

Ms Rachel Skinner,
President, Institution of Civil Engineers,
Great George Street,
London



Dear Ms Skinner,

Open Letter to Prime Minister exposing Key HS2 Design Failures/ Concerns regarding Involvement of Institution of Civil Engineers

Today I have written to Prime Minister Boris Johnson to alert him to critical failings in the technical governance of the HS2 project, and to huge professional deficiencies in the project's leadership. These failings have profound implications for the reputation and integrity of the civil engineering profession, and in particular the Institution of Civil Engineers.

The ICE has long proclaimed itself as the premier professional Institution of the built environment, involved at all stages of project inception, design, construction and operation. It has a clear public and professional duty to use the expertise of its membership to offer independent and impartial advice to Government, and thus ensure that projects such as HS2 are developed on a quantified, rational basis to provide the best possible service to the public. Regrettably, there is every indication that the ICE has failed in its role as 'critical friend' to Government, and it must therefore bear major responsibility in the impending failure of the HS2 project.

You will of course be familiar with HS2's exorbitant cost and destructive environmental impact, but I must advise you that these are still only symptoms of a much deeper failure of railway engineering design to deliver the step-change connectivity improvements on which all of HS2's proclaimed benefits are based. This failure will be conclusively demonstrated with the forthcoming publication of the Government's Integrated Rail Plan¹, based on HS2 and effectively the culmination of the wider UK high speed rail project.

I am writing to you as ICE President, but it is vital that the wider Institution has a full understanding of the issues at stake, and take the necessary actions to address these matters. I attach copies of my letter to the Prime Minister, and of the full suite of attachments, for your review. I trust that you will disseminate these to all relevant parties within the Institution.

Mismatch between Remit for High Speed Line and Need for National Network

I am not questioning the quality of HS2's civil engineering, or indeed the work of any other engineering discipline. My concern is that the massive engineering effort devoted to HS2 will squander billions and do immense environmental damage, but not achieve anything worthwhile. Construction of HS2, the largest single UK rail project in over a century, is now proceeding with no coherent plan for how the ultra-fast and fundamentally disconnected high speed line that HS2 Ltd's technocrats want to build, will ever develop into the enhanced and cost-effective national rail network that the people of the United Kingdom actually need.

You will hopefully understand that any new railway, high speed or otherwise, has little intrinsic value, however excellent the civil engineering might be. It only has real value if it can form part of a wider network that will serve the public in the locations where they live and work.

Regrettably, this understanding appears to have entirely escaped HS2 Ltd's technical leadership. They have followed their remit - to develop a new railway linking London and the West Midlands - and indeed, they have exceeded it by designing HS2 to be the fastest railway

¹ In February 2020, the Oakervee Review of the HS2 project recommended the development of an 'Integrated Rail Plan for the Whole GB Network' to draw together disparate initiatives such as HS2, Northern Powerhouse Rail (NPR) and Midlands Rail Hub (MRH). <https://www.gov.uk/government/publications/oakervee-review-of-hs2>

in the world². Yet they have scorned any idea of integrating this new railway with the existing network, and in doing so they have effectively ignored the HS2 project's stated objective³ of delivering 'hugely enhanced capacity and connectivity' between the UK's major conurbations.

The outcome, of an improved and optimised railway network based upon HS2 delivering 'hugely enhanced capacity and connectivity', is vital not only to serve the public, but also to meet wider 'public interest' concerns of a rebalanced economy, a greener transport system and a better-connected nation. These public interest issues are central to several recent Government initiatives - the *Integrated Rail Plan*, the *Union Connectivity Review*, *Great British Railways* and *Decarbonising Transport* - yet all will be hugely compromised if HS2 fails to meet its capacity and connectivity objectives.

No Process of Network Optimisation in Development of HS2

It would be reasonable to expect the guiding minds at HS2 Ltd to put in place some structured process of optimisation in the development of HS2. This would ensure that HS2 would not only meet its capacity and connectivity objectives, but also be the best possible scheme, providing the best possible service and value to the UK public.

