Biodiversity Conservation Initiatives at Airport's Level

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Introduction

Although the presence of wildlife at an airport surrounding and within its operational areas is a safety hazard and a well-known risk, airports are facing a growing challenge which is the balance between their construction and operation with the safeguard of natural ecosystems and biodiversity conservation under pressure by their activities.

Efforts to conserve biodiversity are essential to maintaining the "ecosystems services" as a foundation of all civilization, ensuring health, food, sustainable economies, and an adequate environmental quality for all living beings.

Growing demand for transport infrastructures such as airports are putting pressure into biodiversity in a number of ways, most commonly causing loss or degradation of natural habitats due to expansion and operation of such infrastructures. In addition, there are strong links between climate change, biodiversity loss and economic prosperity, which leads to changing business approaches in order to increase protection of natural capital, including the ecosystems as a provider of essential goods and services.

In this context, airports worldwide are finding ways to prevent biodiversity loss as a major sustainability challenge and incorporating such challenges into their business strategy, leading to stronger policies and enhanced projects that take into account biodiversity conservation. As such, this article provides examples of initiatives on airport-related biodiversity projects around the globe, indicating worldwide commitment to continuously support the biodiversity conservation in aviation.

Wetlands Conservation at Athens International Airport

In cooperation with the Hellenic Ornithological Society (HOS) and local authorities, Athens International Airport (AIA), located at the Mesogeia Plain, E. Attiki, has undertaken a project for the Preservation and Promotion of the Wetland of Vravrona (Site of Community Importance of the NATURA 2000 Network) since 2008, and the Wetland "Aliki" of Artemis (Priority A' Wetland for Conservation according to Regional Planning) since 2015. Both wetlands are located east of the Airport along the coastline of the South Evoikos Gulf, part of an important bird migration route, at distances of 3.3 km and 4.7 km for Vravrona and Artemis, respectively.

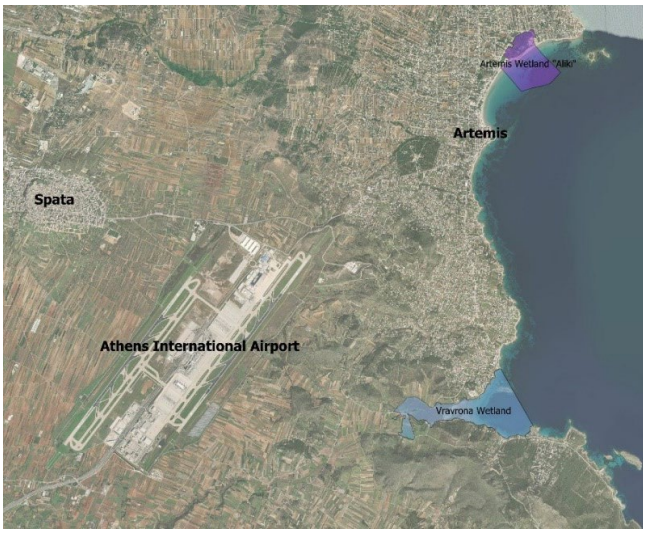

FIGURE 1: Athens International Airport and the adjacent wetlands

FIGURE 2: Wetland of Vravrona

FIGURE 3: Wetland "Aliki" of Artemis

The actions undertaken, mainly include:

- Removal of waste and other inert material and management of the aquatic vegetation to restore the proper function of the habitats;
- The construction and maintenance of walking paths, informative signs, and fences to facilitate year-round visits of the Wetlands;
- Guided tours for students of all ages, complemented by Environmental Educational presentations, and tours for the public, performed by HOS staff. Special events are also organized in honour of International Days celebrating the Environment, Biodiversity and Birds; and
- Monitoring bird populations and their activities at the wetlands.

These initiatives are aligned with AIA's strategy focusing on environmental sustainability, while also promoting aviation safety. The strategy includes, among others, the following pillars:

- Preservation of Biodiversity and Ecosystem Services;
- Mitigation of the impacts of Climate Change;
- Sustainable Wildlife Hazard Management for the mitigation of Wildlife Strike Risks to Aircraft; and
- Social Responsibility.

