Appendix A – Corridor Status Report

A.1 Overview of Corridors

The current appendix aims to provide an overview of existing conditions and goals for high speed rail in the 5 corridors studied in the High Speed Rail Development Programme.

Figure A.1 The 5 corridors studied in the High Speed Rail Development Programme

A.1.1 Economic and Demographic Conditions

The design and construction of a high speed rail network in Great Britain will take many decades. It is thus important to examine economic and demographic conditions not only today, but in the future.

Population and employment trends until 2025 are examined. Predictions 20 or more years into the future are subject to a higher level of uncertainty, and they are thus excluded from this analysis, though they must be included in the demand forecast and business case models.

Figure A.2 shows population and employment density in 2007.[1]

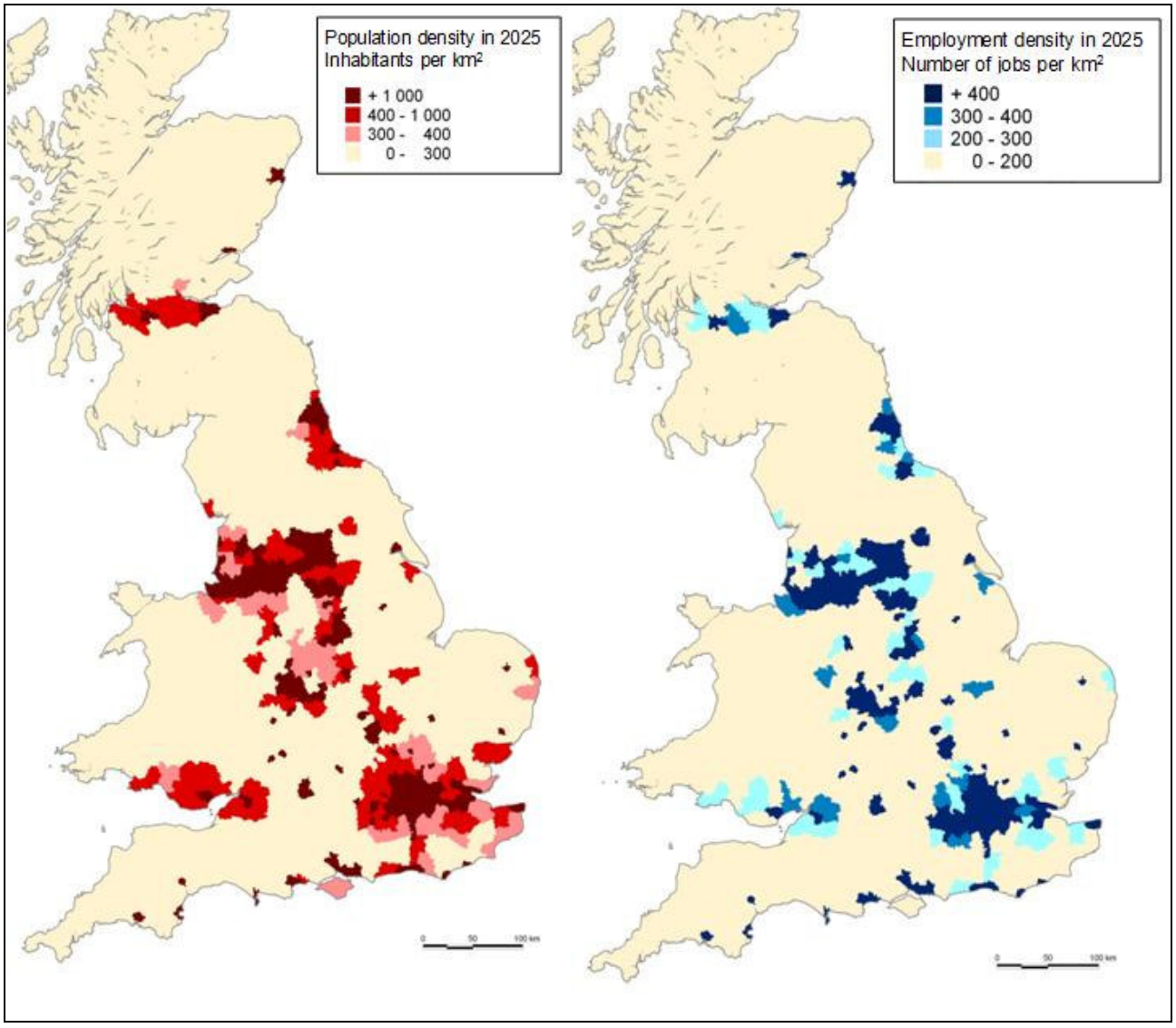


Figure A.2 Population and employment density in 2025

[1] Tempro 5.4 dataset (http://www.tempro.org.uk/Download.aspx)

Table A.1 shows the broad population and job growth trends predicted for the English Regions, Scotland and Wales.

Table A.1 Growth in population and number of jobs from 2007 to 2025 in the 5 Corridors and in all of Great Britain[2]

	Population (millions)			Jobs (millions)		
	2007	2025	% increase	2007	2025	% increase
London	7.4	8.6	16%	4.4	5.2	17%
South East	8.2	9.3	13%	4.4	5.1	16%
West Midlands	5.3	5.8	10%	2.7	3.0	9%
North West	6.8	7.5	10%	3.4	3.6	8%
Corridor 1	**27.7**	**31.2**	**13%**	**15.0**	**16.9**	**13%**
London	7.4	8.6	16%	4.4	5.2	17%
East	5.6	6.6	18%	2.8	3.2	14%
East Midlands	4.3	5.0	16%	2.2	2.5	13%
Yorkshire and Humber	5.1	5.8	14%	2.7	3.0	13%
North East	2.5	2.6	5%	1.3	1.3	2%
Corridor 2	**24.9**	**28.6**	**15%**	**13.4**	**15.2**	**13%**
London	7.4	8.6	16%	4.4	5.2	17%
South East	8.2	9.3	13%	4.4	5.1	16%
South West	5.0	5.9	17%	2.7	3.1	15%
Wales	3.0	3.2	8%	1.4	1.6	8%
Corridor 3	**23.6**	**27.0**	**14%**	**13.0**	**15.0**	**15%**
Yorkshire and Humber	5.1	5.8	14%	2.7	3.0	13%
North East	2.5	2.6	5%	1.3	1.3	2%
North West	6.8	7.5	10%	3.4	3.6	8%
Corridor 4	**14.4**	**15.9**	**11%**	**7.3**	**7.9**	**9%**
Scotland	5.1	5.3	5%	2.6	2.7	6%
North East	2.5	2.6	5%	1.3	1.3	2%
North West	6.8	7.5	10%	3.4	3.6	8%
Corridor 5	**14.4**	**15.4**	**7%**	**7.2**	**7.6**	**6%**
Great Britain	**58.2**	**65.6**	**13%**	**30.6**	**34.3**	**12%**

The expected growth in each corridor is generally near that of the British average. Scotland, Wales, the North East and Wales, however, expect relatively low growth, whereas the growth in the South West and the East will be particularly high. Corridor 5, the Anglo-Scottish link, is the corridor with the lowest overall expected population and employment growth, especially the link to North East England.

A.1.2 Constraints: urban areas, human activities and protected natural zones

A.1.2.1 General approach

This section seeks to provide an overview of the urban areas, protected natural zones and monuments that constitute constraints for the future high speed lines, and to classify them according to the magnitude of constraint they represent.

[2] TEMPRO Dataset 5.4

These constraints are grouped into two themes: **urban areas and human activities** and **natural areas**.

Urban areas and human activities

The urban areas and human activities that may constitute constraints include:

- Historic buildings, monuments or sites
- Urban areas
- Major installations such as power stations that can represent a risk for the project
- Existing infrastructure, in particular motorways that can generate technical constraints (crossings, exits, etc.) whose costs must be taken into account

Numerous historic features (primarily Scheduled Ancient Monuments, Listed Buildings and Battlefields) can be found along Corridors. Nevertheless, they tend to be small, and it will in most cases be possible to find routes around them when HSL is built. It is therefore not pertinent to list all of these features.

Natural areas

Major natural constraints are composed of:

- Protected areas that may be very sensitive and have a strong influence on route design
- Geological and hydrological characteristics (including risks)

Sites with special designations are presented for each corridor below.

Three categories of designations protect natural areas in the UK:

- International designations, primarily:
  - Ramsar areas[3]
  - Special Areas of Conservation (SAC)
  - Special Protection Areas (SPA)
  - World Heritage Sites (WHS)
  - Biosphere Reserves
- National designations
  - National Parks
  - Areas of Outstanding Natural Beauty (AONB) or, in Scotland, National Scenic Areas, broadly equivalent to AONBs
  - National Nature Reserves (NNR)

[3] The Ramsar convention, named for a town in Iran, is an international treaty for the conservation of wetlands.

– Sites of Specific Scientific Interest (SSSI)

- Regional / local designations, for example:

  – Country Parks

  – Regional Parks

Within the scope of the current document, only international and national designations will be considered. These designations constitute the following constraints for high speed rail:

- International designated sites must be avoided, that is HSL alignments must either go around them or tunnel under them.

- National designated sites have to be avoided wherever possible. In some cases they can be crossed by a high speed rail alignment, but mitigation measures must be put into place, and resistance to a project with some impact on natural areas may cause significant project delays.

Regional and local designated sites will have to be taken into account in more advanced stages of the development of high speed lines.

A.1.2.1 Focus on corridor 1

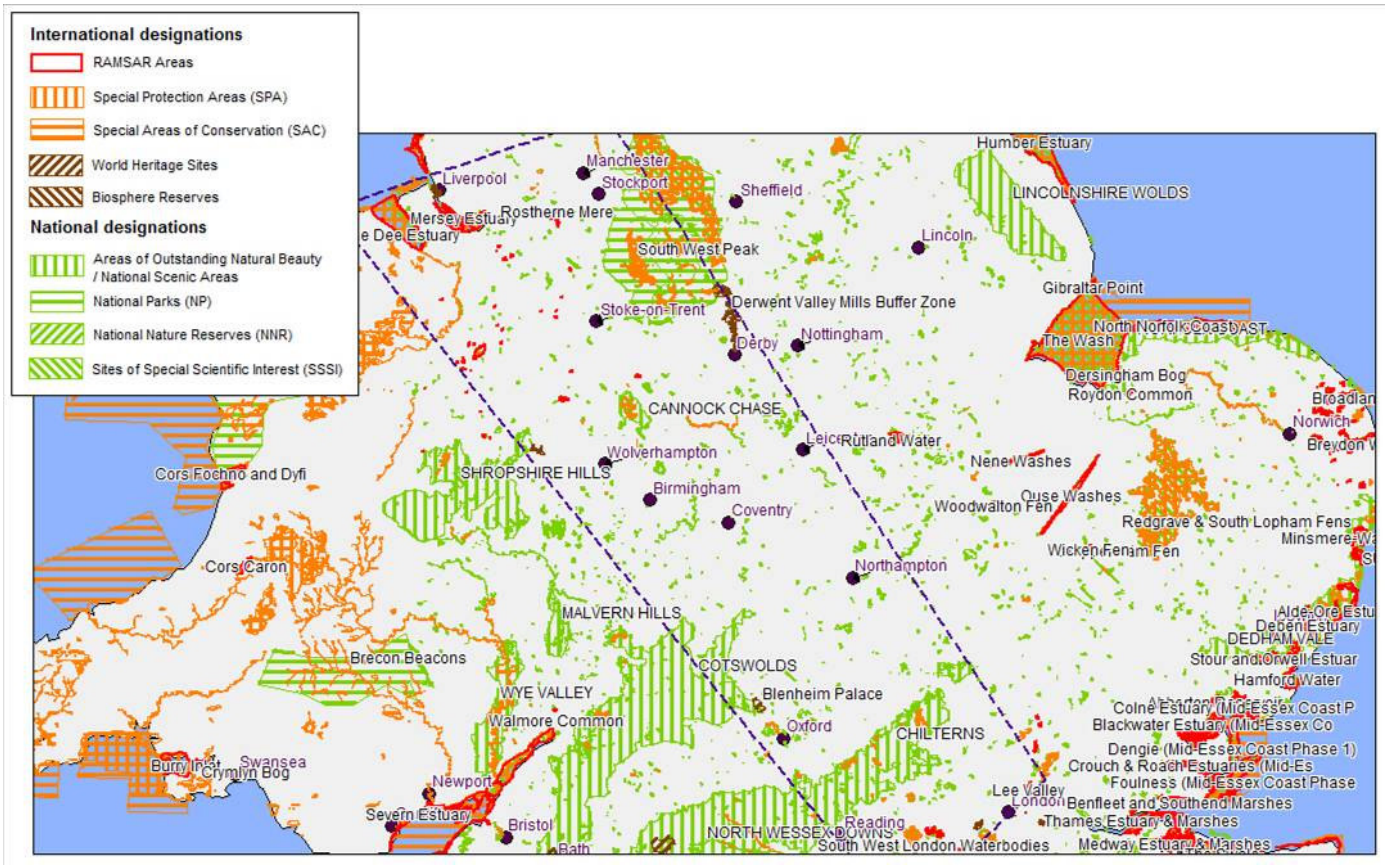
Table A.2 provides the magnitude of the constraints posed by human activities and urban areas.

Table A.2 Magnitude of constraints related to human activities and urban areas

Type	Description	Sensitivity / Magnitude of the constraint
Urban areas	London urban area	Very high
	Birmingham	High
	Manchester	High
	Liverpool	High
Major installations	Power stations[4]	Depends on the nature of the installation
Infrastructure	Motorways (M40, M6)	High
	Major railway lines	Moderate

[4] A map of power stations in Great Britain is available at http://www.energynortheast.net/page/eppne.cfm.

