Transport Scotland Input to Oakervee Review of HS2

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The Scottish Government is supportive of High Speed Rail and recognises the significant economic benefit that this will bring to the whole of the UK, including Scotland, through improved connectivity.

September 2019

Key Points Summary

Phase 1 and Phase 2a

Merge into a single project, deliver as planned, in full as soon as possible. Additional cost of redesign, etc. would likely outweigh any savings.

Phase 2b

Change station design for through running to increase benefit from improved connectivity and reduced congestion in the south.

Interoperability

An Interoperable HS2 design is essential for connectivity and legal compliance.

Design Speed

The additional cost of redesigning Phases 1, 2a and 2b for reduced capability would likely outweigh any savings. Future high speed rail initiatives may realise short term cost saving from less capable vertical alignment but horizontal alignment capability should be preserved for future proofing.

Alternative Standards

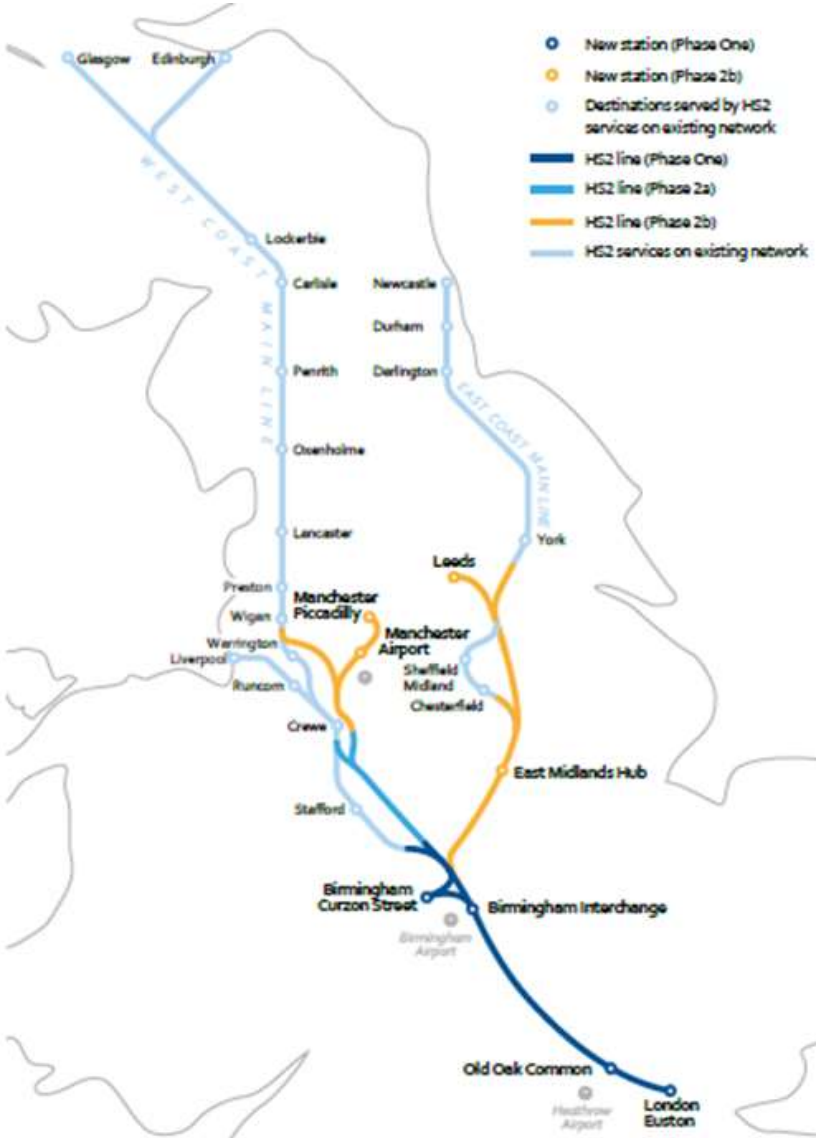
Phases 1, 2a and 2b have already been designed and the additional cost of redesign to alternative standards would likely outweigh any savings. Using alternative design standards could reduce cost of future high speed routes.

Carbon Reduction Achieved from Modal Shift

Scotland's inclusion improves the business case by encouraging air to rail modal shift.

