

HS2 late and over budget: a review

Greengauge 21

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1. Overview

A fresh [analysis of the challenge of delivering HS2](#) has been published.¹ Written by Graham Winch of the Productivity Institute at the Alliance Manchester Business School, it helpfully pinpoints five key reasons why its budget continues to increase. The first of these we believe is mistaken, and we explain why.

But his new analysis provides a revealing and valuable summary of the project's implementation. He side-steps wider political questions but looks into the sequence of formal project reviews in his search for the underlying causes of the implementation difficulties the project has faced.

He pinpoints timescale pressures as being a key factor, and a mis-placed determination to stick with delivery milestones come what may.

Graham Winch draws on a review of published sources, especially National Audit Office Value for Money Reports and a Westminster Forum conference held in November 2023.²

He has written on the challenges of major infrastructure project delivery before, including in 2013 when he looked at lessons that could be learned from the 'Channel fixed Link' aka High Speed One.³

Greengauge 21 has been a champion of high-speed rail from its inception. Where mistakes have been made, it's important to know why and where they arose. Despite the disappointing progress of the last ten or so years, HS2 remains, we believe, a hugely important development that we remain confident can and will become a much-valued national asset.

Aspirations for the project have been trimmed, with cut-backs that diminish the project's scope.

As of February 2025, there is a risk that the need to trim the sails of a project could be taken beyond the point where the national interest is best served. It would be a false economy if the project either failed to reach its London terminus at Euston (still awaiting funding) or to provide a bypass to the rail network pinch-point in Staffordshire on its route to Crewe (*ditto*).

2. Three Phases of delay and cost increase

Graham Winch's assessment is that the escalation of the budget and schedule of the HS2 programme happened in three distinct phases.

The first occurred, he suggests "during the hybrid bill process, when representations from environmental groups and those living along the trace led to various mitigations to reduce its social and environmental [impacts]".

The second phase was from the Royal Assent in 2017 through to re-baselining in 2019. On this Winch says: "this was the phase where the implications of earlier decisions on the specification were worked through in engineering design as detailed information on ground conditions became available. This had a considerable impact on the main civil engineering works [...and...] on the stations and preparatory works." Land acquisition costs also turned out to be higher than expected.

The third period was from the Notice to Proceed in 2020 through to the cancellations of key parts of the project in 2023.

To the first 'phase' he allocates a budget increase of c£1bn; to the second £10bn; and to the third c£8bn.

¹ G.M. Winch (2025) So, *What Went Wrong with HS2?* Productivity Insights Paper No. 052, The Productivity Institute.

² <https://www.westminsterforumprojects.co.uk/publication/HS2-2023>

³ Winch, G. M. (2013). Escalation in major projects: Lessons from the Channel Fixed Link. *International Journal of Project Management*, 31(5), 724-734. HS1 has since been re-named as London St. Pancras Highspeed

3. The sources of budget escalation

There are five key sources of HS2's budget escalation identified by Graham Winch:

- the mismatch between the strategic and economic business cases
- over-specification of the system
- schedule compression
- commercial arrangements
- owner project capability.

Here we review each of these five areas in turn. In some respects, we believe the author's rationale is faulty – in particular in the conclusions he draws from his examination of the project's strategic and economic business cases. We do not share his view that this is a reason for subsequent project cost inflation. But the other suggested sources are telling.

Overall, he suggests that:

“some of the escalation is clearly due to external shocks, and some is due to external stakeholder pressures.”

Increases in the project's civil engineering works, Graham Winch suggests could be:

“largely explained by a combination of COVID-19 restrictions which came into force just as project execution on site commenced, and high levels of inflation in construction materials of 27% over three years, related mainly to the war in Ukraine.”

He argues that it is in the project's 'organisation system' that the source of an extended delivery period and cost inflation lies. He sees two significant problem areas: 'Schedule Compression' and 'Owner Capabilities'. But the effectiveness of the project's business organisation, he argues, was affected by issues around the business case, which he covers first.

