A strategy for a High Speed Rail network in Britain – why do we want one?

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John Segal | 5 October 2009

SYSTRA

mvaconsultancy

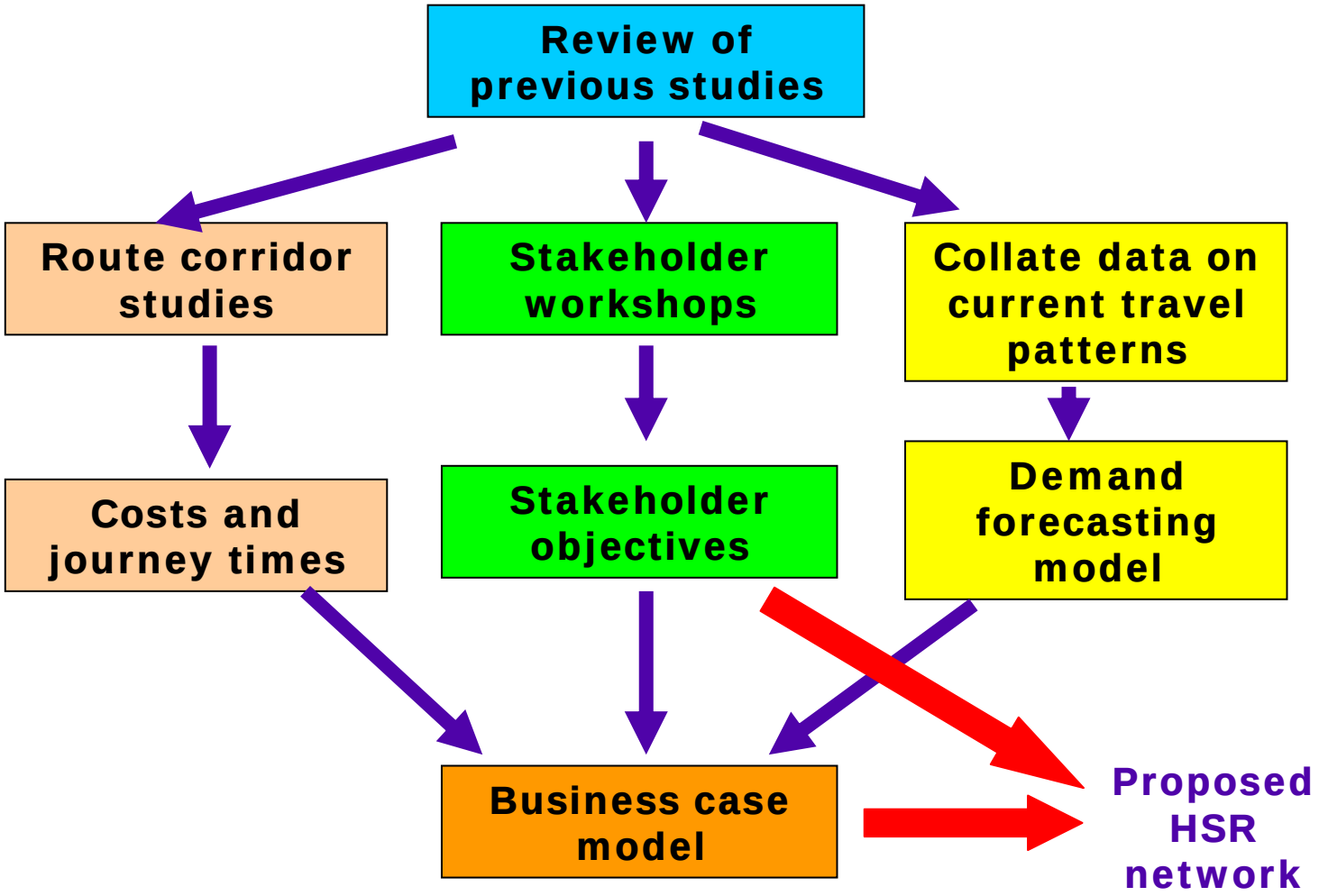
The objectives of a High Speed Rail network are not always obvious

- This paper is as much about these objectives: what we should be seeking to achieve – as about what a network would look like
- It is based on a study by SYSTRA and MVA Consultancy for Greengauge 21
- Greengauge 21 is a Limited Company that formed a Public Interest Group of interested stakeholders, including many UK Regional Development Agencies, Cities, Rail and other transport operators, with government observing
- The study sought to develop a strategy for a High Speed Rail network in Britain; it was undertaken in parallel with a study by Network Rail considering the need for new lines (essentially on rail capacity grounds) and a study by government on the route of a first high speed rail London from London – Birmingham – Manchester
- Other consultancies undertook studies into funding of a network and public consultation / market research
- This presentation represents the views of the author and not necessarily those of Greengauge 21

What will I cover in this presentation?