Economic Vitality

Improved connectivity and journey times will necessarily improve economic geography and ensure that economic benefits are delivered more widely and reduce issues and perceptions of peripherality.



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HS2 Phase 1

<u>London to Birmingham</u>

Phase 1 is under construction. Change at this late stage would generate additional costs for design, land purchase cost and compensation, reopen consultation and because of the enshrined delay add construction inflation. It should be delivered as planned, in full, and expeditiously.

<u>London Euston</u>

Even a temporary pause in construction would add significant construction inflation to the overall cost, increase the duration of disruption and prevent early benefit being gained from a city centre stop.

<u>Old Oak Common</u>

Temporarily terminating trains at Old Oak Common may ease cash flow but would significantly add to the overall cost of Phase 1.

There is a considerable difference to what is required for a through station where trains only pause for a few minutes before moving on and a terminus station where trains may lay over for 30 minutes or more.

Redesigning Old Oak Common as a temporary terminus would require train crew accommodation, and facilities to clean, restock, refill water tanks, etc. for the return journey and either significantly more platforms or a significant number of 400 m plus turn-back sidings. This costly and abortive additional provision would have to be abandoned or removed after only a few years of use, at even more cost, when services are extended to London Euston.

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HS2 Phase 2a

Lichfield to Crewe

The section between Lichfield and Crewe has already been designed and is imminently expected to receive Royal Assent. Detailed design and construction should proceed without delay and be delivered as planned, in full, and as quickly as possible to realise early benefit.

Merging HS2 Phase 1 and Phase 2a into a single project should realise some cost saving and would be a powerful statement of intent of delivering benefits beyond the West Midlands

Consideration ought to be given to a design modification that will retain the intermediate connection near Lichfield as it will provide flexibility and be a valuable diversionary route during perturbed operation, however since its use will now be occasional, rather than intensive, it could perhaps be de-scoped to reduce cost.

Crewe Station

The Crewe hub station interchange will provide wide connectivity with the existing rail network, including north Wales, and extend the benefits of high speed rail.

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HS2 Phase 2b

HS2, as proposed, is good at connecting London with the north but is less so in connecting intermediate cities with each other. The majority of HS2 services from London will run to terminus rather than through stations, which unfortunately has the consequence of increasing the demand for paths on the congested trunk section between London and Birmingham High Speed Rail Junction. A modest addition to Phase 2b of a new 225 kph capable line between Manchester and Leeds, as promoted by Northern Powerhouse Rail, would enable HS2 to work much better as a network and deliver additional benefit from the improved connectivity.

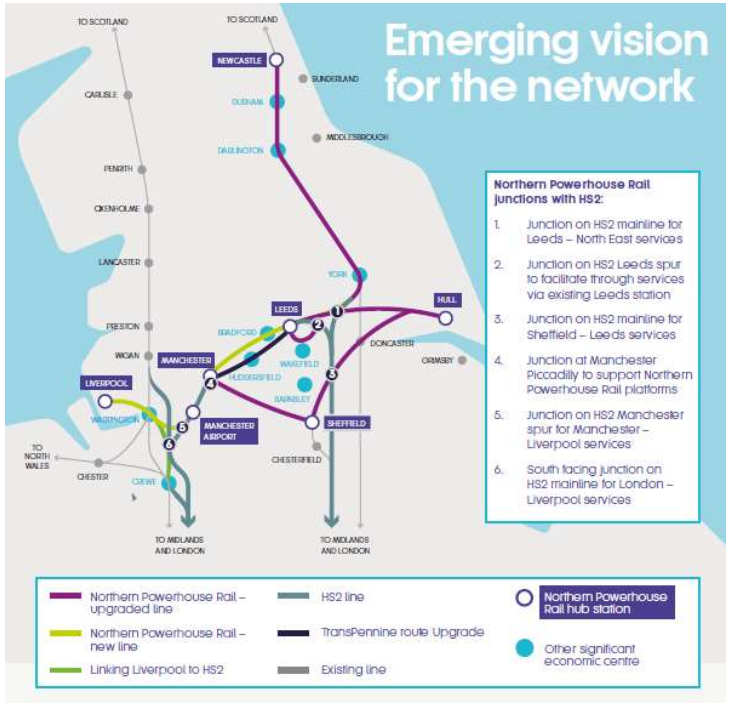
Crewe to Manchester

If the HS2 Manchester terminus was redesigned as a through station, HS2 services could continue on to Leeds, with an intermediate stop at Bradford thus bringing another city onto the high speed network. The benefits for Manchester would be increased since the improved connectivity would flow in two directions rather than just from the south. It would also reduce the number of platforms and facilities that would otherwise have been required to turn-around and service terminating trains as these would run through with only a few minutes dwell time, which could reduce design and implementation costs and reduce operational impacts.