Figure A.3 Protected natural areas in Corridor 1



From the south to the north, the major designated areas encountered are:

- Isolated RAMSAR areas to the North and to the South West of London, as well as SSSI and NNR
- A major constraint due to its size: the Chilterns AONB. Parts of the AONB are also SAC and SSSI
- Around Oxford: scattered SSS of which some are also SAC. To the North East can be found the WHS of Blenheim Palace.
- Scattered SSSI between Oxford and Northampton.
- To the West, the corridor includes a small part of the Costwolds AONB.
- Scattered SSSI between Northampton and Coventry / Leicester / Birmingham.
- To the north of Birmingham, a major constraint is Cannock Chase: a famous AONB with some areas that are also SSSI and SAC. Scattered RAMSAR zones lie to the north of Cannock Chase.
- Scattered SSSI and NNR lead up to the major constraint of Peak District National Park to the north east of Stoke-on-Trent. Peak District National Park also contains some SPA and SAC. A WHS lies to the north of Derby.
- Scattered RAMSAR areas are also found when going to the North, between Cannock Chase, Liverpool and Manchester.

The major constraints are summarised in Table A.3 and Table A.4 (only the strongest levels of protection and / or the largest areas are included).

Table A.3 International designations, Corridor 1

	RAMSAR zones	SPA	SAC	Sensitivity
Chilterns			Parts	Very high
Cannock Chase (Staffordshire)	Parts		Part	Very high
Part of the River Mease (Leicestershire)			X	Very high
Peak District		Parts	parts	Very high

Table A.4 National designations

	NP	AONB	NNR	SSSI	Sensitivity
Chilterns		x		parts	High
Cannock Chase (Staffordshire)		x		parts	High
Part of the River Mease (Leicestershire)				x	High
Peak District	X			parts	High

A.1.2.2 Focus on corridor 2

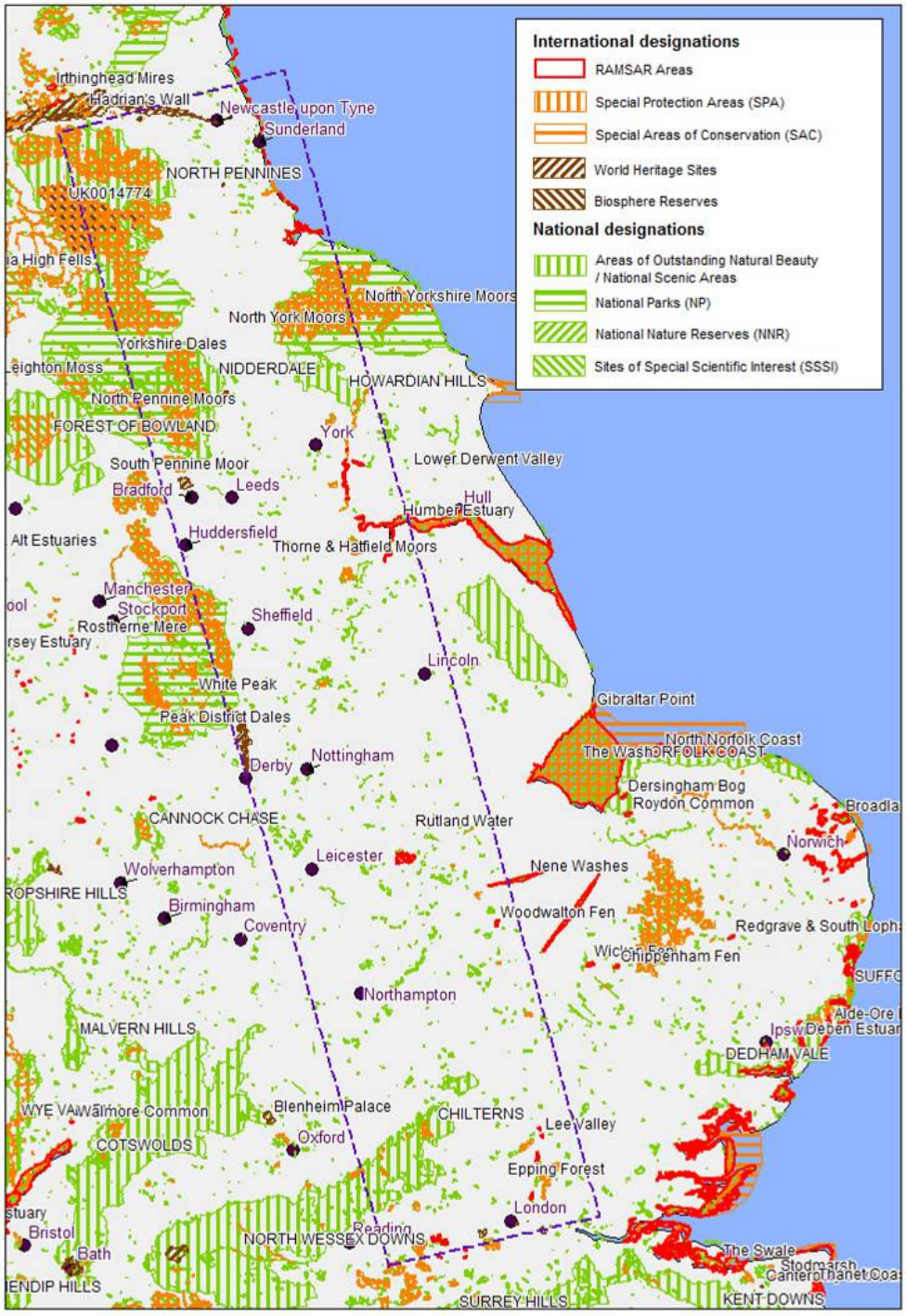
Corridor 2 links London and Newcastle. Table A.5 provides the magnitude of the constraints posed by human activities and urban areas.

Table A.5 Magnitude of constraints related to human activities and urban areas

Type	Description	Sensitivity / Magnitude of the constraint
Urban areas	London urban area	Very high
	Sheffield	High
	Leeds	High
	Newcastle	High
Major installations	Power stations[5]	Depends on the nature of the installation
Infrastructure	Motorways (M11 / M1)	High
	Major railway lines (ECML, MML)	Moderate

[5] A map of power stations in Great Britain is available at http://www.energynortheast.net/page/eppne.cfm.

Figure A.4 Protected natural areas in Corridor 2



From the south to the north, the major designated areas encountered are:

- Isolated RAMSAR areas to the North-East of London such as Lea Valley, as well as SAC and SSI
- Scattered SSSI over the whole corridor. As they mainly remain small, they do not represent a strong constraint and can be dealt with in more advanced stages.
- The north-east peak of the Chilterns AONB is part of the corridor
- RAMSAR areas to the East of Leicester

- Around Sheffield, the corridor is wedged between Peak District Moors to the West and two RAMSAR areas to the East (Humber Estuary and Lower Derwent Valley). More in the centre, small areas are protected by SPA and SAC designations.

- As far as Newcastle, it is possible to find a route without major constraints as North Pennines AONB remain at the West edge of the corridor.

The major constraints are summarised in Table A.6 and Table A.7 (only the strongest levels of protection and / or the largest areas are included).

Table A.6 International designations

	RAMSAR zones	SPA	SAC	Sensitivity
Lea Valley (London)	x			Very high
Epping Forest (Essex)		x	x	Very high
Chilterns			parts	Very high
Rutland Water	x	x		Very high
Woodwalton Fen (Cambridgeshire)	x		x	Very high
Humber Estuary	x	x	x	Very high
Lower Derwent Valley (N Yorks)	x	x	x	Very high
Thorne and Hatfield Moors (S Yorks)		x	x	Very high
Nidderdale (N Yorks)		parts	parts	Very high
North York Moors		x	x	Very high
North Pennines		parts	parts	Very high

Table A.7 National designations

	NP	AONB	NNR	SSSI	Sensitivity
Chilterns		x			High
Howardian Hills (N Yorks)		x			High
Nidderdale (N Yorks)		x		parts	High
North Pennines		x		parts	High

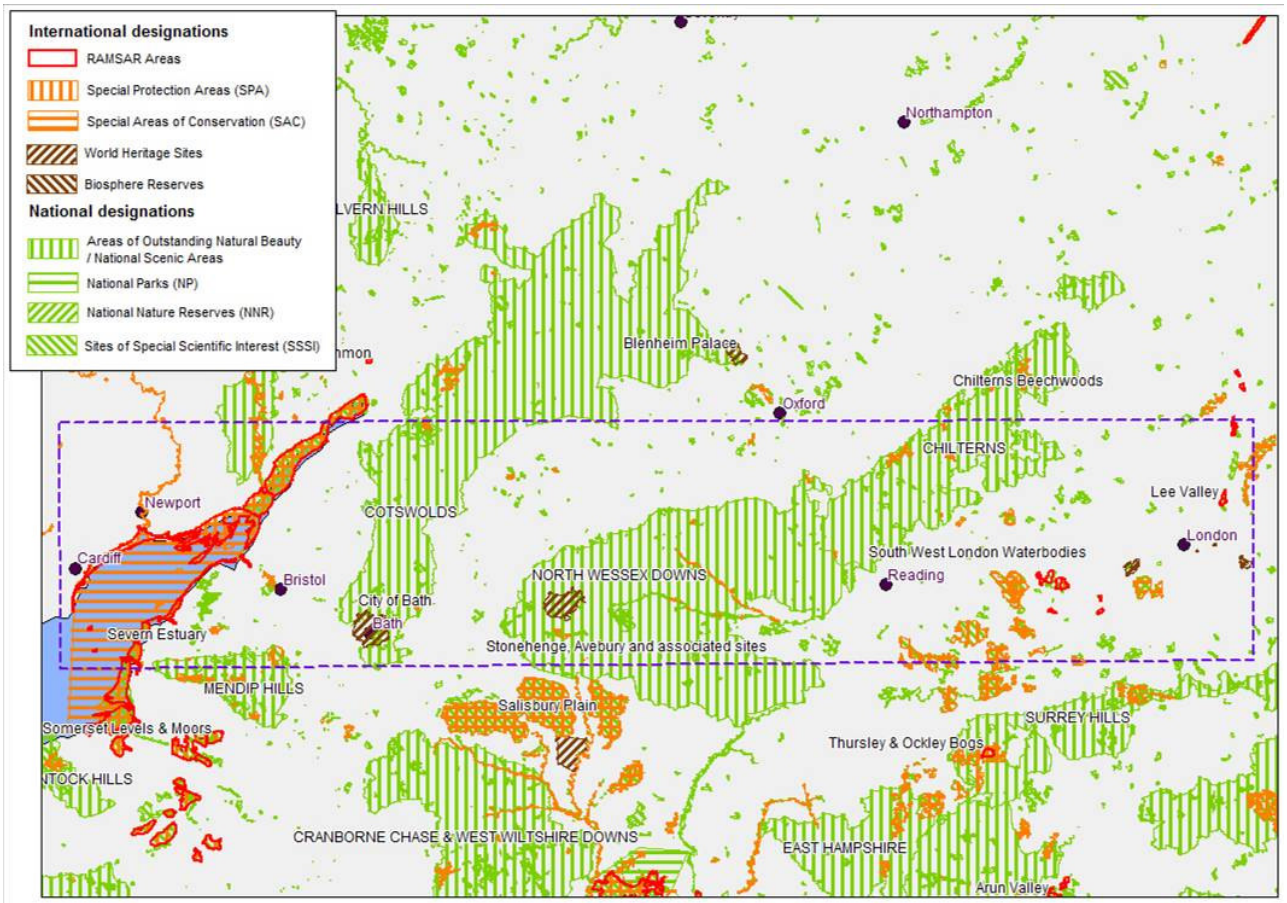
A.1.2.3 Focus on corridor 3

Corridor 3 links London, Bristol and Cardiff. Table A.8 provides the magnitude of the constraints posed by human activities and urban areas.

Table A.8 Magnitude of constraints related to human activities and urban areas

Type	Description	Sensitivity / Magnitude of the constraint
Urban areas	London urban area	Very high
	Bristol	High
	Cardiff	High
Major installations	Power stations[6]	Depends on the nature of the installation
Infrastructure	Motorways (M4)	High
	Major railway lines (GWR)	Moderate

Figure A.5 Protected natural areas in Corridor 3



[6] A map of power stations in Great Britain is available at http://www.energynortheast.net/page/eppne.cfm.

From the East to the West, the major designated areas encountered are:

- Isolated RAMSAR areas to the West of London (Waterbodies), as well as SAC and SPA
- Scattered SSSI over the whole corridor. As they mainly remain small, they do not represent a strong constraint and can be dealt with in more advanced stages.
- A strong constraint due to its vast area: The Chilterns AONB and the North Wessex Downs AONB, where the very famous site of Stonehenge can be found.
- Further to the West, another vast area is protected by the AONB status: The Cotswolds, a part of which is a World Heritage Site (the City of Bath).
- The last major constraint would be the cross of the Severn Estuary that is protected with international designations.

The major constraints are summarised in Table A.9 and Table A.10 (only the strongest levels of protection and / or the largest areas are included).

Table A.9 International designations

	RAMSAR zones	SPA	SAC	WHS	Sensitivity
Stonehenge, Avebury and associated sites				x	Very high
City of Bath				x	Very high
Severn Estuary	x		x		Very high

Table A.10 National designations

	NP	AONB	NNR	SSSI	Sensitivity
Chilterns		x			High
North Wessex Downs		x			High
Cotswolds		x			High

A further constraint within the corridor is the crossing of the Severn River. The Severn Estuary is a designated RAMSAR site. The existing Severn railway tunnel is gauge-constrained, has plenty of freight traffic running through it, and due to safety constraints only one train is allowed into the tunnel per direction. A barrage to harness the energy of the tidal flows has long been proposed. If built, it could be possible to have it carry a railway line. However, to this date, no plans for the barrage have been finalised. It is worth noting, however, that the Severn estuary already has two major viaducts carrying the M4 motorway.