- A brief overview of the project
- Review of the findings from previous studies
- The guiding principles for a High Speed Rail Network in Britain
- How were the different networks appraised?
  - Route selection and costing
  - Demand forecasting methodology
  - Business case – key criteria
- Conclusions drawn
- Impacts of HSR, including Wider Economic Benefits
- What should a network look like?

How did we undertake the project?



What did we learn from previous studies?

- Increasing rail capacity was a primary objective
- Economic regeneration of regions and cities increasingly important; but this is not automatic:
  - needs stations in city centres or other locations where economic activity can be generated
  - needs complementary planning of economic activity
  - risk of abstracting from a locality to the main centre – increased long distance commuting
- (Public transport) access to stations very important
- Integration with existing rail network seen as important where possible – through operation
- Technical standards on gauge, train length, gradients, curvature, etc established
- Line capacity established as 15 trains per hour; but can reduce with junctions and stations
- Intermediate stops cost about 10 mins and impact on line capacity

What did stakeholders tell us they wanted a High Speed Rail network to deliver?

We defined a set of Guiding Principles:

- **Provide additional transport capacity – long distance routes and also access to cities**
- **Stimulate local economies in a sustainable way**
- **Address whole journey to make HSR attractive lower carbon alternative to car**
- **Achieve modal switch from air to reduce carbon impacts**
- **An integrated part of whole transport network with phased delivery to maximise both overall value and spread of benefits across the nation (geographically and socially)**