Birmingham to Leeds

If the HS2 Leeds terminus station was also redesigned as a through station, the benefits for Leeds would be increased since the improved connectivity would flow from the west and north in addition to the south. Such a redesign would deliver similar benefits to those described in relation to Manchester.

A through station would enable at least some of the HS2 services to Newcastle to have an intermediate stop at Leeds could reduce the quantum of separate London to Leeds services reducing the overall number of trains on the congested section between London and Birmingham high speed junction.



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Circular Route Option

HS2 services from London could run through Manchester to Leeds and on to London via the East Midlands. Interoperable double decker rolling stock could be used do meet the high demand on this core route and reduce the overall number of trains on the congested section between London Euston and Birmingham high speed junction.

Liverpool to Hull and Newcastle/Edinburgh

Class 800/2 rolling stock could share the new track between Manchester and Leeds with much reduced journey time and increased benefit.

Interoperability

The priority is completion of HS2, however the long term capability of connecting to HS1 and the European rail network must not be prevented. HS1 infrastructure and rolling stock is already fully interoperable with the European rail network, enabling through running and lower cost rolling stock.

In the medium to long term a direct non-stop high speed rail journey time from Birmingham to Brussels could be as little as 2½ hours and Birmingham to Paris as little as 3 hours.

Platform Height

Despite being otherwise fully interoperable, the bespoke 1150 mm platform height being specified for HS2 infrastructure (and HS2 rolling stock) is not compatible with the European high speed network which has an Interoperable 760 mm platform height. A bespoke 1150 mm platform height is also contrary to the requirement imposed by the Railways (Interoperability) Regulations which require all completely new rail infrastructure and rolling stock to comply with the European Technical Specifications for Interoperability. This requirement is likely to remain in force post Brexit since the revised Railways (Interoperability) Regulations will still require compliance with Technical Specifications for Interoperability and close alignment with Europe. HS2's platform design should therefore be changed to be fully Interoperable.

Future Proofing

A bespoke 1150 mm platform height is unlikely to be reversible at a later date as the cost and disruption of altering every HS2 platform on the network and train door height on the whole fleet, literally overnight, would be prohibitive.

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Accessibility

A bespoke 1150 mm platform height may improve accessibility but it would restrict future ability to operate double decker trains on HS2 Infrastructure between London, Birmingham, Manchester and Leeds to meet growing demand. An Interoperable 760 mm platform height provides level access to the lower deck of double decker trains for passengers with reduced mobility, whilst those who are able to can use the internal stairs to access the upper deck.

An HS2 double decker train with a bespoke 1150 mm external door height would require internal stairs to access both the lower and upper deck, and therefore be inaccessible for some disabled passengers.

Design Speed

Phases 1, 2a and 2b

A Transport Scotland study identified a modest 8% cost differential between a 300 kph and 400 kph capable route. Since HS2 Phase 1, 2a and 2b alignments have already been designed; the cost of redesigning these to a lesser capability, purchasing additional land, reopening the public consultation and especially the significant construction inflation arising from the added delay would likely be more than the relatively small saving that would be realised from the reduced specification. The lesser capability would also realise less benefit worsening the BCR.

Future high speed rail initiatives

The preference is that these should be designed for 400 kph. As an absolute minimum a 400 kph horizontal alignment should be protected as the cost of changing this at a later date would be prohibitive. Designing the vertical alignment, including vertical curves, for 320 kph (200 mph) capability may realise some modest cost savings in the short term from being able to follow the terrain more closely. This would also future proof the route for enhanced rolling stock design and would not prevent gradients, vertical curves and structures from being altered at a later date should there be a demand for further reductions in journey time. As most of a route is not constrained by topography, the savings are likely to be small and the cost of future upgrade disproportionately high.

