National Infrastructure Assessment

Consultation

February 2017

GREENGAUGE21

Overview

Greengauge 21 is delighted to respond to the Commission's call for evidence to provide input into the development of its National Infrastructure Assessment that will set the Commission's position on long-term infrastructure needs over a 30-year time horizon.

We provide evidence to support the following contention: the creation of a truly national high-speed rail (HSR) network is the most important and valuable of candidate transport programmes and it is the investment best-placed to meet the National Infrastructure Commission's objectives, which are:

i. to support sustainable economic growth across all regions of the UK
ii. to improve competitiveness
iii. to improve quality of life.

Private sector developments are signs of economic confidence. Built around the transformation in travel opportunities that HSR can bring – they are already arising in 'the provinces' – not the capital.

The advantage of a truly national strategy for HSR will be that such effects can be spread more widely and inclusively across the nation.

The strategic aim is to bring to the whole of the nation – as appropriate and affordable – the connectivity and capacity gains to rail that HSR provides. This means that the national strategy should be thought of as being an inter-city or inter-regional rail strategy including – but not restricted to – new-build HSR, and with explicit consideration given to improving connectivity to places that are often regarded as peripheral or second tier. The strategy would focus on the outputs of HSR, in terms of services (which should precede considerations of infrastructure) and enhanced connectivity and capacity, with a central focus on the relative merits of upgrade and new-build and combinations thereof.

Despite the excellent progress being achieved in implementing HS2, the best value from high-speed rail is not yet being achieved. This is because its development is not set in the context of a longer term (2050) HSR plan at a national (UK) level. Businesses invest and economies prosper when they can see how current uncertainties – such as an outlook of ever-growing congestion and travel time unreliability – will be overcome.

The rail sector currently makes its plans through a set of detailed 5-year time horizon programmes. It will not duplicate effort if the NIC through its National Infrastructure Assessment sets out a long term (2050) vision for high-speed rail, including the implications for the existing rail network – which may include opportunities to save on expenditure on the existing network as well as how best to align it with HSR plans.

Background

Greengauge 21 has been guided since 2007 by its Public Interest Group. This group offers a means for local, regional and devolved public authorities to come together to help guide research and planning activities that Greengauge 21 undertakes. So we are in a good position to answer the NIC's call for evidence (possibly uniquely in relation to HSR and rail) at a national level (rather than on behalf of a particular city or region) and do so informed by the views and priorities of the English regions, cities and the devolved nations. We responded to an earlier NIC consultation on critical infrastructure challenges in London and the North in January 2016.

We note the National Infrastructure Commission's consultation guidance that we should exclude from consideration projects that are already in the pipeline. In the High Speed Rail context, what qualifies as 'in the pipeline' might itself be a discussion point but we have taken it to include HS2 Phase 1 (as it is expected to be defined though Royal Assent to its Parliamentary Bill early this year) and HS2 Phase 2A – the extension of Phase 1 to Crewe (for which a new Parliamentary Bill is expected to be deposited later in 2017).

We provide responses to Questions 1–15 and we have devoted most attention to the questions that relate to need (which we discuss in relation to the NIC's three core objectives) and those which relate to a national strategy and programme for HSR (as distinct from progressing any specific project), which we believe is important to facilitate the wider economic benefits that HSR can bring. And given the importance of transport to the wider objectives of the NIC, we have responded to the cross-cutting questions that the NIC has set, as well as those specifically concerned with transport.

The inter-relation between infrastructure investment in transport and other sectors

Greengauge 21 has identified the opportunity to use HSR infrastructure to address challenges in related infrastructure areas of interest to the Commission – specifically digital communications, energy and water networks, and flood risk management.

These inter-relations and opportunities were first noted in the **Greengauge 21 Manifesto** for high-speed rail of January 2006. It pointed to the scope for HSR infrastructure to be designed to accommodate adjoining provision for water transmission in order to meet the need for inter-regional (flood basin) water transfers, for example. We note too that HS2 Ltd has plans to explore fibre optics infrastructure for Phase 2.

We would point to a further example, which is the possibility of integrating plans for HSR to Scotland with the planned major multi-£bn electricity power grid upgrade investment across **Morecambe Bay**. This offers the opportunity for integration with a rail link that could reduce the relative isolation of Barrow-in-Furness and the Cumbrian Coastal communities; serve as a useful shortening of the route for nuclear industry fuel and energy sector construction traffic; benefit passenger rail connectivity; and provide a freight diversionary route for cross Anglo-Scottish border railfreight to create more high speed capacity on the West Coast Main Line across Cumbria, reducing the cost of cross border (Anglo-Scottish) high speed rail.

Another inter-relationship with the energy sector (and meeting climate change targets) should be mentioned. Our studies have shown that a crucial determinant of the carbon impact of high-speed rail is the extent to which electrical power generation has been de-carbonised. On the basis of current plans and performance in this regard, **we concluded** in 2012 that it could be appropriate to restrict operating speeds to 300km/h in the early years of HS2 operation. The faster electrical power generation is de-carbonised, the faster high-speed rail services can be operated.

Responses to the NIC's Cross-cutting questions

Q1. What are the highest value infrastructure investments that would support long term sustainable growth?