4. Business Case mis-match

A sound business case is of course important in establishing whether any project is worth adopting in the first place. It is the source of the first of Graham Winch's key reasons why HS2 costs grew so significantly.

HS2's Origins

We need to start by delving into the origins of HS2 to understand why it came into being – its strategic case.

A study into north-south rail transport capacity had been initiated by Sir Alastair Morton in 2001, when he was head of the Shadow Strategic Rail Authority (SSRA). It was completed in 2003. By then the channel tunnel (on which he had played a key role) was open, and the first phase of the Channel Tunnel Rail Link (later renamed HS1) was mid-way through construction.

In 2000, Virgin Stagecoach (VS) had proposed that a high-speed line should be built along the east coast corridor in a competition put out by the SSRA for a 15-year InterCity East Coast franchise. The VS bid would prove unsuccessful, but it was this proposal that had sparked Sir Alastair's attention. VS had included the proposal for a high-speed line because, with the need to project demand forward 15 years in this franchise bid, came a realisation that east coast main line capacity would be reached soon enough.

The study the SSRA commissioned centred on the question of network capacity and long term forecasts of demand. The ensuing report showed how it would likely be the west coast main line that would run out of capacity by the mid-2020s, with the east coast (and midland) lines following soon thereafter. From the outset, transport capacity to/from 'the North' was the driving concern behind what became HS2.

The study, led by consultants WS Atkins, examined possible interventions across both road and rail, with alternatives considered that included pricing action (to reduce demand), and the possibilities of

either new or upgraded infrastructure across the highway or rail networks.⁴ Their study found that the best economic case lay in building a new high-speed rail line. It was a thorough and seminal piece of work, a business case analysis that led to the subsequent adoption of HS2 as national policy.

Graham Winch duly notes the identified capacity problem ahead and clearly recognises its importance in the project's business case.

Where he next picks up the narrative, is with the Eddington Transport Study, published in December 2006. This wide-ranging review piece was carried out for HM Treasury and the Department for Transport (DfT), who supplied a joint team of economists to support him.

Graham Winch says that the (no longer shadow) SRA's 'new north/south railway' (that is a new high-speed line) was 'explicitly rejected' by the Eddington report.⁵ But when asked about this in April 2007 in front of the Transport Select Committee, Sir Rod denied this, saying that his report was only opposed to risky new technology solutions (MAGLEV was being touted as the future of transport at the time). Indeed, he told the Select Committee that Britain should be getting on with building a new high-speed line from London to the north.⁶

There may have been doubt in some minds at the time, but Government's appointed adviser was clear about the strategic case for high-speed rail.

Graham Winch surprisingly misses what followed next: the Conservative Party's announcement in 2008 of its intention (if it won the next General Election, expected in 2010) to implement a new high-speed rail line between London, Birmingham, Manchester and Leeds.⁷

It was a spur to action for the Labour Government, and it decided to plan for a north-south high-speed rail line to meet the national transport capacity challenge noted in the WS Atkins work. Minister of State (later Secretary of State) for Transport, (Lord) Andrew Adonis put this in hand, creating HS2 Ltd in January 2009 to act on behalf of the Department for Transport (DfT) to shape and deliver the UK high speed rail network northwards from London. As Graham Winch notes:

"Its principal recommendation was a Y-shaped network connecting London, Birmingham, Manchester and Leeds via Sheffield⁸ which would release capacity on all three of the north-south rail lines out of London....New rail routes were seen as the only sustainable option for increasing train path *capacity* in north/south travel within England, and onwards to Scotland, releasing *capacity* on the existing network for commuter and freight traffic development. It also noted that while the *capacity* issue could be addressed by building new conventional lines, the marginal cost of high-speed lines brought significant additional benefits in terms of improved *connectivity* through reductions in journey times and hence further the potential to attract traffic from the roads and airlines. The substantial benefits for regional economic growth were also identified."⁹

(Emphasis added: capacity, capacity, capacity and connectivity)

By now, the idea of high-speed rail and HS2 in particular was attracting support across all of the major political parties. As he notes, in 2010 "the incoming Conservative and Liberal Democrat coalition government enthusiastically endorsed the programme, with endorsement from Prime Minister David Cameron."