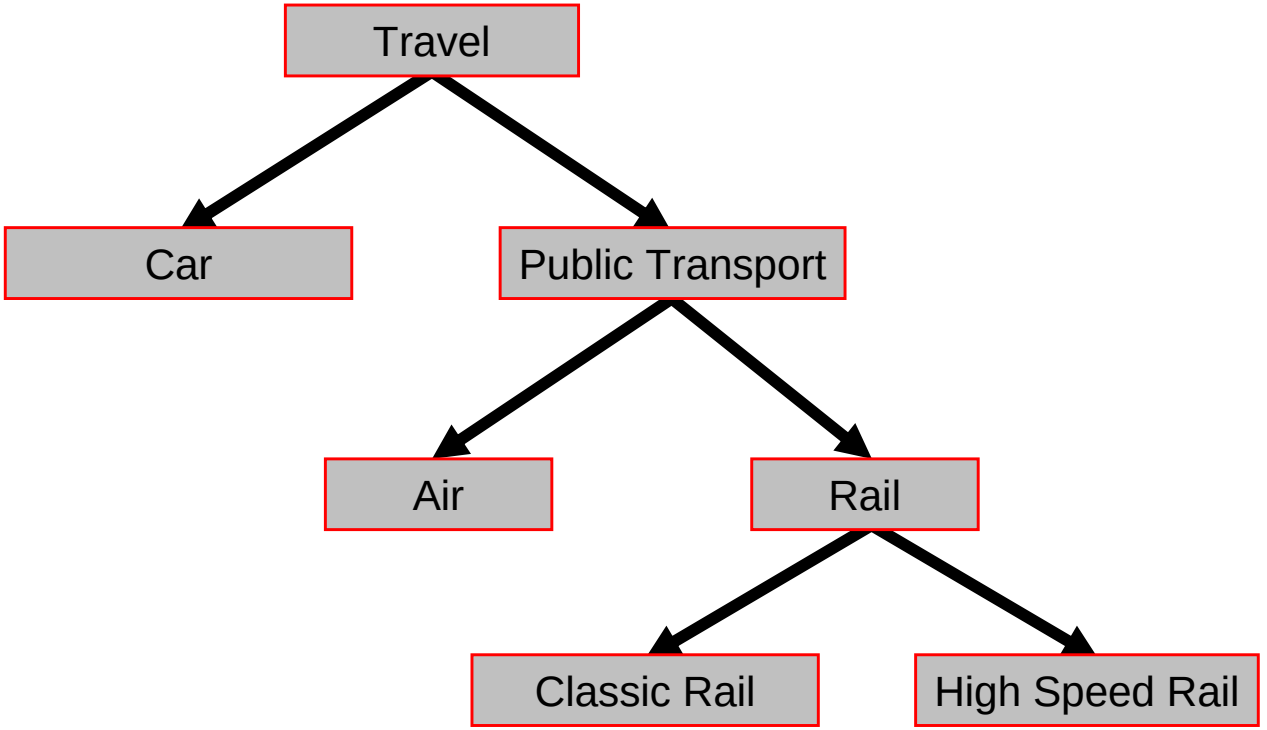
Route selection and costing

Study did not design specific routes: higher level

- **Needed outline route to establish feasibility, estimate journey times and indicative costs**
- **Specifically considered access to cities and potential sites for stations**
- **Indicative length of tunnels and other major structures**
- **Infrastructure costs based on UK experience of HS1 (Channel Tunnel Rail Link) and of experience elsewhere in Europe**
- **Operating costs of infrastructure, train services, etc also calculated**
- **No decision or recommendation on institutional arrangements**

Demand forecasting addressed specific issues relevant to High Speed Rail

- Rail, air, car – coach only considered in context of access to Heathrow
- Zoning system focused around city centres (and other attractors) to reflect the very different competitive situations



- Considered some elements of demand captive to specific modes
- Generated demand would not travel in absence of HSR

Calibrating and Validating the Forecasting Model

The model is calibrated to ensure:

- **Current mode shares are accurately reproduced**
- **Sensitivity to change in cost and time of rail and other modes**

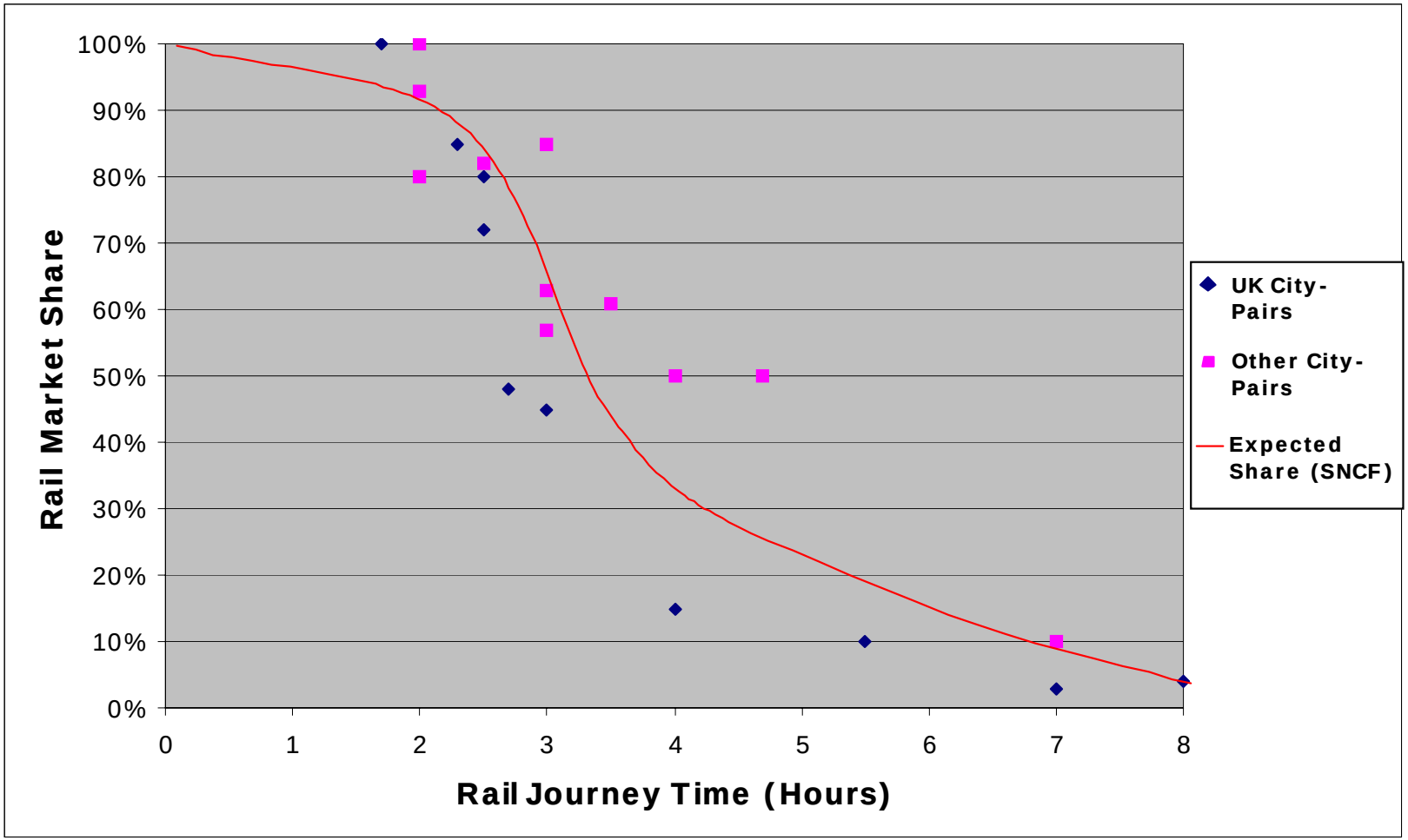
Base data from:

