

High-Speed Rail and Scotland



| A report by *Greengauge 21*
| Commissioned by *High-Speed Rail Group*

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Preface

This report has been prepared by Greengauge 21 on behalf of the High Speed Rail Group. Its purpose is to provide the HSR Group with the basis for a submission to the National Infrastructure Commission's consultation on High Speed North.

Specifically, it addresses one of the questions raised in the consultation which is on rail connectivity with Scotland.

Greengauge 21 is an independent policy research group that carries out and makes freely available its investigations into all aspects of high-speed rail and related matters in the UK.

Over the last ten years as the plans for HS2 have firmed up, Greengauge 21 has undertaken a number of studies into the choices around high-speed rail for the Anglo-Scottish cross border routes. It has also organised a number of conferences on the subject. This report draws together this evidence – which extends to a survey of local authorities in the northern parts of England (on both sides of the Pennines).

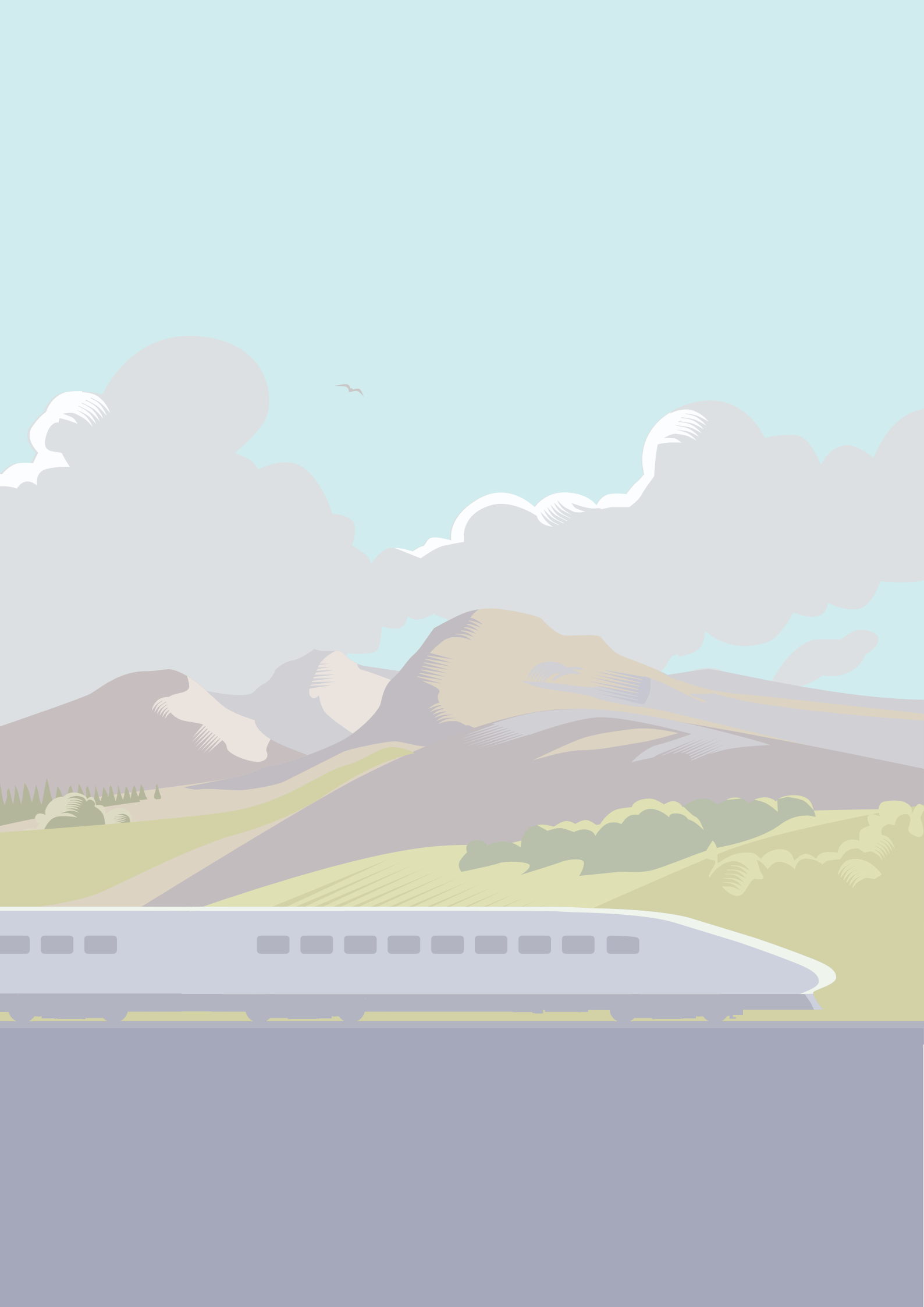
The National Infrastructure Commission's remit does not cover Scotland which has its own institutions addressing questions on infrastructure, high-speed rail and transport policy. But since outputs and outcomes for higher-speed, more competitive, rail services in the Anglo-Scottish travel market are affected by decisions taken both sides of the border, we have included relevant evidence here from Scottish authorities. There is much of common interest.

An ambitious and challenging timescale is proposed to deliver this: by the end of the decade ahead, broadly to match the Phase 1/2a delivery timescale. Later delivery would likely be too late to help contribute towards meeting the forward transport sector carbon reduction trajectory.

The programme of measures needed, which has to be regarded as provisional at this stage and subject to review by Network Rail and others is set out in the table below, which covers improvements along both East and West Coast Main Line corridors.

Investment Programme to Meet Connectivity, Capacity and Carbon Reduction Needs

Location	Element	
West Coast corridor	Glasgow Central and approaches	400m platforms; segregated fast line approaches
	HSR Rutherglen-Carstairs	Saves 12 minutes
	Dynamic freight loops Carstairs-Carlisle-Tebay	Added freight capacity and performance
	Station modernisation: Carlisle and Preston	Faster station approaches; added capacity
	Penrith	Possible high-speed cut-off
	HSR avoiding Oxenholme-Lancaster	Saves c14 minutes
	Wigan-Crewe either HS2 Phase 2b or Route upgrade	Saves 2-5 minutes
	ETCS re-signalling Crewe northwards	Added capacity
East Coast corridor	Edinburgh Waverley and Newcastle Central extra (400m) platforms	400m platforms; fast line approaches
	HSR Mid-East Lothian	Added capacity
	Dynamic freight loops north of Newcastle	Added freight capacity and performance
	Fully segregated freight lines Peterborough-Newcastle	Can also support new local rail passenger services
	Improvements to York and Darlington stations and their approaches	Added capacity
Other areas	Electrification of Felixstowe- Nuneaton and Basingstoke- Nuneaton (for Southampton) strategic freight routes	To provide electrified routes from ports to distribution centres
	In Scotland, electrification of main lines northwards from central belt to Stirling/Perth/ Inverness and Dundee/Aberdeen	To support cross-border high-speed service extensions
	Borders railway completion	To support new regional services and enhance connectivity
	Improvements to Cumbrian Coast line and electrification Barrow-Carnforth and Windermere-Oxenholme	To support new through services
	Provision for new 'Port Road'	If SW Scotland- Northern Ireland tunnel proceeds



1. Introduction – setting the context

In 2009, two influential reports were published. In August that year, Network Rail released its New Lines study. This examined a new high speed line from London to Glasgow, with branches to serve Birmingham, Manchester and Liverpool. It concluded there was a sound business case to build it in full.¹

The following month, Greengauge 21 released *Fast Forward*—a study carried out on behalf of many stakeholders including all the English Regional Development Agencies. It concluded that the first stage of a national high-speed rail (HSR) network should be ‘High-Speed North West’ a new line between London, Birmingham and Manchester and added:

“Extending High-Speed North West to Edinburgh and Glasgow improves the economic return of the line considerably, as the journey time improvements trigger a large shift from air to rail”.²

This is evidenced in the first studies of high-speed rail in Britain. The table below shows that while a high-speed line from London Manchester had a benefit:cost ratio of nearly 3:1, the incremental benefit of adding a high-speed line onwards to Edinburgh/Glasgow is much higher (7.6:1).

Economic appraisal of Anglo-Scottish High-Speed Rail and within-England High-Speed lines

Corridor	High-Speed North West		High-Speed North East	
	London – Birmingham / Manchester	Manchester – Glasgow / Edinburgh	London – Leeds / Newcastle	Newcastle – Edinburgh
New HSR infrastructure				
Benefit : Cost ratio	2.9 : 1	7.6 : 1	2.0 : 1	1 : 1
Net Present Value (£bn, 2002 prices)	24	23	15	0

Source: *Fast Forward*, Greengauge 21, September 2009

Six months later, in March 2010, the first plans from High Speed Two (HS2) Ltd were released, with full details of the planned route of HS2 Phase 1.³

Ten years on, Parliamentary powers have been granted to build HS2 Phase 1 (London–Birmingham) and those for Phase 2a (Birmingham–Crewe) are expected in the next few months.

