

UNDERSTANDING UK INTERCITY RAILWAY CONNECTIVITY... AND BUILDING THE NETWORK

The rationale behind the HS2 project is simple:

- Connectivity between communities and between businesses is vital for our prosperity.
- Our existing transport systems, especially our railways, are now so congested that they cannot practicably be developed as the primary intervention to deliver the increased capacity and connectivity that we need.
- The building of new high speed railways is the best option for delivering the required step-change enhancements in capacity and connectivity.

This rationale is encapsulated in the evidence given by former HS2 Ltd Technical Director Andrew McNaughton to the HS2 Select Committee on 30th November 2015:

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

Mr McNaughton’s statement seems incontrovertible; yet it fails totally to recognise the reality of the HS2 project. HS2 is all about building new super-fast lines, mostly focussed upon London and with minimal connection to the existing network. But the project’s aim of “hugely enhanced capacity and connectivity” is only achievable if HS2 brings about an improved national network that will create enhanced links between the all of the key regional communities that form the bedrock of the UK economy.

To develop such an improved network, it’s vital to understand how the existing network works, and where its weaknesses currently lie. Only then is it possible to design the new high speed lines to optimise the achievement of “hugely enhanced capacity and connectivity” between all major communities (not just the headline primary cities such as London, Birmingham, Manchester and Leeds), and therefore deliver the promised economic gains.

It’s clear, from the astonishingly poor connectivity provided by HS2 (see sheet UKC5), that despite his long railway career, Mr McNaughton simply doesn’t understand the crucial importance of network. Otherwise he wouldn’t have designed proposals as spectacularly inadequate as HS2. The belated ‘sticking plaster’ remedy offered by Northern Powerhouse Rail (see sheet UKC6) can do little to redress HS2’s massive connectivity deficiencies.

To assist Mr McNaughton (and others at HS2 Ltd and in the DfT) we’ve prepared this paper *Understanding UK Intercity Railway Connectivity*. We hope that this will prove a valuable, if belated, learning experience.

DIAGRAM UKC 1
 © NETWORK MAPPING 2018

UNDERSTANDING UK INTERCITY RAILWAY CONNECTIVITY - 1

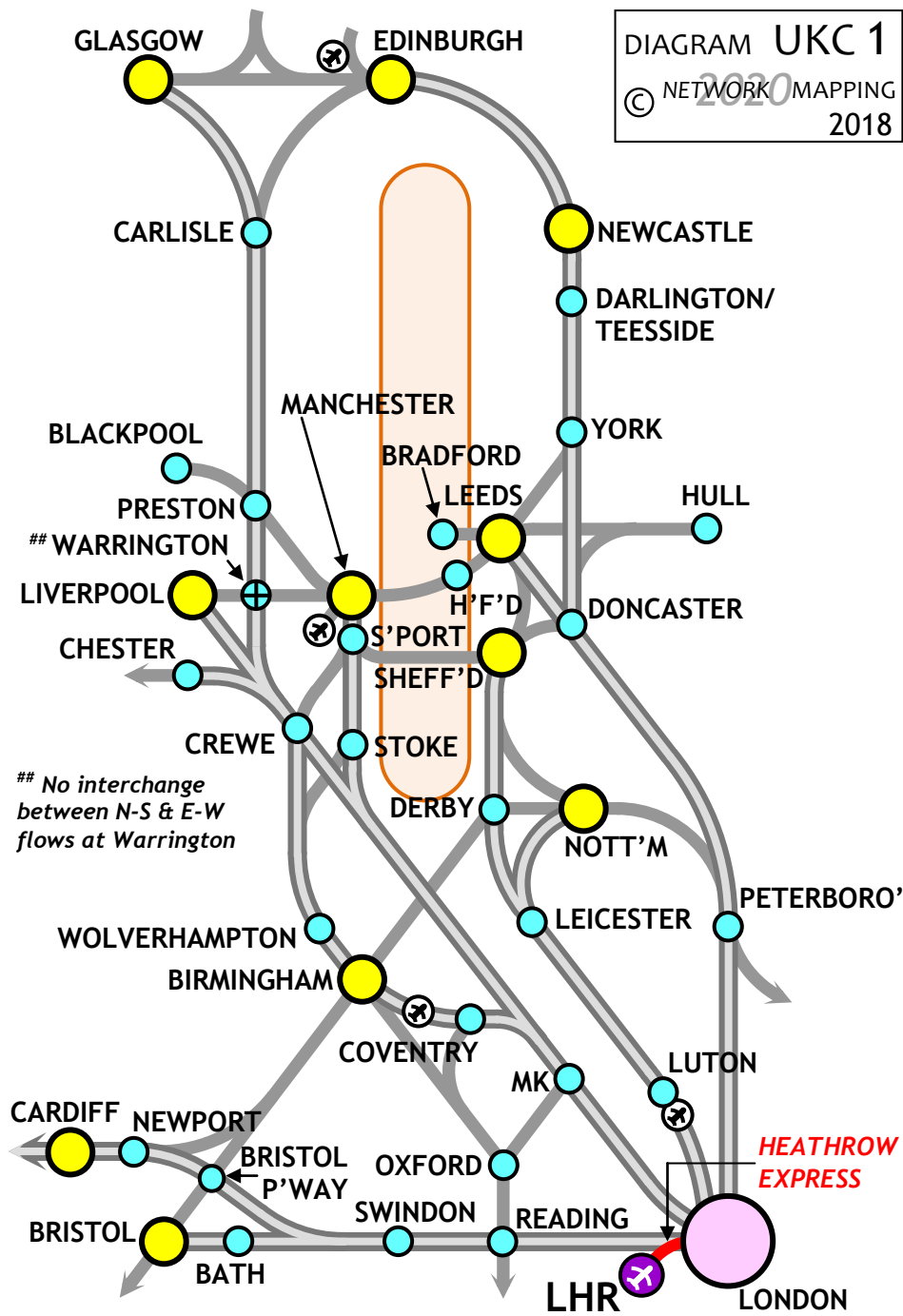
The fundamental purpose of any new intercity railway - conventional or 'high speed' - must be to connect cities. Through connecting to local networks at city centre hub stations, the benefits of the new connectivity are extended to the widest possible population.