Infrastructure investment that best supports national long term sustainable growth in Britain has to:

- help overcome historic factors that have led to low productivity and substantial regional economic imbalances and large disparities in income levels
- take into account the likely changes brought about by Brexit (and give due consideration to other major policy shifts in trading partner nations and relationships)
- recognise that the nation has major short-comings in housing and health provision, and anticipate how these might be put right alongside the highest value infrastructure investments
- protect, nurture and enhance valued quality of life factors including social preferences and environmental conditions
- reinvigorate urban development – because of its agglomeration benefits and because to do otherwise in any significant growth scenarios will undo the adopted national pattern of rural protection/town planning and reduce the nation's food production capacity.

Few initiatives can address all of these requirements to any significant extent, but investment that allows people and freight to travel more speedily, safely and reliably – and with diminished adverse environmental impacts – between the major cities and all of the regions (and devolved nations) can do so. This is especially the case if, as a by-product of the new infrastructure needed, within-conurbation or city region transportation systems can be enhanced cost-effectively. For this reason, we contend that a high-speed rail programme should be considered as potentially the highest value infrastructure investment that supports long term sustainable growth across the nation as a whole.

Q2. How should infrastructure most effectively contribute to the UK's international competitiveness? What is the role of international gateways for passengers, freight and data in ensuring this?

The **UK's international competitiveness** has very often, in recent years, been discussed in terms of London's international competitiveness. London is the national 'HQ' for government, for tourism, for cultural attractions, for finance, for the new 'tech' sector, for retail, for business services, for property development… and of course it also has the major international gateways for air travel (for both passengers and freight), has its own major new container port, and is the only city with direct rail connections to continental Europe. No other developed country (city states aside) has **such a high concentration** of its key economic assets vested in a single location (supported by its surrounding wider south east England hinterland). London has it all.

It follows that to strengthen the UK's international competitiveness, it is necessary both to **protect the current strengths** of the capital and to **build the competitiveness** of the remainder of the country.

London is in danger of losing some of its attraction and, hence, competitiveness because of its very high house prices and a loss of some of its quality of life appeal, with intense pressure on its transportation systems (notwithstanding investment in Thameslink, the Overground and Crossrail) and increased risks to human health through air quality degradation, amongst other effects. And the economic risks associated with Brexit may fall disproportionately upon London should the borderless status of financial services be altered by changes in the regulatory environment.[1] [2]

Rather than continue with the current development model for the national capital (with land and development values progressively exploited to fund infrastructure), an approach which places more emphasis and value on quality of life alongside employment and population growth would help its competitiveness on a **per capita** basis. This would foster a greater emphasis on mixed development that reduces the demand for travel and would relieve unwanted intense development pressure within London and across its wide south east of England catchment.

This has the potential to be an entirely benign strategic market correction that would support what is best for London and would need to be seen in the context of wider policy for a more competitive UK.

The natural counterpart to such a change for London – reflected and implemented through Mayoral, pan-regional and LEP planning instruments – is infrastructure development that **generates demand in the other parts** of the UK. This is the key to reducing the cost of development and increasing productivity through the lower cost base available across the regions which continue to offer high quality of life, but suffer a 'graduate drain' to the south east and lack the connectivity which makes development

1. See Commons library briefing paper, **Brexit and financial services**
2. See Reuters news item **HSBC, UBS to shift 1,000 jobs each from UK in Brexit blow to London**

truly appealing. Strengthening and re-building international competitiveness will take different forms in each region, building on existing economic capabilities that are (or have the prospect of being) globally competitive[3]. This will require investment in skills and innovation as well as infrastructure.

Achieving this shift in spatial demand requires attention to the connectivity of cities and regions with London and – because connectivity between even relatively close regional cities is so poor – very much better connectivity within and between the UK's cities and regions[4]. Connectivity with London, unsurprisingly given its dominance across the economic sectors, is under intense capacity pressure and cannot be ignored. It is immensely important – all the more so as the function of the City and its financial service sector has to engage more directly, post-Brexit, with the challenge of national industrial regeneration as is being pursued through the new **National Industrial Strategy**.

The best way to achieve these connectivity enhancements is through a national HSR programme. The benefits to competitiveness need to be measured under scenarios which cover varying rates of progress in regional development as allowed for in the Nimrod model[5]. Assessments of transport investments need to measure productivity gains (including those from agglomeration benefits, such as wider labour markets and increased employment opportunities; from the ability to use time productively while travelling; from shorter and more reliable time spent making face to face business contacts; and from the opportunity that distributed development brings to reduce unemployment, achieve higher quality of life and a more balanced society).

Transport for the North[6] has highlighted a continuum of evidence that enhancing connectivity between city regions, within city regions and to international gateways and London needs to be an integral part of any strategy to accelerate economic growth. Over the last decade, Core Cities, the Northern Way, Eddington and the House of Commons Transport Committee have all come to this general policy prescription in exploring the links between transport and productivity growth.

The role of international gateways for passengers and freight is hugely important yet – in respect of ports and surface access to airports – remains largely untouched by national policy.

Brexit demands a new emphasis on international connectivity (and not just at Heathrow) as Britain seeks to strike new international trade agreements.

---

3. **The Independent Economic Review** carried out for Transport for the North (2016) provides a good model, and this approach is of course reflected in the new Government thinking on industrial strategy.

4. See the **HS2 Strategic Case 2015 update**; Tables 5 and 6 show the relative dominance of London flows for business travel (so Bath – London volumes are nearly twice the scale of the largest English city-city non London business travel flow (Manchester – Leeds)). And see Chapter 6 for an explanation of the knowledge-based industries that are most likely to drive productivity and economic growth and their relation to cities and to the connectivity gains that HSR brings.

