










Transformation of the West Coast Mainline

How rail investment is benefitting people,
the environment and the economy



	Foreword	3
	Summary	4-5
	Introduction	6-7
	Passenger benefits	8-9
	Road congestion	10-11
	Carbon emissions	11-12
	Economic impacts	13-14
	Recommendations	15-16
	References and methodology	17-18

Foreword

Completed in 2009, the ten-year programme of improvements to the West Coast Mainline was one of the biggest upgrades ever made to the country's long-distance rail network. Without the multi-billion pound investment from government and industry to replace Victorian infrastructure, introduce a new fleet of trains and overhaul the timetable the UK's transport network would look very different.

The scale of transformation on the corridor has had far reaching implications. This report collects the key impacts investment has achieved for passengers, the environment, and regional economies.

For rail users, timetables now feature faster, more frequent train services between London, Manchester, Birmingham and Glasgow. This has driven growth in passenger numbers well beyond that seen on the rest of the network. It has also meant more motorists leaving the car at home and previously busy air routes like that between Manchester and London seeing a precipitous decline helping cut carbon emissions and making more efficient use of our transport networks.

Without investment in the West Coast, Britain's economic geography would also have been different. For example, regular, high quality rail services have been an important factor in the BBC's move north from London, helping seed Manchester's burgeoning creative industries sector.

At a time when rail investment is being questioned because of poorly implemented timetable changes, franchise collapses and over-running and over-budget projects, it is easy to lose sight of the long-term benefits that can be achieved. When the West Coast Route Modernisation Project was underway, it had all the hallmarks of a project in crisis with projected costs ballooning to nearly £15 billion and important objectives like raising line speeds being scaled back. While those failures are very real, the benefits of investment mean much of this has been forgotten.

With radical changes to the UK rail system under consideration, this report shows how thinking, collaboration and co-operation can achieve wide reaching, long-term benefits. As the future structure of the railways is developed, its findings are highly pertinent.

Darren Shirley
Chief Executive, Campaign for Better Transport

“With radical changes to the UK rail system under consideration, this report shows how long-term thinking, collaboration and co-operation can achieve wide reaching, long-term benefits.”

Summary

The transformation of the 400 mile West Coast Mainline (WCML) has delivered major benefits for passengers, the environment, communities and local economies.

Despite significant obstacles and setbacks, vastly improved services have been delivered. This is based on a shared vision which has been realised through investment to replace worn-out infrastructure, numerous line upgrades, and the design and build of innovative high-speed trains.

The outcome is not just better journeys and higher passenger numbers, but less congestion on the roads, growing regional and local economies and lower carbon emissions from transport.

This report sets out some of what has been achieved and considers what would have happened if such investment had not taken place.

Passenger benefits



Doubling passenger numbers on the WCML in under 15 years and outstripping overall growth on the rail network overall by over 40 per cent since 2008

Increasing capacity by up to three times on key routes

Reducing journey times by up to 28 per cent, saving regular travellers hundreds of hours and making rail competitive with domestic aviation even on journeys between London and Scotland

Road congestion



Without transformative investment in the WCML many more journeys are likely to have been taken by road.

Modelling suggests this would have resulted in:

- A significant portion of the motorway network between London and Manchester receiving over 7 million additional car journeys a year
- Up to 26,000 additional daily car journeys on the M1 and M40
- A 17 per cent increase in peak time traffic flows north of Birmingham
- Widespread increases in delays such as a minute a mile increase in journey times on the M1 between London and Luton.

Carbon emissions



Rail travel is green and growth in use of the WCML has dramatically reduced domestic aviation, helping to cut carbon emissions and lessening transport's environmental impact.

Flights to Manchester from other cities served by the West Coast have declined by 67 per cent since 2004.

Rail's growth is the equivalent of 1.7 million fewer people flying between London and Manchester between 2004 and 2017, resulting in 5,000 fewer flights and 60,000 tonnes of carbon savings.

Rail's share of the market between Glasgow and London grew from eight per cent to 20 per cent between 2009 and 2017.

Economic benefits



Modernisation of the West Coast route and its services has supported local economies by raising footfall in urban centres and attracting employers and investors, thereby helping rebalance the economy. For example:

- Greater Manchester's improved connectivity has helped it to attract major employers such as the BBC, IBM, ITV and Microsoft.
- The million people arriving in the Lake District by rail is helping reduce road congestion in the National Park
- A major overhaul of Coventry Railway Station is being undertaken in time for the city to take on the title of City of Culture in 2021
- Chester's rail passenger numbers are closing in on five million a year helping the city centre support 12 per cent growth in footfall
- A 20 year plan to transform Runcorn town centre is being driven by rail after passenger numbers at the WCML station doubled to three quarters of a million.

