

HEATHROW 2.0
**CARBON NEUTRAL
GROWTH ROADMAP**



Heathrow

FOREWORD

Climate change is the biggest threat of our age and at Heathrow we are determined to take a lead in addressing it. Not just by changing what we do, but by using our scale and reputation as one of the world's leading airports to change the way that our supply chain works and to change the way that airlines and airports around the world approach the challenge.

In 2017 we launched our plan for sustainable growth, Heathrow 2.0. The name of the plan demonstrates our commitment to meeting the goal of the Paris Agreement to tackle climate change and keep global warming well below 2 degrees. But as the Intergovernmental Panel on Climate Change's (IPCC) recent report showed, the clock is ticking, and the benefits of keeping within 1.5 degrees are huge so we need to look at how Heathrow and aviation can play our part.

The science tells us that a 1.5 degree world means 'net zero' emissions by the middle of this century. That will mean the transformation of every part of the world economy and aviation is no exception. I believe that we can decouple growth in aviation from growth in carbon emissions. And we can even start moving towards zero carbon aviation. Major aerospace firms are working on electric technology, and start-up companies are piling in. For longer haul flights liquid fuel will still be important, so the next step is to introduce sustainable aviation fuels. We know they work, we now need them at scale.

We will need the right carbon price to help drive these technologies. The UN's new offset scheme for growth in international flights from 2020, The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), is a huge step forward and one we're proud to have spearheaded. Aviation is not the enemy, carbon is. The challenge is to get carbon out of the global economy as quickly and cheaply as possible. It's right that, as well as significant investments to cut carbon in our own activities, part of the price of aviation growth is to pay for cuts in other industries and activities where they can be done more rapidly.

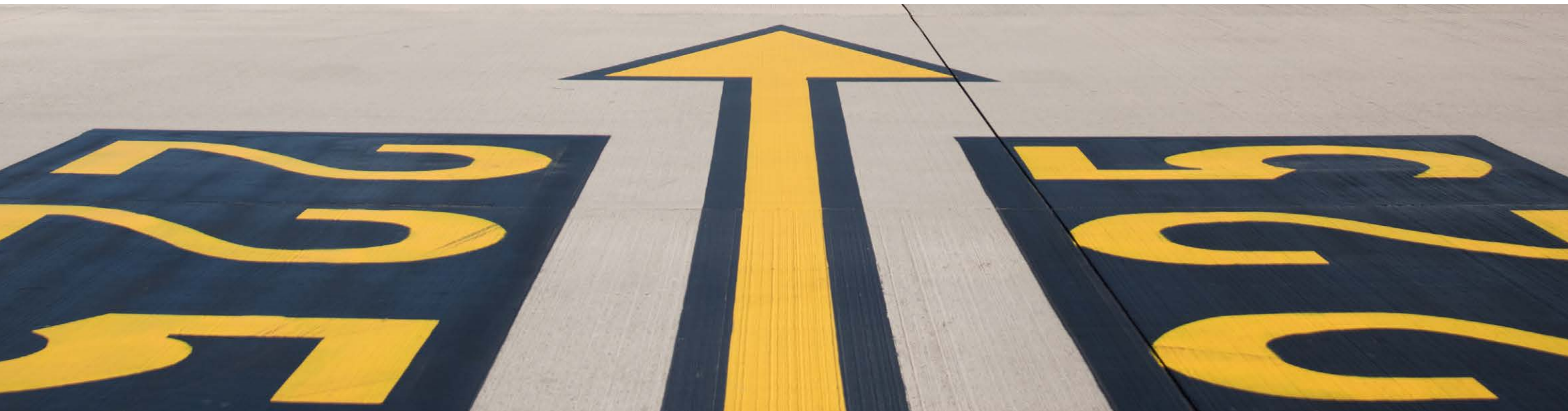
Looking to the future, the aviation sector has to play its part and I am determined that Heathrow will take a lead globally, by showing how it can be done by being an advocate for change. That's why this roadmap, setting out our approach for carbon neutral growth, is so important to our business. It won't be easy and we can't do it alone. Our plans are good, but we will need to keep improving. We don't have answers to everything – part of our leadership role is to pose

the difficult questions and work with our partners in the aviation sector and beyond to answer them. We will need critical friends to challenge us where they think we're not doing enough or where there are gaps. Changing an entire global industry to tackle climate change is no easy task. But by working together we can make the difference.



A handwritten signature in black ink that reads "John Holland-Kaye". The signature is written in a cursive, slightly slanted style.

John Holland-Kaye
Chief Executive,
Heathrow Airport Limited



INTRODUCTION

Climate change is the greatest challenge of our time.

The latest report by the IPCC sets out the benefits of limiting temperature rise to 1.5 degrees and the risks if we do not. That will require a transformation in the way we power the global economy. Aviation is currently an inherently carbon-intensive industry. It therefore has a central role to play in helping to meet this global challenge.

We published our plan for sustainable growth, Heathrow 2.0, in 2017. It sets out how we want Heathrow to be a great place to work and live, contribute to a thriving national and regional economy and to tackle the global issues – particularly climate change – that will help to preserve a world worth travelling.

