Short-haul aviation for business travel

Greater London Authority
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Contents

1. Introduction

This report has been prepared by the GLA Transport team to inform a review of short-haul aviation for business trips. The report has been produced in response to a commitment given by the Mayor to the Green Party Assembly members Darren Johnson and Jenny Jones. The review is based on existing published reports and sources of data.

The Mayor's *Climate Change Action Plan* sets out the Mayor's policy position on the substitution of air travel and states that *'…the Mayor will promote an air travel hierarchy such that individuals ….avoid flights wherever possible, e.g. by travelling by rail within the UK and to Europe, by making use of video and teleconferencing, and offset air travel only as a means of last resort. The Mayoral family itself will reduce flights to the absolute minimum……'*.

Section 2 of the report provides an outline of the impact of air travel compared to rail travel in terms of climate change emissions. Section 3 provides a review of the corporate responsibility and staff business travel policies of other organisations, both public and private, with regard to the mode of travel for longer distance business related trips. Section 4 discusses the rationale for applying a travel time threshold below which rail should be the preferred mode, where practicable, and assesses the implication of a change in GLA policy to favour rail over air travel. Section 5 sets out the recommendations and conclusions.

2. The impact of air & rail travel on climate change emissions

The enhanced greenhouse effect

There is overwhelming scientific evidence that human activity, particularly the burning of fossil fuels, is the primary cause of the increase in greenhouse gases, leading to a rise in average global temperatures. The Intergovernmental Panel on Climate Change (IPCC) and the Stern Review have reported on the threat of climate change and the link between human behaviour and the increase in average global temperatures. Unchecked climate change is predicted to lead to increased global temperatures, rising sea levels and more extreme, unpredictable weather conditions. The Stern Review sets out the rationale for early and decisive to tackle the causes of climate change and estimates that the economic cost of inaction to be in the order of 5-10% versus a 1% cost to act now.

The Mayor's Climate Change Action Plan

The Mayor's Climate Change Action Plan (CCAP) outlines the Mayor's response to the challenge of climate change. Stabilising global carbon dioxide (CO_2) concentrations at 450 parts per million (ppm), which many studies consider to be the tipping point beyond which catastrophic climate change will occur, will require a target of stabilising London and the UK's emissions at 60% below 1990 levels by 2025. The CCAP sets out key priorities for action by sector of activity, including existing homes and commercial property, new development, energy supply, ground transport and the aviation sector, in order to achieve the target. Priorities are also set out for reducing the CO_2 emissions from the operations of the GLA family.

Good international connectivity is important for London's competitiveness with its world city function and specialism in financial and business services. However, aviation is one of the most environmentally damaging modes of transport and, per passenger kilometre, is the most CO_2-intensive from of travel. Presently, aviation accounts for 2% - 3% of global emissions but one third of London's total carbon footprint. It is also a growing sector.

The Climate Change Action Plan states that *'in the absence of major technological advances that reduce emissions from aircraft, the Mayor will:*

- *work with the aviation industry to implement efficiencies that can deliver a step-change reduction in emissions*
- *seek to influence aviation policy at an European Union and international level*
- *challenge the need for further runway expansion at UK airports*
- *advocate demand management mechanisms to limit unsustainable, rampant growth in low-value flights*
- *advocate alternatives to air travel, including developing affordable, high-speed national rail services which can offer comparable journeys at one-third to one-half the CO_2 impact per passenger.'*

and

' In general, the Mayor will promote an air travel hierarchy such that individuals

1. *avoid flights wherever possible, e.g. by travelling by rail within the UK and to Europe, by making use of video and teleconferencing, and*
2. *offset air travel only as a means of last resort. The Mayoral family itself will reduce flights to the absolute minimum and continue to offset the remainder.'*

Comparing rail and aviation

A number of studies, including the Association of Train Operating Companies (ATOC)[1], the Commission for Integrated Transport (CFIT)[2] and, more recently, the Rail Safety and Standards Board (RSSB)[3] have compared the energy intensity of air travel against other passenger modes – including rail and high-speed rail. The RSSB compared UK train performance with the performance of competing short-haul aviation. Information in this section draws from that report.

Energy consumption can be measured per vehicle kilometre, per seat kilometre or per passenger kilometre. The RSSB report compares emissions from rail and aviation on a grams per passenger kilometres basis, taking into account the average loads of the different modes. The load factor is critical in the calculation of energy consumption efficiency, as are assumptions regarding the energy mix for electricity generation (from 'well to wheel') and electricity transmission loss.

Emissions from aviation

Air travel is the most CO_2 intensive forms of transport. Figure 1 shows that for a typical short-haul flight of 300 to 800km an Airbus A320/100 would use between 3.2 and 2.5 litres of fuel per seat kilometre. The average consumption per seat kilometre decreases with distance as a disproportionate amount of fuel is used for take-off and landing. Smaller aircraft tend to be less efficient than larger planes and turboprop aircraft, with a cruise speed of 650 km/h and a maximum altitude of 7,500 metres, can be more fuel-efficient than jet equivalents of a similar size on shorter journeys.

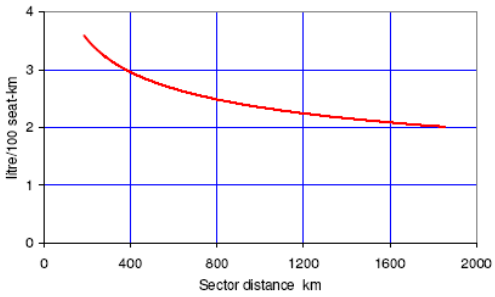


Figure 1: Airbus fuel consumption

During flight, aircraft engines emit carbon dioxide (CO_2), oxides of nitrogen (NO_X), oxides of sulphur (SO_X), water vapour, hydrocarbons and particulates. These emissions alter the chemical composition of the atmosphere in a number of ways, both directly and indirectly. The impact of aircraft emissions can be very different depending where they occur in the atmosphere, but they generally have a disproportionately negative impact, known as radiative forcing. Research by the IPCC indicates that the radiative forcing effect of emissions from aviation may be between 2.0 - 2.7 times that of CO_2 alone. However there is no general agreement on the appropriateness or level of this factor.

