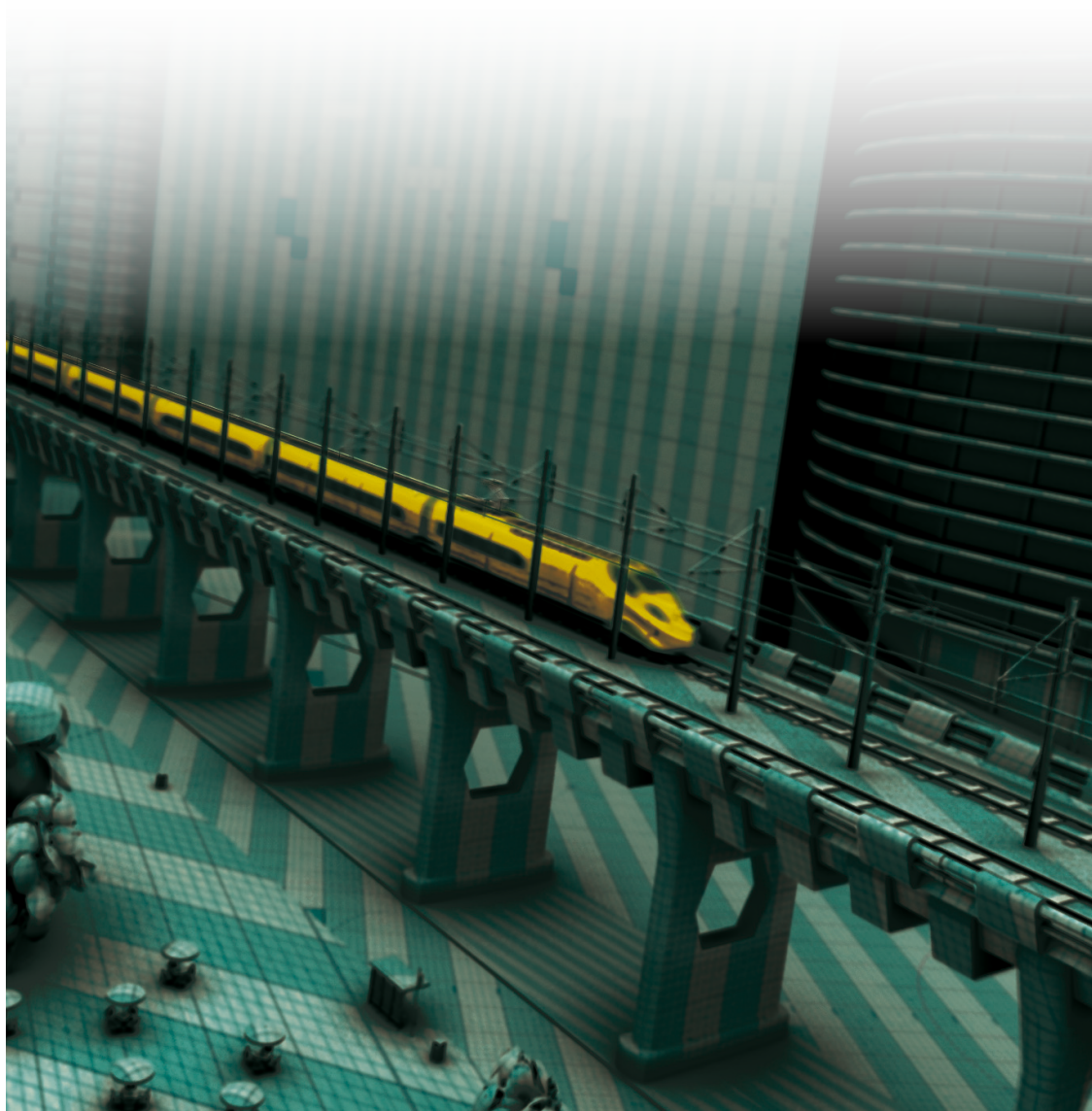




# Meeting the capacity challenge: The case for new lines





# Meeting the capacity challenge



Our railways are getting full. At some point, in the not too distant future, our railways will have no more spare capacity.