- **Rail ticket data, with National Rail Travel Survey (NRTS) to provide journey purpose and actual origin / destination**
- **Air flows and survey data to provide point to point vs interlining and actual origin / destination (both from Civil Aviation Authority (CAA)) – also provided coach data to Heathrow**
- **Car data from National Transport Model**

Elasticities and sensitivities from:

- **Passenger Demand Forecasting Handbook**
- **Air / rail mode shares from well established graph**

Air / rail mode share



The mode share between air and rail depends principally on the rail journey time; there is little difference in air time

Appraising the networks against multiple objectives

Business case model

- Demand and revenue
- Costs
- User benefits
- Non-user benefits (eg decreased highway congestion)
- Carbon impacts
- Wider Impacts (WEBs); including land use impacts

Provides NATA/WebTAG (UK Department for Transport) compliant appraisal

How do the benefits accrue to the regions?

What is match with the Guiding Principles?

The Cities and Regions are very interested in the economic impacts

These were assessed by:

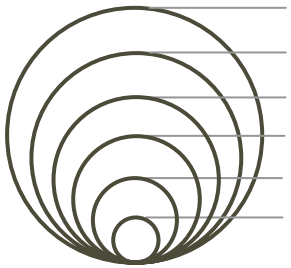
- **Allocating the user benefits to the regions between which they occurred**
- **Calculating the Wider Economic Benefits (agglomeration, improved competition, etc); this was estimated by:**
  - **Estimating the change in average accessibility from each of a number of small zones, based on the weighted average generalised cost from the zone to all destinations**
  - **Using a land use interaction model (DELTA from David Simmonds Consultancy) to estimate the effect on employment**
  - **Inputting the changes in employment and average accessibility into a model to calculate the wider Impacts according to DfT guidelines**
  - **Benefits were then allocated to regions**
- **WEBs were typically about 20% of journey time benefits**

Regional Economic Benefits

Total regional economic benefits
(Present Value over 60 years)

- £0 - £1,000m
- £1,001m – £2,000m
- £2,001m - £5,000m
- £5,0001m – 10,000m
- £10,001m - £20,000m
- £20,001m - £30,000m

Wider Impacts
(Present Value over 60 years)



- £5,000m
- £4,000m
- £3,000m
- £2,000m
- £1,000m
- £500m

Key conclusions (1)