Benchmarking with European Practice

Recent and current European high speed railways have a 320 kph (200 mph) operating speed, e.g. the Paris to Strasbourg high speed line, and have been tested for a 10% higher capability. This should be the absolute minimum to which any new high speed rail initiatives aspires.

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Future Proofing

Given that the high speed route alignment could be laid down for 200 years or more it is essential to consider some future proofing. Would the ECML between London and Edinburgh still be contributing so much to the economic prosperity of the UK if it had merely been built to the 30 mph capability of the trains at the time of design? No, the cost of the initial route alignment would have been largely abortive as it would probably have been abandoned after only a few tens of years of operation and a new route built at a considerably higher cost.

Alternative Design Standards

Case Study 1

A Transport Scotland study identified that it could be possible to reduce the construction cost of high speed railways by between **11%** and **42%** by using alternative standards and also taking more account of the underlying geology when designing earthworks. This applies to new routes; since HS2 Phases 1, 2a and 2b have already been designed, savings from a design change are only likely to be realised in areas of significantly challenging terrain.

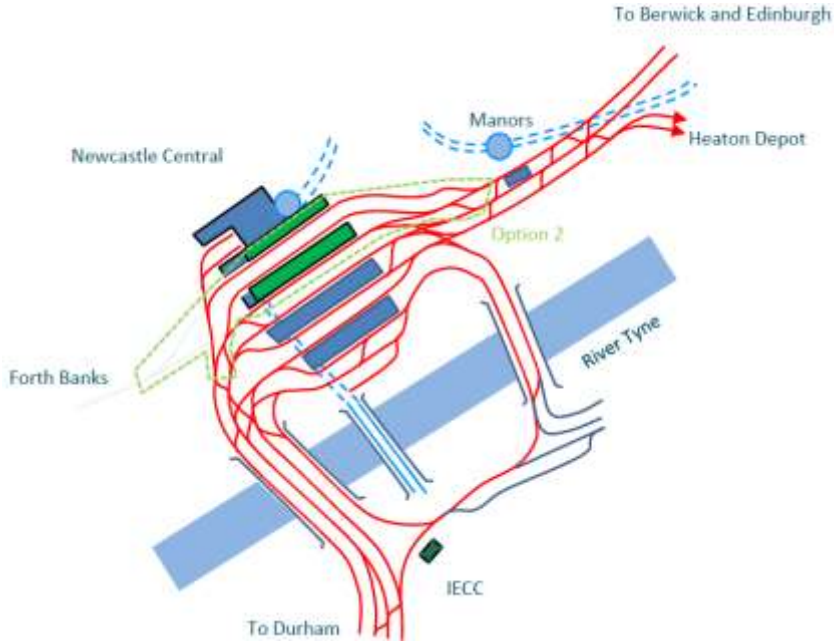
Case Study 2

Transport Scotland has developed plans that facilitate cost reduction where high speed services are only operated by Classic Compatible rolling stock. New high speed lines are connected to the existing network at the outskirts of cities to access existing stations where capacity exists and the risk to operational resilience is acceptable.

Case Study 3

One of the barriers to extending HS2 services beyond Newcastle was the prohibitive cost of increasing the capacity of Newcastle Station to accommodate 400 m long trains, which would be an essential part of meeting on-board demand for London to Edinburgh via Newcastle HS2 services.

Transport Scotland challenged the established view that this could only be achieved by constructing an underground concourse, similar to London Bridge station, and commissioned a study to identify options for accessing two or more 400 m long platforms by an extended/new footbridge. The identified solution was approximately **80%** less than the perceived cost of the alternative.



