occur during maintenance dredging involving sediment remobilization, altering water and sediment quality.

Possible changes in water and sediment, in turn, have an impact on marine organisms. In addition, direct impacts on the biotic environment may occur, such as the availability of new substrates (with the presence of the FSRU), possible interactions of organisms with the seawater collection system or with vessels (whose traffic is associated with the LNGT operations) and even acoustic impacts that stem from the sounds emitted by the equipment used during the operation. For sea turtles, the emission of light is also an element that could cause impacts.



Mitigation Measure 16

MIXING THE FSRU COOLING WATER WITH THE HOT WATER OUTPUT FROM TPPs TO MANAGE WATER TEMPERATURES PRIOR TO DISCHARGE INTO THE OCEAN

Impact to be mitigated

Negative effect on the adaptation of some species and/or marked increase in animal attraction caused by the disposal of thermal wastewater.

Implementation indicator

Temperature of the water in the mixing zone at °C.

Desired outcome

The variation in water temperature in the mixing zone must not exceed 3 °C of the ambient temperature (historically measured in the section, varying between 25.33 °C in summer, 22.53 °C in winter and 22.45 °C during cold fronts). In addition, to monitor the local conditions more reliably, given changes in the climate, a control point was established, outside the dispersion plume, according to modeling made for the subject, and monitoring is done by comparing the temperature in the mixing zone with the control point in real time. If the water temperature varies >3 °C from the ambient ocean temperature at the control point, an alert will be issued, and the output mechanism will need to be recalibrated.

Status and evidence

Measure fully implemented. The FSRU operates by capturing seawater at ambient temperature to exchange heat with liquefied gas received from LNGC vessels at a temperature close to -162 °C and turn it back into natural gas. The effluents from the TPP used to cool the plant are released at a warmer temperature. The implementation project was developed to direct both effluents to the same spillway, promoting the mixing needed to moderate water temperatures before being discharged into the ocean, as recommended in the World Bank Group Environmental, Health, and Safety Guidelines for LNG facilities.

The outfall structure was completed in November 2020. In 2021, at the start-up of the TPP GNA I, the outfall began to discharge the thermal effluents.

Recurrent activity: water temperature monitoring

In early 2021, an automatic water temperature monitoring system was installed to validate the effectiveness of the measure adopted. The measurement grid consists of a point in the reservoir, prior to disposal in the mixing zone, three sampling points in the mixing zone and an additional point, acting as a control point (P5), outside the mixing zone to establish a comparison.

The baseline was established by an average of the values presented in the previous monitoring campaigns and their historical results considering summer and winter in the region, according to the GNA Environmental Impact Study (CPEA, 2017 qty. In JGP, 2020). It also follows the criteria established by CONAMA Resolution 430/11 and Technical Note INEA NT – 202.R-10/86.

Hence, automatic monitoring has been ongoing since mid-March 2021, generating monthly reports and submitting data every five minutes to a system that can be seen online, at any time, by the GNA Environmental team. The overall results suggest that, within the expected range, most of the variation observed at the sampling points is in line with the temperatures measured at the control point, indicating a major influence from the environmental conditions of the area. Since the installation, there have been no significant shutdowns of the systems, only brief interruptions in the monitoring process to fix issues that required intervention by the maintenance team. In all cases, the issues were successfully addressed, leading to a return to normal operation.



Monitoring points of the sea water temperature. P5 represents a control point. Source: GNA Archive.

No Net Loss/Net Gain (NNL/NG)

The indicators of this measure are needed to verify the absence of net loss. Based on the results from the monitoring reports, it can be inferred that the measures established to balance thermal discharges are being done properly and are contributing toward the No Net Loss (NNL) target of biodiversity. So far, no disturbance due to disposal of thermal effluent has been documented. The monitoring will continue throughout the operational stage of the GNA Natural Gas Thermoelectric Park.

Associated management and monitoring plans or documents

- Wastewater management technical instruction
- Ship effluent and waste management procedure
- Effluent Monitoring and Control Program – TPP GNA I and LNGT
- Marine Sediments and Water Quality Monitoring Procedure
- Seawater temperature monitoring procedure

Mitigation Measure 17

INSTALLATION OF AN ANTI-ENTRAINMENT STRUCTURE FOR MARINE LIFE (SEA CHEST) IN THE COOLING WATER INTAKE SYSTEM FOR THE FSRU OPERATION

Impact to be mitigated

Death or injury of large marine animals resulting from the water intake process for FSRU operations.

Implementation indicator

Sea turtles or other large marine organisms not pulled in or trapped by the water intake system.

Desired outcome

There is no record of sea turtles or other large marine organisms sucked in by the FSRU water intake system.



Status and evidence

Measure fully implemented. The opening of the FSRU seawater intake system is 5 m2 wide, which is enough to allow large marine animals to enter, causing possible injuries or deaths. To prevent this from happening, grids have been installed and the intake pump is located away from the grids. In addition, the water intake flow was set to decrease the likelihood of medium and large animals being attracted to the movement of water.

Measures were put in place to verify potential negative impacts from fauna interactions with FSRU and LNGT structures, such as registering sea turtles with atypical behavior around the FSRU or vessels that provide services to GNA. The key initiatives are:

- Instruction on collecting carcasses of marine fauna specimens (sea turtles and cetaceans) that happen to appear in the LNGT area and proper disposal to the Port of Açu Sea Turtles Monitoring Program.
- Use of complementary information resulting from maintenance activities, inspections and other environmental monitoring involving image recording; such as the use of ROV (Remotely Operated Vehicle) and scuba diving, among others, in the FSRU hull and LNGT structures.
- Inspections carried out twice a day by the Emergency Brigade in the LNGT area to record, among other activities, the presence of birds and sea turtles.
- Stepped-up training for employees and promotion of GNA's biotic monitoring plans, procedures, programs and protocols.

Records indicate that, up to December 2024, no evidence of any impact on marine fauna from the FRSU water intake system has been documented. Sea turtles continue to be commonly sighted around the FSRU and LNGT displaying typical behavior. Data from other marine monitoring programs conducted by GNA consultants also report sea turtles carrying out normal activities in the region. Any sea turtle death needs to be investigated, with a necropsy carried out as established by the Sea Turtles Monitoring Program, and any possible relation with the FSRU's water intake process analyzed, with the data being used, if necessary, to reevaluate the effectiveness of the anti-entrainment system installed.

No Net Loss/Net Gain (NNL/NG)

This measure contributes to the goal of No Net Loss (NNL) for GNA projects. However, the interactions of marine animals with the sea chest cannot be assessed directly, due to the unfeasibility of monitoring in the water intake area due to the associated risk. Accordingly, the No Net Loss assessment should be tracked by the associated monitoring plans.

Associated management and monitoring plans or documents

- Sea Turtles Monitoring Procedure
- Marine Monitoring Plan

Mitigation Measure 18

WATER QUALITY MANAGEMENT



Impact to be mitigated:

Water quality affected by the FSRU operation, TPPs GNA I and II and the associated wastewater and thermal discards.

Implementation indicator

Diversity and relative abundance of marine fish, plankton and benthic communities and local fisheries catch per unit effort. The baselines for assessing the indicators are established in the Marine Monitoring Plan and the Fisheries Monitoring Plan / GNA – Port of Açu, respectively, and consider the absence of the FSRU operation as the initial scenario.

Desired outcome

No statistically significant[6] differences are expected to be found between the situation existing before and after the start of the operation of the GNA projects. If there are statistically significant differences or downward trends in biodiversity values discovered, the monitoring needs to be checked, in addition to water quality controls and action plans established to implement corrective measures.

Status and evidence:

In order to establish a baseline of the situation prior to GNA and FSRU operations, campaigns were conducted in January and October 2020. The data generated is important to allow a comparison with previous, current and future values.

[6] *Statistically significant detection of small to moderate changes is not feasible.*

- Water and marine sediment quality

Since October 2020, quarterly water and marine sediment quality monitoring campaigns have been carried out (in the months of January, April, July and October). This monitoring also acts as a monitor of the efficiency of wastewater quality control and thermal discharges from GNA's operations. In addition, in order to understand the influence of the Paraíba do Sul River in the port area, two sampling points were added to the monitoring grid from October 2021 and have been under surveillance since then.

The verified variables for water quality analysis are:

In situ – pH, dissolved oxygen, salinity, electrical conductivity, turbidity, temperature, transparency and depth.

Chemical analysis – Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), oils and greases, suspended solids, Total Organic Carbon (TOC), thermotolerant coliforms, metals and semi-metals, inorganic nutrients and hydrocarbons, and more.

In the sediments, metals and semi-metals, tributyltin, hydrocarbons, organochlorines, pesticides and granulometry are analyzed.



Sampling points for water and marine sediments – Source: Ethica Ambiental.



CHANGE IN METHODS AND SAMPLING POINTS UNDER ANALYSIS

GNA and the consulting firms CPEA and Ethica Ambiental presented a proposal to INEA/RJ to change the methods of monitoring the quality of water and marine sediments. The idea is to discontinue sampling at the mid-depth of the water column, while maintaining sampling at the surface and bottom layers, as historical monitoring data have shown little to no variation in the evaluated parameters throughout the water column.

Another consideration is the reduction of the number of parameters to include only those that are part of GNA's activities and processes. Within this framework, an in-depth evaluation of the product inventory utilized by GNA was carried out, in accordance with the available documentation. This analysis identified key parameter groups that may be present in the untreated and treated effluent and subsequently discharged into the receiving body of water, with potential implications for water and sediment quality, as detailed in Technical Report 5749 – CPEA 01/24 (November 2024).

Finally, changes were also proposed in terms of the location of some sampling points for the two programs and, consequently, for the monitoring programs of the planktonic and benthic communities and the frequency of sediment monitoring. The proposal was positively received by the environmental agency, based on the assessment of the technical opinions for these changes, and they are expected to take effect starting in January 2025.

Results – Water

In 2024, the campaigns were carried out according to the schedule, taking place in January, April, July and October. The results show that the values are within the established limits and are similar to those found in the survey carried out for the environmental licensing of the LNGT and other surveys prior to GNA's operations in the area. It can generally be concluded that the physicochemical variables analyzed are within the range of variation reported by other studies in the region and considered normal for the type of water analyzed, with no differences between the points under the influence of the thermal plume, effluent discharge and boat maneuvers and the control points. There was no vertical variation in the water column regarding the in situ parameters, which, in this case, include temperature, dissolved oxygen, pH, salinity, and electrical conductivity. However, variations were noted between (spatial) points, especially for conductivity, salinity, and dissolved oxygen, which were lower at the point within the Paraíba do Sul River and in the estuary, while, at the same points, turbidity and aluminum values were higher. The conclusion is that these variations are the result of the influence of the Paraíba do Sul River plume in the summer, and depending on the season, intense rains and strong winds that stir up the bottom sediments.

The results demonstrate that there is no need for adaptive management. Conversely, the consolidated dataset from more than five years of monitoring is enough to support the conclusion that intermediate sampling may be phased out, given its redundancy with surface and bottom sample data. This redundancy stems from the area's shallow depth and intrinsic geomorphological features, along with the limited contribution of intermediate measurements toward fulfilling the program's goals. Thus, an improvement to the monitoring methods is being reviewed.