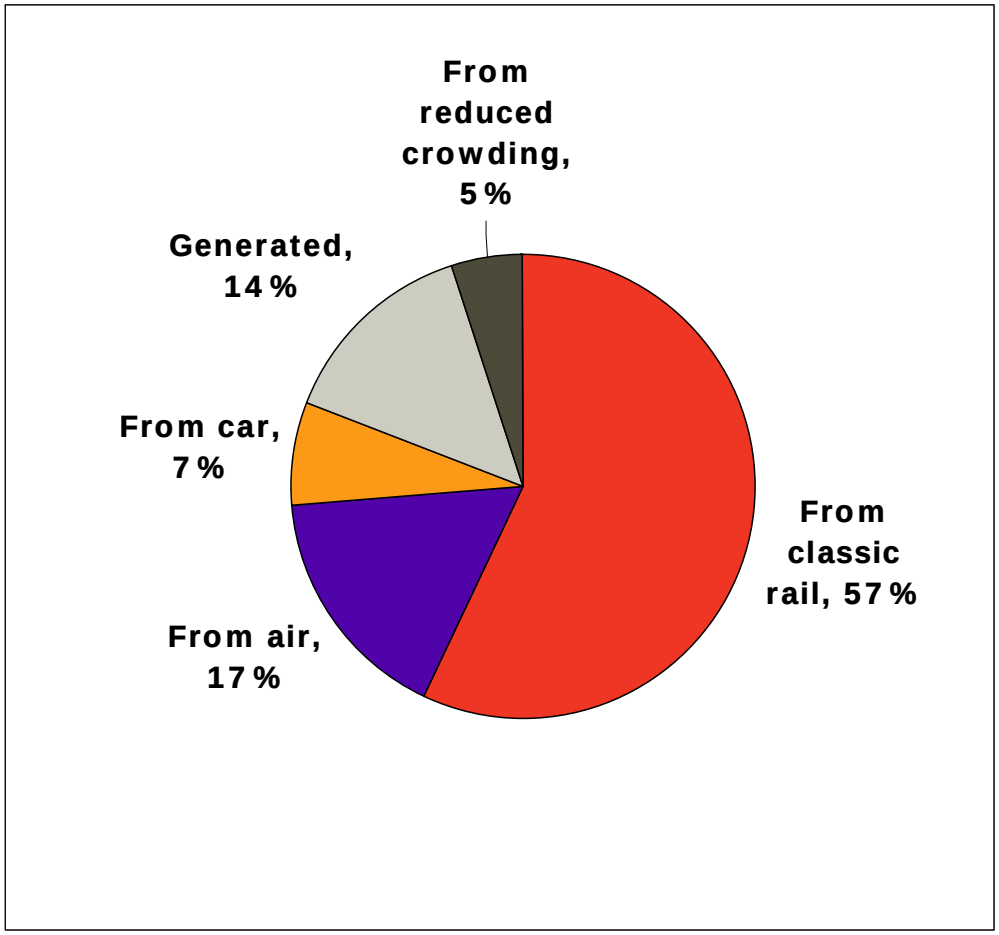
- High speed trains should operate beyond a core network onto the classic network in many cases
- But a core high speed network can take larger trains – 400m long and double deck
- Stations need to be in city centres to provide good (public transport) access and to reinforce economic planning policy
- There may be role for specific 'Parkway' stations provided they have good public transport access as well – airports provide good locations
- HSR can release capacity on existing Intercity trains, and also for local trains (commuters) and inter-regional
- Freight can utilise some of released capacity – particularly on West Coast route,
- The total demand for high speed rail north of London is likely to exceed capacity of single line by about 2040
- Two 2-track routes are likely to give greater benefits in comparison to cost than a single 4-track route

Key conclusions (2)

- Strongest case for initial route is London – Birmingham – Manchester
- The extension to Scotland is particularly strong, given the ability to abstract from air
- East Coast route to Leeds and Newcastle needed for capacity and journey time reasons
- Case for extending this route to Scotland rests on mix of HS West Coast capacity and connections between Scotland and eastern England
- Heathrow worth serving (as airport and transport hub for west London and surrounding area)
  - should not be on route between London and Birmingham because of impact on journey time and capacity
  - should be used as opportunity to provide through services to destination south
  - attractive service frequency to abstract air interlining market
- South West and Wales can probably best be served by partial upgrade to existing route rather than full HSR
- Link to Channel tunnel worthwhile if it can be provided at reasonable cost