Yet in all the outputs of HS2 Ltd, there is no evidence of any such structured process:

- No recognition that a railway network is a design entity capable of optimisation;
- No attempt to assess the performance of the national rail network, with HS2 in place;
- No definition of measurable capacity or connectivity goals to enable this assessment;
- No ambition for the attainment of comprehensive direct intercity services linking all of Great Britain's major conurbations (*surely this would be hugely enhanced connectivity?*);
- No ambition for the integrated development of local and high speed networks in major cities to transform local services (*surely this would be hugely enhanced capacity?*).

Instead, it appears to have been assumed that the act of building HS2 as a segregated, stand-alone high speed line will somehow bring about a fully integrated national network that will then deliver the desired outcome of 'hugely enhanced capacity and connectivity'.

The High Speed UK Exemplar Alternative

The contradictions and the dangers in this flawed thoughtpath should be self-evident, but the true scale of the HS2 project's inadequacies can only be appreciated through comparison with a better-performing alternative. I would commend to your attention the High Speed UK (HSUK) scheme for a national high speed network⁴, and the comparisons of network performance that I have set out in Appendix A of my letters to the Prime Minister.

Figure A1 charts the highly London-centric connectivity performance of the existing network, by which London enjoys by far the best intercity links of any UK conurbation. This is both a symptom and a cause of the North-South Divide that has long afflicted the UK economy, and it would seem plain that a more symmetrically connected network, with greatly improved links between regional cities, is essential if 'levelling up' is ever to happen.

Figure A2 charts the connectivity offered by HS2, Northern Powerhouse Rail (NPR) and Midlands Rail Hub (MRH), assuming that all schemes are implemented to their full planned extent. It demonstrates that HS2 will create no new intercity links, its principal achievement being to make already-fast links to London even faster, while the schemes subsequently introduced to remedy HS2's connectivity deficiencies (i.e. NPR and MRH) will do relatively little to improve interregional links.

² HS2's civil engineering infrastructure has been designed for a potential future operating speed of 400km/h. This is faster than any other high speed rail project anywhere in the world

³ HS2's objective of 'hugely enhanced capacity and connectivity' was stated in *High Speed Rail: Investing in Britain's Future – Decisions and Next Steps*, published January 2012 by DfT, and repeated in evidence given to the HS2 Select Committee by HS2 Ltd Technical Director Andrew McNaughton FICE on 30th November 2015.

⁴ For further details of the High Speed UK proposals see www.highspeeduk.co.uk

Figure A3 additionally highlights the existing intercity/interconurbation links that are projected⁵ to be degraded through the implementation of HS2. This would seem to indicate that HS2 could have the effect of making the national network even more London-centric, and therefore effectively sabotaging the Government's levelling-up agenda.

Figure A4 sets out HSUK's vastly superior network performance, demonstrating that it is possible for a railway system, designed from the outset as a national network, to offer almost complete direct interconnectivity between the UK's major cities.

The Government's Integrated Rail Plan, the Great British Railways initiative and the Commitment to a 'Net Zero' National Rail Network

There are signs that officialdom is belatedly waking up to the dangers posed by HS2's failure to integrate with other railway initiatives:

- In February 2020, the Oakervee Review⁶ recommended the development of an 'Integrated Rail Plan for the Whole GB Network' to draw together disparate initiatives such as HS2, Northern Powerhouse Rail (NPR) and Midlands Rail Hub (MRH).
- In May 2021, the Government announced its intention to establish 'Great British Railways' with its core ambition for 'one connected network'⁷.
- In July 2021, the Government made a specific commitment to developing a 'Net Zero' national railway network based upon HS2 and the Integrated Rail Plan⁸.