Passenger numbers continue to grow, despite the economic downturn, with the railways now carrying more people per year – 1.3 billion – than at any time since 1946 when the network was almost twice the size.



We're running one million more trains per year than just five years ago

To look at solutions to this growing problem, back in June 2008, Network Rail began a detailed and thorough 12-month study into what to do about the long-term need for more capacity on our railways.

The study looked at how best to solve the problem of growing demand for rail travel on the routes between Britain's cities. Four main travel corridors were looked at:

- » London to Yorkshire, the North East and Scotland (e.g. Leeds, Newcastle, Edinburgh)
- » London to the East Midlands (e.g. Leicester, Sheffield)
- » London to West Midlands, North West and Scotland (e.g. Birmingham, Manchester, Glasgow)
- » London to the West (e.g. Bristol, Cardiff)



By 2020 the main rail line to Birmingham and the North West will be full

By the end of the next decade, despite all the investment that has been made and all the additional capacity that has and will be provided, the route that will become full first is the corridor to Birmingham and the North West with no spare capacity for more trains or passengers. There are no further enhancements that can be made to the existing route that could meet future demand.

The study found that the best answer to the question of providing significant new capacity to keep these key urban centres connected is the building of a new railway line. Analysis also showed that the strongest and best case was made by making the new line capable of carrying high-speed trains.



The best answer to the capacity conundrum is a new line to the Midlands, North West and beyond and that such a line should be capable of running 200mph+ services

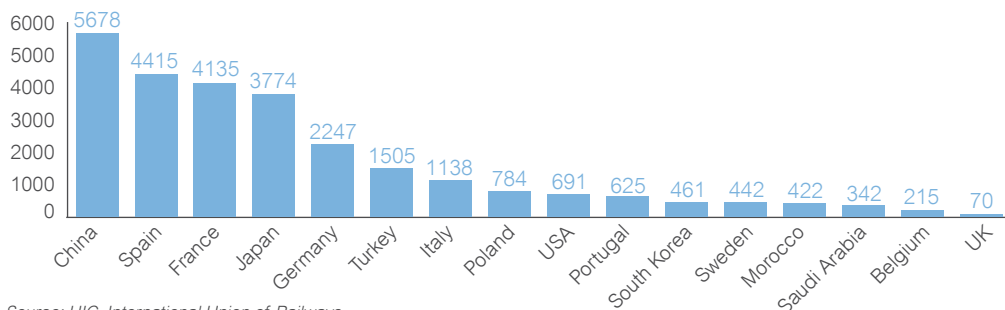




# The case for a new high-speed lines

High-speed rail is now widespread throughout the rest of Europe and across the globe with major networks developed in France, Germany, Italy, Spain and Japan. China and the US are now planning significant investment in this highly efficient, green method of mass transport.

## Miles of high-speed lines in place or planned by 2025



Source: UIC, International Union of Railways

Experience across Europe has shown how high-speed rail generates large revenue streams, takes significant traffic off roads and can almost eradicate domestic air travel. The Madrid to Seville route, opened some 17 years ago, has stolen 90% of the air market between these two cities (2½hrs by rail), and the recently opened line to Barcelona has captured 46% in a little over a year.

With big targets for reducing carbon emissions, our roads and skies getting unbearably congested and with little capacity on existing key rail arteries, the need for new railway routes has never been stronger.



High-speed rail can almost eradicate domestic air travel

Network Rail's 20,000 man hours, 12-month study, running to over 1,500 pages of research, modelling and analysis, looked in detail at the case for a new route.

New routes would need to connect the major economic centres and provide journey times to rival air travel to make it viable. Key markets were identified and detailed market analysis undertaken to determine and evaluate all the possible options and scenarios.

Over a dozen different options were analysed with the study concluding that a new high-speed line from central London to central Manchester (in just 1hr 06mins) with a diverging high-speed line to the centre of Birmingham (just 46mins) whilst delivering many benefits, did not capture a big enough market to make a positive business case.

