

HS2: Levelling up or the pursuit of an icon?

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About the author

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About this paper

This is an analysis of the decision to build HS2. Most of it is an account of the history. The final section is commentary. The author would like to thank Sir Dieter Helm, Peter Mackie, David Starkie and Tom Worsley, among others, for their comments. The views expressed in this paper are the author's alone and not those of the Office of Rail and Road or the Institute for Government. The author retains copyright of the work, and is responsible for its content.

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Summary

The risk is that transport policy can become the pursuit of icons. Almost invariably such projects – ‘grands projects’ – develop real momentum, driven by strong lobbying. The momentum can make such projects difficult – and unpopular – to stop, even when the benefit:cost equation does not stack up, or the environmental and landscape impacts are unacceptable. (Sir Rod Eddington, 2006)¹

High Speed 2 (HS2) is a new, high speed railway in England from London, north to Birmingham, and then north-west to Manchester and north-east to Leeds. That is half the 400 or so miles (644 km) between London and Edinburgh and Glasgow. Trains will reach major English conurbations such as Liverpool and Newcastle-upon-Tyne and the Scottish cities by through-running onto existing tracks.

Following a white paper on high speed rail in 2010² and a consultation, in January 2012 the UK government announced a decision in principle to build this scheme. It obtained the parliamentary powers necessary for Phase One between London and Birmingham and the prime minister, Boris Johnson, gave the final Notice to Proceed with Phase One in April 2020. About a year later, parliament granted further powers for the branch from Birmingham to the north-west as far as Crewe, which is 28 miles (45 km) south of Manchester. Construction has started in earnest.

The current government has yet to apply for the parliamentary powers for the eastern branch from Birmingham to Leeds and for Crewe to Manchester, but successive governments have always intended to build the complete scheme. It has been on that basis that the debate on the merits of the scheme has been conducted. Few people have argued that Phase One on its own has merit.

Public debate about the scheme continues, but the principle was settled with the decision in 2012 to deposit a hybrid HS2 bill in parliament. That was the point at which it became government policy to build the scheme. While it is always possible for a subsequent government to decide not to complete it, the decision had been made that the scheme as a whole is in the national interest. Some continue to argue that it might have been better to put the resources into improving connectivity between the northern city regions and points north,³ but if that is funded it will now have to be in addition to the resources expended on the link between London, Birmingham and Crewe.

Desk studies and practical experience dating back to the late 19th century suggest that the case for extremely high speed rail in English circumstances is weaker than it might be in some countries with population centres further apart and slower pre-existing rail services. The seminal Eddington Transport Study report of 2006 thought

that there would be more productive, alternative uses for the UK's national resources.

The Conservative Party in opposition in 2008 revived the idea, partly as an alternative to expanding Heathrow Airport. The Labour government took up the idea in 2009, creating HS2 Ltd as an arm's-length company limited by guarantee to investigate whether or not there was a case for the scheme – to provide advice on engineering feasibility, route, economic benefits, costs, revenues and burden on the taxpayer. This was in order to inform a ministerial decision on whether to continue with the idea. Labour peer, Andrew Adonis, secretary of state for transport, 2009–10, enthusiastically promoted HS2. He was instrumental in delivering the scheme and has since indicated that he had been determined to deliver a high speed rail scheme from long before he took office.

The Labour government published a white paper on high speed rail in 2010.⁴ The prime minister, David Cameron, and chancellor, George Osborne, of the 2010 coalition government enthusiastically promoted the idea: they instructed their secretary of state for transport, Philip Hammond, to deliver the scheme single-mindedly. After the public consultation, his successor, Justine Greening, announced the decision to seek parliamentary powers for a first phase from London to Birmingham, on the promise that the second phase would be completed in due course.

The 2010 white paper said that the estimated cost of construction, rolling stock and subsequent operation would be about £30 billion (2009 prices). It later transpired that the initial civil engineering costs had been superficially researched. At the Notice to Proceed in 2020, the estimated cost had increased to £108.9bn (2015 prices) – that is, about £100 million a week for 20 years – eventually to be offset by revenues totalling £45bn. The anticipated opening date for Phase One had moved⁵ from 2026 to 2029–33 and Phase Two had moved from⁶ 2033 to 2035–40. In late 2020, a National Infrastructure Commission study, commissioned by the government after having issued the Notice to Proceed with Phase One, suggested that the package adding in other government commitments to railways in the Midlands and the north of England would take the total to more than £180bn. It also said that, in addition: "The Commission has separately estimated that more than £40 billion is required between now and 2040 to fund major transit schemes in the fastest growing, most congested cities, as well as increased multi-year settlements for transport in all cities."⁷

Between 2010 and 2020 there were a number of inquiries into the likely costs and the merits of HS2, in addition to the parliamentary scrutiny of the Phase One bill. Most expressed reservations.

In July 2019, Boris Johnson became Conservative prime minister and faced the decision of whether to issue the final Notice to Proceed for Phase One. He asked Douglas Oakervee to advise, with the help of an independent advisory panel.

Oakervee reported in late 2019, recommending that, on balance, the scheme should go ahead, but not before a number of important caveats had been addressed.⁸

In April 2020, the government published a Full Business Case for Phase One⁹ and the prime minister simultaneously issued the Notice to Proceed. When doing so he committed to funding the completion of both phases of the scheme, in addition to committing to funding a package of other new rail schemes in the Midlands and the north of England.

The government did not fully accept Oakervee's recommendation that final approval should be delayed pending the resolution of several issues. These included:

- the maximum speeds
- that caution should be exercised about increasing the planned service frequency to more than 14 trains an hour
- that development plans for the main stations (especially London Euston) should be rationalised and finalised
- that the civil engineering contracts should be renegotiated.

Later, the National Infrastructure Commission questioned whether the economies of the Midlands and the north of England would have been best served by starting building HS2 as a link to London, in preference to investing in local rail connectivity. It talked of "mistakes of the past". It suggested that connectivity between the northern cities was a higher priority than HS2. It noted that the budgets may not be adequate, in which case choices will be unavoidable. It said: "Our analysis suggests that prioritising regional links, for example from Manchester to Liverpool and Leeds or Birmingham to Nottingham and Derby, has the potential to deliver the highest benefits for cities in the Midlands and the North."¹⁰ The Commission expressed the view that the later, eastern leg of HS2 Phase Two should have lower priority.

Although the prime minister has reiterated the commitment that previous administrations made to build the complete scheme – Phases One, 2a and 2b – there remains a concern, especially among political leaders in the northern city regions, that, in practice, Phases One and 2a will be completed but not Phase 2b to Manchester and to Leeds because of constraints on public spending, a lack of consensus about rail needs and doubt about the bullish forecasts of growth in passenger rail demand.

The National Infrastructure Commission pointed out that if the objective is to 'level up' regional disparities then there are policies other than railway investment that need to be given proper consideration, especially those related to education and skills.

In response to Oakervee and wider concerns about the capacity and capability of HS2 Ltd to deliver this vast project economically and efficiently over 20 years, the governance of HS2 has been changed by the creation of a new ministerial

appointment, new reporting requirements to parliament and a number of new Whitehall committees. It remains to be seen whether this supervision by civil service committees and government will deliver economy and efficiency.

This paper comments on the following issues:

- **Is all infrastructure spending justified?** The £180bn cost of HS2 and associated rail schemes in the north of England is in the context of spending on infrastructure in general and the overall national finances. Is it adequately acknowledged that choices have to be made and by what criteria? The quantitatively assessed benefits in relation to costs put the first phase of HS2 into HM Treasury's 'low' category for value for money and the full scheme into the 'low to medium' category. Broader considerations have carried weight.
- **What problem is HS2 intended to solve?** HS2 has been variously promoted as a means: to save time; to increase rail capacity; to generate wider economic impacts; to create jobs; to reduce carbon emissions; to improve connectivity; to bridge the north–south divide; and to level up. In terms of quantified evidence, time savings dominate the benefits.
- **Is HS2 part of a national transport strategy?** Governments have not articulated a comprehensive case for HS2 as part of a UK National Policy Statement in advance of making the decision to proceed. More than a year after committing to both phases of HS2, the present government is considering the place of the second phase as part of a rail strategy for the north of England.
- **Will HS2 help reduce carbon emissions?** People commonly argue that railways in general help to reduce carbon emissions and that HS2, being a railway, will do this. However, all the formal, quantitative assessments have agreed that HS2 will be broadly carbon-neutral. There will not be enough transfer from road and air to HS2 to offset the emissions from the construction and operation of HS2.
- **Transparency and the governance of HS2 Ltd.** Governments have delegated the development, delivery and promotion of HS2 to an arm's-length company limited by guarantee. Neither the company nor ministers were quick to report emerging cost problems to parliament. For a period after HS2 had decided that the budget was unachievable, ministers insisted in the House of Commons that the budget would not be breached. It was not until the final announcement by prime minister Johnson, of his decision to proceed that it was officially stated that the costs would be almost twice as high. There have been allegations of poor treatment of adversely affected individuals. Since the decision to proceed, the government has announced a number of institutional changes to strengthen the governance of HS2.

- **Is HS2 a commercial proposition?** HS2 will undoubtedly offer opportunities for private financing. However, there is no escaping the reality that taxpayers will be required to fund more than half the costs sooner or later.
- **Unresolved issues.** In his *Review*, Douglas Oakervee recommended proceeding with the scheme, but not before a number of issues had been resolved.¹¹ Some remain unresolved, including: design and commercial issues at some of the major stations and associated land; and integration of the second phase with the plans for transport investment in the north of England. Government rejected other recommendations: reviewing the designed maximum running speeds and maximum train frequencies; and renegotiating the contracts for the major civil engineering works. Fare levels and structures, and the economic regulatory regime, are yet to be settled.
- **Icon or strategy?** The consequences of a long gestation period and the influence of particular individuals and interests are discussed. By contrast, the lack of influence of a number of parliamentary, official and other inquiries is noted.

1. 19th- and 20th-century high speed rail in England

The issues surrounding the decision to commit to HS2 were similar to those surrounding a number of high speed rail proposals in England stretching back to the 19th century. In every case, a crucial question has been: Will the revenue and other benefits be sufficient to recompense the considerable costs of construction and operation? In England, unlike in some parts of the European mainland or China, the revenue and other benefits of high speed are limited because the major cities are relatively close to one another and – including in the second part of the 19th century – there has been strong competition from established, medium speed and high frequency railways. Further, the costs of construction tend to be particularly high, among other things because of high population densities, high land values and the obligation to compensate private property owners in full.

In the 1890s, Sir Edward Watkin envisioned a high speed line from Liverpool and other northern cities to Paris via London and a tunnel under the English Channel.¹² The full scheme was not completed but the Great Central Railway did open in 1899 between Manchester, Sheffield and London Marylebone. The infrastructure was expensively designed, with gentle vertical and horizontal curves to facilitate high speed running and with sufficiently generous clearances to allow the use of trains from the Continent, which have larger vehicle cross-sections (loading gauge: the track gauge is standard). Its offering of “rapid travel in luxury” did not generate enough passenger traffic in competition with the existing routes and the venture was not a commercial success.¹³ The company was absorbed into the London and North Eastern Railway under the Railways Act 1921. Some experts advocated reconstituting this line of route for HS2.

The efforts to increase steam-hauled speeds during the 1930s are well known. They relied on the existing fixed railway infrastructure. Similarly, in the 1970s, British Rail ran two programmes in parallel, to reduce the journey times of diesel and electric-hauled passenger services without incurring the cost of new, purpose-built

infrastructure. One of these, the Advanced Passenger Train, was technically innovative, using aerospace technologies for the vehicles and attempting to introduce the ability to tilt on bends. That programme ended in technical and commercial failure but a more modest development, the InterCity 125, with a service speed of 125 mph (201 km/h) was successful. Originally seen as a stop-gap, pending the delivery of the Advanced Passenger Train, it used older and simpler technologies and found a successful balance between the commercial benefits of higher speed, the problems of reliability and the cost of even higher speed on the existing fixed infrastructure. Later, tilting passenger vehicles using an Italian design (the Pendolino) were successfully introduced, together with other improvements such as improved bogies and suspension systems. It would have been technically possible to increase maximum running speed in some cases but it has remained standardised at 125 mph.

This left many of England's major population centres interconnected by rail services that are fairly frequent and fairly fast by international standards. Three major infrastructure investment programmes over the 30 years to 2008 were not about increasing speed but about reducing operating and maintenance costs and increasing capacity: the electrification of the East Coast Main Line (London–York–Edinburgh); the modernisation of the West Coast Main Line (London–Manchester–Glasgow); and the electrification of the Great Western Main Line (London–Wales–the South West).

The West Coast Main Line was electrified between 1959 and 1974 as part of the 1955 British Railways Modernisation Plan.¹⁴ It received a major modernisation between 1996 and 2008. This was a major project that did not go well, causing much disruption and costing about £10bn. It illustrated the risks of ambition with untried new technology (moving block signalling) and the disruption that can be caused to existing services by improving old infrastructure rather than building new lines.

2. High Speed 1 (HS1)

The only piece of new and separate high speed rail infrastructure built in England in recent decades was the link from London to the Channel Tunnel, now known as High Speed 1 (HS1). London to Paris (Eurostar) services began in 1994 using existing, conventional track. A first section of new, high speed line, from the Tunnel to north Kent, started construction in 1998 and opened in 2003, with trains running on into London Waterloo on existing track at conventional speeds. The second phase continued the separate high speed line to London St Pancras and opened in 2007. This was a continuation of the high speed services on the Continent and so it was built to the same standards.

The legislation creating the powers to build the Channel Tunnel had specified that there would be no financial support from the government. In 1997, when the New Labour government came to office, its intention was that the high speed rail link would also be entirely funded from its own revenues. There was already a significant passenger market by air from London to the Continent and it was thought that the new link would capture a large part of that.

In the event, an offering on the financial markets in an attempt to raise the financing was unsuccessful. Government had to underwrite the financial risks. In due course the government guarantee was called and government had to write off debt of about £6bn and received about a third of that when it sold an operating concession.¹⁵ Meanwhile, government had funded operating losses and had borne the cost of building well over 100 rail vehicles that were to have operated 'Nightstar' overnight sleeper services from Scotland, Wales, the West Country and London to France, Belgium and Germany.¹⁶ This idea was abandoned in 1997 when it became apparent that there would be insufficient demand for it in competition with much faster air services.¹⁷ The never-used vehicles were eventually sold at a discount to Canada.

Once the high speed line was completed, an organisation was created to hold the physical infrastructure (HS1), alongside separate enterprises to operate the train services (principally Eurostar and Javelin, a London commuter service from Kent). Later, a 30-year concession was sold to overseas pension funds to operate and maintain HS1 and to receive the revenues from train operators. The concession agreement was subject to independent regulation and was designed so that charges to train operators would be sufficient to fund maintenance and long-term renewals, and provide a fair return on capital.

Patronage of the international passenger services proved disappointing: about a third of early forecasts. This was partly because the city economies at the ends of the line did not grow as fast as had been assumed and partly because the railway won a smaller share of the aviation market than had been anticipated. In short, seen as a whole, this high speed railway has not been self-funding – which is not to say that it was unsuccessful in fulfilling non-financial objectives. This, in spite of the fact that it was taking a share of an unusually long-distance market by English standards.

3. The Eddington Transport Study

From 2001 there were a number of proposals and desk studies on the prospects for new high speed lines: Virgin on the East Coast;¹⁸ FirstGroup London to the west; Atkins for the government; and Steer Davies Gleave for the Commission for Integrated Transport.

