

# **HS2**

# **High Speed to**

# **Almost**

# **Nowhere**

**A detailed study of HS2's very Poor Performance and the  
Fragmentation of the National Network caused by HS2**

**Executive Summary**

**[www.highspeeduk.co.uk](http://www.highspeeduk.co.uk)**

# HS2 – High Speed to Almost Nowhere – Executive Summary

## Introduction

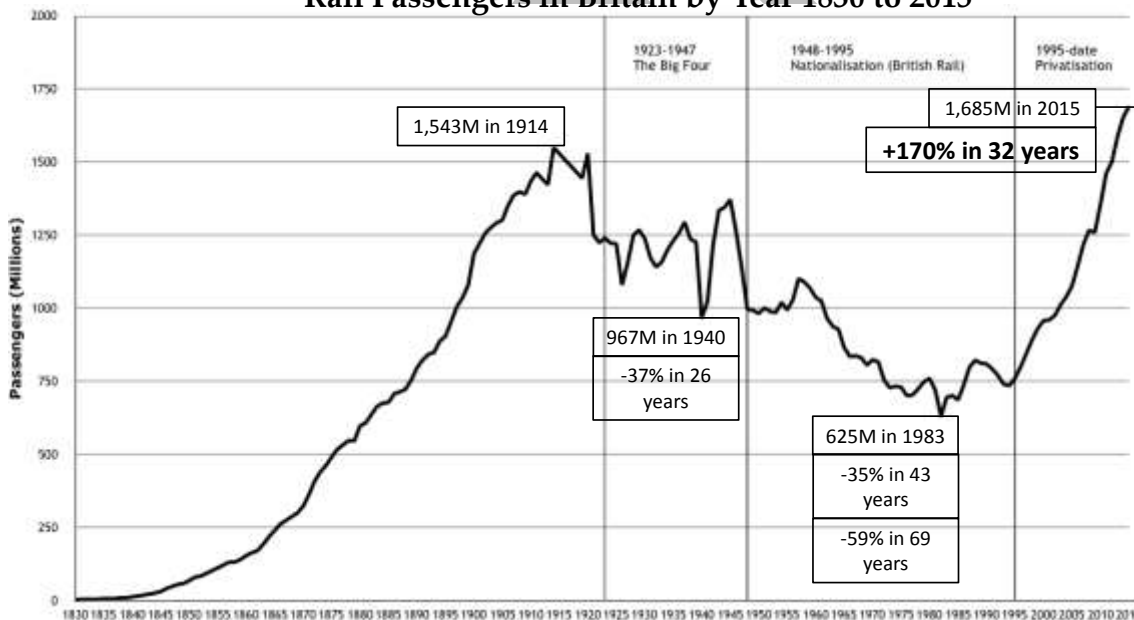
HS2 has been a controversial project since its inception. It is said in turn to be: not necessary; environmentally damaging; too expensive; a rich man’s toy; a vanity project and “The Zombie Train that Refuses to Die”. HS2’s promoters on the other hand say that HS2 is essential to deliver extra capacity, to enhance connectivity between our major conurbations and to deliver transformational economic benefits by facilitating the growth of the regional economies. It is impossible to believe that two such opposing views can both be correct. The purpose of “*HS2 – High Speed to (Almost) Nowhere (A detailed Study of HS2’s very Poor Performance)*” and its companion volume “*HS2 – High Speed to Failure (22 Reasons why the Government’s Experts have got it Wrong)*” is to carry out an in-depth review of the HS2 scheme to establish definitively, HS2’s capacity and connectivity performance. That performance can then be directly measured against HS2’s stated objectives and against the results from the “Exemplar Alternative” High Speed UK (HSUK).

This document is a stand-alone Executive Summary of “*HS2 – High Speed to (Almost) Nowhere*” which is a 392 page document recording the whole study. That document and other supporting documents are available for downloading from the High Speed UK Website. [www.highspeeduk.co.uk](http://www.highspeeduk.co.uk)

## Capacity and the Genesis of HS2

Construction of the UK rail network began in early Victorian times and rail passenger journeys rose year on year to reach a peak of 1,543 million journeys by 1914. Since that time, the number of journeys declined to reach an all-time low of 625 million journeys in 1983. At that point rail’s fortunes changed and almost every year since then has seen an increase in patronage with no less than 1,685 million journeys being made in 2015, a 170% increase over the 32 years since 1983.

**Rail Passengers in Britain by Year 1830 to 2015**



Faced with this unprecedented change in the fortunes of rail transport in Britain, the Government realised that it had a major problem on its hands; there simply was not enough rail capacity. The effects of the Beeching cuts of the 1960’s were really beginning to bite. In addition, one other major problem had come into the picture; Global Warming. The 2008 Climate Change Act committed the Government to achieving an 80% reduction in CO<sub>2</sub> emission by 2050 and a major part of that reduction will have to come from a modal shift from car journeys and road haulage onto trains.

In response to the clear need for additional rail capacity and a better connected rail system to entice drivers out of their cars, Government decided that it was time for the UK to build a new generation of high speed lines to make rail more attractive and, at the same time, respond to the ever growing demand. For many years the HS2

project has been the cornerstone of successive Governments' commitment to developing the nation's rail infrastructure to meet increasing demand in the 21st Century. Over the past 9 years a broad political consensus has grown in support of the HS2 project, overruling the views of objectors. Nevertheless objectors continue to protest against the environmental vandalism of HS2 and its lack of a credible Business Case which has very uncertain economic benefits and an unacceptable Benefit to Cost ratio of 2.3.

## **HS2 Objectives and Scrutiny of the Outcome**

So far there has been no effective scrutiny of the most crucial consideration – whether HS2 will work efficiently as a railway network and deliver its core objectives. In evidence to the House of Commons HS2 Select Committee on 30th November 2015 the Technical Director of HS2 Ltd Andrew McNaughton stated:

**“The aim of the HS2 project is to deliver hugely enhanced capacity and connectivity between our major conurbations.”**

The public, the Government and politicians generally have neither the technical skills nor the time necessary to evaluate a project on the scale of HS2 and thus check that it will deliver what it promises. They have had no option but to accept the assurances of the Department for Transport and HS2 Ltd that building HS2's infrastructure as currently designed will deliver the promised transformation of rail services.