1. Network Rail *New Lines Study*.
2. Greengauge 21, *Fast Forward*, September 2009, p48.
3. DfT *Cmnd 7827*, HMSO, March 2010.

Crewe is 158 miles north of London on today's West Coast Main Line—less than 40% of the way to Glasgow. It is a further 141 miles to Carlisle, and then a further 102 miles to Glasgow. One possible extension in HS2's Phase 2b, is a high-speed line that provides an extra 32 miles northwards from Crewe (towards Wigan), but it is not currently clear that Government intends this part of the scheme to proceed. The 'large shift from air to rail' discussed in *Fast Forward* remains elusive on current plans.

Within Scotland, studies have considered the case for a high-speed line between Glasgow and Edinburgh. They concluded that a **free-standing** scheme would not be worthwhile, given improvements to the existing line between the two cities—on which electrification works were about to start. However, it was also concluded that the case would be quite different if north-south HSR became part of the picture⁴. Transport Scotland has since been quietly pursuing the case for high-speed rail in Scotland that connects with the rail network in England and, provides a fast Glasgow–Edinburgh link as a by-product.

The Current Prospects

In this report, we look at a series of investigations into the challenge and opportunity that Anglo-Scottish (and within-Scotland) high-speed rail presents. Both east and west coast opportunities are examined, and although clearly the two great cities of Scotland's central belt are primary targets in terms of travel markets, we also give consideration to the next five Scottish cities, (Stirling, Perth, Aberdeen, Inverness, and Dundee) and how their connectivity can also be improved.

From a Scottish stand-point, the advantage of high-speed links across the border to England doesn't just rest on the opportunity to provide a substitute for short-haul air travel in the very large Glasgow/Edinburgh-London travel market. It also arises from the economic advantage of creating stronger links between city pairs such as Glasgow-Manchester and Edinburgh-Newcastle.

South of the border, current HS2 plans leave large parts of northern England to be served with HS2 trains operating over existing lines en route to Glasgow, Edinburgh or Newcastle. Here, over the years that HS2 has been in its planning stage, concerns have been as much about losing rail service connectivity on existing lines ('the Penrith question'⁵) as getting improvements.

4. See: <https://www.transport.gov.scot/media/1606/rail-high-speed-rail-scotland-summary-report-web-version-march-2016.pdf>

5. The Penrith question has been the subject of discussion for at least 7 years. Today, Penrith (which serves as an access point to the northern Lake District) has direct London services taking about 3 hours to cover a journey of 281 miles. Oxenholme (the next station south) is in a similar situation. Neither station features in the current HS2 London service plans. There has been no indication either of any presumption that fast (or any) services from London to the far North West of England (Cumbria) would be operated over the existing West Coast Main Line once HS2 is operational. For a long time, Lancaster and Carlisle were also left unserved in HS2 plans, but they each now are offered an hourly London HS2 service (source: HS2 Phase 1 Full Business Case).

As of February 2020, Government intends to proceed in the North of England through an integrated plan: High-Speed North. This will examine prospects for HS2's Phase 2b in conjunction with Northern Powerhouse Rail (NPR)—the plan to provide a new fast railway between Liverpool, Manchester and Leeds. Included in the High-Speed North terms of reference are four aims, and the fourth is:

“How best to deliver rail connectivity with Scotland, in conjunction with the Scottish Government.”

This is a question that also impacts on connectivity questions within England, as well as within Scotland itself.

To inform the development of *High-Speed North*, Government asked the National Infrastructure Commission (NIC) to advise on 'rail needs'. Connectivity with Scotland is one of these potential areas of need. The NIC is currently consulting on the subject, seeking evidence on the matter. With a lot of the focus in the north of England on HS2 Phase 2b and NPR, we aim to provide High-Speed Rail Group in this report with the evidence needed to support a submission to the NIC's work specifically on this fourth aim of the integrated plan⁶.

Just as the Scottish authorities discovered when considering the case for high-speed links between Glasgow and Edinburgh as a free standing scheme, and then got a rather different perspective if this was examined as part of a wider network development, we will look at the question of '**how best to deliver rail connectivity with Scotland**' as widely as necessary.

The NIC's remit doesn't cover Scotland, only south of the border, so to get a coherent view, we have ensured that a Scottish perspective is included in our report, based on published work.

'Rail needs' is not a defined term. We take it as meaning:

“those rail capabilities which can be taken as **needed** by virtue of:

- (i) the implications arising for rail from the need to deliver committed Government **policies**
- (ii) a requirement to accommodate, reliably and safely, future levels and patterns of demand for rail services (both by passengers and for freight), taking into account **likely demand level** and patterns post-Covid-19
- (iii) the **reasonable requirements** of local and regional authorities in relation to rail service provision across the broad geography where 'connectivity with Scotland' is under consideration.”

6. In the NIC consultation, this is stated as the *third* issue it will cover: “In undertaking its assessment, the Commission will: 1. Consider how best to integrate HS2 Phase 2b and wider transport plans..... 3. Consider how best to deliver rail connectivity with Scotland.” See <https://www.nic.org.uk/wp-content/uploads/NIC-Rail-Needs-Assessment-Call-for-Evidence.pdf>. The NIC consultation has one set question specific to connectivity with Scotland: 9. Which set of investments would best improve rail connectivity with Scotland?

In short: rail needs based on policies, market demand and reasonable requirements.

The rail network has two cross-border routes—East and West Coast—and both are addressed in this report. Also covered is freight, as well as passenger-based rail needs.

In practice, of course, rail needs generally arise as transport capability needs that are not mode-specific. Here, we consider, where relevant, whether other modes could better meet any needs presumed to be met by rail, as encouraged by the NIC.

2. **The challenge and opportunity**

In this chapter, we explore Government policies of relevance (to define the challenge) and outline the contribution that rail can make in response. We also consider the position taken by local and regional authorities that are served by the Anglo-Scottish rail routes.

Committed Government Policies

The policy drivers of the case for HS2 were set out succinctly in the recent Ministerial Foreword to the Full Business Case:

“..its potential to redistribute opportunity and prosperity across the country, provide much needed future rail capacity, and support the 2050 net zero carbon objective...”⁷

This identifies, then, three policy issues — and these apply to the whole of the HS2 project and not just Phase 1. They set a useful framework for considering the UK Government policy driver element of identifying ‘rail need’.

This policy wording also happens to fit tidily with Infrastructure Scottish Infrastructure Commission’s Phase 1 Report which has, as its first conclusion: **“All Scottish Government funded projects included in its 2020 Infrastructure Investment Plan should be prioritised against available inclusive net zero carbon economy outcomes.”⁸** The difference between Holyrood and Westminster objectives is small: the distinction between redistributing prosperity and being ‘inclusive’, and the Westminster identification of capacity as a distinct requirement.

The Government policy statements serve as a useful direction of travel and, given the Secretary of State for Transport’s recognition of the need to change current policies to get on track to meet the 2050 zero carbon commitment, also give an indication of the scale of impact needed.

For NIC in formulating its rail needs, at least in terms of national policy goals, the question can be reduced to this: **“does meeting the ‘rail need’ deliver an improvement in the distribution of prosperity to lagging regions and does it deliver a significant improvement in terms of carbon reduction?”**

7. HS2 Phase 1 Full Business Case April 2020.

8. See https://infrastructurecommission.scot/storage/238/ExecutiveSummary_160120.pdf, published January 2020.

Economic Re-balancing

The first objective — to redistribute opportunity and prosperity across the country — is commonly described as ‘levelling up’. It means that the regional distribution of benefits from transport provision needs to be distinguished and taken into account. In this report, this is taken as meaning that raising productivity through better business opportunities, improved access to employment and higher education in areas which have below average gross value added (GVA)/head, should be scored as ‘rail needs’ because of their contribution to this Government policy objective.

Along the broad corridor to Scotland served by the West Coast Main Line, five local authorities in Lancashire (Blackpool, Chorley, Hyndburn, Pendle and Wyre) all lie in the bottom 20% measured on GVA/head scores (2015 data), as do five served by the East Coast Main Line (County Durham, Northumberland, South Tyneside, Hartlepool and Redcar & Cleveland). In terms of social mobility scores, Carlisle, Allerdale and Barrow-in-Furness all score poorly in the west, as do Northumberland and Scarborough in the east. These are all places that rely on the east and west coast main lines for north-south rail connectivity through services that connect at key public transport hubs: Preston, Penrith, Carlisle, York, Darlington, Durham, Newcastle and Morpeth.

Meeting Capacity Needs

There is a capacity component to the question of **‘How best to deliver rail connectivity with Scotland, in conjunction with the Scottish Government’**. This entails looking at evidence on demand trends, and a need to look beyond the impact of Covid-19 and its effect on transport demand in the immediately ensuing years.

We present evidence on demand trends in Chapter 3 below. It will be seen that rail services have been growing in the Anglo-Scottish market; that services have expanded in response; that further expansion is planned; and that service reliability levels are poor (reflecting amongst other factors a degree of overload on the network). Indeed, it is widely believed that on key parts of the Anglo-Scottish rail network, capacity has been ‘oversold’.