⁴<https://webarchive.nationalarchives.gov.uk/ukgwa/20100409090644/http://www.dft.gov.uk/pgr/rail/researchtech/research/h-speedlinestudysummaryreport.pdf> (accessed 18/01/24).

⁵ *The Eddington Transport Study* (2006).
London: HM Treasury.

⁶ <https://publications.parliament.uk/pa/cm200607/cmselect/cmtran/458/7041602.htm>

⁷https://www.bbc.co.uk/manchester/content/articles/2008/09/29/290908_hi_speed_rail_feature.shtml This announcement, made by Theresa Villiers at the Conservative Party conference, during the crucial weekend of the world financial crash, also proposed the scrapping of Heathrow Airport's plan for a third runway

⁸ So achieving broadly the same travel market and regional coverage implied by Theresa Villiers' vision of 2008

⁹ Graham Winch p2

Strategic Case, 2013

Graham Winch then turns to the Strategic Case for HS2, published in September 2013, which he suggests:

“re-iterated many of the points from the 2010 document regarding capacity and regional growth benefits while placing noticeably greater emphasis upon connectivity through travel time savings.”

Actually the extra connectivity benefits of high-speed rail (as opposed to creating additional rail capacity at conventional railway line maximum speeds) had already been fully understood to be a feature of a high-speed line approach.

No, what was distinctive about the Strategic Case document of 2013 was that it actually showed some examples of how the released *capacity* on the parallel ‘classic’ network could be used, while recognising that for DfT it was far too early to speculate on specific proposals for revised train services. For the Department, this was just a matter of prudence.

But this reluctance left a vacuum in understanding likely HS2 capacity benefits on the ground. The absence of visible plans and any estimates of benefits from (say) additional passenger services to intermediate destinations on the pressure-relieved, West Coast Main Line, denies a key aspect of the HS2 project benefits appearing in its economic case.

In fact, what the Strategic Case report of 2013 added to the HS2 narrative was the value in providing relief to an over-subscribed national rail network that was seen as likely to lead to poor levels of train *service reliability*, with the frustration and economic cost that brings. The 2013 Case was prescient on this point (train service reliability *has* worsened in the years since as the rail network has filled up).

Economic Case for HS2

It is his concern with the analytical treatment of journey time savings that leads Graham Winch to identify the first of his five reasons for project budget over-runs. He asserts that there is a mismatch between the strategic and economic cases for HS2 that somehow led HS2 Ltd/DfT astray in the delivery of the project. He argues that the HS2 strategic case centres on extra capacity (true) while the economic case centres on faster journey times (a misunderstanding, as we will explain). He writes that: “time savings amounted to over 70%” of the economic case and that this is inconsistent with the strategic aim of increasing capacity.

Journey time is one component of benefit used in *all* transport economic appraisals – from minor local schemes to large network upgrades – to estimate the ‘generalised cost’ of travel. For rail investment appraisals, a rich seam of empirical research is used to add appropriate weightings to time spent, travelling in overcrowded conditions, for example. To these estimates, out-of-pocket travel expenses – fares in particular for rail travel – are added to create an estimate of generalised cost of travel. The economic benefit calculation is then built up from spatially disaggregated travel demand patterns, contrasting generalised cost values for the with-project and without-project cases to compute ‘user benefits’.