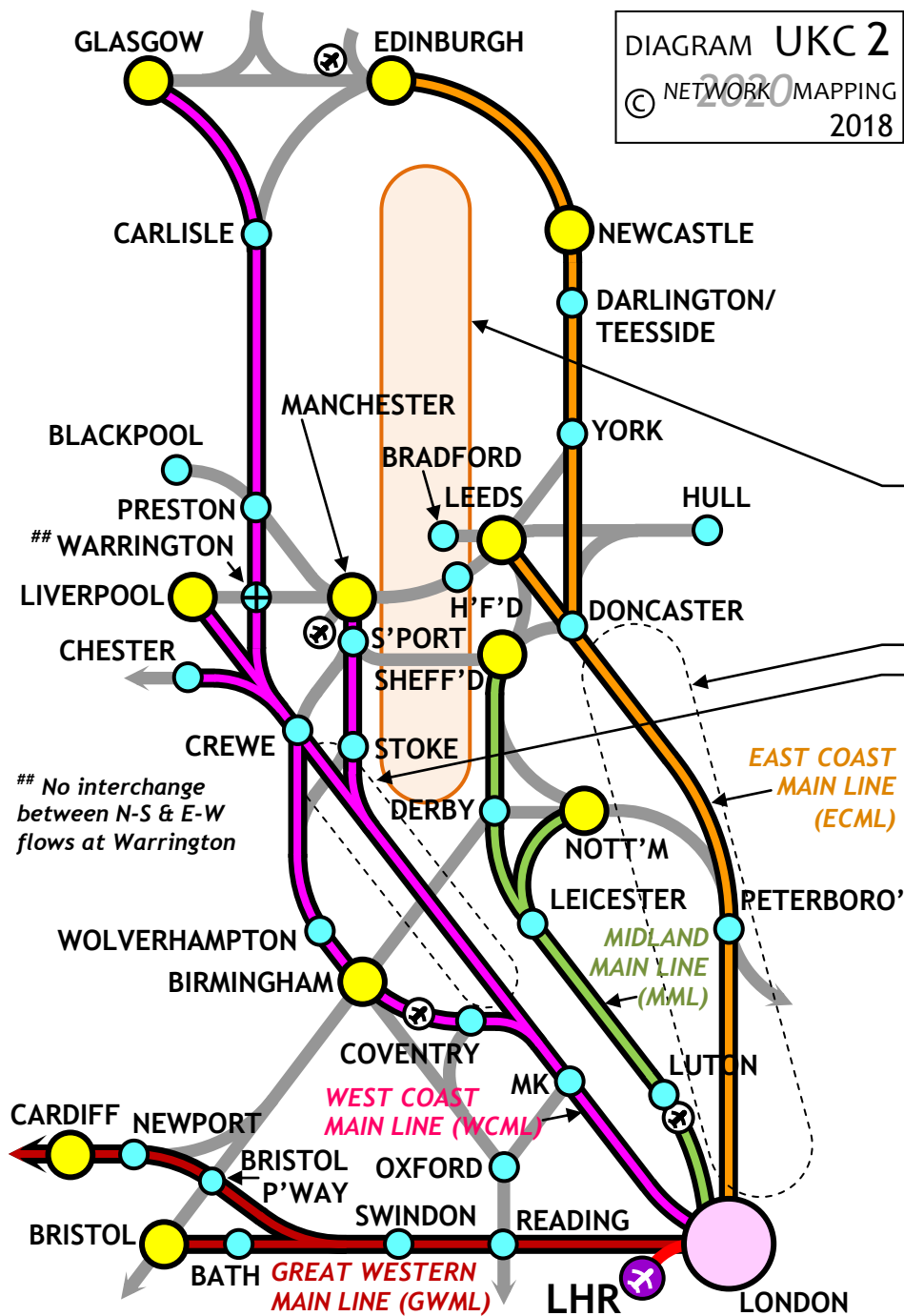
Connectivity - the linkages enabled by a transport system, either single or multimode - is vital for economic prosperity. With connectivity optimised, economic gains are optimised. Hence economic prosperity is maximised where the greatest connectivity is achieved.