By continuing the high-speed line to Preston (1hr 13mins), with a diverging high-speed line to Warrington (1hr 06mins) and Liverpool (1hr 23mins), and then northwards splitting to go directly to Glasgow (2hrs 16mins) and Edinburgh (2hrs 9mins), a much bigger market could be tapped and a significant modal shift from air to rail realised.

This transformed the business case generating revenue and benefits worth almost £55bn. The line, over the course of 60 years, paid for itself 1.8 times over.

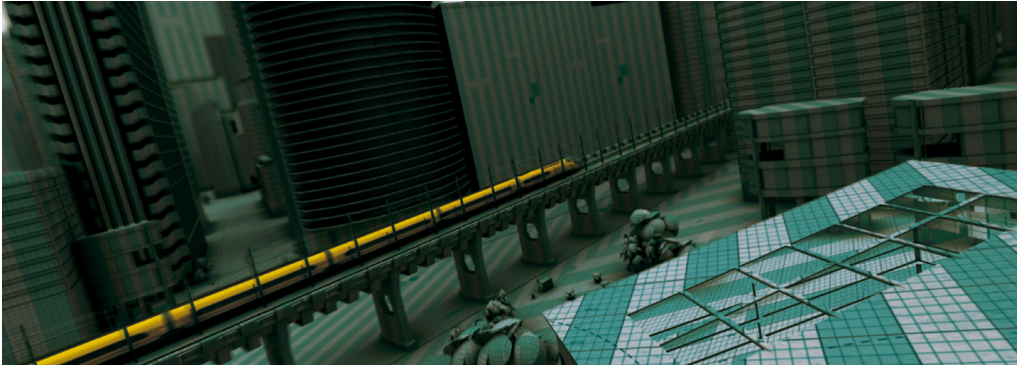


A new high-speed line to Scotland more than pays for itself





# The best route



The best value for money option was a new high-speed route from the centre of London to Scotland with new high-speed lines delivering passengers to the centre of Birmingham, Manchester, Liverpool, Glasgow and Edinburgh with calling points at Warrington and Preston. This option is called Option 1.4.1 in the study document.



A new high-speed line delivers 9,100 seats per hour into London = over 900 flights a day or over twice the capacity of today's Virgin's services into London Euston

The new high-speed line could offer up to 16 trains per hour from and to London, the Midlands, North West and Scotland and four trains per hour between regional cities.

The new city centre terminal stations in London, Birmingham, Manchester, Glasgow and Edinburgh would be located close to the principal existing city centre stations allowing good access to where people want to be.

At this stage of the study no lines have been drawn on a map, it is just too early in the development of the scheme.

A typical timetable might be...





From London

London	dep.	07:00	07:03	07:06	07:12	07:15	07:18	07:21			07:30	07:33	07:36	07:42	07:45	07:48	07:51		
Birmingham	arr.		07:49				08:04					08:19				08:34			
	dep.								07:45	08:00								08:15	08:30
Manchester	arr.	08:06				08:21			08:23		08:36				08:51			08:53	
	dep.								08:28									08:58	
Warrington	arr.			08:12									08:42						
	dep.			08:14									08:44						
Liverpool	arr.			08:29									08:59						
Preston	arr.				08:25				08:43	08:46				08:55				09:13	09:16
	dep.				08:27				08:45	08:48				08:57				09:15	09:18
Edinburgh	arr.							09:30		09:47							10:00		10:17
Glasgow	arr.				09:28				09:46					09:58				10:16	

To London

Glasgow	dep.						05:59			06:16					06:29				06:46
Edinburgh	dep.	05:51								06:15								06:45	
Preston	arr.						07:00			07:14	07:17				07:30			07:44	07:47
	dep.						07:02			07:16	07:19				07:32			07:46	07:49
Liverpool	dep.				06:49									07:19					
Warrington	arr.				07:04									07:34					
	dep.				07:06									07:36					
Manchester	arr.									07:34									08:04
	dep.		07:00					07:15		07:39		07:30				07:45			08:09
Birmingham	arr.								08:02	08:17							08:32	08:47	
	dep.												07:38						
London	arr.	08:00	08:06	08:09	08:12	08:15	08:21	08:24			08:30	08:36	08:39	08:42	08:45	08:51	08:54		



# The benefits

A new high-speed line to the Midlands, North West and Scotland will represent a transformation in travel experience between these key economic regions.

