Trains over Planes:

Why the government should encourage domestic train travel

John Hobby

Intergenerational Foundation

The Intergenerational Foundation (www.if.org.uk) is an independent, non-party-political charity that exists to protect the rights of younger and future generations in British policy-making. While increasing longevity is to be welcomed, our changing national demographic and expectations of entitlement are placing increasingly heavy burdens on younger and future generations. From housing, health and education, to employment, taxation, pensions, voting, spending and environmental degradation, younger generations are under increasing pressure to maintain the intergenerational compact while losing out disproportionately to older, wealthier cohorts. IF questions this status quo, calling instead for sustainable long-term policies that are fair to all – the old, the young, and those to come.

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Foreword

We are in the midst of a climate and nature emergency. We cannot afford to continue damaging our environment. As a politician who has long called for net-zero carbon emissions by 2045, an end to most carbon emissions by 2030, and airport expansion to be halted until more environmentally-friendly fuels are available, I welcome this new paper from the non-party-political Intergenerational Foundation.

The public understand that flying harms the environment but they need policy support to help encourage them out of planes and onto trains. If the French can ban domestic flights with a rail equivalent so too can the United Kingdom.

We must do more to educate people that taking the train actually adds less than 30 minutes on to an average journey from city-centre to city-centre. When booked in advance, the train can actually be cheaper than the flight alternative if travel-to-airport costs are included. On environmental grounds, taking the train over planes could reduce CO2e emissions by half.

As domestic travellers, we can make better choices for our wallets, better choices for the environment, and better choices to protect future generations.

Wera Hobhouse, MP

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Executive summary

The UK needs to make significant efforts to decarbonise its transport network. A key part of this transition is to limit the scope and growth of UK-based aviation. This report argues that this drive should start with robust regulation of the domestic market.

While the sector represents a small proportion of the UK's total emissions, the UK domestic aviation market is a great opportunity to develop and trial emissions' reduction policies. Such policies could then be scaled up to global aviation in collaboration with international partners.

Travel by train is seven times more environmentally friendly than flying within Great Britain.

These environmental costs, however, are not reflected in ticket prices. Within the UK, subsidies and tax exemptions granted to the domestic aviation sector reduce the price of air fares below their true market price and social cost. Artificially cheap plane tickets incentivise people to travel by air rather than rail, to the detriment of the environment and future generations.

When the CO_2 and non-CO_2 impacts of aviation are accounted for, UK domestic aviation emitted 2.7 Mt of CO_2 equivalents (CO_2e) in 2019.

This is equivalent to the annual emissions of 1.7 million typical UK petrol cars or the gas and electricity use of 700,000 UK homes.

Of these emissions, 62% (1.7Mt CO_2e) are from routes served by rail alternatives, meaning over half of domestic aviation emissions could be eliminated by more use of trains.

The average flight within the UK emits 128kg of CO_2e. This is equivalent to driving 710km in a petrol car or washing a load of laundry at 40 degrees every two days for an entire year.

For two-thirds of passenger journeys within mainland Britain, taking the train instead of flying adds less than 30 minutes to the journey time from city-centre to city-centre. Almost a third of journeys are as fast or faster by train.

IF proposes the following policies to incorporate the environmental impact of aviation in tickets costs, reduce the demand for domestic flights and encourage a modal shift to rail travel where possible:

The government should ban domestic flights on routes that could be travelled by rail in 4.5 hours or less.

This would reduce CO_2e emissions by 885Kt, a 53% reduction in CO_2e emissions from domestic flights within Great Britain.

This is equivalent to removing 553,125 petrol cars from the road, the gas and electricity use of 221,250 UK households, decommissioning a coal power plant every 4 years or 14.6 million tree saplings grown for 10 years.

Affected routes would be only 14 minutes longer on average by rail than by air; and rail fares are of comparable price to flying when booked in advance.

The free permits received by the aviation industry in the UK ETS, which amounted to more than half of their total emissions in 2019, should be revoked.

The government should revoke tax breaks granted to the domestic aviation sector. If fuel duty were levied on aviation kerosene and Air Passenger Duty (APD) were replaced with VAT, HM Treasury would have earned £468m in 2019 that could have been invested in green projects. This would also reduce the demand for domestic air travel by 16% and emissions by 18%.

For routes with a rail alternative, the government should introduce incentives to travel by rail rather than flying in order to encourage a modal shift. This report recommends the introduction of a smart-ticketing system or a rail-miles scheme to reward rail travellers.

1. Introduction

While many countries have made legal commitments to reach net zero by 2050, the UK government plans to support 70% more airline passengers by the same year relative to 2019.[1] Aviation is the most environmentally harmful mode of transport and is notoriously hard to decarbonise as a sector, having missed 49 of the 50 decarbonisation targets it has set itself over the past 20 years.[2] As such, forecasts project that aviation will become one of the largest emitting sectors by 2050 if current trends continue. This means that other sectors will have to decarbonise faster than would otherwise be the case, increasing the costs of energy transition and threatening net zero commitments.

This is a fundamental incompatibility. The pathway towards a zero-carbon economy requires deliberate policy to limit the demand for air travel below its business-as-usual trend. Currently, within the UK, VAT and fuel duty exemptions awarded to the aviation sector have driven down the price of domestic flights to the extent that some estimates find that almost two-thirds of domestic flight tickets are cheaper than the rail alternative, making aviation artificially competitive against rail.[3]

This subsidisation of an environmentally harmful industry clearly violates the "polluter pays" principle that is central to the UK's Net Zero Strategy.[4] Subsidies keep air fares artificially low, inflating demand and allowing people to become accustomed to flights that are much cheaper than their true social cost, due to the unpriced costs of aviation emissions.

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[1] UK Government (2022) Department for Transport "Jet Zero Consultation: Summary of Responses and Government Response": https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1091862/jet-zero-consultation-summary-of-responses-and-government-response.pdf

[2] Beevor, J. and Alexander, K. (2022) Green Gumption & Possible: "Missed Targets: A Brief History of Aviation Climate Targets of the Early 21st Century": https://static1.squarespace.com/static/5d30896202a18c0001b49180/t/6273db16dcb32d309eaf126e/1651759897885/Missed-Targets-Report.pdf

[3] Lewis, D. and Clatworthy, B. (2019) The Times "Flights cheaper than trains for majority of long-distance UK trips London": https://www.thetimes.co.uk/article/flights-cheaper-than-trains-for-majority-of-long-distance-uk-trips-hfvzxbwtg

[4] UK Government (2021) BEIS: "Net Zero Strategy: Build Back Greener": https://www.gov.uk/government/publications/net-zero-strategy

On top of these pre-existing subsidies, vast sums were spent bailing out the aviation industry in the wake of the COVID-19 pandemic.[5] Instead of spending this money keeping airlines above water, IF believes that taxpayer money would be better spent developing a more sustainable transport system that is fairer to future generations.

However, the government's "Jet Zero Strategy" deliberately eschews any efforts to constrain demand, choosing instead to gamble our collective future on a range of speculative technologies and offsetting in order to decarbonise aviation by 2050. This approach ignores the unpriced social costs of flying and simply seeks to wish away the current trade-off between the size of the aviation sector and its environmental impact. The upcoming policy to halve the rate of Air Passenger Duty (APD) for domestic flights will further entrench this perverse financial incentive of flying and increase carbon lock-in.

This report argues that the government should stop extending such generous assistance to domestic aviation and instead aim to reduce the number of UK domestic flights. To assist this aim, the government should make every effort to get people out of planes and into trains.

IF believes that the UK government should immediately: reverse its decision to reduce APD for domestic flights; revoke the free permits awarded to airlines in the UK Emissions Trading Scheme (ETS); and begin charging fuel duty on aviation kerosene. The report also argues that the government could consider replacing APD with more progressive charges such as VAT or a frequent flier levy.

The UK's extensive rail network also offers a competitive alternative for many domestic routes within Great Britain. IF research finds that 60% of passengers taking domestic flights within the UK mainland could switch to rail with a total journey length only 30 minutes longer than by plane, with one-third of passengers experiencing journeys of roughly equal length or faster. As such, the government should consider a range of policies to incentivise rail travel over flying – particularly the introduction of a better smart-ticketing system and rail miles schemes. The report also considers the potential emissions reduction of a ban on domestic flights with a rail alternative under 4.5 hours; a measure that could cut total UK domestic aviation emissions by up to 33%.