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Case Study 4

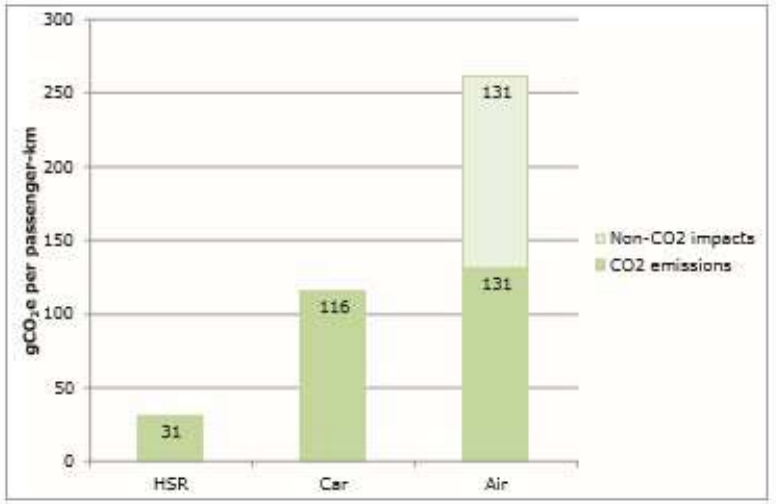
Transport Scotland promoted a solution to split and join high speed trains at Carlisle rather than Carstairs, as had been planned. An HS2 Ltd study has been confirmed that this would improve operations and could be implemented at a more economically advantageous cost which did not involve the time consuming upgrade of Carstairs Junction.

Carbon Reduction

The current UK Government target is to reduce carbon emissions by 80% by 2050, which is expected to be revised to a new, much tougher goal of net zero greenhouse gases by 2050.

Greengauge21 suggests that the first phase of HS2 alone would deliver a saving of 0.6 million tonnes of CO2 emissions over 60 years and a similar amount from phase 2. Their research suggests that these projected emissions savings could be quadrupled if Government put in place a wider package of policies to capture the full carbon benefit that HS2 could deliver.

Carbon emissions from High Speed Rail travel is estimated to be 73% lower than an equivalent journey by car and on average 76% lower than an equivalent journey by air.



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KLM Case Study

The Railway Gazette reports that KLM Royal Dutch Airlines is to replace one of its five daily flights between Brussels and Amsterdam Schiphol with reserved seat capacity on a Thalys high speed train https://www.railwaygazette.com/high-speed/klm-replaces-plane-with-high-speed-train/54577.article. KLM said it was in favour of replacing short-haul flights with rail 'as long as trains fully match the speed, reliability and comfort that air travel offers' and enable available airport slots to be used for flights to long-haul destinations. It should be noted that the service operates a guaranteed rail/air booking system.

This suggests that reserved seat capacity on HS2 services could also be used by airlines serving Manchester, Birmingham and perhaps Heathrow via Old Oak Common as a replacement for interlining on short haul flights.

Image reproduced from Railway Gazette

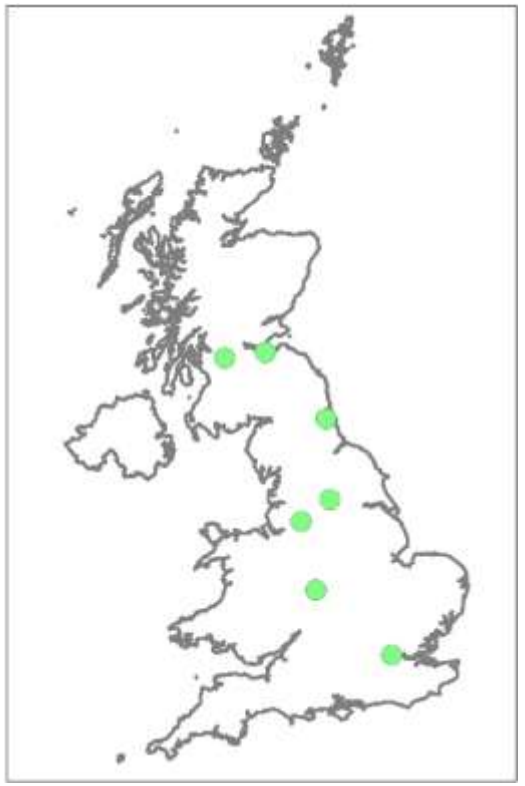
Economic Vitality

The Scottish Government recognises the importance of improved connectivity and the need to ensure that Scotland is at the heart, and an integral part, of a truly national rail network. The prosperity of the UK will be greater if economic growth is balanced across the whole of the UK and not just concentrated in the southern half of England that struggles to grow fast enough to meet that demand. If the high speed rail network is not extended to the north of England and into Scotland with the resultant improvements in connectivity and journey time, the relative peripherality of these northern regions will increase as journey times between the major cities in the south of England are substantially reduced by HS2 Phases 1 and 2.