Some of the key benefits include:

- » Very quick journey times
  - Just over two hours from London to Glasgow and Edinburgh with two trains per hour (tph)
  - 46 minutes to Birmingham with four tph
  - Just over an hour to Manchester with four tph
  - 38 minutes from Birmingham to Manchester with two tph
  - Just over one hour 20 minutes to Liverpool with two tph
- » 9,100 seats per hour into London provided. Equivalent to 900 flights per day
- » £39.4bn of revenue generated (over 60 years) but a reduction in revenue on the existing route of £16bn gives a net increase of £23.4bn
- » £31.4bn worth of benefits (over 60 years)



20,000 annual flights cut

The analysis in the new lines study uses the latest government guidelines and modelling for calculating the benefits. It includes things

like the value of the time saved by users, the value of time saved by passengers on the existing route and the reduction in overcrowding. Also the value of additional freight paths created on the existing route and the value of the reduction in congestion, accidents and carbon emissions from modal shift.

The wider economic benefits such as productivity improvements and regeneration have not been included in the study or its calculations. These benefits would further enhance the case.

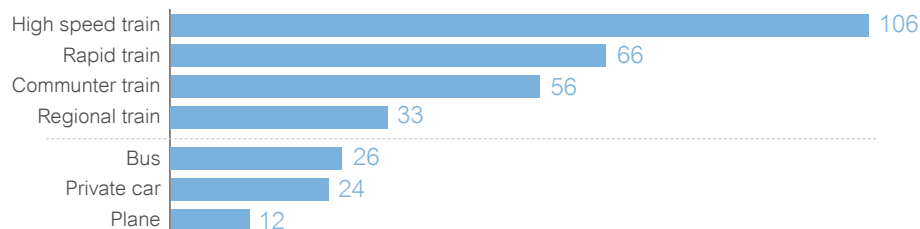
The numbers by 2030:

- » 480m vehicle miles saved every year
- » 50m hours or over 5,000 years of time saved by new line passengers
- » 43.7m journeys per year would be taken on the new line – almost 2½ times the number on the intercity routes out of King's Cross
- » 3.8m less vehicle journeys per year, reducing CO<sub>2</sub> by 39,000 tonnes
- » 3.6m less air journeys per year, reducing CO<sub>2</sub> by almost 250,000 tonnes
- » Safety benefits equivalent to 19 lives saved per year through people using the train rather than the car



Almost £55bn of revenue and benefits generated

## Passenger miles carried per unit of energy



Source: UIC, International Union of Railways







# The costs



The study looked in great detail at the costs attached to the scheme and used the most detailed and up-to-date information available. The team used the unit costs of building railways today and making comparisons with the costs of building High Speed 1 and international high-speed lines.



Over 1,500 miles of track and 30 miles of tunnels required

The costs outlined in the study are comprehensive and included things like:

- » Land costs
- » Over 1,500 miles of rail, sleepers and ballast
- » 138 bridges over trunk roads and railway lines
- » 53, 10-carriage and 20, five-carriage, 200mph capable trains
- » 34 miles of tunnels
- » 32 bridges over motorways
- » 8 new stations – with 400m platforms
- » 8 major junctions
- » Overhead lines and all electrical equipment
- » Signalling – latest computer controlled signalling system
- » Cost of operation

- » Ongoing maintenance and renewals costs
- » Moving utilities, such as gas and water mains
- » Fencing
- » Acoustic barriers in urban centres
- » Drainage
- » Embankments and cuttings

The approaches to city centres are assumed to be mainly in tunnels and have acoustic barriers in the suburban areas.