With rail connectivity optimised, potential for modal shift from higher-emitting cars and planes - and hence CO₂ emissions reductions - is also optimised.

Key stakeholders in UK intercity rail connectivity are:

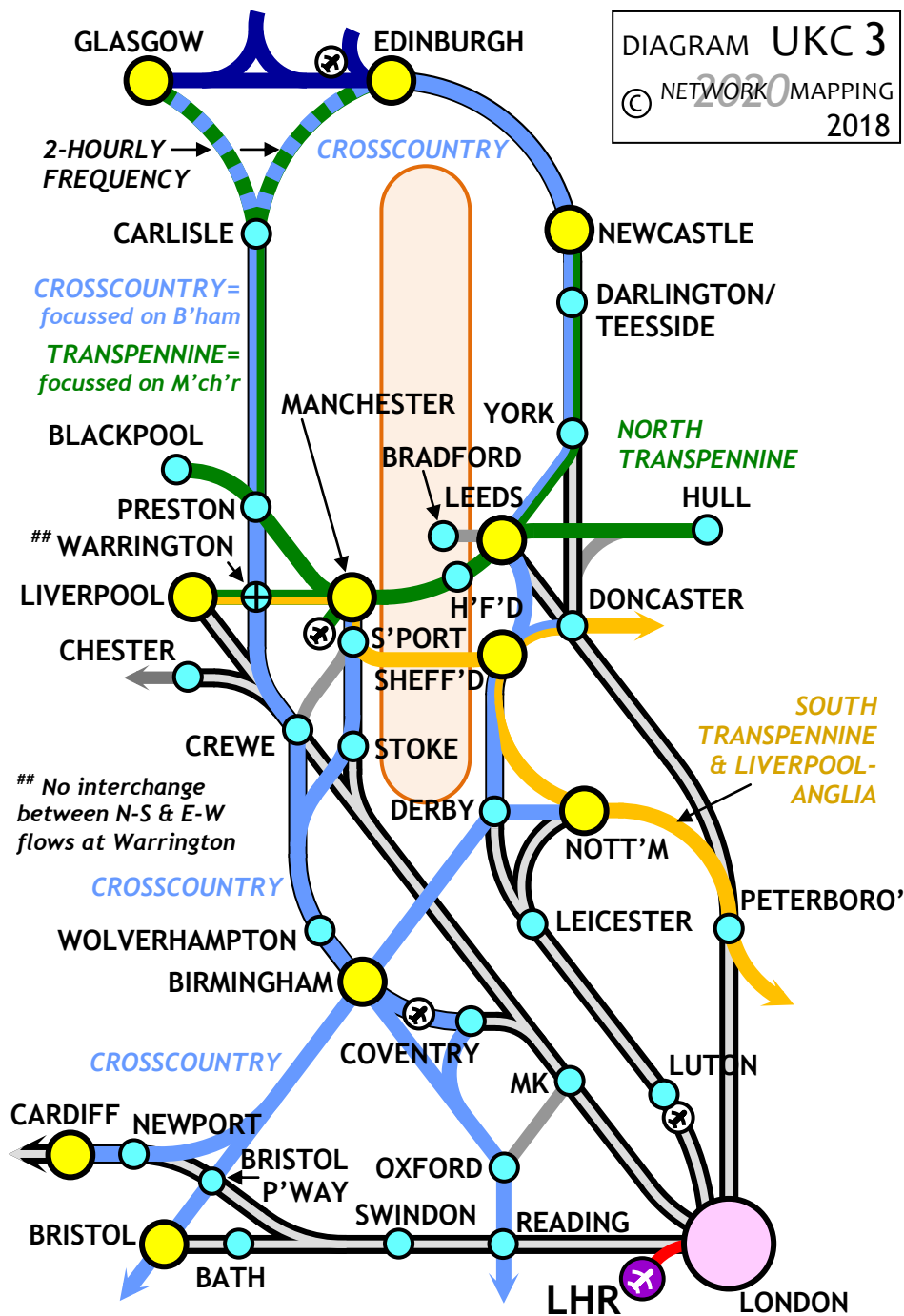
- 1. Capital city i.e. London ~ 10M population, and gateway to international intercity rail services via HS1.
- 2. Primary (or 'core') regional cities of 500k plus population, usually at hub position in larger regional conurbation.
- 3. Second-tier centres circa 200 - 500k population, often with only uniaxial connectivity on intercity network.
- 4. Heathrow Airport, UK's only 'hub' airport and vital for international connectivity - but only linked to London via Heathrow Express.
- 5. Other regional UK airports, international links mainly to Amsterdam & Paris CDG.
- 6. Intercity route to London.
- 7. Other intercity route.