5. See discussion of the Nimrod model in the **strategic analysis of the future of national infrastructure** published in the ICE proceedings February 2017.

6. Transport for the North. One North: A Proposition for an Inter Connected North. July 2014.

Taking ports policy first, it is time to seek a major shift in the role of Britain's ports and establish port facilities that will challenge and out-perform continental-based ports so that EU-level tariffs on non-EU trade can be avoided[7]. The level of investment this will entail should not be under-estimated. It will require the creation of not just larger ports, but also the development of port-centric logistics and much better port access transport, particularly by rail, given the container volumes involved. New linkages will also be needed between the major British points of entry and production/consumption centres (both nationally and abroad).

The capacity challenge at our major ports could be met by private sector investment, building on developments at Felixstowe, Southampton, London Gateway, Liverpool and elsewhere. And with west and east facing ports, the UK is very well placed to grow and reshape its maritime connectivity. But upscaling in the way described here, post-Brexit, will need a policy commitment from Government and incentives, perhaps in the form of enterprise zone and freeport status. Freeports offer warehouses in tax-free zones. Goods entering freeports are not subject to customs duties and goods sold are not subject to value added tax. No withholding tax is collected on capital gains, though sellers could be required to report to HMRC.

The challenge of congested surface access particularly by rail for the sustainable distribution of large volumes of containers also cannot be ignored, especially in those instances (such as London and Liverpool) where ports are located within very established major urban areas. The example of the Kennedy Tunnel in Antwerp and Dublin, which invested in a new port access road tunnel following a **strategic review started in 1992**, points a possible way forward. Otherwise the easiest strategy is for ports to grow away from centres and put development pressure on rural land around cities.

The major gap in the high gauge clearances needed for maritime container transport on the national rail network is east-west across the Pennines which can be resolved as part of Northern Powerhouse Rail. The bigger strategic challenge is lack of capacity, especially where long distance passenger and local and regional services and freight are all competing for space on the strategic network – and this includes on HS1. A comprehensive examination of how railfreight might develop in the post-Brexit world is needed. This needs to cover volumes, time criticality and routings and include consideration of a switch to electric haulage, alternative routes, suitable full length freight loops, three/four-tracking as well as off-line bypasses – as well as an examination of the way that high-speed rail can bring capacity relief to existing main lines.

A congested Heathrow with limited air and surface access by rail from the regions has led to a dependency across the regions on global access to new and emerging international markets being made via hub airports on the continent. Advancing the 3rd runway and maximising the potential of the international gateway airports in the regions and nations of the UK will have a critical part to play. It also requires new thinking about long term plans for surface access to all our major airports if they are to reach their full potential.[8]

---

7. The same logic also applies to the need to strengthen access to UK-based international airports to provide an alternative to hubbing through continent-based airports such as Schiphol and Frankfurt.

8. See for example the **Independent International Connectivity Commission Report**, February 2017, commissioned by Transport for the North.

Looking at Heathrow's world hub competitors, the success of direct rail services from widespread locations into Schiphol, Charles De Gaulle and Frankfurt Airports can be readily seen. This is how these world hub airports have come to serve nations, not just a capital or major city. The UK's world hub airport merits the equivalent.[9]

The new western rail access at Heathrow should be upgraded so that it can provide direct services from the South-West, South Wales, Oxford and the West Midlands (and potentially the North West), and from the East Midlands and Cambridge via Bedford using the new east-west rail link. And a southern link should not be restricted to the airport's immediate catchment but be designed to connect the major travel generators in Surrey, Hampshire and Dorset. Regions further from Heathrow (and Scotland and Northern Ireland) should be afforded the direct air link access that the Secretary of State for Transport announced at the time of the Runway 3 decision in 2016.

Now is also the time for a link to HS1 to be put back on the agenda so that Heathrow has high-speed direct access from Paris, Brussels, Amsterdam and Frankfurt. An extended catchment strengthens the airport's attraction for the most attractive long-haul flights, to the wider benefit of UK competitiveness. The connections will also assist business growth and retention in the M4/M3 corridors.

Along with Crossrail's connections to London's West End, the City, Docklands and north Kent/Essex, it is clear that it is time to recognise Heathrow's role as a rail hub. And the case for creating the necessary infrastructure is not something to insist on the airport-owner providing as a planning agreement obligation. There is a rich mix of M25-style rail journeys and de-congestion benefits that a rail hub will bring regardless of airport access. The funding mix needs to reflect this point.[10]

Planning better rail connectivity **west of London should not be delayed**: the rational development of rail transport west of London as outlined above relies on having a hub rail facility at Heathrow. While the airport access component is crucial for international competitiveness, the investment case for these links exists quite separately, just as did the case for building the M25, 30 years ago.

In the North, there are similar opportunities to transform surface access to Manchester Airport by developing a rail hub capability and removing the current capacity constraints of the Airport station's terminus platforms. These opportunities include Northern Powerhouse Rail and implementation of the protected western rail access scheme which could be implemented well ahead of the arrival of HS2 Phase 2B. And looking ahead to 2050 we see Stansted linked into the national high speed rail network too.

---

9. See the **Mawhinney Review** which called for a strategic approach to this question. **Before** (and **after**) HS2 Ltd abandoned its planned links to Heathrow, Greengauge 21 published a series of reports on Heathrow Access that addressed the challenge of developing wider rail access to the airport.