## **Publication of HS2 Phases 2a and 2b**

Phase 1 of HS2 – London to the West Midlands was published in mmmm yyyy and gained Royal Assent in mmmm yyyy. However it was only in November 2016 the official proposals for Phases 2a and 2b of HS2 were published. At last it became possible to subject HS2 Ltd's promises to a rigorous test. Sufficient information now exists concerning HS2's proposed routes, stations, services and connections to the existing network to constitute a complete design. This enables detailed calculations to be made of all the journey times which can be achieved between the major cities served by the UK intercity network after the introduction of HS2. Those results have then been used to determine how well HS2 can meet the declared objectives for improved capacity and connectivity.

## **Comparative Study using the HSUK “Exemplar Alternative”**

The efficiency of the HS2 design can only be measured by making a rigorous comparison with an “exemplar alternative”. To that end, the High Speed UK (HSUK) proposals have been used as the necessary “exemplar alternative”. The HSUK remit specifies that HSUK must be designed to deliver the greatest possible capacity, connectivity and journey time benefits for the least cost and least environmental impact whilst being accessible to the greatest possible proportion of the UK population. None of these provisions are in the HS2 remit.

By applying identical tests to HS2 and HSUK and comparing the results it is possible to determine whether HS2 has been properly optimised as a railway network to create the greatest possible improvement to connectivity between the UK's many major population centres. It is known that the HSUK design does work well as a network, with a timetable developed to demonstrate how the entire national rail system would operate with HSUK in place. Given the far greater resources available to HS2 Ltd, it would be reasonable to expect that HS2 would perform at least as well as HSUK in all respects.

This study establishes for the first time the models and the methodologies necessary to determine the effectiveness of a railway network and the tools developed have been applied equally to HS2 and HSUK. This involves far more than a simple comparison of the few HS2 journeys from London and Birmingham to Manchester, Sheffield and Leeds plus some destinations on the existing network reached via the 5 connections proposed between HS2 and the existing network.

## **Scope of the “HS2 – High Speed to Almost Nowhere” Study**

HSUK believes that to be of use to the maximum number of people any new high speed railway system should improve the journey opportunities between all the major population centres and airports in the area potentially served by the railway. Accordingly the following 32 places have been considered:

London, Heathrow (LHR), Birmingham, Birmingham Airport (BHX), Bradford, Cheltenham, Chester, Coventry, Crewe, Derby, Doncaster, Huddersfield, Hull, Leeds, Leicester, Liverpool, Luton, Manchester, Manchester Airport (MAN), Milton Keynes, Northampton, Nottingham, Oxford, Peterborough, Preston, Sheffield, Stockport, Stoke, Walsall, Warrington, Wolverhampton and York.

These 32 places have a possible 496 journeys between them, excluding return journeys. The journey times for each of the 496 separate journeys have been calculated for both HS2 and HSUK. There is no indication in any of HS2 Ltd's many published outputs that this level of detailed analysis has ever been undertaken. It is only with this depth of analysis that the effectiveness (or lack of it) of the HS2 and HSUK designs can be **measured**, **compared** and **independently verified**.

## HS2 Results

Figure 1 (Page 5) summarises the results for HS2. The results do not make comfortable reading for the promoters, designers and proponents of HS2.

Out of 496 journeys:

- HS2 improves a mere 88 journeys; just 17.7% of the total;
- HS2, indefensibly, makes 94 journeys worse than they are today; 19.0% of the total;
- **HS2 therefore makes more journeys worse than it improves;**
- HS2 leaves 314 journeys, 63.3% of the total, broadly the same as they are today;
- Only 12 of the 32 centres considered will be directly served by HS2.
- HS2 achieves an overall average journey time reduction of just 8%, a very poor result.

HS2 Ltd has claimed that there will be radically reduced journey times from regional cities to London and that "transformational economic benefits" will accrue as a result. This cannot possibly be the case considering the significant number of journeys made worse and the almost complete lack of improvement to journeys **between** regional cities. HS2 Ltd is simply seeking to promote a few cherry-picked primary flows between the few primary cities that they arbitrarily chose to connect. These statistics paint a starkly different picture to that which HS2 Ltd has sought to portray. Ministers, the DfT and HS2 Ltd never tire of telling the public that HS2 will achieve major improvements in rail network capacity. The truth is that all of HS2's new capacity will be consumed in improving just 18% of intercity journeys. The remaining 82% will be crammed onto an existing network where speed and frequency of intercity services will be reduced to accommodate a greater number of local commuter and freight services.

## HSUK Results

To bring the desired transformational economic benefits to the UK regions, a properly designed system with far greater capacity and connectivity is required; cue HSUK. HS2's failure is only fully illuminated by the massive superiority of the alternative High Speed UK scheme. Whatever performance measure is used, be it journey times, connectivity between cities, capacity of its 4-track spine, compliance with the 'Northern Powerhouse' objectives or revving-up the 'Midlands Engine', HSUK hugely outperforms HS2, and this is replicated for every single city and airport considered in this study.

HSUK's superior performance stems from 2 key differentiating factors, its fundamental objective to interlink all major population centres and its full integration with the existing network.

Figure 2 (Page 6) summarises the results for HSUK. Out of the same 496 journeys:

- HSUK improves an excellent 455 journeys; 91.7% of the total;
- **HSUK makes 0 journeys worse than they are today**, exactly what one would expect of a good design;

- HSUK leaves 41 journeys, 8.3% of the total, broadly the same as they are today;
- All 32 centres considered will be directly served by HSUK;
- HSUK achieves an overall average journey time reduction of 45%, an excellent result.

## Conclusions

HS2's shortcomings can be attributed to one central failure – its design as a stand-alone high speed line with no effective consideration of its performance as part of a national network. No attempt has been made to design HS2 to enhance the existing network. As such, HS2's introduction threatens the very integrity of our national rail network and as a result, it also threatens the prosperity of every community dependent upon that network.