In Heathrow 2.0 we announced our aspiration for growth from our new runway to be carbon neutral. This roadmap sets out our approach on how we plan to work towards that long-term aspiration.

As part of the development consent process for the new runway we will have to comply with the requirements of the Airports National Policy Statement in relation to carbon. This includes ensuring that expansion must not result in an increase in carbon emissions so significant that it would have a material impact on the ability of Government to meet its carbon reduction targets, including carbon budgets.

However, our long term aspiration looks beyond this requirement as we seek to deliver no net growth in emissions following expansion.

The vast majority of carbon associated with Heathrow today is a result of flights so this document focuses on the action that we can take there. The roadmap sets out the four core areas where we can use our scale to influence change:

- 1 Accelerating the arrival of new aircraft technology
- 2 Modernising airspace and making ground operations more efficient
- 3 Encouraging the production and take up of sustainable alternative fuels
- 4 Promoting the right carbon pricing to support innovation and developing best practice for offsetting in the UK

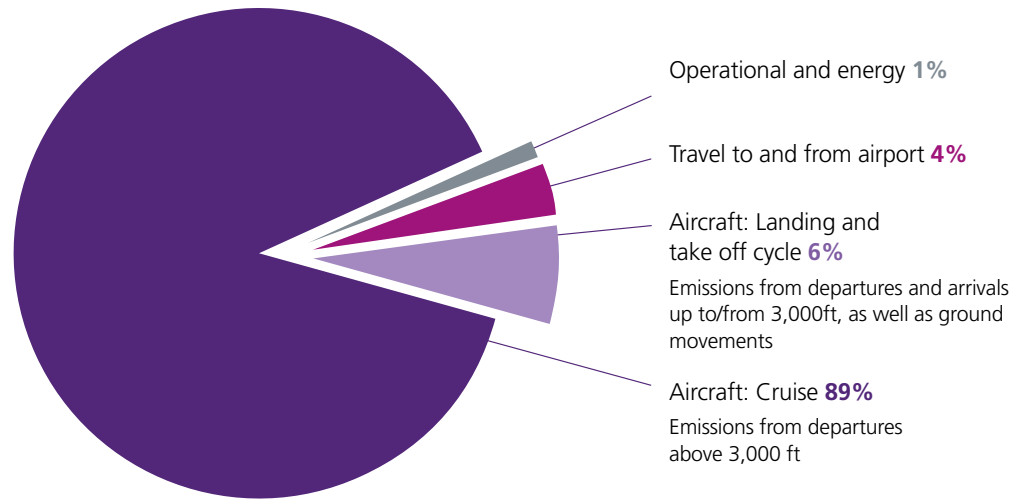
In addition to flights, this document also touches briefly on the steps we are taking to reduce energy use in our infrastructure, on ground travel to and from the airport and on 'embodied carbon', particularly in construction materials.

The Preliminary Environmental Information Report that will be published along with our statutory consultation in summer 2019 will take into account the potential for increased uptake of cleaner aircraft and biofuels, explain the benefits of a modernised airspace, and will set out the ways in which we intend to make ground operations associated with expansion more efficient.

This document is designed to explain our current thinking and act as a platform for engagement with stakeholders. It summarises important areas of ongoing research and preliminary technical analysis. It will evolve and develop as new insights and opportunities emerge.



OUR CARBON GOALS



Breakdown of carbon emissions from Heathrow in 2016

Goal definitions

Zero carbon airport infrastructure

Our goal is to be a zero-carbon airport by 2050 – generating no carbon from the energy used to run Heathrow.

Carbon neutral airport infrastructure

We're maximising renewable energy generation onsite and already purchase 100% renewable electricity for the entire airport since April 2017. In fact, Terminal 2 is now powered by entirely renewable means with roof-top solar, an onsite biomass centre using locally sourced forestry waste, and renewable gas alongside the green electricity we already purchase. For the rest of the airport, the residual use of natural gas alongside the remaining fossil-fuelled vehicles in our own fleet still produce some carbon – we'll be offsetting these emissions from 2020 as an interim measure, making the airport's energy use carbon neutral.

Carbon neutral growth from expansion

Our long-term aspiration is to make growth from the new runway carbon neutral. This would mean that growth in emissions from additional flights after expansion would be offset through carbon credits – resulting in no net growth in emissions. Our aspiration also applies to emissions from ground transportation for passengers and colleagues and the embodied carbon that would result from construction of our new runway.

Centre of Excellence

HEATHROW SUSTAINABILITY

This is a fast-paced agenda, with new technology, new policy, and new ideas emerging all the time. That's why we've set up our Heathrow Centre of Excellence for Sustainability. It has a role to research knowledge gaps and encourage and test innovation that can help to accelerate the arrival of sustainable flight.

