

This report looks at the carbon savings offered by shifting travel from air to rail between Central Scotland and London. It considers the implications for carbon emissions from the already impressive growth in modal share for rail between Scotland and London over the last decade (a shift from 20% to 33% between 2005 and 2015). It then goes on to estimate the additional emissions that would be saved should rail continue its progress towards a 50% share of the travel market by 2023. The report finds that, even allowing for continued growth in the overall travel market, this switch to rail would lead to substantial reduction in carbon emissions for Scotland to London travel. The paper concludes by setting out a series of policy recommendations for the Scottish and UK governments.

While this report has been carried out by Transform Scotland, we wish to acknowledge the support of Virgin Trains, the principal Anglo-Scottish rail operator, in its preparation.

## ABOUT TRANSFORM SCOTLAND

Transform Scotland campaigns for a society where everyone can have their travel needs met within the limits of a transport system that is environmentally sustainable, socially inclusive and economically responsible.

We are the only organisation in Scotland making the case for sustainable transport across all modes. We have a membership of over 60 organisations across Scotland, including public transport operators, local authorities and sustainable transport voluntary organisations. Transform Scotland is a registered charity, politically independent, science-based and strictly not-for-profit.

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# A GREEN JOURNEY TO GROWTH

The carbon benefits of switching from air to rail for travel between Scotland and London.



Supported by  
The logo for Virgin Trains, featuring the text 'Virgin trains' in a stylized font with a blue and white swoosh.

# 1 INTRODUCTION

Scotland has demonstrated a positive start in its journey to reduce greenhouse gas emissions, with a target to cut CO<sub>2</sub> by 42%, based on 1990 levels, currently running six years ahead of schedule. But transport has proven more resistant to the climate change challenge than other parts of Scotland's economy. Transport emissions have barely fallen since 1990, and the sector has recently overtaken others to become Scotland's largest source of emissions. Despite this weak performance, there are areas of progress, one such being in Anglo-Scottish travel.

Over the last two decades, the number of people travelling by air and rail between Scotland's Central Belt and London has broadly doubled. Despite a slight dip following the global recession of 2008, this growth trend has continued and shows little sign of abating. In 2015, more than 5 million journeys were made between Glasgow/Edinburgh and London, compared to 2.7m in 1994.

As we set out in this report, that growth has not driven up emissions but in fact has prevented a substantial increase in overall CO<sub>2</sub> emissions. The reason, simply, is the volume of passengers who are now choosing to travel by train rather than plane.

A decade ago, following the introduction and then the rapid expansion of budget airlines on short haul routes, rail's market share on Glasgow/Edinburgh to London was only 20%. Fast forward to 2015 and rail now accounts for around a third of journeys relative to air on this route. The environmental consequences of that shift are significant, given rail's low carbon footprint relative to air travel.

In this report we have, for the first time, measured the carbon savings that have been generated by that switch from air to rail, by considering a hypothetical situation in which the same level of growth had occurred but without any change in air/rail market share. We have also looked forwards, to analyse what level of carbon savings we can expect if both the trend for overall growth and a modal shift from air to rail continues. Lastly, we have tried to tease out the implications for governments, businesses and individuals, calculating the environmental benefits that can be achieved at each level by encouraging this change from air to rail travel.

We conclude this report with a series of policy recommendations for the Scottish and UK governments as well as the public and private sector, to encourage this green journey to growth for the London-Scotland travel market as well as exploring wider implications across the transport sector. These measures are vital if we are to continue the success story we describe in this report and work towards transport playing a full role in decarbonising the economy rather than acting as a brake on our environmental ambitions.