Perhaps the supreme irony is that the stand-alone HS2, which has been designed to be the fastest railway in the world, fails to perform effectively even as a high speed railway. High Speed UK, designed to the diametrically opposite principles of integration and inclusivity and a lower maximum speed, can offer far greater journey time reductions, and outperforms HS2 on the vast majority of the 496 journeys considered in this study. As Figure 3 (Page 7) demonstrates, HSUK offers superior journey times on 440 of the 496 journeys, while HS2 performs best on just 21. Put another way, for every HS2 winner there are more than 20 HSUK winners. Figure 4 (Page 8) displays the same information but presents it city by city. This shows that, for every one of the 32 cities in the study **including London**, HSUK delivers to all the other 31 cities a much greater number of services which are faster than HS2. This is the hallmark of good network design.

The final 6 pages of this document (pages 9 to 15) show the comparison between HS2 and HSUK for 3 of the 32 cities studied; London in south, Coventry in the West Midlands & Sheffield in the north and show the achievable journey times from each city to all the other 31 locations. London (pop 8,nnn,nnn (2001)) was chosen as it the nation's capital and has very large passenger flows. Coventry (pop 316,900 (2001)) was chosen because it is one of the cities which currently has a good service to London (3 fast trains per hour) and which will be bypassed by HS2 leaving it with a much poorer residual service on the West Coast Main Line. Sheffield (pop 690,000 (2001)) was chosen because it is off the route of HS2 and is only connected to it by using existing lines, condemning it to substandard London services compared with other northern cities. The complete results are in the main document of which this is the Executive Summary.

The most astonishing feature of HS2, a project intended to deliver widespread economic benefits, is just how few places it serves and how few journeys it improves. For this reason, we have chosen to entitle this study: "*HS2 – High Speed to Almost Nowhere*". In order to appreciate the full scope of HS2 Ltd's failure, this study should be read in conjunction with its companion volume "*HS2 – High Speed to Failure*". As noted above both the full text of these documents can be downloaded from [www.highspeeduk.co.uk](http://www.highspeeduk.co.uk)

**The final irony** is that HSUK's far superior performance also delivers CO<sub>2</sub> savings of **600 million tonnes** (while HS2 saves nothing), **avoids the Chilterns AONB** completely and for Phases 1 & 2 is **£21 Billion** cheaper.