The Economic Case for HS2¹⁰ published in October 2013 (with analyses concurrent to the Strategic Case) is informative in this regard. Its Table 5.1 shows in fact that these ‘user benefits’ make up 84% of total benefits, and that time savings make up just over 50% of that figure (so 44% of total benefits). Two other important benefits are reductions in crowding and greater reliability levels on the HS2 Network, which together make up almost 23% of total benefits, and form a partial measurement of the beneficial capacity effect. Frequency improvements represent a further 13% of benefits, as measured by savings in waiting time. Thus, the analysis *did* reflect a balanced set of benefits in the 2013 Economic Case – in contrast to what Graham Winch suggests on this point.

The value of adding *capacity* to the national transport network from HS2 was at least partially quantified. True, the level of capacity benefit could have been more substantial (and no doubt more

¹⁰ [The Economic Case for HS2. Department for Transport. October 2013.](#)

easily understood) if an attempt had been made to reflect the likely replacement services that would be added to the west coast main line, reducing crowding levels for commuters, improving connectivity to intermediate places and allowing HGV mileage to be reduced with the increased availability of paths for freight trains.

The use of travel times in the appraisal process does rather play into the hands of those making cheap shots about the pointlessness of transport infrastructure projects in general and this one in particular “to save just a few minutes’ travel time”. But the purpose of HS2, as reflected in its Strategic Case, is to increase capacity, and this has never shifted and the way it is quantified in the Economic Case cannot sensibly be seen as reason for project timescale extension and budget over-runs.

Yet, Graham Winch asserts this:

“This lack of specificity [on capacity improvements] in the strategic case led to a much greater emphasis on the economic case where the benefits that could be measured were traveller time-saved, in line with standard DfT appraisal practice. This led to an emphasis upon speed and frequency in the original specification of the network in order to gain enough benefits to outweigh the estimated construction costs.”

We think this is speculative at best, and a most unlikely source of cost inflation as the project progressed.

While there are important valid reasons that Graham Winch helpfully uncovers in the remaining four areas covered in his paper, this one can surely be dismissed.

5. Over-specification

Graham Winch notes that the specification of a service speed of 360km/h for HS2, confirmed for the project in 2012, was higher than commonly adopted elsewhere in Europe (and indeed, on HS1). The route would support a service frequency of up to 18 trains/hour – also higher than high-speed lines elsewhere, and it would be designed to accommodate ‘European loading gauge trains’.

If the top speed was set at today’s maximum railway line speed of 200 km/h (125 mile/h), the capital cost saving was expected to be just 9%, with most of the connectivity benefits lost.¹¹ But as Winch notes: “the 360 km/h requirement meant that it moved outside existing European Technical Standards¹², turning it into an innovation project without significant experience of constructing earlier high speed lines to build upon.”

His point is *not* that the more challenging specification results in a higher cost/route-km (although clearly it does), but that *its innovative character* meant that construction approaches that had become near standard in Europe (and had been used for HS1) could not be followed here. There would be an ongoing risk that the innovative nature of this higher specification would end up costing more than forecast. This is a good point to have nailed. Shades here of Sir Rod Eddington’s dislike of innovative technologies.

But Graham Winch’s paper then drifts off message, saying that HS2’s high cost was driven by an inability to follow “the standard European practice of using existing lines to enter city centres” which he proposes is due to the (over-) specification of HS2 train service frequency. This is fanciful: part of the reason for building HS2 as specified is that the railways into the centres of our main cities (London, Birmingham, Manchester) are full, or nearly full – just as much as along the West Coast Main Line that connects them.

And here he goes further off course, saying that intermediate stations on HS2¹³ were driven by regional economic objectives. But this is a worthy aim, surely, and again, none of it explains why the costs of the

¹¹ House of Lords (2019). *Rethinking High Speed 2*. London: Stationery Office.

¹²PwC. (2016). *High Speed Rail International Benchmarking Study*. London: PricewaterhouseCoopers.