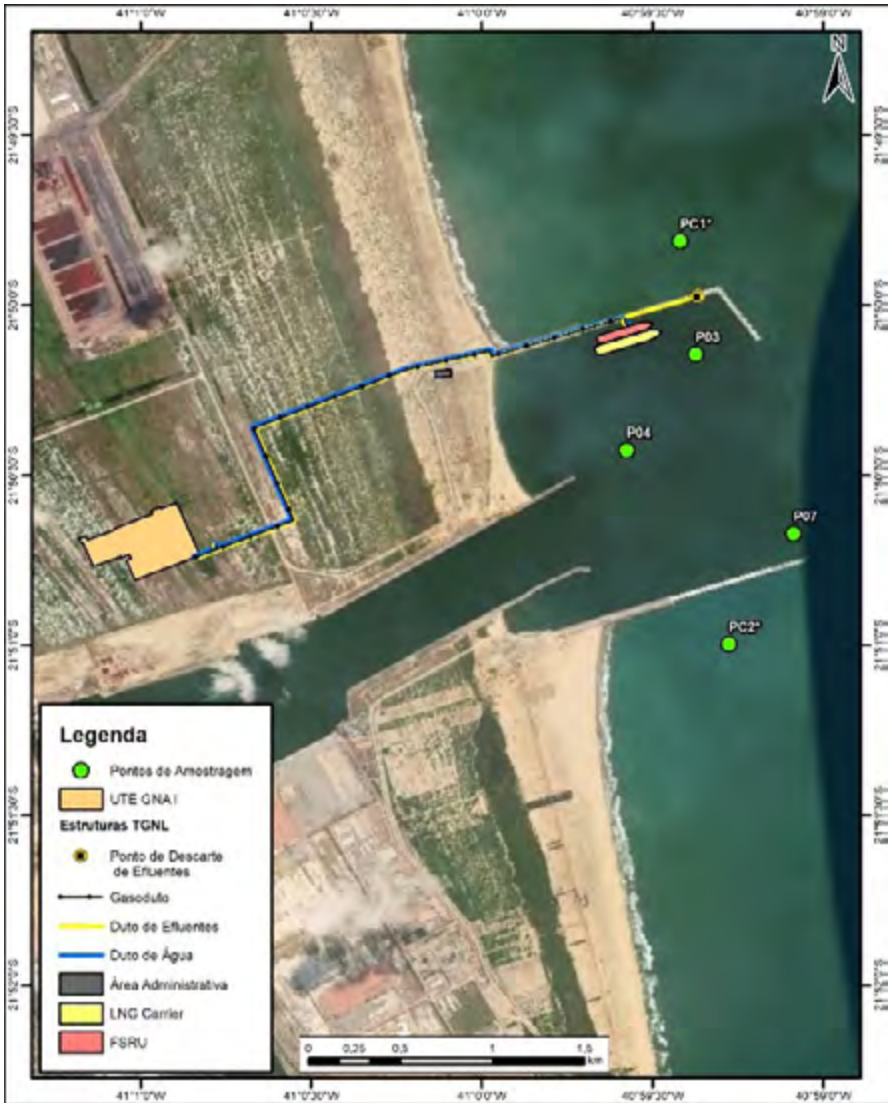
Results – Sediments

The results of the campaigns carried out in 2024 show that most of the parameters measured are within the limits established by CONAMA Resolution No. 454/2012 – Level 1, with the exception of arsenic (As), which presented high concentrations at most sampling points. However, the average amounts of arsenic are compatible with those provided for in the Environmental, Health, and Safety Guidelines (EHS Guidelines) for Ports, Docks and Terminals, in addition to being in accordance with the historical levels observed in the region.

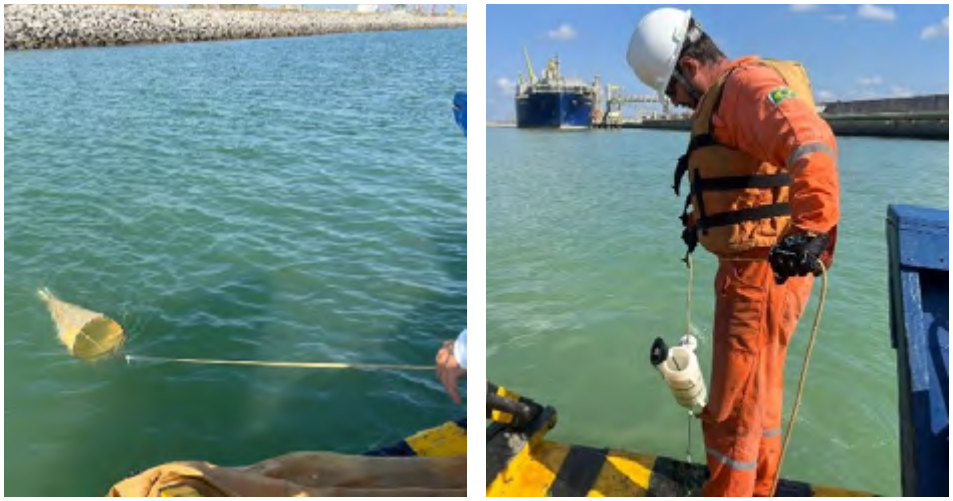
As such, there is no evidence that the presence of arsenic is related to GNA's activities. An improvement to the monitoring methods that should contribute to this process is under review.

- Planktonic Community

Planktonic community monitoring campaigns took place every six months, as scheduled, in January and July of 2024. Data such as richness, density, relative abundance, diversity and equitability, which are the indicators established by the Marine Monitoring Plan, were analyzed. The survey involves phytoplankton, zooplankton, and ichthyoplankton, all collected at the same sampling points.



Sampling points for planktonic community monitoring. Source: GNA.



Monitoring Activities of the Planktonic Community. Quantitative sampling with a Van Dorn bottle (left); qualitative sampling with 20 µm mesh (right). Source: Ethica Ambiental.

Results – Phytoplankton

In the campaign carried out in July 2024, a total of 45 taxa belonging to five phytoplankton classes were identified, namely: Bacillariophyceae (10 taxa), Coscinodiscophyceae (9 taxa), Mediophyceae (14 taxa), Cyanophyceae (1 taxon) and Dinophyceae (1 taxon). Species richness values were found to be lower than those recorded in the July 2023 campaign (54), but higher than those documented in January 2024 (24), and can be regarded as low for coastal water environments, but it is still within the range that has been found in other monitoring campaigns in the region. In terms of floristic composition, the pattern is similar to the previous campaigns from July 2023 and January 2024.

INDICATORS FOR PHYTOPLANKTON MONITORING (2019 TO 2024). THE BASELINE CORRESPONDS TO SAMPLES IN 2019 AND 2020.

Campaign	Richness (S)	Average Density (ind/mL)	Most common	Diversity (H')	Equitability (J')
Apr/2019	69	196,6	Diatoms	1,26	0,53
July/2019	116	44,0	Diatoms	1,13	0,71
Oct/2019	99	51,0	Diatoms	1,62	0,71
Jan/2020	87	330,4	Diatoms	1,16	0,55
Oct/2020	75	36,0	Diatoms and dinoflagellates	1,50	0,76
Jan/2021	58	814,0	Diatoms	1,31	0,65
Apr/2021	48	190,3	Diatoms and dinoflagellates	0,70	0,42
July/2021	66	79,6	Diatoms and dinoflagellates	1,61	0,85
Jan/2022	72	60,8	Diatoms	1,64	0,73
July/2022	40	3,6	Diatoms and dinoflagellates	0,89	0,90
Jan/2023	62	122,6	Diatoms and dinoflagellates	1,63	0,75
July/2023	54	35,2	Diatoms	0,61	0,86
Jan/2024	24	90,0	Diatoms	0,53	0,37
July/2024	45	17,6	Diatoms and dinoflagellates	1,02	0,88

The results found for density, relative abundance and ecological indices are within the expected range of variation, and most of them are similar to the campaigns carried out before the start of the operation, which shows that there is no need to establish adaptive management measures at this time. The species of phytoplankton algae identified in the area are common in the estuarine and coastal regions of Rio de Janeiro, and no species has been identified that had not previously been seen in these waters. No rare, exotic, endemic or threatened species were found either.

Results – Zooplankton

In the campaign carried out in July 2024, a total of 29 zooplankton taxa were identified at all sampling sites, comprising four phyla: Annelida, Chordata, Chaetognatha and Mollusca. The highest abundance was for the subclass Copepoda, representing 95% of the specimens. The average amounts were significantly lower than those noted in the October 2019, January 2020, January 2021 and July 2021 campaigns, while the number of taxa found is similar to those of the campaigns in July 2023 (28) and January 2024 (26).

INDICATORS FOR ZOOPLANKTON MONITORING (2019 TO 2024). THE BASELINE CORRESPONDS TO SAMPLES IN 2019 AND 2020.

Campaign	Richness (S)	Average Density (ind./m3)	Most common	Diversity (H')	Equitability (J')
Apr/2019	31	724,5	Copepoda, Cirripedia and Mollusca	2,19	0,74
July/2019	42	5.983,3	Copepoda	1,70	0,55
Oct/2019	39	4.069,6	Copepoda, Mollusca and Anellida	2,18	0,72
Jan/2020	27	1.185,0	Copepoda e Cirripedia	2,01	0,72
Oct/2020	34	8.408,1	Copepoda, Cirripedia and Mollusca	2,17	0,72
Jan/2021	21	278,8	Copepoda, Cirripedia and Mollusca	1,98	0,76
Apr/2021	24	1.133,6	Copepoda, Cirripedia and Mollusca	1,31	0,48
July/2021	38	7.206,5	Copepoda, Cirripedia and Mollusca	2,00	0,64
Jan/2022	27	346,26	Copepoda	1,95	0,70
July/2022	26	23.251,62	Copepoda	1,60	0,60
Jan/2023	28	916,5	Copepoda, Cirripedia and Chaetognatha	1,95	0,68
July/2023	28	11.384,1	Copepoda, Cirripedia, Mollusca and Chaetognatha	1,83	0,63
Jan/2024	26	264,2	Copepoda, Cirripedia and Chaetognatha	1,95	0,71
July/2024	29	9.291,6	Copepoda, Cirripedia and Chaetognatha	1,41	0,50

The results found for density showed high values, indicating an increase in zooplankton production in the July 2024 campaign. The relative abundance and ecological indices are similar to the campaigns carried out before the start of the operation and in the campaigns during the same period (winter), which demonstrates that there is no need for adaptive management at this time. The species found are not endemic to the study area but are commonly found in environments along the southeast coast of Brazil. No rare, exotic or threatened species have been found.

Results – Ichthyoplankton

In the campaign carried out in July 2024, four families of ichthyoplankton were identified at the sampling sites. The average egg density in the July 2024 season (75.8) was lower compared to the July 2023 (128.8) and January 2024 seasons (354.2), as was the average abundance of fish larvae (4.6) when compared to January 2024 (11.8). Nonetheless, the findings fall within the range previously observed in other monitoring efforts in the region, suggesting that there was no significant impact. They appear to result from seasonal variations, current patterns, and the presence of predators, among other factors that could influence the ichthyoplankton community.

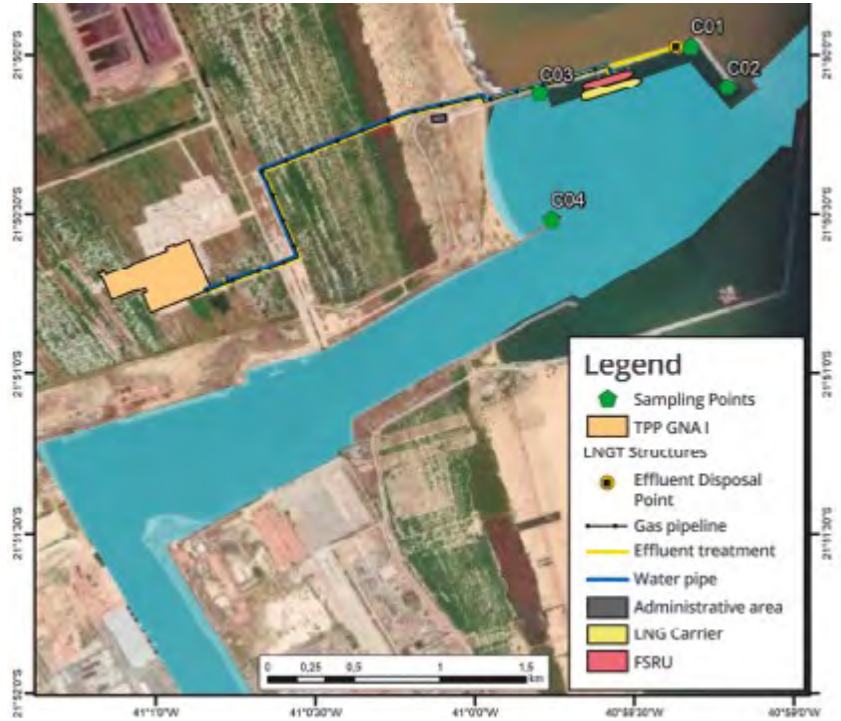
INDICATORS FOR MONITORING ICHTHYOPLANKTON (2019 TO 2024). THE BASELINE CORRESPONDS TO SAMPLES IN 2019 AND 2020.