# HIGH SPEED 2

## NETWORK PERFORMANCE : JOURNEYS IMPROVED/MADE WORSE

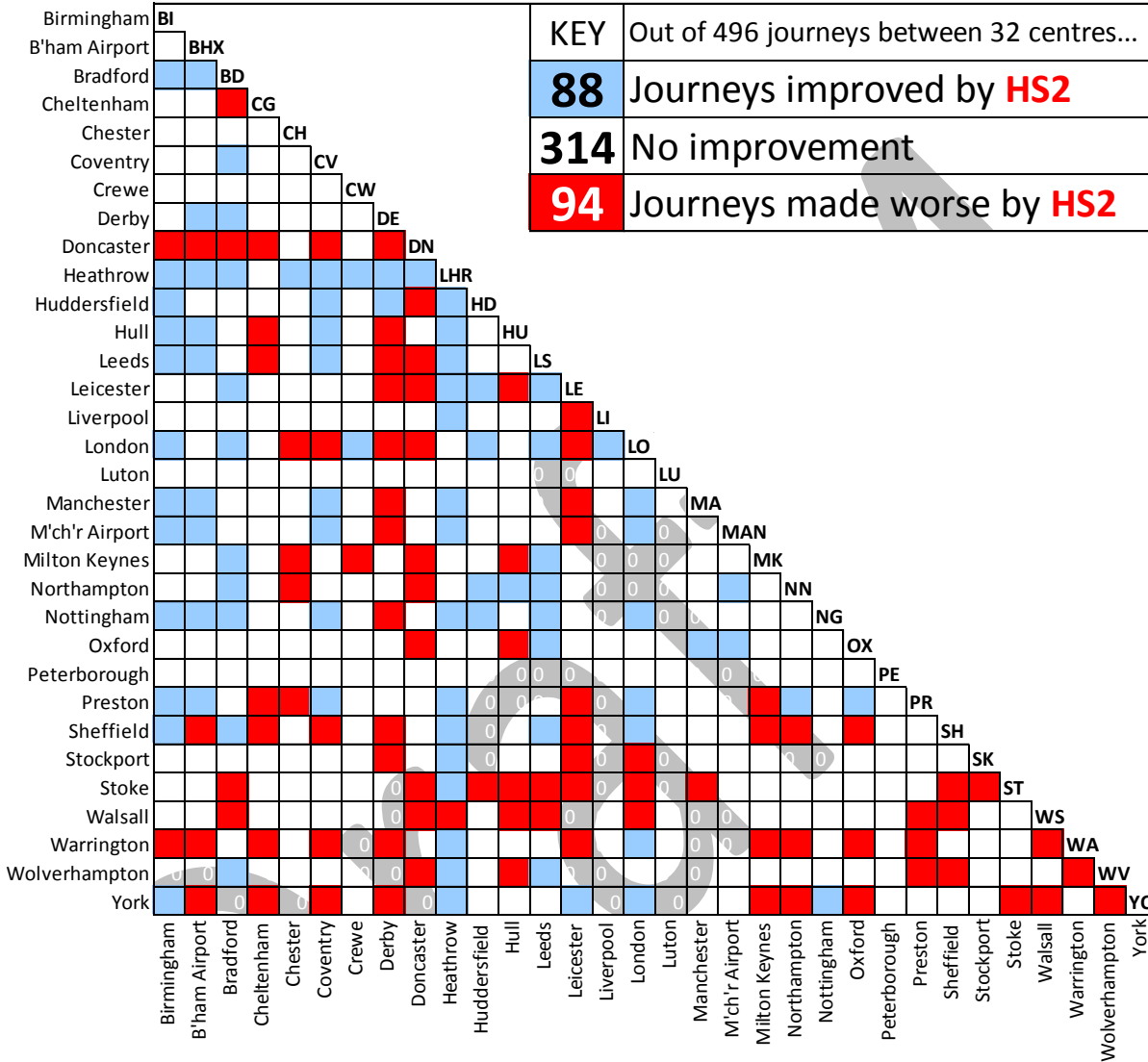


Figure 1

# HIGH SPEED UK

## NETWORK PERFORMANCE : JOURNEYS IMPROVED/MADE WORSE

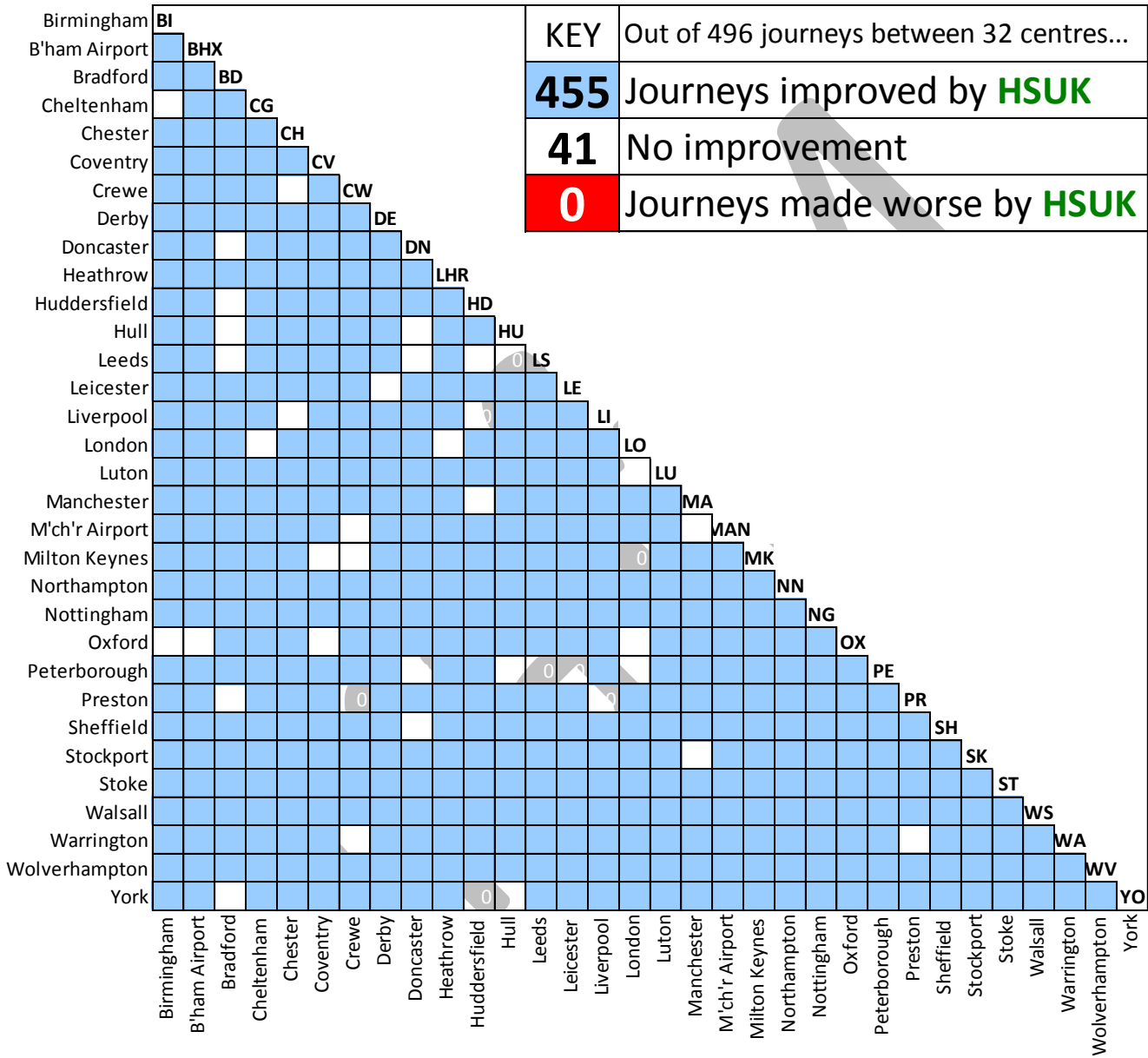


Figure 2

# HIGH SPEED UK & HS2

## COMPARATIVE PERFORMANCE IN ACHIEVING JOURNEY TIME REDUCTIONS ACROSS NATIONAL NETWORK

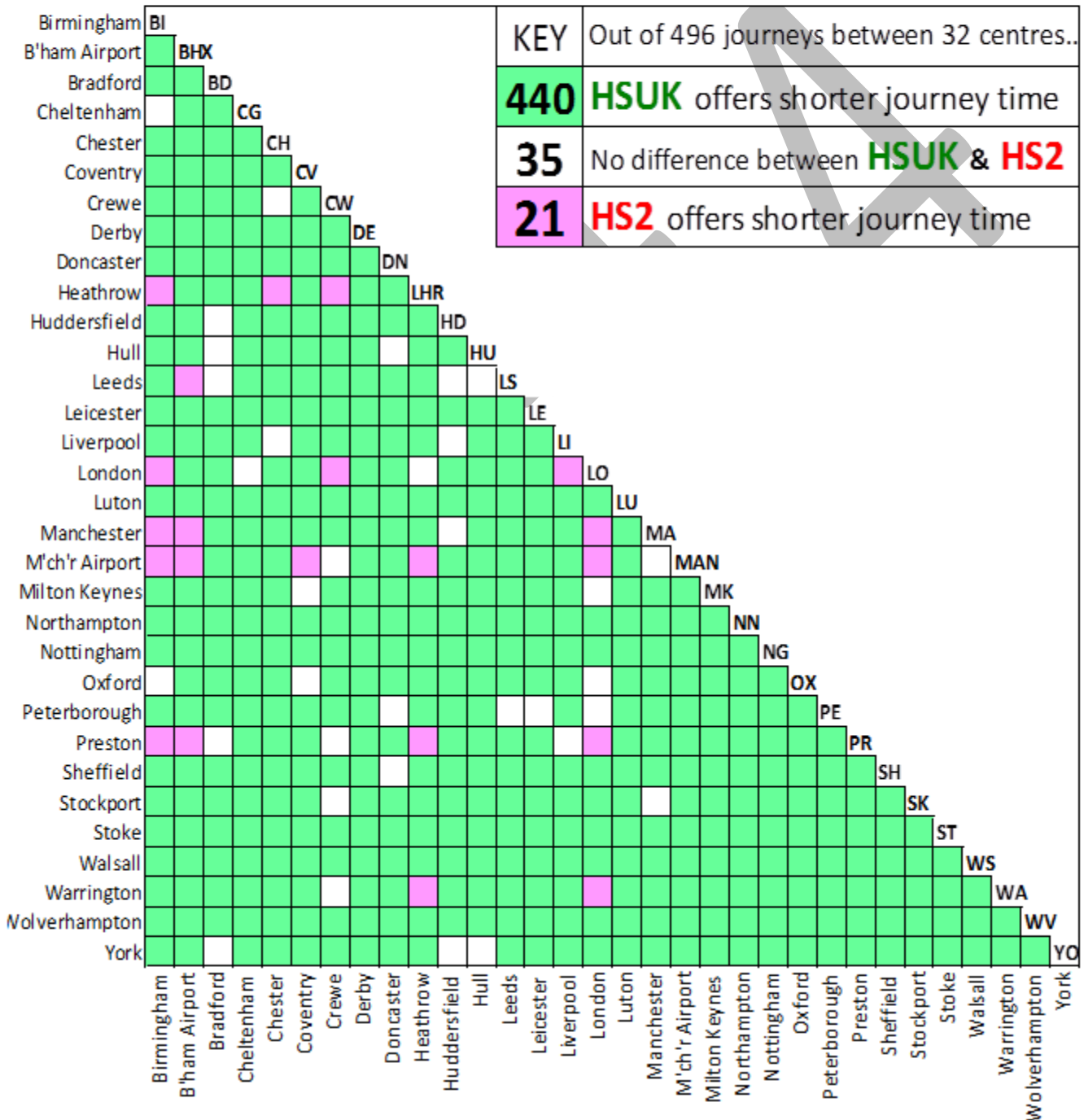


Figure 3



# HIGH SPEED UK & HS2 : WINNERS AND LOSERS

**Interpreting this table.** The table below lists the 32 towns, cities and airports considered in this study. From each place it is possible to make a journey to each of the other places, a total of 31 journeys. Taking London as the example, HSUK offers the fastest journey to 18 destinations, HS2 is fastest to 7 destinations and journeys to 6 destinations remain the same as today. In the case of the 6 cities at the bottom of the table, Derby to Wolverhampton, which between them are home to some 1.6 million people, HSUK offers the fastest journeys from each of the 6 to all 31 destinations.

	Number of journeys (out of 31) with shortest journey time offered by:			Journeys made worse by HS2
	HIGH SPEED UK	No difference	HS2	
London	18	6	7	7
Heathrow	24	1	6	1
Birmingham	24	2	5	2
M'ch'r Airport	24	2	5	2
Preston	24	3	4	7
B'ham Airport	27		4	4
Manchester	25	3	3	3
Crewe	25	4	2	1
Warrington	28	1	2	12
Leeds	26	4	1	5
Liverpool	27	3	1	1
Chester	28	2	1	3
Coventry	28	2	1	5
Bradford	26	5		4
Huddersfield	26	5		2
Hull	27	4		8
Peterborough	27	4		0
Doncaster	28	3		16
Oxford	28	3		5
York	28	3		10
Cheltenham	29	2		8
Milton Keynes	29	2		8
Stockport	29	2		4
Leicester	30	1		12
Luton	30	1		N/A
Sheffield	30	1		11
Derby	31			12
Northampton	31			5
Nottingham	31			1
Stoke	31			11
Walsall	31			10
Wolverhampton	31			6

Figure 4

# London

<b>Town/City</b>	<b>London</b>
City Region	Greater London
Population of built-up area**	<b>9,800,000</b>
Ranking amongst UK cities**	<b>1</b>
Number of cities directly linked by existing rail network (out of 31)	<b>26</b>

## References:

HSUK London-Birmingham Rail Strategy  