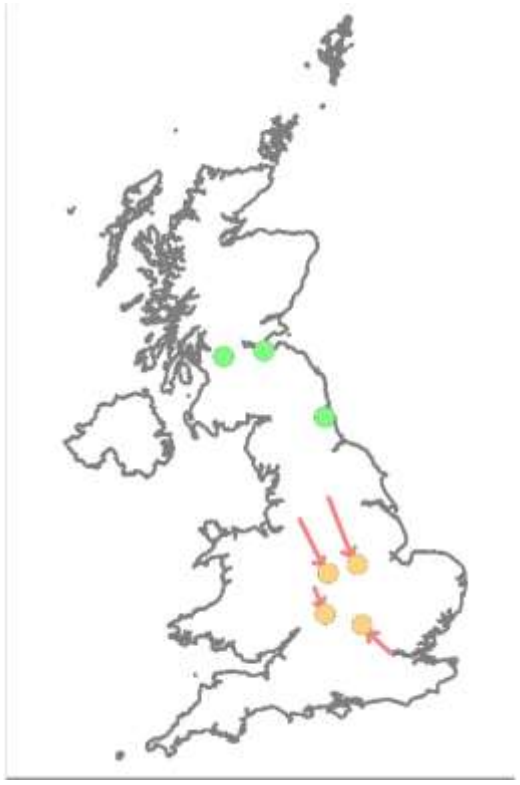
Building an additional two track railway between London, Birmingham, Manchester and Leeds is an essential means of creating a substantial increase in capacity and connectivity between these great cities in order to realise the latent economic growth that is being held back from a lack of network capacity. It is no different in the north of the country where economic growth is also being held back by insufficient network capacity, perhaps more so considering historic lack of investment in new infrastructure.

<u>North of HS2 to Scotland Working Group</u>

The DfT, Transport Scotland, HS2 Ltd and Network Rail have been working together in a very effective partnership over the past three years to deliver the joint UK and Scottish Government commitment to improve capacity and connectivity on the routes between England and Scotland. The shared target is a 3 hour journey time between London and both Glasgow/Edinburgh with improved connectivity between the intermediate towns and cities.



Cities – Actual Location



Cities – Virtual Location post HS2 Phases 1&2

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Feasibility Studies and Business Case

East Coast

Congestion on the ECML limits growth of local, regional and long distance traffic which cannot be met without new infrastructure. The Working Group confirmed that it would be feasible to incrementally construct a new line between the outskirts of Newcastle and Edinburgh that would increase capacity and halve journey time to 45 minutes, enabling the two cities to work much more effectively as a city pair.

West Coast

Congestion on the WCML similarly limits growth of local, regional and long distance traffic which cannot be met without new infrastructure. The Working Group confirmed the feasibility of a new line between ***"Redacted Text"*** and ***"Redacted Text"*** and also between Carstairs and the outskirts of Glasgow to increase capacity. Collectively these two options would reduce the journey time from London to Glasgow by between 22 and 27 minutes to as little as 3 hours and 10 minutes depending on the option chosen.

Benchmark

Transport Scotland has commissioned a Benchmarking Study which will review the larger cost drivers for constructing high speed railways in a UK environment and compare these with international practice.

Business Case

Outputs from the various Transport Scotland and DfT commissions will inform a business case which will be presented to Ministers in due course for consideration in the light of their 2016 joint commitment.

"Redacted image"

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The Message

Connectivity is what Railways are about; collectively delivered by an integrated network of branch, suburban, regional, intercity and high speed lines. HS2 will become an inseparable part of that integrated rail network, but that message appears to have been lost and HS2 is promoted and reported in the media as a completely separate entity.