# 1

## RAIL IS FIVE TIMES GREENER THAN AIR

### ANNUAL ELECTRICITY USE of one household



is the **EQUIVALENT** of



**9** flights



**49** rail journeys



**CENTRAL SCOTLAND to LONDON**



# 2

## RAIL'S SUCCESS IN CUTTING CARBON EMISSIONS

For Scotland-London travel: 2005-2015



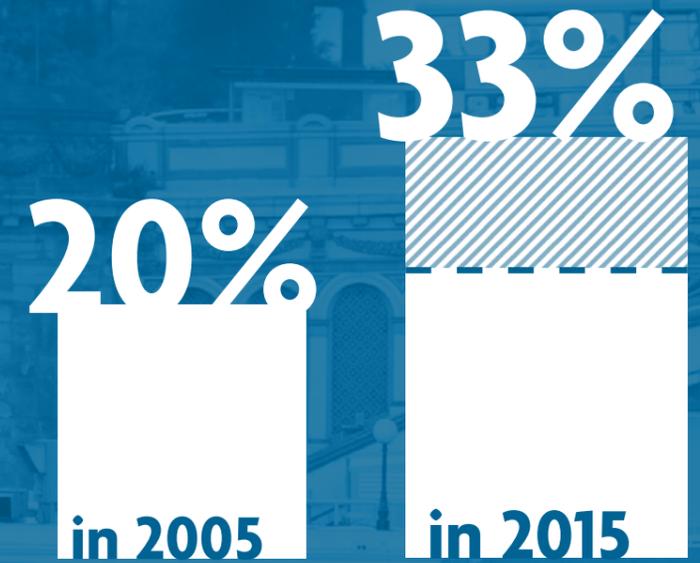
Over the past decade, people have increasingly chosen to travel by train rather than plane. Between 2005 and 2015, rail's market share for trips between Central Scotland and London grew from 20% to 33%. There was an increase from 24% to 34% for trips between Edinburgh-London, and from 15% to 32% for trips between Glasgow-London. Growth in rail has been particularly strong on the West Coast Mainline, which benefitted from £9bn investment in infrastructure, new trains and the Virgin High Frequency timetable, which introduced faster journeys and greater frequency.

Across the whole Central Scotland to London travel market, the shift from air to rail led to 681,064 tonnes of carbon emissions being saved. This is a significant number: it is more than all the emissions from air and rail combined in 2015 on this route, and prevented a significant increase in carbon emissions from travel between Central Scotland and London. On the Glasgow-London route, where there has been a doubling of Virgin's market share, 332,208 tonnes of emissions were saved as a result of people switching from air to rail.