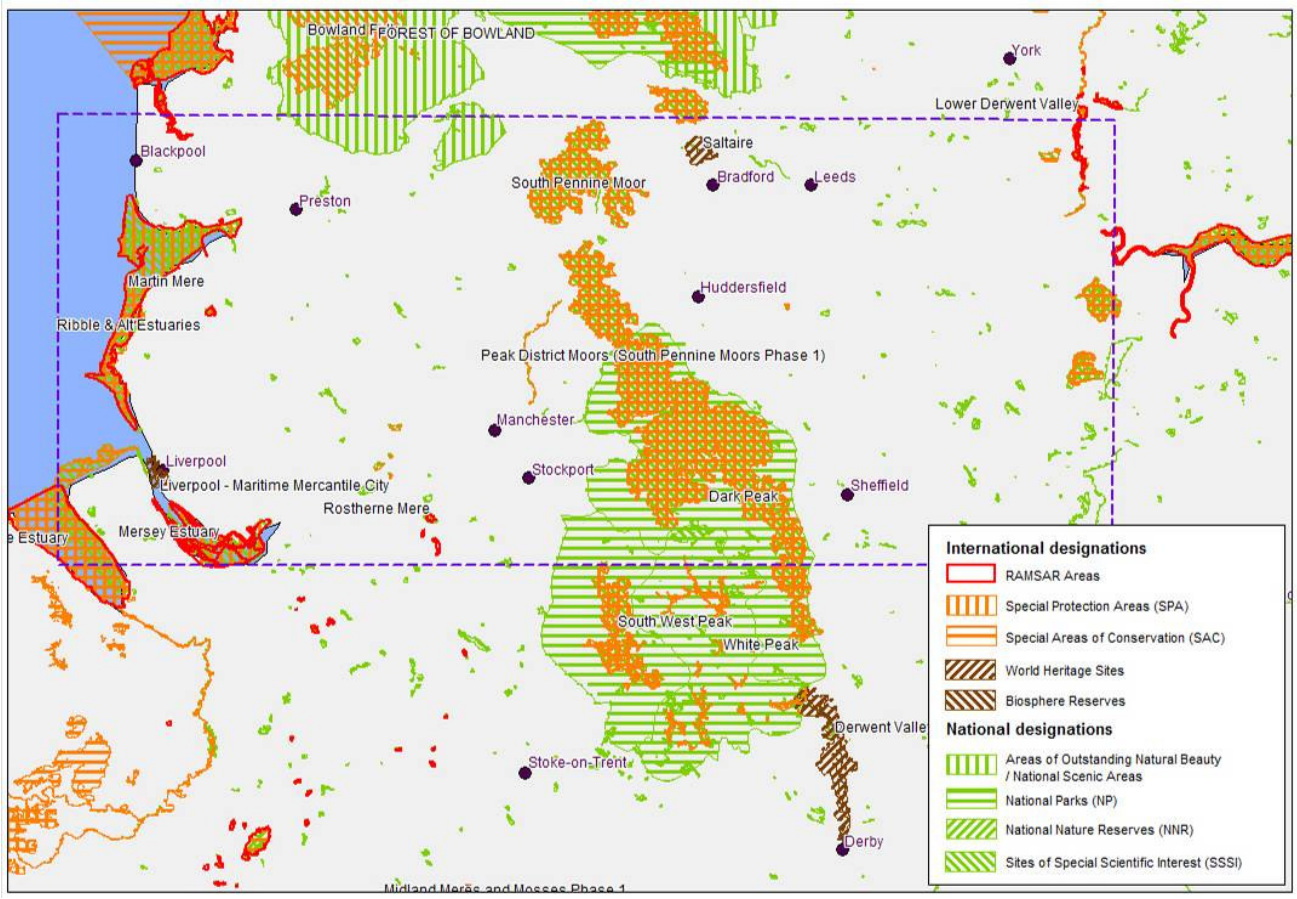
A.1.2.4 Focus on corridor 4

Corridor 4 links Liverpool and Manchester to Sheffield and Leeds. Table A.11 provides the magnitude of the constraints posed by human activities and urban areas.

Table A.11 Magnitude of constraints related to human activities and urban areas

Type	Description	Sensitivity / Magnitude of the constraint
Urban areas	Liverpool	High
	Manchester	High
	Sheffield	High
	Leeds	High
Major installations	Power stations[7]	Depends on the nature of the installation
Infrastructure	Motorways (M62)	High

Figure A.6 Protected natural areas in Corridor 4



[7] A map of power stations in Great Britain is available at http://www.energynortheast.net/page/eppne.cfm.

Due to the small distance that separates Liverpool / Manchester from Sheffield / Leeds, only one major constraint crosses the corridor and is linked to the Pennines: the area of Peak District Moors and South Pennine Moor, that is SPA and SAC. To the North of Bradford, Saltaire is a World Heritage Site.

The major constraints are summarised in the tables below (only the strongest levels of protection and / or the largest areas are included).

Table A.12 International designations

	RAMSAR zones	SPA	SAC	WHS	Sensitivity
Peak District Moors, South Pennine Moor		x	x		Very high
Saltaire				x	Very high

Table A.13 National designations

	NP	AONB	NNR	SSSI	Sensitivity
Peak District Moors, South Pennine Moor	X			X	High

A.1.2.5 Focus on corridor 5

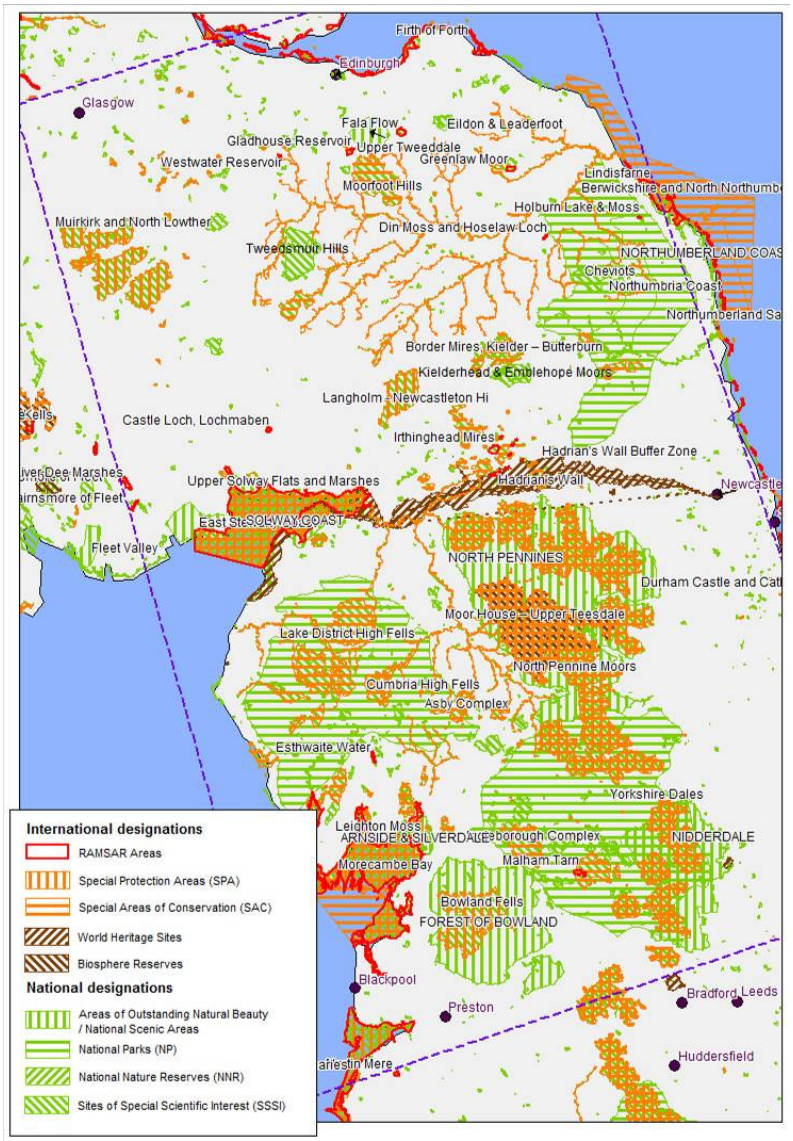
Table A.14 provides the magnitude of the constraints posed by human activities and urban areas.

Table A.14 Magnitude of constraints related to human activities and urban areas

Type	Description	Sensitivity / Magnitude of the constraint
Urban areas	Newcastle	High
	Edinburgh	High
	Glasgow	High
Major installations	Power stations[8]	Depends on the nature of the installation
Infrastructure	Motorways (M74, M6)	High

[8] A map of power stations in Great Britain is available at http://www.energynortheast.net/page/eppne.cfm.

Figure A.7 Protected natural areas in Corridor 5



In this corridor, the major designated areas are vast and mainly located in the middle of the lands, associated with the steep relief of the Pennines. From the South to the North, the following zones can be found:

- Scattered SSSI over the whole corridor. As they mainly remain small, they do not represent a strong constraint and can be dealt with in more advanced stages.
- Wide AONB areas and national parks such as Nidderdale, the Forest of Bowland and Yorkshire Dales. Some parts are protected with an international designation (SPA of Bowland Fells, SPA and SAC of North Pennine Moors, SAC of Ingleborough Complex). In the middle, Malham Tarn is a RAMSAR zone.
- On the west coast, the very sensitive area of Morecambe Bay is simultaneously RAMSAR, SPA and SAC.
- To the North, another sensitive area is very vast: the North Pennines AONB. Almost its entire surface is also SAC, SPA and a part is a Reserve of Biosphere (Moor House – Upper Teesdale).
- To the West can be found a SAC area called Lake District Fells that belongs to a wider national park (Lake District).

- Further to the North, a horizontal area almost crosses the Island and constitutes a strong constraint as it is a World Heritage Site called Hadrian's Wall Buffer Zone, associated with scattered RAMSAR areas). To the West, the estuary is also protected with international designations: RAMSAR, SAC and SPA.

- To the North, except the National Park of Northumberland, constraints are more localised but some international protections can nevertheless be found (Langholm - Newcastleton Hills, Muirkirk and North Lowther, Moorfoot Hills...). Isolated RAMSAR areas are situated to the South of Edinburgh.

- From Newcastle to Edinburgh, the coast is globally the subject of international protection.

The major constraints are summarised in the tables below (only the strongest levels of protection and / or the largest areas are included).

Table A.15 International designations

	RAMSAR zones	SPA	SAC	Biosphere Reserve	WHS	Sensitivity
Bowland Fell (Lancs)		x				Very high
North Pennine Moors		x	x	part		Very high (and very spread)
Malham Tarn (N Yorks)	x					Very high
Morecambe Bay (Lancs)	x	x	x			Very high
Lake District Fells (Cumbria)			x			Very high
Hadrian's Wall Buffer Zone (Cumbria/ Northumberland)	parts				x	Very high (vast)
Upper Solway Flats and Marshes (Cumbria)	x	x	x			Very high

Table A.16 National designations

	NP	AONB	NNR	SSSI	Sensitivity
Nidderdale (N Yorks)		x		Parts	High (vast)
Forest of Bowland (Lancs)		x		Parts	High (vast)
Yorkshire Dales	x				High (vast)
North Pennines		x		Parts	High (vast)
Northumberland	x				High
Lake District (Cumbria)	x				High (vast)

A.1.3 Transport infrastructure

Airports

The major airports that may be impacted by a high speed rail network are presented in the table below:

Table A.17 Number of passengers in major airports in 2007[9]

Airport	Total Passengers (2007)
HEATHROW	68,066,028
GATWICK	35,216,113
STANSTED	23,779,697
MANCHESTER	22,112,625
LUTON	9,927,321
BIRMINGHAM	9,226,340
EDINBURGH	9,047,558
GLASGOW	8,795,727
BRISTOL	5,926,774
NEWCASTLE	5,650,716
LIVERPOOL	5,468,510
NOTTINGHAM EAST MIDLANDS INT'L	5,413,360

The impact that HS rail may have on these airports may be an overall reduction in air traffic (and thus of CO2 emissions, as outlined in the Guiding Principles), or it may concern a modification in the way that runway space is used: a shift may occur from short-haul national flights to longer-haul international flights.

A.2 Passenger Travel Market

This section examines in broad terms the passenger travel market in the five Corridors. The modes studied are car, air and rail.

The coach market is generally considered to be irrelevant to the high speed rail study because coach travellers are unlikely to find high speed rail attractive. Their major reasons for choosing coach would preclude their choosing high speed rail in the future. Those who currently choose coach:

- do so for the low monetary cost (traded off against potential time savings if using rail)
- prefer point-to-point journeys (journeys which would involve interchange if using rail)

Coach has thus been omitted from this study, with the exception of some consideration with regards to links to Heathrow, where coach is often faster than existing rail links.

[9] Source: Civil Aviation Authority, UK Airport Statistics 2007, http://www.caa.co.uk/default.aspx?catid=80&pagetype=88&sglid=3&fld=2007Annual

Workstream 2 identified the importance of designing a high speed rail network that would maximise abstraction from both air and car. **Error! Reference source not found.** below offers an overview of 2007 demand on key itineraries, from city centre to city centre, where rail is currently the dominant mode..

Two important East-West itineraries are not included in this graphic: Manchester-Leeds, 46 million trips, of which 93% were made by car, and Edinburgh-Glasgow, 80 million trips, of which 90% were by car.

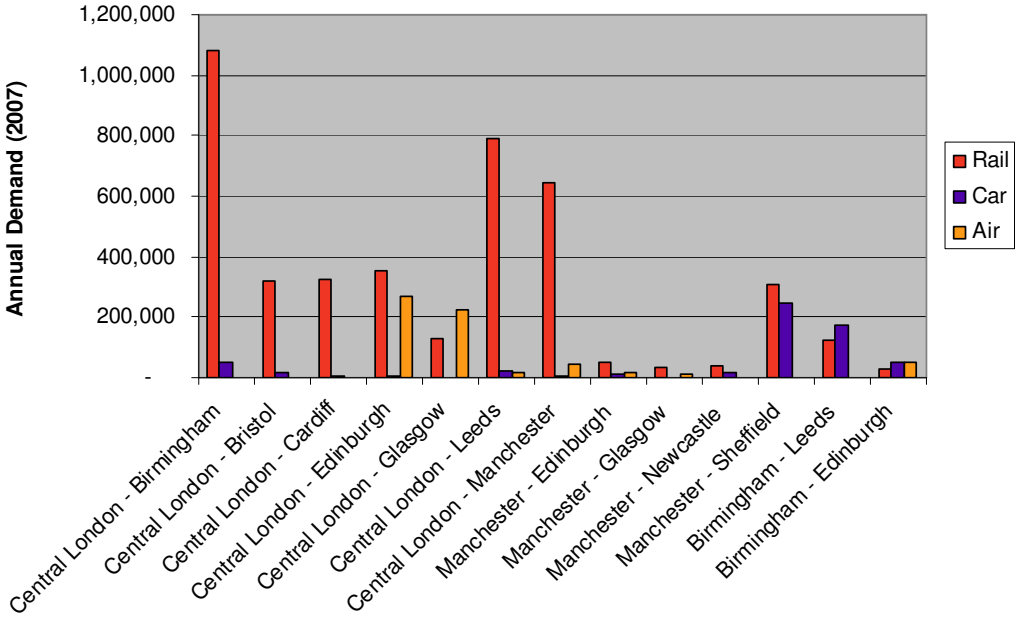


Figure A.8 2007 demand between city pairs, between HSR catchment zones[10] - demand from city centre to city centre

Whereas Figure A.8 shows demand between the centre of the listed cities, Figure A.9 shows how these mode shares differ when comparing demand from both the cities and their associated city regions, showing rail to be less competitive over these wider areas.