Impact of HSR network

178m HSR trips in 2055



£69 bn infrastructure cost

£2.6 bn pa increase in rail OPEX

£4.6 bn pa increase in rail revenue

2.7 bn car-km removed pa

0.4 bn HGV-km removed pa

18 bn air pass km removed pa

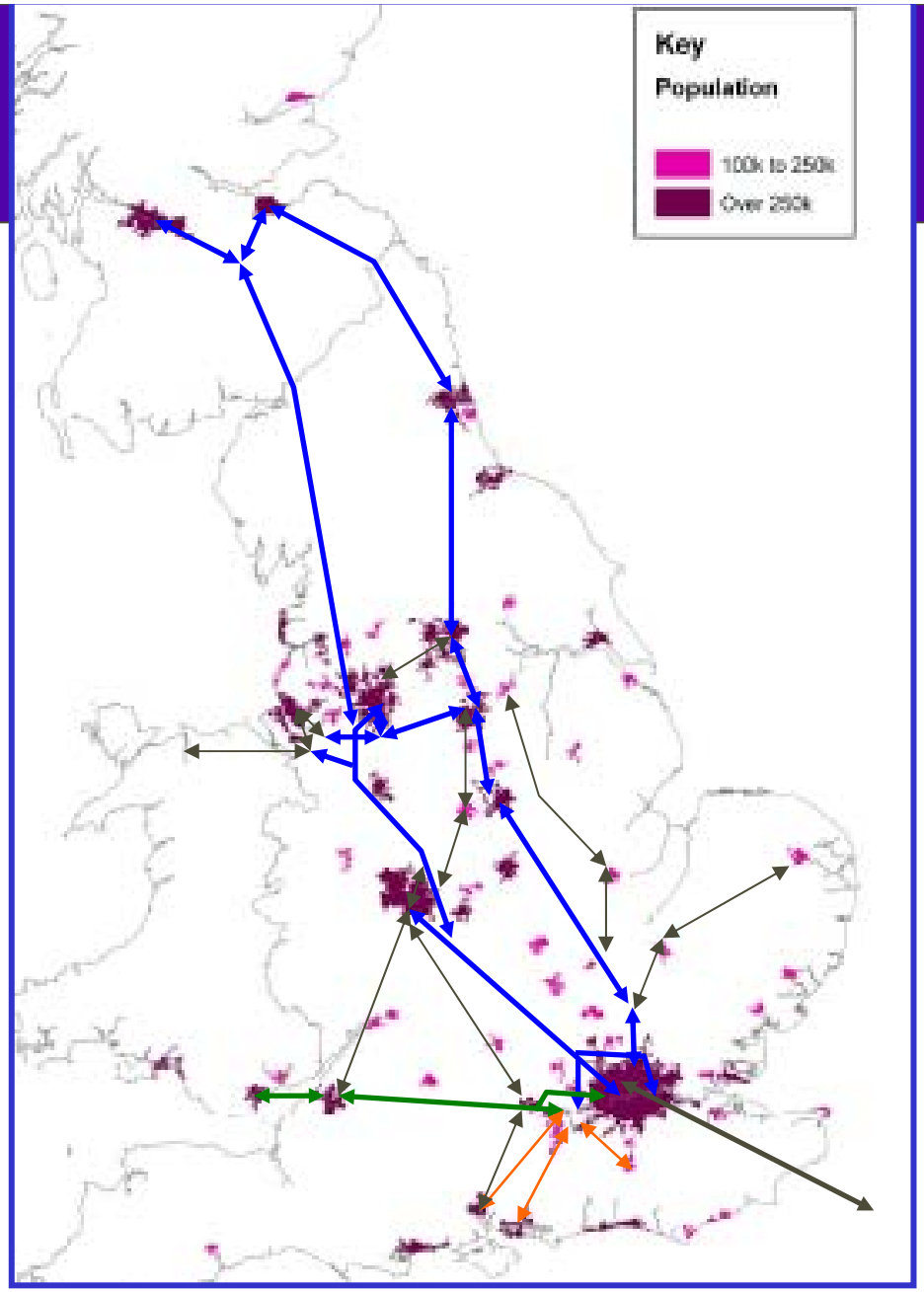
1 m tonnes of CO_2 pa saved

£89 bn NPV user & non-user benefits

3.5:1 BCR public sector funding

£11 bn NPV Wider economic benefits

Possible High Speed Rail Network



- Core HS routes
- S West and S Wales
- HS-CT
- LHR links to South England
- HS services on classic tracks

- **High capacity HSR trains operate on core network**
- **GB gauge trains operate over upgraded lines and on extensions**

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