The overall capital costs for construction of the route to Scotland, Option 1.4.1, are estimated to be:

Cost of construction	£15.086bn
Non-construction cost *	£5.403bn
66% uplift *	£13.523bn
<b>Total</b>	<b>£34.012bn</b>

\*Non-construction costs include things like surveys, design, programme development, planning costs, project management

\*A 66% uplift is applied to the estimate (following government guidelines) due to the early nature of scheme development.

The study also looked at the likely costs of rolling stock and operating, maintaining and renewing the new line over 60 years. This pushed the total cost to £41.3bn.





## The existing route



Building a new high-speed line to Birmingham, Manchester the North West and Scotland delivers enormous benefits to passengers who will still use the existing or 'classic' line as the withdrawal of long-distance non-stop intercity services enables capacity to be released.

Benefits that passengers on the existing West Coast Main Line could see include:

- » A complete recast of the timetable enabling more services between major towns on the route and more direct, faster services to London
- » New capacity created for freight trains
- » New, faster journeys from London to large regional centres such as Milton Keynes, Nuneaton and Northampton
- » Reductions in overcrowding
- » New markets developed not presently served with direct services to London



More capacity created on the existing route for new passenger and freight services





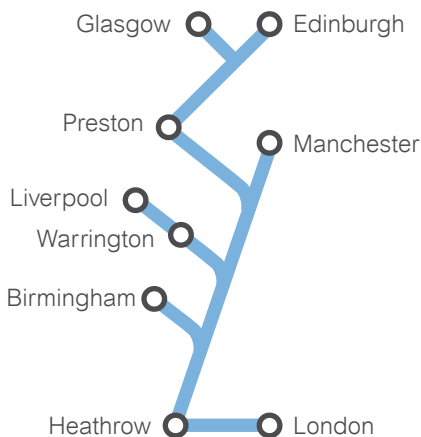


# The Heathrow question

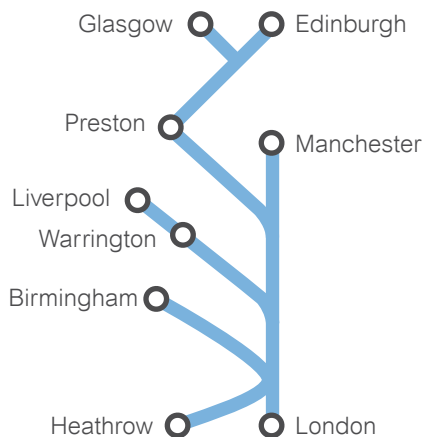
The study looked in some depth at the question of whether the new line should connect to, or be routed via, Heathrow.

Several options were analysed with two main contenders coming to the fore. In the study these options were called:

## Option 3.4.1 (new line via Heathrow)



## Option 1.7.1 (high-speed spur to Heathrow)



## What the study concluded

Building the high-speed line via Heathrow (Option 3.4.1) reduced the value and benefits of the new line by some £3bn compared to Option 1.4.1.

This is because the vast majority of passengers using the new line would be travelling to the city centre terminal station in London, not Heathrow. Adding an extra 15 minutes of journey time for the minority to get off at Heathrow does not make good financial sense.

Option 1.7.1, a new line with a high-speed spur to Heathrow, while impacting on the business case does so to a much lesser degree. Network Rail believes this option still delivers a very good business case with such a new line paying for itself 1.6 times over in the course of 60 years.

## Benefits of connecting to Heathrow

A new high-speed line to central London would attract large numbers of rail users, as has been the experience across Europe. It is possible that 90% of air passengers between the cities on the high-speed line to London would switch modes.

Giving travellers the choice of reaching Heathrow directly by high-speed rail will attract millions of people who would otherwise have made the choice to drive or fly.

While not improving the business case for a new line, the building of such a spur does make sense in the long-term as congestion on our roads and airways continues to build up.





## What next?

Network Rail's 12-month long new lines study has some firm recommendations and contains detailed analysis on the costs and benefits of using a new high-speed line to help solve Britain's fast approaching rail capacity crisis. The economic downturn may have impacted on the speed with which our existing routes will become full but it has not altered the fact that they will, and quickly.