Yet these ambitions seem certain to be frustrated. Great British Railways will only comprise 'one connected network' with 'Net Zero' CO₂ emissions if the Integrated Rail Plan (IRP) succeeds in bringing about this connected and fully integrated network. This is a highly unlikely prospect for 4 reasons:

- The IRP is predicated upon HS2 Phases 1 and 2a, which were designed with no thought for integration or optimised network performance.
- The IRP has failed to consider alternative schemes that might better deliver the required integrated network performance.
- The IRP has been developed with no specification for its technical performance.
- All the policy ambitions represented by *Decarbonising Transport* and *Great British Railways* are entirely dependent upon an Integrated Rail Plan which on all available evidence will fail to offer the necessary efficiency, optimisation or integration.

Although the Government has yet to publish its Integrated Rail Plan, its key elements i.e. HS2, NPR and MRH are already well defined, no further major interventions are proposed and its poor performance as a network can be confidently predicted. See Figures A2 and A3.

This unacceptable situation demands both the establishment of an overarching performance specification⁹, and also the introduction of an Exemplar Alternative (i.e. High Speed UK¹⁰, designed from the outset as a national network, with a 'demonstrator timetable' developed to establish its performance potential) to reveal the true extent of the official proposals' suboptimal performance. See Figure A4.

⁵ Table 23, pp91-92, HS2 Regional Economic Impacts, HS2 Ltd, September 2013

⁶ <https://www.gov.uk/government/publications/oakervee-review-of-hs2>

⁷ P33, *Great British Railways : The Williams-Shapps Plan for Rail*, DfT, May 2021

⁸ P9 & P79, *Decarbonising Transport: A Better, Greener Britain*, DfT, July 2021

⁹ See Appendices B and C in my letter to the Prime Minister. These relate respectively to the Integrated Rail Plan in the Midlands Engine and Northern Powerhouse regions, and they set out 7 key tests of network performance. The assumption is made that HS2 will be built to its full planned extent as the 'Y-network'; any curtailment of HS2's extent (e.g. the rumoured deferment or cancellation of HS2 Phase 2b to Yorkshire) will further degrade its performance.

¹⁰ Much further detail can be found on www.highspeeduk.co.uk.

The comparisons set out in Appendices B and C demonstrate conclusively what should have been obvious from the very start of the UK high speed rail project - that there was only ever one logical objective, a fully connected, fully integrated and fully optimised national network. All new high speed lines and other component elements needed to be designed from the outset in an integrated and holistic manner to achieve this objective.

No Competence in Design and Development of National Railway Network

The collective failure of the great and the good of the UK transport establishment to appreciate these simple truths highlights one very concerning fact: whatever competence they might possess in their particular fields of expertise, and however great their obsession with building the fastest railway in the world, it would appear that they have no competence whatsoever in the design and development of a national railway network.

This critical failing is likely to cost many hundreds of billions of pounds in wasted capital expenditure and lost economic opportunities, in particular the much-vaunted 'levelling-up' of the UK economy. It will also have devastating and completely unnecessary impacts on natural environments, essentially through building the wrong sort of railway in the wrong place.

High Speed Line - Slow Speed Network (The HS2 Speed Syllogism)

The extent of the professional and intellectual failure of those leading the HS2 project can be encapsulated in one extraordinary misconception. The decision to design HS2's civil engineering infrastructure for potential 400km/h operation has always been represented as some sort of 'future proofing' against possible advances in high speed rail technology. Yet this decision has also dictated HS2's ultra-straight, environmentally destructive and exorbitantly expensive rural alignments. This has in turn made it effectively impossible to follow existing transport corridors, such as that of the West Coast Main Line, and therefore impossible also to integrate with the existing railway system and thus form an enhanced network.

This folly is exposed by the vastly superior performance of the HSUK Exemplar Alternative, designed to radically different principles as a fully integrated network. With its southern section closely aligned with the M1 motorway, designed for a maximum speed of 360km/h and connected at close-spaced intervals to both West Coast and Midland Main Lines, it can offer network-wide journey time savings that vastly exceed¹¹ anything HS2 can offer.