Travel to and from the airport on the ground

Around 40% of passengers use public transport to get to Heathrow. The Airports National Policy Statement, approved by Parliament in June 2018, requires us to set out details of how we will increase that to 50% by 2030. With committed rail links to the high-speed network via Old Oak Common and to the western mainline via Slough in future, and with private companies developing links to the south, Heathrow will be much better integrated into the UK's rail network.

We've long supported the concept of 'the right mode for the right journey'. When city centre to city centre journeys by train fall to three to four hours, rail begins to compete with air travel for speed and convenience. Many cities in the UK are already within that distance of London, and with the introduction of HS2 more will be. However, many are further, including cities in Scotland and Northern Ireland where air will remain a convenient choice for a quick journey. In addition, many of those travelling from the UK to Heathrow by air are connecting to another flight, reflecting Heathrow's role as a hub. For example, over 70% of passengers on our flights to/from Manchester are connecting. For rail to be a

viable alternative for connecting passengers we need seamless and straightforward journeys to Heathrow by rail. We're committed to working with rail industry partners to achieve that.

We are exploring the incentives we can use, including charging, for people to use the cleanest vehicles when they travel to Heathrow. Projections show a massive increase in electric vehicles on our roads in future, with Transport for London predicting that 60% of all new vehicle sales in London could be electrically powered by 2030. At Heathrow we are exploring the incentives we can use, including charging, for people to use the cleanest vehicles when they travel to Heathrow.

Embodied carbon

Carbon associated with the creation of infrastructure is known as embodied carbon. For Heathrow expansion, this would include the third runway, buildings, and other assets. Measures such as maximising the use of low-carbon concrete mixes, minimising the use of carbon-intensive materials like aluminium, and using materials with recycled content help to make best use of resources over their life cycle and minimise embodied carbon. A Centre of Excellence study will be testing low-carbon concrete options during 2019.

COMPONENTS OF OUR CARBON NEUTRAL GROWTH ASPIRATION

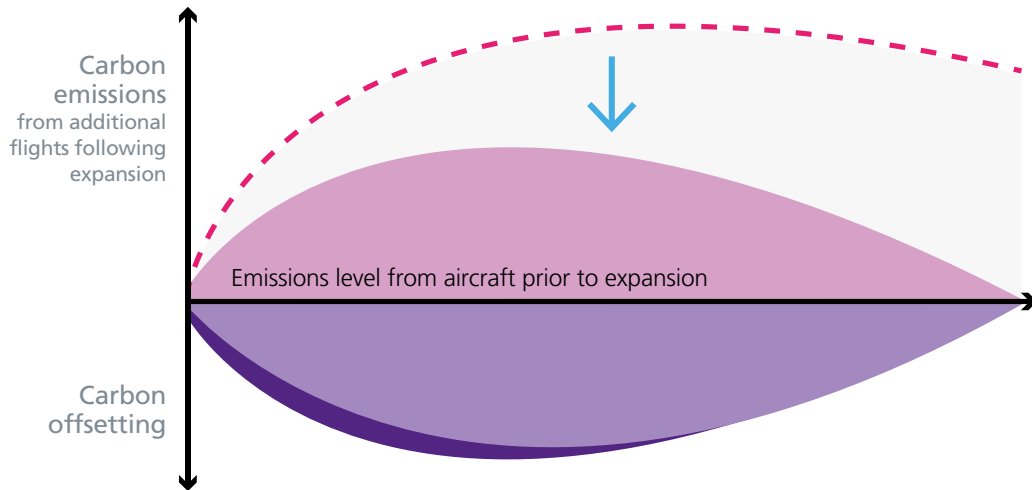


Following a historic agreement in 2016 at International Civil Aviation Organization (ICAO), the UN body for international aviation, the industry is working with governments to implement the world's first sector-wide market-based measure for offsetting the growth in international aviation emissions after 2020.

Our aspiration is to make growth from the new runway carbon neutral. This would mean that growth in emissions from additional flights after expansion would be offset through carbon credits – resulting in no net growth in emissions.

This figure illustrates the potential effect of the four core areas that could reduce and offset the growth in carbon emissions following expansion.

- - - Potential growth in emissions under 'Business as Usual' expansion
- ↓ Potential effect of cleaner aircraft, airspace and operational improvements, and sustainable aviation fuels
- Potential emissions under Heathrow's carbon neutral growth scenario
- Anticipated offsetting through CORSIA
- Additional offsetting not covered by CORSIA



Note: Figure not to scale, for illustrative purposes only

1

AIRCRAFT TECHNOLOGY

New aircraft entering the fleet today are much more fuel efficient thanks to hi-tech materials and new engines. For example, the new Boeing 787 Dreamliner typically emits 25% less carbon than the aircraft it replaces. The aviation industry's goal is to continue to improve the fuel efficiency of the global fleet of aircraft by

1.5% a year until 2020. Developments in electric and hybrid technology offer the potential for exciting breakthroughs, particularly for short-haul travel. easyJet has said that within the next decade it could be operating short-haul services of up to 300 miles using electric propulsion.