10. The NIC could usefully highlight the inconsistency between the aviation and rail sector regulatory standpoints on funding rail access to airports and propose a resolution which ends the treatment of airports and their expansion as being equivalent to other kinds of development such as retail.

3. How should infrastructure be designed, planned and delivered to create better places to live and work? How should the interaction between infrastructure and housing be incorporated into this?

The approach here should be through:

1. a much greater emphasis on devolution
2. the development of a national spatial strategy[11]
3. learning what has worked well elsewhere[12]
4. linking HSR to city region networks.

Without connectivity to get to other places easily without using a private car, the urge to continue high levels of car ownership will continue, distorting the design of urban areas and their transport networks. This in turn leads to sprawl rather than the densification of urban areas needed for sustainability reasons.[13]

Greater devolution of powers, funding and responsibilities is under way, but painfully slowly. The existence of a national spatial strategy and through it the mechanism to provide a framework for housing development should help accelerate this proces[14]. In practice, a national spatial strategy should both inform and be informed by a national infrastructure plan. The NIC's development of a 2050 infrastructure plan is therefore an important building block towards the future potential development of a national spatial strategy. A national spatial plan would also be informed by fostering initiatives such as the one initiated by IPPR North and the RTPI aimed at developing a Great North Plan.[15]

With regard to interaction with housing, it may be necessary for the NIC to address the housing crisis and point to it being a prime example of market failure, as well as the source of significant inflationary pressure that affects all areas of the economy and damages competitiveness. Experts in the field see no major resolution to the problem without some fundamental interventions that are not on current Government agendas.[16]

---

11. Noting that these already exist for Northern Ireland, Scotland and Wales (but not England).

12. See for example, Sir Peter Hall's book of 2014, *Good Cities, Better Lives* (Routledge) which reviews the best post-war European experience in housing, transport and sustainable development of attractive urban areas.

13. *Smart Growth* by Jon Reeds, Green Books, 2011.

14. *The Interim Prospectus of The Common Futures Network* as submitted to the NIC provides some of the evidence on the case for a national spatial strategy. We would advocate that such a proposal is considered not just as a paper-based plan, but in an open and accessible electronic format to which registered correspondents (public agencies and private companies – such as property developers) can introduce and keep up to date relevant data. The scope for using such a facility to aid the industrial strategy is, we believe, significant.

15. See **Blueprint for a Great North Plan**. This sets out a series of principles to guide how the Plan should be developed; identifies the suite of documents that might together comprise the Great North Plan; suggests the different themes or 'layers' of planning that need to be fitted together through collaborative action; and proposes a process for the next steps in moving from blueprint to plan.

16. See, for example, *Housing: Where's the Plan*, Kate Barker, London Publishing Partnership, 2014.

4. What is the maximum potential for demand management, recognising behavioural constraints and rebound effects?

Given constraints on resources, demand management needs to play an important role in optimising sustainable growth for a given level of infrastructure investment. Research suggests that travel demand management measures could reduce national traffic levels by around 11%[17]. This was supported by the Sustainable Travel Demonstration Towns programme, which resulted in a decrease in car trips of between 11 and 13%. Demand management has a second, broader, role to play in rationing carbon resources and in meeting the UK's climate change obligations. Poor **air quality**, for instance on the M1 in South Yorkshire could see a reduction in permissible speeds of 10 mph, and it would seem inevitable as the links between poor health outcomes (including premature death) and the vehicular source of poor air quality become more widely understood, that demand management – in some cases instead of capacity expansion – will need to be considered. With air quality and carbon effects of growing importance, a strategy for setting fuel prices through differential policies across diesel/petrol/electric needs to be developed, and the habit of perpetual non-application of the annual fuel duty escalator re-considered.

In practice, the challenges of using pricing as a demand management tool are intensified as wider disposable income ranges inevitably trigger questions of fairness and acceptability. On rail, it has been found possible to respond to very diverse levels of willingness to pay: Britain has both some of the highest fares in Europe and the lowest[18], and there is the key advantage that the pricing mechanism is under government regulatory control.

Transport capacity is in scarce supply (in urban areas, and elsewhere) and emerging and disruptive technologies (Uber; autonomous vehicles of various sorts; drones for delivery) can generate additional demand, stretching capacities yet further. This should be seen as a further incentive to revisit charging systems for use of infrastructure in order to achieve best overall outcomes.

17. See **Traffic Demand Management**.
18. See Mark Smith in *RAIL*, issue 818 January 2017.

5. How should the maintenance and repair of existing assets be most effectively balanced with the construction of new assets?

There is a very substantial level of catch-up needed to get roads to a state of good repair, and nationally funding should be directed more to this area and less to new or expanded road network capacity. The well-documented issues with infrastructure in the US, especially road, are a clear reminder that if maintenance is neglected the reliability and ultimately the very existence of key structures and roads is threatened, posing huge economic risks.[19]

The established HLOS/SOFA process for rail – where the balance of enhancement is considered alongside maintenance and renewals – could be fully extended with advantage to the highways sector with the role of independent oversight via ORR reinforced.

6. What opportunities are there to improve the role of competition or collaboration in different areas of the supply of infrastructure services?