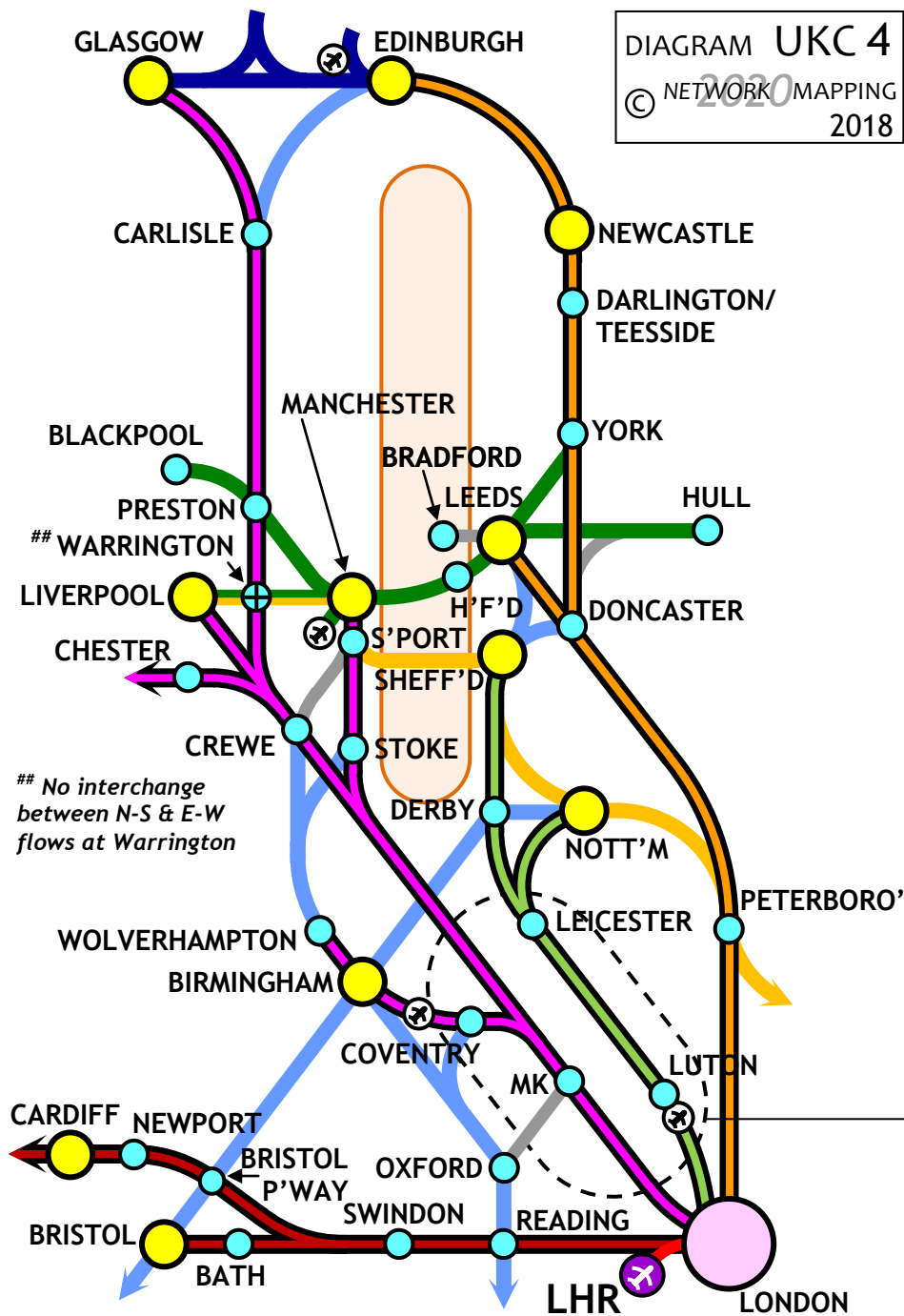
UK I/C RAILWAY CONNECTIVITY - 2 LONDON-CENTRICITY OF NETWORK

1. Primary economic logic for existing intercity rail system - dating from 19th Century - was to link principal regional cities to London.
2. This produced a primarily London-centric system, with ECML, MML, WCML & GWML radiating from London.
3. Access to city centre hub stations - e.g. Leeds City, Birmingham New St, Manchester Piccadilly - is vital for wider connectivity around conurbation and region.
4. Division between systems was reinforced by Pennine divide, and by intercompany rivalry.
5. Difficulty of aligning time-sensitive routes through conurbations surrounding principal cities resulted in creation of bypassing routes to further-flung destinations (e.g. Great Northern from London to Doncaster, Trent Valley from Rugby to Stafford).
6. Hence all principal cities e.g. Leeds, Birmingham, Manchester - are located clear of trunk main lines, with south-facing spurs funnelling towards London.
7. Hence intercity rail links from principal cities to London generally comprise 'single city pair' links.
8. Newcastle (on ECML between London and Edinburgh) is the only exception to this rule.
9. All other intermediate calling points comprise second-tier centres, for example:
 - Milton Keynes, Coventry, Stoke, Crewe, Warrington, Preston, Carlisle on WCML.
 - Luton, Leicester, Derby on MML.
 - Peterborough, Doncaster, York, Darlington on ECML.
10. There is no direct rail connectivity from regional cities to Heathrow Airport (LHR).



UK I/C RAILWAY CONNECTIVITY - 3 LINKS BETWEEN REGIONAL CITIES