### 2a

## RAIL'S SHARE OF THE TRAVEL MARKET HAS GROWN STRONGLY

RAIL MARKET SHARE CENTRAL SCOTLAND to LONDON

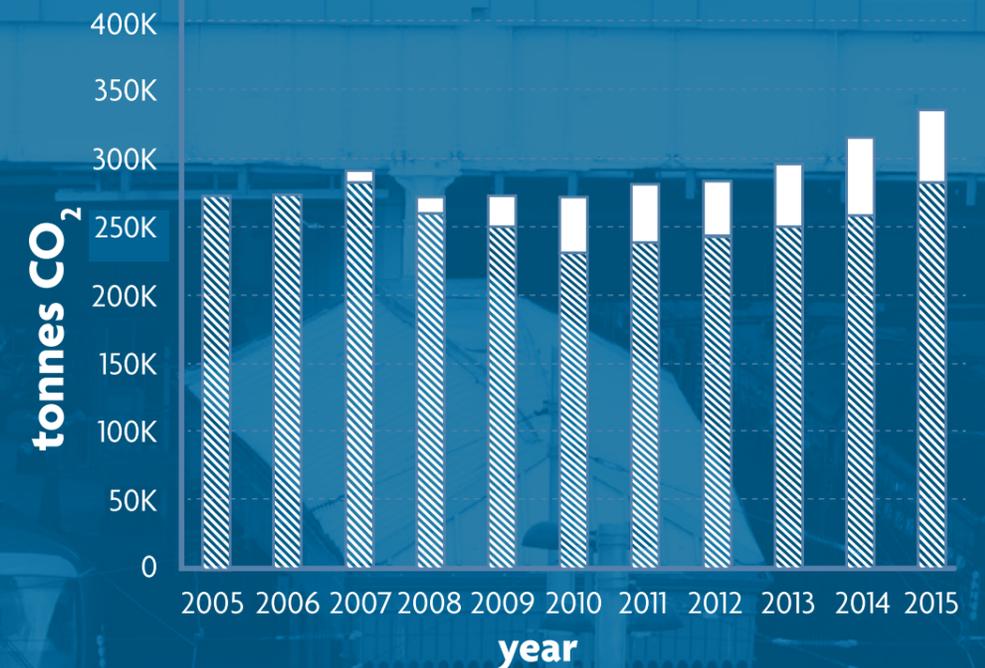


### 2b

## SWITCH FROM AIR TO RAIL HAS LED TO LARGE CUTS IN EMISSIONS

CARBON EMISSIONS GLASGOW to LONDON FOR AIR AND RAIL

■ emissions saved due to modal shift  
 ▨ carbon emissions GLA-LDN



# 3

## GROWING THE SCOTLAND-LONDON TRAVEL MARKET

### WHILST CUTTING CARBON

2015-2023



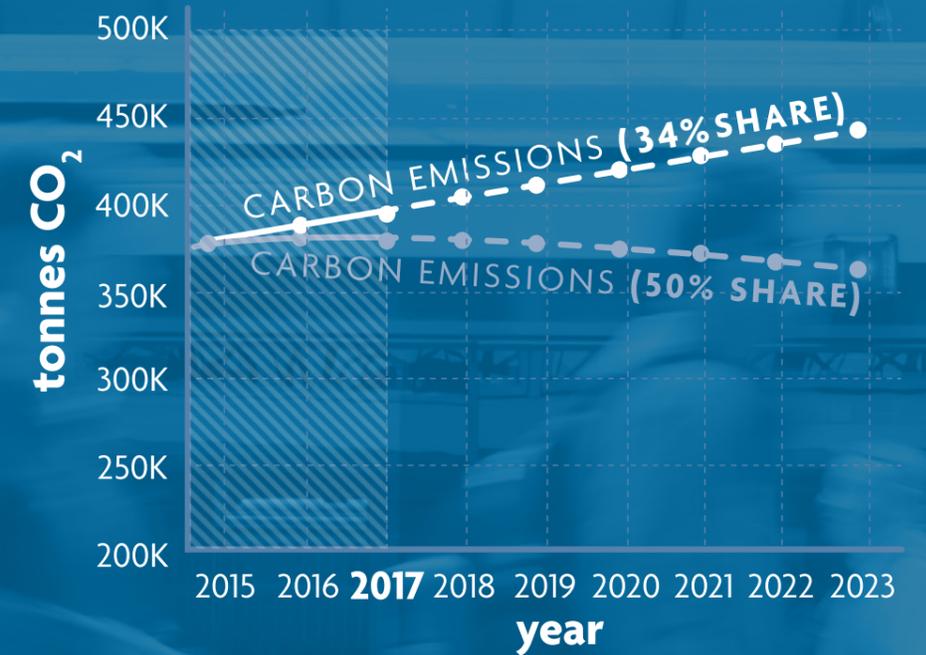
Looking forward, there is potential to continue this positive trajectory of growing the travel market while cutting carbon emissions. The UK Government projects that demand for travel between London and Scotland will continue to grow over the next decade, while Virgin Trains wants to increase its market share for Edinburgh to London travel from 34% to 50% by 2023. The plan to achieve this target includes regular four-hour journey times, new trains, better customer service and an improved customer experience.

Based on projected growth of 2% a year in air/rail travel between Central Scotland and London (the same as average annual growth in travel from 2005 to 2015) this level of modal shift would lead to savings of 325,713 tonnes of carbon between Edinburgh and London. However, if similar ambition is deployed on the West Coast route, and rail also wins 50% market share between Glasgow and London, then the carbon emission savings between Central Scotland and London between 2016 and 2023 would total 586,942 tonnes of carbon equivalent.