In 2005, the Treasury and the Department for Transport commissioned a major review of “economic productivity, growth and stability” in relation to transport and the economy.¹⁹ The chairman, Sir Rod Eddington, reported in December 2006.²⁰

This was an independent and well-resourced exercise. A number of research papers were commissioned from experts in their fields. A particularly important one in relation to high speed rail was a review of the international evidence on the effects of major transport investments in railways by Michael Mann.²¹ His paper considered all the arguments that were to be addressed repeatedly until the final decision to proceed was taken some 15 years later.

The approach adopted was: “Review of literature; identification of potential step changes appropriate to the UK; and a strategic assessment of the potential economic and environmental benefits offered by a high speed rail line in the UK.” The conclusions were as follows:

3c. There is little appraisal or ex-post evaluation evidence on the extent to which transport policies and schemes have delivered national economic benefits. The vast majority of studies concentrate on the local or regional distributional effects, without distinguishing how far these are additional at the national level...

3e. Any solutions providing fixed infrastructure are inherently less flexible in response to external and policy driven risks than other measures such as liberalisation of markets and pricing policies to better reflect external costs.

3f. ... the experience of the [French] TGV identifies limited overall stimulation of business travel market and little evidence of wider economic benefits not captured through standard appraisal techniques.

5b. A high speed line may offer additional benefits from releasing capacity constraints on existing routes with heavy commuter and freight demand in agglomerations, but this proposal for relieving capacity constraints would need to be compared with the value for money (vfm) of alternative rail and other modal options for relieving congestion on particular economically important routes.

5e. Given the very large costs involved in constructing and operating a high speed line (with, for example, capital costs of a comprehensive network estimated at £33bn by the Atkins study) and the risks involved, Government will find it difficult to ensure that it offered better value for money in meeting economic, environmental and other policy objectives than alternative ways of spending that money.

6. Transformational economic benefits are unlikely to arise from a north-south high speed line because:

1. UK cities are already well connected...
2. Agglomeration effects typically extend over 45–60 minutes door to door travel time – even the fastest of [high speed lines] to the North of England and Scotland are unlikely to provide such benefits.

7. Starting with an analysis of the problems facing the UK economy, and the potential for wider economic impacts, to the extent that there is a case for [high speed lines] it would be most likely to reside in: freeing up existing/forthcoming capacity constraints on commuter links, particularly into and within London; or extending the labour market of London and the South East... The literature argues convincingly that higher returns will typically come from tackling existing and known congestion bottlenecks.

12. One important theme emerging from the literature is that new or improved transport links can be enablers of growth but cannot, by themselves, generate wider development impacts. The mechanisms and linkages between the transport link in question and other markets are critical to the delivery of wider development impacts. For example, a new transport link on its own is unlikely to improve local productivity and growth if local people do not have the skills and qualifications needed by prospective employers...

37. ... With existing speeds already relatively high and distances generally shorter than 400 kilometres, UK cities are already well connected, making the advantages in Britain rather less strong than in France and Spain.²²

The Eddington Transport Study considered this paper, submissions and other evidence and came to the following conclusions:²³

1.140 The risk is that transport policy can become the pursuit of icons. Almost invariably such projects – ‘grands projects’ – develop real momentum, driven by strong lobbying. The momentum can make such projects difficult – and unpopular – to stop, even when the benefit:cost equation does not stack up, or the environmental and landscape impacts are unacceptable.

1.141 The resources absorbed by such projects could often be much better used elsewhere. The suggested benefit:cost ratios of such projects, although only estimates, are often lower than many other less-exciting transport projects. International evidence collated for this Study suggests that the claimed transformational impacts of such projects are rarely observed, and any speculative assessment of ‘macro-economic’ benefits would involve considerable risk, particularly in view of the large sunk cost investment that would be required. Furthermore, the projects are rarely assessed against other interventions that would achieve the same goals – it can often seem that, unless government can somehow demonstrate that the project’s costs outweigh the benefits, the project

should go ahead. In fact, the question should really be are there better ways to achieve the same goals, or are there better uses of the funds to achieve different, but more valuable goals, for the same cost?

1.142 In short, step change measures, such as a new nation-wide very high-speed train network, are not, in a world of constrained resources, likely to be a priority. That is why it is critical that the government enforces a strong, strategic approach to option generation, so that it can avoid momentum building up behind particular solutions and the UK can avoid costly mistakes which will not be the most effective way of delivering on its strategic priorities...

1.180 Government should adopt a sophisticated policy mix to meet both economic and environmental goals. Policy should get the prices right (especially congestion pricing on the roads and environmental pricing across all modes) and make best use of existing networks... reflecting the high returns available from some transport investment, based on full appraisal of environmental and social costs and benefits, the Government, together with the private sector, should deliver sustained and targeted infrastructure investment in those schemes which demonstrate high returns...

Eddington did not conclude that high speed rail would not produce benefits. Rather, the evidence on the magnitude of these benefits was inconclusive, especially in the English context. Unless public spending is limitless, choices will always have to be made and there could be better ways of spending those limited resources in terms of achieving the transport objectives.

The arguments have changed little since their clear statement in the Eddington Transport Study report – except that at that time the estimated capital cost of the ‘comprehensive network’ was £33bn, whereas by the time of the Notice to Proceed with the scheme joining London to Manchester and Leeds it was estimated to have a total cost of £108.9bn (2015 prices; see Table 1 in section 12).

4. High speed rail after Eddington

In spite of the Eddington Transport Study report's lack of enthusiasm for high speed rail, the idea continued to be investigated. A notable body was (and still is) the Greengauge 21 Public Interest Group – an agglomeration of railway and local authority interests. In 2009, it published *Fast Forward: A high-speed rail strategy for Britain*.²⁴ This proposed two new high speed lines from London to Scotland (the East and West Coast Main Lines) and enhancements to the route from London to South Wales.

John Preston examined reports on high speed rail with specific reference to evidence on the economic benefits and costs:

These reports indicate that although the capital costs of [high speed rail (HSR)] are high, and are particularly so in Britain, there are also substantial benefits. As a result recent studies have put forward HSR schemes for Britain with Benefit Cost Ratios between 1.8 and 3.5. The dominant benefits are time savings to HSR users and the net revenue to the rail industry.

Other benefits, such as reduced overcrowding, the benefits of released capacity on the classic rail network and on parallel roads, and of reduced emissions of greenhouse gases are much smaller but are positive. The main benefits of HSR are thus transport benefits with the main beneficiaries being existing and future rail users.

Many of the benefits of HSR are thus predicated on there being strong demand growth for passenger rail services. There may be some wider economic benefits as a result of the greater scope for long-range commuting and business travel offered by HSR but these are unlikely to radically alter the economic case for HSR. Although recent studies have shown that HSR in Britain could cover its operating and maintenance costs, it could only contribute to a fraction of its capital costs, with public support of between £17 billion and £27 billion required.

It will therefore be important to ensure that an investment of this magnitude represents value for money, both within the transport sector and across Government departments. The limited reviews of high speed rail projects elsewhere in Europe indicate that they have been affected by appraisal optimism and that out-turn results suggest Benefit Cost Ratios much lower than those being forecast in Britain.²⁵

5. The Conservative Party in opposition reintroduces high speed rail

In September 2008, the Conservative Party in opposition brought the subject of high speed rail back into general public discussion, as reported by Deborah Summers in *The Guardian* newspaper:

Delegates at the Conservative conference cheered today as Theresa Villiers, the shadow transport secretary, said a future Tory government would say no to a third runway at Heathrow and instead give the green light to a £20bn 180mph rail link between Leeds, Manchester, Birmingham and London.

"This is one of the hardest decisions we've faced as a party and we will not run away from it," she said.

A high-speed link from St Pancras to Heathrow, connecting the north, could replace up to 66,500 flights a year.

"That would free up almost a third of the capacity that would be provided if a third runway were built," Villiers said...

Construction would begin in 2015 with full completion by 2027, Villiers said. "The case for high-speed rail is clear," said Villiers. "It would generate huge economic benefits, it would dramatically improve transport links between north and south and it would give a vitally important boost to our efforts to protect future generations from catastrophic climate change.

"I believe that this announcement signals a momentous step forward for Britain's transport infrastructure. It will leave a lasting legacy for the future. And it will lay the foundations for a high speed network that I believe will one day stretch across the country."²⁶

So one reason for this announcement was that the Conservatives saw it as a way of responding to the clamour for new runway capacity at Heathrow Airport, something that the party opposed.

The incumbent Labour government was unconvinced:

Ruth Kelly, the outgoing transport secretary, said... "These proposals are politically opportunistic, economically illiterate and hugely damaging to Britain's national interests. The Tories are posing a false choice – we need both more capacity in Britain's airports and on our main rail lines."²⁷

6. Labour minister, Andrew Adonis, promotes high speed rail

Ruth Kelly's scepticism marked the low point of enthusiasm for high speed rail on the part of ministers of governments of any political persuasion and of the Department for Transport. On 3 October 2008, Goeff Hoon was appointed secretary of state for transport. He was supported by Baron Adonis of Camden Town as minister of state (promoted to secretary of state in June 2009). Andrew Adonis has been by far the most influential individual in bringing HS2 to its current state. He is keen on railways. In a lecture to the Institute for Public Policy Research in June 2019, he said:

"As a boy I was an unusual kind of train nerd. I was never a train spotter. Rather, at the age of 13, I wanted to be chairman of British Rail because I was fascinated by railway timetables and by improving public transport connections between places.

I was equally interested in bus timetables, and wanted British Rail to take charge of them so that trains and bus timetables could be integrated and published together, with a single national timetable serving every town, village and district of every city in the country. I even wrote my own integrated national timetable, with 483 tables, and sent it to Sir Peter Parker, then chairman of British Rail. All I got was an acknowledgement, which I thought impolite so I wrote to tell him so. I didn't get a reply to that one."²⁸

The *Independent* newspaper reported an interview with Andrew Adonis in July 2009:

"I'd always been interested in high-speed rail." Most politicians with any sense would fight tooth and nail to avoid the political graveyard of the DfT [Department for Transport], which has seen 12 secretaries of state come and go in just 20 years. Yet it was Adonis who approached [prime minister, Gordon] Brown with an offering – to move him to the department and allow him to push ahead with an extraordinary plan to bring high-speed rail to Britain. He certainly isn't playing it [sic] down the scale of the project. "It will be one of the biggest infrastructure projects the country has ever undertaken and we've been embracing it with real enthusiasm," he said. "I'm a man on a mission."²⁹

And in August 2009, Glover and Milmo reported in *The Guardian*:

Adonis says: "We have had a massive national aversion to long-term transport planning. We had this view that high-speed trains might be suitable for France and Japan but these were highly exceptional. While we were busy conducting ideological experiments in rail privatisation most of the rest of Europe was getting on with the serious job of building high-speed railway lines astonishingly fast." He rattles off the facts like an enthusiast. "Spain, which didn't start until the 1990s,

now has 1,600km in operation, 2,200 under construction, and 1,700 planned. This year Spain has a budget of €6bn just for building high-speed rail lines.”

“We’ve set up a dedicated company, High Speed Two, which by December will produce a dedicated route plan for the first stage of a high-speed line between London and the West Midlands including all associated environmental and economic assessments. We’ve also asked it to recommend a broad route north to Scotland.”³⁰

Adonis took the chair of a new National Networks Strategy Group on his appointment as minister of state for transport in October 2008. This had met four times by March 2009³¹ but it is evident that it quickly decided that high speed rail was worthy of further investigation. On 14 January 2009, secretary of state, Hoon, created a new enterprise, HS2 Ltd, “by incorporation under the Companies Act 2006, and limited by guarantee. It is an Executive Non-Departmental Public Body tasked with delivering the HS2 programme and is funded by capital contribution from the government. The Secretary of State is its sole member, for whom it is remitted to undertake work.”³²

The company’s aims were to give the secretary of state (in the event Hoon’s successor, Adonis) advice that would facilitate a decision on whether a high speed line was worthwhile pursuing further. He announced:

The creation of a new company – High Speed 2 – to help consider the case for new high speed rail services between London and Scotland and tasked initially with developing a proposal for an entirely new line between London and the West Midlands which could link to Heathrow and Crossrail through a new international interchange station...

A new rail line between London and the West Midlands approaching London via a Heathrow International interchange would enable faster journeys to the North and Scotland and could link the airport with rail destinations throughout the UK. This would unlock Heathrow for the rest of the country, making it a truly national asset. I expect to receive advice from High Speed 2 by the end of the year on a credible plan for a new line with financing proposals...

High Speed Two will build on Network Rail’s study of options for new lines and the formation last October of the National Networks Strategy Group chaired by Andrew Adonis. Network Rail’s work has pointed to a strong case for a new line from London at least to the West Midlands. This would both improve connectivity and increase capacity on the existing West Coast Main Line, which is forecast to become overcrowded by about 2025.³³

It is readily apparent that Adonis was determined to deliver a high speed rail scheme from long before he took office at the Department for Transport. But HS2 Ltd was set up to take forward the engineering, economic and legal planning to the point at which the feasibility of the scheme was shown.

In February 2009, HS2 Ltd, with chief executive officer, Alison Munro, set about its work in this spirit of inquiry. It created three advisory panels: the Technical Expert Panel; the Strategic Challenge Panel; and the Analytical Challenge Panel.*

The External Challenge Groups have been set up to ensure that HS2's approach to High Speed Rail is rigorously scrutinised at every stage. They are comprised of panels of independent experts specialising in the groups' respective areas of focus and they challenge and reinforce; they will challenge and reinforce HS2's strategic, technical and analytical approaches.³⁴

Membership was drawn from independent experts, as noted in the quote above, and they were supported by consultants and the civil service. The last meeting of the Analytical Challenge Panel was in March 2012.³⁵ The Transport Select Committee of the House of Commons commented:

Of the three groups, currently comprising 22 people (all men), only the Analytical Challenge Panel contains any evident critic of high-speed rail. The Strategic Challenge Panel comprises eight transport and local government experts who are almost all publicly supportive of high-speed rail, including the Director of Yes to HS2, the Director of Greengauge 21 and the Chairman of Network Rail.³⁶

While the advisory panels did not produce published reports, individual members published their views in May 2011 in written evidence to the Transport Select Committee.³⁷ HS2 Ltd carried out the economic appraisal in accordance with the current general practice, as later stated in a note by Joe Grice, chair of the Joint Analytical Group (Department for Transport):

As the NAO [National Audit Office] report noted "the Department has broadly used the same methodology to analyse High Speed 2 (HS2) that it uses on other transport projects"³⁸. This methodology is based on the Department for Transport's published transport appraisal guidance (WebTAG) and has been assembled and refined over the last decade or so. It meets the requirements for Central Government appraisal as set out in the HM Treasury Green Book and gives the means to implement the Green Book's principles in transport projects... WebTAG provides a comprehensive

* The author was a member of the Analytical Challenge Panel from its inception until 2012 when the government made the decision to deposit a hybrid bill in parliament for Phase One of HS2, at which point the remit of HS2 Ltd changed from investigation of the arguments to one of positively promoting the scheme.

and disciplined framework for consistent modelling and appraisal by providing key methods, assumptions, and values.³⁹

This was appropriate given that a decision to proceed with HS2 would be a decision to divert public funds from alternatives and those alternatives would be appraised within the same framework. This decision attracted criticism later, particularly from objectors who argued that there was an inherent bias in favour of the scheme: notably that the standard values attributed to the saving of time by business travellers were too high because of the common practice of using time on a long-distance train for productive work. For instance, Lord Forsyth, when presenting the House of Lords Economic Affairs Committee's report to the House, commented:

"Our second reservation concerns the methodology and evidence used to calculate the value of travel time. These measurements have improved since their first iteration—when they forgot that people can, and quite regularly do, work on trains—but they are still questionable."⁴⁰

Analysts will, with good reason, defend the values attributed to saving time. They were refined in a 2015 study.⁴¹ As it turned out, the estimated economic returns contained in HS2 Ltd's 2009 report (published in 2010)⁴² were modest compared to available alternative public projects and any alleged bias was not dominant in the eventual decision to go ahead. At that time, as at the point of the final decision in 2020, the evidence on the broad economic benefits of the scheme was not overwhelming and decisions depended on a judgment of wider, strategic issues.