Recommendations



Investing in rail can achieve far reaching benefits. To build on and replicate successes on the West Coast requires a supportive policy environment including:

- Developing better partnerships to deliver projects through shared objectives and appropriate risk and responsibility
- Setting better objectives which capture the full range of social, economic and environmental benefits that rail can deliver, rather than regarding them as happy side effects
- Improving decision making by establishing processes to learn from what has gone before, quantifying outcomes and ensuring the railways full benefits are captured through tools such as land value uplift.

A DIFFERENT KIND OF FRANCHISE

The 1997 West Coast Franchise was structured very differently to current rail franchises. Rather than pursuing objectives for track and train separately as current rail policy arguably does, the agreement was based around a partnership with shared objectives, and which transferred risk and responsibility to specific organisations.

The Virgin High Frequency (VHF) timetable at the centre of Virgin Trains successful bid for the new franchise required new rolling stock and infrastructure upgrades to deliver it. Virgin took responsibility for procuring rolling stock in a deal underwritten by the Department for Transport (DfT). Alstom and Bombardier were contracted to design, build and maintain the new rolling stock fleet. Meanwhile, the network operator took responsibility for delivering infrastructure upgrades based on the broad technical requirements of the new train fleet and timetable.

Not all aspects of the partnership went smoothly. While procurement bought innovative train design and an efficient and reliable fleet, the West Coast Route Modernisation programme ran massively over budget, was greatly delayed and eventually had to be descoped.

This required new timetable proposals to be drawn up to make best use of the revised capacity. With up to eight operators using the line at different points, industry consensus around the timetable had to be fostered to avoid formal objections between operators. The partnership approach achieved this through revisions to franchises with the result of strong growth for all operators using the West Coast.

Upgrading the West Coast Mainline

The WCML is a vital artery for the country. It links major conurbations through high capacity, high speed and high frequency rail services that are used for tens of millions of journeys every year.

It is easy to take for granted that such a standard of service exists. But the present quality of links between London, Birmingham, Manchester, Liverpool, Glasgow, Edinburgh and many other locations has only been made possible because of the innovative partnership which oversaw major investment in the WCML.

This followed a different model of investment than has been seen elsewhere on Britain's railways. Bringing together public and private sectors, it created a shared vision, combining investment in infrastructure and rolling stock to transform the line and its services. This included not just the renewal of the existing track, but numerous upgrades and the design and build of an entire fleet of groundbreaking high-speed tilting trains able to accommodate the twisting WCML at up to 125mph (the first time such technology had been successfully deployed in the UK).

Before this, neither track nor trains had seen meaningful improvement since the mid 1970s. A combination of worn out infrastructure and tired rolling stock had resulted in slow, unreliable services and falling passenger numbers.

While the quality of the WCML is now largely taken for granted, its gestation was far from straightforward. After Virgin Trains won a 15-year franchise in 1996, Railtrack oversaw a ballooning in costs for the West Coast modernisation programme from £2.5 billion to £14.5 billion.

When Railtrack went bankrupt in 2001, being replaced by Network Rail, the scope of the project was reduced, eventually being completed in 2009 at a cost of £8.9 billion (all prices 2005-06).

What would have happened if such investment had not taken place?

This report considers intercity services, the impact of the modernisation programme and the introduction of Virgin Trains' VHF timetable. This period has been characterised by shortened journey times and growing passenger numbers. But investment and new services have not only delivered a growing railway; they have helped achieve other end results including supporting the economy, progress toward environmental objectives and social benefits.

The broader outcomes of rail investment are not happy accidents. Instead, they are the result of long-term decision making by public and private sectors. The response should not be judged solely in terms of more passengers on trains, but also in less congestion on the roads, growing regional and local economies, and lower carbon emissions from transport. As the report shows, such benefits are often substantial and should inform both transport planning and policy making. The recommendations from this report make clear, it is only by considering all the things that flow from investment that a full picture begins to emerge.

WEST COAST MODERNISATION

The 400-mile WCML is one of Europe's busiest rail corridors. At peak periods, the high-speed lines now carry up to 16 trains per hour at 125 mph - more than some purpose-built high-speed lines. But in the 1990s, the West Coast was creaking with capacity and performance well below those of the East Coast and Great Western routes.