Britain is currently attracting a wide range of international interest in delivering its forthcoming infrastructure programme. This combines with its long-standing ability to serve wider geographies from a UK base – such that many international companies are happy to locate their HQs for geographies as substantial as Europe, Middle East and Africa in the UK. Clearly part of this rationale is negatively impacted by the Brexit vote.

So the requirement is to counter this adverse effect, and this can be achieved by:

1. Adopting confident procurement practices that encourage innovation, partnering and appropriate risk-sharing, so that the supply chain seeks out UK opportunities as a means to enhance delivery and reputation and gain competitive advantage

2. Putting public sector funds into STEM training, preferably through devolved agencies that can match their focus to regionally-based leading-edge industries

3. Further strengthening the NIC programme, seeking to gain widespread popular support and understanding through a major 'reach-out programme', and ensuring that it is made as free as practical from shifting political and national budgetary stand-points.

7. What changes in funding policy could improve the efficiency with which infrastructure services are delivered?

As the **Rail Delivery Group** has pointed out, rail is now self-financing in respect of maintenance and repair of existing assets. A sensible roads policy aim would be to get to a similar position, with road users being set charges that meet marginal long run social costs – that is the maintenance and repair of existing national highways assets and externalities such as costs falling to health, social services and the environment.

---

19. See ASCE **Infrastructure report card**.

8. Are there circumstances where projects that can be funded will not be financed? What government interventions might improve financing without distorting well-functioning markets?

The up-front planning and political risk around a project such as HS2 makes it fundamentally unsuited to third party funding. But it is amenable to concessioning as a means to recoup much of the public sector outlay. Greengauge 21 **commissioned PwC** to examine funding options for high-speed rail in 2011. Their report sets out the first published analysis of what the Government could expect to see as a financial return if it elected to sell (or, more precisely, concession) the infrastructure of High Speed 2 (HS2), in the same way as a 30-year concession was sold for the 109 km-long HS1. PwC's figures showed that HS2 could produce between £6bn and £7bn as a return on the same basis soon after project opening.[20]

The report also suggested that there are potentially further cash returns over the lifetime of the project. The Exchequer will receive, over time, estimated extra tax receipts on the profits earned by the infrastructure concession holder and rail operating franchises worth £1.5–2bn and, at the end of the initial concession period, HS2 could be sold again, generating a further return to the taxpayer.

It should also be noted that extensions of HS2, once it is past its proof-of-concept stage (that is, investment has proven deliverable within budget and to timescale and there is an established stream of track access charge revenues), could be amenable to co-financing, as is the case with the Tours – **Bordeaux LGV PPP** – currently at the construction stage).

9. How can we most effectively ensure that our infrastructure system is resilient to the risks arising from increasing interdependence across sectors?

One of the risks facing the national rail (and road) network is the effect of climate change – and in particular increased risk of flooding (of various types). Greengauge 21 has identified an example of where the creation of new alignments would bring **major resilience benefits** – which, while on their own possibly insufficient to justify the investment needed – can, in conjunction with providing enhanced connectivity to growth locations and integration with existing rail services, make for a sound investment case.

20. The HS1 concession was let for £2.1bn for a 30-year period but is potentially now going to be **sold on for £3.6bn** (a sum that may be contrasted with its £5.6bn construction cost), so if the same analysis was repeated, the value of concessioning HS2 Phase 1 to HM Treasury would be potentially £10–12bn.

10. What changes could be made to the planning system and infrastructure governance arrangements to ensure infrastructure is delivered as efficiently as possible and on time?

The planning system (if by that is meant the professional/public authority response to planning applications) is working well – with consents agreed in record times. But clearly there are sometimes excessive costs and significant delays in obtaining major project approvals, and converting approvals into delivery can be disconcertingly slow.

The largest transport sector plans require extended public consultation and this is not unusual in advanced developed economies such as those in Western Europe (as required by the Arhus convention). It would be wrong to suppose that developments proceed more swiftly in other countries[21]. Planning delays slowed down completion of Germany's HSR network for over 10 years and extension of TGVs along the Cote d'Azur has effectively been abandoned for planning reasons.

One area of particular concern can be addressed at NIC-level, and that concerns the problem of interaction between major infrastructure investments. In many instances, the lengthy period between approval and completion (about 10 years in the case of London's Crossrail, for example) virtually guarantees that there will be some interaction with another major project (or two, or more).

In the Crossrail case, after its funding approval, HS2 was developed and its interface with Crossrail became a key design feature. But the adaptation to Crossrail[22] that would be needed to make the task of implementing HS2 easier (less costly, less disruptive and faster) was not forthcoming because of the perceived risk to Crossrail completing on time and budget.

Overall, taking the two projects together, it is clear that it would have been possible to find a better solution (and Greengauge 21 identified the opportunity at a workshop held within a few months of the publication of the HS2 alignment in summer 2010), but each project has its own governance arrangements, budget and timescales so this wasn't forth-coming. Such interactions are not exceptional and will become increasingly common. That is why we have advocated that Transport for the North takes a responsibility for HS2 Phase 2B along with its Northern Powerhouse Rail plan. Elsewhere, a NIC-level Programme Board is needed to resolve such matters in future.

---

21. Examples would be the development of the French TGV network from Marseilles to Nice, first identified in a master plan of 1983 but not yet constructed; or the major delays to and lengthy protests against large infrastructure projects in Germany (the short section of high-speed line and major station rebuild at Stüttgart and the construction of a new runway at Frankfurt Airport, for example); or the five years that have elapsed since Amtrak identified high-speed proposals on the North East Corridor of the USA during which time a 'programmatic' level Environmental Impact Assessment has been carried out with multiple stage consultations.

