Implementing nature–based solutions to climate change, by Guadeloupe Port Authority: the case of mangroves

Aplicación de soluciones naturales al cambio climático en el la Autoridad Portuaria de Guadeloupe : el caso del manglar

Mise en œuvre de solutions fondées sur la nature pour lutter contre le changement climatique, par le Grand Port Maritime de la Guadeloupe : le cas de la mangrove

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EXTENDED ABSTRACT

INTRODUCTION

The Guadeloupe Port Authority manages its natural areas through programs like LIFE Adapt'Island project, focusing on nature-based solutions to combat climate change's impact on coral reefs, seagrass beds, and mangroves. Guadeloupe's mangroves, crucial for ecosystem services such as protection from waves and habitats for fish and shellfish, face threats from deforestation, pollution, urbanization, and climate change. These pressures disrupt water circulation, hinder natural recolonization, and promote invasive species. In response, the Guadeloupe Port Authority is carrying out restoration efforts to protect and rehabilitate these vital coastal ecosystems.

METHODOLOGIES

Site selection is crucial in restoration and rehabilitation projects. It must be justified and enable measurable objectives to be achieved quickly. Selection criteria include:

- Availability and sustainability: The site must be stable and available for at least 15 years.
- History: Understanding the site's past evolution.
- Presence of reference ecosystem: The site must contain elements of the target ecosystem, past or present.
- Distribution and number of sites: Enough representative sites to ensure project feasibility.

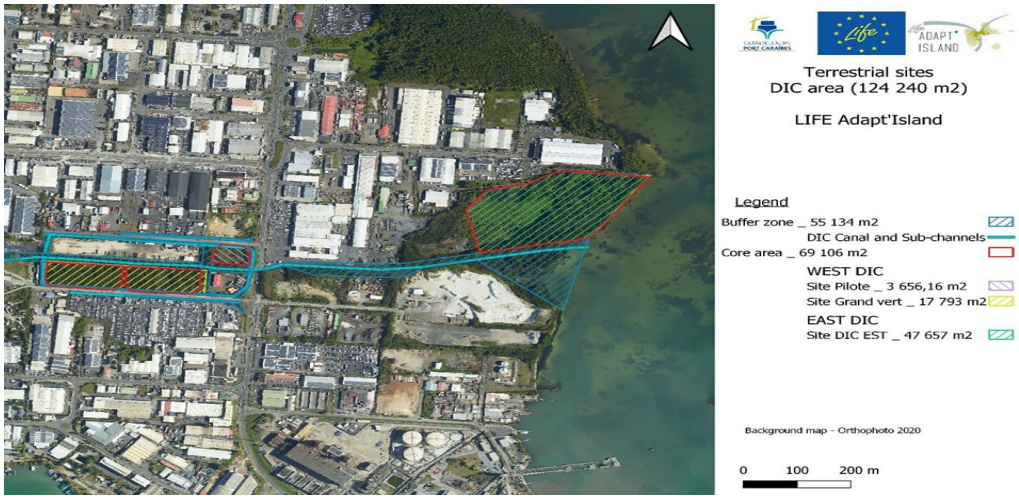

Figure 1. Selected restoration sites.

- The aim of the "preliminary diagnosis" is to determine whether a site requires active management to promote ecosystem restoration, or whether the ecosystem can recover naturally.

The selected sites are in Jarry, Guadeloupe, an area once dominated by mangroves, but which has undergone significant degradation. This degradation is due to several factors, including high pollution levels and increased urbanization through the construction of numerous commercial buildings. These impacts have altered the natural ecosystem, reduced biodiversity and disrupting the essential ecological functions of the mangrove. The area now faces environmental challenges, requiring efforts to restore and preserve this crucial ecosystem.

Two main sites have been selected (figure 1). Once the sites were selected, a clearing process was carried out to remove litter, including waste electrical and electronic equipment (WEEE) and vegetal invasive species. Physico-chemical analyses were conducted to assess pollution levels and soil contamination. These analyses identified pollutant types and concentrations, enabling the determination of appropriate treatments for their removal, disposal, or management.

The results also helped adjust soil restoration methods based on their condition and determine the best approaches for their rehabilitation to enable effective natural regeneration. Additionally, the cuttings were used to restore a landscape that closely resembles the natural state, maintaining an elevation close to 0m.

The outcome is a zone with the biotic and abiotic characteristics of a wetland, making it ideal for planting mangrove species. This process of clearing and restoration focuses on creating a favorable environment for the regeneration of natural ecosystems, specifically targeting the restoration of wetland conditions suitable for mangroves.

After the clearing work, planting operations were carried out, with 68 Rhizophora mangle plants on the pilot site and 90 Laguncularia racemosa plants on the East DIC. These plants were arranged in a staggered pattern to optimize their distribution and ensure soil stability. The plants were planted with their root systems intact.

After planting, some seedlings will be included in ecological monitoring campaigns to assess their growth and health. The elements to be monitored include, but are not limited to, the number of leaves and branches, the height of the highest and lowest branches, the condition of the leaves, the presence of fruits and flowers, signs of predation, as well as mortality. Forty plants of each species will be monitored.

A natural habitat nursery has been established by the pond. Three shade structures, each measuring 3.30 m by 10 m, have been installed along the channels, providing space to accommodate at least 400 plants simultaneously. The foundations are made of metal and are screwed into place. Purlins and galvanized wires have been used to facilitate the installation of a sliding shade net, providing 30% shade.

RESULTS

Eighteen months after planting R. mangle in the pilot site, the living plants show good general health: turgidity of leaves and stems, green color of leaves, development of roots with little damage to the plants. However, the development of the spindles is slow, with 28% of the plants monitored being less than 45 cm tall. The mortality rate was 30% at T+18 months. It should be noted that 3 plants are showing flowering and fruiting, including one propagule almost mature at the time of the field visit.

About the L. racemosa on the DIC Est site, the spindles monitored are about 1 year old. They were grown in a nursery before being planted on site on January 22, 2024. The first monitoring campaign (T0 monitoring) takes place a few weeks after planting on site, on February 28,

Figure 2. Evolution of the pilot site (2019-2022-2024).

2024. For the first monitoring campaign, all the plants selected for monitoring are alive. There was therefore no mortality among the control plants at T0. In addition to the planted mangroves, natural regeneration is occurring, particularly with white mangroves, which are sprouting in the area (Figure 2). This natural recovery highlights the ecosystem's resilience.

Furthermore, wildlife such as white herons and crabs have been observed, signaling improved ecological health. These signs of biodiversity recovery show that the restoration efforts are not only supporting planted mangroves but also fostering a favorable environment for the natural re-establishment of species and the return of key fauna to the area.

CONCLUSIONS

The restoration efforts led by the Guadeloupe Port Authority show promising results for mangrove regeneration in the Jarry area. Through careful site selection, pollution assessments, and targeted actions such as removing invasive species and planting native mangroves, the project is fostering the recovery of these vital ecosystems. The initial plantings of Rhizophora mangle and Laguncularia racemosa show good overall health, with signs of flowering and fruiting.

The establishment of nurseries and ongoing ecological monitoring demonstrates the long-term commitment to maintaining the health of these ecosystems. While challenges like slow growth and plant mortality persist, the current results indicate the success of the initiative. This project highlights the importance of nature-based solutions in combating the impacts of climate change and human pressures on coastal ecosystems

KEYWORDS: nature-based solutions, mangrove, port authority, degraded area, management