Further to the benefits mentioned above, Athens International Airport intends to continue its project to Preserve and Promote the Wetlands of Vravrona and Artemis, adjusting and improving the actions planned in order to address future challenges.

From Biodiversity Benchmark to Protecting Woodlands and Attenuating Floods: the Gatwick Airport Experience

In 2012 Gatwick Airport launched its Biodiversity Action Plan (BAP). The BAP was prepared to drive the protection and enhancement of 75 hectares of Gatwick's non-operational landholdings (Figure 4). These areas are collectively called Gatwick's biodiversity areas and are dedicated to wildlife conservation and the local community. A range of habitats are located in the biodiversity areas including ancient woodland, rivers, floodplain meadows, old hedgerows, scrub mosaic and wildlife ponds, and therefore provide habitat for a wide range of species including rare and threatened flora and fauna.

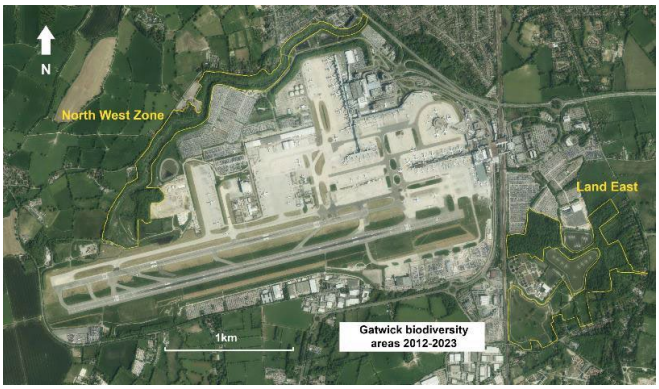

FIGURE 4: Gatwick Airports biodiversity areas

The BAP was initiated by Gatwick's Environmental Health and Safety Team in partnership with the grounds maintenance team and the Gatwick Greenspace Partnership (GGP). It provides a framework for managing our biodiversity areas to enhance their condition through

FIGURE 5: Invertebrate surveying in the North West Zone.

FIGURE 6: Nationally scarce Long-horned Bee on Gatwick's road verges.

setting improvement targets, scheduling actions and monitoring performance through a robust ecological monitoring programme. The BAP and its delivery are also aligned to The Wildlife Trusts Biodiversity Benchmark Standard which is designed to complement ISO 14001 and achieve continual biodiversity enhancement and protection. Gatwick Airport is proud to have retained this award for 8 consecutive years.

A critical element of the BAP is the biodiversity monitoring programme delivered by our Biodiversity Advisor, technical specialists, and community volunteers (Figure 5). In 2021 the monitoring programme involved 22 different survey methodologies, including bat, reptile, bird, invertebrate, mammal, fungi, and botanical surveys. The results of these surveys are fundamental to improving our understanding of the biodiversity areas and the species that rely on them. To date Gatwick has 35,570 biological records, comprising of 2,490 different species across our landholdings. This includes 74 rare, declining or protect species, including Great Crested Newt, several bat species, and the nationally scarce Long-horned Bee (Figure 6).

Community involvement in our biodiversity areas is another crucial element of our approach to biodiversity, ensuring the project is raising awareness about biodiversity with our staff (Figure 7) and with local community members (Figure 8). Educational events involve introducing local schools and colleges to wildlife conservation practices and visits from university students to witness conservation in action. In 2021 Gatwick held 58 volunteering and 15 educational events on our sites.

Surrounded by three main rivers including the River Mole, Crawters Brook and Gatwick Stream, Gatwick's biodiversity areas play a key role in safeguarding our airport operations by reducing flood risk potential through provision of flood storage capacity. Our Land East Zone flood attenuation field provides 186m^3 of storage capacity and our Northwest Zone provides floodplain meadows providing both biodiversity

FIGURE 7: Gatwick security staff volunteering in the woodlands

FIGURE 8: Community volunteers installing Dormouse boxes

benefit and reducing flood risk potential downstream of the airport.

Gatwick Airport is committed to protecting and enhancing biodiversity and has robust plans for building on our efforts thus far. In the short-term we are focused on progressing a wildflower road verge scheme to improve the connectivity and wildlife potential of our existing greenspaces. Further, we are also trialling biodiversity net gain methodologies enabling us to quantify the biodiversity performance of habitats while keeping in line with latest standards.