The West Coast Route Modernisation project was undertaken from 1998 to 2009 to upgrade the whole route and its services. This included:



**53 HIGH-SPEED
TILTING TRAINS
OF UP TO 11 CARS**



**430 MILES
OF TRACK**



2149 SIGNALS



**13 MAJOR
JUNCTIONS**



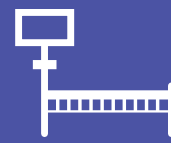
**837 SWITCHES
& CROSSINGS**



56 PLATFORMS



**179
BRIDGES**



**77 LEVEL
CROSSINGS**

Among the benefits have been increased maximum speeds on the line and the creation of capacity for nearly 40 per cent more long-distance services. This has been delivered through Virgin West Coast's VHF timetable which was implemented from 2009 with improvements including an increase in services:

40%

More long-distance services

25%

More services between London and Scotland

50%

Between London and Birmingham

150%

Between London and Manchester

Passenger benefits

For passengers, modernisation of the WCML and the West Coast franchise has led to faster, more frequent and more reliable services. Combined with new approaches to passenger care, this has resulted in passenger growth well above that seen elsewhere on the network.

Milestones have included Virgin Train's introduction of Class 390 Pendolino trains from 2002, replacing 25-year old rolling stock, and the launch of the VHF timetable in 2009. This was a central part of the West Coast modernisation programme and increased line capacity by nearly a third, meaning 45 trains each weekday between Manchester Piccadilly to London Euston with the 20-minute interval also running on Saturdays and Sundays.

The major investment in West Coast's services have brought travel times down significantly. For example, London to Manchester is now 28 per cent faster, giving rail the edge over road and air travel for medium to long distance journeys along the route.

Featuring an innovative tilting mechanism developed by Alstom, Pendolino trains were introduced from 2002. Despite the technology being new, Pendolinos have offered greatly improved speed and reliability compared with the locomotive-hauled services they replaced. Service frequency has been transformed with numbers of services on popular routes increasing by up to 150 per cent. Capacity on individual trains has also been enhanced. Originally introduced with eight and nine cars, passenger demand on WCML led to around half the Pendolino fleet being extended to 11 cars with platforms being extended to accommodate the change.

Passenger care improvements on Virgin services have been made by tackling 'pain points' identified in customer feedback. Responses include industry leading initiatives in ticketing such as online sales, print at home and mobile ticketing. Passenger experience has also been improved including pre-boarding support for vulnerable travelling groups and use of social media to advise on alterations to services and to engage directly with passengers.

While performing well in Transport Focus' biannual National Rail Passenger Survey, Virgin has also adopted a Net Promoter Score model to create a more responsive assessment of passenger experience that can be targeted down to the level of individual stations in order to inform passenger care.

The VHF timetable added an estimated ten million seats a year to the West Coast from 2009; this number extended again with the introduction of longer trains from 2012. Along with increased frequency, new routes such as an hourly service between London and Chester are now well established, meaning the route serves more communities.

These improvements have coincided with a fall in passenger complaints of 39 per cent on Virgin Trains West Coast between 2010/11 and 2017/18.

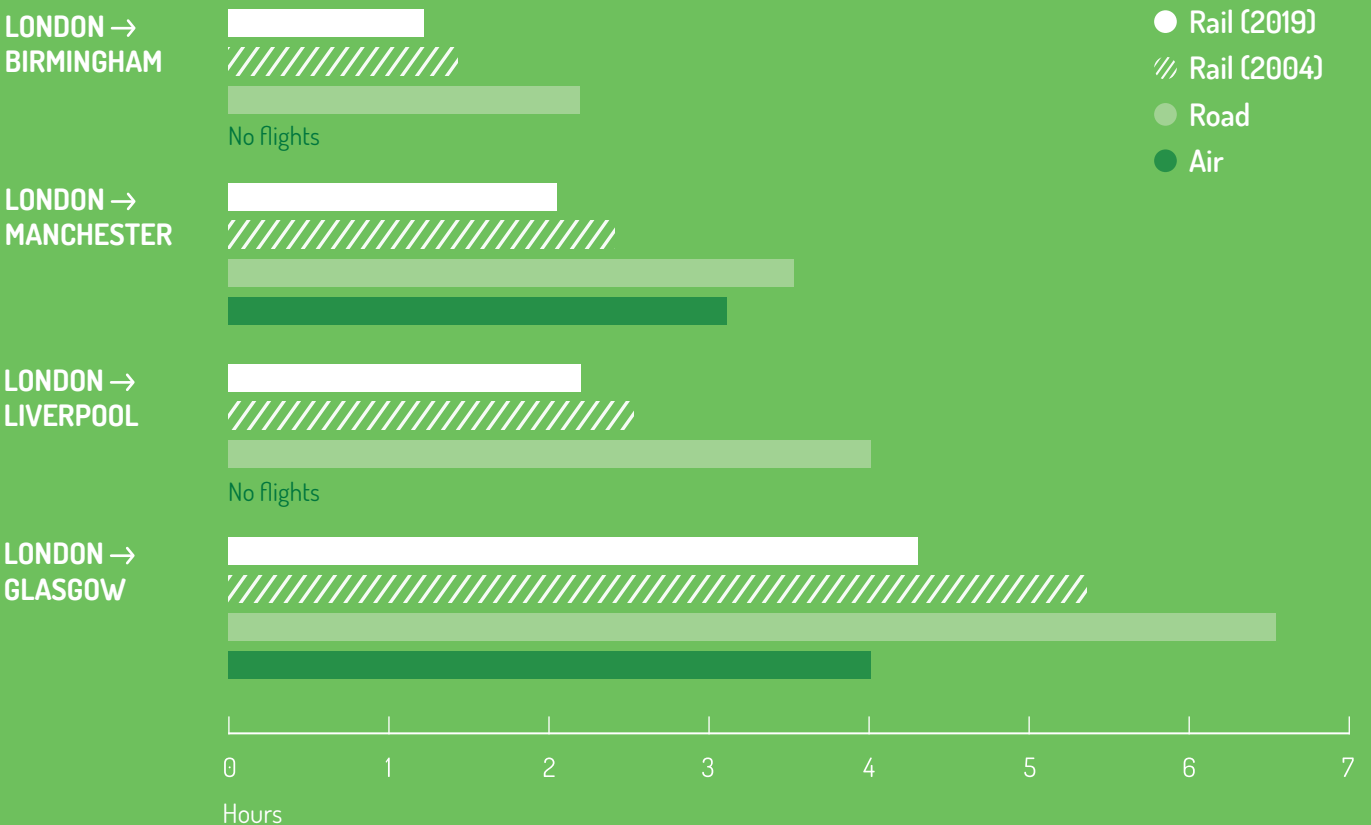
Even compared with strong growth on the railway overall, journey numbers on the West Coast are impressive. While percentage increases had been comparable with those of other long-distance routes, the introduction of the VHF has seen Virgin West Coast outstrip growth on the network by over 40 per cent in the ten years from 2008/09.