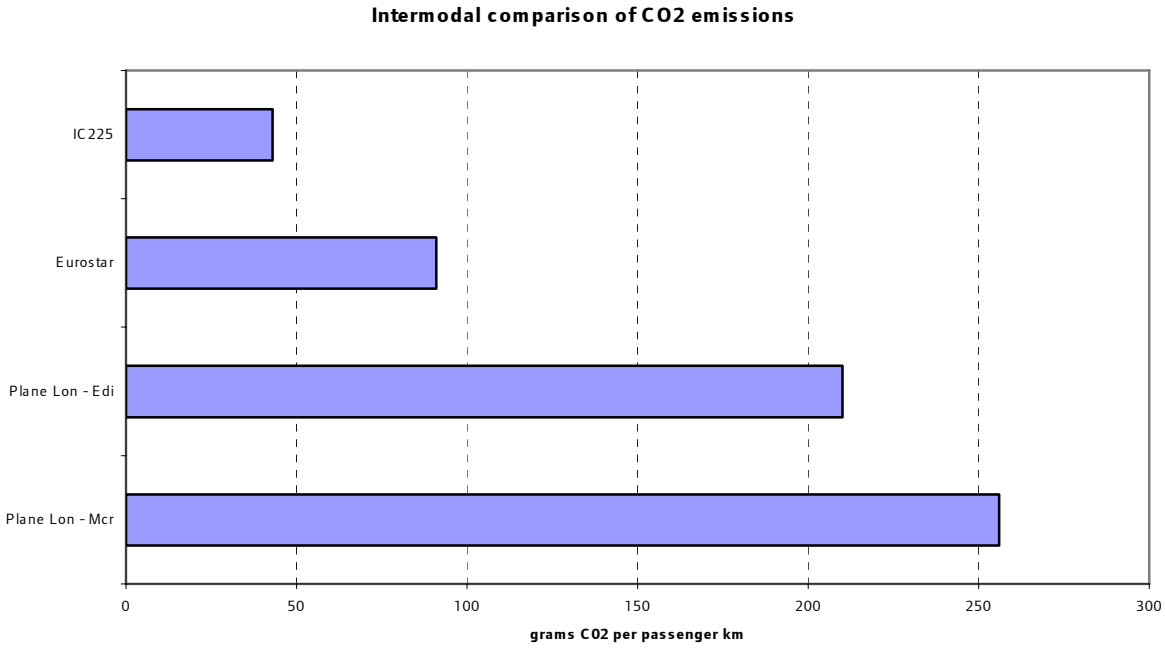
Although CO_2 emissions per passenger km are predicted to fall in the longer term, for example with the introduction of the Boeing 7E7 Dreamliner and the Airbus A380, these will largely impact on long haul intercontinental flights rather than the short-haul market where rail is a direct competitor.

Emissions from rail travel

Estimates of CO_2 emissions for rail are primarily divided by the power source – diesel or electric. For diesel-powered trains estimates are made of the emissions of the train itself with an allowance for refinery and production. For electric powered trains an allowance is made for generation and transmission. The electricity generation mix assumptions are fundamental to the emissions calculations. For the purposes of this work, the existing UK generation mix has been assumed: Gas 40%, Coal 33%, Nuclear 19%, Oil 1%, Hydro 1%, other fuels (including wind, biomass and landfill gas) 3.5% and imports 2.5%. However, the generation mix for high-speed rail travel in France has a larger proportion of nuclear generated power.

Figure 2 shows the comparison of CO_2 emissions between rail and aviation for a selection of air journeys and train types. CO_2 emissions per passenger kilometre from the short haul air journeys are between four and five times the emissions per passenger kilometre for an electric powered intercity train. Comparison with the higher speed Eurostar shows emission levels are between two and three times higher per passenger kilometre.

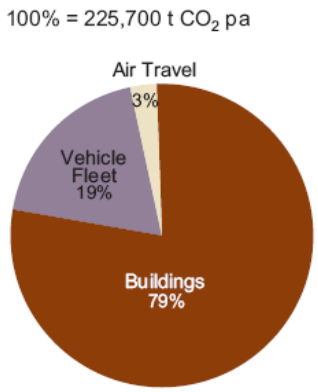
Figure 2: Modal comparison of CO_2 emissions



3. Corporate responsibility and staff business travel policies

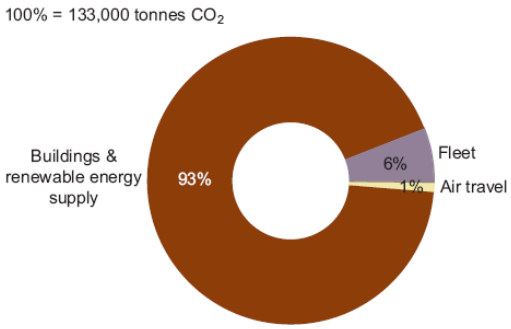
The Climate Change Action Plan and GLA group policy

Figure 3: Mayoral group emissions



In 2006 the Mayoral Group produced an estimated 225,700 tonnes of CO_2 emissions. Of this total, 3% came from flights used for business travel. In response to the projected growth in London's economy, population and consequent demand for services that will be required of the GLA family, without the measures set out in the Mayor's Climate Change Action Plan, the GLA's CO_2 emissions are forecast to increase by 13% to 255,700 tonnes by 2025.

Figure 4: Source of potential savings from the Mayoral group



The CCAP has set a target to reduce CO_2 emission by 133,000 tonnes, from GLA Group activity. The reduction in Mayoral group business related air travel is expected to make a 1% contribution - circa 1,000 tonnes - to the target.