## 3a

### CONTINUED GROWTH IN RAIL'S MARKET SHARE WILL FURTHER REDUCE EMISSIONS

CARBON EMISSIONS EDINBURGH to LONDON FOR AIR AND RAIL



## 3b

### OVERALL GROWTH IN THE TRAVEL MARKET CAN BE ACHIEVED WHILST CUTTING EMISSIONS

WITH GROWTH in RAIL MARKET SHARE to 50%



# 4

## WHAT A **SHIFT FROM AIR TO RAIL** HAS MEANT FOR CUTTING CARBON

For Glasgow-London travel

2005-2015



It can be difficult to put carbon figures into perspective, particularly when dealing with the large volumes of CO<sub>2</sub> that are generated by millions of passenger journeys over the course of several years. So to give some perspective on the scale of opportunity that modal shift presents, we've compared the carbon savings generated by the shift from air to rail to car travel and household electricity use.

The shift from air to rail over the past ten years has been responsible for preventing a significant increase in carbon emissions from travel between Central Scotland and London. Between 2005 and 2015, the shift from air to rail saved a total of 681,064 tonnes of carbon. This saving is equivalent to removing all traffic on the M8 travelling between the outskirts of Glasgow and Edinburgh for two years. This represents a significant contribution to the Scottish Government's goal of sustainable economic growth: allowing more people to travel whilst reducing carbon emissions as is required by the Scottish Climate Change Act.

# 4

## PAST DECADE'S EMISSION SAVINGS

# 332,208tCO<sub>2</sub>

emissions savings for  
**GLASGOW to LONDON**  
(2005 – 2015)

is the **EQUIVALENT** of



taking over

## 145,000 cars

off the road for a year



driving around **the world**

## 44,000 times



driving around  
**the M25 motorway**

## 9.5m times

# 5

## WHAT CONTINUED GROWTH

### IN RAIL WOULD MEAN FOR

### FUTURE CARBON EMISSIONS

For Edinburgh-London travel: 2015-2023

# 5a

## PROJECTED EMISSION SAVINGS

**325,713tCO<sub>2</sub>**  
emissions savings for  
**EDINBURGH to  
LONDON (2015 – 2023)**

is the **EQUIVALENT** of



taking over  
**140,000 cars**  
off the road for a year



driving around **the world**  
**44,000 times**



driving around  
**the M25 motorway**  
**9.3m times**

This first graphic shows the carbon impact of rail on the Edinburgh-London route hitting the target of moving from its 34% share of the overall travel market (in 2015) to a 50% share by 2023. As before, we assume that the overall travel market will continue to grow at 2% every year. The amount of emissions saved would be substantial (325,713 tonnes of carbon).

It's also useful to look at the difference individuals and organisations can make by choosing to travel by train rather than flying. The second graphic contextualises what the growth in rail's market share could mean for organisations and individuals travelling between Central Scotland and London. Four types of typical travellers are considered: a large company (50,000 journeys per year), a SME (250 journeys), a regular business traveller (60 journeys), and a leisure traveller (8 journeys), and we make assumptions about the current percentage of journeys done by rail, and the impact of increasing the percentage of rail journeys.

# 5b

## EMISSIONS SAVINGS FOR INDIVIDUALS AND FOR COMPANIES



### Leisure traveller

A shift from  
**50% to 100%**  
rail modal  
share



### Business traveller

A shift from  
**14% to 30%**  
rail modal  
share



### SME

A shift from  
**10% to 20%**  
rail modal  
share



### Big corporate

A shift from  
**9% to 19%**  
rail modal  
share

Would save the **CARBON EQUIVALENT**  
of the **ANNUAL ELECTRICITY**  
used in...