Most countries across Europe and beyond have recognised the massive benefits high-speed rail delivers in economic and environmental terms. The UK lags significantly behind.

A new high-speed rail line to the West Midlands, North West and Scotland with a spur to Heathrow has a sound and positive business case that more than pays for itself over the course of its lifetime and beyond.

The study will help inform the 'high-speed' debate and further work will be needed to take this outline proposal and business case to the next stage.

Work might also be considered to look at the large economic markets of the East Midlands, Leeds and the North East, which will also experience capacity issues in the decades ahead.

In conclusion, Network Rail firmly believes that the building of new lines is essential for the future health and wealth of our country. We will continue our work, and to lobby to make this vision a reality.



## Special thanks

The new lines study involved many experts and reviews of previous work in this area and Network Rail would like to thank and acknowledge all those who have contributed including:

AEAT  
Alstom  
Association of Train Operating Companies  
DB Regio  
DB Schenker  
Department for Transport  
East Midlands Trains  
Eurostar  
Fieldworks and KGS  
First Group  
Greengauge 21  
Hitachi

Leeds University, Institute for Transport Studies  
Manchester Airport  
Rail Industry Association  
Roadchef  
Robert Watson Associates  
Steer Davies Gleave (study specialist consultants)  
Transport for London  
Transport Scotland  
UIC, International Union of Railways  
Virgin Trains  
Welsh Assembly Government





# Questions and further information

## Why not connect Leeds and the North East?

Two main reasons:

1. Connecting Leeds through Manchester has a large incremental cost and does not provide a significant journey time benefit over the London-Leeds direct service on the East Coast Main Line
2. Leeds is the top target market for what could potentially be a London to the North East high-speed line. If this was added to the proposal, the case for the second line would be substantially weakened

## Who will build it?

Not Network Rail but perhaps a similar consortium as that which came together to build HS1.

## Who will run it?

Network Rail strongly believes that any such new line must be seen as an integral part of the country's rail network in order for it to be able to take full advantage of its benefits for onward travel and connections with the classic network.

## Who and how will it be paid for?

Lessons from the building of HS1 and lines across Europe demonstrate that only Government has the capability of funding such large infrastructure projects. However, planning and building it may well take over a decade and be built in phases enabling a much more affordable proposition with a funding requirement of only a few billion pounds per year.

## When could work start or be completed?

Much remains to be done with more work needed on design and route alignment and then extensive planning powers required. Up to five years could be needed for this phase and potentially a further five years, or more, for construction.

## Where would the London station be?

A city centre location has been assumed for all terminals. For London, the terminal is assumed to have good tube connections, and to take advantage of good links with HS1, close to St Pancras. This assumption has a bearing on the costs (amount of tunnelling will vary) and demand forecasts if journey time is longer.

For Manchester and Birmingham, the assumption is that the terminal is near or adjoining an existing terminal station.

For Warrington and Preston (through stations) the assumption is that the new station is located close to the motorway network with connections to the existing railway, thus maximising the potential market captured.

## What about the Government created company High Speed Two?

The news lines study started some six months before the creation of HS2 and thus has had an advantage in the detail of its modelling and analysis. All of this work has been made available to HS2 to help it move quickly forward with its own, very specific brief.