[10] The demand is for the city centre to city centre, defined as the area covered by the relevant city council (London is Westminster, City of London, Islington and Camden.) . Rail demand is sourced from the demand forecasting tool MOIRA. Car demand is sourced from the DfT National Travel Model. Air demand is sourced from the Civil Aviation Authority. Note that air demand regards customers travelling from city centre. For example, 0.44 million people took a flight to travel between Greater London and Greater Manchester, whereas more people actually took Manchester-London or London-Manchester flights, but with other ultimate origins or destinations.

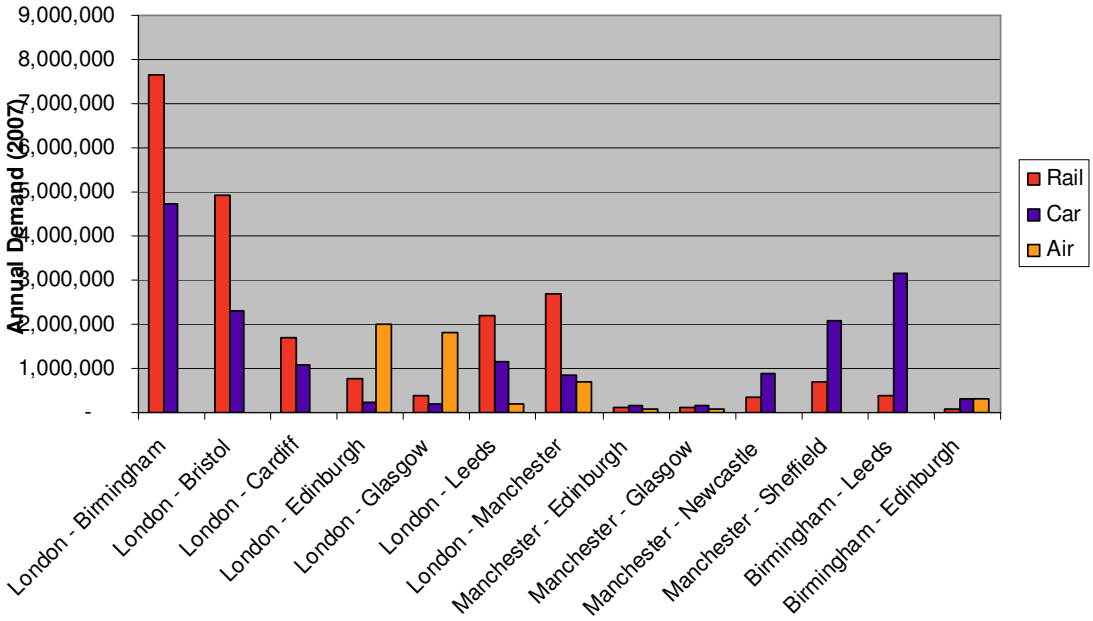


Figure A.9 2007 demand on key itineraries, between HSR catchment zones - demand from cities, including surrounding city regions

Travel times by mode are shown in Table A.18; these exclude access/egress times. In order to encourage modal shift towards high speed rail, journey times must be competitive, in particular with regards to air travel.

Table A.18 Travel times by mode Times are typical advertised times – selected journeys be significantly faster, e.g. London –Glasgowby rail can be as fast as 4hr 10 min.

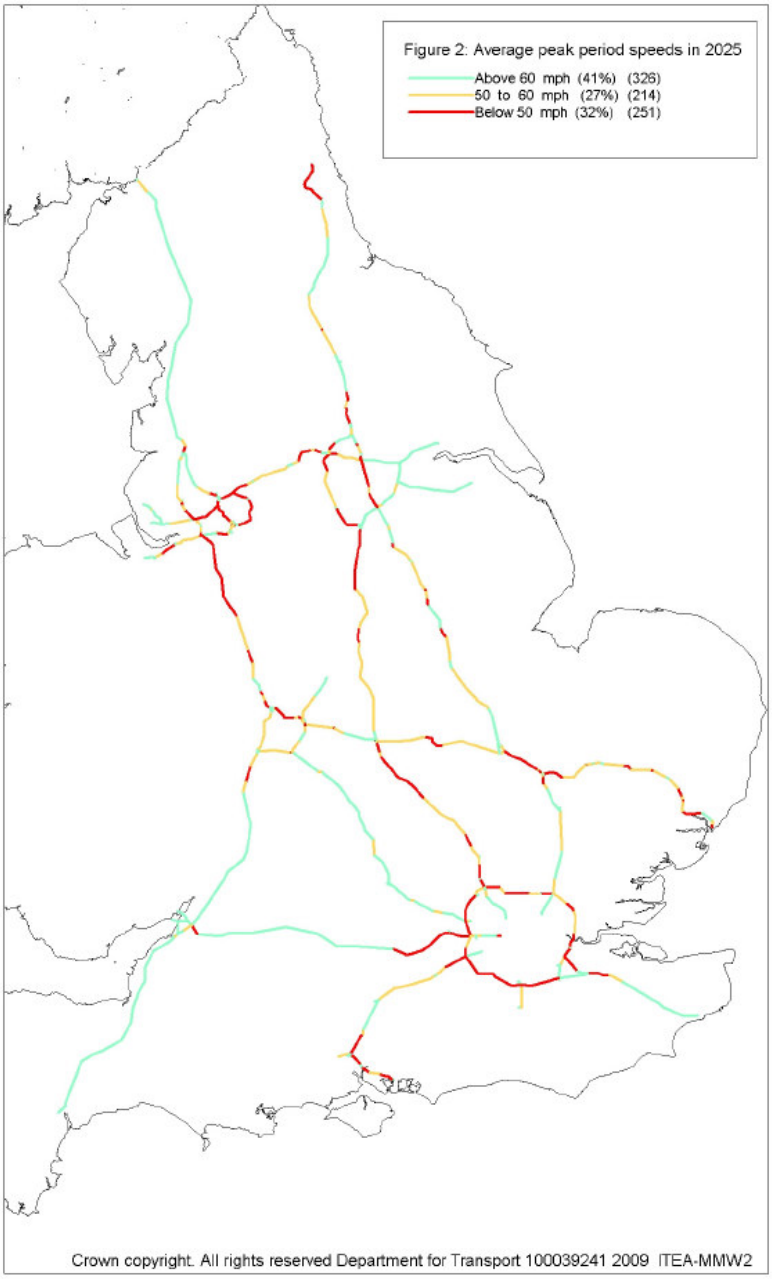
Itinerary	Rail travel time	Air travel time	Road travel time
London - Manchester	2hr 10 min	1 hr 6 min	4 hr
London - Birmingham	1hr 25 min	n/a	2 h 30 min
London - Bristol	1 hr 50 min	n/a	2 – 2.5 hrs
London - Cardiff	2 hr 10 min	n/a	2.5 – 3hrs
London - Edinburgh	4 hr 40 min	1 hr 20 min	7+ hr
London - Glasgow	4 hr 40 min	1 hr 20 min	7+ hr
London - Leeds	2 hr 25 min	n/a	3.5 hr
London - Newcastle	3hr 10 min	1 hr 12 min	~5hr
Birmingham - Manchester	1 hr 25 min	n/a	1.5 – 2hr min
Edinburgh - Glasgow	50 min	n/a	1h

Travel times by mode are shown in Table A.18. these exclude access/egress times. In order to encourage modal shift towards high speed rail, journey times must be competitive, in particular with regards to air travel.

Figure A. shows the average peak period vehicle speeds on major roads forecast for 2025. These peak period vehicle speeds reflect the forecast level of congestion. The M1 from London to Leeds and the M6

between Birmingham and Manchester will experience average peak speeds below 50 mph because of congestion in 2025. The M62 between Leeds and Manchester will also experience significant congestion.

Figure A.10 Average peak period speeds on key national trunk roads[11]



A.3 Rail Infrastructure and Services in the Five Corridors

This section outlines the current situation on the five corridors, as well as existing plans for their upgrades. The current service patterns and the restrictions on capacity they bring are also considered.

[11] Source: Department for Transport, *Britain's Transport Infrastructure: High Speed Two*, January 2009.

A.3.1 Corridor 1: London to the North West

The primary rail link between London and the North West is the 645km West Coast Mainline (WCML), which has recently undergone a lengthy and thorough £10bn upgrade which has seen speed increases from 177km/h to 200km/h, the introduction of tilting trains, removal of major bottlenecks (Rugby, Nuneaton) and the addition of extra tracks to portions of the route. This has made it possible to reach Manchester and Liverpool in just over 2 hours, and Birmingham in 1h20min. The modernisation has also increased the clearance on the entire route to W10-gauge, making the route the most important freight and container rail link between the South East, the North and Scotland. Many strategic freight terminals, such as Daventry, Rugby, Trafford Park and Garston are located along the route. According to Network Rail's Route Plan for the WCML, freight depots across the route could generate up to 30% growth in freight traffic by 2019.

The route today is continuously four-track between London Euston and Rugby (133km). From there the Birmingham and Coventry branch diverges. The route has long three- and four-track sections from Rugby up to Preston (a further 204km). From Preston the route is two-track with passing loops for freight trains. At Carstairs (599km from London) the route splits, with one branch continuing to Glasgow Central via Motherwell, the other, more lightly used, to Edinburgh. The other main junctions on the route are:

- Colwich Junction (where the Stoke-on-Trent branch splits),
- Crewe (where the Manchester and North Wales routes diverge),
- Weaver Junction (branch to Liverpool)
- Preston (branch to Blackpool),
- Carlisle (Junction of Settle & Carlisle Line, Cambria and Newcastle lines).

The premier long-distance operator on the WCML is Virgin Trains (VT). Following the introduction of their Very High Frequency timetable in December 2008, VT now operate the following service patterns:

- 3 trains per hour (tph) between London and Birmingham New Street (1tph extended to Wolverhampton),
- 3tph between London and Manchester (2x via Stoke-on-Trent, 1x via Crewe), and
- 1tph each to Liverpool, Glasgow and Chester, with some extensions to North Wales.

Additionally, there are 14 trains per day between Birmingham and Scotland on the West Coast route, ending alternately at Edinburgh or Glasgow. All these services are provided by relatively new Class 390 Pendolino and Class 221 Super Voyager tilting trains, built 2000-2004.

Other long-distance services using the WCML are Cross Country and Transpennine Express. Cross Country operate a 2tph service between Manchester and Birmingham New Street (via Stoke-on-Trent, Stafford and Wolverhampton), from where trains run either to Reading, Hampshire and Dorset, or Bristol, Devon and Cornwall. Transpennine Express operates:

- 7 trains per day between Manchester and Central Scotland (mainly to Edinburgh, with some to Glasgow),
- 1tph between Windermere / Oxenholme and Manchester Airport, and
- 1tph between Blackpool and Manchester Airport.

Local services on the southern half of the route are provided by London Midland, with the following service pattern:

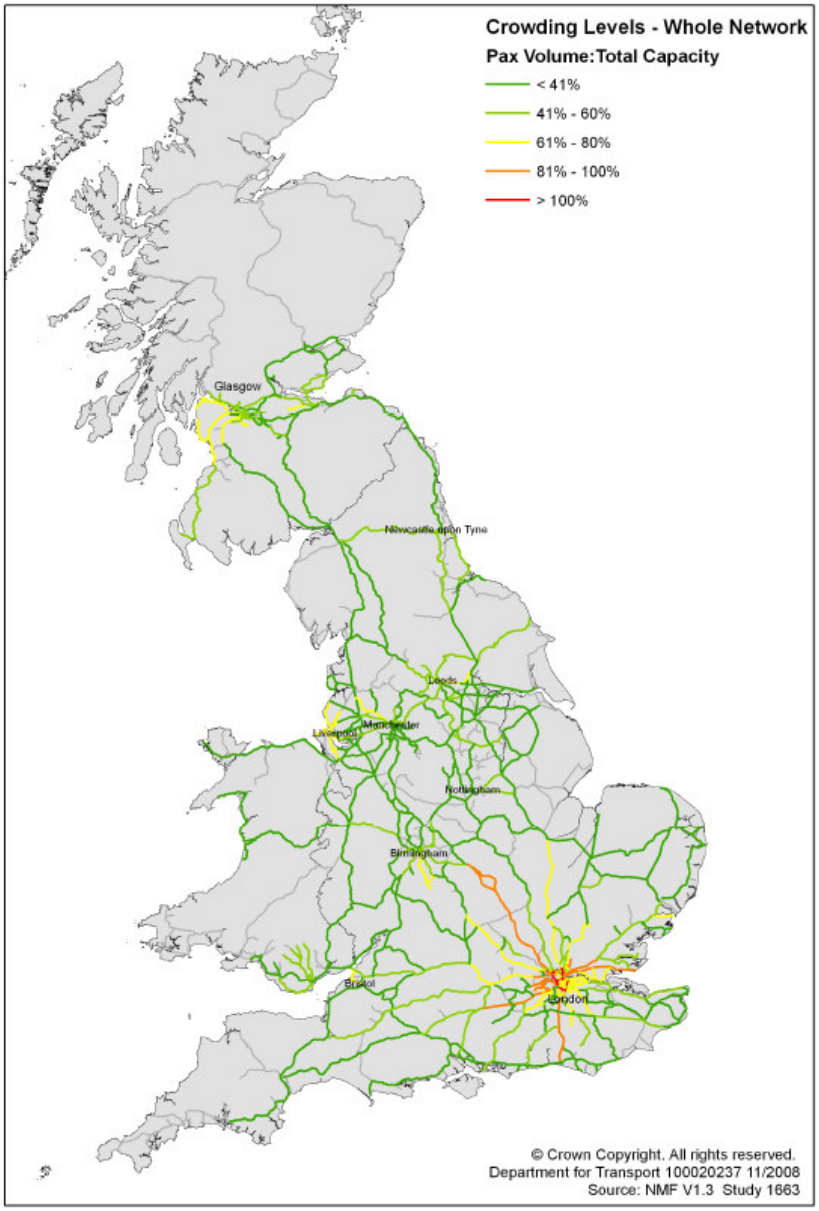
- 1tph London Euston to Crewe via Northampton, Stafford and Stoke-on-Trent
- 6tph London Euston to Milton Keynes, Northampton and Birmingham New Street (stopping and semi-fast)
- 3tph Birmingham New Street to Northampton
- 2tph Birmingham New Street to Liverpool

Local services on the northern half of the route are provided by Northern Rail, with the following service patterns:

- 2tph Liverpool – Wigan and 1tph to Blackpool
- 1tph Blackpool – Preston - Manchester- Buxton
- 1tph Blackpool – Preston – Blackburn – Leeds

Despite recent upgrades to infrastructure at the southern end of the route, the WCML will soon be struggling to provide enough capacity for passengers wishing to travel. Figure A. shows projected crowding levels in 2024/2025.