Corporate Responsibility in Business: Examples of air travel polices

Target Setting

Royal Sun Alliance
The Royal Sun Alliance Environmental programme has set targets based on a 2005 baseline. These include targets to reduce electricity usage, CO_2 emissions and water consumption. The target set for reducing air travel by their UK employees is set at 20% less than the 2005 level.[1]

Greenpeace
Greenpeace have made a commitment in their environmental policy statement document that *'since 2003 Greenpeace UK has not allowed staff to fly from its office in London to any UK destination, Paris, Brussels, Amsterdam or any destination of a similar distance without special dispensation'*. The policy also states that by altering the way in which they work they will reduce the need to travel. Any air travel that is incurred is offset.[2]

Modal change

Transport for London
TfL's Travel at Work policy states that air travel is to be avoided within mainland UK or mainland Europe wherever possible. Rail or bus travel should be the preferred mode for any journeys within mainland UK and where there are high-speed links to mainland Europe. If flights are undertaken they will need to be approved by the Managing Director and will be offset.[3]

Alternatives to air travel

Barclays Bank
Barclays mention business travel in their corporate responsibly mission statement, yet there is no commitment on air travel[4]. The focus is on teleconferencing facilities and a head office travel plan, working with the Energy Savings Trust[5]. However they do have a target to reduce carbon emissions by 4% from 2006 to 2007. They have also calculated how much carbon was burnt through business travel of their employees and other activities of the company.[6]

[1] http://www.royalsun.com/royalsun/ir/page2.jsp?link=3&sub=76&sup=78
[2] http://www.greenpeace.org.uk/MultimediaFiles/Live/FullReport/6764.pdf
[3] http://www.tfl.gov.uk/assets/downloads/businessandpartners/travel-at-work-policy.pdf
[4] http://www.personal.barclays.co.uk/BRC1/jsp/brccontrol?task=articleFWsocial&site=pfs&value=12554&menu=5392
[5] http://www.personal.barclays.co.uk/BRC1/jsp/brccontrol?task=articleFWsocial&value=12560&target=_self&site=pfs
[6] http://www.personal.barclays.co.uk/BRC1/jsp/brccontrol?task=articleFWsocial&site=pfs&value=12556&menu=5401

Penguin Publishing
Penguin Publishing has established a 2003 base line for the number of flights and aims to reduce the amount of air travel taken by 2007. Flights that are made are offset by the Climate Care Agency. Quarterly progress reports are produced.[7]

Set criteria for travelling by air

Vodafone
Vodafone's UK headquarters has a green travel plan which sets out criteria for employees to follow when considering whether they need to fly or not (i.e. to use a different mode of transport or to use the video-conferencing facilities – with a dedicated team to support staff using).[8] Air travel, by Vodafone employees, fell by 20% in 2006 compared to previous years.[9]

Metropolitan Police Service
MPS Overseas Travel Policy sets out criteria for the justification of overseas travel for business trips. All air travel is offset as part of the GLA Group offset policy and therefore personnel have to justify carbon offsetting costs, time and resources when using a mode of travel.[10]

[7] http://www.penguin.co.uk/static/cs/uk/0/aboutus/aboutpenguin_greenpenguin.html
[8] http://www.vodafone.com/start/responsibility/environment/transport.html
[9] http://www.itm.org.uk/icarus/pdfs/Tool_No_6b.pdf
[10] http://www.met.police.uk/foi/pdfs/policies/overseas_travel_policy.pdf

4. Revising the GLA staff business travel policy

Analysis of GLA foreign business travel

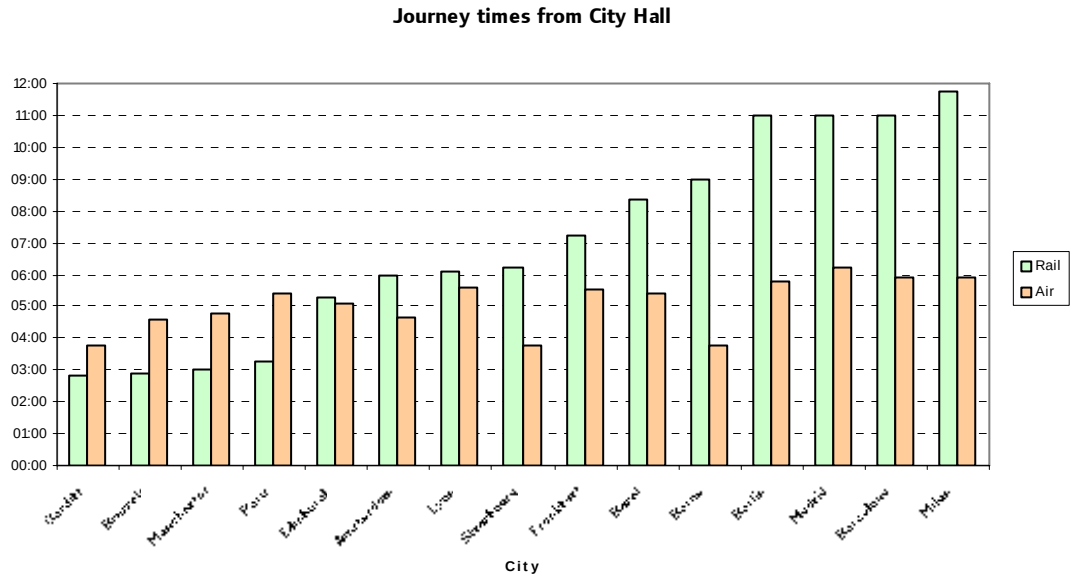
In order to assess the potential impact of different options for switching to more CO_2 efficient modes for GLA foreign business travel it is necessary to have a clearer picture of the current pattern travel. GLA City Hall staff foreign business travel has been analysed for 2006 and 2007 (including trips up until the end of September 2007). The authorisation process gives details of the mode of travel and the destination. Distances have been calculated separately.

