Enhancing biodiversity by carbon sequestration through Nature-Based Solutions – Abidjan Airport Côte d'Ivoire

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Introduction

The aviation industry is increasingly seeking innovative methods to minimize its environmental impact while aligning with broader sustainability goals. To attain various certification levels within the Airport Carbon Accreditation (ACA) program and, more importantly, to fulfill specific and measurable objectives for managing and decreasing CO_2 emissions, airports are required to conduct a thorough inventory of their emission sources (scopes 1 and 2). This effort also entails monitoring the execution of reduction initiatives and compensation measures within these scopes. For residual emissions and those from third parties, such as ground handling services or airlines (Scope 3), airports must establish compensation mechanisms.

Félix Houphouët-Boigny (FHB) Airport in Abidjan, the second-largest city in West Africa, has been dedicated to sustainable development for over ten years. It became part of the ACA program in 2015 and made history by becoming the first airport in Africa to achieve Level 3+ Neutrality in 2017 and currently ACA 4+ (first airport in Africa). To counterbalance its remaining Scope 1 and 2 emissions, Abidjan International Airport (AERIA), the airport operator, has adopted globally recognized solutions grounded in international standards, including the Greenhouse Gas (GHG) Protocol, ISO 14064, and guidelines from the Intergovernmental Panel on Climate Change (IPCC).

In this context, EGIS, the technical partner of Abidjan's Félix Houphouët-Boigny International Airport for nearly thirty years, is assisting AERIA with its strategy, management, and operational efficiency. **Together, they have developed the Soil.is solution, a method based on natural carbon sequestration—where CO_2 is captured from the atmosphere and stored in soil and vegetation through photosynthesis. This nature-based approach also contributes to biodiversity restoration.** This collaboration exemplifies how underutilized airport land can be converted into productive ecological assets, highlighting the aviation sector's potential role in large-scale landscape restoration.

The concept and implementation of "Soil.is"

Soil.is is a natural solution focused on restoring degraded soils and increasing carbon sequestration by planting trees and hedges and improving soils with compost. The project is being implemented in four main areas:

- Re-vegetation of runway edges (green maintenance) to reduce soil erosion and improve green maintenance.
- Creation of a market garden and agroforestry belt.
- Restoration of a mangrove swamp on the airport site.

- A circular economy project based on the production of compost from organic waste from both the airport and agricultural sites.

Implementing these four main areas of work will make it possible to build up organic matter in the soil, reduce erosion, improve water retention and stimulate microbial activity, thereby creating favourable conditions for the sustainable restoration of the ecosystem. To launch the project, AERIA and its partner EGIS followed a number of practical steps.

In 2023, Egis organised a business consultation which led to the selection of a consortium of local companies to carry out the work. Also in 2023, as part of the re-vegetation of the runway edges, several pilot areas were developed with plantings of various species adapted to different soil types. The plant species were chosen for their low height (10 cm maximum), in order to limit the frequency of mowing for the operator (Figures 1 & 2).

In 2024, all four activities will continue. Planting for the market garden belt has begun. In coordination with the gardeners, tree and hedge species such as moringa, neem, soursop, vetiver and korsaflan have been selected and planted along the edges of the areas and between the market gardeners' plots.

FIGURE 1: Green maintenance focus around the airside signalization by using local grass species to reduce mowing frequencies.

FIGURE 2: Soil sampling along runways to assess carbon stock.

FIGURE 3: Construction of a wooden nursery to serve for mangrove propagules activities are managed with the support of local communities; co-construction workshops were key to engage them to enhancing biodiversity by mangrove restauration.

Results and co-benefits

Although no direct measurements of biodiversity (such as entomological monitoring, standardised species counts or floristic analyses) have yet been carried out, initial observations in the field already point to a strong positive impact. The initial planting of tree species (*teak, moringa, neem, gliricidia*) and hedges (*korsaflan, green jatropha, vetiver, pigeon pea*) quickly led to a restructuring of the vegetation cover, creating a more complex mosaic of habitats more conducive to the return of wildlife. Pollinating insects and beetles were once again observed on the site (Figure 4), an encouraging sign that ecological recovery is underway.