In total, over 280 million journeys were made on Virgin West Coast from the introduction of the VHF timetable and March 2018. Shorter journey times mean a commuter traveling once a week between Birmingham and London will have saved the equivalent of eight working weeks over the last ten years, while a commuter who switched from car to train for the same London to Birmingham journey will have saved nearly six months of working days.

Percentage change in rail passenger numbers since 2005



Rail's time competitiveness



40%

Amount passenger growth on West Coast has outstripped growth on the railway overall since 2008-09



8 weeks

Time saved by a once-a-week traveller between London and Birmingham since 2009

Road congestion

Over the last 20 years, millions of journeys which would previously have been made by road have transferred to rail. This has only been possible because of the investment that the railways have seen, helping make the train an attractive alternative to the car. What would have happened to road congestion and journey times if this investment had not been forthcoming and rail had not grown?

The route of the WCML connects several of the largest cities in the country. London, Birmingham, Manchester, Liverpool, Glasgow, Edinburgh and other major settlements are also linked by the Strategic Road Network (SRN) and sections of motorway including the M1, M40, M6 and M60. These are among the most congested of the country's roads outside of major cities.

Over the last ten years, use of the rail network has grown significantly faster than any other transport mode. This means millions of journeys which might otherwise have been made by road being transferred to rail. This has only been possible because of the investment that the railways have seen, helping make the train an attractive alternative to the car.

What would have happened if this shift had not taken place and rail had not grown? How would journey times and road congestion be affected if investment had not been made in the WCML and other rail projects?

Using mapping and modelling, this analysis predicts where the road network would have been worst affected by a failure to invest in the WCML. It draws on the most common journeys on Virgin Trains from 2009 to 2018 and assesses what the impact on traffic and congestion would have been if these trips had instead been taken by road.

7 million 

Additional car journeys a year between London and Manchester

A significant portion of the motorway network between London and Manchester would receive over seven million additional car journeys a year. With many of the sections of road in question already operating at or close to capacity during peak times, additional traffic has a disproportional effect on delays and congestion. For example, by 2018 a combination of the M1 and M40 would have seen over 26,000 additional car journeys each day. As well as being highly detrimental to the travelling public, the economy and the environment, such an increase would also be likely to have public spending implications through pressure to increase capacity of the road.

26,000 

Additional daily car journeys on the M1 and M40

The largest percentage increase in road traffic would have been on the M6 north of Birmingham. For example, the 11 miles between Stafford and Newcastle Under Lyme would have seen a 17 per cent overall increase in daily traffic flows between 2009 and 2018 if rail passengers had instead travelled by road.

Increases in car numbers would also mean growing congestion and delays. The worst affected area would be the M1 between London and Luton. If Virgin Trains passengers had instead travelled by road, journey times over the 16-mile stretch would be a minute a mile slower for everyone using this road at peak periods.