High-speed rail is typically competitive with short haul aviation over distances up to 600-700 kilometres and travel times of up to 5-6 hours. Door-to-door travel times, from City Hall, were calculated for each trip based upon the following assumptions:

	St Pancras	Heathrow
Access from City Hall	00:30	01:25
Departure controls	00:30	01:30
Controls on arrival		00:30

It should be noted that the access travel time to City Airport would be shorter than the access time to Heathrow. Flight times were calculated from British Airways flight timetables. Rail travel times were calculated from the Rail Europe and Eurostar on-line timetables for a trip in December, assuming a one-month advance booking. A comparison of the journey times is shown in table 1 and figure 5.

Figure 5: Journey times from City Hall for a range of cities

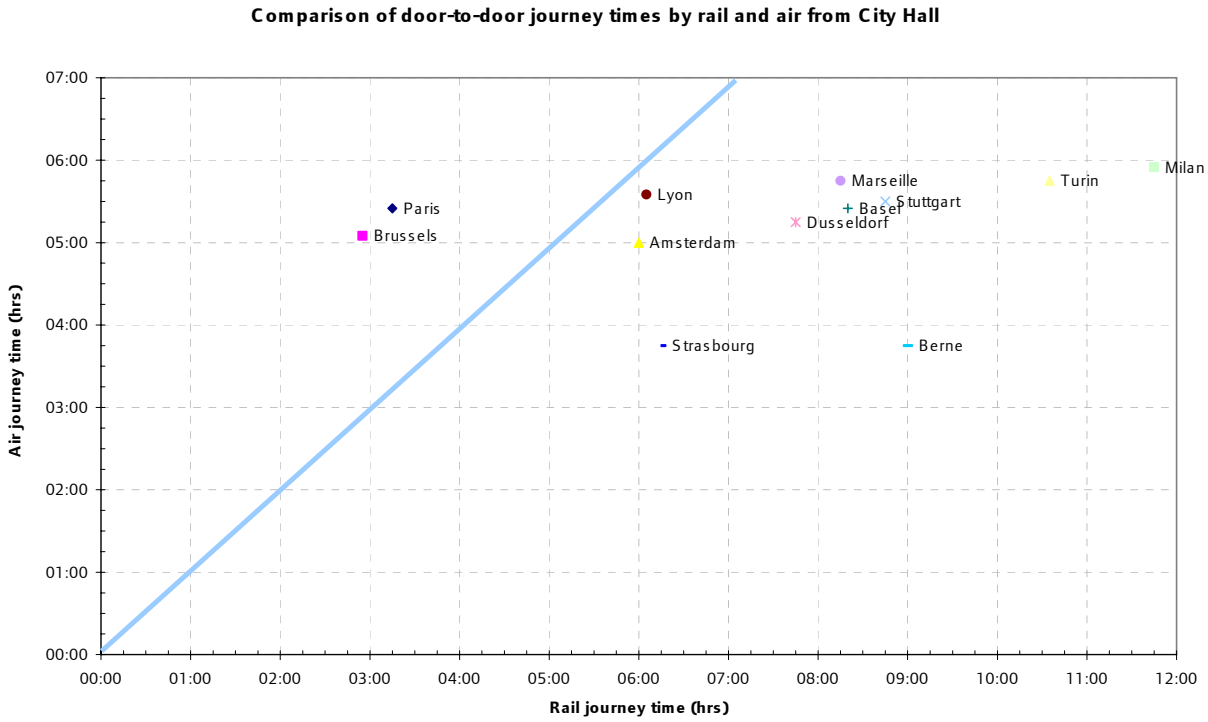


Access times at the journey destination were calculated for each city. Rail stations are generally located in the centre of cities and the access time to a notional destination is assumed to be shorter than the access time from the peripherally located airport. In

general, access time from the airport to the city centre was estimated to be an additional 20 minutes to 45 minutes on top of the rail city centre access time.

Figure 6 shows a comparison of journey times to each city destination.

Figure 6: GLA business trip door-to-door journey times by rail and air from City Hall



For destinations where the door-to-door travel time by rail is quicker than by air, for example Paris and Brussels, all GLA business trips were made by rail. Brussels and Paris were the main destinations for rail trips, with 22 and 11 return trips respectively.

For destinations where the door-to-door journey time by rail is up to one hour slower than by air, which include Lyon and Amsterdam, three return flights were made. A further three return flights were made to a destination - Frankfurt - with a two hour journey time differential. For destinations within a broadly three hour journey time differential – Marseille, Düsseldorf, Basel and Stuttgart – 2 rail and 3 plane return trips were made. These latter destinations have an overall journey time by rail of between 8 – 9 hours.

Table 1: Door-to-door journey times by rail and air from City Hall

Destination	Rail (Hrs)	Air (Hrs)	Difference in journey time (Hrs)	Dist by air (km)	Nos of trips by rail	Nos of trips by air
Brussels	02:55	05:05	-02:10	349	22	0
Paris	03:15	05:25	-02:10	346	11	0
Lyon	06:05	05:35	+00:30	750	0	1
Amsterdam	06:00	05:00	+01:00	370	0	2
Frankfurt	07:15	05:30	+01:45	653	0	3
Marseille	08:15	05:45	+02:30	988	2	0
Düsseldorf	07:45	05:15	+02:30	500	0	1
Basel	08:20	05:25	+02:55	708	0	1
Stuttgart	08:45	05:30	+03:15	754	0	2
Turin	10:35	05:45	+04:50	917	0	2
Berlin	11:00	05:45	+05:15	947	0	3
Barcelona	15:00	05:55	+09:05	1,146	0	2
Venice	15:20	06:05	+09:15	1,150	0	1
Madrid	17:15	06:15	+11:00	1,244	0	2