7. HS2 Ltd's report and the Labour government's 2010 white paper on high speed rail

HS2 Ltd duly delivered its report to the secretary of state for transport by the end of 2009. It was published in March 2010 alongside the government's own white paper on high speed rail.^{43,44}

The HS2 Ltd report envisioned a London to Birmingham scheme which would:

generate capital costs of between £15.8 and £17.4 billion, including risk and optimism bias, but excluding rolling stock... We forecast that the preferred HS2 scheme would generate transport user benefits worth £29bn (2009 PV), as well as additional revenues worth £15bn (2009 PV). This is driven almost entirely by time savings – which also reflect benefits from relief of crowding. Wider Economic Impacts would add a further £4bn or additional 11%... Balanced against the costs of construction and operation, we calculate that HS2 would demonstrate a Benefit Cost Ratio (BCR) of 2.7 : 1 including Wider Economic Impacts. Consistent with the range of costs, the range of the BCR would be 2.5 - 2.9. Without Wider Economic Impacts the central figure would be 2.4 : 1...

The overall network demonstrates a good BCR. We have also examined Manchester and Leeds as the possible next stages and both show a good business case. Further work would be required to investigate routes in more detail and to analyse the impacts in greater depth. However, we believe our findings can give Government confidence that there is a substantial case for deploying further resources on such work and we recommend both the North West and Yorkshire via the East Midlands as priorities for the next stage.⁴⁵

In view of the genesis of HS2, in which ministers and shadow ministers in both main political parties had emphasised the importance of serving Heathrow Airport directly, it is ironic that the report concluded that it was not worthwhile serving it:

In the report we present options for serving Heathrow Airport directly via a loop from our proposed route, possibly as the network is extended in the longer term. We also present options for building a connection to High Speed One (HS1) for through services to mainland Europe. In neither instance is there a clear cut economic case for doing so at this stage, given the costs involved. Providing a loop to Heathrow would add at least £2.5bn, after risk is included, to the overall cost. An HS1 connection would add more than £1bn. While passive provision could be made for a Heathrow loop, we recommend that, should Government wish to pursue the HS1 connection, at least the tunnel should be built for Day One to avoid costly disruption at a later date. We also highlight the option of providing passenger connections to HS1 at St Pancras International by way of an advanced people mover from Euston.⁴⁶

It also concluded that:

HS2 would have both positive and negative effects on transport emissions. The ultimate impact depends critically on a number of external factors (such as the grid intensity of electricity) which we set out in the report. Taking these variables into account, we calculate that the impact of HS2 on carbon emissions will be between a reduction in emissions of 25 million tonnes of CO₂ and an increase of 26.6 million tonnes of CO₂ over 60 years. This is small when set in the context of overall transport emissions.⁴⁷

The HS2 report was an excellent piece of work, especially considering the short time that was available for research on this scale and difficulty. The modelling task was daunting. To make a plausible estimate of how many people might use the new railway, it was necessary to make estimates of where journeys would ultimately begin and end. The available data on this were not good. The conventional rail models rely on passenger responses to generic changes in time and cost and there was no specific representation of station, destination or mode choice, effects that are important for a new network such as HS2. (The PLANET strategic model that had been set up for the 2001 desk studies was largely untested.) The issues surrounding the data and modelling of access journeys (origin to destination as opposed to station to station) were especially demanding and remained so.

Since the exercise assumed that the railway would not begin operations until 2025, HS2 Ltd had to forecast the trip patterns *starting* in 15 years' time and then continuing for six decades. It also had to make assumptions about growth in population, its location, the locations of people's places of work and the effects of economic growth on the total demand for movement up to 2025, and thereafter for the decades over which the scheme was appraised. This is all difficult and imprecise, but the exercise cannot be avoided. It is no different from the problem that has to be faced when appraising any large-scale, long-lived infrastructure project.

In accordance with the terms of reference, HS2 Ltd made a careful study of the best route from London to Birmingham. This had to be costed and, to achieve that, a line of route had to be specified in considerable detail. The appraisal of carbon emissions and economic costs and benefits was made in detail for the stretch between London and Birmingham. The study assumed that, north of Birmingham, trains would rejoin the existing West Coast Main Line. However, HS2 Ltd did have a discussion of how other cities might be served: it offered an outline conclusion that a branch to Nottingham, Sheffield, Leeds and then on to points north might be the best option. But the proposals beyond Birmingham were analysed in much less detail.

The simultaneously published white paper on high speed rail was a statement by the government on its policies towards high speed railways.⁴⁸ It took a much broader stance. It did encompass the HS2 Ltd research but speculated about a larger network of high speed railways. The analysis and its interpretation did not exhibit the same standard of rigour as HS2 Ltd's and there is some double-counting, which HS2 Ltd quite correctly took care to avoid.

The House of Commons Transport Select Committee had observed that "it is only a relatively small proportion of journeys on our major roads that could be transferred to rail, let alone high-speed rail".⁴⁹ The HS2 Ltd study confirmed this: only 8% of HS2's forecast passenger demand would come from roads (and a further 8% from air) and this would reduce traffic on the southern section of the M1 by 2% – a couple of years-worth of typical growth. The general public had been encouraged to believe that investment in railways is an effective way to achieve modal transfer from road to rail but the evidence is that this is not always the case.

HS2 Ltd described the magnitude of the forecast carbon savings as "small when set in the context of overall transport emissions".⁵⁰ The white paper did cite HS2 Ltd's calculations but it sought to imply that high speed rail would have substantial environmental benefits. For instance, it displayed a table of *average* carbon emissions per passenger kilometre by mode, which is irrelevant to the proposal under consideration: one must calculate – as HS2 Ltd had done – the *change* in emissions attributable to the change in policy.

The white paper considered high speed rail in isolation, with limited running on to the rest of the network with a small fleet of classic compatible stock. As Douglas Oakervee observed 10 years later,⁵¹ any proposal for high speed rail should be considered inside the existing framework for planning the railway. Then there can be a sensible discussion about whether high speed rail should be allowed to compete for funds at the expense of the existing railway.

HS2 Ltd's estimated benefit:cost ratio for the London to Birmingham section was at the average rate of economic return for rail in the set of rail schemes reported in the Eddington Transport Study. So, at that time, high speed rail did stand in comparison with a number of other rail proposals. But this was substantially lower than the rate of return typically found for road schemes using comparable appraisal techniques: average ratios of 4.7 for Highways Agency schemes and 4.2 for local authority road schemes.⁵²

8. The coalition government consults and decides to proceed

In May 2010, the Labour government was replaced by a coalition government and Philip Hammond succeeded Lord Adonis as secretary of state for transport. Hammond later recounted "how [prime minister, David Cameron] said one thing to me, he said: 'Get HS2 done. Get out there and promote it like mad, get it done, get it through, that's your only task.'"⁵³

Justine Greening succeeded Hammond in October 2011. In January 2012, she announced⁵⁴ that, having considered the public consultation issued in February 2011, the government had decided to go ahead with the scheme and would deposit a hybrid bill in order to secure the necessary parliamentary powers. A hybrid bill takes the decision to build the scheme as a given – as formal government policy – and gives people affected an opportunity to petition for changes or compensation in relation to their own, private interests. Once the parliamentary processes are complete, the Act gives the promoter the rights to build the scheme and to make compulsory purchases of property. It defines the exact route to be taken within narrow limits of deviation.

However, there was a complication. The government had divided the scheme into two sections. Phase One is from London Euston to Birmingham. Trains bound for destinations further north will join the existing West Coast Main Line north of Birmingham. Phase Two is one branch from Birmingham to Manchester and a second branch to a point between Derby and Nottingham, Sheffield and Leeds. The hybrid bill only sought powers for Phase One. HS2 is a massive scheme, with many individuals affected, and the limitation to Phase One made the parliamentary process more manageable. In any case there was insufficient clarity about the detail of what was required in Phase Two to draft a bill. Subsequently, Phase Two was subdivided into Phase 2a and Phase 2b, with Phase 2a extending Phase One from Birmingham to Crewe (28 miles south of Manchester). A bill for Phase 2a attained Royal Assent in February 2021 but no detail has been decided about Phase 2b, as discussed below.

9. Cost information made available to the public and parliament

The issues and the arguments deployed were set out by Sir Rod Eddington in 2006⁵⁵ and changed little between 2010 and 2020. However, there were three material changes to the circumstances over the period from the 2010 white paper on high speed rail to the decision on the Notice to Proceed in 2020.

One was the estimated cost of delivering the scheme. At the time of Justine Greening's crucial decision in January 2012, the cost, including the rolling stock, was estimated at £14bn for Phase One (at 2011 prices) after net revenues of £13bn.⁵⁶ The net cost for the full scheme was estimated at £32bn after revenues of £27bn,^{57,58} so a gross cost of £59bn.

Between 2015 and 2019, the official estimate for the whole scheme was held at £55.7bn (2015 prices). But in September 2019, the new chairman of HS2 Ltd, Allan Cook, published his *Stocktake*, which revealed that "the budget and target schedule for the programme have proved unrealistic...".⁵⁹ The cost estimate was raised to £75bn (2015 prices). It transpired that the 2015 estimates had been based on superficial civil engineering estimates, especially north of Birmingham. More recently it has become clear that the designs for the major stations at Euston, Manchester and Leeds had not been settled – and therefore could not be definitively costed. They remained unsettled at spring 2021.

The permanent secretary of the Department for Transport confirmed to the Public Accounts Committee on 4 March 2020 that government had been aware that the 2015 estimates were unrealistically low for some time.⁶⁰ The committee's first conclusion was that:

The Department and HS2 Ltd were aware of the scale of the issues facing the programme as early as October 2018. In March 2019 HS2 Ltd formally notified the Department that it could not deliver Phase One to budget and schedule. Despite being aware of these issues, the Permanent Secretary withheld from us that the programme was in significant difficulty when she appeared before the previous Committee in October 2018 and May 2019, even in response to specific questions about the programme's delivery timeline and budget. HS2 Ltd's annual report and accounts for the year ending 31 March 2019 similarly failed to give an accurate account of the programme's problems... no adequate excuse was provided for not disclosing to this Committee and Parliament the risk and uncertainty the programme was facing... Lack of clarity and obfuscation about the budget issues with HS2 risks jeopardising the trust between Parliamentary committees and Government officials.⁶¹

In public there had been long-standing rumours that the declared budget for HS2 was known to be inadequate. In a letter of 11 November 2019, Lord Berkeley, deputy chair of the Oakervee Review, alleged that:

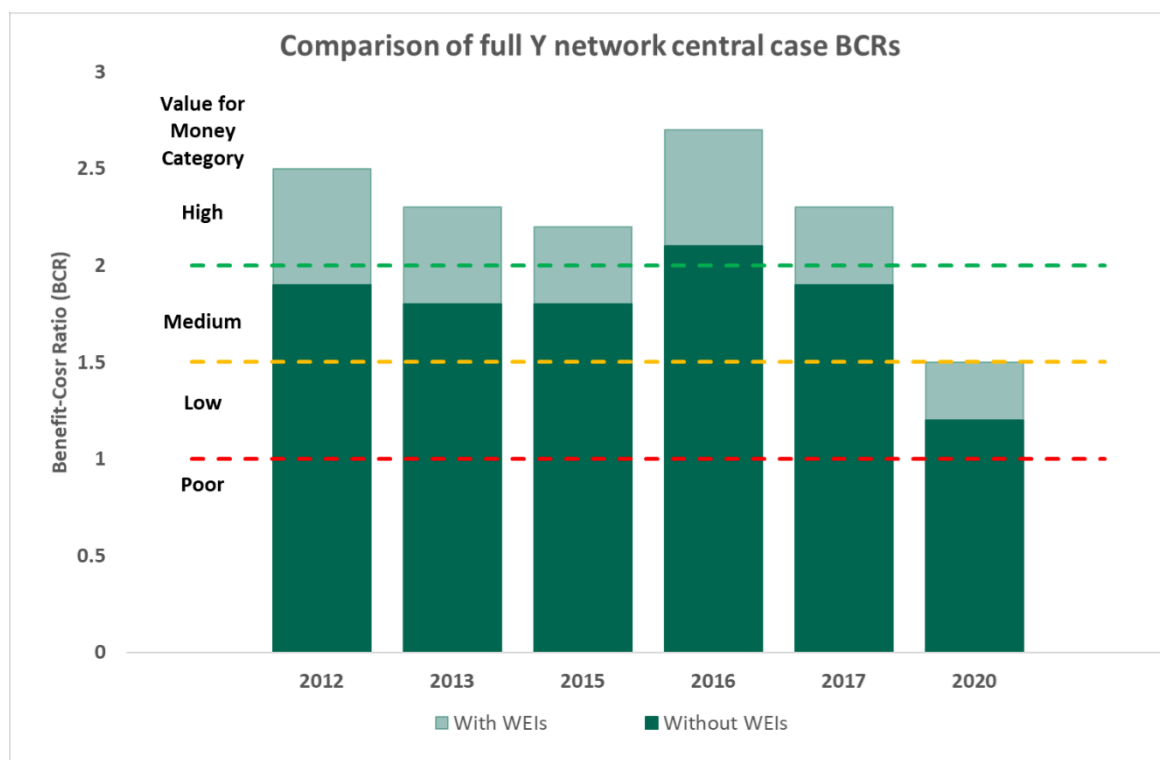
Internal memos from within HS2 indicated a serious concern among senior managers that the budget could not be adhered to and that a figure of at least £84 to £86 bn was accepted within HS2 Ltd higher management in the Autumn/Winter 2016, and there are reports that, at a conference held at the Saïd Business School at Oxford at the same time, attended by officials from HM Treasury, the Department for Transport and HS2 directors, there was discussion that the ultimate costs at 4th Quarter 2015 prices could be as high as £100 bn.⁶²

Yet, as late as July 2019, ministers were reassuring parliament that “there is only one budget for HS2, and it is £55.7 billion”.⁶³ There is some ‘careful’ wording here: the statement refers to the “budget” rather than the cost estimate. For some time the government had been holding to a position that the scheme would be delivered to the 2015 budget figure, but only by achieving yet-to-be-identified efficiency gains. At her appearance at the Public Accounts Committee on 4 March 2020, the permanent secretary, reflecting on this period, said:

“I was actually quite careful in my remarks in 2019. I did not say that the project was coming in on budget and schedule. What I said was that the budget remained at that point £55.7 billion, which it did; it had not been changed. I indicated that it would not change other than at the spending review, which at that point we were expecting to have in the autumn. I also highlighted that there were challenges with the scope of choices, and that there were emerging cost pressures. I don’t think I did say at that point that it was on budget and schedule—I was quite careful. In reality, you are right—the NAO Report is clear about this—that we were aware that significant cost pressures existed. At that point we were still examining choices around scope, which would have brought the project within budget. They were very difficult choices, but we were still looking at remedial action that, in theory, would have made it possible to bring it back into budget.”⁶⁴

So at the time of the public statements in spring and summer of 2019, in private, officials were aware that the 2015 estimates were proving to be unrealistic and that significantly higher figures were due to be published in the September. Neither parliamentarians nor the press seem to have noticed the government’s careful use of language.