[5] Transport & Environment (2022) "Bailout Tracker ": https://www.transportenvironment.org/challenges/planes/subsidies-in-aviation/bailout-tracker

2. The Jet Zero strategy and its flaws

On 19 June 2022, coincidentally the first time a temperature over 40°C was recorded in the British Isles, the UK government released its Jet Zero Strategy. The report is meant to address the rapidly growing emissions from the UK's aviation sector and make it net zero compliant. This review was an opportunity for the government to conduct a thorough analysis of the environmental impact of UK aviation and set out a rigorous plan to decarbonise our transport network. Instead, the review is reliant on overly optimistic assumptions, allowing it to not only reject meaningful demand management strategies but also to continue business as usual.

The strategy commits to all of UK aviation reaching net zero by 2050 and makes the further commitments that UK domestic aviation and UK airports will reach net zero by 2040. These aims are to be delivered by low-carbon aviation technologies, predominantly hydrogen and electric aircraft, SAF (sustainable aviation fuel) and GGR (greenhouse gas removal) technologies. The report commits public money to funding research and development (R&D) in these technologies and sketches out an industrial strategy to foster greater collaboration between government, industry and academia in attempt to increase innovation in these fields.

The Jet Zero Review imagines UK domestic aviation as integral to the UK's ambitions. The market is proposed as a trialling ground for low-carbon aviation innovations, which will then be rolled out to the rest of the world.

While the aims of the strategy are noble, its overly optimistic assumptions and outright rejection of demand management policies mean that the UK government is gambling our collective future on unproven technologies and optimistic assumptions.

One of the review's overly optimistic assumptions relates to the rate of efficiency gains on conventional aircraft. The report assumes aircraft efficiency will improve at 2% per year, which is predicted to account for 15% of total emissions reductions. This is significantly higher than estimates from other research, which suggest that a figure in the region of 1.4% per year is more appropriate. This does not sound like a large difference on the face of it, but amounts to a 10pp difference over a 30 year timespan.

The strategy is also heavily reliant on negative emissions and offsetting to account for any "residual" emissions, which currently account for 37% of emissions' reductions by 2050. Offsets are inaccurate, easily manipulated, inefficient and do not go far enough on intergenerational fairness grounds. A reliance on offsets will limit the industry's incentives to reduce in-sector aviation emissions and hinder the ability of the sector and public to make the necessary behavioural changes.

All of the proposed sustainable aviation technologies are either extremely expensive, close to impossible, very resource-intensive or would not actually reduce emissions: the weight of batteries makes electric planes unlikely to be viable over longer distances; hydrogen storage requires large volumes that may not be feasible to fit inside aeroplanes; SAFs still burn biomass and release emissions; and significant concerns exist over whether direct air carbon capture and storage is workable at large scales. There is therefore a high degree of uncertainty whether these promising innovations will be commercially viable by 2050.

A breakthrough in any or all of these technologies would certainly help UK aviation reach its net zero targets. However, IF believes that basing an entire national strategy on such unproven technologies is highly irresponsible. The approach should also accommodate for a lower-than-expected innovation scenario by limiting the growth in passenger demand, offering high-quality low carbon alternatives and adequately taxing aviation.

These overly optimistic assumptions lead the government report to conclude that the aviation industry can continue expanding without decarbonising, as future innovations will clean up the mess. This, subject to government calculations, completely negates the need for demand management policy.

The report also ignores the few measures we know, for certain, will reduce aviation emissions. There is no mention of limiting the growth of passenger numbers, instead the government plans a 70% increase in passengers by 2050. There is no mention of a modal shift from air to rail, even though rail travel is 5–10 times more environmentally friendly than air travel. There is no mention of taxing kerosene, so that its environmental impact is reflected in its price.

If the proposed risks do not pay off and new technologies are incapable of achieving a net zero compliant aviation sector by 2050, we will find ourselves in a similar, but worse, situation than we are now. Aviation will be a bigger, more important industry that makes up a larger share of global emissions. We will have needlessly emitted millions of tonnes of additional CO_2 emissions and will have much less time to deal with the problem.

IF believes that a transition to a sustainable transport network is impossible without some degree of demand management. As the Jet Zero report recognises, but falls short of fully appreciating, the UK domestic aviation market provides a great opportunity for trialling meaningful demand management policies, which could then be delivered to international aviation through international cooperation. This report offers a vision of what such demand management policy could include.

3. Reduce demand for domestic aviation

Instead of simply waiting for a technological panacea to arrive, IF believes that the government should also implement policy to limit the number of domestic flights. This section outlines: the environmental impact of aviation; the scale of UK domestic aviation and its total emissions; how aviation is taxed; and the effects of reforming how aviation emissions are priced.

3.1 Environmental impact of aviation

Aviation is among the most environmentally harmful modes of transportation. Figures from the Department for Business, Energy and Industrial Strategy (BEIS) estimate that aviation emits 133g of CO_2 per passenger per kilometre (ppkm).[6] The equivalent statistic for the average single-occupancy petrol car is 191g and Department for Transport (DfT) figures estimate that rail travel emits 35g CO_2 ppkm.[7]

On the surface, this suggests that aviation is around four times as polluting as rail travel but that travel by car within the UK is even more harmful. However, in addition to its CO_2 emissions, burning kerosene at high altitudes produces nitrogen and sulphur oxides, both potent greenhouse gases, and generates contrails that include cloudiness and increase the total heating effect of aviation through "radiative forcing".[8] Although these effects are relatively short-lived and subject to large uncertainties, they contribute significantly to the climate effects of aviation. When accounting for these factors, climate scientists estimate that the total effect of aviation on the climate is two to four times higher than the effects of CO_2 alone.[9] Much government analysis, including the Jet Zero strategy, does not adequately account for these non-CO_2 effects of aviation.

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[6] UK Government (2021) BEIS: "Greenhouse Gas Reporting Conversion Factors": https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2021

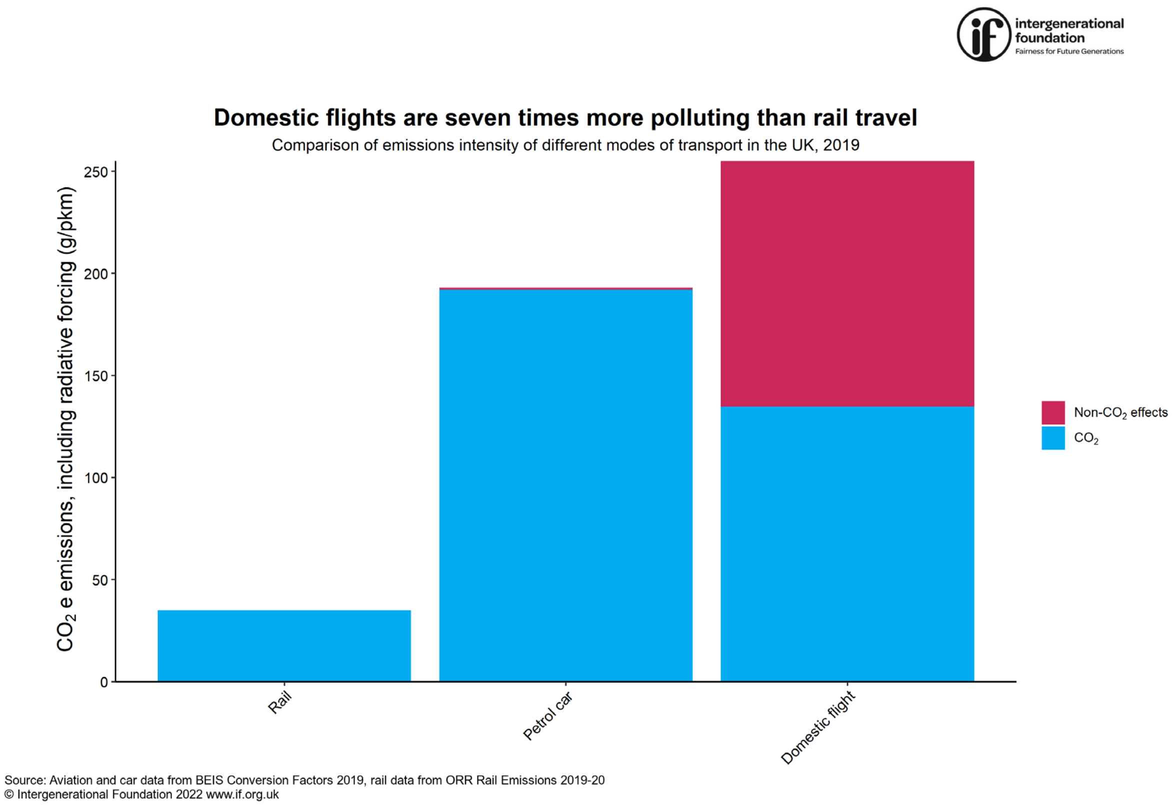
[7] Office of Rail and Road (2020): https://dataportal.orr.gov.uk/media/1843/rail-emissions-2019-20.pdf

[8] Klöwer, M. et al. (2021) Environmental Research Letters 16, no. 10: Quantifying Aviation's Contribution to Global Warming: https://iopscience.iop.org/article/10.1088/1748-9326/ac286e

[9] Scheelhaase, J. D. (2019) Journal of Air Transport Management 75: 'How to Regulate Aviation's Full Climate Impact as Intended by the EU Council from 2020 Onwards': https://doi.org/10.1016/j.jairtraman.2018.11.007

BEIS apply a conversion factor of 1.9 to the CO_2 emissions of air travel to reach final figures of 255g CO_2e ppkm for aviation, 192g for petrol cars and 35g for trains. As this conversion factor is standard practice for carbon accounting in the UK private sector, it is the factor used in this report.