Benefits and costs of a change to the business travel policy

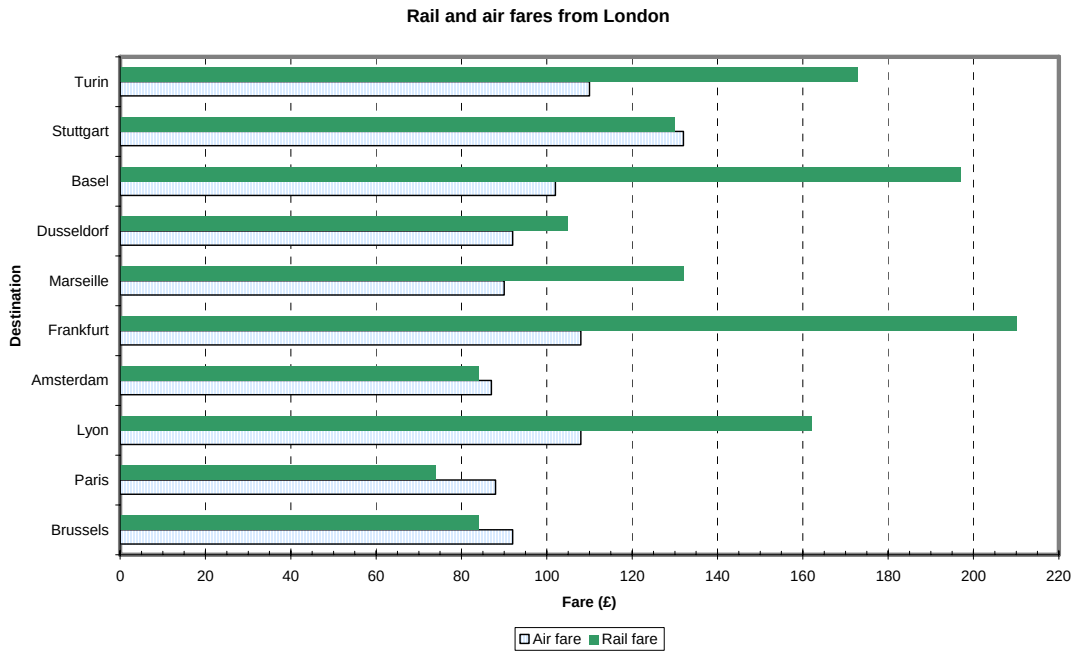
The application of a business travel policy of substituting rail trips for flights would have a number of financial, economic and environmental costs and benefits. The level of these costs and benefits would be dependent on the type of threshold applied. Cost and benefits include:

- Difference in fares
- Additional staff travel time costs
- Additional accommodation and subsistence costs
- Carbon off-set savings
- CO_2 savings

Fares

Costs (and savings) would include the difference between the air and rail fare. Short-haul air fares from London to Europe are predominantly lower than rail fares. However, the margin between rail and air fares is narrowing as the European rail companies apply more flexible and competitive pricing structures more comparable with the approach of the 'low-cost' airlines. Figure 7 shows the typical cost of journeys for rail and air travel for the subset of European destinations. The fares are based on booking a month in advance of the trip.

Figure 7: Rail and air fares from London for a return trip

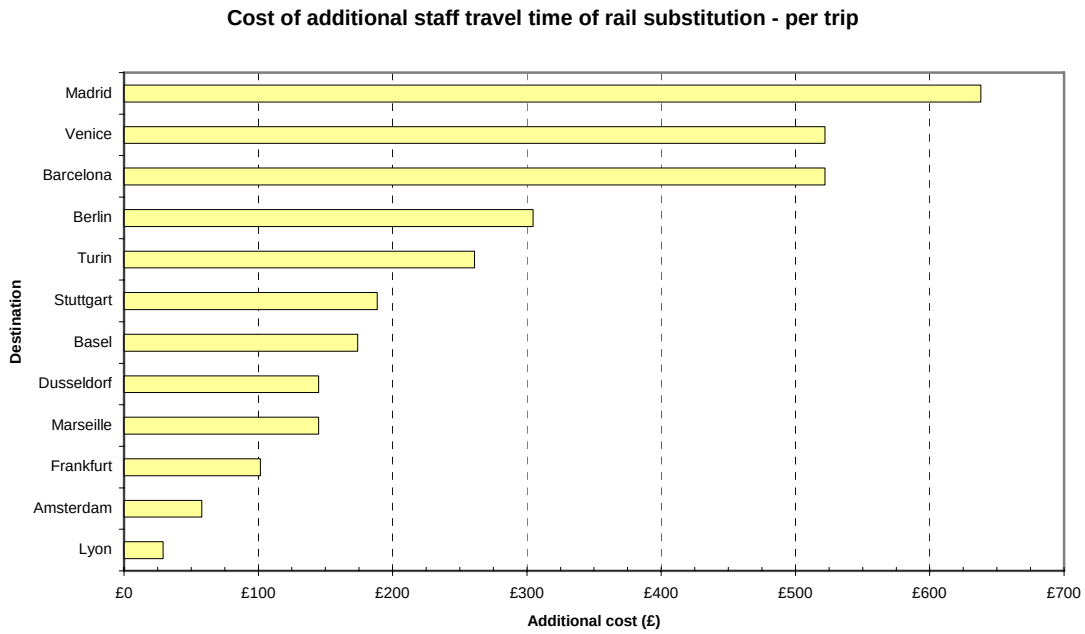


Staff time

The additional travel time, by whichever mode, would have a staff working time cost. However, in vehicle travel time, by whichever mode, could be used as working time. Further, it could be argued that train, compared to air travel, has a more conducive

working environment and hence more effective productive time. For some of the longer rail journey times there may be a necessity to stay an additional night at the destination. This would incur additional staff time, accommodation and subsistence costs. This may also create problems for staff that have particular responsibilities, such as child-care. Rail journeys of over eight hours are assumed to require an additional night stay at the destination, although the additional staff time has not been added to the staff time cost. Figure 8 shows the cost of the additional staff travel time, based upon an average GLA hourly pay-rate.