As a matter of arithmetic, if the costs increase, other things being equal, the benefit:cost ratio will deteriorate. This is illustrated in Figure 1, which shows how the estimated benefit:cost ratio for all phases (the full ‘Y’ network) fluctuated over the years but fell substantially when the higher costs were applied at the point of the Notice to Proceed in 2020. At that point, including the wider economic impacts (WEIs), the whole scheme had a benefit:cost ratio estimated at 1.5 and the Phase One scheme alone scored 1.2.

Figure 1: Full 'Y' network benefit:cost ratios (BCRs) over time

Source: Department for Transport, *Full Business Case: High Speed 2 Phase One*, Department for Transport, 2020, Figure 2.1, p 51

A second problem revealed by the chairman's *Stocktake* in September 2019 was that the expected opening dates had been postponed from 2026 to 2028–31 for the line to Birmingham and from 2033 to 2035–40 for the line to Manchester. This matters because there are only costs until services can commence and start delivering benefits. All benefits will be discounted by a further several years.

The third development between the 2012 decision and the final Notice to Proceed was that the northern city regions had developed much more sophisticated plans concerning what their local communities believed they needed. This is made clear in the National Infrastructure Commission's report of December 2020,⁶⁵ which is discussed in section 14.

10. Public discussion of the strategic case

Although the government took the crucial decision in January 2012, there was public discussion about whether HS2 should go ahead throughout the period from 2010 to the grant of the Notice to Proceed in April 2020, together with publication of the *Full Business Case: High Speed 2 Phase One*.⁶⁶ It continues at the time of writing (spring 2021), as the long-term implications of the Covid-19 pandemic are debated.

There have been a number of investigations by the parliamentary Select Committee on Transport; the House of Lords Economic Affairs Committee; the Institution of Civil Engineers; the National Audit Office; the Major Projects Association; the Infrastructure and Projects Authority; the cabinet secretary; and many interest groups. There are good summaries of the arguments in two House of Lords reports⁶⁷,⁶⁸ and in a House of Commons Library briefing paper by Louise Butcher.⁶⁹

Common themes of the official reviews were:

- concern that the outturn costs might be higher than the official estimates that HS2 Ltd and the Department for Transport were giving to parliament
- an acceptance that HS2 would generate benefits (broadly defined) but a scepticism that there was enough hard evidence that the magnitude of these benefits would be sufficient to offset the net cost to the public purse
- controversy about claims that would always be hard or impossible to predict or quantify (such as 'bridging the north-south divide', stimulating local economic activity and attracting inward investment)
- what could be deduced from the (mixed) experiences of other high speed rail schemes
- the risks in terms of cost outturns and forecasts of passenger demand for at least 60 years *starting* in the late 2020s
- whether damages to landscape and the natural world have been properly assessed.

There was also dispute about double-counting. If new jobs were to be created near to HS2 stations, would these be entirely new or diverted from unserved regions? If agglomeration and productivity benefits had already been appraised in the 'wider economic impacts' part of the appraisal, which had been included, were there additional benefits of that kind? If journey time savings have been appraised, is an increase in land values an additional benefit? If carbon emission reductions have been valued in the standard appraisal, is it legitimate to claim them as an additional, non-valued benefit?

HS2 Ltd commissioned a study from KPMG on 'HS2 Regional Economic Impacts' and published it in September 2013.⁷⁰ This study was important because it offered a different approach and it seemed to estimate much higher benefits than the conventional method. The report received considerable publicity. The secretary of state for transport, HS2 officials and others cited it frequently as providing strong

new evidence of high benefits for the economy from HS2. The headline was that it would produce annual benefits of £15bn in 2037 (and, by implication, each year thereafter).⁷¹

The Department for Transport's *The Strategic Case for HS2* says that:

There has been much debate about the scale of the potential economic benefits of HS2 and their distribution between north and south. With advice from an independent panel of experts, HS2 Ltd commissioned KPMG to consider the potential impacts of HS2 on the economy at a city and city region level. The results of the analysis suggest that HS2 could increase economic output by £15bn per year. Even with more cautious assumptions the annual benefit could be £8bn. In addition the analysis shows that, while all regions benefit, the city regions in the Midlands and the North do particularly well. Given differences in approach it is not directly comparable to the standard appraisal... but it does suggest that there may be benefits not captured in the transport appraisal and the analysis is a step forward in improving the evidence in this area. The benefits calculated by this new method are not simply additional to the benefits measured in a conventional appraisal...⁷²

This approach was, in principle, a valid alternative to the standard one. But the KPMG report attracted some scepticism and the report itself makes cautionary warnings. For instance: "The projections set out in the analysis have been prepared for illustrative purposes only and do not constitute a forecast" (page ii); and "It is also important to recognise that these results are considered the first step in assessing the overall productivity impacts of investment in HS2 on the British economy and the distribution of total economic output across the country" (page 15).⁷³

The headline figure, that HS2 would generate £15bn a year in return for the investment, would be a spectacularly high return and a higher one than other researchers have estimated. The figure has not been discounted according to standard practice. The costs of constructing HS2 are expressed as a discounted present value (PV) so, for comparability, the benefits should have been also. £1bn in 2037 had a present value in 2013 of £0.44bn if discounted at the then-standard Treasury rate of 3.5% a year. So £15bn should have been discounted to £6.6bn. But also note that the return is the value of additional output for the British economy *every year* from 2037. Allowing for, say, 2% a year real growth in the economy from 2037 and using the standard 60-year horizon after opening, the present value in 2013 of this stream of benefits is £256bn. This would have been an implausibly large return on an investment of £50bn.

In a similar piece of work for the Northern Way, Professor Overman and others⁷⁴ noted an important potential source of bias in the method, which originated in the assumption that the composition of the workforce is homogeneous, when, in fact, more productive individuals will have self-sorted to locate in the more productive locations. They show that removing this source of bias dramatically reduces the estimates of the benefits of improved connectivity. The KPMG noted this possibility (para 6.3.27)⁷⁵ but was unable to correct for it.

There is an important issue of disentangling cause and effect: is it that good connectivity improves productivity; or is it that where productivity is high, connectivity has already been made good, not least because good infrastructure was easier to afford? It is likely that the causation runs both ways. This problem of 'simultaneity' is difficult to disentangle, but when it has been it becomes apparent that assuming the causation runs in one direction only can cause a significant overestimate of the true impacts of connectivity on productivity.

Finally, the KPMG report contained a piece of manipulation that is hard to defend and probably exaggerated the benefits: indeed the report itself says (para 6.3.38) that "we recognise that this approach does not have a firm statistical foundation...".⁷⁶ The problem was that KPMG identified four distinct types of connectivity improvement that might contribute to improved productivity. It initially decided to apply a multivariate statistical analysis in an attempt to identify the separate influence of each of the four, which is a valid approach. Unfortunately, as is often the case, the four measures tend to move closely together and there was insufficient information in the data to separate out their individual impacts.

However, KPMG goes on to apply a technique that is misleading (running four separate, univariate analyses, which is a known source of bias) and then manipulates the results in a way that is obscure and involves selecting the largest of the available coefficients: "We have taken an approach which assumes that, within each sector, the overall importance of connectivity is best described by the highest elasticity found from the different forecasting equations" (para 6.3.33).⁷⁷

Professor Overman provides a detailed description and commentary of the KPMG study.⁷⁸

11. The Oakervee Review

In July 2019, Boris Johnson was appointed prime minister and he appointed his own advisers. Phase One of the HS2 scheme was waiting for the government to issue a Notice to Proceed.

On 21 August, Johnson announced that he had set up a rapid, independent review under the chairmanship of Douglas Oakervee. The terms of reference stated:

The Prime Minister has stated his wish to review “whether and how we proceed” with HS2 ahead of the ‘Notice to Proceed’ decision for Phase 1 (London-West Midlands) due by the end of 2019. The review will assemble and test all the existing evidence in order to allow the Prime Minister, the Secretary of State for Transport and the government to make properly-informed decisions on the future of Phases 1 and 2 of the project, including the estimated cost and schedule position... The deputy chair will be Lord Berkeley. There will also be a panel consisting of Michele Dix, Stephen Glaister, Patrick Harley, Sir Peter Hendy, Andrew Sentance, Andy Street, John Cridland and Tony Travers. Each will focus on a specific area of interest; they will feed in to and be consulted on the report’s conclusions, without having a right of veto in the event that consensus cannot be reached... The review will report to the Secretary of State for Transport with oversight from the Prime Minister and the Chancellor of the Exchequer. It should produce a written report suitable for publication.⁷⁹

The membership of the unpaid advisory panel* was widely drawn and included individuals with well-known, publicly stated and differing views on the overall merits of the scheme. The chairman had been chair of HS2 Ltd from 2012 to 2014. The deputy chair, a member of the House of Lords, was a long-standing opponent of the scheme. The membership included the chair of Network Rail, the mayor of the West Midlands (which includes Birmingham) and the chair of Transport for the North. The panel members signed a strict confidentiality agreement.

The timescale for the review was short. The first meeting was at the end of August and the panel’s appointments expired at the end of October.

In view of the timescale, the competing time commitments of the panel members, their allegiances and their prior views, it was never going to be possible to agree the text of a report; and that was not the intention. It was always going to be the chairman’s report, written with the advice of the panel. The terms of reference explicitly said that panel members “will feed in to and be consulted on the report’s conclusions, without having a right of veto in the event that consensus cannot be reached”.

* The author was one of the members.

As the chairman says in the introduction to his *Review*:

Throughout this report I refer to the conclusion and recommendations of the Review – these conclusions are mine and I reached them with the support and recommendations of my Deputy Chair and panel members... All the panel members, with the exception of the Deputy Chair, have confirmed they support the approach taken in the report.⁸⁰

Note that the panel members were not invited to say whether or not they agreed with the conclusions of the *Review*.

The Oakervee Review was advisory: contrary to some commentary, it could not have been set up to actually make any decisions. It always remained the responsibility of government and it was free to accept or to reject advice.

Following regional visits, meetings with the Department for Transport and HS2 Ltd officials and others, a draft of the chairman's report was prepared by the end of October. In late October and early November, panel members were invited as individuals to comment on this draft. At that point the panel disbanded; the members were not involved in redrafting in response to their comments.

On 11 November, Lord Berkeley, deputy chair, published a letter to the chairman "as a formal notice that I do not support the Review Report. I reserve the right to publish my own alternative report in due course."⁸¹ (Lord Berkeley published his own report on 5 January 2020.⁸²) Among other reasons, Lord Berkeley expressed dissatisfaction about the way in which the review had treated estimates of scheme costs, which he thought would be substantially higher than those mentioned in the draft, citing the advice of a private individual.

The following day, *The Times* newspaper published details of a document that it described as a "leaked" copy of the report under the headline "HS2 will boost north despite soaring costs... The HS2 rail project should go ahead despite costs ballooning to £88bn and a dramatic drop in the benefit to taxpayers, according to a review of the scheme seen by *The Times*."⁸³

Grant Shapps, secretary of state for transport, had said that he expected to receive the Oakervee Review in the autumn⁸⁴ but it seems that *acceptance* of the final draft was delayed by the general election of 12 December 2019. Baroness Vere later told the House of Lords: "The department received the draft report before Christmas..."⁸⁵ In the event it was not published until 11 February 2020, eight weeks after the election.⁸⁶ On the day of publication, the prime minister made a statement to the House of Commons that: "The review recently conducted by Douglas Oakervee... leaves no doubt of the clinching case for high speed rail... today Mr Speaker, the Cabinet has given high speed rail the green signal."⁸⁷

On 15 April 2020, the government published the *Full Business Case: High Speed 2 Phase One*⁸⁸ and issued the Notice to Proceed with Phase One, stating:

After careful consideration of the independent Oakervee review, the Prime Minister confirmed to Parliament in February 2020 that the project should go ahead, to deliver vital improvements to capacity and connectivity across the Midlands and North, alongside a reform package to improve governance at HS2 to ensure the project is delivered better and more efficiently. 'Notice to proceed' marks the formal approval for the project to begin the construction phase and HS2 Ltd is now entering Stage 2 of the main works civils contracts, with each held by a specific joint-venture.⁸⁹

The *Oakervee Review*, as published, reports estimates of total costs exceeding £100bn, rather than the £88bn that had been current after the HS2 Ltd chairman's *Stocktake* and Lord Berkeley's letter in November 2019. This was no doubt the consequence of further work done by the Department for Transport and HS2 Ltd since the disbanding of the panel. It is broadly consistent with the figure of £108.9bn for the complete scheme, which appears in the government's April 2020 *Full Business Case* (see Table 1 in the next section).

In spite of these increases in estimated costs and the consequential weakening of the economic case, Oakervee's recommendation remained that the scheme should proceed:

Notwithstanding changes that have occurred since the 2009 Network Rail study, its principal conclusion – and original rationale for HS2 – still holds: there is a need for greater capacity (both more trains on tracks and more seats on trains) and reliability on the GB rail network. The primary need is for capacity; speed although an important factor in economic benefits should not be in and of itself the primary driver of decision making. HS2 should be thought about as a new railway that enables fast inter-city services to be on segregated lines to free up capacity for commuter and freight services – and should be designed, built and operated with this in mind...⁹⁰

But Oakervee's recommendation was subject to a number of important qualifications: "The choice of 'whether and how we proceed' with HS2 is the responsibility of the government... the Review considers that, on balance, Ministers should proceed with the HS2 project, subject to the following conclusions and a number of qualifications."⁹¹

In conclusions 48 and 49, Oakervee notes that the decision is inherently a strategic one, and one that is not fully supported by unambiguous evidence:

The economic case does not currently fully align with the strategic case. Economic rebalancing, one of the primary drivers in the strategic case for HS2, is not currently reflected in the economic case... Further work is needed on understanding the potential impact of HS2 on the number and location of homes and jobs. Work is needed by the DfT and HS2 Ltd for future HS2 business cases to review and quantify the level 3 impacts in the benefit-cost ratio given the prominence of these impacts in the strategic case.⁹²

Oakervee suggests that, while the 2010 white paper on high speed rail conceived of HS2 as a free-standing isolated railway, in practice it has many physical and commercial interactions with the classic rail network and it should be planned as part of an "integrated plan for the GB rail network".⁹³ There needs to be a better understanding of how the existing rail network will be used once HS2 is in operation.

He notes the oft-made observation that there is no point in building Phase One on its own: if the government were to go ahead, it must commit to the whole scheme. Yet what is needed north of Birmingham is unclear and there was not enough consensus to allow drafting of a bill for parliamentary powers for Phase 2b:

Conclusion 4: HS2 can be part of transformational economic change, but only if properly integrated with other transport strategies, especially those seeking to improve inter-city and intra-regional transport, and also with national, regional and local growth strategies. Transport investment alone will not 'rebalance' the UK economy.⁹⁴

Oakervee was unconvinced of the performance specifications that had been assumed:

6.4 ... Phase One civils infrastructure has been designed to a 400kph alignment,... the planned operating infrastructure and rolling stock is designed to operate at a commercial operating speed of 330kph, with a maximum speed of 360kph... An operating speed of 330kph is faster than is currently achieved internationally apart from China...