¹³France has intermediate stations on its TGV lines too – including so-called “Gare de Bettaves” – named for the Beetroot fields in which at least one has been located. In the HS2 case, the intermediate stations thankfully have wider functions.

project once specified with intermediate stations should escalate through the delivery phase. The station at Old Oak Common (or nearby), was a requirement of DfT's original specification to HS2 Ltd, to provide access to Heathrow Airport, an expensive (but known) requirement from the start.

Nonetheless, Graham Winch has a good point here in that HS2's technical specification meant that there was an innovative element to the project's design and delivery and this increases the risk of surprises and increased costs.

6. Schedule Compression

A key factor in HS2's cost escalation, he terms 'Schedule Compression' and he explains how badly this worked out for HS2, and the extract is worth quoting in full:

"Royal Assent for the Phase 1 hybrid bill was received some 23 months late in February 2017, against an original milestone of March 2015, yet the opening date originally set in 2010 remained 2026.

Additionally, the deadline for completing construction was *brought forwards* by 12 months so as to allow more time for commissioning.¹⁴ This schedule compression had a number of perverse consequences that surely drove in escalation to the budget.

Prior to the hybrid bill becoming law, HS2 did not have the legal powers to acquire the land along the trace, and hence to carry out detailed site investigations on ground conditions. The budget estimates prior to Royal Assent were, therefore, necessarily based on limited real data.

The perceived immovability of the 2026 deadline despite schedule compression then drove a number of project governance failures. The construction schedule required that construction actually start in 2018, and a prerequisite for this was the appointment of the contractors.

So, HS2 Ltd was given permission to start the procurement of the main civil engineering works in June 2016, some three months after the award of the Engineering Delivery Partner contract and Enabling Works contracts in March of that year.

The award of two-stage tender design-build contracts to four international joint ventures (JVs) was in March 2017, *just one month* after the receipt of Royal Assent. This series of milestones can only be described as rushed, with engineering of the Phase 1 as a whole underdeveloped prior to contract award, and detail design reliant on the acquisition of data on ground conditions which turned out to be worse than expected."

[emphases added]

It is certainly true that HS2 Ltd started off life at high pace in 2009, with Secretary of State, Lord Andrew Adonis, leading the charge to get the first stage of the project fully specified before the General Election of Spring 2010.

But if the planning approvals process takes *fully two years longer than expected*, then inevitably the delivery timescale should have been eased back, but it wasn't changed. It is a great point.

7. Commercial Strategy

The main civil engineering works for the Phase 1 route were split into four design and construct contracts won through competitive tender by international JVs. In the original invitation to tender for the main civil engineering works for Phase 1, Graham Winch points out the "first stage was to be on a cost-plus basis while the detailed design was worked up following full site investigations which had been impossible prior to starting procurement because the programme had not received Royal Assent".

He continues: "This development work then formed the basis for the negotiation of... significant transfer of risk to the JVs which were to be responsible for 60% of any forecast cost increase against the target during actual delivery." There is an obvious commercial response to such a situation as Graham Winch notes. And with four separate construction JVs he notes there was "a lack of standardization of

¹⁴*Progress with Preparations for High Speed Two*. London: National Audit Office, 2016.

structural elements such as bridge and viaducts and hence missed opportunities for engineering cheaper solutions”.¹⁵

That would only lead to later cost inflation if, of course, it had been presumed previously that there would be standardisation of designs throughout. In any event, following the Oakervee Report commissioned for DfT¹⁶, the contractual arrangement was revised, “removing the high level of risk for the JV member companies to their balance sheets and [switching] to paying the JVs a feeagainst performance incentives... to improve performance and a share of whatever contingency remained in the budget at the end of the contract.” However, this means, as Graham Winch points out, a reversion to: “what was, in effect, a cost-plus commercial strategy.” Reality bites.

What is clear is that timescale pressures didn’t help in achieving the best approach to contracting. If the risk appetite of major international construction businesses is not understood, then at some stage the client budget is likely to suffer.