22. Addition of a second west side route to divert suburban services from the West Coast Main line into Crossrail, adding to Crossrail project benefits, creating the opportunity to find a better location for a Crossrail depot and reducing the disruption and need for land-take at Euston and hence HS2 costs.

We see that the work the NIC is doing through the National Needs Assessment is a critical opportunity to make a start in formulating a **strategic analysis of the future of national infrastructure** (as published in the ICE proceedings of February 2017) where key questions of project inter-relationships and mechanisms to ensure that projects deliver against multiple objectives can begin to be understood and explored.

11. How should infrastructure most effectively contribute to protecting and enhancing the natural environment?

There are three fundamental points to make here on this most important topic of protecting natural capital and resisting its erosion:

1. There are circumstances where major infrastructure is being proposed where some disruption and significant impacts to the natural environment/capital is inevitable, and in these cases, consideration must be given to accommodating the infrastructure requirements of other sectors and agencies to avoid subsequent separate incursions and intrusions into the natural environment. This should be a pre-requisite of qualification for inclusion within the National Infrastructure Assessment. A good example is the possibility of a road tunnel through/under the Peak District National Park to better link the cities of Sheffield and Manchester, where despite the specific recommendation of the **One North Report of July 2014**, this is **not** being considered as a multi-modal facility with the option of rail tunnel (and even Eurotunnel-style shuttle operation). Only road connections have been considered so far by Highways England which is leading on this project.

2. The creation of new environmental capital for the future, eg. by creation of new woodland and other habitats is likely to be an increasing feature of infrastructure development – road as well as rail.

3. The principle of a continued preference for brown field and city-based expansion through urban strengthening remains the best approach to minimise commuting and encroachment on undeveloped areas of land and its natural capital.

12. What improvements could be made to current cost-benefit analysis techniques that are credible, tractable and transparent?

Because cost-benefit analysis techniques are best developed for the transport sector, they provide a more rigorous quantified assessment tool than is available in others sectors. This has the effect, in practice, of placing a higher bar for technical compliance in the evidence base for funders of transport sector projects.

The substantial legacy of previous transport project appraisals is both a strength and weakness. The use of consistent parameters subject to progressive and managed evolution allows for transport project benefit:cost ratios almost to assume the tenor of a currency. But over time, the need to measure different kinds of benefits – for instance, the addition of capacity to overcrowded and congested networks – may suffer from the imposition of generalised tools developed in earlier eras with 'free-flowing' network conditions which no longer apply to road or rail or indeed airspace (except at off-peak times). Within the transport sector, there is evidence that significant improvements in

connectivity can have more-than-proportionate effects on quality of life and economic performance outcomes[23]. These 'threshold effects' of large investments in altering economic behaviour should be given more weight within the appraisal process.

Responses to the NIC's transport questions

13. How will travel patterns change between now and 2050? What will be the impact of the adoption of new technologies?

In terms of future travel patterns, DfT provides excellent statistics on long term trends that can form a suitable starting point. Over time, people in Britain are making slightly fewer trips and travelling longer distances. Car ownership and usage is trending differentially in the largest cities (especially London where they are falling). Freight traffic by road is growing strongly and consistently (fostered by the shift to internet shopping) – and on rail likewise but only in two distinct markets – aggregates for construction and intermodal traffic to/from ports.

Achieving more productive regions beyond London and the South East will generate more travel demand and traffic – and there is evidence of higher elasticities of transport demand in the North compared with the South[24]. This adds to the case for more sustainable patterns of development across the regions, allied to high capacity urban transit provision.

International tourism, both inbound and outbound, is likely to have an increasing effect on patterns of travel demand and while currently a small part of overall travel (except for airlines) will experience some of the strongest areas of growth.

There is no evidence that increasing availability of **new technologies** through broad-band and mobile electronic communications devices is reducing the demand for longer distance journeys, but there is trend evidence that journey to work volumes, while still growing and with lengthier journeys – are not increasing in line with job growth. The latter reflects an increased propensity towards self-employment and to flexible working arrangements that can be expected to continue, as the balance of employment opportunities adapts in response to technological innovation.

The widely expected introduction of autonomous technologies will lead to changes in ways that have not been studied well enough to date in terms of holistic effects. The challenges in terms of individual/small group travel and logistics services by road are significant, especially in the realms of insurance and accident liabilities, human-machine behavioural interfaces, personal security against terrorist and other abuses of the technologies, and in terms of impacts on congestion and infrastructure capacity.

---

23. See Urban Studies research article: **Traffic Congestion's Economic Impacts: Evidence from US Metropolitan Regions**.

24. The Northern Way Transport Compact: The Economic Case for Transport Investment in the North, March 2011.

Clearly, autonomous vehicles are seen as a threat by the automotive industry – hence their rapid adoption of development programmes in this area, which are being progressed initially as an extension of existing driver assistance facilities. Autonomous vehicles offer a number of potential social and quality of life advantages – for instance non-emergency ambulance travel. But claims that they could be some kind of solution to urban congestion and to the need for parking space provision are probably unduly optimistic. Indeed, analysis of driver behaviour, including at the pinch-points of the road network (junctions) where practice (especially in major urban areas on congested networks) is observably in breach of safety guidelines on breaking distances, suggests that the introduction of AVs will more likely reduce network capacity if they are to operate at acceptable safety standards – noting that these are likely to need to be set at more stringent levels than drivers impose on themselves.