Campaign	Richness (S)	Average Egg Density (eggs.100m3)	Larvae (larvae.100m3)	Most common	Diversity (H')	Equitability (J')
Apr/2019	6	76,5	5,2	Blenniidae, Haemulida and Sparidae	0,46	0,82
July/2019	4	45,6	2,7	Guerreidae, Blenniidae and Engraulidae	0,57	0,89
Oct/2019	9	114,0	32,3	Engraulidae, Blenniidae and Gobiidae	1,12	0,70
Jan/2020	6	158,9	9,4	Engraulidae, Scianeidae and Haemulidae	0,56	0,64
Oct/2020	7	67,5	28,8	Engraulidae, Scianeidae and Blenniidae	1,18	0,81
Jan/2021	7	388,2	4,6	Carangidae, Guerreidae and Gobiidae	0,19	0,60
July/2021	4	204,7	6,1	Engraulidae, Scianeidae and Blenniidae	0,58	0,83
Jan/2022	2	91,94	1,1	Scianeidae and Blenniidae	0,0	0,0
July/2022	6	144,52	3,12	Clupeidae, Scianeidae, Blenniidae and Globiidae	0,82	0,96
Jan/2023	5	47,9	2,1	Achiridae, Scianeidae, Engraulidae, Blenniidae and Clupeidae	0,48	0,85
July/2023	5	128,8	4,5	Blenniidae, Clupeidae, Engraulidae, Gobiidae and Scianeidae	0,75	0,97
Jan/2024	4	354,2	11,8	Engraulidae, Scianeidae and Blenniidae	0,49	0,74
July/2024	4	75,8	4,6	Engraulidae, Scianeidae and Blenniidae	1,00	0,91

The results of ecological indexes such as diversity, equitability and richness were similar to the other monitoring campaigns, which demonstrates that there is no need for adaptive management at this time. No families of rare, exotic, endangered or endemic fish larvae have been verified.

- Benthic Community

Similar to the planktonic community, monitoring campaigns for the benthic community occur twice a year, in January and July. Data such as richness, density, relative abundance, diversity, equitability and dominance are analyzed, which are the indicators established by the Marine Monitoring Plan. The survey includes benthic macrofauna from unconsolidated and consolidated seabed substrates, with distinct sampling points established for each type.



Sampling points of the consolidated seabed substrate benthic monitoring campaign. Source: GNA.



Sampling points for the soft-bottom benthic monitoring. Source: GNA.

Results – Soft-bottom benthic macrofauna

In the July 2024 campaign, 97 zoobenthic taxa of seven phyla were identified along the sampling sites: Annelida (62 taxa), Mollusca (11 taxa), Arthropoda (14 taxa), Echinodermata (3 taxa), Nemertea (1 taxon), Cnidaria (5 taxa) and Platyhelminthes (1 taxon). The benthic macrofauna found was composed of species normally observed along the Brazilian coast. No families of rare, exotic, endangered or endemic species were identified.

The historical data series, which includes records since October 2019, showed variations in species richness, with the mean richness value in July 2024 differing significantly only from that recorded in July 2023. Among the other campaigns, those of July 2021 and January 2024 showed a significantly higher value than July 2023, which was the only significant variation between the periods evaluated. The campaigns of July 2021, January 2024 and July 2024, however, recorded the highest averages among the surveys conducted. In terms of the variation in the community structure, the July 2024 campaign showed average values similar to those of October 2019, October 2020, January and July 2021, January 2022, January and July 2023 and January 2024.

INDICATORS FOR SOFT-BOTTOM BENTHIC MONITORING (2019 TO 2024). THE BASELINE CORRESPONDS TO SAMPLES IN 2019 AND 2020.

Campaign	Richness (S)		Average Density (ind./m³)	Most common	Diversity (H')	Equitability (J')	Simpson (Dominance)
	Average	Total					
Out/2019	7	76	392	Annelida, Arthropoda and Mollusca	1,12	0,56	0,36
Out/2020	8	80	385	Annelida, Mollusca and Arthropoda	1,49	0,77	0,28
Jan/2021	8	65	401	Annelida, Arthropoda and Mollusca	1,55	0,84	0,22
Jul/2021	11	104	576	Annelida, Mollusca and Arthropoda	1,72	0,81	0,21
Jan/2022	9	71	1.118	Annelida, Mollusca and Arthropoda	1,38	0,72	0,32
Jul/2022	9	74	739	Annelida, Mollusca, Nemertea and Arthropoda	1,47	0,75	0,27
Jan/2023	7	62	284	Annelida, Mollusca, Nemertea and Arthropoda	1,62	0,87	0,19
Jul/2023	5	49	125	Annelida, Mollusca, Nemertea and Arthropoda	1,26	0,73	0,28
Jan/2024	11	77	1.101	Annelida, Mollusca, Nemertea and Arthropoda	1,62	0,56	0,36
Jul/2024	11	97	629	Annelida, Cnidaria, Mollusca and Arthropoda	1,68	0,76	0,25

Thus, the community exhibited significant differences in various aspects such as richness, diversity, number of specimens, density, equitability, and dominance among the sample points. The results found for relative abundance and ecological indexes are similar and/or higher than those of the campaign carried out before the start of the operation, while the AMBI environmental integrity index indicated an environment with mild and moderate disturbance in some internal and control areas. Fluctuations in faunal abundance and composition were noted, marked by a decline in the presence and dominance of bioindicator families linked to organically enriched and environmentally stressed conditions, including *Cossuridae, Paraonidae*, and *Dorvilleidae*.

This suggests the need to understand whether these changes are related to the operational aspects of GNA's activities, to other processes taking place at Port of Açu or even to elements from the external area and whether they are of concern or not. Aspects such as variations in the availability of nutrients and organic matter need to be considered, which may reflect a response to situations by the local community, such as the release of effluents into the environment (by GNA or other companies), the movement of vessels in the internal area of the port or external sources, since some control points also presented similar results.

An improvement in monitoring methods is being studied, which should help in understanding what may be causing this impact.

Results – Hard-bottom benthic macrofauna

The results of the campaign conducted in July 2024 identified a total of 127 species and 43,063 specimens of the hard-bottom benthic macrofauna. The average density (5,741,733.33) was the highest recorded among the previous campaigns, with a significant difference between the campaigns.

INDICATORS FOR BENTHIC MONITORING OF CONSOLIDATED SUBSTRATE (2019 TO 2024). THE BASELINE CORRESPONDS TO SAMPLES IN 2019 AND 2020.

Campaign	Richness (S)	Density Ind./m2	Relative Abundance (%)	Diversity (H')	Equitability (J')
July/2019	91	718.355,56	Balanus sp., Chthamalus sp., Leptocheliidae sp. ,Trypanosyllis sp., Corophium sp. E Elasmopus levis	1,12	0,56
Jan/2020	68	619.466,67	Balanus sp., Leptocheliidae sp., Chthamalus sp., Corophium sp., Trypanosyllis sp. e Cheiriphotis sp.	1,49	0,77
Jan/2021	68	972.666,67	Elasmopus levis, Balanus sp., Ampithoe sp., Megabalanus sp., Cheiriphotis sp. e Leptochelia sp.	1,55	0,84
July/2021	81	1.469.866,67	Photis sp., Quadrimaera sp., Brachidontes exustus, Syllis sp., Cheiriphotis sp. e Dulichiella sp.	1,72	0,81
Jan/2022	85	1.496.800,00	Leptochelia sp., Megabalanus sp., Chthamalus sp., Elasmopus sp., Cheiriphotis sp. e Photis sp.	1,38	0,72
July/2022	89	1.172.933,33	Balanus sp., Megabalanus sp., Brachidontes exustus, Leptochelia sp., Elasmopus sp. e Chthamalus sp.	1,47	0,75
Jan/2023	72	1.859.866,67	Balanus sp., Megabalanus sp., Leptochelia sp., Isognomon bicolor, Photis sp., Elasmopus sp., Balanus sp., Megabalanus sp., Eusyllis sp., Isognomon bicolor, Eualetes tulipa e Caprella sp.	1,62	0,87
July/2023	96	1.415.200,00	Balanus sp., Megabalanus sp., Eusyllis sp., Isognomon bicolor, Eualetes tulipa e Caprella sp.	1,26	0,73
Jan/2024	106	4.019.333,33	Syllis sp., Balanus sp., Bemlos foresti, Megabalanus sp. , Elasmopus fusimanus, Caprella sp., Leptochelia sp., Photis sp. e Chthamalus sp.	1,62	0,56
July/2024	127	5.741.733,33	Syllis sp., Megabalanus sp., Exogone sp., Balanus sp., Oenone sp., Ophiothela mirabilis , Leptochelia sp., Ampithoe sp. e Branchiomma luctuosum	1,68	0,76

Overall, the analysis of historical data shows that the community is developing well in the monitored area, suggesting that there is no need for adaptive management at this time. Average richness, which had been fluctuating over the last five campaigns (2021 and 2023), increased compared to the previous campaign (January 2024), maintaining an upward trend. Equitability continues to show a slight positive trend between campaigns, with a significant difference over time.

No rare, endemic or endangered species have been found in the coastal area. As for exotic species, Isognomon bicolor was identified in all sampling points, in addition to Eualetes tulipa, a gastropod of the Vermetidae family in the campaign of July 2022. In the July 2024 campaign, an increase in the frequency of the exotic species of the Ophiotrichidae family (Ophiothela mirabilis) was observed. It is important to highlight the presence of sun coral (Tubastraea tagusensis) among the findings of this campaign, which may affect the development of the native community of the benthic substrate in the future. The findings from this program also inform the implementation of Measure 19, concerning the management of sun coral, as outlined in this document.

- Ichthyofauna



The ichthyofauna monitoring campaigns are scheduled to take place every six months in January and July. The survey is intended to satisfy the indicators established by the Marine Monitoring Plan, analyzing data such as richness, density, relative abundance, diversity, equitability and dominance. The assessment encompasses the ichthyofauna associated with consolidated substrates, along with the ichthyofauna, benthic epifauna, and commercially important shrimp species, with each group having its own specific set of sampling points.

With regard to monitoring the ichthyofauna associated with the hard bottom, sampling is done at four sites, two of which coincide with the sampling points of the hard-bottom benthic community. It is also worth noting that in 2021 adaptive management was applied involving the relocation of two sampling points to areas with a similar substrate to the others: formed by rocks, with recesses and refuges for fish and other organisms in the reef fish food chain. After relocation, the sampling performed satisfactorily in terms of monitoring, proving the effectiveness of the adaptive management adopted.

Adaptive management was also needed in the sample framework to monitor ichthyofauna, benthic epifauna and commercially important shrimp species. In July 2022, a new sampling station was established within the port complex adjacent to the LNGT to assess the potential influence of terminal operations, and it has been included in subsequent monitoring campaigns. In addition, the sampling method has been adjusted to include recommendations made in January 2023 during the Environmental Resources Management (ERM) monitoring visit to the GNA area.

It is important to mention that all vessels used for the monitoring activities are inspected before the fieldwork begins, using a standardized checklist.



Sampling points that make up the consolidated seabed ichthyofauna monitoring campaign. Source: GNA.



Sampling locations that make up the ichthyofauna monitoring campaign. Source: GNA.