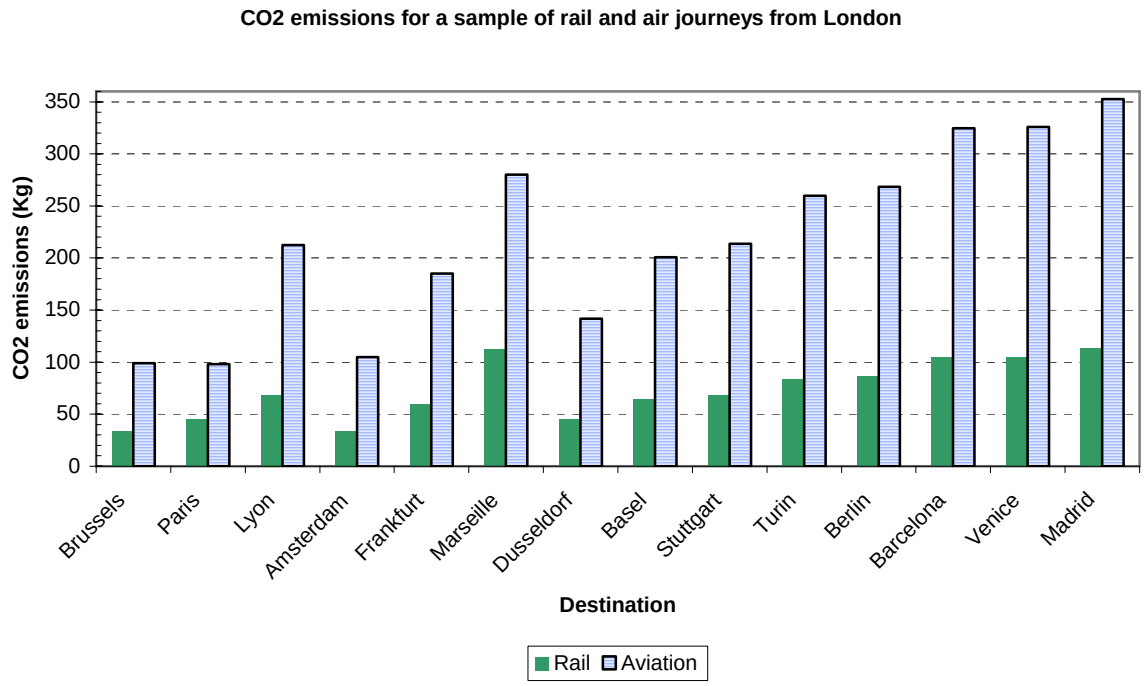
Figure 8: Cost of additional staff travel time



CO_2 emissions

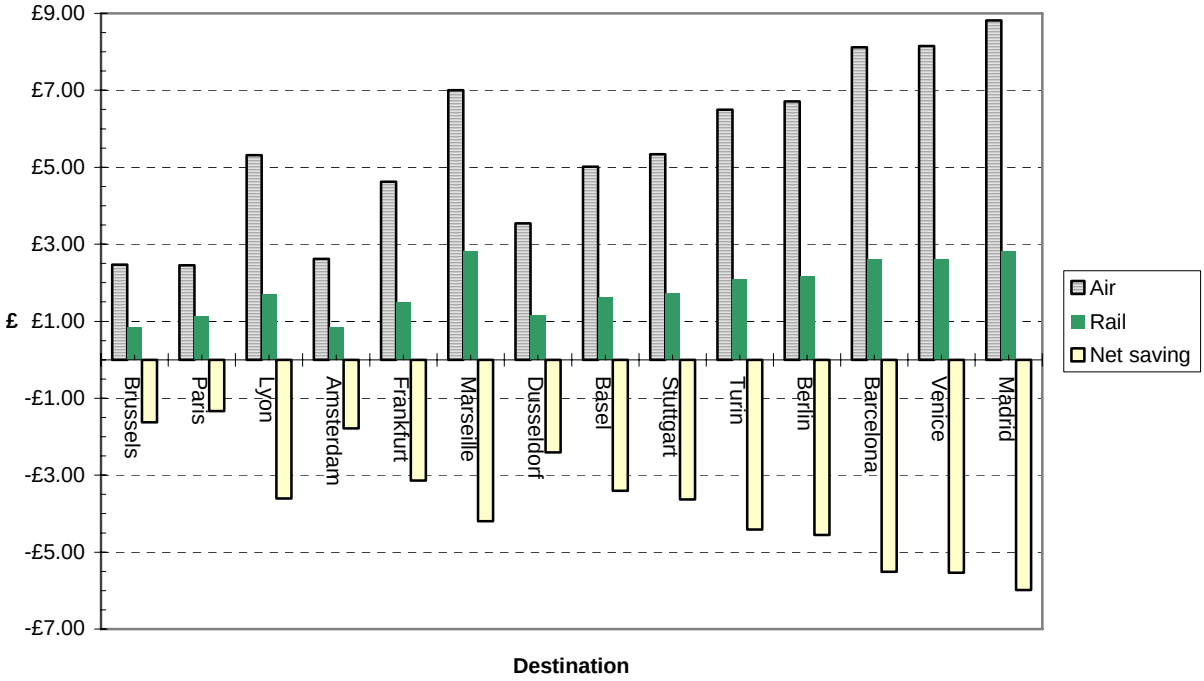
Benefits of a rail for air travel substitution policy would include a reduction in CO_2 emissions and a consequent saving in CO_2 off-setting charges. Figure 9 shows a comparison of the CO_2 emissions for a single journey by rail and air to the subset of European destinations. Emissions by rail are typically a third to quarter those of aviation for the range of destinations. The aviation emissions have been adjusted to include the effect of radiative forcing.