## What about a connection to HS1?

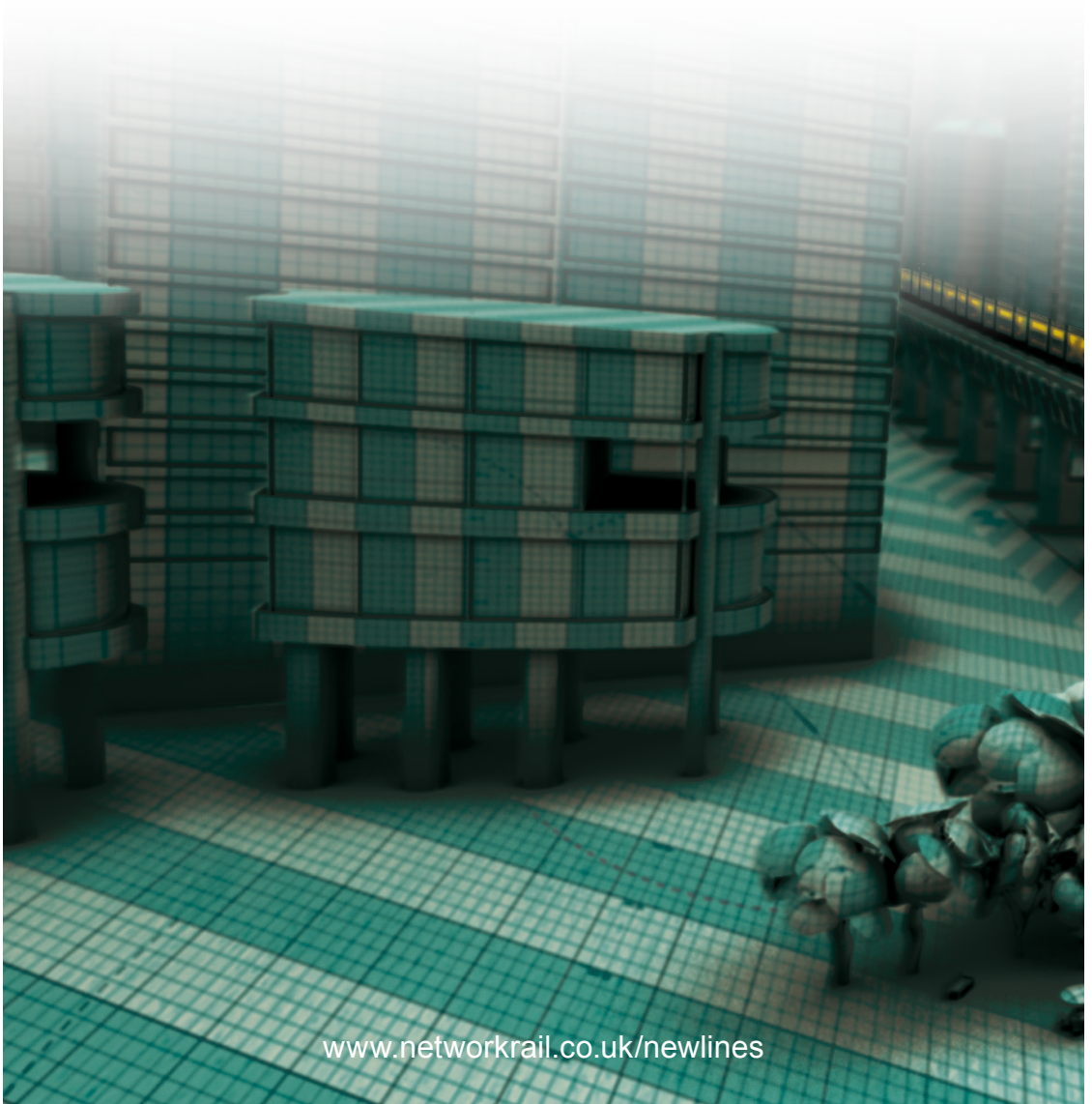
A physical connection to HS1 will lead to a small modal shift from air to rail. However, the same can be achieved through a simple interchange, particularly if the London terminal was at or near St Pancras. A physical connection will be expensive, operationally difficult and will be detrimental to the overall business case – most people will want to go to London, not Europe.

## Further information

This document, the strategic business case and other supporting documents can be found at [www.networkrail.co.uk/newlines](http://www.networkrail.co.uk/newlines)

Views and opinions on this study can be emailed to [newlinesprogramme@networkrail.co.uk](mailto:newlinesprogramme@networkrail.co.uk) or posted to: New Lines Programme, Route Planning, Network Rail, Kings Place, 90 York Way, London N1 9AG





[www.networkrail.co.uk/newlines](http://www.networkrail.co.uk/newlines)