Sampling points that make up the ichthyofauna, benthic epifauna and commercial shrimp monitoring campaign. Source: GNA.



Ichthyofauna monitoring activity during the 2024 campaigns. Source: Ethica Ambiental.

Results – Ichthyofauna associated with the hard-bottom

In 2024, the monitoring campaigns were conducted as scheduled and took place in January and July.

During the July 2024 monitoring, 37 specimens of six species distributed across four distinct taxonomic groups were recorded, with Abudef saxatilis being the most frequently observed species. Although the July 2023 campaign noted 13 taxa (which represented a new record of richness in the monitoring history) and 177 specimens (the second highest abundance value recorded), in January 2024 the result was lower (6 taxa and 20 specimens) due to water turbidity resulting from the heavy rains of January 2024 and the end of 2023. In the July 2024 campaign, the conditions were also not ideal due to the strong winds during the collection process, but the results were better when compared to January 2024.



INDICATORS FOR THE MONITORING OF ICHTHYOFAUNA (2021 TO 2024).

Campaign	Sampling Points	Richness (S)	Equitability (J')	Diversity (H')	Dominance (d)
Jan/2021	C01	3	0.69	0.76	0.47
	C02	4	0.92	1.28	0.81
	C03	3	0.82	0.90	0.61
	C04	7	0.83	1.61	0.77
July/2021	C01	0	0.00	0.00	0.00
	C02	0	0.00	0.00	0.00
	C03	0	0.00	0.00	0.00
	C04	4	0.81	1.12	0.65
Jan/2022	C01	0	0.00	0.00	0.00
	C02	0	0.00	0.00	0.00
	C03	4	0.92	1.28	0.81
	C04	4	0.98	1.36	0.78
July/2022	C01	6	0.89	1.59	0.24
	C02	11	0.88	2.12	0.14
	C03	7	0.85	1.66	0.22
	C04	6	0.90	1.62	0.21
Jan/2023	C01	4	0.96	1.33	0.28
	C02	8	0.87	1.82	0.19
	C03	8	0.87	1.81	0.19
	C04	5	0.95	1.53	0.23
July/2023	C01	7	0.75	1.45	0.70
	C02	10	0.70	1.62	0.70
	C03	5	0.94	1.51	0.81
	C04	4	0.83	1.15	0.69
Jan/2024	C01	2	1.00	1.10	1.00
	C02	4	0.90	0.69	0.80
	C03	4	0.96	1.24	0.87
	C04	4	0.90	1.33	0.87
July/2024	C01	3	1.00	1.24	0.75
	C02	3	0.82	0.90	0.61
	C03	4	0.83	1.15	0.69
	C04	3	1.00	1.10	0.75

The indexes generally improved throughout the campaigns. The optimal oceanographic conditions in the rainy season (January) do not always allow better visibility for recording purposes, so some campaigns in the dry season (July) had better outcomes than in January. The July 2022 and 2023 campaigns, for example, did not follow this pattern, exhibiting high richness and density, reflecting the allocation of two points in environments more conducive to colonization by reef fish. The January 2023 and 2024 campaigns also differed from the norm because they showed lower density and richness, which was associated with higher water turbidity during the campaign.

The results to date indicate that the relocated points demonstrate acceptable results for monitoring. Accordingly, the adaptive management approach has proven effective in fulfilling its goal, fostering an increase in species records within the region and, as a result, enhancing the average density values recorded of the local ichthyofauna.

Results – Ichthyofauna, benthic epifauna and commercial shrimp

In 2024, the monitoring campaigns were conducted as scheduled and took place in January and July.

In the July 2024 campaign, 12 species of fish were identified, covering five families in a total of 122 specimens collected, with the Stellifer brasiliensis species being the most frequently collected (24%). Regarding spatial variation, it was possible to notice that the point added in this campaign within the port complex showed a higher average abundance (19.33).

The sampling point within the navigation channel, near the LNGT, was included, and the results indicate that abundance, richness, and diversity were higher at this point, suggesting that no negative impact occurred. In terms of the shrimp that is so vital commercially, efforts to allow more flexible use of local artisanal fishing grounds have not yet led to improved results or more concrete data about shrimp production.

INDICATORS FOR THE MONITORING OF ICHTHYOFAUNA (2019 TO 2024). THE BASELINE CORRESPONDS TO SAMPLES IN 2019 AND 2020.

Campaign	Richness (S)	N	Catch Per Unit Effort (CPUE) Total (g/h)	Most common	Diversity (H')	Equitability (J')
July/2019	7	25	3.456,41	*Aspistor luniscutis and Bagre bagre*	0,33	0,90
Oct/2019	10	35	3.407,55	*Isopisthus parvipinnis and Macrodon ancylodon*	1,28	0,85
Jan/2020	16	131	60.733,84	*Cathorops spixii, Macrodon ancylodon, Stellifer rastrifer and Paralonchurus brasiliensis*	0,93	0,97
Oct/2020	3	5	646,08	*Symphurus tesselatus*	0,47	0,43
Jan/2021	14	58	4.939,31	*Cathorops spixii, Stellifer brasiliensis, S. rastrifer and Paralonchurus brasiliensis*	1,93	0,86
July/2021	10	92	2.894,17	*Pellona harroweri, Isopisthus parvipinnis and Peprilus paru*	1,49	0,70
Jan/2022	8	92	1.815,33	*Isopisthus parvipinnis, Stellifer brasiliensis and Symphurus tesselatus*	1,61	0,95
July/2022	10	304	10.842,47	*Stellifer brasiliensis and Stellifer rastrifer*	1,28	2,05
Jan/2023	9	213	2.521,13	*Stellifer brasiliensis, Stellifer rastrifer, Isopisthus parvipinnis and Symphurus tesselatus*	1,08	0,61
July/2023	13	166	6.945,54	*Stellifer brasiliensis, Isopisthus parvipinnis, Cathorops spixii, Ctenosciaena gracilicirrhus and Stellifer rastrifer*	1,29	0,81
Jan/2024	10	71	3.907,60	*Symphurus tesselatus, Stellifer brasiliensis, Paralonchurus brasiliensis, Paralichthys brasiliensis and Cathorops spixii*	1,14	0,90
July/2024	12	122	5.321,80	*Stellifer brasiliensis, Paralonchurus brasiliensis, Isopisthus parvipinnis and Stellifer rastrifer*	1,54	0,90

SPECIFIC INDICATORS FOR SHRIMP MONITORING (2019 TO 2024). THE BASELINE CORRESPONDS TO SAMPLES IN 2019 AND 2020.

Campaign	Catch Per Unit Effort (CPUE) - Total (kg/h)	Average length (mm)	Average weight (g)
July/2019	2,07	71,70	2,40
Oct/2019	0,40	71,70	4,54
Jan/2020	6,00	56,07	5,80
Oct/2020	0,07	69,01	1,84
Jan/2021	3,33	81,23	2,12
July/2021	1,15	60,87	3,92
Jan/2022	2,35	45,49	2,32
July/2022	3,20	63,28	3,25
Jan/2023	0,37	45,36	2,33
July/2023	0,11	47,38	2,36
Jan/2024	0,40	50,36	2,59
July/2024	1,31	44,88	2,39

Examining the historical set of data, the higher average abundance observed in the 2021 surveys was influenced by the shift in methodology, which involved selecting better drag points. In July 2022, with the addition of a point within the port, there was an even more significant increase and the best average abundance (101.3) of the historical series noted. In July 2023, another change was implemented, with triplicate collection. However, the abundance did not correspond to what was expected in the last three campaigns, although it still presents better results compared to the period without adaptive management.

In terms of shrimp for commercial purposes, only one species has been identified, *Xiphopenaeus kroyeri* (Atlantic seabob), with a total of 95 specimens collected. In the 2024 campaigns, no rare, endemic or exotic species were registered.

The results found for ichthyofauna, epifauna and shrimp of commercial importance showed rates similar to or even higher than those of the campaigns carried out before the start of the operation.

No Net Loss/Net Gain (NNL/NG)

These indicators are needed to verify NNL, especially after start-up of operations of the TPP GNA I and releasing the thermal effluent. The results show that the measures established to control marine water pollution are contributing to avoid net losses. No disturbance capable of altering environmental quality and marine life has been detected.

Associated management and monitoring plans or documents

- Water quality and marine sediments monitoring procedure
- Seawater temperature monitoring procedure
- Benthic community monitoring procedure
- Planktonic community monitoring procedure
- Ichthyofauna monitoring procedure
- Marine Monitoring Plan
- Fishery Monitoring Plan / GNA – Port of Açu



Mitigation Measure 19

SHIP BALLAST *OFFSHORE* EXCHANGE TO MINIMIZE THE RISK OF INTRODUCING INVASIVE ALIEN SPECIES



Impact to be mitigated:

Decline in *habitat* quality due to the presence of invasive alien species, which can be introduced by ship traffic due to ballast water exchange, marine biofouling or accidental transportation. In addition, the GNA Environmental Impact Study identified the existence of marine alien species such as *Pseudopolydora sp.*, *Tubastraea coccinea* (sun coral) *Branchiomma luctuosum* and *Styela plicata* in the region where GNA projects were being established.

As a result, a monitoring plan was put in place that prioritizes the alien sun coral species. Sun coral competes with other benthic invertebrates for space in the substrate and is considered aggressive due to its high reproductive capacity. Their presence can lead to the exclusion or extinction of native species, especially sponges and corals, compromising the entire native ecosystem.

Despite the focus on sun coral, it should be mentioned that the monitoring actions adopted, including the detection methodology, are also applicable to other invasive organisms and fouling flora.

Implementation indicator

Density of invasive sun coral per square meter.

Desired outcome

To maintain a density of less than two specimens of sun coral per square meter in the sampling areas defined by the Marine Bioinvasion Monitoring Plan. If a higher than desired density is documented, actions have to be implemented, such as: removing, increasing the frequency of removal, giving greater attention to biofouling and reinforcing compliance with ballast exchange requirements for ships entering the port to fuel the GNA operation.

Status and evidence:

Measure fully implemented with the creation of the Ballast Water Control Procedure, required for all ships that provide service to GNA and with the preparation and implementation of the Marine Bioinvasion Monitoring Plan, which involves four procedures: diagnosis of marine biofouling, biofouling removal, biofouling monitoring, and ballast water management, in addition to being related to procedures in the Marine Monitoring Plan.

Results of these actions include:

Diagnosis of biofouling

After non-native marine species were identified during the GNA Environmental Impact Study activities, conducted in 2018, Porto do Açu Operações updated its monitoring plan for the presence of sun coral in November 2020, expanding it to include new areas such as the channel and the north jetty, the latter associated with the LNGT pier. The measurements demonstrated a trend towards stable colonization in the northern pier, with density/m² values lower than those observed in the monitoring carried out in 2018.

Monitoring point – North Jetty	Density
A10P1	1/m²
A10P2	<0,5/m²
A10P3	<0,5/m²
A10P4	<0,5/m²
A10P5	0/m²

Sun coral density at monitoring points, in 2020



Sun coral identified in the LNGT during the monitoring of marine biota in 2024. Source: Ethica Ambiental.

Sun coral monitoring

Porto do Açu Operações (port administrator) monitors the presence of sun coral on an annual basis and is preparing an action plan on the topic, which is intended to be shared with all companies operating in Port of Açu.

Biofouling inspection on the hull of the FSRU BW Magna

In 2024, an underwater visual inspection was conducted on the submerged structures (hull) of the FSRU BW Magna. 21 locations were inspected and the presence of sun coral was not found. It should be pointed out that an inspection carried out in April 2021 located sun coral specimens that were classified as “localized distribution” and with “low population density” (1% – 24% coverage of the point found). The next inspection is scheduled for 2025.