Biomonitoring with Bees and Reducing Pesticides at Aerodom

Aeropuertos Dominicanos Siglo XXI (Aerodom) has been part of the global airport platform VINCI Airports since April 2016. Aerodom manages and operates six airports in the Dominican Republic, under a concession contract granted by the State, which runs until 2030, and handles an annual average of 5 million passengers, with 76,610 aircraft movements. Through its airport network, 49 airlines connect the Dominican Republic with 63 cities in the world. One of the pillars of VINCI´s global environmental policy is *Preserving Natural Environments*, which means that throughout the operations, the airports must have as little impact as possible on natural environments and must develop solutions to conserve freshwater resources and restore ecological balance.

In 2019, all Aerodom´s airports eliminated the use of glyphosate-based herbicides which are known to affect honeybees and other beneficial insects´ survival, honey production, brood survival, and development, thus impacting the pollination of nearly three quarters of the plants that produce 90% of the world's food.

Biomonitoring with bees

Biomonitoring is an environmental assessment technique that determines the impact of pollution on the living part of the environment, unlike traditional methods that only assess the abiotic part of it (air, water, soil). This application on beekeeping has its first antecedents in the 1970s[1] and until now there have been many professionals who have investigated the subject. Bees are 1,000 times more sensitive to pollutants than other insects on their average travel of a 3km radius, and they accumulate air pollutants by electrostatics and with the help of their body hairs. These pollutants can be particles, pesticides, heavy metals, volatile organic compounds, among others, and help determine if these contaminants are attributed to the airport's operation or not, and how effective are the environmental management plans implemented.

FIGURE 9: Bees at Aerodom

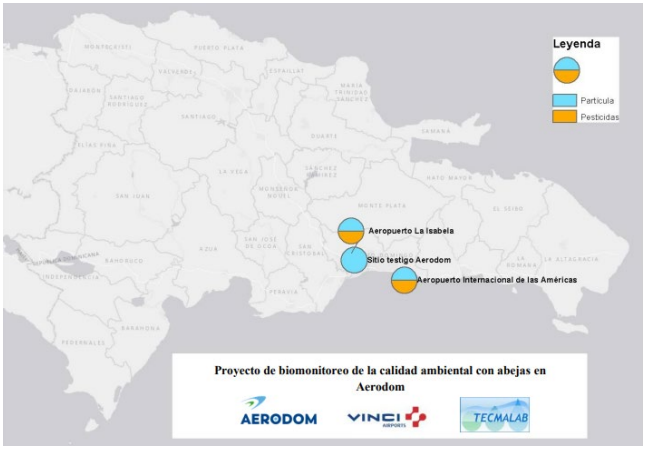

FIGURE 10: Environmental quality biomonitoring project of with bees at Aerodom

1 Tong et al, 1975. "Elemental analysis of honey as an indicator of pollution."

The management of hives intended for environmental monitoring allow a better observation of the bees' behavior and biological activity and the collection of data from samples of the wax, honey, pollen, propolis and the bee itself. At Aerodom, two biomonitoring stations with three beehives each were installed on Las Américas International Airport and La Isabela International Airport. Observations and data collection have been carried out at both stations and compared to the data on a "model hive," far from the airport sampling locations.

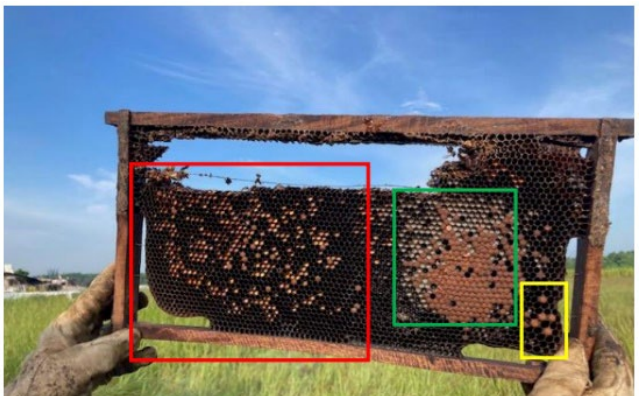

FIGURE 11: Monitored bee-hive at La Isabela Airport.