2

AIRSPACE AND OPERATIONS

The network of routes that aircraft follow in the skies above us is called 'airspace'. Much of the world's airspace was designed many years ago for older aircraft technology and is less efficient than it could be. In the UK for example, the Government has forecast that without airspace improvements flight delays of

more than half an hour could impact one in every 10 flights by 2020. Governments around the world have said that airspace needs to be modernised to take advantage of the satellite navigation technology that exists on modern aircraft and allows them to fly much more efficiently, lowering carbon emissions.

3

SUSTAINABLE FUELS

Sustainable aviation fuels – often derived from municipal, agricultural or industrial waste streams – provide an alternative to the traditional fossil fuels that power jet engines. They're a critical ingredient for the aviation industry in the UK and globally to reduce carbon emissions. More recently, the benefit of synthetic fuels based on a mixture of carbon dioxide and hydrogen has shown

increasing potential. Regardless of what type of alternative fuel is being considered, the challenge isn't in proving that they can work, it's about producing them commercially in the quantities needed to displace substantial quantities of conventional jet fuel without creating any unintended impacts on society and the environment.

4

CARBON PRICING AND OFFSETTING

There's a huge amount that aviation can do in-sector to cut carbon and that must be our focus for the long-term. But decarbonising aviation will take more time and be more expensive than for other sectors. In the short-term, aviation can help by investing with other sectors and activities that can reduce or capture

emissions where they can do it more cheaply and quickly. CORSIA, a global market-based measure for aviation has been agreed and will help deliver aviation's goal for carbon neutral growth from international flights after 2020 through the purchase of carbon credits from other sectors – so-called 'offsetting'.

AIRCRAFT TECHNOLOGY

1

OBJECTIVE

We want to become the world leader in incentivising next generation carbon-efficient aircraft.

HEATHROW'S ROLE

As a leading global hub, Heathrow already attracts the newest, quietest and cleanest planes in airline fleets today. We use our landing charges to provide further incentives – charging less for quieter, less polluting aircraft. As a result, less than 0.1% of movements at Heathrow are operated by aircraft in the highest international category for noise and we have more operations by the newest and most efficient aircraft – like the Boeing 787 – than any other major European airport.

As well as providing financial incentives, we also publish a quarterly 'Fly Quiet and Green' league table which publicly ranks the aircraft noise and local emissions performance of the top 50 airlines at Heathrow. In 2019 we'll review how to best extend the league table to incorporate carbon as well.

To help accelerate the arrival of the next generation of clean and quiet aircraft we will continue to use our influence to encourage the development and deployment of lower carbon aircraft and fuel. In our latest annual consultation on landing charges we asked for airline views on the next steps we should take. We also announced that the first electric aircraft to operate a commercially-viable flight from Heathrow will have a year's free landing, a prize worth up to £1 million.

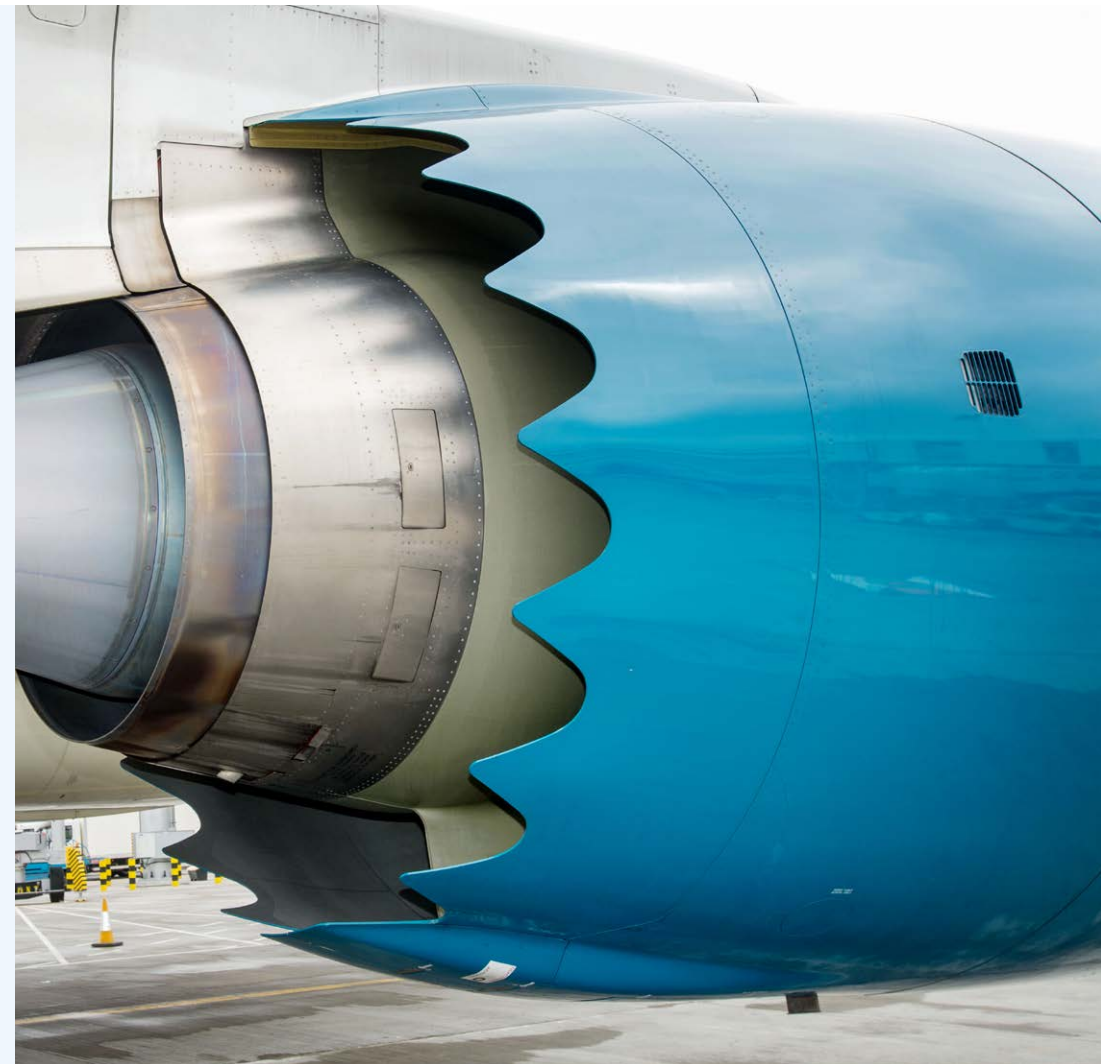
Through the Heathrow Centre of Excellence for Sustainability we will review the infrastructure requirements for charging electric aircraft at the airport. The prospect of electric flight has made radical developments in the last few years and there are a number of potential technologies being considered – we will review these to make sure that we've got the right charging infrastructure to support the first electric flight at Heathrow, and every one after that.