Similarly, the M40 between Banbury and Birmingham is a busy road used by nearly 90,000 vehicles a day. If Virgin Trains passenger growth had instead gone to road, average journey times over the 29 miles would have been five minutes longer in 2018 compared with 2009. For someone commuting by road daily, that would mean another one and a half days driving a year (38 hours).

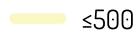
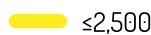




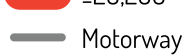
38 hours

Increase in annual commuting time by road between Banbury and Birmingham

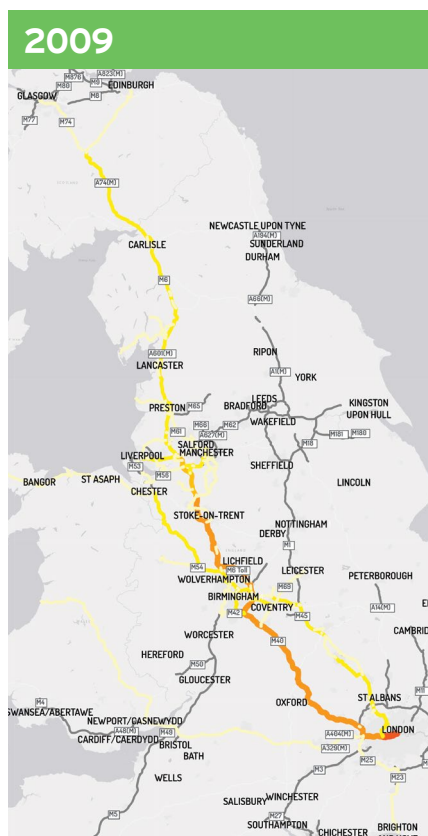
Technical modelling was carried out by PJA to inform this report. Full details of this can be accessed on the Campaign for Better Transport website via the references of this document.

No rail growth - impact on average traffic flows on the road network

Annual additional journeys on the Strategic Road Network

-  ≤500
-  ≤2,500
-  ≤5,000
-  ≤10,000
-  ≤15,000
-  ≤20,200
-  Motorway

Based on journeys which attract more than 10,000 WCML passengers per annum.



Carbon emissions

Transport is responsible for more greenhouse gas emissions than any other sector of the economy, but rail is a green way to travel with lower carbon emissions than other long-distance options. Services on the West Coast are having a positive impact on efforts to tackle climate change, shifting journeys to rail and away from domestic aviation and roads.

Travel patterns between London and Manchester exemplify rail's growing dominance. While rail journeys to Manchester have burgeoned, growing by 77 per cent between 2009 and 2017, the number of domestic flights to the city has collapsed.

Flights to Manchester from other cities served by the West Coast peaked in 2004 and have declined by 27 per cent since 2009 and 67 per cent overall, the equivalent of 1,665,880 fewer passenger journeys a year. As recently as 2007, four airports in London and the South East offered frequent services to Manchester, but now only Heathrow does. Flights between Heathrow and Manchester fell by 53 per cent over the same period while passenger

numbers from Gatwick, Stansted and London City to Manchester have subsided from over 630,000 a year to almost nothing. Air services between London and Liverpool have gone the same way, and rail's share of journeys between Glasgow and London increased from eight per cent to 20 per cent between 2009 and 2017.

The shift from air to rail has significantly reduced carbon emissions. Aviation's reduced share of the market between London and Manchester means nearly 5,000 fewer flights took off which would have produced 60,000 tonnes of carbon between 2004 and 2017 including 23,000 tonnes from 2009 to 2017 alone.

LONDON → MANCHESTER
2009 - 2017



77% ↗

Increase in rail passenger numbers

27% ↘

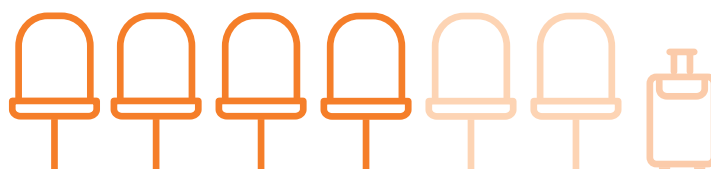
Decline in domestic aviation passenger numbers