Quantitative/qualitative benefits

The monitoring of the urban and industrial environment requires increasingly expensive and complex techniques. Biomonitoring with bees is the only tool that allows the collection of qualitative and quantitative data on: (i) type of plant species present and their deficiency and impact on the whole ecosystem (biodiversity measurement tool) and (ii) the type, concentration, and impact of industrial pollution (pollution measurement tool). This is done over large areas, at a relatively low cost. Additionally, social programs can be implemented with local beekeepers for bee production and commercialization.

AERODOM´s goal is to be able to spread this biomonitoring program on all its airports, as it is already part of the National Observatory of Air Quality and provide valuable information on the environmental health of the ecosystems and allow targeted action to be taken, if necessary, by collaborating or communicating with the local community and evaluating the impact of the measures taken, with scientific indicators and figures.

Vancouver International Airport: A Salmon Safe Airport

Vancouver International Airport (YVR) is located on Sea Island, 25 square kilometres of low-lying land at the mouth of the Fraser River, and on the traditional, ancestral and unceded territory of the Musqueam people in Richmond, British Columbia, Canada.

In 2016, YVR became the first airport in the world to achieve Salmon-Safe certification. This certification acknowledges the ongoing efforts and commitment to transform land and water management practices in order to protect Fraser River water quality and enhance habitat so that Pacific salmon continue to thrive.

YVR's Environmental Management Plan sets out four strategic priorities; improve ecosystem health, achieve net zero carbon emissions by 2030, reduce potable water and increase the diversion of waste. While Salmon-Safe is focused on improving ecosystem health, it affects nearly all aspects of development and operation at YVR through improvements in environmental management and innovation.

To certify YVR, a team of independent Salmon-Safe experts conducted an assessment looking into stormwater management, water quality protection, landscaping practices, construction practices, chemical containment, and wildlife and pest management.

Key commitments include:

- Ensuring all development activities at YVR meet rigorous standards, including a commitment to zero sediment run-off from construction sites into waterways
- Conducting a comprehensive water quality monitoring program and operating a centralized and contained de-icing facility to protect water quality
- Undertaking a significant habitat restoration project on Sea Island in collaboration with the Musqueam Indian Band
- Managing over 530 hectares of land airside with use of minimal herbicides and pesticides through a zoned

FIGURE 12: Aerial view from Vancouver International Airport (YVR) and the Salmon-Safe certification.

FIGURE 13: View of water filtering bioswale at YVR.

approach and innovative grass management strategies to manage pests and control wildlife. Landscape management practices groundside include onsite nutrient cycling of organic matter through leaf recycling and sparse irrigation or use of fertilizer

- Building a public demonstration project to showcase the role of green infrastructure in stormwater management
- Reducing potable water consumption by using drought tolerant species as well rainwater harvesting for equipment washing.
- Supporting public education efforts that increase knowledge and understanding of the cultural, environmental, and economic importance of salmon to British Columbians, and the tangible connection between land-use, water quality and salmon health.

In 2021, YVR underwent an assessment of its Salmon-Safe program and successfully re-certified for the next five-year period. In recognition of the importance of indigenous ways of knowing, the Musqueam Indian Band was asked to review the salmon-safe standards prior to the evaluation and Salmon-Safe BC invited an Indigenous Assessor from Musqueam to be part of the Assessment Team, a first for a recertification process. Including indigenous knowledge in the assessment helped to inform the workplan for the next five years, strengthening our relationship with the Musqueam people and our commitment to reconciliation.

Over this next recertification period, YVR will continue to evolve our program specifically looking to complete our habitat restoration project, which was put on pause due to the impacts of the COVID 19 pandemic, exploring green stormwater infrastructure and green flood management w while encouraging our tenants to do the same, continuously improving our water quality and water conservation programs, ensuring native plants are chosen carefully to align with Musqueam historical use and knowledge that is site-specific and showcasing our environmental stewardship story within our Terminals.

Achieving and maintaining YVR's Salmon-Safe certification enables YVR to maintain the highest standards of conservation and stewardship on Sea Island while operating a world class sustainable hub airport.