On the question of the longer term impact of the changes in travel behaviour wrought by the Coronavirus, as of May 2020, there is inevitable uncertainty. We make the following observations based on the limited evidence available and an assessment of the likely consequential effects of already discernible trends:

1. As the economy recovers, so too will any short-term loss of freight demand and there is considerable scope to move more freight onto rail
2. A step down in commuting demand, including into city centres is likely, perhaps of the order of 25%, as those businesses and employees that are able to, elect to continue with virus-period home-working arrangements, rather than returning to a regular full-time commuting pattern, and others (probably particularly in the retail sector) cease high-street operations as more sales move on-line. These trends will be off-set by a pattern of re-purposing city centre buildings with a greater emphasis on the provision of cultural and service sector activities alongside traditional functions and by an increase in trends towards residential relocation out of larger cities with consequences for longer distance rail commuting into cities

3. Travel for shopping may well not recover to previously seen levels as home-delivery and internet shopping arrangements are adopted, but day-out travel to cities with multiple attractions will most likely recover
4. Travel for employer's business reasons will recover to previously seen levels, although the patterns may shift
5. Travel for personal business, visiting friends and relatives, to attend sporting and cultural events and domestic and foreign tourism will also recover to equivalent levels subject to the rate of economic recovery, and to employment and personal disposable income levels.

These reflections are of course subject to high levels of uncertainty. They also presume there is no overall shift (for instance through fares policy or tax changes) to the cost of travel. Separate consideration needs to be given to the likelihood of 'modal shifts' in travel, and part of this will likely arise from Government policy and the transport sector response to the carbon imperative, part from consumer behaviour.

Bringing this up to date, the French government has released details about its Covid-19 bail out of Air France. A condition is the airline must achieve 50% CO₂ reduction domestically by 2024, ordering a dramatic reduction in air journeys that can be done in 2h30 or less by train.

Our tentative views on the implications for the area of study (the Anglo-Scottish travel corridors) are as follows:

1. Demand for cross-border travel by rail will recover as the virus period ends. The travel market most likely to fall significantly (journey to work) is a very small part of cross border rail travel. On the other hand, the availability of short-haul air services in this market is likely to shrink. This creates an extra opportunity for rail in both passenger and freight markets, the latter particularly in high-speed logistics
2. Both rail and road-based cross-border travel modes are dominated by long distance trips. Where this travel shares the use of infrastructure and services with those travelling more locally to work, especially into city centres, the demand for commuting services must be expected to fall in the early years after the virus period. But whether this will lead to a reduction in commuter rail service frequency is much less clear. Faced with the prospect of resurgent car use and ensuing high congestion levels/poor air quality (and other adverse environmental) outcomes, retention of broadly similar rail service levels may be seen as necessary, especially at a time when economic stimulus and modal shift will be policy imperatives
3. Having the capacity on rail to accommodate demand encouraged away from using more carbon intensive transport will be a critical question in the years ahead because the volumetric impact could be high, even if the immediate short-term picture post-Covid-19 is characterised by continuing degrees of societal caution in travelling again.

We conclude that:

- (i) previously identified capacity requirements in terms of train paths are likely to continue to need to be met, and
- (ii) that provision for growth will need to take into account the consequences of policy decisions on the steps needed to achieve net zero carbon emissions and economic recovery and rebalancing.

There is also an important related question of **resilience**. Providing rail connectivity and capacity is of diminished value if rail infrastructure is not resilient to externalities that cause service disruption and line closures while repairs are carried out. Specific concerns arise because of weather related events and in this time of rapid climate change, the question of flood resistance is the most likely threat to service continuity.⁹ The Anglo-Scottish market is provided by two main railways lines which to a large extent can provide back up, one for the other, at times of serious service disruption: they offer intrinsic resilience. New high-speed line construction, built to withstand the changed climate conditions and with a much-developed understanding of soil mechanics than was available in the middle of the 19th century when the existing lines were built, offers a further benefit on this subject.



The West Coast Main Line 'under 8ft of water' at Carlisle, January 2016 (Source: ITV)

9. See <http://www.greengauge21.net/transport-links-as-well-housing-have-to-be-protected-from-increased-flood-risk/>

Achieving the 2050 net zero carbon emissions target

The third policy objective — meeting the 2050 net zero carbon objectives is not yet translated into a UK Government action programme. But it is already clear (from DfT’s current consultation on the subject) that potentially radical changes are needed to get on course to deliver it. The northern part of North England and Anglo-Scottish travel, we contend, could have an important role to play in rising to this national challenge.

Decarbonising Transport Consultation — *extract*

“Climate change is the most pressing environmental challenge of our time. There is overwhelming scientific evidence that we need to take action, and doing so is a clear priority for the Government. That is why in June 2019 we became the first major global economy to pass a law that requires us to achieve ‘net zero’ greenhouse gas (GHG) emissions by 2050.

Transport has a huge role to play in the economy reaching net zero. The scale of the challenge demands a step change in both the breadth and scale of ambition and we have a duty to act quickly and decisively to reduce emissions.

Public transport and active travel will be the natural first choice for our daily activities. We will use our cars less and be able to rely on a convenient, cost-effective and coherent public transport network.

Success will require the sector, and its users, to embrace new technology and innovation like never before. We believe the transport sector is ready to step up and meet those challenges.”

Source: Secretary of State Grant Shapps, Ministerial Foreword, in *Decarbonising Transport: Setting the Challenge*, Department for Transport, March 2020

Transport is now the largest contributor (28% in 2018) to the UK’s domestic GHG emissions. Transport emissions in 2018 were 4% higher than in 2013, and are only 3% lower than in 1990.

In 2018, GHG emissions from rail (passenger and freight) made up just 1.4% of the UK’s domestic transport emissions¹⁰, while accounting for 10% of passenger miles (and a similar proportion of freight tonne-miles).¹¹

10. BEIS (2020) 2018 UK greenhouse gas emissions: final figures – statistical release (online). Available at: <https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-2018>

11. DfT (2019) Travel Survey Great Britain Modal Comparisons, TSGB0101 (online). Available at: <https://www.gov.uk/government/statistical-data-sets/tsgb01-modal-comparisons#travel-to-work?>

Transport is currently Scotland's largest sectoral emitter, responsible for 37% of Scotland's total greenhouse gases in 2017. The Scottish Government is committed to reduce greenhouse gas emissions by 75% of 1990 levels by 2030, 90% by 2040 and net-zero by 2045. The stated aim is to "decarbonise Scotland's passenger railways by 2035. Where electrification isn't feasible or it is not appropriate to do so, there will be investment in battery-powered trains and work with developers of hydrogen fuel cell trains to accelerate their development and deployment through practical trials in Scotland".¹²

Government figures suggest that for a London-Edinburgh journey, travelling by air and excluding emissions entailed in accessing and using airports, a single passenger will be responsible for 144kg greenhouse gas (GHG) emissions. The equivalent for the same journey by car is 115kg GHG (diesel) and 120kg GHG (petrol). For rail travel the equivalent figure is 29kg GHG.¹³ High-speed rail has similar carbon emissions per passenger-km to conventional intercity rail. This is because the effects of operation at higher speed are outweighed by the benefits of carrying greater numbers of passengers at a steadier speed.¹⁴

However, it seems that the Government's current rail estimates may seriously underestimate the advantage (already impressive) that rail provides. In an update of the assessment carried out by Professor Roger Kemp for the Rail Safety and Standards Board study of Traction Energy Metrics, rail expert Roger Ford recently showed that the 2018 figure for an individual rail journey London-Edinburgh is now much lower at 16kg, thanks to the rapid growth of energy generation from renewables.¹⁵ Carbon emissions from travel by electrified rail will fall further as power generation moves away from fossil fuels. A further saving will come from the application of regenerative braking systems.

London-Glasgow/Edinburgh is by far the largest domestic air travel market, with 150–200 flights/day (pre-Covid-19, but even during the lock-down, some flights continue). There are also flights from Manchester and Birmingham and other smaller English airports to Scotland that compete with rail. The volume of long distance cross-border trips by car is not known but is undoubtedly substantial.

There are also substantial volumes of long-distance HGV movements. Rail freight emissions are falling year on year, but many freight services remain diesel rather than electrically hauled.¹⁶ Both of the cross-border railways (East and West Coast Main Lines) are fully electrified and so any increase in railfreight with loads transferring from HGVs (or indeed domestic shipping) will offer a significant carbon reduction dividend (see below).¹⁷

12. *National Transport Strategy*, laid before the Scottish Parliament by Scottish Ministers, February/2020 SG/2020/10

13. *Decarbonising Transport: Setting the Challenge*, Department for Transport, March 2020.