Figure A.11 Loading levels in the 3-hour morning peak period, 2024/25[12]



Despite the route having four tracks on most of the stretch between London and Manchester, there is an inherent conflict between the needs and objectives of the different train services. On one hand, improvements to long-distance services have meant that passenger numbers have risen from 13m in 1997 to 23m in 2008[13], some of which reflect a mode switch from air, and will keep on growing with a more frequent service and fewer weekend closures. On the other hand, the Government has planned

[12] Source: Department for Transport, *Britain's Transport Infrastructure: High Speed Two*, January 2009.

[13] Source: 2008 Rail Industry Monitor

thousands of new homes in the Milton Keynes area as part of its Sustainable Communities Plan[14], which will add more rail commuters into London. This will create severe problems on the southern half of the route, where the slow lines have to accommodate the stopping patterns of both the slower all-stations services, freights, as well as the faster semi-fast services to the Trent Valley and beyond.

Further north, Birmingham New Street and Manchester Piccadilly are amongst the busiest stations in Great Britain outside London. They are currently running at close to capacity in terms of train movements and are struggling to keep up with the growth in passenger numbers.

A.3.2 Corridor 2: London to the North East

The corridor from London to Yorkshire and Tyne & Wear is today served by two main lines. The East Coast Mainline (ECML) runs out of London Kings Cross, to Peterborough and by-passes the core of South Yorkshire to the east via Doncaster, where the branch to Leeds diverges. The mainline runs further North to York, Darlington, Durham and Newcastle, and then on to Edinburgh Waverley. Most of the route up to Doncaster lies on flat terrain, with 200km/h running on most of the route, using electric non-tilt trains built at the beginning of the 1990s, and some diesel HSTs and newer diesel units. Further north from Darlington the line is somewhat twisting, however, but speeds upwards of 160km/h can be achieved on most stretches.

The line is the main connection between London, Leeds, York, Newcastle, and Edinburgh. It is four-track between London and Welwyn Garden City (32km), with two tracks over Welwyn Viaduct, a major pinchpoint on the route. Adding two additional tracks here would be a major infrastructure cost. From there, it is four-tracked until Connington (111km from London), where the line again narrows to two tracks for 10km. From then on, the line passes Peterborough and continues as either a three or four track alignment till Stoke Junction (161km from London), where it turns to a two-track alignment for most of the way to Edinburgh. Besides the two-track section over Welwyn Viaduct, the capacity constraints on the route are:

- Hitchin Junction, where 'down' trains from London to Cambridge have to cross both 'up' lines at grade as they leave the ECML – the peak period trains on this route are especially heavily loaded and the junction is one of the constraints to providing additional capacity,
- The two track section over Stilton Fen south of Peterborough
- Peterborough station itself, especially with the planned extension of Thameslink services to this point and the possibility of the need to create new junctions to facilitate the use of the GN/GE Joint Line for north-south freight movements
- Newark Level Crossing – a flat diamond crossing with the Nottingham to Lincoln line, where trains have to slow down from 200 to 160km/h
- Doncaster area junctions (including Shaftholme)
- York and Newcastle stations – busy stations with very slow approaches
- Leeds station – an extremely busy station with a complicated layout and 6 tracks approaching from the west and only 2 from the east.

The key services, operated by the East Coast franchisee, are:

- 2tph London to Leeds
- 1tph London to Edinburgh (some extended to Inverness, Aberdeen and Glasgow), and
- 1tph London to Newcastle (some extended to Edinburgh).

The ECML is also used by two open access long-distance operators, with a third due to start by the end of the year. Hull Trains runs 7 services a day to Hull, while Grand Central runs 4 trains a day to Sunderland

[14] Source: Milton Keynes Partnership. http://www.miltonkeynespartnership.info/future_plans/index.php.

via York and Eaglescliffe, and now has approval to launch a 3 trains per day Bradford service too, under the name Grand Northern. Other long-distance operators are:

- Transpennine Express: 3tph from Liverpool and Manchester to Scarborough, Middlesbrough and Newcastle
- Cross Country Trains: 2tph from the South and South West via Birmingham New Street – Leeds/Doncaster to Newcastle and Edinburgh

Local services out of London (Kings Cross and Moorgate) are operated by First Capital Connect, with up to 10 services per hour serving locations such as Peterborough, Kings Lynn, Cambridge, Hertford, Stevenage or Welwyn Garden City. These services are one of the longest-distance commuting services in Britain, and have widely varying stopping patterns to cater for both the long and shorter-distance markets. Further to the North, Northern also operates some local services around Teesside and Tyne & Wear.

The ECML is also an important freight artery, carrying containers from the Haven ports to Yorkshire and the North East, as well as coal and other traffic. Due to the existing capacity constraints, freight passing from the London area is diverted via the Hertford Loop, but most freight trains join the route at Peterborough.

The East Coast Route Utilisation Strategy (RUS)[15], published by Network Rail, forecasts approximately 20% growth in the number of passengers using the long-distance services out of Kings Cross between 2006 and 2016, with West Yorkshire stations growing at twice that rate. Partly due to the capacity constraints in serving the London commuter market, the RUS only foresees an 11-26% growth during that time for stations to Peterborough and Cambridge. Despite the recession, what is already a busy route will become even busier over the next decade.

The single biggest infrastructure investment currently planned for the ECML will be the connection of the southern end of the route to the Thameslink tunnel as part of the Thameslink modernisation programme. A total of 24tph is scheduled to run through the tunnel from 2015 onwards, with ten of these destined for the ECML. Together with platform lengthening on the route, this should contribute towards the alleviation of some crowding issues, and will free up platforms at Kings Cross. However, it may take up further capacity on the fast lines, shared between Peterborough/Cambridge services and long-distance services. A further major investment for the route will see the introduction of the new Super Express Train on the route by 2015, that will shorten journey times from London to Leeds by 10 minutes and from London to Edinburgh by 12 minutes, while also increasing capacity per train by around 20%.

A constraint to increasing the speed of long-distance services on the ECML is the (irregular) stopping pattern of these services. While the route by-passes large cities like Leicester, Nottingham and Sheffield, the operator is bound to make calls at smaller stations en-route, such as Grantham, Newark and Retford. The irregularity of the stops is a further significant constraint for services, and a standard clockface timetable with a higher number of paths than today has been under consideration for some time now. Furthermore, Leeds is a very capacity-constrained station, with either station throat at capacity despite the station's recent modernisation and remodelling.

The Midland Mainline (MML) runs out of London St Pancras, towards Leicester, Derby and Sheffield, also serving Nottingham via a branch. The route only permits 177km/h running until Derby, with limited scope for 200km/h between Derby and Sheffield. Though somewhat smaller, the stations of Wellingborough, Kettering and Market Harborough (between London and Leicester), have East Midlands Trains as their only service provider.

The route is electrified and four-tracked as far as Bedford (Sharnbrook Jn, 91km from London), with three tracks to Kettering (119km from London) and two tracks to Leicester. Approximately half of the

[15] East Coast Route Utilisation Strategy. Network Rail 2007. http://www.networkrail.co.uk/browse%20documents/rus%20documents/route%20utilisation%20strategies/east%20coast%20main%20line/east%20coast%20main%20line%20rus.pdf

route from Leicester onwards is three or four-tracked, owing to large numbers of freight trains utilising the infrastructure.

The main long-distance operator on the line is East Midlands Trains, which operates 5tph out of London:

- 1tph to Corby, semi-fast
- 2tph to Nottingham, one fast, one semi-fast
- 1tph to Derby
- 1tph to Sheffield (some extended to Leeds)

Semi-fast trains are trains that call at smaller stations between London and Leicester (Wellingborough, Kettering, Market Harborough).

The northern part of the route (Derby – Sheffield) is also used by Cross Country trains, which operate 2tph between the South, South West, Birmingham and the North East and Scotland. Both East Midlands Trains and Cross Country operate a mix of 1970s diesel HSTs and newer (built from 2000 onwards) Class 220, 221 and 222 units.

The London commuter market is catered for by First Capital Connect, which runs trains as far as Bedford. These trains continue through the Thameslink tunnel to London Bridge and Brighton, and to Sutton. There are two service groups:

- 4tph Bedford – Brighton (utilising fast lines and slow lines), more intensive in the peak
- 4tph Luton – Sutton (stopping train, slow lines), more intensive in the peak

In the Midlands, East Midlands Trains, Northern Rail and Cross Country run the following local and long distance services on the MML:

- 1tph Liverpool – Norwich (uses MML between Sheffield and Clay Cross Jn)
- 1tph Nottingham – Matlock
- 2tph Nottingham – Birmingham (1tph extended to Cardiff)
- 1tph Nottingham – Leeds (uses MML between Sheffield and Clay Cross Jn)
- 1tph Birmingham – Stansted Airport (uses MML between Wigston North Jn and Syston South Jn)

The MML is also an important freight route. Leicester is located on the strategic cross-country freight route from the Haven Ports to the West Midlands and the West Coast Mainline. Ratcliffe-on-Trent power station is also an important traffic generator. A combination of these flows leads to the railway being severely capacity-constrained for most of its length. Coupled with relatively low top speeds on the route, this makes the MML one of the more unattractive intercity routes in Great Britain.

A.3.3 Corridor 3: Great Western

The Great Western Mainline (GWML) out of London Paddington is probably the busiest portion of railway in Great Britain not yet fully electrified. The Mainline serves a host of destinations in the West and South West of England (Bristol, Exeter, Plymouth, Cornwall, Oxford, Worcester, Gloucester), and South Wales (Newport, Cardiff and Swansea), as well as many suburban destinations and Heathrow Airport. The route is four-track all the way from London past Reading (where services to Exeter, Devon and Cornwall branch off) to Didcot Parkway (85km from London), where it branches out into two two-track routes. One goes to Oxford, carrying services to Worcester. The other carries the bulk of the services to Swindon (where the line to Cheltenham branches off), and further to Wooton Bassett Junction (where services to Bath and Bristol Temple Meads branch off). From there the line continues to Bristol Parkway, through the Severn Tunnel, and onward to Newport, Cardiff and Swansea.

The main freight flows on the route are aggregates flows between Somerset and Acton. Other notable flows include flows towards the Avonmouth Docks and towards South Wales. The section between Reading and Oxford is a major freight route for trains from Southampton towards the North.

The route is today electrified from Paddington to Heathrow Airport, however, all long-distance services are today served by diesel HST trains, with smaller units running on local services.

The main operator on the route is First Great Western (FGW), which runs the following long-distance services:

- 2tph to Bristol Temple Meads via Bath
- 2tph to Cardiff via Bristol Parkway (with 1tph onward to Swansea)
- 1tph to Exeter and Plymouth via Reading and Westbury (with some trains extended to Cornwall)
- 0.5tph to Cheltenham and Gloucester
- 1tph to Worcester and Hereford via Oxford
- 2tph to Oxford (1tph extended to Moreton-in-Marsh)

Cross Country trains also operates on sections of the route between Reading and Oxford (services from Reading and Bournemouth/Southampton to the North), between Bristol Temple Meads and Bristol Parkway (services from Devon and Cornwall to the North), and between Cardiff and Severn Tunnel Junction (services to Birmingham and Nottingham).

Local services out of Paddington are operated by First Great Western, Heathrow Express and Heathrow Connect as follows:

- 4tph Heathrow Express to Heathrow non-stop
- 2tph Heathrow Connect to Heathrow calling all stations
- 2tph FGW to Greenford
- 2tph to Oxford (semi-fast)
- 2tph to Reading

FGW also operates local trains around the Bristol area, while Arriva Trains Wales operates local services around Newport, Cardiff and Swansea.

The GWML is a very busy railway, but it does benefit from a relatively new and efficient Integrated Electronic Control Centre (IECC) at Slough, which controls the busiest section from Paddington to Heathrow Airport. The main pinchpoints on the route are Reading Station, and the Severn Tunnel, which are full to capacity.

The GWML will undergo three significant changes within the next decade. One will be the electrification of the route from Heathrow Airport Junction through to Swansea and Bristol Temple Meads. Scheduled for completion by 2018, it and the associated introduction of new rolling stock will reduce the travel time to Swansea by around 19 minutes. The second major project is the remodelling of Reading station. Due to its complex layout, a lack of platform faces and the numbers of conflicting moves generated by various different passenger and freight services, Reading station has been the biggest generator of delays on the line. By rebuilding the station, creating new platform faces and installing flyovers to the west of the station, reliability will hopefully improve.