Figure: 9 CO_2 emissions for rail and air journeys from London



The financial benefit from reduced off-setting of CO_2 for rail journeys compared to air is shown in figure 10, below. The calculation of savings is based upon a shadow price of CO_2 of £25 per tonne of CO_2 (DEFRA[4], 2007). Typical savings are in the range of £1.30 - £6.00 per journey (£2.60 - £12.00 per round trip).

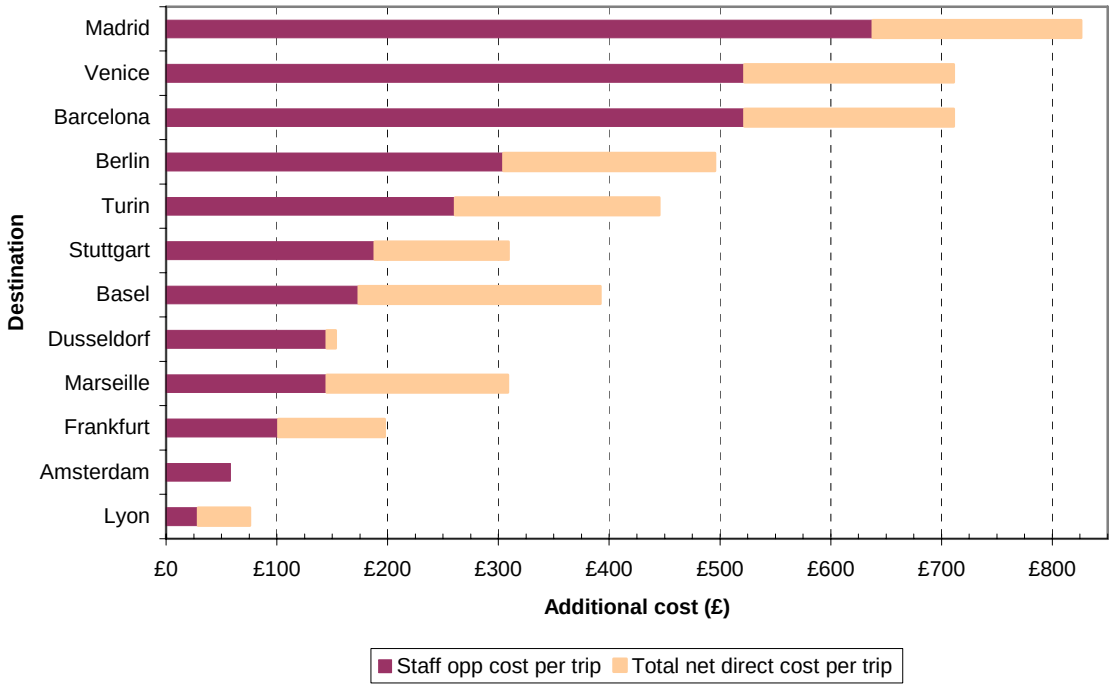
Figure 10: CO_2 Off set costs and savings for rail and air journeys



Total additional costs per trip

Total additional costs per trip include the fare differential between rail and air, the savings in offset costs, staff time and additional subsistence and accommodation costs. Figure 11 shows the overall additional cost per trip for the subset of destinations. Amsterdam and Lyon have additional cost of £50 - £100 per trip. Frankfurt and Dusseldorf have additional costs of £150-£200 per trip. All of the remaining destinations have additional total costs of more than £200 per trip.

Figure 11: Additional costs per trip for rail substitution



Options for the business travel policy

Two principal considerations for the business travel policy review are its practicality and cost for the benefit it derives. Firstly, in terms of practicality, an appropriate door-to-door rail journey time limit should be set as a threshold, below which rail is the preferred choice for travel. Secondly, an appropriate balance needs to be struck between the CO_2 benefits and the additional costs to the organisation.

Threshold journey time

Figure 12 shows destinations in Europe and the difference in the rail and air door-to-door journey times from City Hall. Cities within a three-hour journey time include Paris and Brussels. Lyon and Amsterdam are within six hours by rail and the difference between the rail and air journey times is around one hour. Cities which are around eight hours jail journey time from London include Marseille, Strasbourg and Stuttgart. However, the rail / air journey time differential widens to around three hours.

In terms of practicality, six hours would appear to be an appropriate upper limit for rail to be considered to be the preferred mode. This allows return trips to be made in one day if necessary.