14. <http://www.greengauge21.net/wp-content/uploads/Carbon-and-HS2-GG21-flyer.pdf>

15. See *Modern Railways*, May 2020, p30 (note that the text wrongly quotes this figure as g rather than kg).

16. ORR (2019) Rail emissions 2018–19 Annual Statistical Release (online). Available at: <https://dataportal.orr.gov.uk/media/1531/rail-emissions-2018-19.pdf>

17. There remains a challenge to eliminate residual diesel haulage of some cross-border rail traffics including electrification of links to key ports and distribution centres.

Given the scale of both passenger and freight markets on the Anglo-Scottish routes, significant at a national level, and the very substantial carbon advantages rail offers, increasing rail market share would make a significant contribution to the Government’s commitment to achieving net zero carbon by 2050. Compared with other areas and types of travel—especially where trip distances are shorter—the Anglo-Scottish transport markets represent ‘**low hanging fruit**’ for carbon reduction.

Are there alternatives available to de-carbonise HGV road-based haulage systems? One option would be to provide an electric power supply, and this is being examined in both Sweden and Germany (see below). But this would be an expensive solution (although it might be more attractive north of the border where electrical power generation capability is plentiful and the M74 operates—south of Glasgow—with spare capacity). Battery and Hydrogen solutions don’t work easily with lengthy trip distances and attempts in Sweden to improve HGV efficiency by using autonomous technology to reduce headways and operate as platoons have encountered set-backs. Electrified rail would still seem the best approach for longer distance freight flows.



Swedish example of electrified HGV system

The reasonable requirements of local and regional authorities

Here we need to consider the ‘reasonable requirements’—which we translate as needs—as stated by the local and regional authorities from the rail network that serves them.

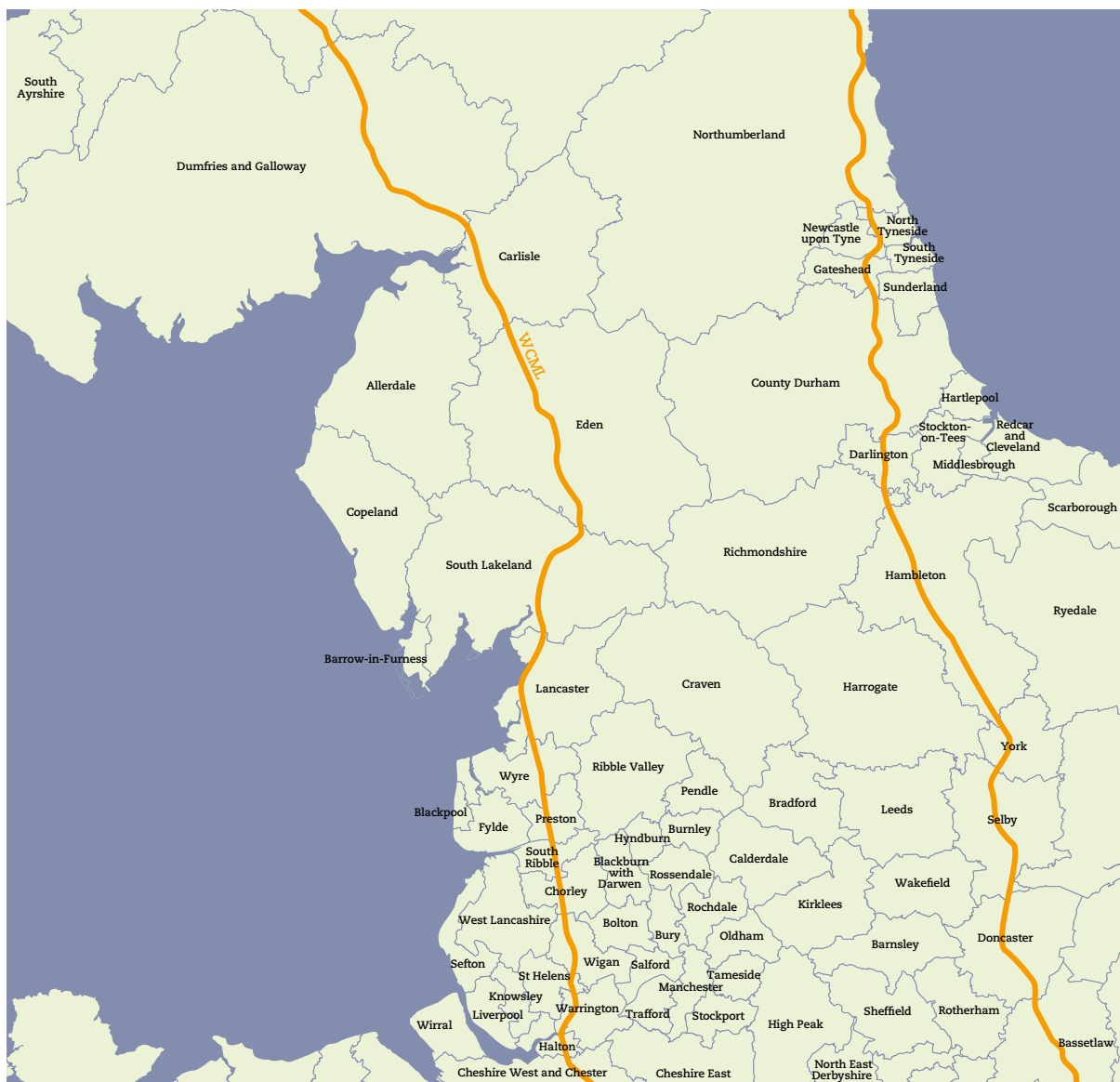
Broadly the geography translates into:

- » North West England, the area covered by Lancashire and Cumbria, for whom the WCML is the key rail artery

- » North East England, here taken to cover North Yorkshire, Tees Valley, Durham, Northumberland and the Tyne and Wear area for whom the ECML is the key rail artery
- » Southern Scotland: Dumfries and Galloway, Strathclyde, Lanarkshire, Borders, Edinburgh and the Lothians (which are served by the WCML, ECML, the Nith Valley line (Carlisle-Dumfries-Kilmarnock-Glasgow) and the Borders Railway).

We deem local/regional authority requirements as reasonable if:

- (i) They seek to retain a service level that pre-exists HS2 or
- (ii) They are based on meeting a local/regional ambition that will help achieve the Government level objectives or
- (iii) There is evident demand for an improved higher rail service level.



3. **Evidence on capacity, connectivity and carbon**

Most of the North will not see any HS2 construction. Phase 2a reaches Cheshire, Phase 2b will cross Cheshire and reaches into Greater Manchester and the West Riding of Yorkshire. No construction is planned in the substantial geography of Lancashire or Cumbria, nor to the east in North Yorkshire, Tees Valley Durham, Tyne & Wear and Northumberland.

All of these areas are served by the railway corridors that link England with Scotland. Here we consider the accumulated evidence that new high-speed lines and upgrades to the existing network in these areas are a national priority. This is the geography where the first sections of the national rail and motorway networks were built, and there is no reason why rail investment here should, in the 21st century, be accorded the low level of priority it currently has.

The investment case, modal diversion from air and carbon reductions

Two studies from 2009 set out the investment case for cross-border high-speed rail.

(i) Network Rail New Lines Study

Network Rail's 2009 New Lines study, running to over 1,500 pages of research, modelling and analysis, concluded that in order to meet demand a new high-speed line from central London to central Manchester with a diverging high speed line continuing to Preston and then northwards to go directly to Glasgow (2hrs 16mins) and Edinburgh (2hrs 9mins) offered best value for money of the options tested and a benefit/cost ratio of 1.8:1.¹⁸ Adding the Anglo-Scottish element north of Manchester was found to improve the overall investment case.¹⁹

18. See: <https://www.networkrailmediacentre.co.uk/news/london-to-scotland-by-train-in-just-two-hours-network-rail-unveils-results-of-new-lines-study-scotland>

19. Although unpublished at the time, there was a second Network Rail new lines study covering the eastern side of the country and this was revealed in Network Rail's subsequent *London and South East Route Utilisation Strategy*. This showed that there was also a business case for a second, eastern, high-speed line in Britain. It was also clear that trying to speed up services on the current East Coast Main Line was 'a rather fruitless exercise'. Increasing the maximum permitted speed to 140 mile/h from the current 125 mile/h would only save five minutes on a journey from London to Edinburgh.

(ii) Greengauge 21 Fast Forward

Also released in 2009, the Greengauge 21 study was a major and comprehensive exercise, looking across the range of possible HSR networks for the UK. The schemes examined of relevance to the Anglo-Scottish market yielded the following in benefit/cost ratio terms:

National HSR network	3.5:1
London to Manchester (HS-NW)	2.9:1
Extending HS-NW to Glasgow/Edinburgh	7.6:1
London to Newcastle (HS-NE)	2.0:1

Just as Network Rail had found one month earlier in their parallel exercise, the marginal case for adding high-speed rail northwards from a high-speed line built as far north as Manchester was very strong—and indeed helped support the case for the whole enterprise.