ICE Members Implicated in HS2 Design Failure

All this should be alarming from any perspective, but it must be of especial concern to the Institution of Civil Engineers as the leading professional institution in the development of public infrastructure. ICE members have been present in senior roles in every major organisation involved in the HS2 project - either client, regulator, reviewer, consultant or contractor - and all appear to be implicated in some way in HS2's failure as a public infrastructure project.

I have no detailed inside knowledge of either HS2 Ltd or any other related organisation, and I can only take a view on their published outputs and public statements; I am certainly in no position to level specific accusations against specific individuals. But when considered on a project-wide, more corporate basis, there have been clear breaches of every primary aspect of the ICE's Rules of Professional Conduct.

Competence

As noted previously, no competence in the crucial matter of the design and development of a national railway network has ever been exhibited.

¹¹ Figure 5.66, P141, *High Speed to Nowhere*, Colin Elliff, available as document A03 on www.highspeeduk.co.uk

Integrity

The idea, that no-one in any position of influence ever understood the contradiction and conflict between HS2's remitted development as a segregated, stand-alone high speed line, and its objective to form an integrated network offering 'hugely enhanced capacity and connectivity', is simply not credible.

Public Interest

Every aspect of the failure of HS2 and its subsidiary schemes (i.e. Northern Powerhouse Rail and Midlands Rail Hub) to form part of an integrated and optimised regional/national network is a betrayal of both the public and the national interest.

Natural Environment

The wanton destruction currently being inflicted upon the Chilterns AONB and previously unspoilt rural areas further north must be viewed in the context of the nearby M1 corridor. Extensive survey and design work undertaken by HSUK indicates clearly that the M1 corridor offers a far more suitable high speed route between London and the Midlands, much cheaper to build and much more capable of integrating with the existing rail network and thereby benefitting local communities. Regrettably, this route appears to have been deliberately ignored in the early development of HS2.

Development of Professional Knowledge

There is no indication that any leading figure involved in the HS2 project has ever taken the necessary steps to develop his or her competence in the design and development of a national railway network.

Implications for the Institution of Civil Engineers

The above commentary is not intended as an exhaustive list of professional conduct failures in the development of HS2 and the wider UK high speed rail project. Its purpose is merely to provide an indication of the many issues whereby considerations of professional ethics would appear to have proved insufficient to deter many individuals from benefiting their careers and bank balances by unquestioningly following the HS2 juggernaut.

I believe that this issue of conflicted professional ethics also extends to the Institution of Civil Engineers:

- By its very *raison d'être*, the ICE always tends to favour major infrastructure projects.
- As a membership organisation, the ICE will inevitably favour a public mega-project providing major employment opportunities to its members.
- But as a learned society, the ICE should understand the potential conflict between HS2's remit as a high speed line, and its true objective to form a connected network.
- As a trusted advisor to Government and as the holder of a Royal Charter, the ICE should do all necessary 'due diligence' to ensure that public mega-projects such as HS2 will deliver optimum outcomes, and therefore best serve the public interest.

The largely uncritical support that the ICE and many other establishment institutions have so far given to the HS2 project will become increasingly unsustainable as public and politicians alike begin to understand the full extent of HS2's disastrous performance as a national network. All these institutions will be left exposed to the criticism that they have placed the interests of their members and their industry above those of the wider public, but the ICE is in by far the most vulnerable position. Civil engineering is the industry most on display in the construction of HS2, and in the public and political perception the ICE - which promotes itself as the premier institution of the built environment - will be deemed to bear prime responsibility.