Figure 1

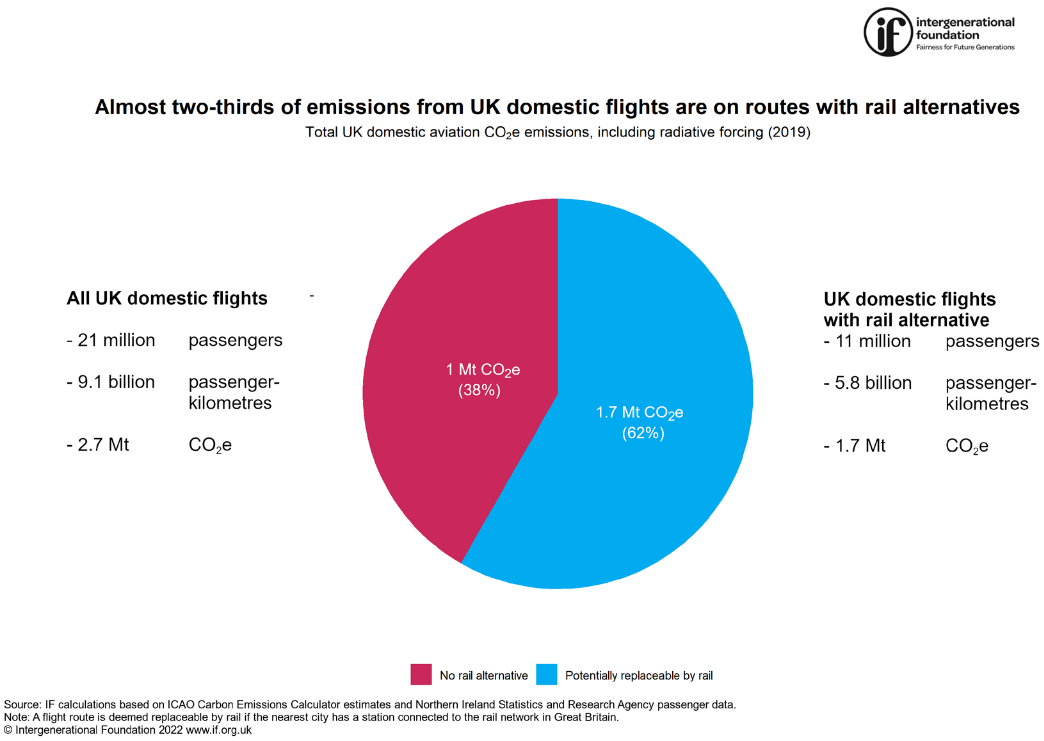


Short-haul flights are more emissions-intensive than longer routes due to the high energy intensity of the take-off and climb phase, which represents a higher proportion of the total journey for short-haul flights compared to longer distances. Due to the relatively small size of the UK, all domestic flight paths are determined to be short-haul, with the longest route (London Gatwick to Inverness) being 754km. Fortunately, the most inefficient short-haul flights are the ones that can be replaced most easily by alternative modes such as rail.[10]

[10] Baumeister, S. and Leung, A. (2021) Case Studies on Transport Policy 9, no.1: The Emissions Reduction Potential of Substituting Short-Haul Flights with Non-High-Speed Rail (NHSR): The Case of Finland: https://doi.org/10.1016/j.cstp.2020.07.001

The UK should therefore make every effort to reduce the number of inefficient short-haul flights and replace them with rail where possible. IF analysis shows that 62% of CO_2e emissions from UK domestic flights in 2019 were between cities linked by the rail network and are potentially replaceable by rail travel.

Figure 2



3.2 Tax treatment of aviation

The negative environmental effects of domestic aviation are not currently reflected in air fares due to successive government's favourable tax treatment of aviation, together with flaws in the UK ETS.

Fuel used for road transport is subject to fuel duty at 57.95p per litre[11] with VAT being levied at 20% on the after-tax price of fuel.[12]

[11] As of 23 March 2022 this has been subject to a 12 month reduction of 5p. As this measure is temporary, the full rate is used for analysis in this used in this report.

[12] UK Government (2022) Tax on Shopping and Services: https://www.gov.uk/tax-on-shopping/fuel-duty

Diesel used for passenger rail travel is zero-rated for VAT[13] but is subject to fuel duty of 11.14p per litre, the rebated gas oil (red diesel) rate.[14] Domestic airlines, by contrast, pay no fuel duty on kerosene (jet fuel) and tickets are zero-rated for VAT.

The only direct tax paid by the aviation sector is APD which currently stands at £13 per ticket for domestic flights,[15] a rate that is already significantly undertaxed and will be further reduced to £6.50 for domestic journeys in 2023.[16]

Airlines are required to partake in the UK ETS, but there are several flaws in the scheme that mean that UK domestic flights do not pay for all their environmental impacts. Primarily, UK airlines received almost half of their UK ETS carbon permits for free in 2019,[17] a clear contradiction of the polluter pays principle. Furthermore, the UK ETS only applies to the CO_2 emitted by airlines,[18] which, as outlined above, only represents around half of the environmental impact of aviation.

This under-taxation, together with flaws in the UK ETS, make domestic air fares artificially cheap, from both environmental and market competition perspectives. Tax exemptions make domestic aviation cheaper other modes of transport, allowing airlines to unfairly outcompete other transport modes, which has inflated demand.

Environmentally, the fact that the social costs of aviation are not paid by airlines creates a significant "negative externality". This leads to the emission of significantly more GHGs into the atmosphere than would be the case if airlines were forced to pay for the damage they cause. This regulatory treatment violates the "polluter pays" principle outlined in the UK's Net Zero Strategy, threatening the UK's obligations to future generations.

13 UK Government (2022) The VAT Treatment of Passenger Transport (VAT Notice 744A): https://www.gov.uk/guidance/the-vat-treatment-of-passenger-transport-notice-744a

14 UK Government (2022) Using Rebated Fuels in Vehicles and Machines (Excise Notice 75) from 1 April 2022: https://www.gov.uk/guidance/using-rebated-fuels-in-vehicles-and-machines-excise-notice-75-from-1-april-2022

15 UK Government (2022) Rates for Air Passenger Duty: https://www.gov.uk/guidance/rates-and-allowances-for-air-passenger-duty

16 Calder, S. (2021) The Independent: "Everything You Ever Wanted to Know Air Passenger Duty, the UK's Flight Tax ": https://www.independent.co.uk/travel/news-and-advice/air-passenger-duty-tax-flying-b1946375.html

17 UK Government (2022) "Developing the UK Emissions Trading Scheme (UK ETS)": https://www.gov.uk/government/consultations/developing-the-uk-emissions-trading-scheme-uk-ets

18 UK Government (2022) "UK Emissions Trading Scheme for Aviation: How to Comply": https://www.gov.uk/guidance/uk-emissions-trading-scheme-for-aviation-how-to-comply

The UK needs to radically reform its regulatory treatment of domestic aviation if it is to be net zero compliant. Policy here needs to achieve two distinct aims: to ensure that the social costs of aviation are fully reflected in air fares and to reduce demand for domestic flights to sustainable levels. These two aims should be met with different regulations in order to be fully effective.

Primarily, the government should revoke the free UK ETS permits received by the aviation sector. This would mean that UK airlines pay for the negative effects of CO_2 on the environment, which would be ultimately reflected in air fares.

Secondly, fuel duty should be levied on aviation kerosene used in domestic flights to reflect the non-CO_2 impacts of aviation. IF believes that this should be levied at the full rate of 57.95p per litre, as the non-CO_2 effects of aviation are almost as significant as single-occupancy petrol cars per passenger kilometre. Both measures would ensure that the full environmental impact of domestic aviation is paid for by airlines – "pricing-in" the social cost of emissions. These would pressure airlines to innovate in more sustainable practices, such as more efficient aircraft and sustainable aviation fuel, as well as raising prices that would dampen demand.