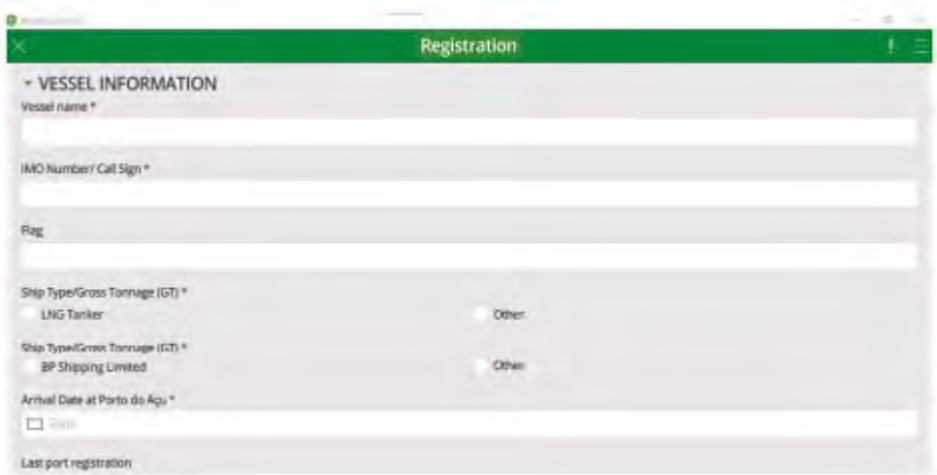
Exchanging ship ballast

From the first liquefied gas cargo until the end of 2024, GNA received 15 LNGC vessels, six of which docked at the LNGT in 2024. None of them carried out ballast water disposal in the region of Port of Açu. GNA maintains a specific dashboard to manage this, with real-time updates.



Dashboard created to support ballast water exchange management, demonstrating that there were no ballast water exchanges in 2024. Source: GNA.

It is worth noting that the ballast exchange data are registered in a computerized system whose fields are based on the Ballast Water Form of the Brazilian Navy, a federal agency and government authority responsible for this control.



Form created to input data into the ballast water management system. Source: GNA.

No Net Loss/Net Gain (NNL/NG)

This indicator is supporting information and does not apply to verify No Net Loss/Net Gain (NNL/NG). However, the measure helps achieve NNL over the duration of GNA's projects. Based on a prior diagnosis, invasive species have already been identified in Port of Açu prior to the installation of the GNA project, so a joint effort is needed to effectively control marine invasive alien species and prevent the net loss of biodiversity in the area.

Associated management and monitoring plans or documents

- Technical Instructions for Ship Ballast Control
- Marine Bioinvasion Monitoring Plan

Mitigation Measure 20

REMOVAL OF INVASIVE MARINE SPECIES FROM PORT AREA AND FSRU BW MAGNA



Impact to be mitigated

Decline in *habitat* quality due to the presence of invasive alien species.

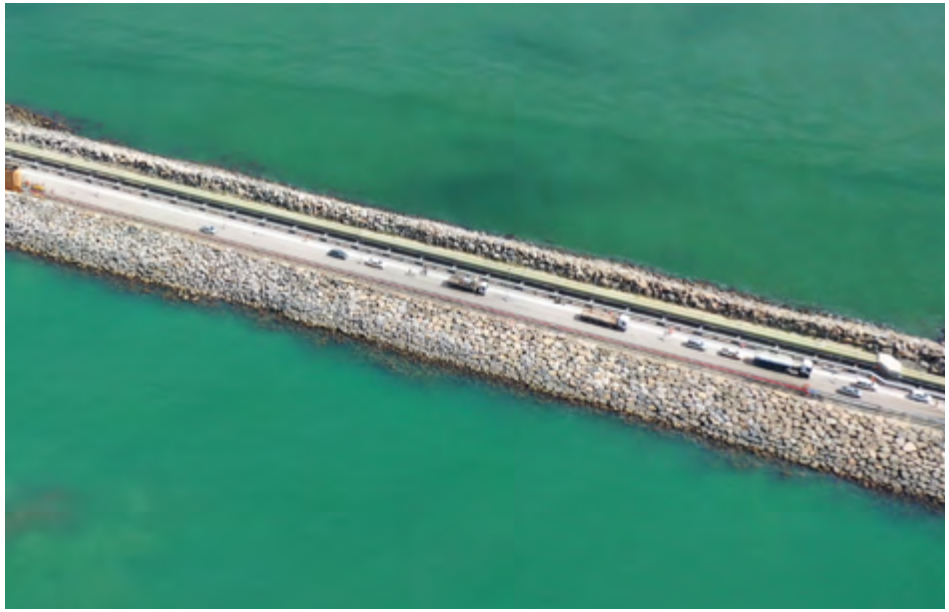
This measure is complementary and interdependent with Mitigation Measure 19 and its details are described in the respective item.

It is worth noting that there are specific guidelines for the removal of invasive alien species if they are located in the LNGT or during routine cleaning activities on the hull and sensitive areas of the FSRU BW Magna. Considering that both facilities are within the Port of Açu Complex, removal actions need to adhere to the protocols established by the port management company and be previously approved by it. This definition takes the applicable legislation and the Marine Invasive Species Monitoring Plan into account, and is supported by specialized technical consultants.

The removal work needs to be performed by a licensed company with proven experience in the removal of encrusting organisms. In the case of removing the sun coral, the disposal of waste will follow the Alien Species Prevention and Control Plan (Plano de Prevenção e Controle de Espécies Exóticas – PPCEX, from its acronym in Portuguese) and applicable legislation, and will be performed by a company that is certified and licensed for this activity.

Mitigation Measure 21

CONSTRUCTION OF THE PIER USING ROCK INCREASES *HABITAT* AVAILABILITY FOR HARD-BOTTOM MARINE SPECIES



Impact to be mitigated

Decline in the quality of the marine habitat due to the presence of GNA projects.

Implementation indicator

Occurrence of fish species populations associated with hard-bottom *habitat* in the North Jetty area. This structure, required for GNA's operations, represents an increase in the availability of habitat for hard-bottom marine species, which can be confirmed with the increase in the number of organisms, threatened and endemic species.

Desired outcome

Presence of any population of fish species associated with hard-bottom *habitat*, helping to boost diversity and the abundance of native species. If no native fish species settle in the habitat created by the construction of the pier, water quality monitoring and controls need to be reviewed and action plans put in place to mitigate any possible water contamination. On the other hand, the structure of the pier can provide a habitat for alien species. This means that the effect of pier construction on marine life should be monitored.

Status and evidence

Measure fully implemented. The pier (Molhe Norte) was built using rocks.

Recurrent activity: marine monitoring

To analyze the effectiveness of the measure, sampling points for the ichthyofauna associated with the hard-bottom were included in the Marine Monitoring Plan. This is why monitoring campaigns have been carried out every six months, with the first taking place in January 2020 (with the exception of July 2020, due to the pandemic). Fish associated with the hard-bottom are sampled through visual inspections using dives along four 100m x 2m transects.

In 2024, the campaigns were held according to schedule, taking place in January and July.

Monitoring of species associated with hard-bottom *habitat*.

Campaign	Species Richness
January/2020	10
July/2020	Monitoring not conducted due to Covid-19 pandemic
January/2021	8
July/2021	3
January/2022	6
July/2022	12
January/2023	9
July/2023	13
January/2024	6
July/2024	6



Pomacanthus paru



Acanthurus coeruleus (peixe azul)
Abudefduf saxatilis (listrado)



Lutjanus jocu



Pomacanthus arcuatus

Species associated with hard-bottom habitats documented during the July 2024 monitoring campaign. Source: Ethica Ambiental.

The record of species associated with hard-bottom *habitat* continues to show the establishment of an ichthyofauna community inside the jetties of Port of Açu navigation channel. No endemic or threatened species were recorded, but the localized species are vital in terms of commercial/fishing value.

Species associated with hard-bottom habitats documented

Species	2020 campaigns	2021 campaigns	January 2022 campaign	July 2022 campaign	January 2023 campaign	July 2023 campaign	January 2024 campaign	July 2024 campaign
Abudef saxatilis (Common name: castanheta-das-rochas)					X	X		
Abudefduf saxatilis (Common name: sargentinho)		X	X				X	X
Acanthurus coeruleus (Common name: cirurgião-azul)			X		X			
Aluterus sp. (Common name: peixe-porco)						X		
Anisotremus surinamensis (Common name: pargo de beiço)	X	X			X	X		
Anisotremus virginicus (Common name: salema)	X	X	X		X	X	X	X
Caranx crisos (Common name: xaréu-pequeno)						X		
Caranx latusAgassiz; (Common name: xerelete)		X						
Caranx latus (Common name: chicharro-pintado)						X		
Caranx sp. (Common name: peixes-reis)					X			
Cathorops spixii. (Common name: bagre-gonguito ou bagre-amarelo)				X				

Species associated with hard-bottom habitats documented								
Species	**2020 campaigns**	**2021 campaigns**	**January 2022 campaign**	**July 2022 campaign**	**January 2023 campaign**	**July 2023 campaign**	**January 2024 campaign**	**July 2024 campaign**
Chaetodipterus faber (Common name: peixe enxada)		X				X	X	
Diplodus argenteus (Common name: marimbá)					X			
Isopisthus parvipinnis (Common name: pescada branca)				X				
Larimus breviceps (Common name: oveva)				X				
Lutjanus jocu (Common name: vermelho)	X	X	X		X	X	X	X
Mugil curama (Common name: parati-olho-de-fogo)						X		
Mugil sp (Common name: tainha)		X						
Nebris microps (Common name: pescada-banana)				X				
Odontognatus mucronatus (Common name: sardinha)				X				
Pellona gradeeri (Common name: traíra)				X				
Pellona harroweri (Common name: sardinha)				X				
Pomacanthus arcuatus (Common name: parú-cinza)	X	X			X	X		X

Species associated with hard-bottom habitats documented								
Species	**2020 campaigns**	**2021 campaigns**	**January 2022 campaign**	**July 2022 campaign**	**January 2023 campaign**	**July 2023 campaign**	**January 2024 campaign**	**July 2024 campaign**
Pomacanthus paru (Common name: peixe-frade)			X		X	X	X	X
Sparissoma sp. (Common name: escaro)	X	X	X		X	X	X	X
Stegastes fuscos (Common name: maria mole)					X	X		
Stellifer brasiliensis (Common name: cangoá)				X				
Stellifer rastrifer (Common name: cangoá)				X				
Rastrifer stellife (Common name: cangoá)				X				
Symphurus tessellatus (Common name: língua-de-mulata)				X				
Trichiurus lepturus (Common name: peixe-espada)				X				

Prevention of reproductive colonies of seabirds in the LNGT

Following the sighting of *Thalasseus acuflavidus* eurygnathus (a seabird known in Brazil as trinta-réis-de-bando) in the LNGT structures, an action plan was developed in order to prevent bird breeding colonies from forming, which can pose risks for the operation and for the birds.

The action plan includes:

- Theoretical and practical training for the Emergency Brigade and Environmental teams
- Displacement of reproductive pairs
- Rescue and relocation of nests

Consequently, since 2020 two training sessions on the topic were held for the Environmental and Emergency Brigade teams.

During the nesting season (April to September/October), members of the brigade drive breeding pairs away using visual and acoustic methods. These actions take place each day, in the early morning (from 6:00 a.m. to 7:00 a.m.) and late afternoon (from 5:00 p.m. to 6:00 p.m.) when the birds are most active.

In 2024, specimens were observed approaching the LNGT area in order to feed. Although the appearance of breeding pairs attempting to establish the colony in the LNGT area in the months of the reproductive period is expected the daily actions carried out by the GNA brigade were effective and, for the fourth consecutive year, no eggs were recorded in the LNGT area.

Action plan for *Thalasseus acuflavidus* established according to the lessons learned during the 2021 monitoring and relocation procedure

Months	Probability of establishing a reproductive colony	Actions in the event of encountering eggs/hatchlings in the LNGT
Jan-Mar	Very Low	Eggs and nest rescue and veterinary care.
April-June	High	Drive reproductive pairs away. Rescue and allocation to a safe location for birds.
July	Medium	Established reproductive colony: rescue and allocation to a safe location for birds. Non-established reproductive colony: rescue and veterinary care.
Aug-Sep	Low	Established reproductive colony: rescue and allocation to a safe location for birds. Non-established reproductive colony: rescue and veterinary care.
Oct-Dec	Very Low	Eggs and nest rescue and veterinary care.