 HSUK Regional Map 01  
 HSUK London Network Map  
*All available on HSUK website*  
[www.highspeeduk.co.uk](http://www.highspeeduk.co.uk)

\*\* [https://en.wikipedia.org/wiki/List\\_of\\_urban\\_areas\\_in\\_the\\_United\\_Kingdom](https://en.wikipedia.org/wiki/List_of_urban_areas_in_the_United_Kingdom)

## London : Intercity Connectivity with HSUK and HS2

London	Average journey time reduction	Cities directly linked (out of 30)	Journeys made faster (out of 31)	Journeys made worse (out of 31)	Best performer (out of 31 journeys)
<b>High Speed UK</b>	<b>31%</b>	<b>27</b>	<b>24</b>	<b>0</b>	<b>18</b>
<b>HS2</b>	<b>19%</b>	<b>10</b>	<b>13</b>	<b>7</b>	<b>7</b>

Greater London is by far the UK's largest conurbation, and also the richest in terms of per capita income. It is also the focus of the national rail network, with more high-quality intercity services operating from London than from any other city. Its principal local airport, Heathrow, is the busiest international airport in the world, with a far greater range of international destinations than any other UK airport. London's connectivity far exceeds any other UK city, and it is both the effect and the cause of London's greater prosperity compared with regional cities. Long-standing Government policy of greater spending per capita on London's transport network – reflected both in greater subsidy and much larger capital spending on projects such as Crossrail and Thameslink – tend only to reinforce these disparities.

Although HS2 has been promoted as a project intended to improve regional connectivity and redress the North-South divide, the reality is that its configuration is focussed on London and the majority of its services are also focussed upon London. With HS2's connectivity focussed upon London, it is London that will derive the greatest economic benefit from HS2. At the same time London will suffer all the adverse social effects of its hot-housed economy, in particular the increasing inability of Londoners to afford to buy houses and to live in their own city.