14. What are the highest value transport investments to allow people and freight to get into, out of and around major urban areas?

The UK lags most European countries in both the provision and density of urban rail systems, and in stark contrast to (say) France where there has been a programme of urban transit investment lasting 40 years. With a lot of focus on vehicle automation, there is a significant risk that the virtues of high capacity transit systems will be overlooked, in the belief that fully autonomous car-sized systems will be able to use existing road networks more efficiently. Urban transit systems still offer the best value because they:

i. are compatible with high quality urban streets and spaces

ii. reduce dependence on less energy-efficient and more polluting travel modes

iii. provide sufficient capacity for travel peaks

iv. offer reliable connectivity with high levels of travel time predictability, which has a productivity benefit to the urban economy.

With city/conurbation level autonomy having receded each decade since 1968 when the first city-based Passenger Transport Executives were formed, the scope for the public sector to make informed decisions in answer to Question 14 is limited. Choices on urban rail network usage are generally determined centrally by DfT, following consultation, in franchise specifications.

Only one new Light Rail system has been introduced in the UK in the last ten years (in Edinburgh, where ridership has exceeded forecasts). This is in contrast with (say) the USA where 16 cities have started urban rail transit schemes since 2000.

Better use of existing rail networks for access to urban centres can be achieved as a by-product of high-speed rail (freeing up network capacity by removing non-stop inter city services) – and since this benefit has in effect been ignored in the business case for HSR, this can represent a very cost-effective approach.

15. What are the highest value transport investments that can be used to connect people and places, as well as transport goods, outside of a single urban area?

The evidence available shows that high-speed rail can best achieve sustainable long term growth, offering a positive, 'good' economic return, out-performing other transport alternatives.

DfT started to look at inter-regional transport policy issues with its multi-modal studies in the early 2000s, followed by the sustainable transport studies ('TASTs' and 'DASTs') until their abandonment in 2010 before a coherent picture or set of conclusions emerged.[25]

But one piece of work was completed at this time. Triggered by an unsuccessful rail franchise bid that had been made against a 20-year time horizon and had recognised the network capacity challenges that lay ahead, the shadow Strategic Rail Authority commissioned consultants to look at north-south high-speed rail in Britain. Led by Atkins, this work was eventually published by DfT in January 2004[26]. The consultants had been asked if there was a case for north-south high-speed rail in Britain and if so how such an investment would perform in cost benefit terms compared with alternative investment policies. The comparison was made with conventional rail upgrades, with building new non-high speed rail lines and with expanding the motorway network. High-speed rail performed best, delivering the highest benefit cost ratios of these options.

While the Atkins study had initially concentrated on a new line between London, the West Midlands and the North West (Manchester), it also examined network configuration and concluded that a second north south line should also be built, on the eastern side of the country, linking London and Newcastle.

Ministers were not minded to act on these conclusions, where the imperative to act rested on a projection of continuing demand growth and a forecast that by the mid-2020s the West Coast Main Line (followed a few years later by the Midland Main Line and the East Coast Main Line) would be unable to accommodate any more trains. In effect the strategic national rail network linking the country's major cities would be full – but 20 years hence.

In fact, demand grew more strongly than had been assumed in these studies and the West Coast Main Line is in effect full (in the sense that no more trains can be operated) already. There remain some further train lengthening options that could be instigated between now and the projected opening of HS2 Phase 1 in 2026. But it is notable that from the outset, the case for high-speed rail clearly rested on questions of capacity.

25. Towards (and developing) a sustainable transport system, respectively.
26. See ***A Vision for the High Speed Line***.

In December 2006, the Eddington Transport study was published on behalf of DfT and HM Treasury. It is still regarded as the most comprehensive examination of the relationship between transport investment and the economy. It was widely held to have rejected high-speed rail, but as **Sir Rod Eddington made clear in 2007** in evidence to an ensuing Transport Select Committee he was in fact a supporter of HSR using proven technology.

In a climate of Government inaction and scepticism, Greengauge 21 was formed and established a Public Interest Group that carried out the next major piece of work on high-speed rail in Britain. Released as the report ***Fast Forward*** in September 2009, this report provided evidence on the economic value of high-speed rail as a national network, with benefit:cost ratios identified for key route segments – see summary table, below. Contemporaneous work by Network Rail ('New Lines') found a positive cost benefit ratio for a high-speed line from London to Manchester and Glasgow.[27]

Corridor	HS-NW		HS-NE		HS-TP	HS-WW	HSR Network
New HSR infrastructure	London–Birmingham / Manchester [a]	Manchester–Glasgow / Edinburgh	London–Leeds / Newcastle	Newcastle–Edinburgh	Manchester–Sheffield	West of Didcot (part)	**All**
Benefit : Cost Ratio	2.9 : 1	7.6 : 1	2.0 : 1	1 : 1	1.3 : 1	2.8 : 1	**3.5 : 1**
Net Present Value (£bn, 2002 prices)	£24bn	£23bn	£15bn	£0bn	£1bn	£3bn	**£63bn**

[a] This includes the costs and benefits of the connections to Heathrow and HS-CT.