6.13 ... it would be prudent to have a core assumption of 14 trains per hour [not 18] on HS2 infrastructure and understand the marginal impacts of increasing beyond this in the future.

Conclusion 6: ... reducing the specifications of HS2 Phase One should be looked at, but only within the limits of the Phase One Act powers. This is due to the significant costs of making changes to these powers, both in terms of time and monetary costs, and the benefits of future-proofing the scheme for future service enhancements.⁹⁵

On the maximum number of trains an hour, commentators have thought that the Systra technical study on which HS2 Ltd's specification of a maximum of 18 was based⁹⁶ was optimistic in its assumptions about the availability of suitable technologies and about the realities of running a high speed line which accepts trains arriving from remote origins on the conventional network.

Oakervee, himself an experienced civil engineer, was concerned about the contracts:

Conclusion 25: ahead of issuing Notice to Proceed for Phase One, the government should ensure that HS2 Ltd achieves a satisfactory position with each of the Main Works Civils contractors in order to obtain acceptable Stage 2 prices and a reasonable level of value engineering. If HS2 Ltd cannot achieve a satisfactory position with the Main Works Civils contractors, then HS2 Ltd, subject to further discussions with the DfT and HM Treasury, may have to consider re-procuring some or all of these.⁹⁷

During his review it became apparent that commercial aspects of the HS2 stations and surrounding lands were unresolved or unsatisfactory from the perspective of the public interest, especially at the largest station, London Euston.

Conclusion 28: Work needs to continue to ensure that commercial opportunities are maximised at HS2 Phase One stations.

Conclusion 29: HS2 Ltd and the DfT should continue... to develop HS2 stations... If the current arrangements for station development are left in place, there is a significant risk that economic value from HS2 station developments will not be maximised...

Conclusion 30: There needs to [be] further consideration around whether and how value created in land close to HS2 stations could be captured.

Conclusion 31: Governance arrangements for the development of the HS2 stations need to be streamlined with HS2 stations closely integrated with the existing transport network and the local area.

Conclusion 32: Until the issues set out in conclusions 28 to 31 above are sufficiently progressed, procurements for the development of HS2 stations should be paused.

Conclusion 34: There needs to be a single plan for the overall Euston project. In order to help deliver this single Euston plan, one organisation should bring together all the stakeholders and be responsible for the overall development and governance of the Euston project. Given the complexity of the Euston project, this organisation should not be HS2.⁹⁸

Oakervee was unconvinced that the current governance arrangements or capabilities were sufficiently robust to deliver this enormous project over a 20-year span.

10.10 ... HS2 Ltd's governance arrangements need to be reconsidered and strengthened to reflect the project's complexity and scale... Any governance arrangements should also reflect the future integration of HS2 into the national railway network.

Conclusion 41: Going forward, HS2 Ltd needs to demonstrate improvements in capability, to the satisfaction of both HS2 Ltd's board and the DfT, in a number of key areas including commercial strategy, design management and construction management.⁹⁹

12. After Oakervee: the business case for Phase One and the Notice to Proceed

The government was required to publish a full business case for Phase One at, or before issuing, the Notice to Proceed. In the event, both occurred on 15 April 2020. This timing meant that parliament could play no part in reaching the final decision with the benefit of either the Oakervee Review or the latest business case, in particular the latest estimate of cost to the exchequer. Lord Hollick commented that:

The failure of the Government and HS2 Ltd to be transparent and communicate details of the cost overruns and project uncertainties in a timely manner has deprived Parliament of the opportunity adequately to scrutinise progress and undermined public trust in HS2. This communications strategy has allowed the project to proceed to the point where the sums invested are now so great that sensible alternatives to reduce costs or reprioritise work have become costly and complex. Some say that was the plan.¹⁰⁰

Table 1 summarises the economic analysis of HS2. Note that the benefit:cost ratio excluding wider economic impacts (not shown) is 1.0 for Phase One, 0.9 for Phases One and 2a and 1.2 for the full 'Y' network.

Table 1: Economic analysis of HS2

PV, 2015 prices, £bn	Phase One only, 'parliamentary powers'	Phase One and 2a, 'Statement of Intent'	Phase One, 2a and 2b, 'full Y network'
(1) Net transport benefits (including wider economic impacts)	32.8	38.0	94.7
(2) Total costs	43.3	51.2	108.9
(3) Revenues	15.7	18.4	45.4
(4) Net costs to government (2) – (3)	27.6	32.8	63.5
Benefit:cost ratio (including wider economic impacts) (1) / (4)	1.2	1.2	1.5
Value for money category	Low	Low	Low to medium

Source: Department for Transport, *Full Business Case: High Speed 2 Phase One*, Department for Transport, 2020, Table 2.1, p 46

The 'value for money' categories shown here are part of the standard 'five case model', recommended by HM Treasury to be used in all decisions about public projects.¹⁰¹ The *Full Business Case* records that:

2.91 To compare across schemes, [transport analysis guidance] specifies value-for-money categories within which schemes can be placed. Table 2.13 below presents these categories.

Table 2.13: value-for-money categories

VfM Category	BCR
Poor	Less than 1.0
Low	Between 1.0 and 1.5
Medium	Between 1.5 and 2.0
High	Between 2.0 and 4.0
Very High	Greater than 4.0

2.92 The results show that Phase One in isolation has a central BCR [benefit:cost ratio] of 1.2, including wider economic impacts (WEIs) and 1.0 excluding WEIs. This indicates that the scheme on a standalone basis is designated "low" value-for-money by the Department.

2.93 However, it is important to recognise that Phase One is not a standalone project. Alongside Phase 2a it is an enabler to a series of national transport investments such as Phase 2b, Northern Powerhouse Rail and Midlands Rail Hub. The Statement of Intent, which includes Phase One and Phase 2a infrastructure has a central BCR of 1.2, including WEIs and 0.9 excluding WEIs. Integrated together Phase One and Phase 2a is designated "low" value-for-money by the Department.

2.94 The full "Y" network, which comprises all three phases delivers "low to medium" value-for-money with a central BCR of 1.5, including WEIs and 1.2 excluding WEIs.¹⁰²

The *Full Business Case* reports a sensitivity analysis in relation to the Phase One scheme (the 'parliamentary powers case'), as shown in Table 2.

Table 2: Sensitivities against the parliamentary powers case

Sensitivity	Description	BCR impact	
		Without wider economic impacts	With wider economic impacts
Reference case		1.0	1.2
Increased costs	Capital costs at the funding envelope of £40bn	0.8	1.0
High demand	Demand is 16% greater than in the reference case	1.3	1.6
Low demand	Demand is 16% less than in the reference case	0.7	0.9
Single forecast year	Single forecast year in 2029	0.8	1.0
Third forecast year	Third forecast year in 2049	1.1	1.4
No reliability	Reliability benefits are excluded from the results	0.8	0.9
Residual value	100-year appraisal period from scheme opening	1.4	1.8
Schedule	Old Oak Common opening 2033; Euston opening 2036	0.9	1.1

Source: Department for Transport, *Full Business Case: High Speed 2 Phase One*, Department for Transport, 2020, Table 2.4, p 54

In 16 out of these 18 scenarios, the Phase One scheme is appraised as being poor or low value for money.

The *Full Business Case* records a breakdown of the benefits. It says: "2.37 The key driver of benefits in Phase One are the transport user benefits that derive from the improved connectivity that the new high-speed network will deliver."¹⁰³ Fifty-three per cent of "improved connectivity" is shown to be simply the valuation of reduced journey times for passengers. As Table 3, presented in the *Full Business Plan*, shows, for the full scheme about half of the transport user benefits derive from increased speeds (journey time savings) and a further 27% come from a reduction in waiting times and improvements in train service reliability. The benefit of a reduction in crowding is assessed but it is only 18% of the transport user benefits.

Table 3 shows a breakdown of benefits for the three HS2 reference cases. Road decongestion benefits and carbon emission reductions are a small part of the total benefits. Wider economic impacts (agglomeration, imperfect competition and increased labour force participation) constitute 22% of the total benefits.

Table 3: Breakdown of benefits for the three HS2 reference cases

Grouped benefit	Disaggregated benefit	Benefit value (PV, 2015 prices, £m)		
		Parliamentary powers	Statement of Intent	Full 'Y' network
Transport user benefits				
	Improved access	620	630	700
	Reduction in crowding	5,120	5,140	13,470
	Improvements in interchange	250	180	2,770
	Reduction in waiting	3,200	3,320	8,920
	Reduction in walking	20	40	- 120
	Reduction in train journey times	13,900	17,680	39,070
	Greater reliability	4,000	4,350	11,850
	Benefits to road users	210	220	820
	Total	27,310	31,560	77,490
Other impacts				
	Reduction of car noise	10	10	40
	Carbon	150	160	280
	Reduction in car accidents	160	180	550
	Noise from HS2 trains	- 30	- 30	- 70
	Infrastructure	10	10	20
	Total	300	330	810
Indirect tax	Loss to government of indirect tax	- 1,390	- 1,610	- 4,140
Net transport benefits		26,230	30,270	74,170
Wider economic impacts				
	Agglomeration	4,070	4,780	13,670
	Imperfect competition	2,190	2,540	5,990
	Increased labour force participation	360	420	830
	Total	6,620	7,740	20,500
Net benefits including wider economic impacts		32,850	38,010	94,660

Source: Department for Transport *Full Business Case: High Speed 2 Phase One*, Department for Transport, 2020, Table 2.12, pp 61–2

Taking these estimates of benefit at face value, HS2 is, indeed, primarily about providing a faster, and more reliable, journey to rail travellers. Increasing rail passenger capacity is an important, but secondary, consideration. Conclusion 50 of the Oakervee Review is: "Further work is needed on understanding why reducing crowding doesn't play a greater role in the quantified benefits."¹⁰⁴

The *Full Business Case* acknowledges that, as Oakervee had observed,

1.46 Decisions on the use of released capacity on the conventional network will be made in the run up to HS2 becoming operational...

1.51 The Oakervee Review has recommended that "much more work needs to be done jointly between HS2 Ltd, DfT, Network Rail and the Shadow Operator in an integrated GB rail plan to maximise these benefits and articulate them clearly".¹⁰⁵

The implication of this is that many of the estimates of the benefits from the increased capacity offered by HS2 must have been rough estimates.

The *Full Business Case* implies that the intended running speeds have not been changed in response to the Oakervee Review: "1.63 HS2 is designed to operate at 330kph routinely, with a maximum speed of 360kph. HS2 trains will run up to 177kph on the conventional network."¹⁰⁶ Note that 177 kph is 110 mph and therefore slower than the established, standard maximum on the conventional network (125 mph). Lord Bradshaw has commented that:

When a train runs to Birmingham and it eventually goes off HS2 towards Scotland, if it has tilting capacity, it can use it on all the twisting curves around the Lake District. There is little point in saving a lot of money from London to Birmingham and then squandering it because you cannot use tilting capacity as you go further north.¹⁰⁷

In response to Oakervee's concern that it may be difficult to operate HS2 reliably at more than 14 trains an hour, the *Full Business Case* says:

1.68 Research from the University of Birmingham states that under perfect conditions, 16tph [trains per hour] capacity could be obtained on a high speed line like HS2, without including recovery time. If Automatic Train Operation was provided one to two more trains per hour is possible... the research suggests 17-18tph is feasible.¹⁰⁸

The research referred to is a conference paper.¹⁰⁹ The *Full Business Case* resolutely assumes a service of 17 trains an hour: for instance at paragraph 2.23 it says: "Phase 2a is scheduled to open in 2029, Phase 2b with the full 17tph in 2035."¹¹⁰

The government rejected Oakervee's recommendations on reviewing speed and frequency in a letter from the minister of state in June 2020.¹¹¹

The *Full Business Case* acknowledges the comments that Oakervee made in relation to the arrangements for Euston and in relation to the procurement of the Phase One main contracts. But it did not accept the need to delay the Notice to Proceed until these matters were addressed:

5.16 The Oakervee Review concluded, and the Government agree that, Euston is an important part of realising the benefits of HS2 and that work should continue on the section from Old Oak Common to Euston. Notwithstanding this, Euston is a very challenging, complex major programme and given its current status, Old Oak Common will be expected to operate as a temporary terminus for a period of time.

5.19 In addition, lessons have been learnt from Phase One in the procurement of the Main Works Civils contracts. Much more design work has been undertaken for Phase 2a compared with Phase One and significant investigations into the ground conditions (c.1,400 boreholes, of which c.800 have been completed to create a Geotechnical Baseline before tendering) have taken place. HS2 Ltd and the Department continue to actively consider how to implement contracting lessons from this stage of Phase One to future Phases of the scheme.¹¹²

13. After the Notice to Proceed: the National Infrastructure Strategy

In November 2020, the government published the *National Infrastructure Strategy*.¹¹³ This expresses a positive view towards public spending on infrastructure in spite of the short-term effects of the Covid-19 pandemic on both the demand for public transport and on the overall state of the public finances:

This decision to press on with high levels of investment, despite the fiscal pressures COVID-19 presents, marks the government's commitment to end the stop-start pattern of investment that has been common in the UK in the past...

... the pandemic has had a profound impact on the way people use infrastructure. Many of these changes will be temporary: aided by government, city centres will bounce back; aviation will return... The government will work closely with the [National Infrastructure Commission] and industry to understand the longer-term effects COVID-19 may have on UK infrastructure, and the implications for policy.

The government shares the National Infrastructure Commission's (NIC's) view on the importance of strong regional cities; the vital organs of the UK economy...

However, the NIC noted that many of the UK's largest cities have below average productivity relative to their size and population, in part due to high congestion and poor local transport links...

... the government will invest in the North, Midlands and South West to help rebalance the UK economy, and devolved administrations will receive funding to enable public transport investment in Scotland, Wales and Northern Ireland. Levelling up the rest of the UK does not mean levelling London down.¹¹⁴

The *National Infrastructure Strategy* commits government to completing all phases of HS2 but also to the other rail plans in the Midlands and the north of England:

The government is fully committed to improving connectivity between northern cities. Over the course of this year, the government has been drawing up an Integrated Rail Plan for the Midlands and the North of England, which will be published shortly. In line with the terms of reference, the Plan will ensure that Phase 2b of HS2, Northern Powerhouse Rail and other planned rail investments in the North and Midlands are scoped and delivered in an integrated way. This will bring transformational rail improvements more quickly and to more places, and will be informed by the NIC's assessment of the rail needs of the Midlands and the North.¹¹⁵

The *National Infrastructure Strategy* announced a change in policy of the way project appraisal is to be carried out within government:

A central finding of the review is that the appraisal process often fails to properly consider how a proposal will deliver the government's policy ambitions, including levelling up. This leads to appraisals being focused on a benefit cost ratio (BCR) that does not reflect social policy objectives or give ministers the information they need about where costs and benefits fall. HM Treasury has therefore updated the *Green Book* to end the dominance of the BCR in decision making, starting with this Spending Review. Appraisals must give a comprehensive picture of cost and benefits, including non-monetisable, non-economic impacts.