FIGURE 4: Image of a *Psilothrix viridicœrule* (Interaction between flora and fauna in an agricultural ecosystem).

This plant diversity not only promotes biodiversity but also limits soil erosion, improves water retention and increases resilience to climatic hazards. At the same time, preliminary analyses carried out at the edge of the runway revealed an increase in organic carbon content and probably in microbial activity from the first year. The newly planted grassland cover made a significant contribution to these dynamics. In terms of climate, a sequestration of 4.7 t of carbon/ha, or 17.2 t of CO_2 eq/ha, has already been measured in the first year, mainly in the form of biomass (Figure 5). Sequestration in the soil is set to intensify from the second year onwards.

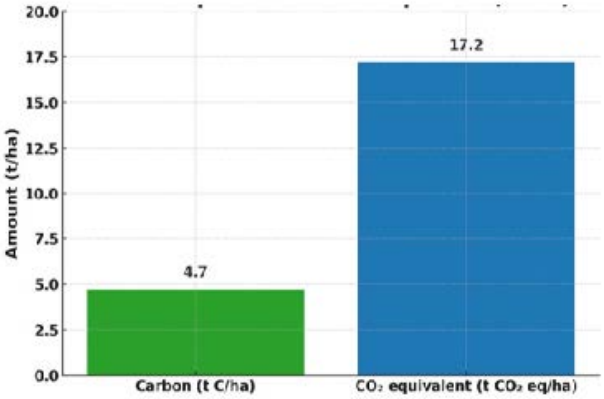

FIGURE 5: Carbon and CO_2 Equivalent Sequestration from grassland.

But the benefits of the project don't stop at carbon sequestration. The Soil.is solution is fully in line with AERIA's ESG (environmental, social and governance) strategies. From an environmental point of view, the participative selection of plant species with market gardeners means that fertilising, medicinal or slow-growing species can be favoured, thus limiting the need for chemical inputs and reducing mowing operations, particularly around overhead signalling infrastructures. Livestock effluent is also collected and recycled, preventing it from being discharged into the lagoon and feeding the production of agricultural compost. From an operational point of view, this solution offers tangible benefits: reduced erosion, less need to backfill runway edges, lower costs, etc. Emissions, and improve safety by limiting the exposure of maintenance staff in runway areas. Once the carbon credits have been certified, Soil.is should also enable the airport to offset more than 35% of its scopes 1 and 2 emissions, thereby reducing its purchases on the voluntary market.

The social impact of the project is also significant: over 200 market gardeners involved, more than 1,000 direct and indirect beneficiaries, training in agroecology, sustainable land management and waste recovery. The project is run in consultation with local communities (Figure 6), who co-design the solutions and reap the economic (fruit crops, beekeeping), nutritional and health benefits (medicinal species).

Soil.IS: A scalable model for the aviation sector

The promising results of the Soil.is project, as well as Abidjan airport's long-term commitment to sustainability, were highlighted at the "Airports Going Green" international conference in Chicago in November 2024. On this occasion, Mr. Aly Ouattara, as a keynote speaker underlined the strategic importance of the project for the airport operator**:**

"The implementation of Soil.is represents a significant advancement for Abidjan Airport. As a natural carbon sequestration solution, it serves as a set of strategies for mitigating and adapting to climate change. Furthermore, it reinforces the airport's commitment to sustainable practices and operations while preserving and enhancing biodiversity. This project also has a considerable social impact, fostering collaboration with local communities and contributing to the improvement of quality of life. Together, we cultivate a more sustainable future."

Conclusion

Beyond the case of Abidjan Airport, Soil.is is a scalable and replicable model for the aviation sector, perfectly in line with ICAO's vision of sustainability. **By integrating environmental protection into airport land-use planning, this nature-based solution offers an innovative framework for transforming underused land into a lever for climate mitigation and ecological regeneration.** Its flexible design means it can be adapted to a variety of climates, organic waste deposits, and social and ecological contexts. Partnerships between operators, researchers and local communities are at the heart of the model's success. Other airports can adopt this model to **enhance biodiversity by natural approach.**

FIGURE 6: Activities are managed with the support of local communities.