# ICE submission to the Transport Committee on major transport infrastructure projects: appraisal and delivery

**January 2021**

## Introduction

Established in 1818 and with over 95,000 members worldwide, the Institution of Civil Engineers exists to deliver insights on infrastructure for societal benefit, using the professional engineering knowledge of our global membership.

Our submission to this inquiry draws on ICE's extensive body of work and insight, including our 2020 State of the Nation Report on net zero and infrastructure[1], White Paper on Covid-19 and the 'new normal' for infrastructure systems[2], policy paper on reducing the gap between cost estimates and projects outturns[3], and collaboration with the Infrastructure Client Group on Project 13.[4] For more information, please contact:

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## Transport infrastructure strategy and priorities

### Government's transport infrastructure priorities

At Spending Review 2020, the Government formally responded to the National Infrastructure Commission's National Infrastructure Assessment (NIA). There were two responses: one was the publication of a National Infrastructure Strategy (NIS), the other a more detailed response to each of the recommendations in the NIA.

ICE had long called for the publication of a NIS, and published a policy paper in 2019 on what a NIS should include.[5] Our main recommendation in that paper was for government to either accept the recommendations set out in the NIA or outline what they intend to do instead. The response to the NIA indicates a number of areas where the NIC's recommendations on transport were not fully endorsed. As a result, a policy gap remains where action by government will be necessary:

- Recommendation 30a, on the steps needed to achieve 100% electric new car and van sales by 2030
- Recommendation 33, on the role of local authorities in making available electric vehicle charge point parking spaces
- Recommendation 36, which called for a significant increase in funding for local highway authorities

[1] ICE (2020) State of the Nation 2020: Infrastructure and the 2050 Net-Zero Target
[2] ICE (2020) Covid-19 and the New Normal for Infrastructure Systems – Next Steps
[3] ICE (2019) Reducing the Gap Between Cost Estimates and Outturns for Major Infrastructure Projects and Programmes
[4] Infrastructure Client Group (2020) Project 13
[5] ICE (2019) What should be in the National Infrastructure Strategy?

- Recommendations 37, 38 and 39, which recommended additional powers for Mayors to deliver joined up strategies for transport, employment and housing and

- Recommendations 40 and 41 on a significant increase in transport funding, over regular five-year cycles, for cities

## Covid-19 implications

ICE's White Paper on Covid-19 examines the impact of the pandemic on the future shape of infrastructure systems in the UK.[6]

The UK has a number of long-term social, economic and environmental goals that remain, such as achieving the 2050 net-zero greenhouse gas emissions target and the 2030 UN Sustainable Development Goals (SDGs).

In addition to the desirable long-term outcomes, there are also a range of long-term challenges that can't be ignored in determining future infrastructure provision as the UK's economy emerges from the pandemic. Chief among these is that the UK's population is projected to reach 75 million by 2050.[7] Even if some public life activities – including both working and socialising – are carried out in a more remote way in the future as a result of enhanced digital connectivity, the underlying demand growth on conventional transport networks will remain significant.

Whether this demand is met by building new capacity or by using existing capacity in a more intelligent way, including through the implementation of measures to smooth peaks, it remains a long-term and complex challenge.

In view of the new transport capacity and improved connectivity that was required before Covid-19, continuing with planned works is likely to be important as passenger numbers recover in a post-vaccine environment. But the pandemic also provides an opportunity to reset some of the ways in which public transport operates, including restructuring of timetables and fares to accommodate more flexible working and new social habits. Likewise, and where appropriate, the prioritisation of active travel provision is needed to maintain the positive shift to healthier forms of travel.

The long-term demand drivers for infrastructure will continue to lead decisions on major infrastructure programmes that take longer to plan, design and deliver. Our assumption in May 2020 was that a rapid review of major transport infrastructure would be needed within two years.[8] This should consider existing government transport priorities, to identify changes in long-term demand forecasts and as a result, how major programmes would need to be reprioritised.

While we are aware some of this work has already begun – notably with the reallocation of some parts of Network Rail's Control Period 6 from projects in the South to the North at the 2020 Spending Review – ICE would recommend any review be made public at the earliest opportunity in order to allow for effective stakeholder engagement.

## Net zero

Transport is the largest source of CO2 emissions in the UK – 34% of the total – deriving primarily from the use of petrol and diesel in road transport.[9] While progress has been made in reducing emissions, the UK is not currently on track to meet its target of net-zero emissions by 2050, nor the intermediate carbon budgets recommended by the Committee on Climate Change.

There is no plausible path to net zero without major transport emissions reductions – reductions that need to start being delivered soon. ICE believes that in order to deliver major projects – including transport – while ensuring the Government meets its 2050 net-zero targets, a Net-Zero Infrastructure Plan for transitioning the UK's economic infrastructure systems

[6] ICE (2020) Covid-19 and the New Normal for Infrastructure Systems – Next Steps
[7] ICE (2016) National Needs Assessment
[8] ICE (2020) Covid-19 and the New Normal for Infrastructure Systems – A Green Paper for Consultation
[9] BEIS (2020) 2019 UK Greenhouse Gas Emissions, Provisional Figures

to a net-zero footing must be put in place.[10] We recognise that BEIS plans to launch a net zero strategy prior to COP26, including sector-by-sector strategies setting out pathways to decarbonisation by 2050.