However, London's benefits under the HS2 scheme only seem large relative to other less well-connected communities. HSUK's greater capacity and connectivity, spread across the nation, will create far greater overall economic and environmental benefit. With the poorest connected regional cities experiencing the greatest connectivity gains, and all regions gaining direct access to Heathrow and improved access to their respective regional airports, it seems likely that HSUK will also have the effect of redressing current economic imbalances. This rebalanced economy should benefit all UK regions, including London.

# HIGH SPEED UK

## & HS2 LINKS TO

# LONDON

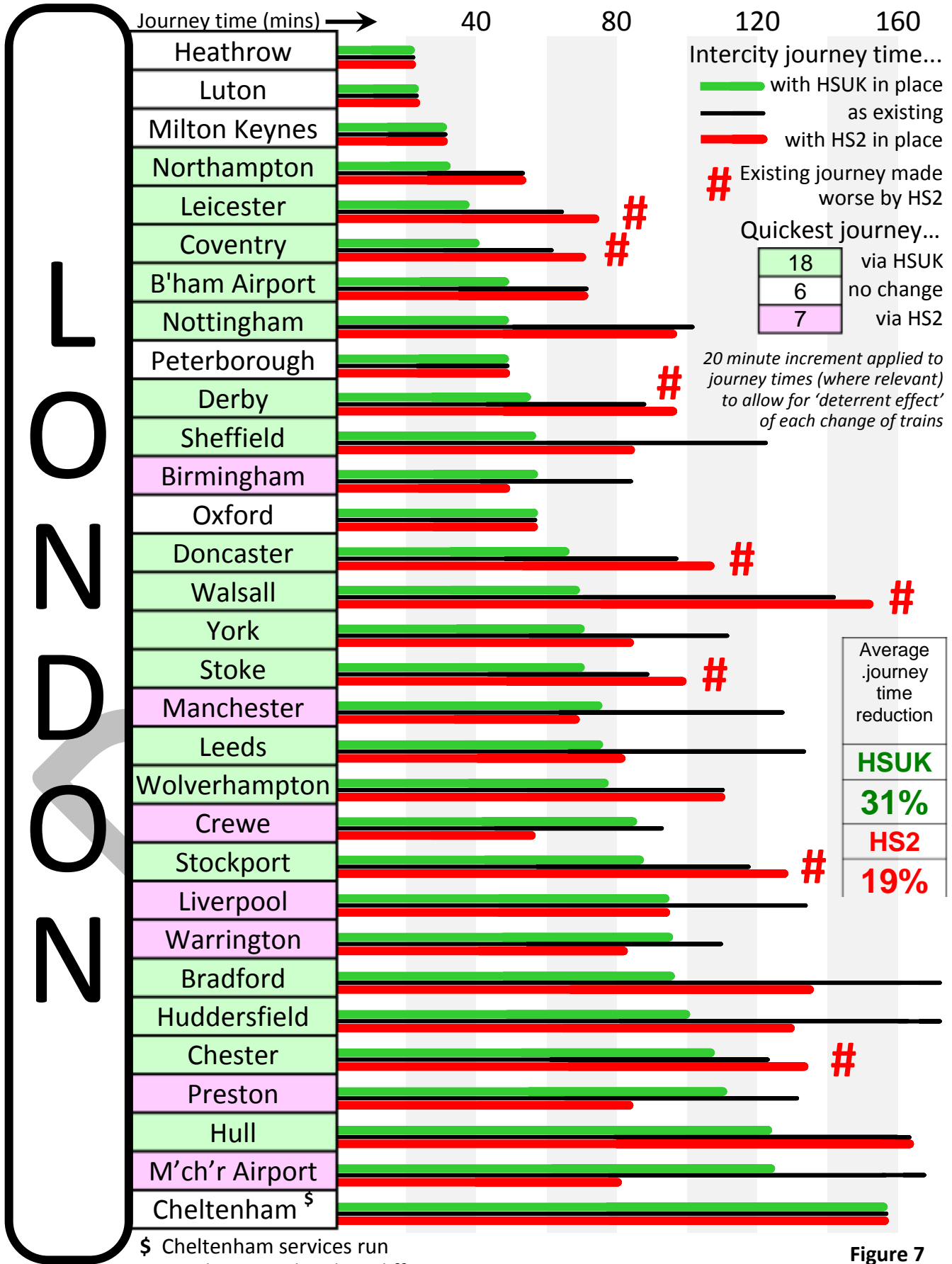


Figure 7

# Coventry

<b>Town/City</b>	<b>Coventry</b>
Population of built-up area**	<b>360,000</b>
Ranking amongst UK cities**	<b>20</b>
Number of cities directly linked by existing rail network (out of 31)	<b>12</b>

## References:

HSUK London-Birmingham Rail Strategy  
 HSUK West Midlands Rail Strategy  
 HSUK Regional Map 04  
 HSUK Coventry Network Map  
*All available on HSUK website*  
[www.highspeeduk.co.uk](http://www.highspeeduk.co.uk)

\*\* [https://en.wikipedia.org/wiki/List\\_of\\_urban\\_areas\\_in\\_the\\_United\\_Kingdom](https://en.wikipedia.org/wiki/List_of_urban_areas_in_the_United_Kingdom)

## Coventry : Intercity Connectivity with HSUK and HS2

Coventry	Average journey time reduction	Cities directly linked (out of 31)	Journeys made faster (out of 31)	Journeys made worse (out of 31)	Best performer (out of 31 journeys)
<b>High Speed UK</b>	<b>46%</b>	<b>24</b>	<b>29</b>	<b>0</b>	<b>28</b>
<b>HS2</b>	<b>9%</b>	<b>0</b>	<b>9</b>	<b>5</b>	<b>1</b>

Coventry is a primary calling point on the West Coast Mail Line route from London to Birmingham New Street, and as a consequence the city gains great benefit from the 3 trains per hour service from London to Birmingham. With the extension of one of these trains to Wolverhampton and onwards along the WCML to Scotland, and with Coventry also being on the CrossCountry route from Bournemouth to Manchester, the city enjoys excellent connectivity along the north-south axis of the West Coast Main Line. However, its links to other more easterly cities from Leicester through Yorkshire to the North-East are poor, mostly reliant upon change of trains at Birmingham New Street.