Emergency against bird flu (H5N1)

GNA adopts procedures to protect the Emergency Brigade team and those responsible for rescuing the animals from being contaminated by avian influenza (H5N1), especially as of 2023, when there was an increasing detection of avian influenza outbreaks in wild and farmed birds in several countries.

Therefore, when a bird is identified as impaired, the established procedure is to record photos and videos of it, which would be sent to the Environmental team and the company responsible for checking the animal's condition and advising on the measures to be taken in order to avoid any contamination of human beings. In all cases of live animals, the Official Veterinary Service of the State of Rio de Janeiro is called in to take the necessary measures. If there were any dead birds found, the instructions are to bury them in an appropriate place, following a specific protocol.

In 2024, the brigade was called in to rescue two animals weakened by the flu.



No Net Loss/Net Gain (NNL/NG)

This indicator is required to evaluate the No Net Loss/Net Gain (NNL/NG) targets. The discovery of substantial larval specimens and fish species associated with the hard-bottom *habitat* shows evidence of Net Gain, especially for the establishment of the ichthyofauna community. Furthermore, the procedure for monitoring and driving away *Thalasseus acuflavidus* has played an important role in preventing net losses to biodiversity.

Associated management and monitoring plans or documents

- Ichthyofauna Monitoring Procedure
- Marine Monitoring Plan
- Monitoring of Nests in the LNGT *(Thalasseus acuflavidus)*

Drill for attending to oiled wildlife

In order to make sure that the Emergency Brigade, the Environmental department team and the volunteer brigade members are prepared for different types of potential occurrences, an oil spill drill was carried out in 2024 with the presence of oiled wildlife (animals contaminated with oil adhered to the body).

The activity included active participation from the Environmental team of GNA, as well as seven organizations, including Aiuká, OceanPact, and the TAMAR Project Foundation.





Final remarks





Final Remarks

The data presented in the 6th Annual Report of the GNA Biodiversity Action Plan, based on the indicators documented by the Biodiversity Management Plan (BMP) and Biodiversity Monitoring and Evaluation Plan (BMEP), presented in this summarized version, demonstrate GNA's commitment to achieving the environmental outcomes that were agreed upon since the signing of the financing agreement.

The activities carried out are aligned with the mitigation hierarchy determined by Performance Standard 6 – Biodiversity Conservation and Sustainable Management of Living Natural Resources (PS6) of the International Finance Corporation (IFC), which initially includes preventing and minimizing impacts, followed by restoration/rehabilitation and compensation measures.

The project is expected to generate a gain in biodiversity, as recommended in paragraph 18 of PS6 for critical habitat regions.

Among the 21 Mitigation Measures initially proposed, 20 have now been implemented. Only Mitigation Measure 4 is still in the feasibility analysis phase because it is not a GNA management issue. In terms of measures 19 and 20, established to control alien invasive species, especially the sun coral, GNA awaits the definition of removal actions to be determined by Porto do Açu Operações, when — and if — reproductive potential is recorded.

The work remains active, even with the completion of most measures. This is due to the fact that many of the actions implemented involve

the execution of programs and plans for monitoring fauna, flora, limnic and marine biota, and other elements related to biodiversity and the environment. These are essential surveys to validate the effectiveness of implemented measures and to assess the occurrence of “No Net Loss” (NNL) and “Net Gain” (NG) in biodiversity, which are desired outcomes for GNA’s projects.

It is worth noting that the operational procedures of the BAP (BMP and BMEP) are dynamic methodological tools that require ongoing evaluation and updates, as well as the monitoring programs, to ensure they remain effective amid potential changes in scenarios. The monitoring strategies have been enhanced in accordance with recommendations from independent auditors and thematic specialists, incorporating statistical analyses that will support a more precise assessment of future net gains and biodiversity trends. In addition, the GNA BAP was updated in December of 2022 to include both the projects associated with TPP GNA I and those of TPP GNA II, under construction.

Through these actions, GNA maintains its commitment to comply with the requirements of the International Performance Standards within the timelines stipulated in the BAP, making the necessary efforts to mitigate and compensate for environmental impacts on habitats and local biodiversity values.



GNA Biodiversity Symposium

Between September 11 and 12, 2024, GNA hosted the 3rd Biodiversity Symposium at the RPPN Caruara, bringing together GNA's team, partner companies, researchers, and representatives from municipal and state environmental agencies. The purpose was to present updates on GNA's BAP, results and perspectives related to efforts to observe, track, and maintain the health and sustainability of terrestrial and marine flora and fauna in the region.

The initiative is a component of a larger commitment focused on transparency, accountability, and the sharing of knowledge and lessons learned, and has been held annually since 2022.







Implementation Summary

Summary of the implementation of mitigation measures

BIODIVERSITY AFFECTED	NO. OF MITIGATION MEASURE	MITIGATION MEASURE	INDICATOR(S)	INDICATOR(S) USE	STATUS OF THE IMPLEMENTATION OF THE MITIGATION MEASURE	ACHIEVEMENT OF NO NET LOSS/NET GAIN	DESIRED OUTCOME(S)	ADAPTIVE MANAGEMENT	OVERALL ASSESSMENT
Atlantic Rainforest / Restinga	1	Installation of Firebreaks	Firebreaks Installed	Support Information	**GNA I:** Fully completed. Firebreaks installed **GNA II:** Firebreaks under construction **GNA I** and **GNA II:** Educational campaigns conducted	Not Applicable	No impact of unmanaged fire on Restinga *habitat* in Port of Açu	Na – Result Achieved	No Concern
	2	Restoration and conservation, in the RPPN Caruara, of native restinga vegetation, at a minimum proportion of 1:1	Hectares planted at the RPPN Caruara, certified by regulatory agencies	Required to verify Net Gain	**GNA I:** 56.71 hectares planted, not yet certified Another hectare planted by Port of Açu for 345 kV TL, later transferred to GNA I **GNA II:** 62.94 hectares planted, not yet certified	Progressing as planned to achieve Net Gain	119.65 hectares planted and certified by regulatory agencies. (The first certification for planting occurs in year 1. The second certification, for successful establishment, occurs in year 5) Another hectare planted by Port of Açu for 345 kV TL, later transferred to GNA I	If the planted areas are not certified by regulatory agencies, they must be replanted.	No Concern
			1) plant density (ind./ha) 2) % of plants with high wildlife value 3) canopy cover (%) 4) Pielou's uniformity index (J') 5) richness of native species 6) average height (m) 7) % of grasses		**GNA I** 1) >650 2) ≥60 3) >29* 4) ≥0.7 5) ≥25 6) <0.71* 7) ≤20 **GNA II** No data yet	Progressing as planned to achieve Net Gain	**GNA I** 1) >650 2) ≥35 3) ≥50 4) ≥0.7 5) ≥25 6) ≥2 (in regulatory review, to be reduced) 7) ≤20 **GNA II** No data yet	If the planted areas do not meet certain goals or standards, additional efforts will be required on site to help restore the area.	No Concern
			Presence of Critical Habitat species: **Flora:** *Inga maritima, Erythroxylum ovalifolium, Melanopsidium nigrum, Condalia buxifolia, Scutia Arenicola, Melocactus violaceus* **Fauna:** *Cerradomys goytaca, Glaucomastix littoralis, Bradypus crinitus*		Seven completed monitoring campaigns: Restinga species assembly occurs in restoration areas All CH species documented in the RPPN Caruara (GNA restoration plots will be included in the future monitoring of the RPPN)	**GNA I** suitable for achieving Net Gain **GNA II** No data yet	Normal occurrences in the RPPN Caruara (as a whole) of native species associated with the restinga, including critical habitat trigger species	If there are no critical habitat trigger plant species in the RPPN Caruara, redouble efforts to propagate and plant them in the restoration area (see below)	No Concern
			Specialized written analysis on the effectiveness of restoration activities		To be completed 5-10 years after replanting	Progressing as planned to achieve Net Gain	Receive expert written analysis confirming that the restoration for the planted hectares is progressing as planned, supported by evidence of species composition and structure	If restoration areas are not progressing as planned, additional restoration treatments are needed on site	No Concern
			Legal protection of the restoration area		RPPN Caruara remains legally protected as a private reserve	Progressing as planned to achieve Net Gain	RPPN Caruara is legally protected as a private reserve	NA – Result Achieved	No Concern

BIODIVERSITY AFFECTED	NO. OF MITIGATION MEASURE	MITIGATION MEASURE	INDICATOR(S)	INDICATOR(S) USE	STATUS OF THE IMPLEMENTATION OF THE MITIGATION MEASURE	ACHIEVEMENT OF NO NET LOSS/NET GAIN	DESIRED OUTCOME(S)	ADAPTIVE MANAGEMENT	OVERALL ASSESSMENT
Atlantic Rainforest / Restinga	3	Payment of monetary environmental compensation	Payments invested in regional protected areas	Required to verify Net Gain	**GNA I and II:** Payments completed	Progressing as planned to achieve Net Gain	**Full payment** A summary of expenses was requested from the Operational Manager	NA – Result Achieved	No concern
	4	Voluntary participation in the "Green Belt" program	To be determined, once the plan is approved	Supporting Information	To be determined, as soon as the plan is approved	Not applicable	To be determined, as soon as the plan is approved	To be determined, as soon as the plan is approved	It does not yet apply, as the program has not yet started
	5	Relocation of fauna species of interest to a suitable habitat	Specimens of each named species	Supporting Information	**Fauna:** All vegetation clearing activities were accompanied by fauna rescue teams. All specimens were displaced or rescued and relocated to safe areas near the registration site and at the RPPN Caruara (for GNA I projects) and areas near the registration site (for GNA II projects) **Flora:** All specimens of the species of interest were translocated to RPPN Caruara	Not applicable	ISpecimens relocated to suitable (unoccupied) habitat near the registration area or in the RPPN Caruara, strengthening populations in the RPPN Caruara	NA – Result Achieved	No concern
	6	Restoring the restinga habitat	See restinga restoration indicators above						No concern
	7	Installation of bird flight diverters	Flight diverters installed in areas with a high risk of bird collisions	Supporting Information	**GNA I and GNA II:** Transmission line and diverters already installed **GNA I and GNA II:** Monitoring is ongoing	Not applicable	Bird flight diverters installed	NA – Result Achieved	No concern

BIODIVERSITY AFFECTED	NO. OF MITIGATION MEASURE	MITIGATION MEASURE	INDICATOR(S)	INDICATOR(S) USE	STATUS OF THE IMPLEMENTATION OF THE MITIGATION MEASURE	ACHIEVEMENT OF NO NET LOSS/NET GAIN	DESIRED OUTCOME(S)	ADAPTIVE MANAGEMENT	OVERALL ASSESSMENT
Freshwater bodies	8	Installation of oil-water separators	Oil separator systems installed	Supporting Information	**GNA I:** Systems fully installed. The monitoring campaigns reveal no signs of environmental impacts associated with the GNA project **GNA II:** Systems fully installed	Not applicable	Oil separator systems installed	NA – Result Achieved	No concern
	9	Maintaining a permeable surface	% of Port of Açu with permeable surface	Supporting Information	**GNA I: 2.77 ha representing 15.23% of the project area is maintained with its original permeability capacity** **GNA II: to be calculated after the end of the construction phase**	Not applicable	Permeable surface in Port of Açu => 15%	Permeable surface in Port of Açu < 15%	No concern
	10	Restoring the restinga habitat	See restinga restoration indicators above						
	11	Payment of monetary environmental compensation	See evidence and compensation indicators above						