The Greengauge 21 study used a purpose-designed strategic transport model created by Systra and this estimated that a full network of HSR services in Britain would carry 178 million passengers in 2055, of which 57% would come from classic rail, 19% would be generated, 17% would be abstracted from air and 7% (12.6 million) abstracted from car. These are much higher levels of modal diversion from both air and private car than have been assumed to date in HS2 Ltd's own studies.

Evidence available from established HSR lines shows that in corridors with competing airline services, significant proportions of high-speed rail travellers switch from air: 20% (Paris Lyon TGV); 24% (Madrid Seville AVE); 60% (Madrid Barcelona AVE) and 49% (London-Brussels/Lille/Paris Eurostar)²⁰. Clearly, in the case of Anglo-Scottish high-speed rail, many trips would be diverted from conventional rail services—these are successful and were growing strongly through to 2019—but a substantial switch from short-haul flying can be expected too. This should be recognised as a clear policy objective.

Demand trends and capacity needs

It is evident that the northern section of the West Coast Main Line is operating at its limits. Lancaster railway station has the worst rate for delayed trains in the whole of the UK: some 63.5% of services at Lancaster station didn't leave on time between January 2019 and January 2020.²¹

The combination of an intensive freight service, longer distance commuting into cities such as Glasgow and Manchester, important connections to airports, local services to important railheads along the line of route and a growing network of direct services between Edinburgh/Glasgow and Liverpool, Manchester, Birmingham and London all operate over a very long section of plain double-track railway. This line also has to negotiate two major summits (Shap and Beattock) and the complex traffic mix makes reliable operations challenging. Moreover, locations off the main line that once were served with direct connections to London now can only be reached by interchange. Workington, Whitehaven, Barrow-in-Furness, Blackburn, Burnley, Morecombe, Dumfries, Kilmarnock have all lost previously valued direct rail services to London for which there remains unmet demand.

20. See <https://www.racfoundation.org/wp-content/uploads/2017/11/high-speed-rail-preston-301009-report.pdf>

21. <https://www.lancs.live/news/lancashire-news/lancaster-railway-station-tops-list-17781262>

The pressure points include:

- » major stations that are operating at or close to capacity with unimproved track-layouts: these include Glasgow Central, Carlisle and Preston
- » the summit routes where freight loops are of inadequate lengths and have very low entry/exit speeds
- » very intensively used sections of line such as Lancaster-Preston
- » the approaches to Glasgow through Lanarkshire where there are 9 flat junctions for Anglo-Scottish trains to negotiate, each capable of causing delays
- » unimproved junctions at Winwick, Golborne, Standish and Carstairs which inhibit fast running and limit capacity.

These problems are significant in their own right but also risk the operational performance and benefits of through-running HS2 services and therefore the committed HS2 schemes to the south (Phases 1 and 2a).

Demand trends

Demand growth has been substantial. In an examination of the rail market between London and Edinburgh/Glasgow, environmental campaign group Transform Scotland noted that rail market share grew from 20% to 33% over the period from 2005 to 2015, bringing significant environmental benefits.²² The Glasgow-London rail market—which benefitted from the west coast upgrade and Virgin Trains’ ‘VHF’ timetable—increased its market share from 15% to 32% over the same period.

Between 2006 and 2016 Office of Rail and Road (ORR) figures show all cross border passengers increasing by 61% and between the same two years, Glasgow-London rail flows increased by 120%. Since 2007 alone, rail passenger travel levels between Manchester and Scotland were up +191% and between Birmingham and Scotland +261%.

For the reasons given earlier, it seems likely that the pattern of growth with additional services will continue. Some of the extra trains envisaged in 2013 have already gone into service; the others, identified in the table below for 2030, will likely prove viable too. In this table, north-end West Coast Main Line cross border flows are expected to increase from 3/hour to 8.5/hour by 2030.

22. The percentages relate to rail share of the rail+air market. See <http://transformscotland.org.uk/wp/wp-content/uploads/2017/08/A-Green-Journey-to-Growth-Transform-Scotland-report.pdf>

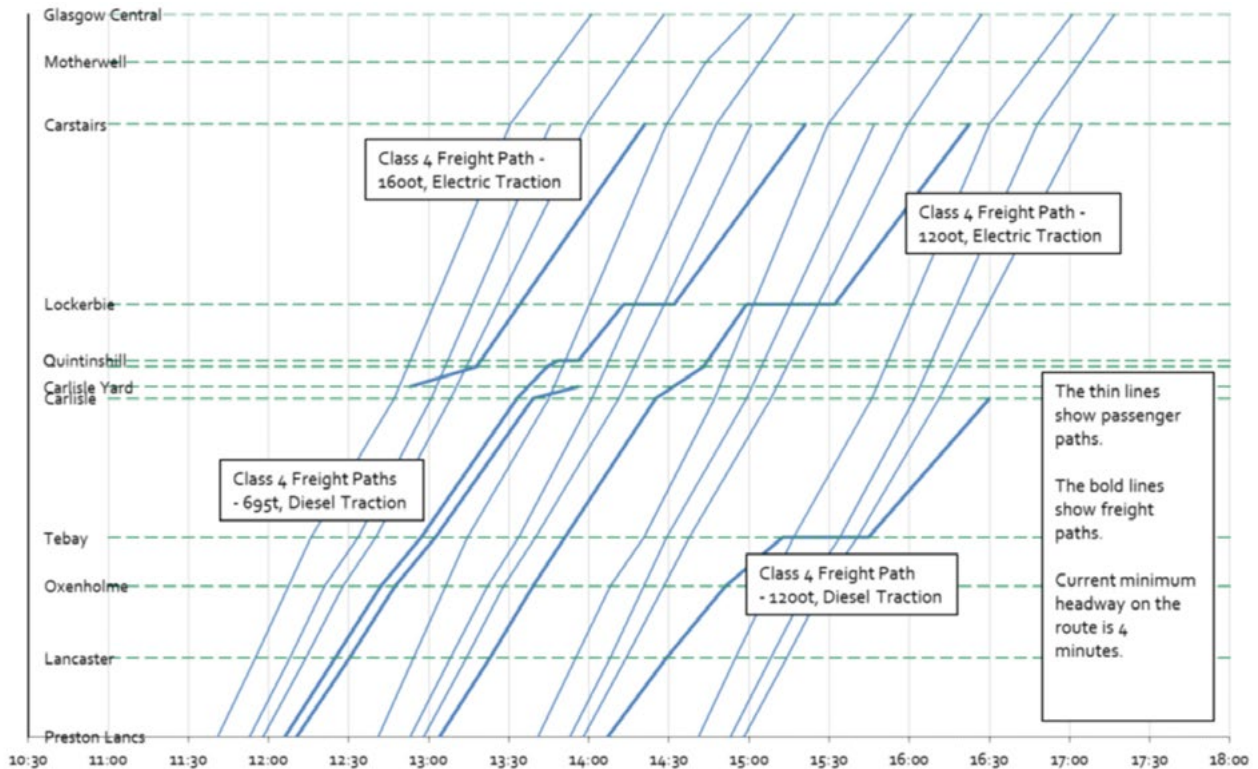
Route	2015	2030
Glasgow – Euston	1	1–2
Edinburgh – Euston	-	1
Carlisle – Euston	peak only	1
Glasgow – Birmingham	0.5	1
Edinburgh – Birmingham	0.5	1
Glasgow – Manchester	0.5	1
Edinburgh – Manchester	0.5	1
Glasgow/Edinburgh – Liverpool	-	1
Glasgow – Carlisle – Leeds	-	0.5
Aberdeen – Manchester/Birmingham	-	0.5

Source: Greengauge 21, Glasgow high-speed rail conference, August 2015

Implications for Capacity

Accommodating trains with very differing speed characteristics—especially passenger and freight trains, is problematic, as illustrated by the following West Coast Main Line train graph.

Preston – Carstairs



Source: Steer Davies Gleave analysis of Network Rail data, 2015

The chart illustrates how the need to operate a mix of train types with very differing operating speed characteristics is destructive of line capacity. Once a freight train leaves Preston northbound, it may be as much as 40 minutes before an intercity express follows.

Rail freight growth is expected in the short to medium term. A new freight terminal, with capacity for 8x800m container trains, is being developed at Mossend in the Scottish central belt which will create demand for an additional 13 freight paths per day, for example. Since each freight train takes roughly 60 HGVs off the road, then this development alone could take 780 HGVs each day off the road network. Most of these will be travelling across the border to England and therefore contributing to a daily reduction of around 230,000 HGV-kms and the associated carbon emissions.



French TGV Postale

The Government's Rail Freight Strategy²³ utilises the assumption that each tonne of freight transported by rail reduces carbon emissions by 76 per cent²⁴. Using the Government's HGV CO₂ usage data²⁵, this converts to a CO₂ daily saving of 151 tonnes or around 45,000 tonnes CO₂ per annum.

With the loss of air carrying capacity, there has been a Coronavirus period sharp uptake of interest in creating new high-speed logistics capabilities. These will only succeed if the infrastructure has the capacity to support them.