Implications for ICE Royal Charter

The ICE's uncritical stance on HS2 is particularly reprehensible, when considered from the perspective of its Royal Charter. This defines the institution's objective as: '...to foster and promote the art and science of Civil Engineering', and it would seem self-evident that this 'art and science' must look beyond the building of a high speed railway to the use to which it will be put. But just as HS2 Ltd has paid no worthwhile attention to HS2's performance as a network, the ICE has similarly failed in its 'learned society' role to appreciate that there might be 'art and science' in engineering a network to achieve optimum performance and thereby best serve the public. The ICE has also failed to encourage free and open debate to ensure that the purpose and the rationale of the HS2 project was properly defined, or to protect ICE members from speaking out in public to highlight HS2's many deficiencies.

These might seem harsh judgments, but I have seen no evidence in any of the ICE's outputs or activities to support any contrary view. On the other hand, I have plentiful experience of interactions with a multitude of personalities in many different ICE roles, all of whom have been either unable to see beyond the actuality of building a stand-alone high speed railway, or totally secure in the belief that an optimised and integrated network will somehow result.

This complacency has deeply infected the work of the ICE's expert panels, for instance in the formulation of responses to official consultations. I refer specifically to the advice provided by the Yorkshire & Humber Regional Advisory Board to the Transport Panel in respect of the ICE's response to the HS2 official consultations in 2011 and 2014. Even when presented with detailed technical concerns as to HS2's inadequate network performance, 'ICE corporate' watered down and suppressed these concerns. I can only conclude that greater priority was placed upon providing a supportive response to friends in Government, than upon ensuring that a public mega-project provided best service to the public. This would appear to fly in the face of everything that the ICE should stand for.

Necessary ICE Actions

I believe that the ICE must quickly get its house in order with regard to HS2, and to the Integrated Rail Plan that is now being promoted as the culmination of the HS2 project. If the ICE fails to do so, it faces potentially existential risks to its reputation and status. Whatever the mistakes of the past, the ICE must now return to its central objective of promoting of the 'art and science' of civil engineering, and it must return to its core values of public service.

The ICE must be firm in its advice to Government that the UK needs not any Integrated Rail Plan, but the Integrated Rail Plan that has been designed to the highest possible professional engineering standards, and is thus best capable of delivering 'hugely enhanced capacity and connectivity' for the people of the United Kingdom. Second-rate and second-best are simply not good enough.

The impending failure of the HS2 project will force the Institution, and certain prominent ICE members, to confront some very inconvenient and embarrassing truths. It is vital that the ICE's leadership understands the true depth and scope of the dangers that the Institution faces, so that it can take proper action to minimise the damage, and prevent any continuation or repetition of its deeply regrettable conduct in furthering the HS2 project.

Please be assured that I am keen to assist you and the Institution in any way that I can, and I would urge that we meet at the earliest possible opportunity so that you have the fullest possible understanding of the issues at stake. If you require any further information please do not hesitate to contact me on 07591 959134.

Yours sincerely,

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PS In my letter to the Prime Minister, I have posed 7 key questions which the UK transport establishment - and indeed, many ICE members involved with the HS2 project - must be able to answer. I trust that you will support me in securing proper answers to these crucial questions of public and national interest:

1. How have you assessed and measured HS2's success in delivering 'hugely enhanced capacity and connectivity' between the UK's major conurbations?
2. How have you determined that HS2 is the best means of achieving this objective?
3. How have you designed HS2, Northern Powerhouse Rail (NPR) and Midlands Rail Hub (MRH) to integrate with the UK rail network, and thus achieve the best possible links between all of the UK's major cities?
4. How have you developed the Integrated Rail Plan to remedy the disconnection between HS2, NPR, MRH and the existing railway system, and thus achieve the best possible network interlinking all UK communities?
5. How have you determined that a national railway network based upon HS2, NPR and MRH will bring about the greatest possible road-to-rail modal shift, and thereby make the greatest possible contribution to reducing CO₂ and other greenhouse gas emissions?
6. Where is your network connectivity analysis, to match that undertaken by HSUK?
7. Please explain why the official proposals, variously HS2, NPR, MRH etc, perform so poorly on every conceivable criterion against the HSUK Exemplar Alternative.