**0.4**  
houses



**0.8**  
houses



**2**  
houses



**439**  
houses



6

# THE NEW AZUMA TRAINS WILL CUT CARBON EMISSIONS EVEN MORE

6

## THE NEW AZUMA TRAINS ARE GREENER STILL



### EMISSIONS FROM PLANES

**177kg** CO<sub>2</sub> per passenger



### EMISSIONS FROM HST TRAIN

**34kg** CO<sub>2</sub> per passenger



### EMISSIONS FROM AZUMA

**28kg** CO<sub>2</sub> per passenger

As part of the UK Department for Transport's Intercity Express Programme, Virgin Trains East Coast will introduce new Azuma trains onto the Edinburgh–London route, to be operational from 2018. These trains have lower carbon emissions than the existing diesel and electric trains operating on the route. According to the Department for Transport, a journey between Edinburgh and London on an Azuma will emit 84% less carbon than a flight.

If rail moves to a 50% market share on the East Coast by 2023, and assuming continued growth across the overall travel market of 2% per year, we estimate that there will be a 4.9% reduction in emissions compared to 2015 (air and rail). With the new Azuma trains in place, emissions savings will be even greater, leading to a 7.0% reduction in emissions for the whole travel market between Edinburgh and London.



# 7

## CONCLUSIONS

- Swapping plane for train travel is a great way for individuals and organisations to cut their carbon footprint. Flying is over five times more polluting than taking the train. Just 9 flights between Central Scotland to London produces the same carbon emissions as the total annual electricity usage of an average UK household. By comparison, it would take 49 rail journeys to reach the same amount of carbon emissions.
- Over the past ten years, the increase in passengers choosing to travel by train rather than plane has made a significant contribution to the Government's carbon reduction targets. The increased popularity of rail has saved almost 700,000 tonnes of carbon, equivalent to removing all traffic on the M8 travelling between the outskirts of Glasgow and Edinburgh for two years. As rail travel becomes increasingly popular, carbon savings have increased year on year, and this trend will continue if rail use continues to grow.
- As rail continues to make progress towards a 50% share of the market, carbon emissions will continue to fall even if the number of people travelling between central Scotland and London continues to increase. Assuming that the overall travel market will continue to grow at 2% per year, if rail reaches a 50% market share then there will still be an overall drop in carbon emissions of over 5% by 2023, a saving of almost 600,000 tonnes CO<sub>2</sub>.

# RECOMMENDATIONS

# 8

Everyone recognises that carbon emissions must be cut significantly if Scotland, and the rest of the world, is to head off massive environmental and social damage. With transport the largest contributor to emissions, it is imperative for the Scottish transport sector to play a leading role in delivering these reductions. The growth in rail's market share for Anglo-Scottish travel demonstrates that progress can be made in reducing emissions, but this needs to be reinforced by new policies and investment decisions which can ensure that rail is able to continue its growth trajectory, and deliver on its tremendous potential for growing the Scotland-London travel market whilst cutting carbon.

1

Policies should be adopted to **encourage** the **continued strong modal shift** from air to rail travel between Central Scotland and London.

2

**Reducing CO<sub>2</sub>** should be a clear policy objective embedded in decision-making with parity to other quality indexes.

3

**Investment** should be made in **both East Coast and West Coast mainlines** to deliver faster journey times and service improvements ahead of HS2, as part of the policy to reduce CO<sub>2</sub>.

4

**HS2** should similarly be developed so as to deliver further strong modal shift from air to rail on Anglo-Scottish routes.

5

UK and Scottish **governments should take a leadership role** by encouraging departments which have a lot of travel between Scotland and England to set modal shift targets.

6

The **tax system** should be used to encourage modal shift from air to rail, rather than incentivising air travel by reducing Air Departure Tax rates on domestic routes.

7

**Investment decisions** affecting different modes such as road, rail and air should be **made holistically** so that the potential for modal shift can be planned and accommodated rather than viewing projects in isolation.

8

This whole corridor approach should be deployed not just on Anglo-Scottish travel but also on other city pairings within Scotland. This is particularly important in the context of reviewing **Scotland's National Transport Strategy and Strategic Transport Project Review**.