The third important project will be the construction of Crossrail. The scheme involves the construction of an east-west rail tunnel underneath London, to enable high-frequency local trains to run between Heathrow and Maidenhead in the west to Stratford, Shenfield, Canary Wharf and Abbey Wood in the east. This will free up some terminal capacity at Paddington.

These three schemes together will be as important to the GWML as the route upgrade was to the WCML. They will reduce journey times quite significantly, and will increase the capacity and reliability on the route overall. However, not all the capacity issues will be addressed. While the route is already four-tracked till Didcot, there are significant conflicts from there to Wootton Bassett Junction, between the fast, slow and freight services, which carries the majority of traffic coming from the east on just two tracks. Hence, an extra pair of tracks to the west of Didcot would have the potential to bring in significant benefits.

A.3.4 Corridor 4: Transpennine

The Transpennine (TP) corridor is composed of two routes. The North TP route runs between Manchester Piccadilly and Leeds via Stalybridge and Huddersfield. The South TP route runs between Manchester Piccadilly and Sheffield via New Mills. Both routes have a low top speed due to their topography, and both are significantly gauge-constrained due to the number of tunnels they pass through.

The North TP route is much busier than the South. Transpennine Express provides the main service on the route, offering 4tph between Liverpool and Manchester Airport to Leeds, Hull, York, Scarborough, Middlesbrough and Newcastle, with an intermediate call at Huddersfield. Northern takes up the rest of the capacity with various local services calling at other stations on the route. Despite the relatively high frequency of the service, platform length and rolling stock constraints make it difficult for the current timetable to cope with the demand. Network Rail have proposed to implement improvements to decrease the journey time through the core section (Manchester to Leeds) from the current 55 to around 40 minutes. Also, the Government has committed to electrifying the route from Liverpool to Manchester, which will lead to a cut in journey times on that section to 30 minutes. Further benefits may also be realised from the Manchester Hub Study, which is looking to resolve the complex capacity and reliability issues around the Manchester area.

The South TP has 2 fast tph, however, at uneven intervals. This is because both trains serve different purposes. One of these is the Transpennine Express running between Manchester Airport and Cleethorpes via Stockport, Sheffield and Doncaster. The other is the East Midlands Trains service between Liverpool and Norwich via Manchester, Stockport, Sheffield, Nottingham and Peterborough. The other train running through the route is an all-stations Northern Rail service. The journey time between Sheffield and Manchester for the faster services is around 50 minutes.

A.3.5 Corridor 3: Anglo-Scottish

The straight-line distance from London to Glasgow is around 560km, and to Edinburgh around 540km. Such long distances have led to air being the preferred mode for travelling from London to Scotland. The hilly topography of the north of England causes the rail journey times on both the WCML and the ECML to be around 4h20min – 4h30min, despite both routes being modernised over the past three decades. This is well above the 3 hours typically considered to be competitive with air. This is also why both routes only have 1tph each between London and Glasgow / Edinburgh – a marked contrast with the 3tph to Manchester on the WCML or 2tph to Leeds on the ECML – both markets, where rail commands a majority of the market share.

The current stopping pattern is equally significant in determining the long journey times on the route, caused by the need for those trains to serve intermediate markets. On the WCML, the Glasgow services usually run non-stop between London Euston and Warrington Bank Quay. From then on, however, they become the main London link for places such as Wigan, Preston, Lancaster and Carlisle. Despite the curving nature of the route through the difficult topography of the Lake District and southern Scotland, a line speed of 125mph (with some short sections of 100, 115 and 120mph running) is achieved using a tilting mechanism, with the most significant speed constraints being through stations such as Carlisle and Carstairs. Moreover, these services have to share tracks with some slower services (Transpennine services), as well as freight trains, in particular many coal trains between Glasgow and Carlisle. The additional station calls and the need to accommodate other services make the typical London Glasgow journey time around 4h20min, much slower than the record of 3h55min set by a VT Pendolino in 2006.[16]

The East Coast route may be slightly less capacity constrained at the north end of the line, however, it too has constraints preventing Scottish services from being faster. The main reason is again the requirement to serve intermediate stations, such as Grantham, Newark and Retford on the southern half of the route, and Darlington, Durham, Alnmouth, Berwick and Dunbar on the northern half. Whilst some of these stations are not very large markets per se, there is no capacity to introduce separate, semi-fast services for them, as is current practice on the MML, for example. The East Coast route also suffers from a number of low speed restrictions due to severe curves.

[16] Virgin Train Breaks Speed Record. BBC News. http://news.bbc.co.uk/1/hi/scotland/glasgow_and_west/5369808.stm

There have been proposals on both the WCML and the ECML to introduce speeds higher than 200km/h on their portions. However, whilst the rolling stock running on both routes is capable of around 230km/h (as is some of the signalling on the ECML), these plans have not materialised. This is because safety considerations require running upward of 200km/h to be controlled by in-cab signalling, which was proven to be too costly to install given the speed benefits it would achieve. It is in any case unlikely, that any upgrade of the current infrastructure would significantly increase the competitiveness of the journey times between London and Scotland to an extent, where rail would become the preferred mode of travel rather than air.

A.4 Planning Issues/Objectives

This section summarises the planning issues and objectives identified in regional and national planning documents that may have an impact on or be impacted by HSR.

A.4.1 Towards a Sustainable Transport System

The UK Government has made specific commitments to tackle climate change, support national and regional economic growth and develop transportation. The Climate Change Act commits to quantified objectives (an 80% reduction in carbon emissions by 2050)[17], the UK Government national transport objectives are primarily set out in the publication 'Towards a Sustainable Transport System[18]' (TaSTS), published in October 2007, which presents the government agenda to tackle transport congestion and improve transport networks whilst satisfying the twin objectives of both economic growth and reduction of carbon emissions.

In November 2008, the Secretary of State for Transport issued a formal consultation paper entitled "Delivering a Sustainable Transport System[19]" (DaSTS).

The objectives set out in this paper were integrated into the guiding principles for high speed rail formulated in Workstream 2: Strategic Choices. The sequence of objectives set out by the DfT are the following:

- Maximising the overall competitiveness and productivity of the national economy, including here the regional economic impact and reduction in congestion;
- Reducing transport's emissions of CO_2 and other greenhouse gases;
- Contributing to better health and longer life-expectancy, including safety and security;
- Improving quality of life for transport users and non-transport users;
- Promoting greater equality of transport opportunity.

In Scotland, Scottish Transport Appraisal Guidance sets out the framework for appraising transport schemes against the Scottish Government's Purpose, which is 'to focus the Government and public services on creating a more successful country, with opportunities for Scotland to flourish, through increasing sustainable economic growth'.

[17] Department for Environment Food and Rural Affairs (November 2007), Climate Change Act 2008, http://www.defra.gov.uk/ENVIRONMENT/climatechange/uk/legislation/.

[18] Department for Transport (October 2007), Towards a Sustainable Transport System, http://www.dft.gov.uk/about/strategy/transportstrategy/tasts.

[19] Department for Transport (November 2008), Developing a Sustainable Transport System, http://www.dft.gov.uk/about/strategy/transportstrategy/dasts.

A.4.2 Regional Development

There are areas where significant developments are taking place or planned to take place in the coming years which will have an effect on the level of likely demand for high speed rail services. These developments typically involve the increase of employment, commercial and residential floor-spaces in areas close to railway stations.

This section summaries these hotspots as identified from a range of sources, including National and Regional Development Agency policy documents and strategic plans. Key findings are:

- **major growth** areas are primarily in the **South East** in rural and suburban locations
- growth in the **North of England** is focused on **inner city regeneration** and **brownfield** site development.
- currently the development targets for **Scotland** and **Wales** are less well defined in geographical terms

England, Wales and Scotland all adopt different methods of planning for future growth and development.

In England the different areas development can be categorized as the following:

- Major Growth Areas
- Growth Points

Major Growth Areas

The majority of future growth in population and development is expected to occur in the wider South East of England (covering the South East, London, East England), plus some in the East Midlands). Much of this growth will focus on four key Major Growth Areas which were defined by the then Office of the Deputy Prime Minister (ODPM) as:

- Thames Gateway
- London-Stansted-Cambridge-Peterborough Corridor
- Milton Keynes and South Midlands
- Ashford

Growth Points

In 2005 the government invited local authorities to submit growth proposals that were sustainable, acceptable environmentally and realistic in terms of infrastructure.

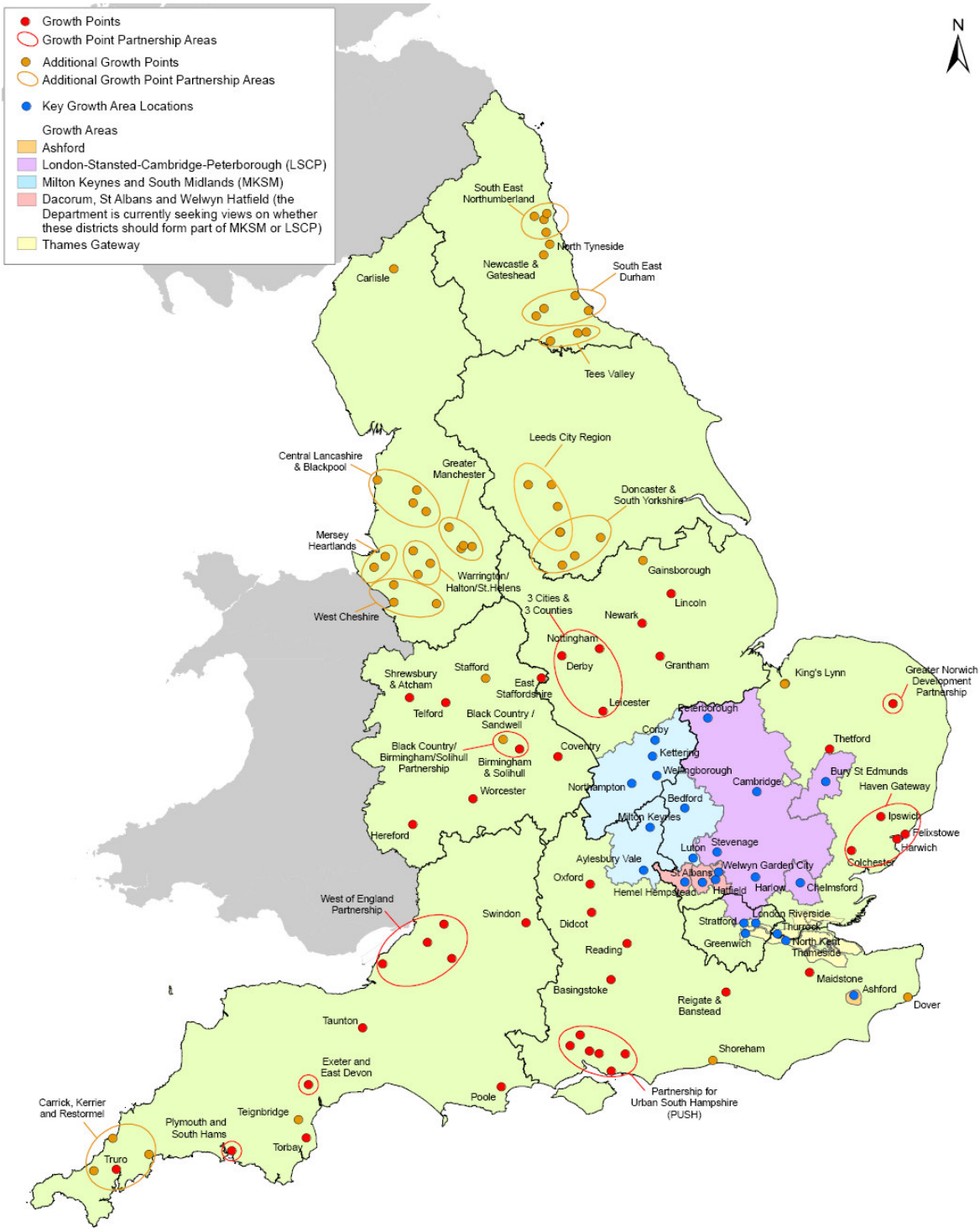


Figure A.12 Growth Areas and Growth Points within England[20]

[20] Source: http://www.communities.gov.uk/housing/housingsupply/growthareas/newgrowthpoints/newgrowthpoints/

Within the UK each Regional Assembly sets overall housing targets which are then distributed between local authorities and local districts. The Sustainable Communities Plan provided high level targets for growth which was primarily focused in the South and East of the country.

Within the North the key policy for the future development strategy is Northern Way which is collaboration between the Regional Agencies of North East, North West and Yorkshire & Humber. Northern Way's overall aim is to establish the North of England as an area of exceptional opportunity combining a world-class economy with a superb quality of life, and to close the prosperity gap between the northern regions and the UK average. Particular objectives include supporting regional strategy development from a pan-regional perspective and to stimulate thinking about the long term development of our economy. Responsibility for defining Additional Growth Point Partnership Areas falls to each Regional Assembly and their Regional Spatial Strategy (RSS).

In Scotland the National Planning Framework provides a strategy for development and growth within Scotland over the next 20 years. However, the Framework does not provide fixed targets on employment growth or housing. Instead, targets are provided in the Scottish Planning Policy particularly SPP 2 (Economic Development) and SPP 3 (Housing). Local authorities produce Local Housing Strategies (LHS) which outline development sites.

In Wales Spatial Plan has been produced which identifies opportunities and constraints to development and growth within Wales over the next 20 years. It does not provide fixed targets on employment growth or housing.

Table A.19 describes some of the key developments areas within the UK.