In particular, options will be assessed first and foremost on whether they deliver relevant policy objectives (for instance, the regeneration of a particular place). Any option which fails to do so cannot be considered value for money and will not progress to shortlisting stage.¹¹⁶

Ironically, in relation to HS2, this is no change. We have documented how, over more than a decade, the benefit:cost ratio estimated for HS2 on its own has failed to make a convincing case. Governments have continued to promote the scheme and, ultimately, to commit to its funding, on wider arguments – although the new *Green Book* is arguably more specific about the relationship between objectives and the intervention than the wider unquantified benefits for HS2.

14. The National Infrastructure Commission's rail assessment

The Oakervee Review noted that there is considerable uncertainty about how Phase 2 of HS2 would fit with the needs and intentions of the affected local authorities:

Conclusion 11: Transport for the North and Midlands Connect, together with Network Rail, HS2 Ltd and the DfT, should develop a plan to maximise the benefits of Phase 2b and ensure an optimised delivery model. This could be the first step in an integrated rail plan for the GB rail network. This Review recommends a further study of circa 6 months of Phase 2b scope in the context of Midlands Engine Rail and NPR [Northern Powerhouse Rail] proposals. The study should consider the appropriate mix of new high speed line and upgrades of conventional network to improve reliability and service frequency, and the sequencing of these to deliver service improvements as soon as possible – before HS2 Ltd's view of opening Phase 2b as currently designed in 2035-2040. The budget allocated towards Phase 2b, along with other relevant funding allocations, should be used in developing an integrated railway plan alongside an integrated railway investment programme for the Midlands and the North of England.¹¹⁷

In February 2020, the government acknowledged this and commissioned the National Infrastructure Commission to undertake an assessment of the rail plans in the Midlands and the north of England.¹¹⁸ Its report of December 2020¹¹⁹ confirms the uncertainties and the considerable menu of additional public spending that will be required.

The study questions whether the economies of the Midlands and the north of England will have been best served by starting building HS2 as links to London, in preference to investing in local rail connectivity. It talks of "mistakes of the past":

The Integrated Rail Plan for the Midlands and the North is an opportunity for government to bring clarity, stability and pragmatism to future rail planning, and avoid the mistakes of the past... The Commission's analysis shows that prioritising regional links is likely to deliver the highest potential economic benefits to the Midlands and the North.¹²⁰

The Commission's *Rail Needs Assessment* notes that, notwithstanding the expansive commitments in the *National Infrastructure Strategy* of one month earlier, the budgets may not be adequate:

Even in the 'plus 50 per cent' budget, there is not enough money for all the proposed major rail schemes in the Midlands and the North, which total up to £185 billion [including the estimated capital cost of HS2]. While there is an argument for increasing the budget to plus 50 per cent, government would need to balance this

against spend on other important aspects of economic infrastructure. The packages in the 'plus 50 per cent' budget have higher potential benefits, but higher risks...

Rail has the best chance of supporting economic transformation if complementary policies are in place. An adaptive approach can help reduce the risks of such a strategic bet, setting a stable core pipeline of investment but enabling further decisions to be made when costs and benefits are more certain...

To give the Plan the best chance of supporting growth in the Midlands and the North, it must form part of a wider regional growth strategy, large parts of which should be delivered by and in city regions.¹²¹

The Commission's assessment is explicit in saying that if, in spite of the optimism of the *National Infrastructure Strategy*, government cannot find enough public funding for everything, then choices will be unavoidable.

It is for the government to decide how much investment in rail is affordable, given competing demands. While there is a strategic case for investing more in rail, the Commission's view is that this should not come at the expense of investment in other important and complementary aspects of economic infrastructure, including local urban transport projects...

There is a strategic case for increasing the budget to 'plus 50 per cent'. However, this high level of investment would be a strategic bet and comes with higher risks. The costs and benefits of all the necessary schemes are not sufficiently well articulated for the Commission to take a firm view on this. If more funding were available, there are options to either enhance these schemes or add further schemes later, under an adaptive approach as set out above.¹²²

The Commission expresses the view that the later eastern leg of HS2 should have lower priority:

While the Commission's analysis suggests that the highest local economic benefits are likely to be delivered by initially prioritising regional links, this does not rule out the further development of options such as the HS2 Phase 2b eastern leg that also have strategic value.¹²³

The Commission points out that, if the objective is to 'level up' regional disparities, then there are policies other than railway investment that need to be given consideration, especially education and skills:

Regional disparities are caused by many interrelated issues, including skills, that would need to be addressed to achieve economic transformation. Other factors,

such as the availability of good housing, schools, urban transport, city services such as shops and hospitals, low crime rates and good governance also affect outcomes, such as where people choose to live. Other measures that support growth can increase the likelihood of rail investment delivering the intended benefits, and rail investment can in turn encourage other investment and contribute to the success of these other measures, contributing to a positive cycle. Therefore, it is vital that when and where rail investment happens it is coordinated with, and enables, local plans to address other issues and support growth, in order to maximise the benefits of the rail investment...

Therefore, while it does make sense to deliver rail investment to address existing issues and contribute to supporting economic outcomes, this does not mean investing in every major project proposed... Government should exercise some caution, especially on projects where the costs and benefits are less certain.¹²⁴

The Commission's report draws attention to a fundamental difficulty, which has existed since the government decided to split HS2 into two phases before depositing a bill for Phase One in parliament: the scheme was conceived as a whole and could only be justified as a whole – as the appraisals have confirmed throughout and as recommended by Oakervee. Yet the details north of Birmingham have never been settled. Neither the costs nor the benefits can be assessed with assurance.

Graeme Paton, writing in *The Times* newspaper, reported the Commission's rail assessment thus:

The eastern leg of HS2 should be shelved in favour of other upgrades of the rail network in the Midlands and north of England, according to a government review.

A long-awaited report published today recommends building HS2 to Manchester without initially constructing the parallel 120-mile line to the East Midlands, Sheffield and Leeds.

The review from the National Infrastructure Commission suggests that £86 billion earmarked for rail improvements should be focused on local and regional routes, including improvements to the main east-west lines across the north.

It said completing HS2 in full, as well as delivering a new high-speed line across the Pennines and other upgrades, would cost up to £185 billion over the next 25 years.

The report urged ministers to "focus improvement on the journeys that people are most likely to take; into cities from the surrounding area, rather than into London".

Boris Johnson promised in February that HS2 would be built in full. He ordered the commission to review the northern leg of HS2 alongside Northern Powerhouse Rail — the east-west line across the north — to ensure benefits were delivered to communities north of Birmingham as quickly as possible.

He said: "This is not an either-or proposition. Both are needed, and both will be built as quickly and cost-effectively as possible."...

The government said today it was considering the findings and would publish its own proposals for the Midlands and north next year in its "integrated rail plan".

A Department for Transport spokesman said: "It is necessary that we take the time to consider these recommendations in full, and we therefore expect to publish the integrated rail plan in early 2021."

Today's report,... makes clear that the "'plus 50 per cent' budget is still not enough to deliver all the proposed schemes in the Midlands and the north". This includes the full cost of HS2, Northern Powerhouse Rail, an upgrade of the existing Transpennine line and improvements across the Midlands, which would cost between £140 billion and £185 billion up to 2045.

The basic package recommends building the western leg of HS2 into Manchester "as there are no viable alternatives to increase capacity" into the city; completing the Transpennine line upgrade which would fully electrify the line from Manchester to York; making improvements to the east coast mainline between London and Edinburgh; electrifying the Midland mainline between Derby and Sheffield to increase speeds and improve reliability; and making upgrades to other lines to improve services between Birmingham, Leicester, Nottingham, Coventry, Derby, Hereford and Worcester.

The conclusions would probably mean shelving the eastern leg of HS2 altogether.

Alternatively, it could end at the existing East Midlands Parkway station on the Midland Mainline, with the high-speed trains continuing on to Sheffield and Leeds on existing lines.

Sir John [Armitt] insisted that HS2 could be built in full in the future, adding: "I see no reason why it shouldn't be built." Addressing an online briefing, he said: "With the regional approach we can get more benefits for the region more quickly."¹²⁵

The prime minister reaffirmed the government's commitment to build the whole of HS2 in the House of Commons in February 2021.¹²⁶

15. Governance and delivery

To strengthen the governance of the delivery of HS2, the government introduced a number of new measures. In February 2020 it appointed Andrew Stephenson MP as minister of state at the Department for Transport with responsibility for HS2 (in addition to Northern Powerhouse Rail, the Transpennine route upgrade and skills). In a letter to the Transport Select Committee, the minister set out new arrangements: the creation of a Ministerial Task Force “for Phases One and 2a, chaired by the Secretary of State for Transport, and attended by the Financial Secretary to the Treasury, the Minister of State at the Cabinet Office, the Minister of State for Regional Growth and Local Government and myself. We have also strengthened the Board of HS2 Ltd by appointing three additional Non-Executive Directors.”¹²⁷

In relation to the development of the Euston site, in November 2020 the permanent secretary wrote to the Public Accounts Committee to say:

The current focus of work is on developing an optimised design and delivery strategy for the HS2 station... This work is currently indicating that moving to a slightly smaller, simpler HS2 station at Euston would have some benefits in terms of reducing costs and risks, including the potential for the main construction works to be undertaken in a single stage...

Alongside the study into the design and delivery options, new delivery arrangements for Euston have been developed.

The Euston Partnership has been established as a first step, with a dedicated Euston Partnership Board and new executive leadership to scrutinise the work and integration of all the projects at Euston. The Board, established in July, is chaired by Sir Peter Hendy, Chairman of Network Rail. It includes senior representatives from the Department, HS2 Ltd, Network Rail and Lendlease (the appointed Master Development Partner), the London Borough of Camden, Transport for London and the Greater London Authority.¹²⁸

Government also committed to publish a six-monthly report to parliament. The first of these was published on 13 October 2020. That mentions the creation of a new ‘Environmental Sustainability Committee’.¹²⁹ The minister also published *HS2 Land and Property Review: Findings and proposals*.¹³⁰ The first six-monthly report says:

The Prime Minister and Secretary of State for Transport made clear the importance of a tighter grip by the government on the delivery of the project and of the need for full transparency. That is why we have consulted the chairs of the Public Accounts Committee and Transport Select Committee in providing this report to Parliament and I intend for it to provide clear information about our progress.¹³¹

16. Commentary

Is all infrastructure spending justified?

The magnitude of the costs and the burden on the taxpayer mean that HS2 makes more sense in a world where there are unconstrained public funds available for this kind of infrastructure than if government has to make choices.

In the debate there has been no denial that HS2 would produce benefits to users and to the economies of the city regions served, including the London region. But that is not enough: while a great deal of attention has been given to the benefits, there has been less recognition of the scale of the burden on the public purse.

Had the 2020 cost estimates and construction periods been known in 2010, the scheme might never have been progressed. There are many alternative areas of public policy that would make good use of £108.9bn – £100 million a week for 20 years. Had the net call on the exchequer been divvied up for the use of the city regions served by HS2, then many of the objectives claimed for HS2 (such as 'bridging the north–south divide' and 'levelling up') could have been addressed in other ways. Arguably, if the regional authorities had been offered the choice they would have preferred the funds over HS2. In the event this was not on offer and the city regions have been strong supporters of HS2 because they see it as a benefit to them at limited cost.

Some people appear to argue as if public spending on infrastructure is a good thing, irrespective of how much benefit it may generate. The November 2020 *National Infrastructure Strategy* is in this spirit.¹³² Others would advocate that any publicly funded infrastructure project should show a decent return of benefit (broadly defined) over cost in order to justify its share of overall public funds. There is particular competition for public funds because the nation has been underinvesting in infrastructure while the population has been growing and changing technologies have created further pressures for new investment in many sectors (notably decarbonisation and digital communication). The Covid-19 pandemic has placed further and severe demands on the public finances and the ability to raise national debt is severely stretched. HS2 will consume taxpayer funds that could always be used on alternative projects, or they could be used to reduce the national debt, or simply used to reduce the current burden on taxpayers. So the question was whether HS2 would produce more benefit than an alternative use of the funds.

At the time of the 2010 white paper on high speed rail, the benefits in relation to the costs by the methods of standard practice in the UK public sector were estimated to be in the official 'medium' category, but they had declined to the 'low' category by the time of the Notice to Proceed. Broader and additional economic and social benefits were cited but the evidence for these is inconclusive.

The government took the final decision on a judgment of strategic and political issues rather than on the strength of a business or commercial case.

What problem is HS2 intended to solve?

Once government had made the decision in 2012 to obtain parliamentary powers, the scheme took some of the characteristics of a solution looking for a problem. What have been the objectives? Over the years there have been a variety of views about this. As its name, High Speed 2, suggests, saving time by speeding up journeys – especially business journeys – was cited. Time saving ('speed') is well suited to assessment by standard benefit:cost analysis techniques.

Others have cited a need to increase rail capacity in this corridor, particularly by releasing capacity on the existing West Coast Main Line to facilitate more commuting into London.

Passenger time savings have always been the single largest component of the formally assessed benefits.* When announcing his decision in the House of Commons, the prime minister, Boris Johnson, emphasised "making it much easier for travellers to move up and down our long, narrow country. That means faster journey times. It means not just more capacity, but faster journey times—extraordinarily fast journey times."¹³³

Taking the quantified estimates of benefit at face value, HS2 is, indeed, primarily about providing a faster, and more reliable, journey to rail travellers – although high speed trains when running on to Scotland on the conventional network will run at a lower maximum speed than the existing trains. Increasing rail passenger capacity shows as an important, but secondary, consideration. This is surprising since many advocates of the scheme discounted the importance of time savings but placed great emphasis on the need for HS2 in order to increase rail capacity. Many of the benefits from extra capacity accrue in the form of reduced crowding on outer London commuter services in this corridor; beneficiaries would include outer London commuters and 'Midland' commuters to London from places such as Rugby and Milton Keynes. The way in which these services might benefit has not been finalised in detail.

Other objectives have included improving connectivity between the city regions in the north of England and social and political objectives such as providing employment, 'bridging the north–south divide' and 'levelling up'. But these proved hard to evidence and little real consideration was given as to how the same public funds might be better applied to achieve these objectives in other ways.

An early notion that HS2 should be regarded as part of the European high speed rail network was abandoned. Considering HS2 as a competitor to pan-European air travel would have put in scope longer passenger journeys better able to benefit from higher speeds. That would have suggested a different design with more

* See, for example, Table 3 in section 12.

emphasis on through-running to the Continent and less on a London terminus. Such a scheme would have required its own appraisal and it seems unlikely that there would have been enough forecast usage to justify it – just as the proposed 'Nightstar' services through the Channel Tunnel were abandoned in 1997 when they proved not to be viable.¹³⁴

That there has been some ambiguity about what the government sees as the principal objective for HS2 was a point that the National Audit Office made as early as 2013:

It's too early in the High Speed 2 programme to conclude on the likelihood of its achieving value for money. Our concern at this point is the lack of clarity around the Department's objectives. The strategic case for the network should be better developed at this stage of the programme. It is intended to demonstrate the need for the line but so far presents limited evidence on forecast passenger demand and expected capacity shortages on existing lines. It is also unclear how High Speed 2 will transform regional economies by delivering jobs and growth. The Department is trying against a challenging timetable to strengthen its evidence and analysis, which at present provide a weak foundation for securing and demonstrating success in the programme in future.¹³⁵

Substantial growth in demand for passenger movement in this corridor is forecast and it is claimed that more rail capacity is needed to meet that. Historically, a justified objection to 'predict and provide' was that one should not mindlessly provide infrastructure to meet any need that might come along, without considering whether there are easy ways of moderating that demand growth or alternative ways of serving it. This criticism applies to the high speed rail proposal, because secretary of state, Andrew Adonis, specified as a matter of policy that the typical fares to passengers of the high speed service would be similar to those on the competing 'classic' service. The growth of rail traffic is presumed to continue so the volume to be provided for after 2030 is substantially higher than today. But a higher fare, to reflect the better service, would reduce the capacity necessary on the line of route, thus reducing the costs and also increasing revenues. This would point up the question as to the extent to which the necessary extra capacity could have been provided by upgrading existing rail routes such as the Chiltern Line.