4,988

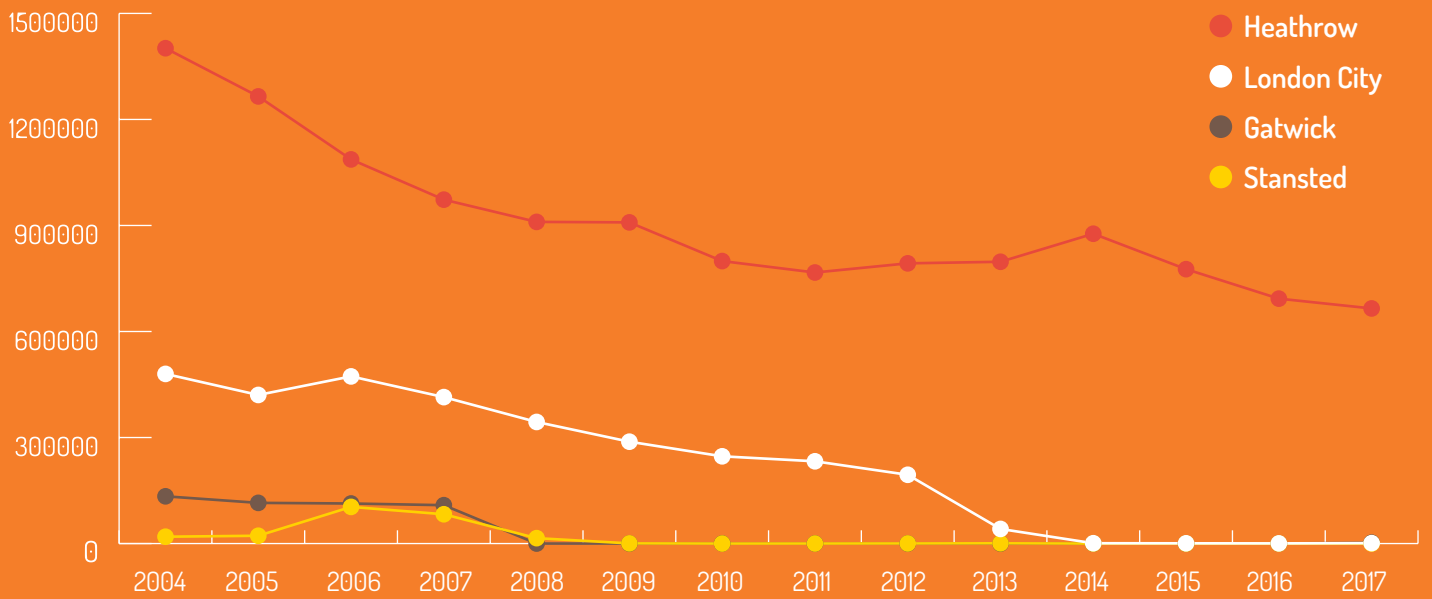
Equivalent plane loads of people who stopped flying

23,009

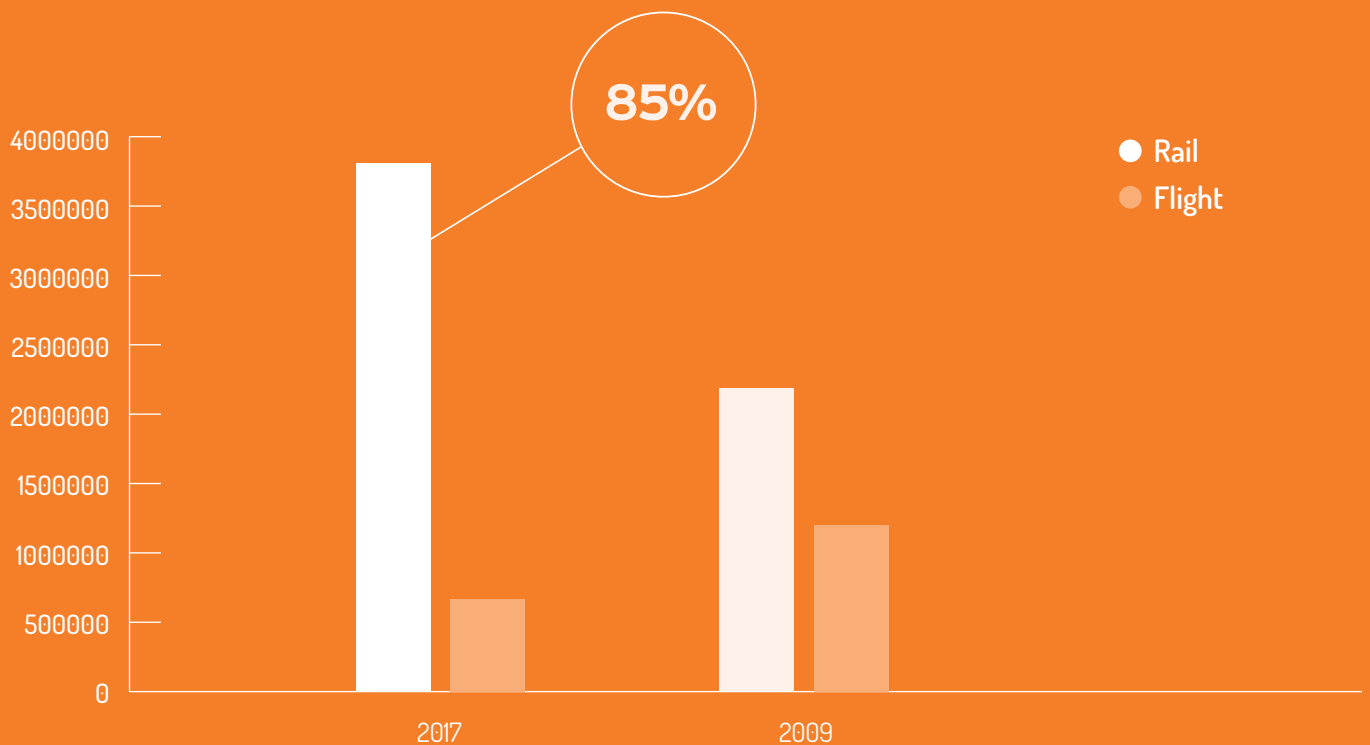
Tonnes of carbon withdrawn flights would have emitted