1. High quality direct rail links between regional cities are necessary to balance London-centricity of primary UK intercity network (ie ECML, MML, WCML & GWML) radiating from London.
2. 'Single city pair' operation is generally not viable for high quality links between principal regional cities.
3. Strongest interregional corridors - ie TransPennine and CrossCountry - comprise multiple city pairs e.g Bristol/Birmingham/Derby/Sheffield/Leeds/York etc.
4. These routes (focussed on Manchester & Birmingham) are vital to provide northward connectivity from principal regional cities onto WCML & ECML.
5. More stops and generally less favourable topography make interregional routes considerably slower (75kph) compared with London-centric routes (120kph).
6. Higher speed and higher quality of intercity services to London (and lack of direct regional services to Heathrow) are indicative of London's superior connectivity. This is both a symptom and a cause of the North-South divide afflicting the UK economy.
7. Optimum functionality of UK intercity rail network is dependent upon maximised through routeing and (if direct journey not possible) interchange between interregional and London-centric intercity routes.
8. Primary interchange points are located at Birmingham New St, Manchester Piccadilly, Leeds and Edinburgh Waverley (for connection with Scottish national network).
9. It is vital to maintain the integrity of these interchanges, not just for overall UK rail connectivity, but also for connection to the local rail networks focussed upon these stations.



