

Enhancing Airport Sustainability: Exploring the Benefits and Challenges of Green Roofing

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Abstract

Airports, a vital component of global infrastructure, contribute significantly to global carbon emissions. This paper explores the use of green roofing to enhance airport sustainability, providing many benefits such as temperature regulation, energy efficiency and increasing biodiversity. However, they do pose a challenge unique to airports: the attraction of birds, increasing the risk of bird strikes. The implementation of effective bird deterrent strategies alongside green roofing is critical to achieving environmental benefits whilst maintaining aviation safety.

Keywords: *Sustainability; Biology; Environment; Green Roofing; Airports*

Introduction

Airports play a vital role in global infrastructure and in connecting all corners of the world but the aviation industry is responsible for a large proportion of CO₂ emissions. The UK is home to the world's largest aviation network, but this industry is responsible for producing 8% of the nation's total CO₂ emissions. Therefore, it is paramount that the aviation sector and airports take measures to reduce their carbon footprint and lower their effect of the environment to help the world combat climate change.

Many airports are already taking measures to reduce their carbon footprint, such as Gatwick Airport's *Second Decade of Change* plan [1] and Heathrow Airport's *Heathrow 2.0* plan [2]. This paper will review the positive impacts that the addition of green roofs (Figure 1) could have on the sustainability of airports and considers a potential problem that they could pose unique to airports – attracting birds.

Benefits of Green Roofing

Green roofing provides many benefits, not only for humans but also for the environment. Rooftop greenery has been shown to reduce local temperatures from between 0.6 – 1.3 °C making the surroundings more comfortable for people in hot weather [3]. Both rooftop and pedestrian level air temperatures are lowered through a combination of



Figure 1 – A green roof on a building [12].

shading provided by the vegetation and evapotranspiration [4]. The mediums for green roofing act as a great insulating layer, and so less energy is required to heat the buildings as less heat escapes. Therefore, they assist in reducing the energy consumption in two ways: reducing the need for air conditioning in hotter temperatures, and lowering the energy required to heat the building in cooler temperatures [5].

Not only do green roofs act as an insulating layer, but they have also been shown to extend roof life – with some lasting over 90 years without needing major repairs [6]. By protecting the rooftops from ultraviolet radiation and extreme weather conditions, they not only save money on repairs, but also result in less materials being needed on the reconstruction of the roof [7]. This results in less natural resources being used which can be used on

other projects elsewhere and saves them for future generations.

Green roofs consist of plants, commonly species of *Sedums*. They therefore improve the quality of the air in the environment surrounding the buildings by removing pollutants and particulates and absorbing CO₂ during photosynthesis [8]. This reduction in CO₂ can be used to offset emissions in other areas of the airport that have not yet been decarbonised, helping airport achieve net zero [4].

The two key components of biodiversity on green roofs are vegetation and invertebrates. These roofs can act as biodiverse islands which could act as a conservation ground for rarer species of insects. Alternatively, they could also become an extension of the habitat at ground level which will enable local species to roam a larger area [8].

Risk of Birds

Green roofs provide habitats for invertebrates, especially insects and spiders. As these rooftops become inhabited and enriched with these insects, they become optimal feeding grounds for birds. Aside from feeding grounds, green roofs can also attract birds such as gulls for nesting [9].

Unlike the utilisation of green roofing on domestic and other commercial buildings where birds may be seen as an inconvenience or nuisance, birds around an airport pose a great hazard to aircraft. Birds are responsible for many damages to aircraft resulting in financial expenses and endangering the lives of the passengers onboard the vehicle. In 2022, the Civil

Aviation Authority reported that there were 1432 reported incidents of bird strikes. Of these, Gulls were the most frequent bird species that were reported in bird strikes [10]. Therefore, it is vital that measures are put in place to deter birds and ensure that the new greenery does not result in birds being drawn towards the airport for feeding, nesting or other purposes.