The introduction of HS2 will have major adverse impacts upon Coventry. Its 3 trains per hour service to London will be reduced to a single train per hour as primary Birmingham to London flows are diverted to HS2. Although there should be more capacity for local commuter services, the loss of intercity services will have the effect of reducing Coventry's status as a regional economic centre closer to that of a dormitory town. Coventry's connectivity will also suffer with the disconnection between New Street and Curzon Street stations in Birmingham, and the degradation of CrossCountry services on the north-east/south-west route.

HSUK will greatly enhance Coventry's intercity, regional and local connectivity. Its primary route from London to Birmingham will follow the existing route via Coventry, which will be 4-tracked (in accordance with the long-term ambitions of the regional transport authorities) to allow local and intercity services to be separated and provide a step-change increase in capacity. A northward link to the HSUK spine route at Rugby will allow direct services from Coventry to Leicester, Nottingham and Derby, as part of the establishment of a 'Midlands Ring' linking all major Midlands cities. The Rugby link will also allow for the first time direct intercity services from Coventry to the key Yorkshire cities of Sheffield, Leeds and Hull.

# HIGH SPEED UK & HS2 LINKS TO

# COVENTRY

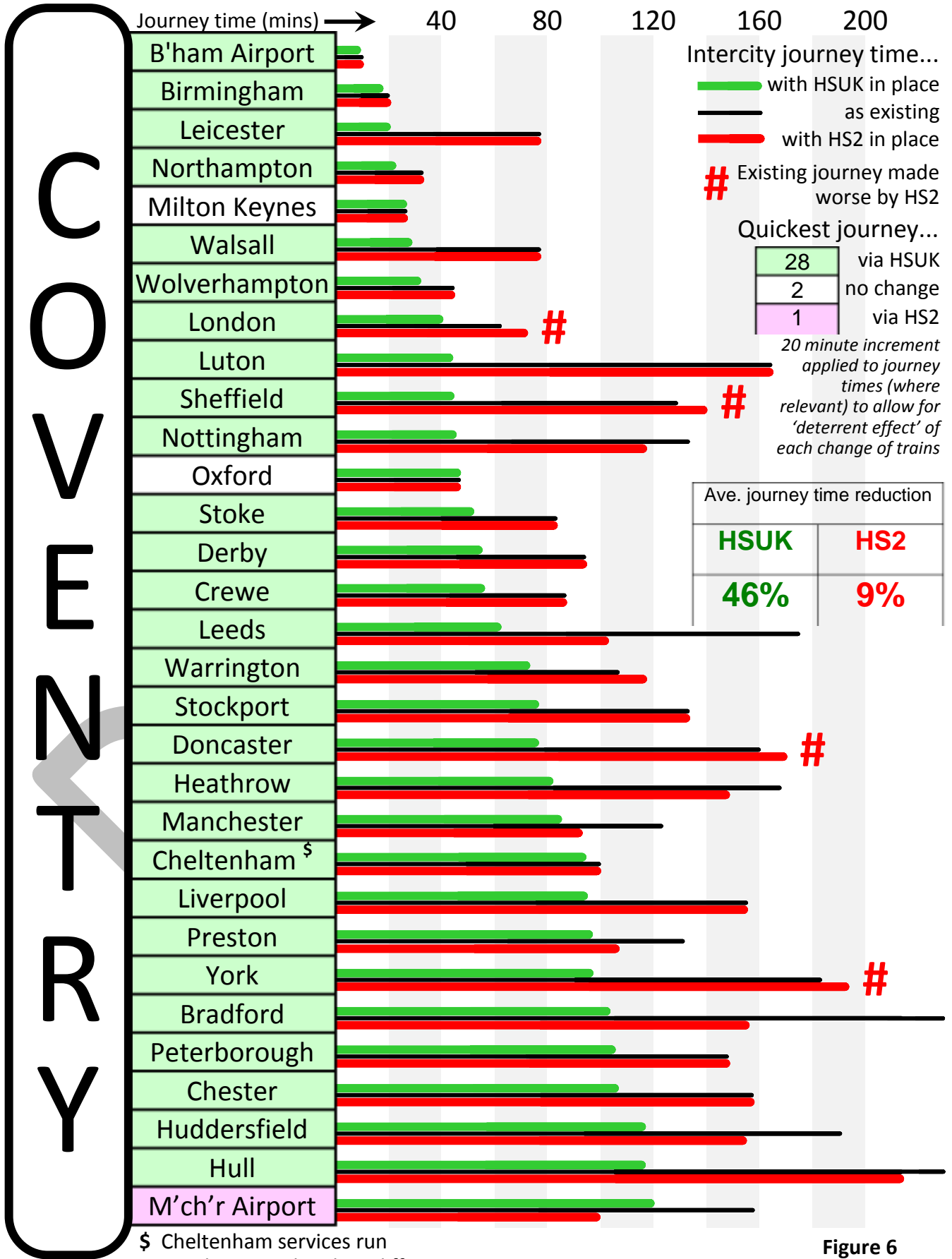


Figure 6

# Sheffield

<b>Town/City</b>	<b>Sheffield</b>
Population of built-up area**	<b>690,000</b>
Ranking amongst UK cities**	<b>10</b>
Number of cities directly linked by existing rail network (out of 31)	<b>18</b>

## References:

HSUK Yorkshire Rail Strategy  
 HSUK Regional Map 07  
 HSUK Sheffield Network Map  
 HSUK Sheffield Victoria Brochure  
*All available on HSUK website*  
[www.highspeeduk.co.uk](http://www.highspeeduk.co.uk)

\*\* [https://en.wikipedia.org/wiki/List\\_of\\_urban\\_areas\\_in\\_the\\_United\\_Kingdom](https://en.wikipedia.org/wiki/List_of_urban_areas_in_the_United_Kingdom)

## Sheffield : Intercity Connectivity with HSUK and HS2

Sheffield	Average journey time reduction	Cities directly linked (out of 31)	Journeys made faster (out of 31)	Journeys made worse (out of 31)	Best performer (out of 31 journeys)
<b>High Speed UK</b>	<b>53%</b>	<b>31</b>	<b>30</b>	<b>0</b>	<b>30</b>
<b>HS2</b>	<b>8%</b>	<b>3</b>	<b>5</b>	<b>11</b>	<b>0</b>

Sheffield's location on the Midland, CrossCountry and South TransPennine main lines places it at a key hub of the national rail network. This, and its status as a UK primary city with a population of over 500,000, make it imperative that Sheffield occupies a similarly pivotal role in any future UK high speed rail network, with a centrally-located station from which high speed services would radiate to all principal UK cities.