Aviation passenger journeys between London and Manchester



Train vs Plane - Market share between London and Manchester



Economic benefits

Modernisation of the West Coast route and its services has not only transformed a nationally important piece of infrastructure, it has also helped support local and regional economies right along its route. It can be seen as a trailblazer for the kind of rail investment anticipated in the 2018 UK Industrial Strategy.

'We will create a new high-speed rail network that connects people to jobs and opportunities'

UK Industrial Strategy

By improving accessibility to towns and cities, rail has supported sustainable economic growth, raised footfall in urban centres, attracted employers and investors, helped rebalance the economy and increased the size of labour markets.

The case studies given in this section show the positive benefits that individual settlements along the route have seen.



3,456

People employed on West Coast - 19% increase on 2009-10



1 million

Passenger journeys to and from Oxenholme Lake District and Penrith North Lakes stations - up 62% since 2008/9

THE LAKE DISTRICT

The Lake District is one of the UK's most popular tourist destinations, but its 19 million annual visitors can have a detrimental effect, clogging roads and detracting from its beauty. To maintain the natural resources on which the area's £1.41 billion tourism industry is built, the National Park Authority has adopted a strategy to reduce the number of visitors arriving by car by a fifth by 2040.

Rail is at the centre of this. Served by regular WCML trains, Oxenholme Lake District and Penrith North Lakes stations have seen passenger growth of 66 per cent and 57 per cent respectively in the last decade, removing up to a million car journeys from the roads. As impressively, both stations have become important hubs for onward travel. More than half a million rail interchanges now take place at the stations including a connection to the Lakes Line to Windermere.

Virgin West Coast and Network Rail have improved facilities for non-rail and onward travel including better taxi and parking provisions, National Express coach stop at Penrith North Lakes and the Co-Wheels car club offering electric car hire at both stations.

RUNCORN

A 20-year plan to transform areas of Runcorn is being driven by rail after passenger numbers at the WCML station doubled to three quarters of a million.

The regeneration plan led by the local authority aims to take advantage of large numbers using the station and includes new public spaces, a transport interchange, leisure facilities, housing and shops. A combination of improved walking and cycling routes and live bus information will better link the station with the town centre.

Runcorn is served by regular trains to Liverpool and Birmingham. After several years of decline, the station has seen rapid passenger growth since 2004, with numbers more than doubling to over 730,000 by 2017/18. The reinstatement of the Halton Curve in 2019 is expected to improve services further.

200%

Since 2004 passengers from Runcorn have doubled to over 730,000



MANCHESTER

Greater Manchester's creative, digital and technology sector has seen dramatic growth over the last ten years with high frequency and high-speed rail connections a key factor underpinning the success.

The creative sector now employs over 84,000 people in the city, contributes £63 billion to the region's economy and was recently ranked above Shanghai, Copenhagen and Madrid in the Innovation Cities Index, with good transport connectivity identified among its central strengths.

The BBC played a central role in seeding the creative sector's growth and the corporation's decision to take up residence in 2011 was partly dependent on the West Coast's modernisation and high-quality links to London. The BBC now employs 3,200 staff at MediaCityUK in Salford, the largest purpose-built centre of its kind in Europe. Other notable businesses with a presence in Manchester include IBM, ITV and Microsoft.

£63 billion (£)

The creative sector now employs over 84,000 people in the city, contributes £63 billion to the region's economy

COVENTRY

A major overhaul of Coventry Railway Station has been brought forward in time for the city to take on the title of City of Culture in 2021.

The existing station was built in 1962 and is struggling to cope with passenger numbers, which have doubled in the last decade. A masterplan agreed in 2015 includes the creation of a second station entrance, improved pedestrian access, a new bus interchange, and retail and office space.

Network Rail, Virgin Trains and Transport for West Midlands are partners in the £82 million project which has leveraged £30 million from the Government's Local Growth Fund.