Anti-bird methods to deter birds from the green roofs should be used alongside methods already utilised for other areas of the airport. Reflective strips, such as Mylar-tape, could be tied to the rooftops. These strips appear to frighten the birds when they reflect sunlight. Flashing lights could also be used to mimic the same effect. Spikes on ledges and netting can be used to make the green roofs less accessible to approaching birds. Audio repellents can also be utilised such as gas cannons and bioacoustics. Bioacoustics play recorded distress calls which the birds respond to as an alarm signal and fly away. However, birds occasionally fly towards to source to investigate the danger [11].

Conclusion

Green roofing provides an excellent opportunity to increase the sustainability of airports. Through decreasing energy requirements, saving natural resources, absorbing CO₂, and increasing habitat area and biodiversity green roofs provide many benefits, to both, nature and humans. Though they do pose a risk of attracting birds, these can be deterred through the implementation of deterrents on the rooftops and existing measures that the airport has in place.

References

- [1] London Gatwick (2024) *Sustainability*, London Gatwick Airport. Available at: <https://www.gatwickairport.com/company/sustainability.html> [Accessed: 13th February 2024]
- [2] Heathrow (2022) *Heathrow 2.0 sustainability strategy*, Heathrow. Available at: <https://www.heathrow.com/company/about-heathrow/heathrow-2-0-sustainability-strategy> [Accessed: 13th February 2024].
- [3] Humera, M. & Corrao, R. (2018) *Role of sky-gardens in improving energy performance of tall buildings*, Conference Proceedings, SER4SC (Seismic and Energy Renovation for Sustainable Cities). Available at: https://www.researchgate.net/publication/330385675_Role_of_Sky-gardens_in_Improving_Energy_Performance_of_Tall_Buildings [Accessed: 13th February 2024].

- [4] Li, Y., Du, H. & Sezer, C. (2022) *Sky gardens, public spaces and urban sustainability in dense cities: Shenzhen, hong kong and singapore*, Sustainability, 14(16). DOI: 10.3390/su14169824.
- [5] Oberndorfer, E., Lundholm, J., Bass, B., Coffman, R.R., Doshi, H., Dunnett, N., Gaffin, S., Köhler, M., Liu, K.K.Y & Rowe, B. (2007) *Green roofs as urban ecosystems: Ecological structures, functions, and services*, Bioscience, 57(10), pp. 823-833. Available at: 10.1641/B571005.
- [6] Köhler, M. (2003) *Plant survival research and biodiversity: Lessons from Europe*. First annual greening rooftops for sustainable communities conference, Awards and Trade show.
- [7] Richardson, J. (2023) *Green roof or sedum roof costs*. The Renewable Energy Hub UK. Available at: <https://www.renewableenergyhub.co.uk/main/green-roof-information/the-cost-of-green-roofs> [Accessed: 1st February 2024].
- [8] Davies, R., Simcock, R. & Toft, R. (2010) *Islands in the sky: Urban biodiversity enhancement in NZ on indigenous living roof landscapes*. The Architectural Science Association. Available at: <https://anzasca.net/paper/islands-in-the-sky-urban-biodiversity-enhancement-in-nz-on-indigenous-living-roof-landscapes/> [Accessed: 13th February 2024].
- [9] Civil Aviation Authority (2017) *Wildlife hazard management at aerodromes*. Civil Aviation Authority. Available at: <https://www.caa.co.uk/publication/download/13426> [Accessed: 11th March 2024].
- [10] Civil Aviation Authority (2023) *UK Reported Birdstrikes 2022*, Civil Aviation Authority. Available at: <https://www.caa.co.uk/media/xoqp1c4z/uk-reported-birdstrike-2022.pdf> [Accessed: 13th February 2024].
- [11] Desoky, A.E-A.S.S. (2014) *A Review of Bird Control Methods at Airports*, Global Journal of Science Frontier Research E, 14, pp. 41-50.
- [12] Judith. (2015) *Lalariche: Green roofs*, Lalariche, June. Available at: <https://lalariche.blogspot.com/2015/06/tejados-verdes-green-roofs.html> [Accessed: 13th February 2024].