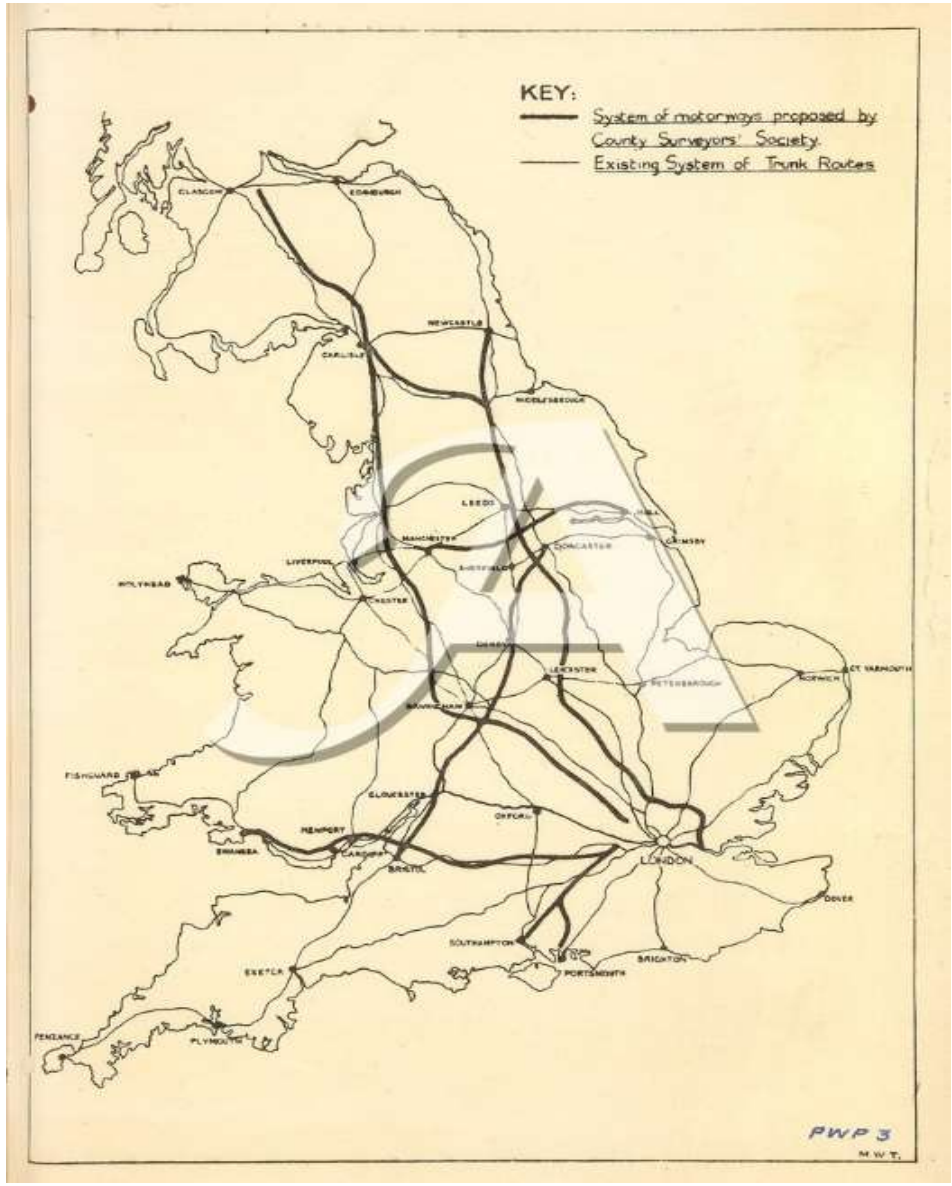
Motorway Network

The UK's motorway network was initially promoted as an aspirational network by the Ministry of War Transport in 1946, based on the system of motorways proposed by the County Surveyors in 1943. The aspirational network was promoted as something that would be built incrementally without commitment of when it would be completed or at what cost. Each individual part of the construction being undertaken of course had a business case, planned budget and projected completion date at the time it was taken forward.

Aspirational High Speed Rail Network

Similarly a future aspirational UK-wide high speed rail network that met the projected needs of the whole of the UK could be promoted without obligation, commitment or cost projection. The individual component high speed lines could then be taken forward, according to need, with their individual business cases, budgets and timescales to gradually build up the Aspirational High Speed Rail Network through a Rail Development Pipeline Process.

Such an overall development framework would aid future planning; reduce isolated, and sometimes conflicting development and enable future transport corridors to be reserved rather than being lost or require controversial compulsory purchase of recent developments.



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CAB 87/3 - Proposed motorway system for England and Wales 1943