As UK's previous City of Culture in 2017, Hull attracted an additional 1.3 million visitors who contributed an estimated £300 million to the economy and created around 800 new jobs. Rail was part of this boon with the station seeing a quarter of a million more journeys in 2016-18, with numbers having been largely static for the previous five years.

CHESTER

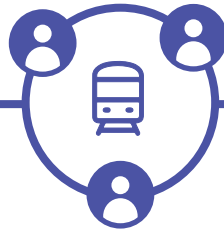
Chester is flourishing. Against a falling average footfall across the UK, visitors to the city centre are up 12 per cent year on year, helping to contribute nearly £2 billion a year to the visitor economy. Chester Zoo's 1.9 million annual visits make it the most visited tourist attraction in country outside London. In 2017, a new £37 million cultural centre, the Storyhouse, opened in Chester, and the city was judged the most accessible in Europe, the first British city to be given the accolade. Rail is an important part of this.

5 million

Passenger numbers closing in on five million per annum, up two thirds since 2008/09



Recommendations



This report summarises the benefits from transformative investment in infrastructure and services on the WCML. Despite significant problems, it shows how a well-structured long-term partnership can deliver major benefits to passengers, the environment and the economy. It is telling that the modernisation of the WCML is arguably the only example of such an approach since privatisation 20 years ago.

A fundamental rethink of how the country's railways are managed is now underway. The problems the WCML faced prior to the modernisation programme were severe but not unique. Ageing infrastructure, outdated rolling stock, lack of capacity and competition from other less sustainable modes are ongoing issues which the network must address.

The recommendations set out below summarise how the experience of the WCML can be harnessed to improve management of the network more broadly.

Developing better partnerships

Currently operators, Network Rail, Office of Rail and Road (ORR) and DfT are rarely united behind shared objectives. This is partly the cause of problems rail users have suffered in recent years. If something akin to this basic structure is retained, then a key lesson learned from the WCML concerns the importance of partnership. The scheme's successes were achieved through:

- Agreeing high level objectives common to all partners for improving services and passenger experience
- Sharing risk and responsibility appropriately among the partners, for example in areas such as rolling stock procurement and management
- Avoiding being over prescriptive and allowing innovation in improving services and other wider benefits.



Setting better objectives

As this report shows, rail investment delivers a range of benefits far beyond the network itself. Rather than being happy side effects, outcomes such as lower carbon emissions, support for local economies and tackling road congestion should be regarded as a direct consequence of support for the railways. To ensure due regard is given to these important outcomes, the lessons from the research demonstrate that industry and Government should:

- Consider the full social, economic and environmental benefits of rail in strategic transport planning and decision making
- Integrate rail into wider decision making by ensuring stakeholders such as local authorities are fully engaged in rail investment decisions
- Make investment decisions that play to rail's natural strengths, for example, by prioritising the improvement in capacity and speed of strategic lines to make rail the natural choice for long distance journeys in Britain or invest in modal interchanges to make the network more accessible.

Improving decision making

Despite the scale of public and private sector investment in the West Coast over a ten year period, surprisingly little work has subsequently been done to quantify the overall benefits which have resulted. The DfT and city authorities should address this gap in our understanding in assessing the case for future investment in the railways by:

- Establishing an equivalent of Highways England's Post Opening Project Evaluation to assess the full benefits of investment in major schemes
- Understand which areas are benefiting from rail investment and use tools such as land value uplift to reinvest in the network.

“Rather than being happy side effects, outcomes such as lower carbon emissions, support for local economies and tackling road congestion should be regarded as a direct consequence of support for the railways.”

References and methodology

Upgrading the West Coast Mainline

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National Rail Inquiries, retrieved March 2019 <http://nationalrail.co.uk>

Rail's time competitiveness with other modes calculated from:

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AA Route Planner, retrieved March 2019 <http://www.theaa.com/route-planner/>

British Airways website, retrieved March 2019

Flight time calculated as duration from Heathrow, plus one hour for boarding, and estimated transfer time from airport to city centre by road using AA Route Planner

Time saving for commuter traveling between London and Birmingham twice a week since 2009:

Based on time saving per journey (out and return) multiplied by 47 working weeks per year over the period 2009-18.

Road congestion

Detailed analysis underpinning the research findings was carried out by PJA and is based on Virgin Trains passenger numbers and DfT road traffic counts data. A technical note has been produced giving full details of the research methodology along with further mapping. This is available from Campaign for Better Transport's website www.bettertransport.org.uk.

Carbon emissions

Methodology:

Aviation passenger journeys between London and Manchester calculated from

Civil Aviation Authority UK Airport Data, retrieved February 2019

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affordable transport that improves quality
of life and protects the environment.**



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