Table A.19 Summary of development areas

Region	Hotspot	HSR Zone	Description
London			600,000 new homes by 2026 900,000 additional jobs by 2026
	King's Cross	Central London	Total floor-space: 900,000 (sq m) Office: 486,000 (sq m) Homes: 1,800 Jobs: 30,000
	Paddington	Central London	Large scale mixed use development around the station
	Stratford	North London	New shopping centre (largest in the UK) 5,000 new homes and new business district including 50+ storey offices
East			400,000 new homes by 2021 Additional 450,000 jobs by 2021
	London – Stansted – Cambridge - Peterborough	East Anglia	180,000 new homes by 2016 Peterborough, Cambridge, Harlow and Stevenage as growth hubs 75,000 new jobs in Cambridgeshire by 2021
	Milton Keynes South Midlands growth area	South Midlands	~ 50,000 new homes in Luton/Bedford area and 50,000 new jobs by 2021

Region	Hotspot	HSR Zone	Description
	Thames Gateway	East Anglia	32,000 new homes and 42,500 new jobs by 2016
East Midlands			320,000 new homes by 2021
	3 Cities	Nottingham and Nott. Annulus	80,000 new homes in Derby, Leicester and Nottingham by 2016 the majority in Nottingham and Leicester
	Nottingham	Nottingham	Major mixed use developments especially around the station across 200 hectares including 9,000 new homes
	Leicester	Nottingham Annulus	9,000 new jobs Office Core by station 9,000 new homes in city centre
	Milton Keynes South Midlands growth area	South Midlands	At least 35,000 new homes in North Northamptonshire by 2021 Similar number in Northampton but figure has been successfully appealed against
North East			130,000 new homes by 2021
	Newcastle	Newcastle	60,000 new homes by 2021
	Tees Valley	Leeds Annulus	Major employment growth in Stockton and Hartlepool 40,000 new homes by 2021
North West			416,000 new homes by 2021
	Manchester	Manchester and Manc. Annulus	Nearly 200,000 new homes by 2021 with half in city centre Employment land to double by 2021
	Liverpool	Liverpool	70,000 new homes by 2021 with majority in city centre
South East			580,000 new homes by 2026
	Thames Gateway	Kent	50,000 new homes and 80,000 new jobs by 2021
	Ashford	Kent	31,000 new homes and 28,000 new jobs by 2031
	Milton Keynes South Midlands growth area	South Midlands	50,000 new homes in Milton Keynes by 2021 15,000 in Aylesbury
South West			No major developments, continuing regeneration of Bristol and growth points throughout the region Almost 600,000 new homes by 2031
West Midlands			Over 200,000 new homes by 2021
	Birmingham	Birmingham	Minimum of 40,000 new homes by 2016
	Black Country	Birmingham	800,000m2 of B1 office development focused on

Region	Hotspot	HSR Zone	Description
		Annulus	West Bromwich and Wolverhampton 33,000 new homes
Yorkshire and Humber			445,000 new homes by 2026 583,000 additional jobs by 2026
	Leeds City Region	Leeds	50,000 new homes by 2016 spread between Leeds and Bradford 120,000 additional jobs by 2026
		Bradford	95,000 additional jobs by 2026
	Doncaster/ South Yorkshire	Sheffield and Sheffield Annulus	50,000 new homes by 2016 spread between Sheffield (central), Barnsley, Doncaster and Rotherham 88,000 additional jobs by 2026
Wales			Details unknown. Cardiff and Swansea will continue to have large scale regeneration
Scotland			Scottish Government target; by 2018 increase new homes built annually from 10,000 to 35,000
	Glasgow		Major development in International Financial Services District, now third most important financial centre in the UK, located a mile to the west of Glasgow Central
	Edinburgh		Landmark life science real estate development in south Edinburgh; 500,000sq.ft academic research space, 900,000sq.ft commercial space; £250m investment, creating 6,500 jobs

A.4.3 Regional Spatial Strategies

In developing an HSR network strategy, it is important to take into account the goals set out in Regional Spatial Strategy policies, the Scottish National Planning Strategy and the Welsh Planning Policy. The policies for which HSR may have particular relevance are summarised in Table A.20.

Table A.20: Policy considerations

Documentation and Policy	Comment
Draft Regional Spatial Strategy for the South West 2006 - 2026, April 2006	
Policy SD1: The Ecological Footprint	"Reducing the reliance on the private car by improved public transport" and "Requiring a shift towards the more sustainable modes of transport". Transport is responsible for 28% of CO_2 emissions in the South West. Providing rapid and efficient rail service will help to meet these goals.
Policy SD1: Climate Change	The Region aims to reduce greenhouse gas emissions by at least 30% 2026 compared to 1990 levels. HSR may help to achieve this goal.
Policy SD3: The Environment and Natural Resources	"Reducing the environmental impact of the economy, transport and development." Though HSR may contribute to a reduction of CO_2

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	emissions and local air pollution, attention must be paid to the impact of the line itself on its immediate environment.
Development Policy A: Development at the Strategically Significant Towns and Cities (SSTCs)	The strategic function of Bristol, one of the SSTCs, will be maintained and enhanced via an improved rail connection to London.
TR5: Inter-regional Rail Network	The HSR network may very well provide "[d]irect rail links to Heathrow from the Great Western Main Line", "improved quality and capacity trains" and "route modernisation of the Great Western Main Line".
Regional Spatial Strategy for the West Midlands, January 2008	
Policy UR2: Town and Cities Outside Major Urban Areas	Need for local regeneration for 12 specific areas. By freeing capacity on classic lines, HSR may make it possible to improve local rail service to these locations.
Policy UR3: Enhancing the role of City, Town and District Centres	Underscores the need to provide HSR service to city centres.
Policy PA2: Urban Regeneration Zones	One of the 5 identified West Midlands urban regeneration zones is East Birmingham and North Solihull. The construction of a HSR station at Birmingham International would contribute to this policy.
Policy PA3: High-Technology Corridors	The planned Coventry, Solihull, Warwickshire High Technology Corridor would benefit from improved access if a HSR station at Birmingham International were to be built.
Policy PA12: Birmingham's Role as World City	HSR service to Birmingham city centre will significantly reinforce Birmingham's role as world city, particularly if direct links to Europe from Birmingham are created.
Policy T1: Developing accessibility and mobility within the Region to support the Spatial Strategy	HSR will play a major role in achieving the Region's goal to support sustainable means of transport and ensure that the West Midlands does not become "a transport bottleneck undermining national economic growth".
Policy T10: Freight	By freeing-up capacity on the classic network , HSR will provide local authorities with more room for action in developing a Regional Freight Strategy
Policy T11: Airports	A HSR station at Birmingham International would contribute to the stated goal of improving surface connections to the airport by all modes.
The North West of England Plan Regional Spatial Strategy to 2021	
Policy RT 1: Integrated Transport Network	The goal to examine transport issues on a multi-modal basis is consistent with the HSR guiding principle of taking into consideration the whole journey. In line with policy RT 1, the proposed HSR network scenarios will seek to make best use of existing infrastructure.
Policy RT 3: Public Transport Framework	Plans should seek to reduce existing or forecast overcrowding along the main public transport corridors. The construction of HSL will help to achieve this goal, as inter-city services will be transferred to the

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	new line, leaving more capacity for local services on the classic lines.
Policy RT 5: Airports	Direct HSR links to Manchester Airport or Liverpool John Lennon Airport would increase surface connectivity to these key economic drivers.
Policy RT 7: Freight Transport	By freeing-up capacity on the classic network , HSR will provide local authorities with more room for action in developing a Regional Freight Strategy.
Policy LCR2: The Regional Centre and Inner Areas of Liverpool City Region	The creation of a HSR link to Liverpool would reinforce the city's role as primary retail centre, main employment location and primary economic driver of the City Region.
Policy MCR 1: Manchester City Region Priorities	Direct HSR links from Manchester to Europe would help realise the vision of the Manchester City Region as "a world class city region at the heart of a thriving North". Furthermore, HSL to Manchester city centre would be a means to "encourage investment and sustainable development in the Regional Centre".
Policy MCR 4: South Cheshire	An onward HS service to Crewe would be in line with developing its role as "regional public transport gateway".
Policy W6: Tourism and the Visitor Economy *and* Policy W7: Principles for Tourism Development and Policy	HSR links to city centres will ensure that cities identified as tourist attractions are "easily accessible by sustainable means". The cities of Manchester, Liverpool, Carlisle, and Chester are highlighted in W6, and as such consideration should be given to providing HS services (or partially HS services) to these destinations.
Policy RDF 1: Spatial Priorities	The first priority for growth and development should be the regional centres of Manchester and Liverpool. This would indicate that the priority should be on providing HSR service to these two cities. RDF 1 also provides a list of other priority towns/cities, which could be served by HSR onward services.
The South East Plan Core Document, Draft Plan for submission to Government, March 2006[21]	
Policy CC2: Climate Change	HSR development will contribute to the reduction of greenhouse gas emissions.
Policy CC7: Inter-regional Connectivity	HSR will contribute to interregional connectivity.
Policy CC11: Supporting an Ageing Population	HSR is well-adapted to the needs of an ageing population that may be unwilling or unable to drive long distances.
Polity T1: Manage and Invest	HSR responds to the goal of rebalancing the transport system in favour of non-car modes. It also minimises negative environmental impacts of transport. HSR links to Heathrow, Gatwick, London St Pancras would support "the function of the region's international gateways" as per Policy T1. In particular, HSR links to the airports could encourage interlining to

[21] http://www.southeast-ra.gov.uk/sep_submitted.html#core_doc

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	long-haul flights at British airports instead of in Europe at Charles de Gaulle or Schiphol.
Policy T5: Mobility Management *and* Policy T6: Charging	The measures aimed at rebalancing the transport system in favour of non-car modes include improvements to regional rail services and the introduction of charging initiatives on motorways. Indeed, the goal of reducing car use can be most effectively met if incentive measures such as motorway charging are put into place in conjunction with the creation of HSR services.
Policy T9: Airports	HSR links to Heathrow and Gatwick would lead to a reduction in the environmental impact of surface access to airports (as per Policy T9), as HSR could replace interlining flights or long-distance car access.
Policy T12: Rail Freight	"The railway system should be developed to carry an increasing share of freight movements." HSR may free up capacity on the classic rail lines, thus making room for freight. According to this policy, priority should be given to the West Main Line corridor.
Policy TC1: Development of Town Centres	In the context of the high-speed development programme, provisions for onward services to town centres in the South (from Birmingham and Heathrow, for example) would contribute to improving the accessibility of town centres.
Policy TC2: Strategic Network of Town Centres	The list of primary regional centres presented in this policy may serve as a guide in the definition of potential HSR onward services to towns in the South.
The London Plan: Spatial Development Strategy for Greater London, Consolidated with Alterations since 2004, February 2008	
Policy 3C.4 Land for Transport	This policy sets out the need to ensure the "provision of sufficient land and appropriately located sites for the development of an expanded transport function". This policy may be favourable to HSR development in the case that land needs to be acquired within London for station expansion or line construction.
Policy 3C.5 London's International, National and Regional Transport Links	HSR will contribute to the goal of improving and expanding London's national transport links for passengers.
Policy 4A.4 Energy Assessment	The energy assessment requirement for all major development projects should strengthen the case for HSR, which is more energy efficient than air or car travel.
East Midlands Regional Plan, March 2009	
Policy 19: Regional Priorities for Regeneration	"Regeneration activity should be focussed on areas of greatest identified need". These areas (including Newark and Chesterfield) will not be directly served by HSR. It is important that the creation of the HSR network free up capacity on the classic network in order to provide improved service to these areas.
Policy 43: Regional Transport Objectives	"To promote improvements to inter-regional and international linkages that will support sustainable development within the Region" and "To improve air quality and reduce carbon emissions from transport by ... encouraging and supporting innovative transport technologies." The development of HSR goes in the direction of both of these objectives.

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Policy 44: Sub-area Transport Objectives	Northern sub-area, N3: HSR will help to "reduce congestion ... along the M1 corridor" Three Cities sub-area, T1: HSR may help to "reduce the use of the car around Nottingham, Derby and Leicester" and, T3, "reduce congestion ... along the M1 corridor".
Policy 50: Regional Heavy Rail Priorities	"[C]onsideration of possible new high speed rail routes serving the Region."
Policy 55: Implementation of the Regional Freight Strategy	The freeing-up of capacity on the classic lines thanks to HSR may help to achieve "a significant modal shift from road to rail."
The North East of England Plan Regional Spatial Strategy to 2021, July 2008	
Policy 1: North East Renaissance	HSR would improve transport conditions and thus help sustainable economic prosperity and growth. HSR may improve connectivity and accessibility within and beyond the Region.
Policy 2: Sustainable Development	Modal shift toward HSR may enhance local air quality HSR would participate reaching climate change objectives
Policy 3: Climate Change	HSR may contribute to mitigating climate change
Policy 4: The Sequential Approach to development	HSR stations may be an opportunity of land redevelopment
Policy 6: Locational strategy	HSR would help improve sustainable external connectivity and accessibility
Policy 7: Connectivity and Accessibility	HSR would help improve sustainable external connectivity and accessibility
Policy 51: Strategic Public Transport Hubs	Creation of a Strategic Public Transport Hub(s) at Newcastle with HS services
Policy 57: Sustainable freight distribution	By freeing-up capacity on the classic network , HSR will provide local authorities with more room for action in developing regional freight
The Yorkshire and Humber Plan, Regional Spatial Strategy to 2026, May 2008	
Policy YH5: Principle Towns	The Principle Towns (ie not the major cities) should be the main focus for development. HSR could potential serve this goal by freeing capacity on the existing infrastructure and thus making it possible to improve local services.
Policy LCR1: Leeds City Regional sub area policy	The transport aspects of this policy focus on regional links. Attention must be paid to what sorts of services can be offered either as ongoing services on classic lines or new services on classic lines thanks to freed capacity.
Policy SY1: South Yorkshire sub area policy	This policy seeks, among other things, to "Secure excellent road, rail inland water and air links between South Yorkshire and the rest of the UK and beyond." The creation of a HSR station in Sheffield would contribute to this goal.