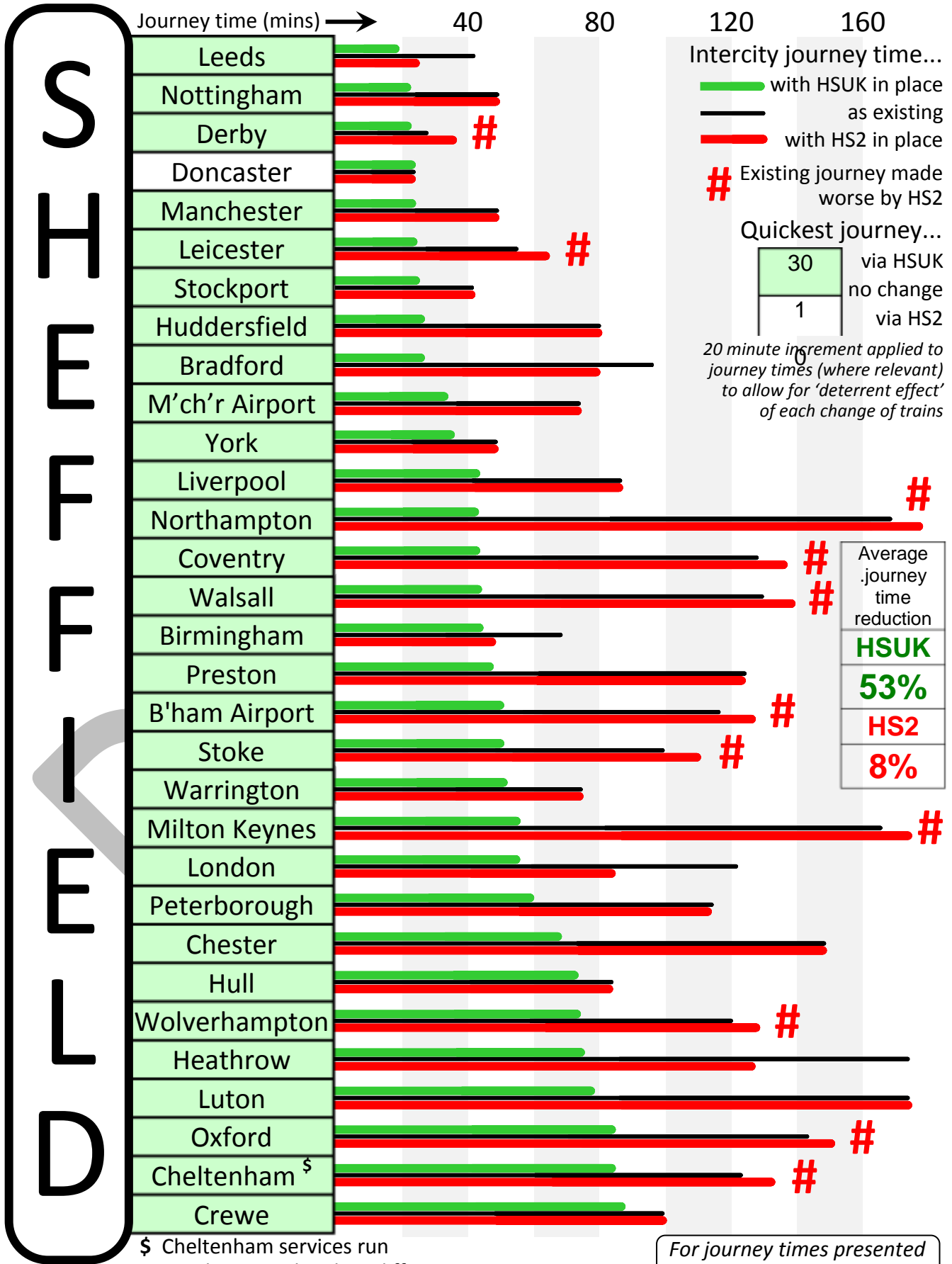
The engineering difficulties of building a high speed line through the Pennine foothills surrounding Sheffield were a major factor in the 2012 decision to align HS2's route to closely follow the M1 to the east of the city, and to site the HS2 station at Meadowhall, 5km from the city centre. This proved highly unpopular with Sheffield City Council, and incompatible with the Northern Powerhouse requirement for 'HS3' journeys between city centre stations.

As a consequence the revised HS2 proposals published in June 2016 abandoned Meadowhall in favour of a more easterly 'M18' route entirely bypassing the Don Valley, with Sheffield served at its existing 'Midland' station. Connections to Sheffield would be provided at Alfreton (42km to the south) and at Thurnscoe (22km to the north). The timing 'penalty' for HS2 services calling at Sheffield, compared with running non-stop on the bypassing route, is calculated at 25 minutes. This effectively places Sheffield on a very long siding, resulting in slow journey times and only 3 connections by HS2 to other UK cities. No credible proposals have yet emerged for Sheffield's crucial transpennine HS3 link to Manchester.

HSUK will directly connect Sheffield to all principal UK cities (including all centres considered in this study), with journey times reduced by an average of 53%. Its transpennine links to Manchester, Manchester Airport and Liverpool will meet all requirements of the Northern Powerhouse. HSUK services will operate from a restored Sheffield Victoria station, with interchange platforms on the approaches to Sheffield Midland allowing full access to HSUK services from an enhanced local rail network.

# HIGH SPEED UK & HS2 LINKS TO

# SHEFFIELD



# High Speed UK Scheme overlaid on Britain at Night