Environmental performance is a key consideration in the strategy for allocating slots when the airport expands. We will be working with stakeholders over the coming months to understand how we can best attract the quietest and cleanest aircraft possible.



HOW GOVERNMENT CAN HELP

The UK Government should continue to provide support for research and development into new aircraft technologies and set out policies to make the UK a world leader in electric propulsion.



AIRSPACE AND OPERATIONS

2

OBJECTIVE

We want to become the world leader in efficient airspace and low emission ground operations.



HOW GOVERNMENT CAN HELP

The UK Government should continue to actively drive forward the modernisation of airspace in the UK and in Europe.

HEATHROW'S ROLE

Heathrow is already the world's most efficient airport when you consider the number of flights we're able to operate with only two runways. We've invested in a number of tools to help us coordinate between all the organisations that help an aircraft run punctually, including airlines, ground handlers and air traffic controllers. We have started to consult on our plans to modernise airspace around Heathrow and intend to introduce those changes in conjunction with our new runway. We want to do it in a way that helps to reduce noise for local communities but also makes the airspace around Heathrow as efficient as possible for fuel and emissions. In January 2019 we will publish the second of three consultations on our future airspace.

We also want to reduce aircraft emissions as much possible on the ground. We already supply plug-in power on every stand and plug-in air-conditioning on over half of our stands – reducing the need for aircraft to keep their engines running while at the gate. We are in the process of testing and upgrading that equipment before we extend it across the whole airport in the future. Most airlines use efficient practices on the ground, like turning off one or more engines during taxiing to save fuel and emissions. We are working with NATS and airlines – and will continue to do so – to maximise these practices and their environmental benefits.

We are also looking forward to welcoming the first electric flight from Heathrow following our announcement of a year's free landing, a prize worth up to £1 million. To make sure that we can enable electric aircraft to operate at Heathrow we will be working closely with manufactures and the industry over the next year to understand the infrastructure that will be required to charge these future aircraft.



SUSTAINABLE FUELS

3

OBJECTIVE

We want Heathrow to be a leading hub for the development and deployment of sustainable aviation fuels.

HEATHROW'S ROLE

In 2008 a Virgin Atlantic 747 flew from Heathrow to Amsterdam with one of its four engines running on a 20% blend of biofuels – one of the very first flights in the world powered by sustainable fuels. Since then there have been significant developments with a range of different sustainable aviation fuels certified for use. The UK aviation industry has played a leading role, with Heathrow's two home-based carriers – Virgin Atlantic and British Airways – both investing in projects to convert waste to jet fuel. British Airways is working with Velocys on converting household waste, and Virgin Atlantic with Lanzatech on using waste industrial gases. In October this year, a Virgin Atlantic jet flew from America to the UK powered with the new fuel. The UK aviation industry is clear that the concerns over the potential adverse impacts from biofuels must be addressed and is actively supporting the Roundtable on Sustainable Biomaterials, a widely recognised organisation that has developed a feedstock-and technology-neutral global standard for sustainability.

Despite their potential, sustainable fuels are still more costly than traditional fossil fuels, which is why we welcomed the UK Government's decision in spring 2018 to extend financial incentives and support to sustainable aviation fuels through its 'Renewable Transport Fuels Obligation'. This change will help reduce the risk of investments in this area which are crucial to ensure it can be scaled up for wider industry use. The Government is also providing capital funding to support pilot projects en route to full scale production.