BIODIVERSITY AFFECTED	NO. OF MITIGATION MEASURE	MITIGATION MEASURE	INDICATOR(S)	INDICATOR(S) USE	STATUS OF THE IMPLEMENTATION OF THE MITIGATION MEASURE	ACHIEVEMENT OF NO NET LOSS/NET GAIN	DESIRED OUTCOME(S)	ADAPTIVE MANAGEMENT	OVERALL ASSESSMENT
Coastal	12	Dredging carried out considering the sea turtles' nesting season	Dredging time (month)	Supporting Information	The dredging activities near the GNA area have already been completed. Dredging at the Port of Açu, however, can only take place in accordance with the recommendations of its Dredging Plan and authorization from the environmental agency	Not applicable	Dredging is reduced or does not take place between September and April. The Port of Açu's dredging schedule will be adapted to accommodate the nesting season of sea turtles	NA – Result Achieved	No concern
	13	Lighting of GNA structures designed to reduce impacts of illumination to the sea turtles' reproduction	The lighting of the operation of GNA I, LNGT and the work on GNA II are in accordance with Brazilian regulatory legislation and as detailed in a specific procedure for mitigating light incidence	Supporting Information	**GNA I and II:** The nighttime inspections indicated that lighting increased due to temporary nighttime activities involved in implementing GNA II, as well as new construction/projects in the port retro area in T2, and ship-to-ship activities in T1. For the LNGT and TPP I installations, the lighting remains the same	Not applicable	The lighting continues to comply with standards for protecting sea turtles and as detailed in the specific procedure	A review of the sampling areas and methods is suggested to make field measurements more targeted towards GNA projects	Minor Concern
	14	The paint color of the FSRU was designed to minimize artificial light reflection to accommodate sea turtles' reproduction	Paint color meets specifications for low light reflection	Supporting Information	The FSRU has been painted navy blue to mitigate the reflection of artificial light and accommodate nesting sea turtles	Not applicable	Paint color meets specifications for low light reflection – Result achieved	NA – Result Achieved	No concern

BIODIVERSITY AFFECTED	NO. OF MITIGATION MEASURE	MITIGATION MEASURE	INDICATOR(S)	INDICATOR(S) USE	STATUS OF THE IMPLEMENTATION OF THE MITIGATION MEASURE	ACHIEVEMENT OF NO NET LOSS/NET GAIN	DESIRED OUTCOME(S)	ADAPTIVE MANAGEMENT	OVERALL ASSESSMENT
Coastal	15	Ongoing and structured actions for the conservation of sea turtles	**Nesting success:** 1) total number of nests 2) total number of eggs 3) total number of hatchlings 4) hatching rate (%)	Required to verify No Net Loss	**Nesting success (2023-2024):** 1) total number of nests: 1,849 2) total number of eggs: 191,968 3) total number of hatchlings: 133,579 4) hatching rate (%): 70.0%	There is no evidence of a decline in the number of nests, eggs and births in the region. In fact, there has been an increase over the nesting seasons, indicating No Net Loss and, for the number of nests, eggs and births, indicating a Net Gain	Stable or improved nesting success from baseline (GNA's financial support to monitoring is voluntary and may change over time)	In the event of a decline in nesting success compared to the baseline, the response will be determined by the Port of Açu. Otherwise, GNA may look for turtle conservation projects elsewhere	No concern
	16	Mixing the FSRU cooling water with the hot water output from TPPs to manage water temperatures prior to discharge into the ocean	Water temperature in mixing zone (°C)	Required to verify No Net Loss	Automatic monitoring network installed and running The temperature measured remained within the expected range	Progressing as planned to achieve No Net Loss The temperature of the water remained within the expected range	The temperature at the edge of the mixing zone should not vary > 3 °C from the ambient ocean temperature	If the water temperature varies > 3 °C from the ambient ocean temperature, recalibrate the outflow mechanism	No concern
	17	Installation of an anti-entrainment structure for marine life (sea chest) in the cooling water intake system for the FSRU operation	Sea turtles or other large marine organisms entrained in the water intake system	Required to verify No Net Loss	Sea chest installed No animals in the FSRU water intake system	Progressing as planned to achieve No Net Loss Visual monitoring will support verifying the effectiveness of the measure	There are no sea turtles or other large marine organisms that have been pulled into the water intake system	In the event that sea turtles or other large marine organisms are drawn into the water intake system, appropriate impact mitigation measures should be proposed	Not applicable
	18	Water quality management	Diversity and relative abundance of marine fish, plankton and benthic communities Local fisheries catch per unit effort	Supporting Information	Monitoring in progress, no major changes detected	Progressing as planned to achieve No Net Loss. The monitoring values remain in line with the baseline and results of previous campaigns	No statistically significant difference before/after the operation. (Note: statistically significant detection of small to moderate changes is not feasible)	If there are significant statistical differences before versus after the installation and/or operation of the project or downward trends in biodiversity values, the water quality monitoring and controls should be re-checked and then possible action plans to implement corrective measures should be determined	No concern

BIODIVERSITY AFFECTED	NO. OF MITIGATION MEASURE	MITIGATION MEASURE	INDICATOR(S)	INDICATOR(S) USE	STATUS OF THE IMPLEMENTATION OF THE MITIGATION MEASURE	ACHIEVEMENT OF NO NET LOSS/NET GAIN	DESIRED OUTCOME(S)	ADAPTIVE MANAGEMENT	OVERALL ASSESSMENT
Coastal	19	Ship ballast offshore exchange to minimize the risk of introducing invasive alien species	Invasive sun coral density/ m²	ISupporting Information	Density of sun coral per m² in the north pier: A10P5: 0/m² A10P4: < 0.5/m² A10P3: < 0.5/m² A10P2: < 0.5/m² A10P1: 1/m² Ship ballast protocol defined to prevent marine biofouling No ballast exchange was carried out in 2024	Progressing as planned to achieve No Net Loss. Regarding the diagnosis of biofouling of Tubastraea coccinea in Port of Açu, any action related to removal must be previously approved by the port administrator. Regarding the presence of sun coral in the FSRU and LNGT, during routine cleaning activities of the FSRU hull and sensitive areas of the ship, if the presence of sun coral is observed, the areas may be cleaned with the approval of the port administrator, observing the applicable legislation and GNA-PLA.SUS.013. In any case of sun coral removal, the disposal of waste will follow the Exotic Species Prevention and Control Project (PPCEX) and applicable legislation and needs to be done by a company certified and licensed for this activity	< 2 sun coral specimens /m2	If the sun coral density > 2/m2, increase the frequency of removal, with greater attention paid to complying with the requirements of GNA-PLA.SUS.013	Not applicable
	20	Removal of invasive marine species from port area and FSRU BW Magna	See Mitigation Measure No. 19						
	21	Construction of the pier using rock increases habitat availability for hard-bottom marine species	Occurrence of fish species populations associated with the hard-bottom habitat in the North Jetty area	Supporting Information	Rock pier constructed Occurrence of species typically found in hard-bottom habitats: 2020: 10 species Jan/2021: 8 species July/2021: 3 species Jan/2022: 6 species July/2022: 12 species Jan/2021: 9 species July/2023: 13 species Jan/2024: 6 species July/2024: 6 species	Encounter of important larval values and fish species associated with hard-bottom habitat (No Net Loss)	Any native species population of hard bottom-habitat	If no native fish species settle in the habitat created by the construction of the pier, water quality monitoring and controls need to be reviewed and action plans put in place to mitigate any possible water contamination	No concern

References, Glossary and Credits



References, Glossary, and Credits

BIBLIOGRAPHIC REFERENCES

The following document was consulted in the preparation of this material:
GNA BIODIVERSITY ACTION PLAN ANNUAL REPORT 2024

GLOSSARY

Adaptive management
Concerns the suitability of mitigation and management measures that can be implemented according to the outcomes of monitoring throughout the project. This means that actions are increasingly precise and efficient in the quest for No Net Loss/Net Gain in biodiversity. Adaptive management actions can be directed to both monitoring methods and operational activities if the need is identified.

ADI - Area of Direct Influence
Corresponds to the area that will undergo direct impacts of the implementation, operation and/or expansion of the enterprise.

AII - Area of Indirect Influence
Corresponds to the area actually or potentially subject to the indirect impacts of the implementation, operation and/or expansion of the project.

Anthropized area
Natural area whose original characteristics have been altered by human activities.

Benthic invertebrates
Different groups of invertebrates that inhabit the bottom of oceans, estuaries, rivers and/or lakes, living stationary, buried or associated with different substrates (under or on them) such as sediments, rocks, logs and others, throughout their entire life cycle or for part of it.

Biodiversity hotspots
Hotspots are places on the planet with great biodiversity but have been devastated by human action. There are 35 hotspots throughout the globe, and Brazil is home to two of them: the Atlantic Rain Forest and the Cerrado.

CH - Critical Habitat
Critical Habitats (HC) are areas of high biodiversity value and include: habitats of significant importance for threatened or critically endangered species; habitats of significant importance for endemic or restricted distribution species; habitats that contain significant concentrations of migratory species and/or congregations of species; unique or very threatened ecosystems and areas associated with key evolutionary processes.

CODIN - Companhia de Desenvolvimento Industrial do Estado do Rio de Janeiro
A mixed public-private corporation, indirectly managed by the State of Rio de Janeiro and linked to the State Secretariat for Economic Development, Industry, Trade and Services (SEDEICS, Secretaria de Estado de Desenvolvimento Econômico, Indústria, Comércio e Serviços), which was formed in order to develop actions that help expand business activity in the territory of Rio de Janeiro in partnership with other government and business entities, universities and technology centers. https://www.codin.rj.gov.br/

CONAMA Resolution 10/96
Establishes that environmental licensing on beaches where sea turtles spawning occurs can only take place after an assessment and recommendation by IBAMA, following dialog with the Marine Turtle Center (TAMAR). https://www.ibama.gov.br/sophia/cnia/legislacao/MMA/RE0010-241096.PDF

CONAMA Resolution 357/05
Provides the classification of water bodies and environmental guidelines for their framework, and also establishes the conditions and standards for the discharge of effluents, as well as other provisions. https://www.icmbio.gov.br/cepsul/images/stories/legislacao/Resolucao/2005/res_conama_357_2005_classificacao_corpos_agua_rtfcda_altrd_res_393_2007_397_2008_410_2009_430_2011.pdf

Resolução CONAMA 430/11
Provides for the conditions and standards of effluent discharge, complements and amends CONAMA Resolution 357/05. http://www.ibama.gov.br/sophia/cnia/legislacao/CONAMA/RE0430-130511.PDF

Resolução CONAMA 454/12
Establishes the general guidelines and referential procedures for the management of material to be dredged in waters under national jurisdiction.
https://www.ibama.gov.br/component/legislacao/?view=legislacao&legislacao=128537

Consolidated bottom (hard-bottom)
Substrate composed of solid and rigid surfaces, such as rocks, coral reefs, sandstone reefs, limestone algae beds, and others. Also called “hard bottom” where different groups of benthic organisms inhabit. In addition, consolidated bottoms can also be considered concrete structures or other materials, built in the aquatic environment, such as jetties and piers.

Decree No. 4.340/2002
Regulates articles of law no. 9.985 of July 18, 2000, which provides for the national system of nature conservation units (SNUC, in Portuguese), and provides other provisions.
https://legislacao.presidencia.gov.br/atos/?tipo=DEC&numero=4340&ano=2002&ato=50dkXSq5UNNpWTb07

Domestic fauna
Includes animals that, through traditional and systematized processes of management and zootechnical improvement, have become domestic, possessing biological and behavioral characteristics that are closely dependent on man. Examples: cats, dogs etc.

Endemic species
A native plant or animal that occurs only in a particular area or geographic region. Environmental Impact Study An environmental study of a project, construction or activity, user of environmental resources, actually or potentially causing significant pollution or some other form of significant degradation of the environment. It is carried out in advance to analyze environmental feasibility and must be followed by a public hearing.