Both increased revenues and reduced scale would mitigate the need for public subsidy. Further, more imaginative use of price on the existing railway could, in principle, be used to obviate the need for a new railway altogether. In the context of roads and other utilities, this is known as variable (or peak) user charging, and there is a great deal to be said for this argument. Sir Rod Eddington in his Transport Study pointed out that if some peak passengers could be induced to time shift by the lower off-peak fares, then it is an option to use price to reduce the waste of empty seats and avoid the spending of many billions of pounds to relieve crowding in the

peaks. He also made the parallel argument in relation to the need for increasing road capacity.¹³⁶

It was argued that building a new line would be less disruptive to existing rail services than attempting it by enhancing the existing railway. The rebuilding of the West Coast Main Line after 1996 certainly illustrated the disruption that could be caused. However, there was little discussion of the disruption that HS2 will cause to rail passengers on existing services at the rail interfaces or the road networks. The National Infrastructure Commission noted that:

The Call for Evidence responses noted that proposals for HS2 Phase 2b could have unprecedented impacts on the Strategic Road Network, with Highways England analysis suggesting work on over 30 junctions is needed and traffic management across key sections of the road network including the M1, M56, M42 and M6 and the realignment of a section of the M1 with 50 mph running for approximately three years. Managing this will be a significant challenge and requires more work on the impacts of road closures, traffic management, construction traffic, traffic mitigation works and interaction with other planned work.¹³⁷

The 2010 white paper on high speed rail promoted the wider economic impacts, such as agglomeration effects and labour market competitiveness.¹³⁸ While these had been recognised in HS2 Ltd's appraisal, that study had shown that in so far as evidence could be established, they were most important over shorter distances than those typically relevant for high speed rail.¹³⁹ An assessment is already included as part of the wider economic impacts in the formal appraisal.

Claims are made for job creation. Of course, a massive public infrastructure project will create new jobs while it is being constructed – many in the London area, where the engineering is particularly expensive, and some overseas with suppliers of equipment like tunnel boring machines (which were procured from Germany). But so would spending the same public money in a different way. Claims are made for long-term job creation in the cities served by high speed rail, but this is difficult to substantiate objectively. Some favourable examples from overseas are cited, but this is a partial selection from what is a mixed set of experiences. Further, there is the prospect that, rather than helping the Birmingham economy to flourish, high speed rail would enable Birmingham to become a dormitory, commuter centre for a flourishing London.

Notwithstanding the rhetoric, successive appraisals consistently showed that there would not be a great deal of shift from road to HS2 – because road trips tend to be relatively short and few are 'in scope' to be switched to HS2. They also confirmed that HS2 is broadly neutral in relation to carbon emissions, as noted below.

The 2011 HS2 consultation document introduced a new claim: "Successive governments have sought to bridge the north-south divide – a national high speed rail network could provide a unique opportunity to finally ensure it happens."¹⁴⁰ So

this claim was that high speed rail was the only measure (“unique”) and that it would *ensure* success. The ‘north–south divide’ is a phrase that has been used repeatedly since then in the context of HS2, although more recently ‘levelling up’ has replaced it.¹⁴¹

The *Full Business Case* for Phase One states at paragraph 2.80 that:

The Oakervee Review set out several conclusions relating to the Economic assessment of HS2. It set out that the previously published evidence on HS2 “has considered the impacts of the full HS2 network in line with the HM Treasury Green Book and DfT’s Transport Appraisal Guidance (TAG)”. However, it also states that there are “wider economic impacts that have not been quantified in the business case”. These wider economic impacts mainly relate to Economic rebalancing, a primary driver of the strategic case for HS2.¹⁴²

A number of commentators suggested that if the objectives were to create employment and to ‘level up’, then it would be better to start by joining the northern cities and then to extend to London – a point that the National Infrastructure Commission raised again in 2020.¹⁴³ For instance, in 2011 David Starkie stated:

I wonder whether some of these schemes like the High Speed 2 rail link should be built from north to south rather than the other way around. There are good arguments for doing so. Vast expenditure on construction is more likely to help in the short term with the north-south divide problem for a start. Less Nimbyism perhaps. And linking the northern cities to each other and Birmingham first might create some sort of counterbalance to the dominant London and south-east economies. As matters stand, I fear the Midlands manufacturing industry will get crucified as local workers get sucked into commuting to London, attracted by City bonuses! Birmingham becomes an adjunct to the London City region.¹⁴⁴

Is HS2 part of a national transport strategy?

Lord Adonis’s observation along the lines of ‘everybody else is doing it, so we should’¹⁴⁵ is not an argument; one needs to analyse the specifics. As we have noted, there are good reasons to think that high speed rail will be less effective in Britain than in other parts of the world. In any case, a number of high speed rail schemes elsewhere have not turned out to be good value for money. In the US the federal government has been offering funding to encourage high speed rail schemes. But Florida, Ohio and Wisconsin have all lost interest (leaving only California) because, on investigation, they have concluded that the market is likely to be weak and they do not wish to be landed with paying operating subsidies in perpetuity.

In the 2011 HS2 consultation document the government talked about high speed rail as part of European *rail* strategy, but never as part of a coherent UK national *transport* strategy:

At present, services on HS1 and the Channel Tunnel are relatively inaccessible for those outside London and the South East. By providing direct access to the wider European rail network for services from Manchester, Birmingham and other cities, a link between a national high speed rail network and the current HS1 line could address this.

The Government favours a direct rail link between HS2 and HS1, which would run in tunnel from Old Oak Common to the North London Line and then use existing infrastructure to reach the HS1 line north of St Pancras International.

This would enable direct high speed services from across Britain to European destinations via the Channel Tunnel. An indirect link – such as improving the interchange connectivity between the respective London termini of the two lines – would come at a lower cost than a direct link.¹⁴⁶

The coalition government, and its predecessor, committed to high speed rail without publishing and debating a statutory *National Policy Statement* (NPS) for road and rail in parliament. That was delayed until 2014¹⁴⁷ and when it did arrive it took HS2 as a given on the grounds that, by then, there was an enabling hybrid bill in parliament. A better sequence would have been for the government to set out its understanding of the nation's transport needs for the forthcoming decades and then say how it intended to meet them. Then it would have become apparent to what extent high speed rail would contribute to this broader picture. Similarly, the terms of reference for the National Infrastructure Commission's first *National Infrastructure Assessment*,¹⁴⁸ published in 2018, required that HS2 be accepted as a given.

The 2010 white paper on high speed rail considered it in isolation, although the potential for the transfer of passengers from classic rail and road was appraised.¹⁴⁹ HS2 was regarded as a free-standing investment and it was never argued to be justified as part of a national rail or national transport network. In the initial proposal, most of the rolling stock was to have the continental dimensions (Berne loading gauge) and so would be unable to use the existing UK infrastructure. Oakervee observed that any proposal for high speed railways should be considered inside the existing framework for planning the railway.¹⁵⁰ That would include consideration of whether it would be better to invest to improve the performance of the existing railway or roads rather than increasing speed and capacity to the extent offered by HS2.

All analyses have consistently shown that the whole scheme has a stronger justification than Phase One on its own. The distance from London to Birmingham, in competition with the existing 125 mph services, is too short to generate sufficient benefit to justify the exceptionally high costs of the approach to the two cities,

especially London. So the scheme is much more clearly in the national interest taking the two phases together – and therefore justifying the unwilling removal of private rights – than Phase One on its own. Oakervee recognised this and recommended that if the government were to go ahead, it must commit to the whole scheme,¹⁵¹ which it did.

Yet, since the government had not deposited a bill for Phase 2b, there was – and still is – the possibility that, in practice, the parliamentary powers would be granted for Phase One but Phase Two would never be built. The National Infrastructure Commission's assessment pointed up this possibility that, ironically, the only part of HS2 that will eventually be built will be Phase One, the part with the poorer economic performance and the part with less contribution to the needs of the areas which the government sees as in need of assistance.¹⁵² The prime minister reaffirmed his government's commitment to build the whole scheme in February 2021¹⁵³ but there remains the possibility that the realities of national public spending, together with the pressure to fund a portfolio of other new transport schemes to serve these regions, will lead to an outcome in which only the first phase of HS2 (and maybe an extension to Crewe, near Manchester) ever gets built.¹⁵⁴ In February 2021, north of England leaders wrote to the secretary of state for transport, protesting their fears that "the government wants to water down plans to build Northern Powerhouse Rail".¹⁵⁵

The appraisals did provide estimates of impacts on passenger flows by road, air and other rail services. However, precisely because the narrow, quantitative appraisal would inevitably be one of several considerations, it was a failing that HS2 was not considered at a strategic level as part of the nation's overall transport system – or, for that matter, as a significant addition to the European road, rail and air transport networks.

Will HS2 help reduce carbon emissions?

The imperative to reduce carbon emissions has been an important consideration throughout the history of HS2. The formal appraisals reflect the issue in several ways.

First, they estimate the extra physical quantity of carbon emitted (a) by constructing the infrastructure and the rolling stock, and maintaining it. Then (b) there is traction power for operating the services. This requires an assumption about the carbon content of the *extra* electricity consumed by HS2 services. Finally (c) there are the carbon emissions avoided by passenger and freight road traffic that will have transferred to rail once HS2 is operating over a period starting about 10 years in the future, over a 60-year horizon. That requires an assumption about the carbon emissions from this transferring traffic.

Second, the net result is presented as a raw total of so many tonnes of carbon emissions avoided. But this figure is meaningless to most people and there is rarely any guide to understand its scale. A sensible response to this is to use a standard unit value per unit of carbon emissions avoided, to give a financial estimate of the

total. This can then be used in the overall benefit:cost calculus, as is standard practice. It provides a way of scaling the importance of the issue, relative to other considerations. One of the issues here is the appropriate unit value. This is a problem across the whole of the public sector where there are many ways of abating carbon emissions, each at its own abatement cost. A solution is to use a common social cost per unit of carbon emissions. This is specified in the standard HM Treasury *Green Book*. This is revised from time to time as views evolve about the social cost of damages caused by a unit of carbon emission. It includes taking a view about the relative importance of reducing emissions sooner rather than later.

It is incorrect to argue that the standard benefit:cost analysis ignores the issue: it is incorporated. As shown in Table 3 in section 12 of this report, in the case of HS2 it turns out not to be a large part of the total. This is partly because the net savings in carbon emissions are quite small. Some people believe that carbon emissions are more important than is recognised in the *Green Book* – which, of course, would be an argument for revising the *Green Book* values.

Third, a much broader argument of principle is often advanced. This usually ignores the fact that the carbon emissions have already been accounted for in the formal benefit:cost analysis. People often cite a simplistic line of argument:

On average a passenger mile by rail emits less carbon than a passenger mile by road. HS2 is a railway.
Therefore HS2 is good for carbon.

We have noted that the 2010 white paper on high speed rail used this argument,¹⁵⁶ as did the 2011 consultation document.¹⁵⁷ The permanent secretary at the Department for Transport also used it in evidence to the Public Accounts Committee on 4 March 2020:

Bernadette Kelly: More broadly, obviously, HS2 should mean that fewer journeys are taken by road and fewer journeys are taken by air. Journeys by rail are seven times more carbon-friendly than journeys by road and 17 times more carbon-friendly than journeys by air, so in broad terms investing in rail is a way of ensuring that the transport system as a whole is more carbon-efficient.¹⁵⁸

Another example of the use of broad averages is Henri Murison's in November 2020:

Why full delivery of HS2 and NPR [Northern Powerhouse Rail] is critical to decarbonising our transport system... HS2's carbon emissions will be seven times less than passenger cars and 17 times less than domestic air travel. Travelling 500 miles on HS2 will use the same amount of carbon as 70 miles in a car and just 29 miles by plane. HS2 will unlock capacity to carry 2.5 million lorries worth of cargo each year, while producing 76% less carbon emissions than by road.¹⁵⁹

The broad averaging argument is also to be found in the *Full Business Case*:

1.88 In June 2019, the Government committed to bring all greenhouse gas emissions to net zero by 2050. There remains cross-party support for decarbonisation. Decarbonising transport will be essential to achieving this ambitious target and HS2 will play a vital role in achieving the transition to net zero. Transport emissions account for 33 per cent of Britain's current greenhouse gas emissions. This section sets out the role that HS2 plays in the Government's net zero objectives.

1.89 Rail is the most sustainable form of inter-city travel, with carbon emissions per passenger mile significantly below that of even battery-electric vehicles.

These averages may have been taken from a 2013 HS2 Ltd document where they are cited. But that document goes on to report the proper calculations, which show a mixed picture and, at best, "a small saving":

5.7.5 When the operational and construction footprints of the Proposed Scheme are combined to form a total carbon footprint over the 60 year assessment period (plus the 10 years of construction), the residual carbon ranges between 2,140,000 tCO₂e and 2,620,000 tCO₂e. This includes all emissions associated with construction, operation and maintenance of the Proposed Scheme, as well as modal shift, carbon mitigation from tree planting and freight benefits from released capacity on the classic network. If the same assumptions for the first 60 years of assessment are extended for another 60 years to align with the 120 year design life of the Proposed Scheme, the footprint ranges from a small surplus to a small saving of 230,000 tCO₂e resulting in a reduction in carbon.¹⁶⁰

Further on, the *Full Business Case* concedes that HS2 may increase carbon emissions, but downplays the importance of this by reference to something irrelevant:

1.96 However, the Oakervee Review says the Government should "consider the carbon impacts of HS2 against alternative ways of managing increased demand for travel". The government accepts that despite applying best practice in carbon management, it is not possible to build a project of the scale of HS2 without generating any carbon emissions. However, to put HS2's carbon footprint in perspective, the estimated total carbon emissions from both building and operating Phase One for a full 120 years produces the same amount of carbon as just one month of the UK's road network.¹⁶¹

The Oakervee Review said: "On balance, taking into account both the construction and operation of HS2, it appears that HS2 is likely to be close to carbon neutral,

though it is not clear whether overall HS2 is positive or negative for greenhouse gas emissions."¹⁶²

In January 2021, government continued to use the decarbonising transport argument in support of HS2, in its response to a UK government petition:

"The Government's decision to proceed with HS2 supports our objectives on climate change as the railway will play a key role in decarbonising our transport sector. This is because, once HS2 is in operation, it will offer a low carbon alternative to cars and domestic air travel."¹⁶³

The *Full Business Case* gives a final reckoning: for the full scheme, out of a total net transport benefits of £74bn, £280 million or 0.4% is attributed to carbon reduction. If the acceleration of the policy of decarbonising road transport succeeds, the outcome will be smaller.

Transparency and the governance of HS2 Ltd

HS2 Ltd was originally set up with the objective of advising ministers on the physical form and the case for constructing a line. Later, once government had decided to deposit a bill in parliament, it became the promoter of HS2. It saw its job as being to deliver the scheme. Between then and the Notice to Proceed there were indications that on occasion the company was less than fully transparent about its current information on the likely cost of the scheme. Perhaps this was because that would reduce the chances of achieving parliamentary approval and HS2 Ltd saw its brief as being to deliver the project.