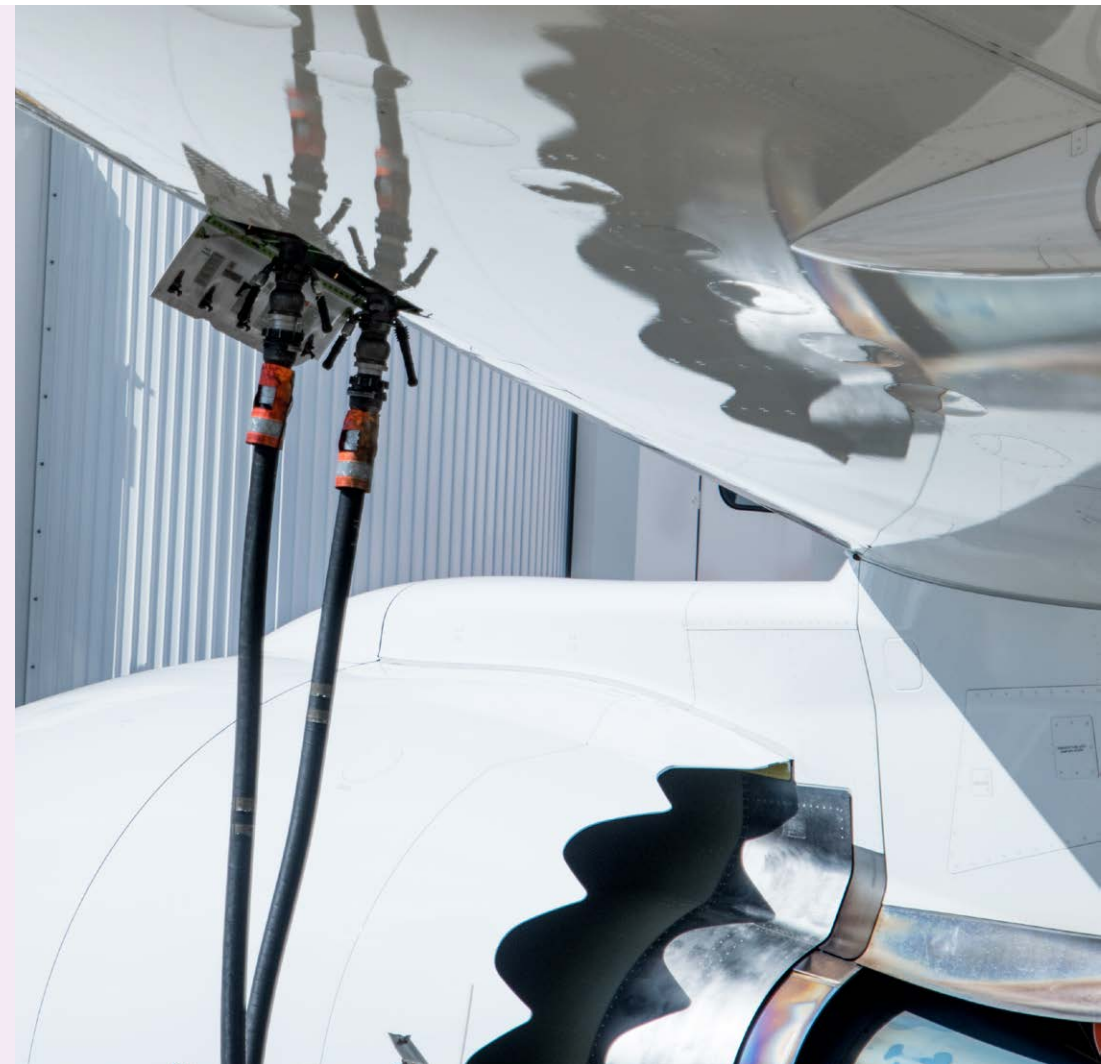
We are actively exploring the airport's role in supporting the development and use of sustainable fuels. We are providing in-kind support to the Virgin Atlantic and Lanzatech project, including ensuring that we can provide the right infrastructure to receive and distribute sustainable aviation fuels in our pipelines. That could play an important role as smaller deliveries of fuel arrive for mixing at the airport by rail or road in the early days of the market's development. We are consulting with airlines on the role that landing charges can play in incentivising uptake of sustainable fuels. We also want to explore with local authorities whether sites in the area around Heathrow could be suitable locations for sustainable fuel plants in the future.



HOW GOVERNMENT CAN HELP

The UK Government should continue to prioritise sustainable aviation fuels in the Renewable Transport Fuels Obligation and provide financial support for research and development.

ICAO should develop a roadmap that projects the uptake of sustainable fuels around the world, the policies needed to achieve this, and set global goals for uptake.