Finally, APD should be scrapped and replaced with VAT on domestic air fares, as is already in place in 23 EU countries.[19] This would further raise air fares and help to reduce demand to sustainable levels.

3.3 Effects of tax changes

This section analyses 2019 data on all UK domestic flights for the impacts of the proposed tax reforms on ticket prices, demand and emissions. The methodology and data sources are outlined in Appendix A. Table 1 shows the combined summary statistics for the constructed dataset.

The combined dataset for all UK domestic flights covers 125 routes between 34 cities. In 2019, just over 21 million passengers took UK domestic flights over an average distance of 436 km. The average CO_2e emissions per passenger for the analysed routes was calculated to be 128kg. This is equivalent to driving 710km in a single-occupancy petrol car or washing a load of laundry at 40 degrees every other day for a year.

[19] Murphy, A. (2019) Transport & Environment "Leaked Study Shows Aviation in Europe Undertaxed": https://www.transportenvironment.org/wp-content/uploads/2021/07/2019_05_Tax_report_briefing_web_0.pdf

Our estimate for total CO_2 emissions of UK domestic aviation in 2019 is 1.44 Mt, just 5% shy of the BEIS figure of 1.5Mt.[20] To account for the non-CO_2 impacts of aviation, this estimate is multiplied by 1.9 to give a total impact of 2.69Mt CO_2e of UK domestic aviation in 2019.[21]

This is a small percentage of the UK's total emissions but is equivalent to the annual CO_2 emissions of 1.7 million typical UK petrol cars[22] or the annual gas and electricity use of around 700,000 UK homes.[23] Assuming an average household size of 2.4 people, this is equivalent to the CO_2e emissions of the total household energy use of all the homes in Liverpool and Nottingham combined.

Table 1

Descriptive statistics relating to all domestic flights operating in the UK. Weighted average values by passenger flow

Analysed routes	125
Departure/arrival cities	34
Average Distance (km)	436.30
Passengers in 2019	21,397,990
Total CO_2 emissions (Mt)	1.44
Total CO_2e emissions (Mt)	2.74
Average CO_2 emissions (kg/leg)	67.36
Average CO_2e emissions (kg/leg)	128.00
Weighted average Fare (£)	97.08

The average fare is estimated to be £97.08, however for reasons outlined above this does not encompass the true social costs of air travel. The following section estimates the effects of applying a fairer system of taxation to aviation.

[20] UK Government (2019) "2019 UK Greenhouse Gas Emissions, Final Figures": https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/957887/2019_Final_greenhouse_gas_emissions_statistical_release.pdf
[21] BEIS do not apply a conversion factor for the non-CO_2 impacts of aviation at the national level.
[22] Based on 2019 Figures for the average distance driven per car, 11,800km, and average emissions per passenger kilometre for road transport of 138.4g ppkm. This comes to the average UK car emitting 1.6t CO_2 per year: https://www.nimblefins.co.uk/average-co2-emissions-car-uk#:~:text=Average%20CO2%20Emissions%20Per%20Car%20Per%20Year%20UK,into%20the%20atmosphere%20each%20year
[23] Based on 2014 average household energy use of 4 tonnes CO_2 per household per year: https://www.theccc.org.uk/wp-content/uploads/2016/07/5CB-Infographic-FINAL-.pdf

Using emissions data from the ICAO (International Civil Aviation Organisation) Carbon Calculator, IF estimates the average fuel used per passenger per leg on each route. IF analysis suggests that the average UK domestic flight would be liable to pay £15.44 in fuel duty if aviation kerosene were charged at the same rate as petrol for road travel, 57.95p per litre.

Removing APD and levying VAT on the final value of each ticket for each domestic route would raise fare prices by a further £19.90. As such, the total effect of removing APD and levying fuel duty and VAT on all domestic flights in the UK would have raised average ticket prices by £22.35 (23%).[24]

Without any changes to passenger numbers, this would have increased government revenue by £478m in 2019. In terms of total government revenue this is a relatively insignificant amount, but it could be ring-fenced to provide £9m per week for green investment in the rail network or low-carbon technologies.

As consumers respond to price changes, such policy would likely lower passenger demand. IF calculates that this taxation would cause air fares to rise by 23% on average, which would lower demand by up to 16%, according to DfT estimates of price elasticity of demand for domestic flights.[25] This reduction in demand would in turn have reduced CO_2e emissions by almost 500kT in 2019, a reduction of 18%.

3.4 Further considerations

It is beyond the scope of this report to consider the political feasibility of implementing such taxation. The report aims instead to lay out the need to incorporate the environmental costs of flying into aviation fares and to measure the impact this would have on passenger demand and emissions. Such policy would likely be contentious regarding the taxation of routes to islands and areas poorly served by train services. IF recognises the importance of connectivity as a vector of economic and social inclusion to such regions within the UK and that a trade-off exists between these factors and the need to reduce carbon emissions. Adjustments would certainly need to be made to ensure that otherwise isolated regions do not suffer disproportionately from aviation taxation.

[24] £22.35 = £15.44 + £19.90 - £13.00

[25] UK passenger forecasts assume a price elasticity of -0.7 for leisure travel and -0.2 for business. UK Government (Department for Transport 2011) "UK Aviation Forecasts": https://www.icao.int/environmental-protection/Documents/ActionPlan/UK_Forecasts_en.pdf

Such policy reform may also increase the incidence of “fuel tankering”, the practice of aircraft carrying more fuel than is required for a given journey in order to defer refuelling and avoid taxation. This extra onboard fuel adds additional weight to the aircraft and makes flights even more emissions intensive. Such concerns demonstrate that the regulation of aviation emissions needs to be a global project. However, by embracing such policy reform, the UK could be among the first movers in terms of the taxation of aviation fuel alongside EU plans to introduce kerosene taxation in 2023 onwards, an opportunity to show real climate leadership.

These considerations, however, do not alter the fundamental need to incorporate the social costs of flying into ticket prices in accordance with the “polluter pays” principle. Other policies would be required to complement such taxation in order to reduce the impact on isolated communities, such as investment in high-speed internet access to facilitate video conferencing.

4. Encouraging a modal shift

Figure 2 shows that over half of passengers taking domestic flights in 2019 and 62% of emissions were on routes within mainland Britain that are served by some form of rail alternative. Compared to travel by air, rail travel is much less environmentally harmful, with academic estimates suggesting that rail travel is 5-10 times less emissions intensive than flying.[26] As outlined above, when the non-CO_2 effects of aviation are considered, travel by rail within the UK is 7 times less harmful than air travel. IF therefore believes that the UK government should also consider policies to induce a shift from planes to trains on routes served by a rail alternative.

4.1 Factors influencing a shift from air to rail

Many studies have been conducted on the substitutability between rail and air transport, from both market competition and, more recently, environmental perspectives. Journey time, distance and the relative prices of air and rail travel have been identified as the key determinants of how competitive rail travel is against aviation.

Travel time is consistently found to be the strongest determinant of substitutability between air and rail travel.[27] Many studies show that rail's market share, a metric for competitiveness, falls as the difference between rail and air travel time increases.[28] A report produced for the European Commission finds that scheduled journey time can explain 84% of the variation in market share between routes.[29]

Distance, a factor closely related to travel time, is found to be another consistent determinant of the substitutability between air and rail on a given route.

[26] Bleijenberg, A. (Transport & Environment, 2020) "Air2Rail: Reducing CO_2 from Intra-European Aviation by a Modal Shift from Air to Rail": https://www.transportenvironment.org/wp-content/uploads/2021/07/2020_03_Air2Rail_Koios_strategy_rev.pdf

[27] Dobruszkes, F. Dehon, C. and Givoni, M. (2014) Transportation Research Part A: Policy and Practice 69: "Does European High-Speed Rail Affect the Current Level of Air Services? An EU-Wide Analysis": https://doi.org/10.1016/j.tra.2014.09.004

[28] Fröidh, O. (2008) Journal of Transport Geography 16, No. 4: "Perspectives for a Future High-Speed Train in the Swedish Domestic Travel Market": https://doi.org/10.1016/j.jtrangeo.2007.09.005

[29] Steer Davies Gleave. (2006) "Air and Rail Competition and Complementarity Final Report": https://kipdf.com/air-and-rail-competition-and-complementarity_5acda0b37f8b9af1698b45d0.html

High-speed rail (HSR) can compete well with air travel for journeys up to 500km, moderately for journeys between 500-1000km and to a limited extend for journeys over 1000km.[30] The UK, however, currently has limited dedicated HSR infrastructure and can only run trains at over 200km/h on a few upgraded conventional rail lines.