Note: NPVs do not total because of phasing assumptions

By then, all of the national political parties had expressed their support for high-speed rail, and HS2 Ltd had been created and was to report in March 2010 with its conclusions on how a HSR line could be best built between London, the West Midlands and beyond.[28]

In our view, the initial infrastructure investment that would best support long term sustainable growth has been properly identified through these developments, and, through HS2 Ltd, implementation is underway. But the best value from high-speed rail is not being achieved because of the lack of a longer term (2050) plan set at a national level. Businesses invest and economies prosper when they can see how current uncertainties – such as an outlook of ever-growing congestion and travel time unreliability – will be overcome. The development of such a plan with a staged implementation strategy would help:

i. plan the best use of HS2 (including its onward connections, a matter set to be examined systematically during 2017) and

ii. best support sustainable growth nationally.

27. This work was funded by: ATOC, Association of North East Councils, BAA, Birmingham City Council, City of London Corporation, Edinburgh City Council, England's Regional Development Agencies, Glasgow City Council, GMPTE, Network Rail, Newcastle City Council, Northern Way, PTEg, Railway Industry Association, Strathclyde Passenger Transport, Sestran, Sheffield City Region, Transport for London.

28. Department for Transport High Speed Two, HMSO Cmnd 7827.

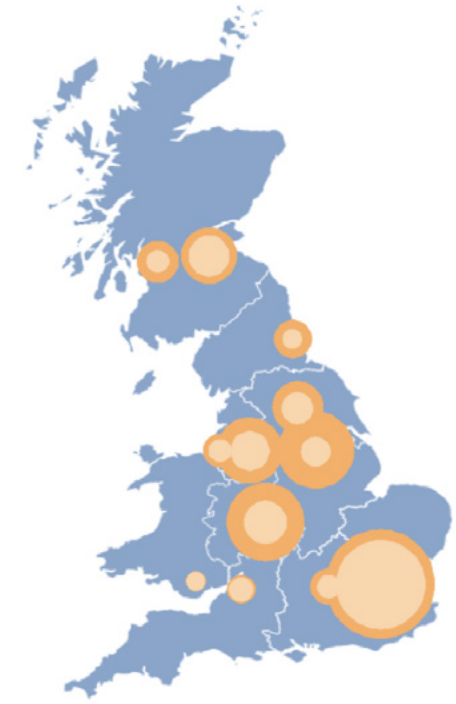
In short, Greengauge 21's contention is that a 2050 strategy with its associated plans is the investment that will best support sustainable growth rather than a further specific piece of infrastructure.

The Fast Forward report provided an initial view on what a long term 2050 strategy for national high-speed rail might look like, and this is shown in the diagram below.

This diagram was produced ahead of HS2 Ltd publishing its plans for the first phase of HS2, but this was anticipated reasonably accurately in terms of the lines coded red in the diagram ('existing or planned'). It can be seen that it was anticipated that HSR would be adopted through a combination of new alignments (coded black) and upgrades to existing lines (coded in green). A key focus was connectivity to airports as was interconnectivity between the various high-speed lines.

It is Greengauge 21's intention to update this work during the course of 2017 to take account of Phases 1 and 2A of HS2 and emerging priorities from the regions and devolved nations. This could form a useful input to the NIC's work on its Assessment.

With major regional economic variations, and a diverse set of plausible scenarios for regional population change[29] (and thus travel demand), the spatial distributional impacts of HSR is an important issue: there have been concerns that its effects will be to strengthen London's economy at the expense of the regional economies. The transformational impact of HSR on spatial economies was studied by KPMG in work undertaken for Greengauge 21 in 2010[30]. This showed very clearly that the accessibility gain – and the projected economic uplift from improved business connectivity – was most strongly felt in the regions/devolved nations, not London.



Existing business connectivity score

Business connectivity score in High Speed Rail Scenario

Source: KPMG analysis for Greengauge 21, 2010.

It is true the evidence from other countries is mixed on this point[31], but the scope for consequential shifts in development patterns and economic activity arising from transport investments is not permitted to enter transport economic appraisals (although it will now be allowed in strategic cases, under the latest DfT appraisal guidance). Yet the evidence of regional economic upturn is now starting to emerge on the ground in Britain as HS2 Phase 1 nears Parliamentary consent. In Birmingham, the decision to locate a large part of **HSBC's UK activity** in the city has been partly attributed by the company to HS2.This experience is consistent in its timing – well in advance of service start-up – with the impact of the development of the TGV network in France.

29. Figure 4 ice proceedings Feb 2017.
30. See KPMG report for Greengauge 21, **Consequences for employment and economic growth**.
31. See 2006 Greengauge 21 report, **High-Speed Trains and the Development and Regeneration of Cities**.

Private sector developments are signs of economic confidence built around the transformation in travel opportunities that HSR can bring – and they are arising in 'the provinces' – not the capital. The advantage of an overall strategy for HSR will be that such effects can be spread more widely and inclusively across the nation. The aim would be to bring the whole of the nation – in appropriate and affordable degree – the level of connectivity and capacity gains to rail that HSR provides. This means that the national strategy should be thought of as being an inter-city or inter-regional rail strategy including – but not restricted to – new-build HSR, and with explicit consideration given to improving connectivity to places that are often regarded as peripheral or second tier. The strategy would focus on the outputs of HSR, in terms of services (which should precede considerations of infrastructure) and enhanced connectivity and capacity, with a central focus on the relative merits of upgrade and new-build and combinations thereof.

Greengauge 21
February 2017