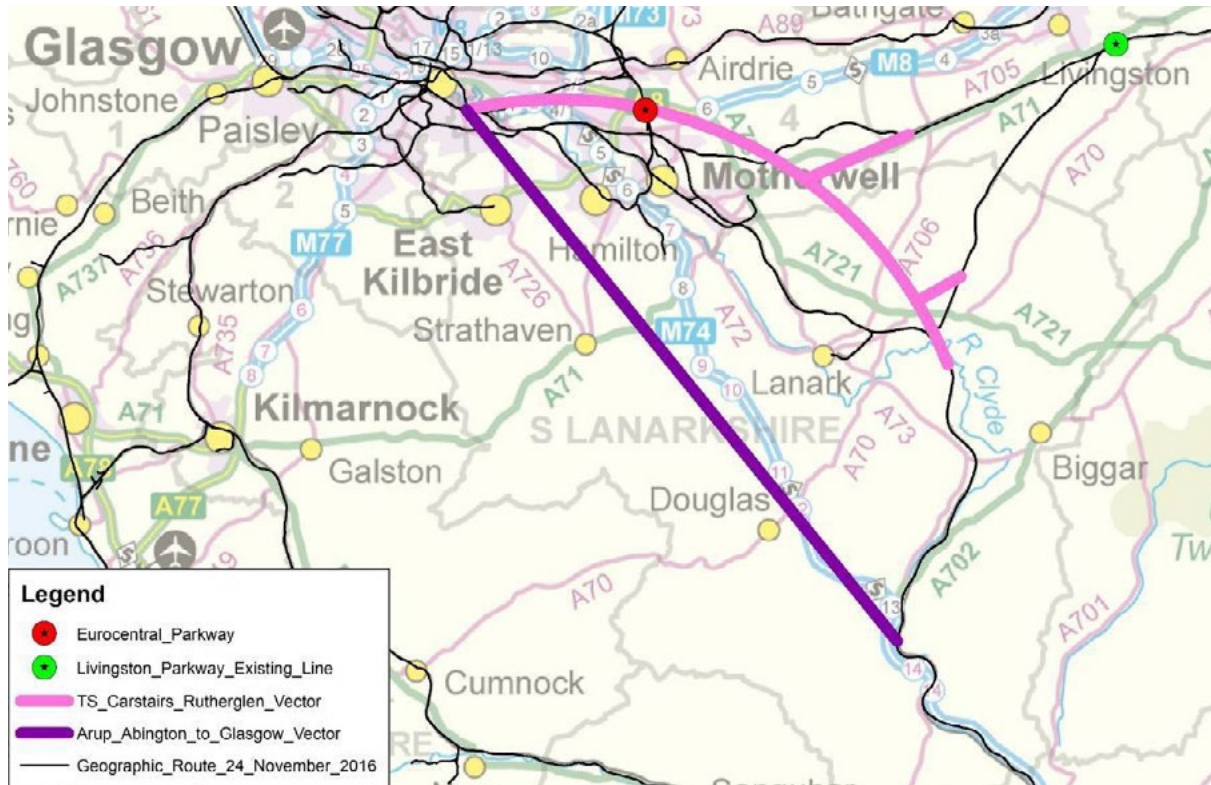
23. Rail Freight Strategy: Moving Britain Ahead. DfT. September 2016.

24. Keeping the lights on and the traffic moving, 2014, RDG (2012/13 prices).

25. UK Government GHG Conversion Factors for Company Reporting - Freight Goods – all HGVs, average laden.

Tackling rail network congestion

The constraints on the capacity of the West Coast main line in Scotland could be eased greatly by a new line shown with an indicative (vector) alignment in pink in the diagram below.



Source: Transport Scotland Input to Oakervee Review of HS2, September 2019

The indicative route, developed by Transport Scotland is capable of a journey time reduction of:

- 12 minutes from Abington (south of Carstairs where the new cut off re-joins the West Coast Main Line) to Rutherglen (Glasgow);
- 5½ minutes between Carlisle and Edinburgh; and
- 20 minutes between Glasgow and Edinburgh compared with the current journey time for trains running via Carstairs.

An equivalent new high-speed corridor has been identified by Transport Scotland to the east of Edinburgh running across the border to Newcastle. But here capacity pressures are much less, and so the investment case, if based on capacity, is lower.

Connectivity

As the NIC consultation identifies, there are two aspects to rail connectivity to be considered under this heading:

- » the provision of **direct** rail connections (as opposed to those that require interchange en route; and
- » the **speed and frequency** of the connections provided.

The availability of direct city to city rail connectivity was assessed by Greengauge 21 in *Beyond HS2* in May 2018.²⁶ This work identified the following missing links in current Anglo-Scottish (and far North of England) rail service provision:

- » Glasgow–Liverpool (since filled by a new Trans-Pennine Express service)
- » Glasgow–Cardiff
- » Edinburgh–Cardiff
- » Edinburgh–Liverpool
- » Glasgow–Nottingham
- » Edinburgh–Nottingham
- » Newcastle–Cardiff.

In terms of journey times, a remit was set by Holyrood and Westminster Ministers in March 2016:

“..in this control period [CP5] the Department for Transport and Transport Scotland will take forward work with Network Rail to identify any and all options with strong business cases, for consideration for implementation in Control Periods 6 and 7 [2019–2029], that can improve journey times, capacity, resilience and reliability on routes between England and Scotland.

This will include consideration of how these improvements can be future-proofed to allow further progress towards 3 hour journeys.”

HS2 Ltd’s broad options study, also published in 2016 had confirmed that an air-competitive 3 hour journey time between London and Glasgow/Edinburgh:

- (unsurprisingly) is not possible from enhancing the WCML or ECML within the constraints of existing Network Rail boundaries;
- but is possible either by means of incremental high speed bypasses of congested/slow parts of the WCML or ECML out-with existing Network Rail boundaries or by a continuous high speed route extending from the northern extent of HS2 Phase 2b (either Manchester or Leeds)—the latter unsurprising too, in the light of the earlier evidence from the 2009 studies.

26. See Figure 5.4 in http://www.greengauge21.net/wp-content/uploads/Beyond_HS2WEB.pdf



Ministers set a remit, March 2016. Ministers Goodwill and Brown at Waverley station (Photo: Greengauge 21)

So, the significant point is that a programme of investment, with some new HSR lines that bypass the most congested sections of line, and some upgrades of existing lines, is capable of delivering 3 hour Glasgow/Edinburgh-London journey times and tackling the capacity constraints on the route.

A North of HS2 to Scotland Working Group, comprising representatives from Department for Transport, Transport Scotland, HS2 Ltd, and Network Rail was set up in June 2016 to deliver the joint Ministerial commitment. The Working Group commissioned Network Rail to undertake a study of approximately 200 potential infrastructure options to identify the better performing options that merit further consideration. On 6 November 2017, the First Minister announced that the Scottish Government would commission a feasibility study into two of these.²⁷ The DfT (on behalf of the Working Group) commissioned a feasibility study into potential infrastructure enhancements in Lancashire, which was expected to be completed in January 2020. It has not (yet) been published.²⁸

27. <https://news.gov.scot/news/cross-border-rail-improvements-planned>

28. The Transport Scotland input to the Oakervee Review of HS2 provides an indicative plan of this possible new section of high-speed line.



Carlisle station approaches: **time for modernisation** (Photo: Greengauge 21, 2015)

Outputs from the Newcastle/Edinburgh, Abington & Carstairs/Rutherglen and the Lancashire feasibility studies into new sections of high-speed line will inform a business case which will be presented to Ministers in due course for consideration in the light of their joint commitment made in 2016.

Along the West Coast Main Line corridor, our judgment is that this programme might contain:

In England:

- a bypass for the very busy section of line north of Preston through Lancaster and Oxenholme (with junctions to permit some direct service calls)
- a major upgrade of junctions between Crewe and Preston (inclusive)
- provision of dynamic loops for freight services
- upgraded stations and track approaches at Warrington, Preston and Carlisle
- progressive applications of European Train Control Systems train control as signalling is renewed.

and in Scotland:

- a new line from Carstairs to Rutherglen and separation of a fast approach from there to Glasgow Central
- capacity enhancements at Glasgow Central station.

Along the east coast corridor, the programme is likely to contain:

In England:

- an upgrade to Newcastle Central station to allow the operation of longer trains
- improvements to York and Darlington stations and their approaches
- creation of a separate route for freight services between Northallerton and the approaches to Newcastle, with the scope to improve accessibility to places which have lost their local rail service.

and in Scotland:

- a new line parallel to the existing approaches from the Dunbar area to Edinburgh (where there is a growing commuter service)
- additional platforms at Edinburgh Waverley station
- (possibly) major remedial works to address the threat of coastal erosion to the line north of Berwick.

This represents a set of interventions that can be implemented incrementally and be substantially in place to coincide with the opening of HS2 Phase 1. Post Covid-19, Government will need to champion public works that are able to quickly deliver on the ground to get the economy moving and to demonstrate results on the decarbonisation and levelling up agendas.