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Policy T4: Freight	Freed capacity on classic lines can help to "maximise the use of rail ... for freight movements".
Scotland: The National Planning Framework 2, July 2009	
Climate Change	HSR would help reducing Scotland's carbon footprint. Non-air transport represents 20% of Scotland's greenhouse gas emissions. Providing a viable lower-carbon transport alternative for intercity travel is an essential step in meeting Scotland's objective of reducing overall greenhouse gas emissions by 80% for 2050.
Connection to North East England	*"The Regional Spatial Strategy for the North East of England recognises the economic influence of the Edinburgh City Region on the North East of England and includes a commitment to improving accessibility and efficiency of movement along the East Coast corridor"*
Transport Objectives	HSR would improve journey times and connections between Scotland and England and between the 2 main cities of Scotland. HSR will help to reduce emissions from short-haul flights.
Europe	A link between the new UK HSR network and HS-CT would improve links to Europe.
Wales: Planning Policy 2002	
Transport	The policy indicates that local authorities should "consider the potential for promoting the use of railways for additional passenger and freight traffic." The HSR programme may produce new infrastructure, thus expanding the possibilities for the existing infrastructure. Furthermore, "Disused railways and disused or unused rail sidings should be safeguarded from development where there is a realistic prospect for their use for transport purposes in the future."

A.4.4 Transport Projects

The likely major transport projects to take place in the near future, and that may have an impact on the future HSR network, are presented in Table A.21.

Table A.21 Likely relevant transport projects

Project	Description	Comments
Crossrail	The Crossrail line, scheduled to open in 2017, will provide a new link between the Great Western Main Line and the Great Eastern Main Line with a link to Docklands and South East London. It aims to relieve congestion on the Central and Hammersmith & City Underground lines, and to provide an improved link between Heathrow Airport/Central London and	Positive effect on HSR: congestion will be relieved on the Hammersmith & City line, which passes through Euston and Paddington, potential HSR stations within London. Will assist in onward distribution of passengers if HSR terminal is at

[22] Network Rail, *Cross London Route Utilisation Strategy*.

	Docklands/E & SE London.[22] It is expected to carry 200 million people a year (source: DfT HS2 paper)[23]	Liverpool St or Stratford
Thameslink	Due for completion in 2017, Thameslink will allow longer trains to operate more frequently north-south through central London.[24]	Will assist in onward distribution of passengers if HSR terminal is at St Pancras or Euston
Reading Station rebuild	Upgrade to Reading Station and lines to west to increase capacity. Includes increase in number of platforms at the station.	
Birmingham New Street Gateway	Upgrade to Birmingham New Street Station to improve passenger flows and aesthetics of station. Will increase capacity in terms of passenger throughput, although the number of platforms remains unchanged.	
Strategic Freight Network	Aims to provide sufficient capacity for freight, and divert freight routes so that they by-pass London.	HSR would free up capacity on the conventional network for freight, especially on the WCML
Intercity Express Programme	Procurement of a fleet of 500 to 2,000 vehicles, to provide longer trains and thus augment number of seats and comfort for passengers.[25]	
Heathrow 3rd runway	Government announcement in January 2009 stating its intention to construct a 6th terminal and 3rd runway at Heathrow Airport. However, the Conservative opposition is strongly against the expansion of Heathrow	The HSR needs to have a good business case irrespective of decision on Runway 3
Upgrade to the north Trans-Pennine corridor (Manchester to Leeds)	Network Rail is considering carrying out an upgrade of the north Trans-Pennine rail link, thus increasing capacity and improving performance and journey times.[26]	This planned upgrade may weaken the business case for the construction of a new high speed North Trans-Pennine link.
Edinburgh-Glasgow rail improvements programme	Proposal to provide six trains per hour between Edinburgh and Glasgow Queen Street with a fastest journey time of 35 minutes.[27] Reopening of Airdrie to Bathgate line providing a new, electrified route between the two cities.	

A.5 Findings from regional workshops

Regional workshops were carried out as part of the High Speed Rail Development Programme in order to identify local stakeholders' objectives and concerns regarding HSR. Key findings are presented in the table below.

[23] Department for Transport, *High Speed 2*, January 2009.

[24] Department for Transport, *High Speed 2*, January 2009.

[25]Department for Transport, *Intercity Express Programme – A summary and overview*, http://www.dft.gov.uk/pgr/rail/pi/iep/summaryandoverview.

[26] Network Rail. *Route Plan – Route 10 – North Trans-Pennine, North and West Yorkshire.* 2008.

[27] Transport Scotland. *Strategic Transport Projects Review*. December 2008.

Table A.22 Findings from the Regional Workshops

Workshop findings	Comments
In general, though good links with London are for most a top priority, participants stressed the importance of providing excellent cross-country links, as well.	This finding is in line with the Guiding Principle regarding comprehensive benefits.
A rapid link (3 hours or less) must be created between London city centre and Scotland. In Scotland the speed of the link is more important than freeing up rail capacity.	
An improved Transpennine link is justified by current transport demand (rail and car) and a need for greater capacity.	
Participants hope that local and cross-country services can be improved thanks to capacity release on the classic network due to a switch of long-distance services to the new HS.	Capacity release is a major issue on the WCML and ECML throughout England, but is less of an issue for Scotland and the Great Western Corridor.
In general, city centre locations for HSR stations were favoured over parkway-type stations. In large part this is because stakeholders believe that regeneration benefits can be obtained primarily via city centres, and not from new development zones. The importance of city centres as opposed to the classic concept of regeneration or development areas is underlined by the current economic crisis.	The WS2 report provided evidence that regeneration benefits were generally stronger with city centre stations.
HSR should probably serve more than one station in London, so as to put less pressure on one station, and in order to better serve different parts of London.	
Concern was expressed that a large-scale HSR project could be detrimental to classic rail users, either because their services would disappear, or because funds for infrastructure maintenance would be shifted towards the HSR and away from the classic lines.	In fact, HSR is expected to improve local services: by shifting long-distance services from the classic to the HSR, new capacity will be created on the classic lines that can be used for additional local services.
HSR must absolutely be integrated with local planning initiatives.	

A.5.1 Work on HSR in the UK Undertaken to Date

Many documents have been published regarding possible routes and other choices for high speed rail in the UK. This section summarises their conclusions.

The Atkins Report

Atkins was commissioned by the Strategic Rail Authority (SRA) to carry out a High-Speed Line (HSL) feasibility study to establish whether there is a transport and business case for constructing a new HSL in the UK from London to the North. This study took place between August 2001 and February 2003.

Multiple high speed route options were examined, including routes in Corridors 1, 2, 4 and 5. These route options underwent demand forecast and business case tests. The Atkins Report's major findings are presented in Table A.22.

Table A.22 Major Atkins report findings

Atkins findings	Comments
A single double-track high speed line coming north out of London will not have sufficient capacity to handle the demand if the line runs up to Scotland.	This point has been verified using our demand forecasting model.
A four-track high speed line coming north out of London is to be avoided because of the extreme cost and difficulty of adding over 12 high speed services an hour out of a single London terminus. Two different high speed routes (Corridor 1 *and* corridor 2) coming north out of London thus seems to be the best option for a high-speed network that extends to Scotland. [28] Furthermore, multiple London terminals provide a better business case for HSR.	The current study estimates costs associated with 4-track infrastructure, though no definite solution for a single London terminus has been found. We agree with Atkins' conclusion that two 2-track routes are preferable.
The economic gains related to building only one trunk (easterly or westerly, as described above) depend on the degree to which the ECML is upgraded. In the case of the less extensive ECML 1c upgrade an easterly trunk would perform better in terms of net benefits than a westerly trunk. In the case of the more extensive ECML 2+ upgrade, a westerly trunk would perform better. Current plans are for a less extensive infrastructure upgrade on the ECML, but with improved timetabling resulting in additional train paths. Thus the Atkins report indicates that under current conditions an easterly trunk (Corridor 2) would be more profitable than a westerly trunk (Corridor 1). Any route going north from London to the west of Peterborough (ie any direct link from London to Birmingham) would probably need to tunnel under the Chilterns AONB, which represents a significant cost. The Cannock Chase AONB also poses difficulties going into Manchester.	Both a West Coast and an East Coast scenario have been tested, with the assumption that there will be no significant upgrade carried out to the ECML infrastructure. Our findings are that the West Coast route has a stronger business case due in part to our cheaper option for the West Coast than that identified by Atkins.
A HSL linking London, Birmingham and Manchester has more value than a HSL that finishes at Birmingham.	We consider that the Atkins results are conclusive, and thus do not study a scenario consisting exclusively of a HSL between London and Birmingham
A link to HS-CT increases net benefits and the benefit cost ratio of HSR.	We have confirmed this, subject to the infrastructure for the link being not excessively expensive.
A link (on a spur) to Heathrow also increases net benefits, though less than does a link to HS1. The analysis carried out by Atkins regarding a link to Heathrow was inconclusive.	The LHR link is included in nearly all scenarios. It was found to offer good value for money, better than the link to HS-CT.

[28] It is to be noted that, on the contrary, Colin Eliff argues in *Joining Up Britain – High speed North* that a double-line track could operating 15 trains per hour would be sufficient to allow the principal population centres in Great Britain to be joined more cheaply and with less line construction time than would be the case with two corridors.

Atkins findings	Comments
It would not be worthwhile to provide a parallel freight line alongside the high speed passenger line.	We rely on Atkins' conclusions and do not test a parallel freight route.
HSR schemes perform better in the cost-benefit analysis than alternative classic rail schemes, though the costs and benefits of HSR are difficult to compare on a like-for-like basis with those of an air-only or motorway-only scheme.	We do not explore classic-only rail schemes. Alternatives to HSR are expected to be considered by DfT in the DaSTS process.
HSR schemes perform better than alternative motorway-only or airport-only schemes in terms of accessibility, integration and safety.	
HSR schemes perform better than a motorway-only scheme in terms of the environmental assessment. The air-HSR comparison is inconclusive regarding local impact, but **HSR performs better in terms of reduction of greenhouse gases**.	We have not addressed these non-rail alternatives in our study.
The **economic case for high speed rail** is most sensitive to overall economic growth, quality of service on HSR, **journey time on HSR** and HSR fares.	We agree that overall economic growth has important influence on the business case; this is because crowding relief is a major objective of HSR and component of the benefits. The journey time point reinforces the importance of minimising the number of stops in the HSR service patterns, in order to keep journey time down.
The following route sections do not appear to add value to the business case of HSL: Manchester-Leeds and Leeds-Newcastle (though this section would be a necessary component of a Newcastle-Scotland link, which does indeed add value).	We have found these to be the weaker components, but they do assist in meeting Guiding Principles. Our study has appraised HSR against a range of criteria, only one of which is the BCR.

Other work by Greengauge 21

In 2007 Greengauge 21 published *High Speed Two: A Greengauge 21 Proposition,* a paper arguing that the next step in the British high-speed rail network should be a link between London and Birmingham, with a spur to serve Heathrow Airport and a link to the West Coast Main Line to provide service further north.

The route from London to the West Midlands and North West is presented as the highest priority because *inter alia*:

- This corridor is likely to experience the greatest capacity pressure in the rail network over the next 20 years
- It connects the two biggest English city regions to the capital
- It offers the possibility of a link to Heathrow

The paper also provides a potential alignment, service patterns and cost estimates for the proposed route.

Energy consumption and CO2 impacts of High Speed Rail: ATOC analysis for Greengauge 21 establishes that high speed rail will continue to emit much lower levels of CO2 per passenger-kilometre, even when the introduction of low-consumption and electric cars, and lower-consumption aviation, are taken into account.

The High Speed 2 Company

The government announcement in January 2009 of its intention to go forward with plans to build a third runway at Heathrow was issued alongside another commitment: create a company called High Speed 2. The goal of this company is to develop a proposal for an HSR between London and the West Midlands To do this, the company must investigate:

- The route for a new high speed rail line from London to the West Midlands
- Options for a Heathrow International multi-modal transport hub with an interchange with Crossrail
- Options for a central London station
- Options for links with HS1 and the classic rail network
- Ensure a fit with a potential future high speed network
- Likely environmental impact
- Overall business case
- Financing and construction possibilities

The company will formally report on its findings by the end of 2009.

Edinburgh-Scotland

The Independent Rail Consultancy Group carried out the *Edinburgh – Glasgow High Speed Rail Route Outline Feasibility Study.*

This report finds that:

- Considerable new build is the only solution which will deliver all the desired objectives (providing high speed services as well as providing for growth in other passenger services and freight).
- The Waverley-Haymarket corridor is particularly restrictive in terms of rail capacity and environmental considerations.

A.6 Core objectives for high speed rail

The core objectives for high speed rail in the 5 Corridors are determined on the basis of the guiding principles, stakeholder input, and current transport challenges.

These core objectives are presented in Table A.23.

Table A.23: Objectives for high speed rail

Guiding Principle	Core Objectives
Capacity	Relieve southern WCML London to Carlisle, ECML London to Morpeth and Dunbar to Edinburgh, GW from Didcot to Wootton Bassett. MML?
	Relieve M1/M6, M25, M40, M11, M62
	Create new terminal and approach capacity in London, Birmingham, Manchester and Leeds
Sustainable economic regeneration	Serve Birmingham, Manchester, Newcastle, Leeds, Glasgow, Bristol, Sheffield and Liverpool city centres
	Accommodate Milton Keynes/South Midlands growth via relieving WCML
	Strengthen regional connections to Heathrow as an international gateway
Whole Journey	Improve rail in-vehicle times from Birmingham, Manchester, Liverpool, N Wales and Scotland to London
	Improve rail in-vehicle times from Manchester, Liverpool, and Scotland to Birmingham
	Improve rail in-vehicle times for cross-country connections like Newcastle-Manchester.
	Reduce rail in-vehicle time by limiting intermediate stops
	Ensure that stations served have good connections
Reduce domestic and cross-channel aviation	Serve interlining market Manchester – LHR and Scotland – LHR
	Abstract LHR – Scotland demand
	Create new access Birmingham – LHR, introduce direct HSR services between Birmingham and the near continent
	Create HS-CT to LHR link, to serve LHR – Paris/Brussels interlining market plus improved accessibility from west London to Paris/Brussels
	Increase overall rail share.
Comprehensive benefits	Use released rail capacity to improve local passenger services
	Enable through running from classic network to HS, e.g. Bristol to Manchester