The House of Commons Committee on Public Accounts documented one example in May 2020 when it noted that:

We asked the Department and HS2 Ltd why the HS2 Ltd annual report and accounts for 2018–19 did not set out a forthright account of the programme's status. There is no mention of delays or that costs had exceeded the budget. Instead, there were minor references to "cost and schedule pressures" leading to the revision of notice to proceed, which has allowed "better definition of the scope, cost and schedule." The Department and HS2 Ltd defended their lack of transparency and careful wording. They told us that, as they were in the middle of a live negotiation with main civil construction contractors, there was a risk that reporting of cost increases might have prejudiced the result. In addition, the Department told us it did not make an announcement as Ministers had not yet decided how to proceed. The Permanent Secretary recognised that there had been an issue with the transparency of reporting on the programme more generally, and that Government had now made a commitment to six-monthly reporting on the programme.¹⁶⁴

There have been allegations that HS2 Ltd has suppressed criticism, for instance as Baroness Kramer noted in the debate on the House of Lords' second report on HS2:

I want to... give thanks and ask for additional support for the very brave whistleblowers on HS2—there have been quite a number—who provided information very early on that made it clear that this project was going to cost significantly more and there were real problems in the way that it was being developed and managed. I will name one, because I have his permission: Douglas Thornton, who recognised that the prices that had to be paid for property would be well in excess of what was budgeted, that HS2 itself lacked the skill base in order to manage much of that process and that some of its contractors—only some—found it easy to take advantage because of the lack of resource and senior management's fear of telling us the truth. We must change that and restore trust.

But it will then be incumbent on the Government and on us in this place not suddenly to start treating people who tell us the truth as if they had betrayed us because the information they give us is new—because costs have increased and the project has complexities that were not understood earlier. We must mature, and our management and the managers of these projects must mature.¹⁶⁵

The National Audit Office noted a tendency to be unduly optimistic:

The Department, HS2 Ltd and government more widely underestimated the task, leading to optimistic estimates being used to set budgets and delivery dates. In not fully and openly recognising the programme's risks from the outset, the Department and HS2 Ltd have not adequately managed the risks to value for money...

2.20 HS2 Ltd had begun work on its April 2017 cost estimate when the spending review that set funding for the programme was being finalised in September 2015. In September 2015, HS2 Ltd estimated that the cost of Phase One was £4.9 billion more than the available funding. To make the programme affordable, HS2 Ltd incorporated £4.9 billion of efficiency savings, changes to the scope of the programme and price estimate reductions to the Phase One estimate between September 2015 and 2017. In our 2016 report, we identified that while it is good practice to identify efficiencies as a programme develops, it would be challenging for HS2 Ltd to realise them, and that if HS2 Ltd could not achieve them, it may have to find additional funding elsewhere, or remove scope from the programme...

2.21 The efficiency savings, scope changes and price estimate reductions were driven by a focus within the government to make the programme affordable within its available funding...

2.22 In 2016, HS2 Ltd had plans which identified where the savings might be found, but it did not develop these further into a programme of activity to achieve them.

Analysis commissioned by the Department shows that elements assumed by HS2 Ltd to have the most efficiencies have seen some of the greatest cost increases.¹⁶⁶

The head of the National Audit Office remarked that:

There are important lessons to be learned from HS2, not only for the Department for Transport and HS2 Ltd, but for other major infrastructure programmes. To ensure public trust, the Department and HS2 Ltd must be transparent and provide realistic assessments of costs and completion dates as the programme develops, recognising the many risks to the successful delivery of the railway that remain.¹⁶⁷

Government has acknowledged that in addition to HS2 Ltd's normal obligations under company law, HS2 should recognise the general public interest in relation to candour and transparency and that it should accept that the cost of treating individual interests fairly and promptly is part of the cost of the scheme. The government's commitment to increased transparency was mentioned in an exchange at the Public Accounts Committee in October 2020:

Q90 Dame Cheryl Gillan: ... Ms Kelly, the Minister made the first six-monthly report on 13 October and in point 3 he says that "the Prime Minister and Secretary of State for Transport made clear the importance of a tighter grip by the government on the delivery of the project and of the need for full transparency."

Could you let the Committee know how that sits alongside what I believe are some 300 non-disclosure agreements that HS2 has signed? ... can you tell me why you would have non-disclosure agreements with everything from the Infrastructure and Projects Authority and the British Geological Survey to the water companies and a whole load of local authorities, all of which feels to me like HS2 is hiding something? Could you comment on that, please?

Bernadette Kelly: Can I just make a general point? I think that the commitment—the very clear commitment—on greater transparency made as part of deciding to proceed with the project has been fundamentally about reporting to Parliament and the public on the progress of the project. That is obviously what the six-monthly report published on Tuesday aimed to do, and I expect that you and other Members may well wish to ask questions. So it is really about building confidence in this project by ensuring that there are regular updates to Parliament on how it is progressing. I think that transparency in the broader context and the commitments that Ministers have made have been very focused on really shining a light on overall progress on the project and how it has been performing against that.¹⁶⁸

A different issue is HS2 Ltd's capability to deliver a large, complex project over a 20-year period. Douglas Oakervee, the National Audit Office, the Committee on Public Accounts and others raised questions about this. The prime minister, Boris

Johnson, who made the final decision to go ahead with the scheme, was reported by the *Evening Standard* to have said in 2013, when he was Mayor of London: "This thing isn't going to cost £42 billion, my friends. The real cost is going to be way north of that... It turns out the whole thing was a gimmick. They didn't have a clue about the economic case for the gigantic new railway."¹⁶⁹ And in 2020 he was reported by the BBC to have "recently criticised how much money had been spent on the project in an interview for Sky Kids' FYI show. He said that HS2 Ltd had 'just wasted money. And the whole way it was managed was hopeless.'"¹⁷⁰

The Oakervee Review commented that "HS2 Ltd needs to significantly improve how it treats individuals and communities affected by HS2".¹⁷¹ The new minister of state at the Department for Transport instigated an HS2 Land and Property Review, and this confirmed that improvements were needed. The findings were published as guidance in November 2020, requiring: "Courteous, respectful and clear communications...; More flexible compensation policies...; A people-centred land and property strategy...; [and] Interactive and efficient application processing".¹⁷²

Is HS2 a commercial proposition?

In the debates there has been confusion between funding and financing that is common in these discussions. It was always clear that the capitalised cost of construction, purchasing rolling stock and operating the railway would be at least twice as high as the capitalised value of the passenger revenues once in operation. So it will inevitably be a financial loss-making enterprise, with the taxpayer filling the funding gap, with those resources having to forgo alternative uses. Borrowing from the private sector – in addition to the public sector – may well be a part of the financing strategy, but borrowing must be repaid and the private sector will not fund the project. Once complete, HS2 is forecast to make a healthy operating profit and if that materialises the private sector would probably be willing to take the project over as a profitable going concern and to fund its activities from that point onwards, providing that it was not encumbered by the full debt incurred up to that point; this is what happened with HS1.

The Executive Summary of the *Full Business Case* could be read to be confusing on this point:

In addition to estimating the up-front costs of HS2, and providing assurance that they are affordable, the Financial Case also examines the financial outlook across the network once HS2 is operational. This analysis indicates that the introduction of HS2 will result in an improvement in the annual subsidy/premium balance for Britain's railways. This is a benefit for the taxpayer.¹⁷³

"This is a benefit for the taxpayer" refers to the situation once operation commences, ignoring the gross cost of construction of at least £100bn. The main body of the document is accurate on these funding and financing issues in

paragraphs 3.35–3.41. However, some people seem to believe that the project as a whole is profitable and therefore not a burden on the taxpayer.

Unresolved issues

Phase One of HS2 is now under construction, but there are a number of policy issues that have yet to be thoroughly debated and resolved. There are the designs and property development plans for the stations, especially London Euston. Discussion of the price level or structure of passenger charges has been absent. In 2009, when HS2 Ltd started its appraisals, Lord Adonis specified that it should be assumed that fares would replicate the existing ones. In practice, with a vast increase in capacity this may not be sensible and different pricing levels and structures will fundamentally affect revenues and, separately, the social value of the public infrastructure. Nor has there been a definitive analysis of the implications of public policies on competition between service providers, nor of the public interest regulation of the new and existing lines, nor of the use of capacity freed up by the diversion of long-distance services from the existing lines.

At the time of writing, an appraisal of the likely effects of the Covid-19 pandemic on the demands for travel and hence on the finances or economic benefits of the scheme has not been published: the final commitment to go ahead was given before anybody could have known about the consequences of the pandemic. In July 2020 the Department for Transport noted that reductions in the assumed rate of economic growth and in population growth by the Office of Budget Responsibility will affect the appraisals of transport schemes.¹⁷⁴ This is pertinent to HS2 because the appraised benefits rely heavily on forecasts of sustained growth in passenger demand for its services over the medium and long term. Had the pandemic struck a few weeks earlier, the decision to go ahead might have been delayed, though the optimistic attitude towards major rail infrastructure investment expressed several months later in the *National Infrastructure Strategy*¹⁷⁵ suggests that the particular government might not have been deterred.

Icon or strategy?

HS2 has taken on a life of its own and has become regarded as a 'good thing' by a section of the public, irrespective of the hard evidence. Naturally, interests such as the equipment supply industries and the civil engineering industries have lobbied in favour of HS2, and the technical press has reflected those interests. Representatives of the city regions in the Midlands and the north of England strongly support it. Public relations companies have been employed to promote the scheme. A number of professional conferences have been held over the years at which it was unusual to hear speakers who questioned the scheme. The national press has been divided but it has rarely subjected the scheme to analytical scrutiny. Throughout, committees of the House of Commons and, particularly, the House of Lords have made analytical reports that raised important questions but these seem to have carried little weight with the House of Commons as a whole or with the several governments involved. They did not catch the attention of the public.

General commentary has often been ill-informed. For instance, it is repeatedly claimed that HS2 will reduce carbon emissions because it is a railway, when, as we have argued, all the analysis suggests that HS2 will be broadly neutral on that score.

Some of the general discussion seemed to ignore basic facts. Some people spoke as if HS2 will be a new, fast line from London to Scotland, whereas the northern end-point is only about half way. Some appeared to argue as if the benefits would appear immediately, neglecting the fact that it will be into the 2030s before any benefits are realised – so ‘levelling up’ and productivity benefits will not start to materialise until then.

The fact that the quantitative evidence was unable to point to a firm decision did not imply that the decision to proceed in 2010–12 was wrong: it meant that the government had to make a judgment on broad strategic and political grounds. But that did increase the influence of particular persuasive individuals and interest groups. The rapid escalation of estimated costs between 2012 and 2020 might have been expected to have precipitated a broad public debate as to whether the decision should be revisited. But the various governments held to the decision as a matter of policy and they were reluctant to reveal the escalating cost estimates to parliament. Parliament seems to have been remarkably tolerant of a lack of transparency in relation to an exercise involving such a large public financial liability. The arguments of iconoclasts – individuals or groups – who questioned the wisdom of the scheme were dismissed as heretical whether or not they had a vested interest.

It is doubtful that the crucial public consultation on HS2 in 2011, in advance of the decision to go ahead with the deposit of the hybrid bill, would ever have led the government to abandon the scheme. We document above how Lord Adonis, as Labour secretary of state for transport, and Conservative prime minister, David Cameron, and his chancellor, George Osborne, were determined to deliver a scheme since long before the consultation.

It was right that the standard methods of formal benefit:cost analysis were applied because they are quantitative, dispassionate and take care to avoid double-counting, which is a pervasive problem. It is an excellent discipline to have to estimate how many people might use the hypothetical facility and to measure the benefits it might offer them. However, it was always recognised that these techniques are best suited to changes smaller than the major change that HS2 represents. So they could only form one of many considerations. That is recognised in the official ‘five case model’ the government uses in such situations and set out in the *Full Business Case: High Speed Rail 2 Phase One* of April 2020.¹⁷⁶

A great deal was spent on public relations in order to create a favourable public sentiment towards the scheme. Lord (Bill) Rodgers commented:

Among many achievements, HS2 has produced a substantial library of literature, full of strategy and vision. In one case there was a 96-page book, *Getting the Best out of Britain*, with lots of pretty pictures that could appear in any advertising brochure. Another, published 18 months ago and called *Realising the Potential*, is full of pointless talk. A third is simply *Changing Britain* and focuses on “some of the places

where HS2 can make a difference”, which includes reaching Northern Ireland—a clever stretch of imagination. The cost of public relations within the cost of HS2 may not matter, but it can be misleading. The Government and many unqualified advocates of the route have claimed that HS2, via the Midlands, will transform the north, a catalyst for regeneration and rebalancing of the economy. That is hyperbole.¹⁷⁷

The scheme took so long to come to the point of final decision that much changed in the meantime. Apart from the increases in estimated cost, the cities of the Midlands and the north of England had taken advantage of a degree of devolution and had formed a clearly articulated view of their own transport needs. As the National Infrastructure Commission noted,¹⁷⁸ they came to regard local commuter capacity and better connectivity within the region as relatively more important than faster rail links to London. If they regard HS2 as an enabler, the key questions are what economic development is enabled and what else has to happen in conjunction? It has become unclear how the plans for Phase Two of HS2, sketched out back in 2010, relate to these needs. So, while it is generally agreed that the scheme for which parliamentary powers now exist would not be a good scheme on its own, there is insufficient clarity about most of the second phase and its relationship with other new rail schemes in the region for a parliamentary bill to be drafted.

Arguably, HS2 has reached its current state because of the determination of a few individuals, particularly Lord Adonis, former prime minister Cameron and former chancellor Osborne. They took a broad, strategic view and were not so concerned about the finer points of economic analysis. Indeed, the conventional economic techniques of project appraisal, while providing useful information, are limited in the face of a national project of this geographical and financial magnitude. It is not obvious that the public consultations were ever likely to change the outcome. Parliament spent a great deal of time in processing the hybrid bill on resolving the conflicts with private interests. It changed the approved scheme in important detail to protect some of those interests, but it was not greatly engaged with the big-picture strategic debate on national transport needs or the allocation of resources. Indeed, the likely costs of the scheme were not transparent to parliamentarians.

The creation of HS2 Ltd, as an arm's-length body to research and develop the scheme, and then to deliver it, was helpful. It created a degree of independence, transparency and accountability that would have been absent had the work been entirely 'in house' within a government department.

A number enquiries by parliamentary specialist committees and other bodies expressed concerns but they were not influential. HS2 Ltd's Analytical Challenge Panel (2009–12) was impressed with the quality and quantity of modelling work in view of the shortage of time and the magnitude of the task. But it noted unresolved, important issues on things like obtaining evidence on wider economic effects, modelling and appraisal issues, and policy scenarios such as future fares.

Oakervee's recommendations that several problems should be addressed before going ahead were not accepted.

Several, different objectives for the scheme were discussed throughout and the decade that elapsed between initial political commitment and the final decision to proceed with the first phase has meant that the perceptions of the needs to be met have changed while the scheme itself is much the same as it was in 2010.

Whatever one's views about the merits of HS2, it is undeniable that a project of this magnitude, being delivered over a 10-year planning period and a 20-year construction period, carries risks and uncertainties. This is a characteristic of most large public infrastructure projects and it is not, in itself, a reason not to carry out the project. Some sensitivity analyses were published and they proved helpful. However, it is not clear that, at the level of strategic policy, the risks and uncertainties were adequately acknowledged and responded to.

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