UK I/C RAILWAY CONNECTIVITY - 4 EXISTING NETWORK PERFORMANCE

The table below sets out the key connectivity deficiencies of the UK intercity rail network.

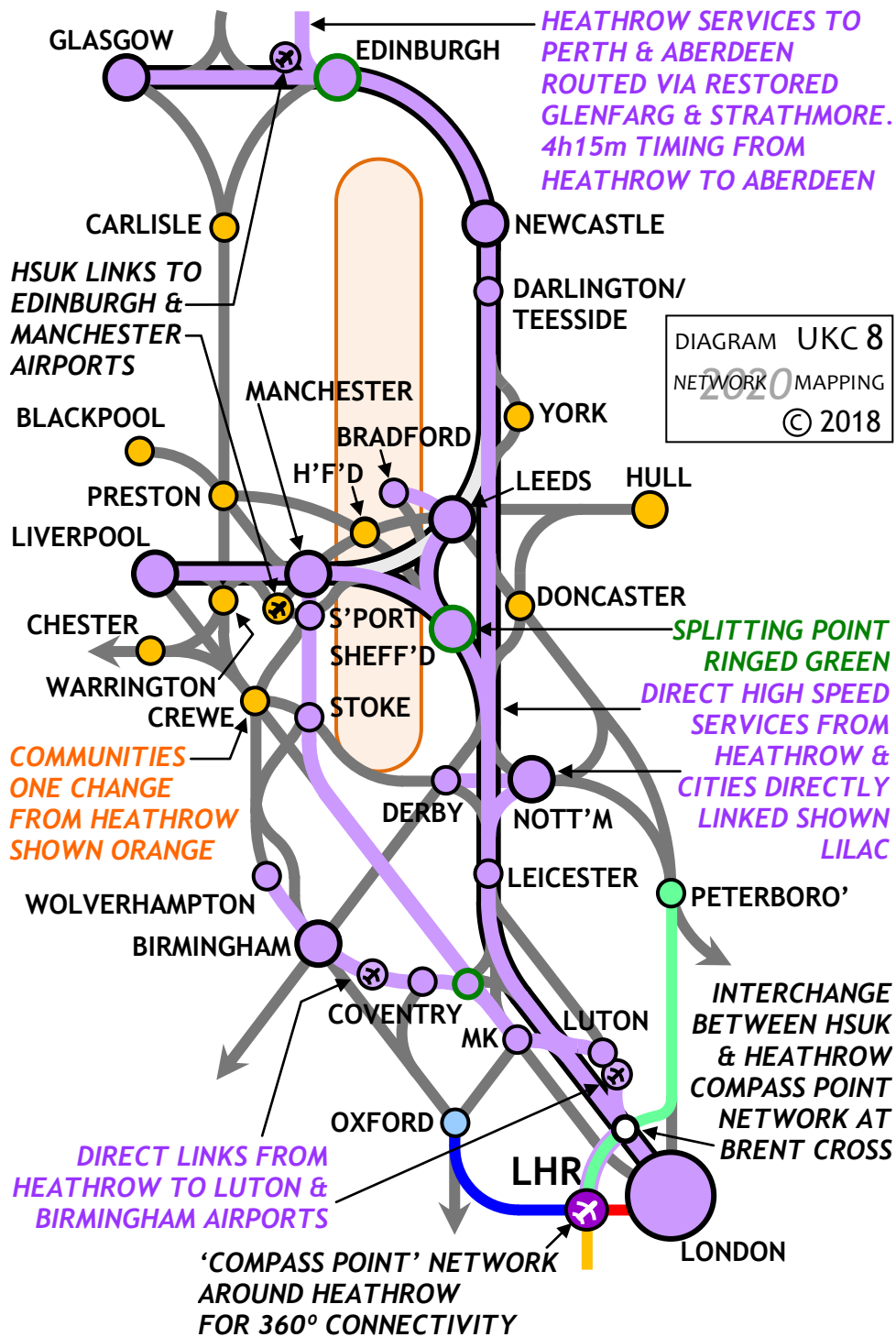
	LO	BI	NG	SH	MA	LI	LS	NE	EH	GL	LHR
London	High quality										
Birmingham	High quality	High quality									
Nottingham	High quality	High quality	High quality								
Sheffield	High quality	High quality	High quality	High quality							
Manchester	High quality	High quality	High quality	High quality	High quality						
Liverpool	High quality	High quality	High quality	High quality	High quality	High quality					
Leeds	High quality	High quality	High quality	High quality	High quality	High quality	High quality				
Newcastle	High quality	High quality	High quality	High quality	High quality	High quality	High quality	High quality			
Edinburgh	High quality	High quality	High quality	High quality	High quality	High quality	High quality	High quality	High quality		
Glasgow	High quality	High quality	High quality	High quality	High quality	High quality	High quality	High quality	High quality	High quality	
Heathrow	No direct regional links to Heathrow	No direct regional links to Heathrow	No direct regional links to Heathrow	No direct regional links to Heathrow	No direct regional links to Heathrow	No direct regional links to Heathrow	No direct regional links to Heathrow	No direct regional links to Heathrow	No direct regional links to Heathrow	No direct regional links to Heathrow	No direct regional links to Heathrow