Fortunately, a Finnish study suggests that non-high-speed rail can compete with air travel for distances up to 400km.[31] This suggests that the UK's current rail infrastructure could compete with aviation on a large proportion of routes, as Table 2 shows the average flight within Great Britain is 517 km in length.

The relative prices of air and rail fares are another determinant of the market share on a given route. As rail and air travel are substitute services, expensive air fares tend to increase demand for train tickets and vice versa. DfT estimates that the own-price elasticity[32] for UK domestic aviation at -0.7 for leisure and -0.2 for business. This means that a 10% decrease in the price of a flight will cause demand to rise by 7% for leisure travellers. This shows that travellers, especially for leisure, are price sensitive and will change their behaviour based on price incentives. Cheap plane tickets therefore incentivise people to travel by air rather than rail, to the detriment of the environment and future generations.

These academic findings are reflected in surveys, Eurobarometer data shows that most travellers would be willing to switch to more environmentally friendly transport modes if costs and speed were comparable.[33]

Capacity must also be considered when determining the UK's capacity to switch from planes to trains. In 2019, 215,000 passengers travelled by air per week within Great Britain, which Figure 4 shows is primarily on intercity routes. DfT statistics show that the UK rail network is already significantly over capacity on many major routes so accommodating these additional passengers would therefore likely require investment to improve the frequency on the busiest services.[34]

[30] Op.cit.
[31] Op. cit.
[32] The percentage change in demand for air travel for a 1 percent change in the price of flight tickets.
[33] Eurobarometer (2020) "Mobility and Transport - July 2020 Eurobarometer Survey": https://europa.eu/eurobarometer/surveys/detail/2226
[34] UK Government (DfT, 2020) "Rail Passenger Numbers and Crowding on Weekdays in Major Cities in England and Wales: 2019": https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/921331/rail-passengers-crowding-2019.pdf

4.2 Analysis of potential for substitution within GB

This section analyses which air routes are potentially substitutable for rail within mainland Britain. Travel time is used as the primary measure of comparison, as it is found to be the most robust measure of substitutability between transport modes.[35] This report uses a city-centre to city-centre (centroid) approach, the methodology and data sources for which are outlined in appendix B. Table 2 presents the summary statistics of the constructed mainland dataset.

Despite shorter in-vehicle times for air travel, airports are typically further from city centres than train stations, meaning air travel typically includes longer idle times at travel terminals. A centroid approach is chosen to account for the fact that total journey times are often much more comparable than in-vehicle times suggest.

One weakness of a centroid approach is an inability to account for passengers taking connection flights due to a lack of available data. Rail is often less competitive against air travel for transfer passengers for the exact reasons outlined above, passengers must transfer from distant airports to make their connecting trains. However, connecting flights are assumed to be a small proportion of UK domestic flights.

4.2.1 Time comparison

While Table 2 shows that the weighted average in-vehicle time is around 3.5 hours (216 minutes) shorter by air than the equivalent journey by rail, this figure is an inaccurate representation of the total travel time due to the significantly longer time spent outside of the main transport mode for air travel. Taking data from a 2019 study of German domestic travel, the average out-of-vehicle waiting time is 1.5 hours (95 minutes) shorter by rail, due to the increased time taken to pass through security, navigate the airport and collect luggage for air travel. IF analysis also shows that terminal access and egress time is also 25 minutes shorter for rail journeys on average.

[35] Avogadro, N. et al. (2021) Transport Policy 114: “Replacing Short-Medium Haul Intra-European Flights with High-Speed Rail: Impact on CO_2 Emissions and Regional Accessibility”: https://doi.org/10.1016/j.tranpol.2021.08.014

Overall, this means that centroid journey times are much more favourable to rail than in-vehicle times would suggest. The weighted average centroid journey is only 1 hour longer by train than by plane.

When accounting for travel time from city centre to city centre, 34% of passengers would experience no significant increase to their travel time, while traveling by train would add less than 30 minutes of travel time for 61% of passengers. With a level playing field, this suggests that around a third of passengers would experience no significant delay or reduce their total journey time by switching from rail and almost two-thirds of passengers would experience only a minor delay of 30 minutes or less.

Table 2

Summary statistics for flights within Great Britain		Air journey	Rail journey
Analysed routes	**48**		
Departure/arrival cities	**18**		
Average Distance (km)	**516.5**		
Passengers in 2019	**11,327,080**		
Average in-vehicle time (minutes)		85.1	299.7
Average access time (sum of access and egress time, minutes)		77.6	45*
Average waiting time (sum of departure wait and transfer, minutes)		157*	32*
Average centre-centre time		5h 19m	6hrs 16m
Average Fare (ticket, £)		123.3	127.2
Average Advance Fare (ticket, £)		65.2	59.7
Average Terminal Access Cost (access and egress, £)		13.3	5.0
Total CO_2e emissions, including radiative forcing (kT)		1,661.0	201.3
Average Emissions per leg, inc. radiative forcing (kg CO_2e/pax)		164.3	18.0**

* Data taken from Sauter-Servaes et al. (2019)

** Estimates based on DfT emissions estimate of 35g ppkm

4.2.2 Price comparison

Public perceptions suggest that travel by plane is significantly cheaper than making the same journey by rail. However, that is a general misconception since people tend to fail to consider the cost of travel to and from the airport and comparisons drawn between different categories of tickets. IF analysis shows that when comparing a plane ticket booked one month in advance with a walk-on rail fare on the same route, rail travel is £62 more expensive on average, almost twice the price.

However, this is obviously not a fair comparison. This price gulf is significantly reduced to just £4 on average when comparing the prices for both journeys booked the next day. When comparing fares booked in advance, train tickets are found to be around £6 cheaper than the flight alternative and under half the walk-on price. This large discrepancy between advance and walk-on fares suggests that significant benefits could be delivered to rail travellers through the introduction of better smart-ticketing systems and load management.

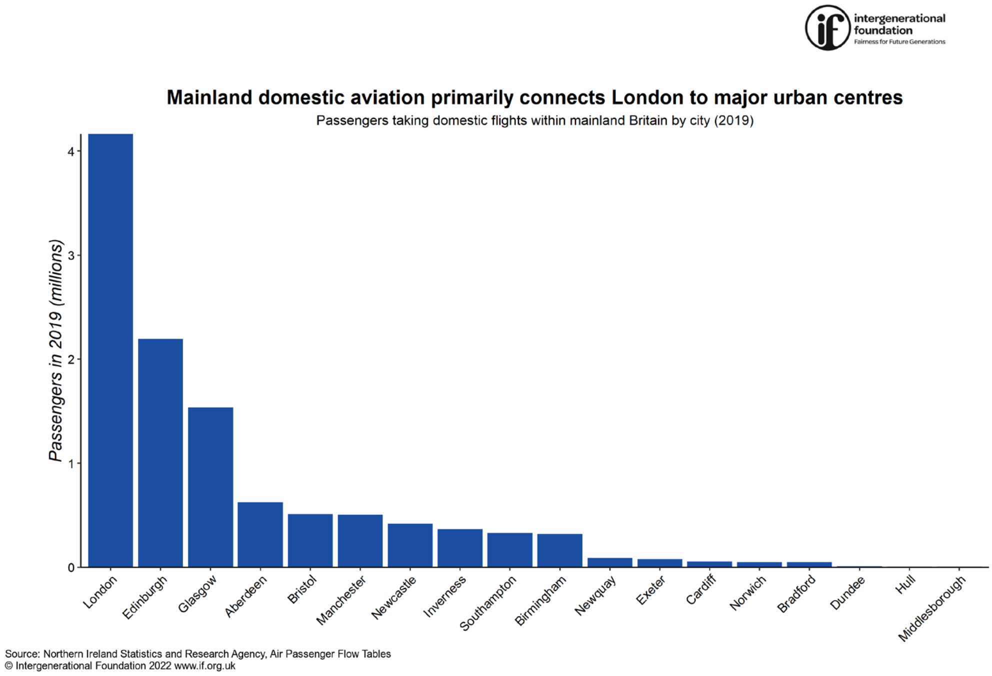
Many such comparisons also fail to consider that the price of reaching and transferring from airport terminals is often significantly higher than travel to train stations, which can often be reached on cheap public transport or on foot. IF estimates that access costs to and from airports are around £8 more expensive than accessing the train station that serves the equivalent rail journey.

Overall, our analysis suggests that with a level playing field between air and rail transport, the average travel costs are relatively comparable between the two modes.