Federal Law No. 9.985/2000
Regulates art. 225, paragraph 1, items i, ii, iii and vii of the federal constitution, establishing the national system of nature conservation units and provides other measures.
https://legislacao.presidencia.gov.br/atos/?tipo=LEI&numero=9985&ano=2000&ato=77ck3aq1kMNpWTfc9

Firebreaks
Extended clearings designed to act as a protective barrier to prevent flames from spreading in the event of a fire.

FSRU - Floating Storage Regasification Unit
The Floating storage and regasification unit is used for the receipt of Liquefied Natural Gas (LNG) by ships, storage of the raw material until the moment of its use and to promote the passage of the raw material from the liquid to the gaseous state (regasification).

Gillnet
Type of passive fishing gear in which fish or crustaceans become trapped in its meshes due to their own movement.

IBAMA - Brazilian Institute of the Environment and Renewable Natural Resources (Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis)
Self-managed federal entity whose responsibilities include: exercising the power of environmental police; conducting actions of national environmental policies, referring to federal attributions, related to environmental licensing, environmental quality control, authorization to use natural resources and inspection, monitoring and environmental control, observing the guidelines issued by the Ministry of the Environment; and carrying out the supplementary actions of competence of the Union, in accordance with current environmental legislation.
https://www.gov.br/ibama/pt-br

ICMBio - Chico Mendes Institute for Biodiversity Conservation (Instituto Chico Mendes de Conservação da Biodiversidade)
Brazilian environmental agency responsible for proposing, implementing, managing and protecting federal conservation units.
https://www.gov.br/icmbio/pt-br

IDG – Institute for Development and Management
IDG is the entity accredited by the public authorities to perform the environmental management of resources from compensatory measures and execute projects allocated for Conservation Units, approved by the Environmental Compensation Chamber of Rio de Janeiro under the auspice of the Mechanism for Biodiversity Conservation.

IFC - International Finance Corporation
World Bank Group member institution aimed at strengthening the private sector in developing countries with a view to combating poverty.
https://www.ifc.org/

IL - Installation License
Authorizes the installation of the project, work or activity according to the specifications contained in the approved plans, programs and projects, setting a schedule for the execution of mitigating measures and the implementation of environmental control systems.

INEA/RJ - State Institute of the Environment of Rio de Janeiro (Instituto Estadual do Ambiente do Rio de Janeiro)
An entity that is part of the indirect state Public Administration, linked to the State Secretariat for the Environment and Sustainability (SEAS, Secretaria de Estado do Ambiente e Sustentabilidade) of Rio de Janeiro. Its role is to implement state policies on the environment, water resources and forestry resources adopted by the Executive and Legislative powers of the State of Rio de Janeiro.
https://www.inea.rj.gov.br

LNGC - Liquefied Natural Gas Carriers
Also known as a “methane tanker”, it is a tanker that transports liquefied natural gas from the Natural Gas Liquefaction Units to the Natural Gas Regasification points.

Nesting
The act of building nests.

Net Gain
Additional conservation action for biodiversity values in critical habitat areas. These gains can be achieved through the application of an impact mitigation hierarchy that includes the development of compensations in other similar areas.

No Net Loss
Point at which biodiversity losses related to the implementation of a project are balanced by the gains obtained by adopting the measures defined to minimize or mitigate the environmental impacts produced by the construction/operation of that enterprise.

OL - Operating License
Allows for the operation of the project, construction or activity after ensuring effective compliance with the environmental control measures and conditions determined in the previous licenses.

ONS - National Electric System Operator
The agency responsible for coordinating and controlling the operation of electricity generation and transmission facilities in the National Interconnected System (SIN, Sistema Interligado Nacional) and for planning the operation of the country's isolated systems, under the supervision and regulation of the National Electric Energy Agency (Aneel, Agência Nacional de Energia Elétrica).
https://www.ons.org.br/

Ordinance No. 11/95 IBAMA/MMA
Provides the maximum permitted intensity of existing sources of lighting in sea turtle nesting areas.
https://www.ibama.gov.br/sophia/cnia/legislacao/IBAMA/PT0011-300195.PDF

Private Natural Heritage Reserve (Reserva Particular do Patrimônio Natural)
Conservation unit of private and perpetual domain, with the objective of biodiversity conservation, without expropriation or alteration of property use rights. RPPN Caruara Private Reserve of Caruara Natural Heritage. It comprises an area of 40km2, protected by the Porto do Açu Operações. It is the largest private conservation unit dedicated to the protection of the restinga (sandbank) ecosystem in Brazil.

SEA/INEA Joint Resolution No. 638/2016
Establishes procedures for signing environmental compensation commitment terms (TCCA, in Portuguese) to fulfill the obligation as to environmental compensation referred to in art. 36 of Federal Law No. 9.985/00 and State Law No. 6572/13.
http://fma.ambiente.rj.gov.br/comum/code/MostrarArquivo.php?C=MTYw

SEAS - State Department for the Environment and Sustainability of Rio de Janeiro (Secretaria de Estado do Ambiente e Sustentabilidade)
First-level hierarchical entity of the state administration of Rio de Janeiro, coordinates the state's public environmental management.
https://www.seas.rj.gov.br

Ship-to-ship operation
Transferring cargo from one ship directly to another without passing through any onshore structure.

SIN - National Interconnected System
A large hydro-thermal-wind system, it is responsible for interconnecting electrical systems via the transmission grid, in order to serve the market safely and with economy.
https://www.ons.org.br/paginas/sobre-o-sin/o-que-e-o-sin

SNUC - National System of Conservation Units (Sistema Nacional de Unidades de Conservação da Natureza)
The set of federal, state and municipal conservation units . It is composed of 12 categories, whose specific objectives differ in terms of the type of protection and permitted uses: those that need greater care due to their fragility and particularities, and those that can be used sustainably and conserved at the same time.

Species of interest
Species that are considered triggers for a given habitat. In the case of the BAP, the species Dendropsophus meridianus, Rhinella pygmaea, Xenohyla truncata, Cerradomys goytaca and Glaucomastix littoralis were considered to be of interest.

State Law No. 7.061/2015
Amends Laws No. 6.572 of October 31, 2013 and No. 6.371/2012 of December 27, 2012 and provides for other measures.
http://alerjln1.alerj.rj.gov.br/CONTLEI.NSF/%20f25edae7e64db53b032564fe%20005262ef/0d689f7cbd71a52083257ecf00616fb8?OpenDocument

Synanthropic Fauna
Includes species of wild animals, whether native or not, that share resources (water, shelter and food) from areas inhabited by humans in order to survive. Examples: domestic pigeons, vultures, rats, cockroaches, scorpions, bats etc.

TAMAR Project Foundation (Fundação Projeto TAMAR)
A non-profit entity with over 40 years of experience in Brazil, whose mission is to promote the recovery of sea turtles, developing research, conservation and social inclusion actions. The foundation operates over roughly 1,100 km of Brazilian coast, in neritic and oceanic habitats in eight states: Rio Grande do Norte, Pernambuco, Sergipe, Bahia, Espírito Santo, Rio de Janeiro, São Paulo and Santa Catarina.

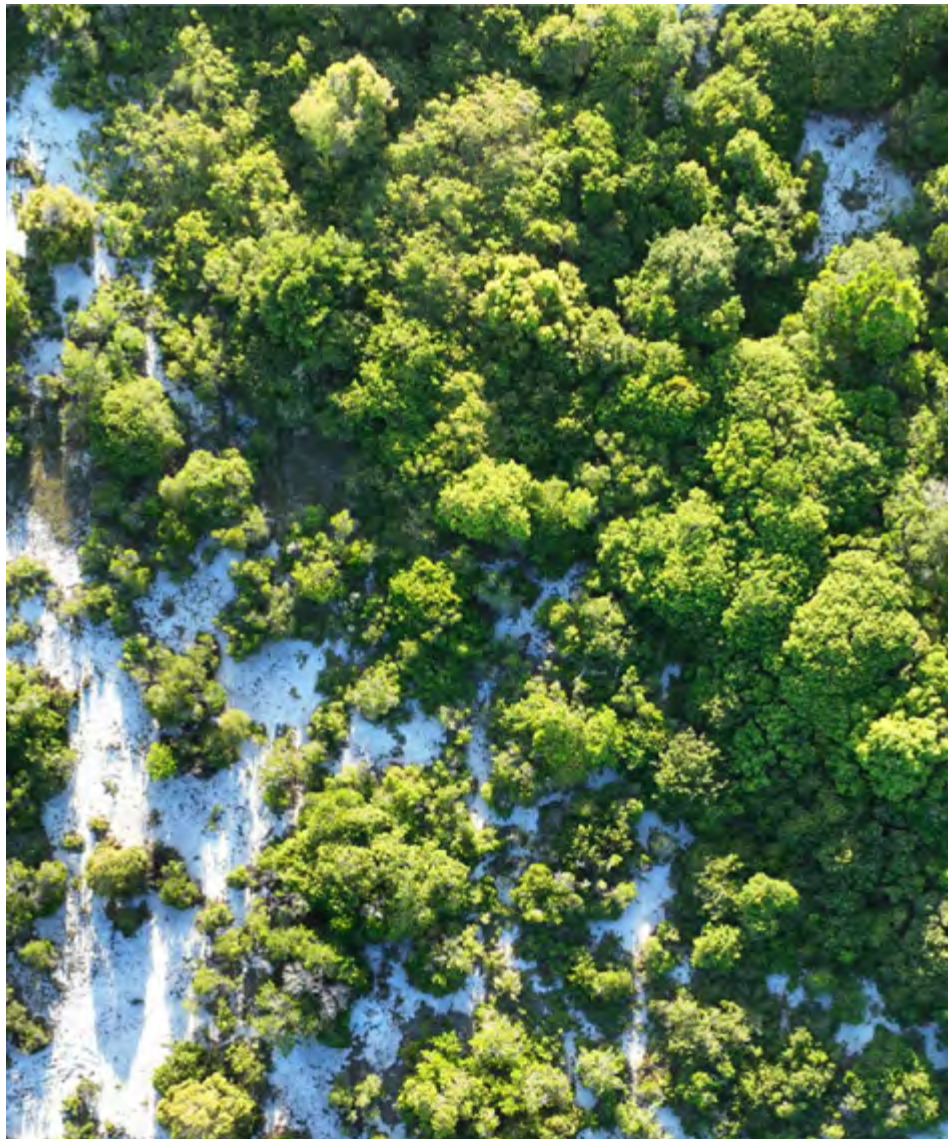
Taxons
The taxonomic unit associated with the scientific classification of living beings at any level.

Transects
A line or section, along which the occurrences of the phenomenon being studied are documented and counted.

Turtle Deflectors
Engineering measure to reduce interactions and incidental catches of sea turtles by dredgers, the main purpose of which is to cause animals resting on the bottom to be diverted from the dredge head layout during suction.

Unconsolidated bottom (Soft-bottom)
Substrate, usually muddy or sandy, where various groups of benthic organisms live. These are accumulations of debris that have lost their firmness, solidity and stability (unconsolidated), which are transported by gravity from their origin and are deposited on the slopes and bottom of oceans, estuaries, rivers and/or lakes.

Wild fauna
Includes aquatic or terrestrial animals belonging to native or migratory species in which they exist naturally within the limits of a given territory, Examples: bat, coati, jaguar, anteater, parrot, canary, tegu, alligator, tortoise etc.



CREDITS

General coordination
Luana Mauad
Clara Peixoto

Proofreading team
Ana Weisz
João Teixeira

Text Editing
Luciana Fleury

Layout
Wake Comunicação Estratégica

Photos
Acervo GNA, Consultorias Técnicas, Agência Berenger, Clara Peixoto, Leon Barcelos, Luana Mauad, Daniel Almada e Carlos Henrique Nogueira.

Translation
Global Translations.BR

Acknowledgements
We would like to thank everyone who collaborates directly or indirectly with GNA, especially the Sustainability team and partner technical consulting firms that perform our Biodiversity monitoring programs.

GNA

GÁS NATURAL AÇU

BAP

BIODIVERSITY ACTION PLAN