These deficiencies can be summarised as follows:

1. Highest quality and fastest trains on routes to London.
2. Liverpool, Manchester and Nottingham (i.e. North-West and East Midlands) lack the necessary high-quality hourly-frequency direct links to Scotland.
3. Glasgow is especially poorly connected, with domestic air services predominant intercity mode.
4. Interregional rail services are generally slower and poorer quality than London-centric services.
5. No direct services from regional cities to Heathrow.
6. London-centricity perpetuates North-South divide.

Additionally, there are major connectivity deficiencies between second-tier cities on uniaxial routes, especially in South-East Midlands, with no rail links whatsoever between adjacent communities e.g. Luton to Milton Keynes & Leicester to Northampton/Coventry along M1/M6 corridor.

Connectivity and capacity improvement must be a primary aim of the UK high speed rail project.



HIGH SPEED UK - ENHANCED UK REGIONAL ACCESS TO HEATHROW

The table below sets out the performance of High Speed UK in linking UK cities to Heathrow Airport.

London	LO	BI	NG	SH	MA	LI	LS	NE	EH	GL	LHR
Birmingham	Green										
Nottingham	Green	Green									
Sheffield	Green	Green	Green								
Manchester	Green	Green	Green	Green							
Liverpool	Green	Green	Green	Green	Green						
Leeds	Green	Green	Green	Green	Green	Green					
Newcastle	Green	Green	Green	Green	Green	Green	Green				
Edinburgh	Green	Green	Green	Green	Green	Green	Green	Green			
Glasgow	Green	Green	Green	Green	Green	Green	Green	Green	Green		
Heathrow	Black	Green	Green	Green	Green	Green	Green	Green	Green	Green	Green

Legend: Green = Direct city pair link or Heathrow link at hourly or better frequency; Lilac = Heathrow link at hourly or better frequency.

Comprehensive connectivity between UK regional cities and the national hub airport will bring major economic benefits to the regions, attracting inward international investment. This investment is normally predicated upon proximity to an international airport; with surface connectivity to Heathrow vastly improved, it becomes possible to spread its 'proximity benefits' across a much wider area of the UK.

These benefits are achieved through the following strategy:

1. Compass Point network, utilising existing Heathrow Express infrastructure, provides 360° regional links around airport and connections at outer-suburban hubs to national rail network.
2. Insufficient traffic exists to fill dedicated trains from Heathrow to any regional city - and operation of such poorly-filled trains could not be justified on congested radial routes from London.
3. Network efficiency of HSUK's 'spine & spur' - with several cities on a single line of route - requires just 4 hourly trains to link central hub stations of all principal cities of Midlands, North and Scotland with the heart of Heathrow Airport.
4. With comprehensive surface connectivity across mainland UK, rail links become the 'spokes' to the aviation 'hub' at Heathrow, replacing wasteful short-haul flights with new routes to emerging economies, and transforming airport operations.