4.2.3 Key routes/airports

Not all airports and routes see the same amount of traffic each year. In order to effectively reduce emissions, it is important to determine which routes and airports are used most. Figure 3 shows which cities saw the highest volume of domestic passengers in 2019.

Figure 3



London's six airports saw by far the most domestic air traffic in 2019, serving over 4 million passengers that year. Cities of Scotland's Central Belt (Edinburgh and Glasgow) are the next most-used by domestic flyers, followed by England's major urban centres (Manchester, Bristol, Newcastle, Southampton and Birmingham) and those in North Scotland (Inverness and Aberdeen). This, along with Figure 4, demonstrates that domestic aviation primarily serves to connect London to major urban centres. While its environmental costs are dispersed evenly, the benefits of domestic aviation are obviously concentrated. Eight of the ten cities with most air traffic each have excellent train connections, suggesting that most air routes to these cities could feasibly be replaced by rail.

Figure 4

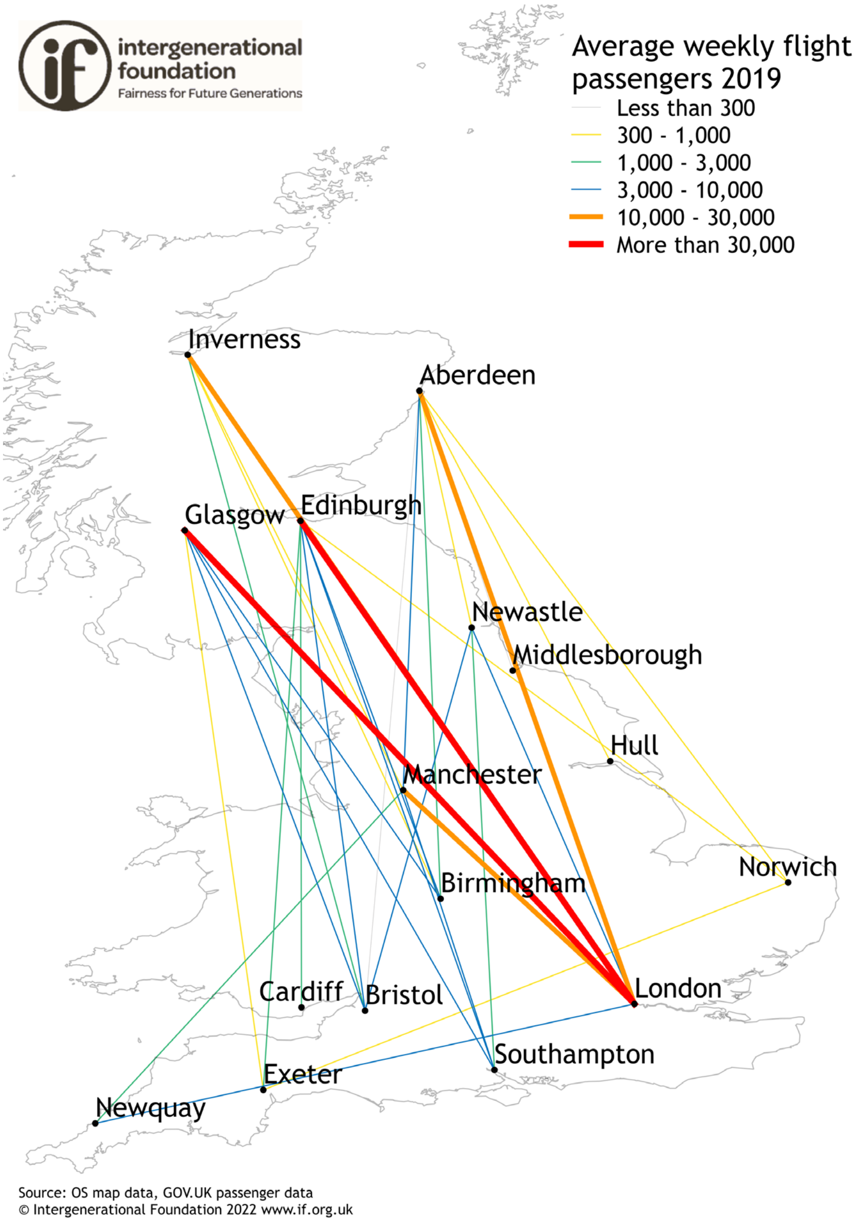
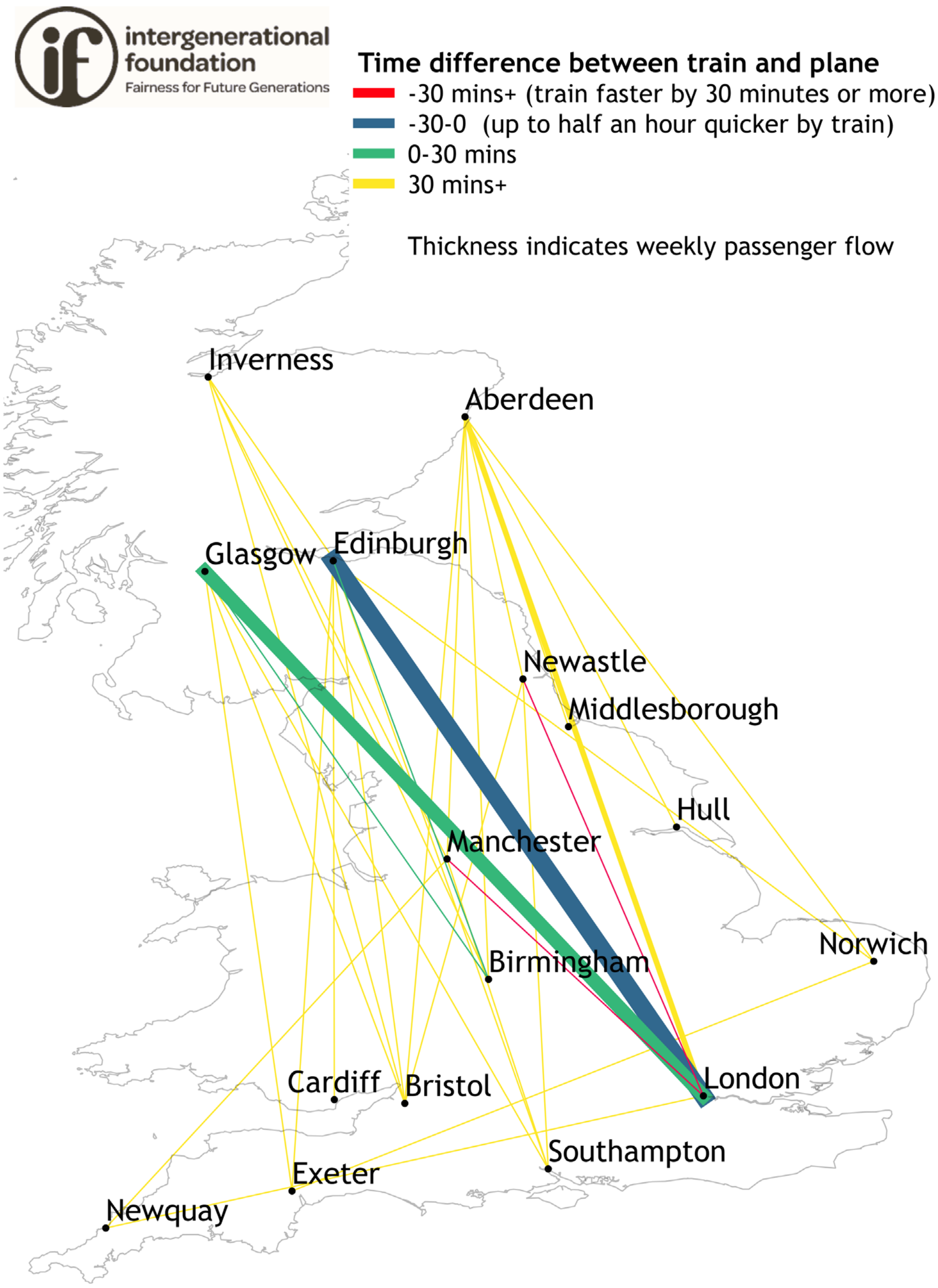


Table 3 presents statistics for the 10 most popular domestic routes within Great Britain. These 10 routes represent 81% of passengers and 77% of emissions for domestic flights within Great Britain. Most of these journeys are around 500km in length, suggesting Britain's conventional rail can offer competitive alternatives on many routes. The vast majority of these routes have good train services with many trains per day, often more than the number of flights per day, meaning that a modal shift to rail offers customers more flexibility. Focusing on these key routes would therefore be the most efficient way to reduce domestic aviation emissions in the UK without excessive costs to travellers, and in some cases even delivering benefits.