While there is a seemingly endless stream of critical review arrangements and bodies to hold HS2 Ltd management to account, it is noticeable in this part of his review that there is no higher authority on infrastructure available to deliver a guiding hand.

8. Owner Project Capability

Graham Winch summarises the situation as this: “HS2 Ltd is the ‘arm’s length body’ responsible for both shaping and delivering the programme as a delegated project owner, and DfT is the departmental ‘sponsor’ accountable to Parliament for the programme, and the channel for finance from HM Treasury. The Senior Responsible Owner (SRO) for the programme sat within DfT.”

Again, timescale pressure is a bugbear: ““HS2 Ltd is building its capability at the same time as starting to deliver the programme, including developing the project management information systems that would be required to control the project once construction began.”¹⁷ And as Graham Winch points out: “There was a high turnover of chairs of HS2 Ltd. Turning to the senior leadership team, there was no Project Director, Commercial Director, nor Chief Operating Officer in post in 2019.”¹⁸

He continues:

“This perceived lack of organizational capability was compounded by the pressures on HS2 staff to find savings as budget and schedule pressures mounted during the 2016 to 2019 period. Managing design development, land acquisition, procurement, and mobilization for construction under a compressed schedule...would have been challenging enough for HS2 Ltd. However, the continual escalation of budget following the award of contracts for the main civils works motivated repeated rounds of searches for additional savings without altering scope and the 2026 deadline. This diverted attention from actually delivering the project while making no discernible difference to budget and schedule escalation.”¹⁹

9. Conclusions

Graham Winch concludes by saying that: “schedule compression is, arguably, the principal proximate cause of both the poor choice of commercial strategy and the broader problem of the lack of project owner capability.” His argument is compelling.

His lesson is this: “plan projects at their natural pace, and if time is lost, don’t try to catch it up except by removing scope from the project.” Well, there has been plenty enough of the latter with HS2!

The emphasis on timescale in his conclusion is surely right and to be welcomed. Others may argue that ‘these schemes are surely done much more quickly elsewhere’ and in some circumstances indeed they

¹⁵ *HS2 - what went wrong? Learning lessons for infrastructure policymaking and the profession*. London: Institution of Civil Engineers, 2023.

¹⁶ *Oakervee Review*. London: Department for Transport, 2019.

¹⁷ *Progress with Preparations for High Speed Two*. London: National Audit Office, 2016

¹⁸ *Oakervee Review, op cit*

¹⁹ *High Speed 2: A Progress Update*. London: National Audit Office, 2020.

are. In France for instance, the adoption for approved national projects of a '*Declaration d'Utilité Publique*' eliminates a lot of post-planning approval distractions and costs that HS2 Ltd has to face with local authorities and utility companies (a source of cost inflation that Graham Winch we believe understates).

Once France has decided on its national infrastructure, it seems, progress can be rapid. But not always – and the high-speed line from Marseilles to Nice for which options were studied as long ago as the early 1990s remains to be delivered. The project is still not currently funded.

It is only where the Graham Winch paper explores the handling of the overriding *purpose* of HS2, that the author comes unstuck, as we have seen. After noting the rationale for HS2 as being centred on adding national transport *capacity*, he says:

“there were considerable difficulties in valuing the benefits of the released capacity due to the difficulties of predicting how the decongested lines could best be used.”

This in turn he attributes to:

“ the lack of an overall strategy for the development of UK rail, and indeed UK inter-urban transportation more generally.”

Yes, but since the birth of rail 200 years ago, there never has been an overall strategy for rail network development. Nor for roads. Arguably the Ministry of Transport of the day was only obligated to start thinking about a national motorway network after the County Surveyor of Lancashire jumped the gun and had the Preston Bypass built to what would become motorway standards in 1958.

No, the DfT may have over-sight of the nation's transport network, but HM Government has never set itself the task of producing a national plan for it. Following Graham Winch's prognosis, we are paying a heavy price for this strategic failure to provide one.