CARBON PRICING AND OFFSETTING

4

OBJECTIVE

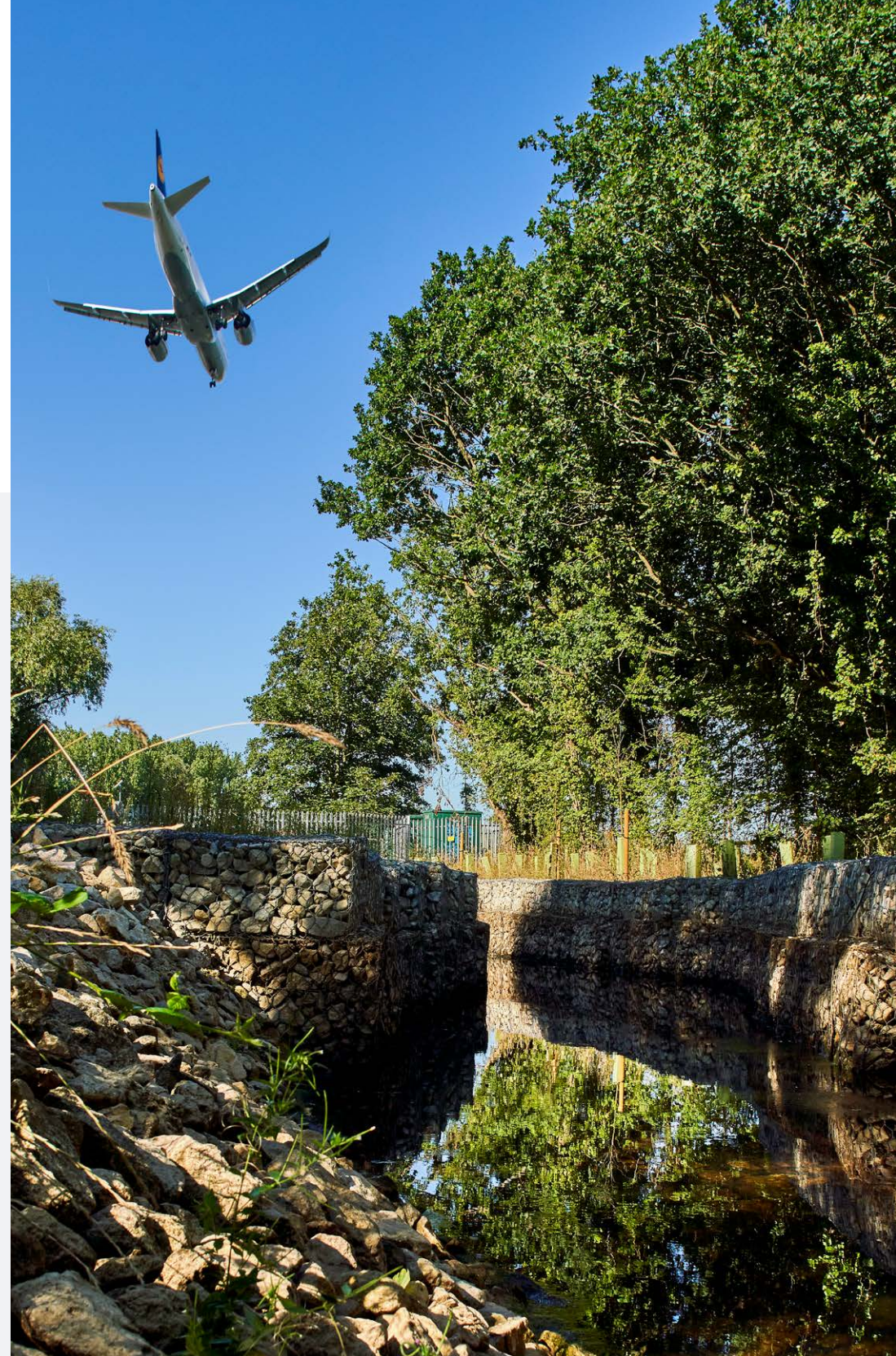
We want to promote the right carbon pricing to support innovation and play a lead role in developing the next generation of high quality UK carbon offset.

HEATHROW'S ROLE

We support the polluter pays principle, where individuals and companies pay for the external costs that their activities have on the environment. We have been a long-standing supporter of pricing carbon and believe the best way to do that is through an emissions trading scheme. That sets a cap on emissions and the market then finds the cheapest way to deliver the carbon cuts needed to meet the cap. There's a huge amount we can do within the aviation sector but we are also a relatively expensive sector to decarbonise, so in an emissions trading scheme aviation is a buyer of carbon credits. That has two outcomes. First, other sectors and activities that can cut carbon more cheaply can sell their credits to aviation, supporting their investment. Second, the price of carbon provides a further incentive to develop and use new technologies within the aviation sector.

In the early 2000s we were one of the first members of the aviation community to support the inclusion of flights in Europe's 'Emissions Trading System', which happened from 2012. In the late 2000s, with leading airlines and NGO, The Climate Group, we helped form the Aviation Global Deal initiative to promote a global carbon trading scheme. The UN has recently agreed the CORSIA scheme to help deliver aviation's goal for carbon neutral growth from international flights after 2020.