Figure 5



Source: OS map data, GOV.UK passenger flow data, Trainline.com train times, Google Flights flight data

Of the 10 most-used routes, 6 are calculated to be less than 20 minutes longer from city centre to city centre. IF analysis therefore suggests that 7 million passengers could have travelled by rail instead of air in 2019 with only minor additions to their journey time. If this complete modal shift to rail were to happen on these six routes, it would reduce total UK domestic aviation emissions by 30%, 827Kt CO_2e.

Table 3

Ten most used flight routes within mainland Britain

Route	Distance (km)	Weekly air flow (2019)	Daily direct trains (each direction)	Daily flights (each direction)	Route CO_2e in 2019 (kT)	Time diff. (mins)	Price diff. (£)	CO_2e saved by modal shift (kT)
LON-EDI	530	64,280	57	23	459	-3	47.90	396
LON-GLA	549	44,100	28	22	337	19	-9.15	293
LON-ABZ	641	14,995	7	7	127	155	-27.00	110
LON-INV	750	10,554	5	6	75	205	109.25	65
LON-MAN	254	10,506	63	6	47	-114	-42.45	42
LON-NCL	398	8,864	48	5	54	-86	-47.40	47
BRS-EDI	502	7,652	12	4	54	151	73.70	47
BRS-GLA	503	6,249	2	4	43	235	60.10	37
BHX-EDI	395	5,036	38	2	30	15	13.30	26
BHX-GLA	406	4,387	6	3	27	20	8.90	23

As many of these routes are comparable in terms of total journey time, policies should be implemented to encourage rail travel, such as:

- The introduction of rail miles programmes - whether travelling for business or leisure, passengers could earn and claim 'Rail Miles', which could be redeemed for discounted travel, on-board refreshments or upgrades. This will help encourage a shift from planes to trains and encourage and reward passenger loyalty.
- A simpler, more transparent ticketing system to help people get better deals on train tickets – as promised in the Williams-Shapps plan for rail. Better load management planning could help to lower the gap between advance and walk-on fares and would make travelling by train more competitive against air travel.

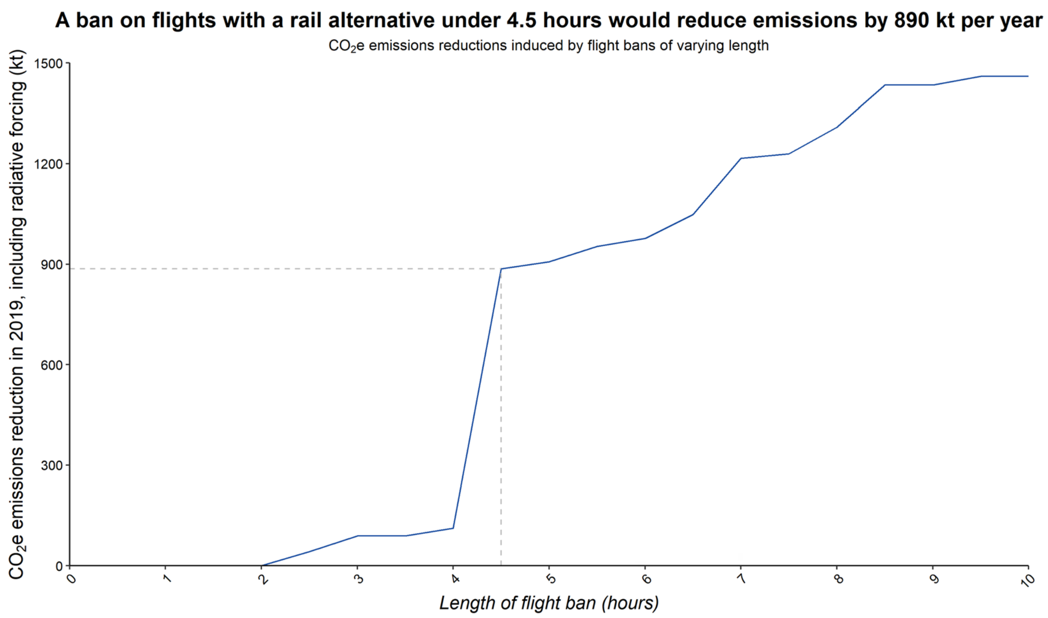
Almost all these routes are served by the East or West Coast Main Lines. The government should also commit to increasing investment on these lines to improve capacity in order to support the modal shift from domestic aviation towards rail travel.

5. France-style flight ban policy

Given that many of the most popular (and most emitting) domestic flight routes are comparably fast by rail, a more radical policy could be to ban flights on routes with a rail alternative under a given amount of time. Such a policy has recently been imposed in France, where domestic flight routes that can be travelled by train in under 2.5 hours have been banned.[36] This approach has the inbuilt benefit of ensuring flights to remote areas are not adversely affected by the policy, as they are not served by suitable rail alternatives.

This section analyses the potential emissions reduction of a policy banning domestic flights by length of rail alternative and provides a rough assessment of the impact of such a policy on consumer welfare in terms of time and ticket price difference. Due to a lack of reliable data, this section does not consider transfer passengers, only city-centre to city-centre trips.

Figure 6



Source: IF calculations based on ICAO Carbon Emissions Calculator and Northern Ireland Statistics and Research Agency passenger data
Note: It is assumed that all passengers travelling on banned routes switch to travelling by rail

[36] BBC News (2021) "France Moves to Ban Short-Haul Domestic Flights": https://www.bbc.com/news/world-europe-56716708

Figure 6 shows the CO_2e reductions achieved by flight bans of varying length. The sharp jump in emissions reductions between 4–4.5 hours shows that an optimal policy would ban flights with a rail alternative under 4.5 hours. Appendix D gives a list of the routes that would be affected by such a ban, including the popular central Scotland to London, Newcastle to London and Manchester to London routes, which and are all comparable in terms of centre-centre time by rail.

Taking 2019 as a baseline, assuming all affected passengers move over to travelling by rail, a ban on flights with a rail alternative under 4.5 hours would result in 7.35 million passengers moving over to rail, equivalent to 66% of passengers within Great Britain and 35% of all UK domestic passengers.

This would reduce CO_2e emissions by 885Kt, a 53% reduction in CO_2e emissions from domestic flights within Great Britain and a 33% reduction in CO_2e emissions from all of UK domestic aviation. This is equivalent to removing 553,125 petrol cars from the road, the gas and electricity use of 221,250 UK households, decommissioning a coal power plant every 4 years or 14.6 million tree saplings grown for 10 years. In reality, the emissions reduction would likely be even higher, as many people who currently make “unnecessary” journeys by air may decide not to travel at all.

Such a flight ban would be a trade-off between the social benefit of decreased emissions and potential losses to consumer welfare, through increases to travel time and differences between fares. For flights with a rail alternative under 4.5 hours, the weighted average journey is only 13 minutes slower from city centre to centre by rail than by plane. People affected by the ban would therefore experience only slightly longer journey times, with travellers on the Newcastle and Manchester to London routes experiencing faster city-centre to city-centre travel times.

6. Policy recommendations

IF believes that the government should reconsider its decision not to pursue demand management policy. The current plan to allow the aviation industry to continue growing runs counter to the polluter pays principle and sends the wrong signals to the industry and consumers. This lack of vision threatens the UK's net zero commitments and will be paid for by future generations, which IF believes in unacceptable.

IF submits the following proposals for consideration:

- **The government should end its subsidisation of domestic aviation**
- **The government should reverse its decision to reduce APD for UK domestic flights**
- **The free permits received by airlines in the UK ETS should be revoked**
- **Fuel duty should be levied on the kerosene used in UK domestic flights**
- **The government should also consider replacing APD with VAT or an incremental frequent flier levy**

IF estimates that removing APD and levying VAT and fuel duty would raise air fares by 23% on average, raising up to £468 million for HM Treasury every year. IF analysis suggests that this taxation would reduce demand for UK domestic flights by 16% and CO_2e emissions by 18%. The money raised could be ringfenced for green investment in infrastructure or foundational R&D.

Similar to the policy recently introduced in France, the government should ban domestic flights with a rail alternative under 4.5 hours. Such a ban would reduce total UK domestic aviation emissions by 33% (885Kt) with minimal time costs to most passengers.

The government should consider a range of policies to encourage people to travel by rail where possible, such as:

- Rail miles programmes - passengers could earn and claim “Rail Miles”, which could be redeemed for discounted tickets, on-board refreshments or upgrades. This will help encourage a shift from planes to trains and encourage and reward passenger loyalty.
- A simpler, cheaper and more transparent ticketing system to help people get better deals on train tickets – as promised in the Williams-Shapps plan for rail. Better load management planning could help to lower the gap between advance and walk-on fares and would make travelling by train more competitive against air travel.