Figure 12: Journey time difference by rail and air

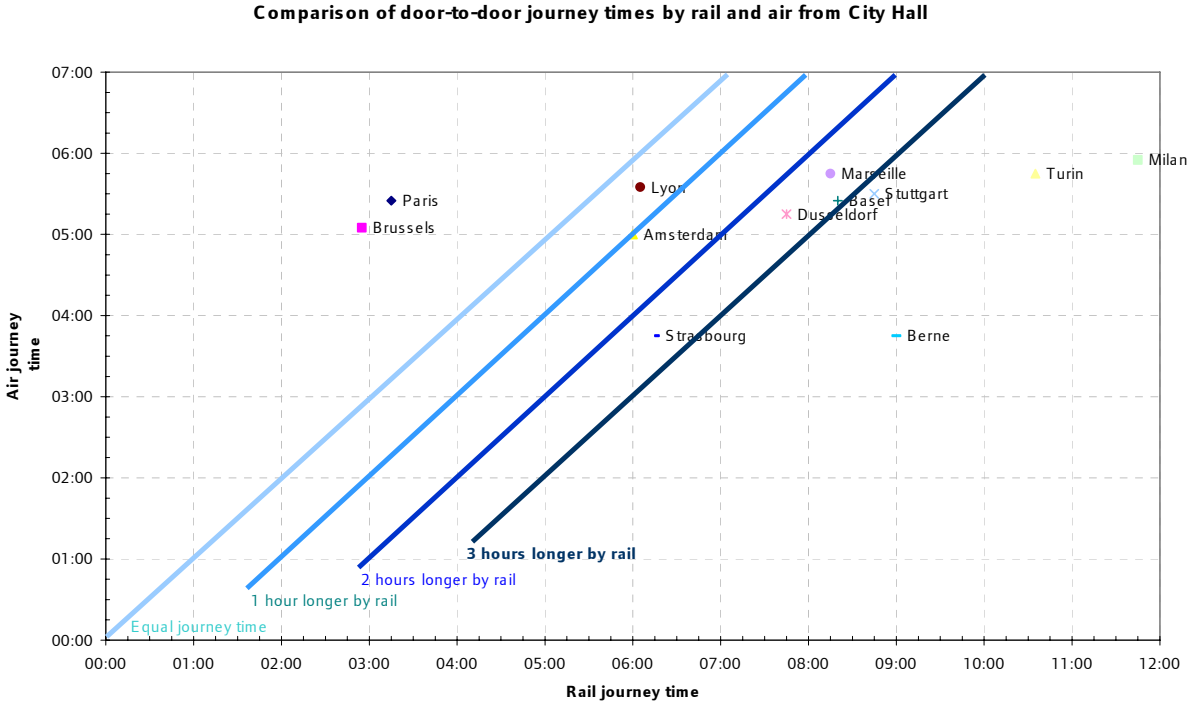
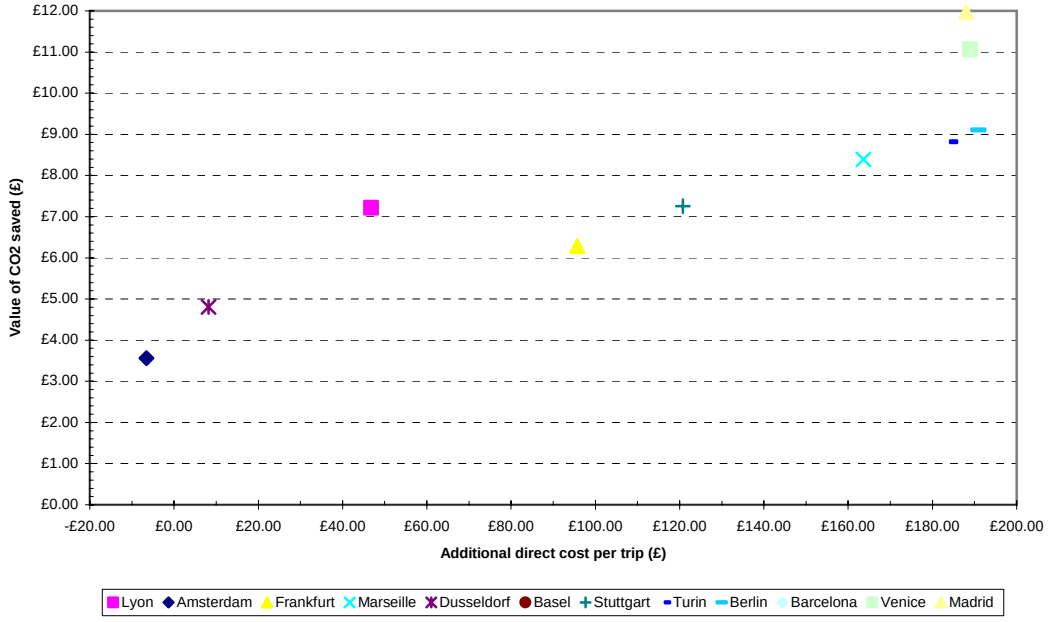


Figure 13 shows the balance of costs and benefits expressed in terms of the additional direct cost compared to the value of the CO_2 saved. The cost includes the fare differential, any additional accommodation / subsistence costs and CO_2 off-set charges. It does not include staff time costs.

Figure 13: Additional cost per trip and value of CO_2 saved



A trip to Amsterdam by rail would have a net financial saving of around £7 by rail and save CO_2 with a value of £3.60. A trip to Dusseldorf by rail, because of its competitive rail fare would have a net financial cost of only £8 for a CO_2 saving valued at of £5. A trip to Lyon by rail would have a net financial cost of around £47 and save CO_2 with a value of £7. A trip to Frankfurt by rail would have a net financial cost of around £96 and save CO_2 with a value of £6. The remaining destinations have additional costs per trip in excess of £100 for CO_2 with a value of less than £12.

Impact of proposed business travel policy

The impact of the revised policy can be assessed by applying it retrospectively to the subset of European business trips.

Table 2 shows that a 6-hour rail journey time threshold would lead to savings of 328 Kg of CO_2 over a 12 months period. Savings for other thresholds are also shown for comparison.

Table 2: Impact of journey time threshold options

Threshold	Destinations included	Additional direct cost by rail (£)	Total CO_2 saving (Kg)*
6 hour	Amsterdam, Lyon	33.67	328
7 hour	Amsterdam, Lyon, Frankfurt	320.82	759
8 hour	Amsterdam, Lyon, Frankfurt, Dusseldorf	324.92	868
9 hour	Amsterdam, Lyon, Frankfurt, Dusseldorf , Marseille, Basel Stuttgart	724.23	1272

*Pro-rata annual figure based on GLA business trips in 2006 and 2007

5. Recommendations & conclusions

- Change to staff business travel policy – no air travel, accept in exceptional circumstances, to destinations in mainland Britain and to Paris, Brussels and Amsterdam. Rail should be the preferred mode for European trips within a 6-hour rail door-to door travel time from City Hall for GLA staff (or main place of work for LDA and TfL staff);
- Publicise policy and explain rationale with worked examples of alternatives;
- Immediately introduce this policy to all staff in GLA City Hall, TfL, and LDA
- Work with the MPA/MPS and LFEPA to introduce this policy to staff in these institutions;
- Travel agency to actively seek rail option;
- Add to the GLA Intranet a price and carbon offset calculator;
- Provide website access for European rail search;
- Set up a consistent monitoring mechanism;
- Report savings annually;
- TfL Workplace Travel team to publicise the policy and to encourage companies and organisations to adopt similar policies towards discouraging short haul flights.

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