Wider opportunities

There are also other cross-border connectivity opportunities to be taken into account:

- the potential for Borders railway to be extended from Tweedbank to Carlisle; and longer term
- the potential for a link between South West Scotland and Northern Ireland.

The Borders railway extension is under active consideration—funding for a feasibility study was obtained in July 2019. It would extend the only-recently re-opened line from Edinburgh to Galashiels southwards via Hawick to Carlisle. It would provide accessibility from the Border towns to Carlisle. This line might accommodate freight (timber) as well as additional passenger flows and will add to the importance of Carlisle as a rail hub and add some demand on the west coast route in England south of Carlisle.

There is also a feasibility study under way to create a tunnelled connection from SW Scotland to Northern Ireland. The implications of this proposal for cross-border rail have been examined and would give an added impetus to reduce London-Carlisle rail journey times²⁹. The tunnel would require a new rail link from near Stranraer to the West Coast Main Line. It could make a dramatic contribution to Government policy by providing Northern Ireland with fast connections to both Scotland and England. It could also have a further significant reduction in greenhouse gas emissions, with through fast rail services attracting passengers from air travel over routes such as Belfast–London and Dublin–Edinburgh.

29. See <http://www.greengauge21.net/connecting-great-britain-and-northern-ireland/> January 2020.

4. **Evidence from Scotland, and from English local and regional authorities**

(i) Scotland

The State of the Nation Infrastructure Scotland report launched in 2015 was supportive of the case for bringing HS2 to Scotland. The report³⁰ focused on the performance, resilience, capacity and condition of Scotland's infrastructure networks. It also analysed the economic, social and environmental benefits of infrastructure.

The Scottish Government committed to improving rail infrastructure, and the Borders Railway and the Edinburgh to Glasgow Improvement Project, amongst other investments, are increasing network capacity and sustainability. The report stated that while improvements to the Aberdeen-Inverness line and Highland lines are planned, enhanced rail connection from northern cities to the central belt would be required if rail is to compete with road and aviation. So far, no plans have shown any HS2 services extended north of Glasgow or Edinburgh. But clearly there is a market for such connections, and direct links could be readily fashioned northwards from the potential new HSR line in north Lanarkshire (to Stirling Perth and Inverness, example) or from west of Edinburgh to Dundee and Aberdeen.

The development of high-speed rail between London and Scotland was seen as the best option for increasing rail capacity, reducing journey times and encouraging shift from air to rail particularly if a journey time under 3 hours can be achieved.

Released in April 2019, the Connecting Glasgow, Phase 2 Report, written by the independent Glasgow Connectivity Commission³¹, described a plan to capitalise on the 'HS2 Opportunity'. It is one of three key inter-linked initiatives for the Glasgow city region's rail network. To develop a Glasgow Metro, to connect the city's two main city rail terminals and to prepare Glasgow Central Station for HS2. The latter has helped overcome a period of uncertainty because Glasgow Central station is in effect 'full' casting some doubt on the northern terminus arrangements for HS2 services. Hitherto thoughts had drifted to the idea of accommodating HS2 services by creating a free-standing purpose-built terminal elsewhere in Glasgow city centre. Central has good onward connections; it is 'centrally' located; and if the Metro connection also comes to fruition, it will be well-connected with Queen Street station too.

30. See <https://www.gov.scot/publications/infrastructure-investment-plan-2015-progress-report-2019-20/> for a progress report.

31. <https://www.glasgow.gov.uk/CHttpHandler.ashx?id=45064&p=0>

(ii) Survey of Authorities in northern England on high-speed rail links to Scotland

A survey in northern England was published in November 2012 once the full plans for HS2 had become clear. On behalf of its Public Interest Group, Greengauge 21, consulted transport authorities, Local Enterprise Partnerships and other organisations. It found that there was strong support across northern England for extending high-speed rail plans northwards beyond Leeds/Manchester to the major cities of Scotland³².

Fully 89% of respondents to the Greengauge 21 survey considered further northwards extension of HS2 to be important. But transport authorities and business groups also identified some crucial differences in the way HSR should be developed in the north compared with the available plans for HS2.

A list of survey respondents is set out in Annex 1. Their views were used to distil a set of planning objectives for the 'northern gap', the long corridors between Manchester/Leeds and the Scottish border. There is no reason to presume the same views would not hold today: the limitations of the existing rail service provision are little changed. We set out the key findings here.

High-level objectives—what should the HSR line deliver?

1. **Relief of capacity pinch-points** on existing main rail lines and on the strategic road network. There are rail capacity constraints in the north of England just as in the south, in part caused by the mix of intercity trains, local stopping services and freight trains and junction arrangements. **HSR should be designed to relieve capacity pinch-points and to provide a better alternative to road-based travel**
2. High-speed connections between provincial towns and cities in England and Scotland. Delivering **fast and frequent connections between the major cities of England and Scotland** will improve the economies of the north and help them together act as a **counterweight to development in the south**
3. **High-speed connections to London.** Providing high-quality access to the services, markets and businesses of the nation's capital, including its hub airport, is essential for the prosperity of the northern cities
4. High-speed connections between London and Edinburgh/Glasgow. Rapid long-distance end-to-end journeys will help deliver an **environmentally-valuable** mode shift from air travel
5. Connection to HS1 to allow through services to Europe via the Channel Tunnel. Direct rail access to continental Europe is a requirement for modern, connected and competitive cities.

32. See <http://www.greengauge21.net/connecting-hs2-to-scotland-the-north-of-england-criteria/connecting-hs2-to-scotland-the-north-of-england-criteria/> for full report, survey question breakdowns and charts.

Planning objectives—what features should the HSR line have?

1. Mixed usage of the line. Where there is capacity available, HSR lines in the north of England should be able to accommodate fast inter-regional passenger services or freight trains where this does not compromise the provision of true high-speed passenger services
2. Intermediate stations serving major cities and towns. Major cities and towns in the north of England should be served by HSR stations where feasible
3. Connections to the existing rail network. High-Speed Rail should be connected to and integrated with the existing rail network, to **allow ‘classic compatible’ high-speed services to operate to destinations off the high-speed line**
4. Integration with strategy for the existing rail network. All **regional centres in the north of England that do not benefit directly from new HSR services or from connections to the HSR network should instead benefit from enhanced classic rail services utilising the capacity freed up by HSR** or delivered through route upgrades.

Planning criteria—how should the line be designed?

1. Compatible technical characteristics with HS2 phases 1 and 2. There should be seamless and efficient operation with the existing HS2 proposals and with HSR proposals in Scotland, with common technical standards
2. **Examination of both new build and route upgrade options. Consideration should be given to all options for delivering HSR services, balancing journey time and capacity benefits with cost and environmental impacts**
3. Minimisation of environmental impacts and reduction of carbon emissions. HSR routes should be designed to minimise the impacts on the built and natural environment, where possible, and also to **deliver a strong reduction in carbon emissions**
4. Engagement of transport authorities, economic development bodies, business representatives and user groups in the planning of HSR. **A fully-inclusive planning process** should be undertaken, with active engagement of stakeholders across the north of England.

Conclusion

Authorities across the north of England believe that HSR is needed, and that it can play a valuable role in meeting projected demand for both freight and passenger travel. They want to see its design and development linked closely to the opportunities in northern England for economic recovery and growth. They share the view of the Scottish Partnership Group that consideration needs to be given to the mix of services that could use the new line, while recognising the importance of achieving very attractive journey times for high-speed rail customers.

They also believe that careful consideration should be given both to new build and to upgrading existing lines.

(ii) West Coast Rail 250 research

This second Greengauge 21 report dates from October 2017. It included an analysis of LEP's plans along the west coast corridor and also provides a useful summary of the relationship between rail connectivity and economic benefits.³³

A good example of the fit between economic development plans and the scope that HSR in the Anglo-Scottish corridor provides was illustrated by reference to Lancashire's plans. This plan provided examples of the close fit between the economic aspirations set out in Lancashire's Strategic Economic Plan of 2014 and the roles that enhanced rail connectivity can play in realising them, including:

- » The focus on Preston as a regional growth hub for inward investment boosted by both its role as a station on the HS2 service network and the opportunity to unlock direct and more frequent connections to other (non-HS2) WCML destinations such as Milton Keynes. The LEP estimate that there would be a lifetime economic benefit of £150m
- » Intervention priorities for Blackpool and its tourist market — where the release of rail capacity could allow improved rail services
- » Labour market skills interventions (especially for young people) — complementary release of capacity for enhanced local rail services to widen realistic job and training search opportunities.

The report identifies rail links as being critical for sustainable tourism development in the north of England and South West Scotland. It also provides local authority perspectives and what should be made of capacity released by any new high-speed line construction:

- » No West Coast station loses direct London rail connectivity

33. <http://www.greengauge21.net/wp-content/uploads/WCR250-report-by-Greengauge-21-October-2017.pdf>

- » Intercity services on the WCML should be both extended where practicable and operated on a limited stop basis to provide key interchange stations on the WCML with a regular interval service
- » Sufficient 'clean' path capacity is provided for fast intermodal freight traffic, allowing for expected growth
- » Additional capacity is provided for commuter services on shared routes into the major cities.