The Government should prioritise further upgrades to the East and West Coast Main lines in order to support the modal shift away from air to rail. The most popular and polluting flight routes serve cities that are almost exclusively served by these two lines. The Eastern Leg of HS2 would have significantly improved capacity on both lines, so the scrapping of that project should also be reconsidered in the interests of long-term policy goals to reduce carbon emissions.

Finally, the COVID-19 pandemic and related improvements in communication infrastructure has shown that many meetings can occur just as well remotely as in-person. In the interest of the environment, more remote meetings should therefore be encouraged in order to dampen business demand for domestic aviation.

The government should put its obligation to lower emissions at the heart of all policymaking decisions, in the interests of young people and future generations. More rigorous intergenerational impact assessment tools would help to convert net zero ambitions into policy action.

Appendix A - Section 2 methodology

The primary data sources for this report come from Table 7d of the Northern Ireland Statistics and Research Agency compilation of Air Passenger Flow[37] within the UK. COVID-19 significantly disrupted UK domestic aviation since 2020, so 2019 is used as a baseline for pre-pandemic travel.

The annual air passenger flow figure for a given route counts passengers at both origin and destination, meaning that a passenger making a one-way trip from London to Edinburgh is counted twice. The totals should not, therefore, be added together in order to prevent double counting. As flow is listed in both directions for each route, an average for both directions was taken and rounded up to the nearest whole number to represent the annual bi-directional flow for each route pairing.

The dataset also includes irregular and chartered flights so, for simplicity, routes with a weekly flow of under 400 passengers (roughly two flights in each direction per week) were assumed to be irregular or insignificant on the national scale so were excluded from the analysis.

These data were combined with CO_2 emissions and flight distance estimates for each route using the ICAO Carbon Emissions Calculator.[38] These estimates do not include non-CO_2 emissions, which is accounted for using the BEIS scale factor of 1.9.

This constructed dataset is comprised of flights within mainland Britain but also flights to and from islands that cannot be replaced by rail. This led to the separation of the dataset into two: the "combined" dataset of all domestic flights within the UK, and a separate "mainland" dataset of all domestic flights within mainland Britain.

Flight times and prices were retrieved from Google Flights on 1 March 2022. All flights were direct with one bag to even the comparison between conventional and budget airlines.

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[37] Northern Ireland Statistics and Research Agency (2022) Accessed 9 Aug 2022: https://www.nisra.gov.uk/publications/northern-ireland-air-passenger-flow-10-march-2022

[38] International Civil Aviation Organization (2022) Carbon Emissions Calculator; Accessed 9 Aug 2022: https://www.icao.int/environmental-protection/Carbonoffset/Pages/default.aspx

In order to reflect the high variability in ticket price over time, two data-points were collected, one on the next day (or next available day) and one month in advance. This range means that all estimates calculated using our price data are unlikely to be exactly right and instead provide upper and lower bounds.

A mean was taken between the advanced and next day fares and taken to be the representative price.

Fuel use per passenger was estimated using ICAO Carbon Emissions Calculator data. The estimated CO_2 per passenger per leg is divided by 3.16 (the number of kilogrammes of CO_2 produced by burning one kilogramme of aviation fuel) to give the kilogrammes of kerosene burned per passenger per leg. As fuel duty is calculated by volume, this figure is divided by the density of kerosene, 0.8kg/l, to give the volume of kerosene attributable to each passenger on each flight route. This Figure is then multiplied by the fuel duty rate 57.95p per litre to give the value of fuel duty attributable to each passenger.

$$\text{Fuel duty per passenger} = 0.5795 * \frac{\text{ICAO } CO_2 \text{ estimate per passenger}}{3.16*0.8}$$

The cost difference caused by replacing APD with VAT was estimated by subtracting £13 from the mean price of each ticket and adding the due fuel duty. This Figure was then multiplied by 0.2 to calculate the amount of VAT due.

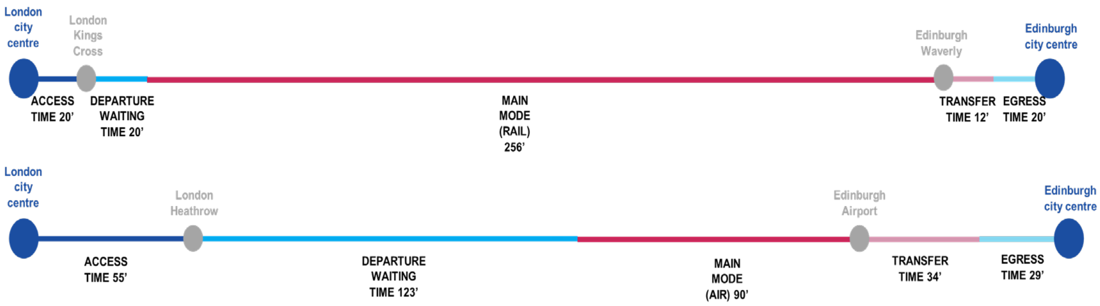
$$\text{VAT per passenger} = 0.2* (\text{Ticket price} - 13 + \text{Fuel duty per passenger})$$

Appendix B – Section 3 methodology

Passenger flow data for Section 3 is taken again from Table 7d of the Northern Ireland Statistics and Research Agency compilation of Air Passenger Flow within the UK.

The centroid splits each route into five stages; access time, departure waiting time, in-vehicle time, transfer time and egress time. Figure 7 shows the breakdown of the city-centre to city-centre journey for the most popular domestic route in the UK, London Heathrow to Edinburgh

Figure 7



Access time and egress time represent the time taken to reach the terminal from the closest city centre by public transport. This was assumed to be 20 minutes each way for train journeys, based on a 2019 German survey.[39] For flights, this data was retrieved from Google maps on 15 March 2022.

[39] Op.cit.

Figure 8

Airport	City	Access/ egress time (mins)	Access/ egress cost (£)
Aberdeen	Aberdeen	18	3
Anglesey	Bangor	54	4
Birmingham	Birmingham	36	4
Blackpool	Blackpool	23	3
Bournemouth	Bournemouth	71	7
Leeds Bradford	Bradford	44	4
Bristol	Bristol	47	5
Cardiff Wales	Cardiff	78	5
Doncaster	Doncaster	39	3
Dundee	Dundee	10	2
Edinburgh	Edinburgh	29	4
Exeter	Exeter	30	3
Glasgow	Glasgow	14	3.5
Humberside	Hull	26	45
Inverness	Inverness	35	4
Liverpool	Liverpool	53	3
Gatwick	London	55	18.3
Heathrow	London	55	5
Stansted	London	71	19
London City	London	40	3
Luton	London	80	25
Southend	London	86	23.5
Manchester	Manchester	32	7
Durham Tees Valley	Middlesborough	16	26
Newcastle	Newcastle	36	3

The simplifying assumption was made that departure waiting times and transfer times were equal across terminals for all flights and rail journeys. Data for these was taken from the same 2019 study of German domestic travel. German data is used as no such similar data was found for UK domestic trips.

Total travel time (***TTT***) was then estimated for each mode (represented by the ***j*** subscript) on each route (represented by the ***i*** subscript) by summing the relevant access, waiting, in-vehicle, transfer and egress times.

$$TTT_{ij} = AT_{ij} + WT_{ij} + MM_{ij} + TT_{ij} + ET_{ij}$$

The increase in travel time (***ITT***) was then estimated for each route by finding the difference between the total travel times for rail (TTT_{iR}) and air (TTT_{iP}).

$$ITT_i = TTT_{iR} - TTT_{iP}$$

Appendix C - List of flight routes banned under a 4.5-hour ban

Route	Distance (km)	Weekly air flow (2019)	Route CO_2e in 2019 (kT)	Time diff. (mins)	Price diff. (£)	CO_2e saved by modal shift (kT)
LON-EDI	530	64,280	459	-3	-47.90	396
LON-GLA	549	44,100	337	19	-9.15	293
LON-MAN	254	10,506	47	-114	-42.45	42
LON-NCL	398	8,864	54	-86	-47.40	47
BHX-EDI	395	5,036	30	15	13.30	26
BHX-GLA	406	4,387	27	20	8.90	23
MAN-SOU	291	3825	11.8	36	-32.60	9.79
LON-LBA	277	1,942	8.6	-79	9.00	7.65
ABZ-NCL	244	531	2.25	53	-46.60	2.01

Notes

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Charity no: 1442 230