In 2008 aviation set a goal to halve net emissions by 2050. That represented the first time that an entire global sector had set a long-term climate goal. CORSIA is an important step towards delivering it. Since that goal was set, other sectors have developed their own plans: global shipping has set out to cut absolute emissions by 50% by 2050, for example. The latest assessments from the IPCC outline the need to reach net zero emissions globally by around the middle of this century. The aviation sector now needs to define what that scientific advice means for us. We want to work with our industry partners, the UK and other Governments and ICAO to define the right long-term goal for aviation, and the right package of measures to achieve it.



OFFSETTING CONTINUED

As part of our plan, we also want to play a lead role in developing the next generation of high quality, cost-effective carbon offsetting in the UK. We recently funded a project to restore 70 hectares of peatland in the north-west of the UK, in partnership with the Lancashire Wildlife Trust. Peatland covers over 10% of the UK but 80% of it is degraded and emitting carbon – around 16 million tonnes a year, which is a similar level emitted currently by flights from Heathrow. But it's also relatively easy to restore by blocking up drainage ditches and seeding the right kind of moss so it starts to accumulate again. Not only does that stop it emitting carbon, but over time it begins to sequester it too, as well as delivering other benefits – like more biodiversity and a lower risk of flooding downstream.

Our peatland pilot project will help us offset a portion of the emissions from Heathrow's own facilities to achieve our goal of carbon neutral infrastructure by 2020. But the real opportunity is to channel funding from international flights to deliver significant investment in high quality UK offsets. ICAO is shortly publishing the rules on which projects will be eligible under CORSIA. We will study those in detail and engage the UK Government and ICAO to make the case for UK peatland to be eligible.

We're also exploring with NGOs, other sectors and Government how we can support the development in the UK of a market for the ecosystem services that peatland and other habitats can provide. A market could enable the different benefits – carbon, biodiversity etc – to be 'stacked' in a way that lowers the cost and helps scale up investment and the speed of environmental improvements.

When we published Heathrow 2.0 we set out the aspiration for growth from our new runway to be carbon neutral. CORSIA comes into effect in 2021 and will become mandatory from 2026, meaning that growth in emissions above 2020 levels, representing close to 95% of our traffic following expansion, would be offset by the international scheme. But there will be some exceptions – such as flights to small island states and some of the world's least developed countries, for example. We want to close that gap and will engage with airlines and governments on steps we can take to achieve that, including voluntary agreements with carriers or financial incentives to drive sustainable operations.

Between them airlines and airports reach many millions of passengers, giving us a unique opportunity to communicate about climate change and engage individuals in the actions they can take. We want to engage with aviation industry partners in the UK and beyond on how to work together to make the most of this reach. This will include looking at voluntary offsetting by individuals and corporates, which can provide additional funding for carbon project investment and for investment in new technologies. Many airlines already offer voluntary schemes. Some airports do the same, like Swedish operator Swedavia's 'Fly Green Fund', which has created an investment fund for sustainable fuels. We think there's an opportunity to coordinate and scale industry efforts in this space.



HOW GOVERNMENT CAN HELP

The UK Government should continue to support the implementation of CORSIA and enable the development of a multi-sector market in UK land carbon credits.

The Government should engage ICAO and fellow member states to agree a 2050 goal for aviation emissions.



UK POLICY

The UK introduced Air Passenger Duty (APD) in the 1990s. It is charged on passengers flying internationally from the UK starting at £13 for an economy class passenger flying within Europe and rising to £468 for a premium class passenger flying long-haul. APD it is estimated to raise approximately £3 billion. Approximately £2 billion of this is derived from Heathrow's passengers, reflecting the significant percentage of long-haul travel at the airport. APD was originally introduced as an environmental charge. However, with a tax like APD, while the

cost is certain the environmental outcome is not. This is different from carbon trading where the environmental outcome is certain because a cap is agreed, but the cost can vary as the market finds the best way to deliver. In addition, none of the money raised by APD is 'hypothecated' and invested in environmental improvements in aviation. As an interim step towards the global carbon trading system we need, we are open to exploring with stakeholders how APD could be improved to help contribute to tackling climate change.

FAIR FLIGHTS

We need policies that reflect the environmental costs of carbon emissions in a passenger's ticket price. But we need to make sure that that doesn't mean the benefits of aviation are only available to those that can afford to pay more. We want to explore policies that price carbon while contributing to the goal of fair and equitable access to air travel for all.





Join the journey to carbon neutral growth



**Centre
of Excellence**
HEATHROW SUSTAINABILITY



SUSTAINABLE AVIATION
CLEANER | QUIETER | SMARTER

Get in touch

If you have questions, comments or would like to know more please contact:

- w [heathrow.com/sustainability](https://www.heathrow.com/sustainability)
- e sustainability@heathrow.com
- a [heathrow.com/apps](https://www.heathrow.com/apps)
- t twitter.com/yourHeathrow

[heathrow.com](https://www.heathrow.com)

© Heathrow Airport Limited 2018
NND 6985 1118

Heathrow