5. **Conclusions on rail needs**

This report sets out criteria necessary to distinguish between loose ambition and ‘needs’ in relation to the rail network in Northern England and across the border to Scotland. These needs, consistent with the National Infrastructure Commission’s advisory remit to High Speed North, are expressed in terms of capacity (and resilience); connectivity; and contribution to carbon (greenhouse gas) emission reduction.

Evidence presented covers the geography of Northern England north of Leeds-Manchester—the approximate limit of ambitions for new infrastructure for the key components of High Speed North (Northern Powerhouse Rail and HS2 Phase 2b)—and beyond into Scotland. It covers questions of the business case for major investment and the views of local and regional authorities. This is territory that Greengauge 21 has been considering for the last ten years and is well placed to advise on, and we make no apology for much of the evidence being drawn from Greengauge 21 research.

This report was commissioned by the High-Speed Rail Group which advocates creating a truly national network of high-speed rail for Britain. There are no established plans for high-speed rail in the geography under study, but there are some in the making. While there are Ministerial targets, which are most welcome, the absence of a joined-up strategy is concerning.

There is now an urgent need to address this planning gap. Post-Coronavirus there will be questions about the scale of peak period commuting demand. But this has little direct bearing on the case for investment in the Anglo-Scottish corridor where other travel purposes predominate. It is already apparent that the aviation sector is unlikely to return to business on a ‘before outbreak’ scale. And in any case regional air services make little sense in the face of the climate emergency—especially if there is a reasonably fast electrified surface transport option. Providing this capability through an investment programme in high-speed rail that can commence without delay is a national priority.

The Anglo-Scottish corridors (plural, because both east and west coast corridors are in scope) need an integrated plan, just as is intended for HS North. Because of its cross-border element, this must involve a continuation of the partnership with Transport Scotland (who have been working on this territory with Network Rail, HS2 Ltd and DfT). But:

- » The oversight arrangements for this planning effort must be extended to include the statutory sub-national body, Transport for the North (with Network Rail and HS2 Ltd’s key roles still recognised)
- » It should not be rolled into an expanded HS North remit. There is a different/additional constituency notably Scotland. And as is evident from the last ten years, the northern part of the North of England (east and west) also seems to lose out to the economic powerhouses in the Liverpool-Manchester-Leeds belt (and with it the prospects for better cross-border rail services)

- » The integrated plan needs to be initiated now so that improvements can be in place by the end of 2020s (with further investments to come to fruition in the following decade).

As has been evidenced, the northern parts of the East and West Coast Main Lines and their train services are of huge importance to the economies of the cities, towns and regions along the lines of route, and meeting rail needs in this geography is absolutely critical to meeting the UK Government's ambition to 'level up'.

If that isn't a big enough spur to action, then the opportunity to make a major reduction in the transport sector carbon budget surely must be. With investment that we detail below, it should be possible to double or treble the amount of cross-border freight handled by electrified rail, leading to a huge decrease in HGV mileage. And it would be expected that, with more, and much faster, long distance train services, including but by no means restricted to Edinburgh/Glasgow-London, there would be a huge uplift in rail's share of the Anglo-Scottish travel market with a reduction in short-haul flights and a very valuable reduction in high-carbon long distance private car trips.

What's needed to achieve these twin goals is a programme of investment for the northern and cross-border sections of both east and west coast corridors, with a judicious mix of new cut-off lines designed for high-speed operation and upgrades to the existing lines. Some of these improvements are needed in places that are remote from northern England/southern Scotland, improvements needed to improve connectivity and capacity that will also happen to improve 'connectivity with Scotland'. They include electrification schemes that will support the full electrification of Anglo-Scottish rail freight flows, measures set out in *Beyond HS2*,³⁴ and the set of incremental improvements outlined in Rail North's *Long Term Strategy Update* of January 2018.³⁵

The programme needs to deliver, by the early 2030s:

For the West Coast:

- » 8 long distance daytime passenger paths/hour on Anglo-Scottish routes
- » Service levels and connectivity no worse than today's for all intermediate stations
- » A 3h10 journey time London—Glasgow and Edinburgh
- » Enhanced connectivity through connectional timetabling with interurban bus and local rail services at key hub stations (Carlisle, Penrith, Oxenholme, Lancaster).
- » New long distance through services from off-route locations including Barrow-in-Furness, Windermere, Workington/Whitehaven and Dumfries and Kilmarnock
- » An increase in daily freight paths to 40 (each way)
- » Punctuality restored to PPM 90 or equivalent

34. *Beyond HS2*, Greengauge 21, May 2018.

35. See https://transportforthenorth.com/wp-content/uploads/Long-Term-Rail-Strategy_TfN.pdf

- » Resilience to 50-year flood risks
- » An ability to accommodate additional services from a Northern Ireland—SW Scotland rail connection should the Irish Sea tunnel and new rail connections be provided.

In addition, these plans should also anticipate the completion of the Borders Railway connection to Carlisle and the restoration of medium-speed long distance passenger services over the Settle-Carlisle line.

And for the East Coast:

- » A reduction of 15 minutes in Edinburgh-London journey times
- » Capacity for 5 cross border long distance passenger trains/hour
- » An increase in daily freight paths between Newcastle and Edinburgh to 12 (each way)
- » Punctuality restored to PPM 90 or equivalent
- » Resilience to 50-year flood risks
- » Capacity to accommodate additional services in east East/Mid Lothian to support housing development plans.

To meet connectivity (and capacity and carbon reduction) needs ‘to Scotland’, we recommend that HSR Group calls for the infrastructure programme set out in the table below in its submission to the National Infrastructure Commission. The programme entails around 50 miles of new HSR lines in the West Coast corridor and some substantial upgrades. Works at key stations such as Preston, Carlisle and Newcastle will inevitably entail some disruption and it will be important that the current practice of planning engineering works continues so that only one of the cross-border routes is facing major works at the same time is maintained.

Investment Programme to Meet Connectivity, Capacity and Carbon Reduction Needs

Location	Element	
West Coast corridor	Glasgow Central and approaches	400m platforms; segregated fast line approaches
	HSR Rutherglen-Carstairs	Saves 12 minutes
	Dynamic freight loops Carstairs-Carlisle-Tebay	Added freight capacity and performance
	Station modernisation: Carlisle and Preston	Faster station approaches; added capacity
	Penrith	Possible high-speed cut-off
	HSR avoiding Oxenholme-Lancaster	Saves c14 minutes
	Wigan-Crewe either HS2 Phase 2b or Route upgrade	Saves 2–5 minutes
	ETCS re-signalling Crewe northwards	Added capacity
East Coast corridor	Edinburgh Waverley and Newcastle Central extra (400m) platforms	400m platforms; fast line approaches
	HSR Mid-East Lothian	Added capacity
	Dynamic freight loops north of Newcastle	Added freight capacity and performance
	Fully segregated freight lines Peterborough-Newcastle	Can also support new local rail passenger services
	Improvements to York and Darlington stations and their approaches	Added capacity
Other areas	Electrification of Felixstowe-Nuneaton and Basingstoke-Nuneaton (for Southampton) strategic freight routes	To provide electrified routes from ports to distribution centres
	In Scotland, electrification of main lines northwards from central belt to Stirling/Perth/Inverness and Dundee/Aberdeen	To support cross-border high-speed service extensions
	Borders railway completion	To support new regional services and enhance connectivity
	Improvements to Cumbrian Coast line and electrification Barrow-Carnforth and Windermere-Oxenholme	To support new through services
	Provision for new 'Port Road'	If SW Scotland- Northern Ireland tunnel proceeds

This programme needs strategic oversight from High Speed North. It doesn't represent an end-state, and following its completion, it should be possible to make further incremental improvements that will secure the 3h travel time goals between London and Glasgow/Edinburgh.

Annex 1: North of England-Scotland Greengauge 21 Survey Questionnaire Respondents

Blackpool Council
Centro
Cheshire and Warrington LEP
Cheshire West and Chester Council
Durham County Council
Eastern Network Partnership*
Glasgow City Council
Greater Manchester Chamber of Commerce
Institute of Directors North West
Merseytravel
Metro
Nexus
North and Western Lancashire Chamber of Commerce
North Cheshire Rail Users' Group and Wirral Transport Users' Association
North East Chamber of Commerce
North Yorkshire County Council
Sheffield City Region
Warrington Chamber of Commerce

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*The Eastern Network Partnership comprises: SYPTE (representing the Integrated Transport Authority and Sheffield City Region Local Enterprise Partnership), Metro, Tees Valley, Derby City Council, Derbyshire County Council, Nottingham County Council, Nottingham City Council, Leeds Chamber of Commerce, East Midlands Councils, North Eastern LEP and Tyne & Wear ITA.

High-Speed Rail and Scotland

A report by *Greengauge 21*
Commissioned by *High-Speed Rail Group*

May 2020