This plan should set the overarching framework and policies for transitioning infrastructure to net zero, while providing clear direction to other levels of government and to industry, including subsidies and incentives required to support the transition to net zero. Investors and industry seek clear and stable direction from the government and a simple, investable set of rules and incentives to enable them to act and innovate for net zero.

Department for Transport analysis of current policies and regulations demonstrates that the UK must go much further in reducing domestic transport emissions to meet the targets. The government has recently published a range of strategies to reduce emissions across all conventional transport modes, including the Road to Zero strategy, Maritime 2050 and the Clean Maritime Plan, and the Aviation 2050 Green Paper and forthcoming net-zero aviation consultation and Aviation Strategy. These have been supported by the Cycling and Walking Investment Strategy, the Freight Carbon Review and the Rail Industry Decarbonisation Taskforce. Fundamentally, the Net-Zero Infrastructure Plan must bring all this analysis together and put forward answers to several key policy choices, including:

- How to constrain demand for unsustainable passenger and freight transport services without disadvantaging certain geographies, industries or populations (e.g. demand management through urban design, remote working and localised production).

- How to shift passengers and freight to lower-carbon transport modes at an acceptable cost to the taxpayer (e.g. decarbonising road freight, promoting a modal shift to active travel or public transport, as well as a shifting revenue base from road taxes to pay-as-you-go models).

- How to improve environmental performance through vehicle design, infrastructure provision and substituting fossil fuels with low-carbon energy vectors (e.g. industry transitioning to electric vehicles, alternative fuels such as green hydrogen, as well as smaller, more efficient vehicles).

The government's Transport Decarbonisation Plan is due to be published later in 2021 and it must examine these issues in greater detail.

# Appraisal and funding of transport infrastructure

## Green Book

In November 2020, ICE published a position statement on reforming the Green Book to achieve better outcomes from infrastructure investment.[11] The paper found that there is little wrong with the Green Book as a tool to allocate resource on the basis of scheme performance. It provides a robust means to adequately take account of major policy issues, but requires better application, as well as guidance and clarity on the detailed policy context that it operates in from the government.

Our policy position statement made a number of recommendations:

- Reform of the Green Book should relate to improving the application of the Five Case Model rather than drastically changing the appraisal process and practice. ICE has previously called for a standardised scorecard to be developed to prioritise, identify and weight non-financial outcomes for major projects. We would welcome such an approach in the Green Book project appraisal.

[10] ICE (2020) State of the Nation 2020: Infrastructure and the 2050 Net-Zero Target
[11] ICE (2020) ICE Policy Position Statement: Reforming the Green Book to Achieve Better Outcomes from Infrastructure Investment

- In order for strategic objectives to be better addressed through the Green Book, additional clarity and detail are required from the government on specific interim targets towards net zero, both over time and at a spatial level, alongside a definition of 'levelling up' and its specific goals.

- It is important for the Green Book's strategic narrative to align with specific regional requirements and not rely on a single set of national objectives. This can allow for balanced decisions and trade-offs to be made regionally, including on social value. We suggest that this is backed up with greater devolution of decision-making and funding regarding infrastructure in order to improve capability and pace, encouraging more developed evidence bases at regional levels.

- ICE believes net zero should be appraised through the existing Five Case Model, providing the net-zero target is explicitly and clearly stated as a key objective and subsequently reinforced in the methodologies and guidance in the Five Case Model. In this way, net-zero thinking is woven as a bright green thread throughout each of the case models, rather than as a separate model entirely.

ICE welcomed the changes made to the Green Book at the 2020 Spending Review, particularly as project promoters are now encouraged to focus on developing schemes that maximise local impacts and benefits in accordance with strategic priorities, alongside more thorough consideration of wider benefits, including contributions to net zero.

However, the Green Book is designed to appraise projects and programmes based on clear, measurable and quantifiable metrics. The success of strategic national objectives, such as 'levelling up' and net zero, is challenging to measure as successful outcomes have not been defined and overarching strategies remain, as yet, undeveloped.

# Factors influencing the cost of transport infrastructure in the UK

## Reducing the gap between project forecasts and outturns

Major infrastructure projects and programmes suffer from a tendency to cost more or take longer than initial estimates outline.

The reasons for this are complex. Projects are themselves complicated undertakings, spanning a development time of years or decades, with unique requirements, bringing together multiple stakeholders and a disparate workforce that spans the entire supply chain.

The nature of major projects and programmes means that their estimation of cost and schedule often carries limited accuracy. Estimation takes place against the backdrop of cost envelopes, risk allocation, and probability calculations. As such, there will always be things which cannot be foreseen or do not go as planned. The challenge of squaring realistic estimates with a procurement process that may favour those who bid the least only adds to the problem.

In 2019, ICE produced a paper setting out recommendations for limiting overruns, while also arguing for a shift in thinking around what constitutes success.[12] Indeed, more weight should be attached to the whole life benefits of projects and programmes – be they economic, social and environmental – as opposed to a fixation on achieving lowest capital cost in delivery. The recommendations are outlined below:

[12] ICE (2019) Reducing the Gap Between Cost Estimates and Outturns for Major Infrastructure Projects and Programmes

- Infrastructure owners should complete scope, design and exploration before commencement of work is allowed, to avoid scope creep or retroactive changes, taking steps to include contractors in design at an early stage.

- The Government and infrastructure owners must move away from capital cost as the most important metric when assessing project benefits, recognising the importance of whole-life economic, social and environmental value.

- Principles set out in the Outsourcing Playbook should be mandatory for Government infrastructure owners, this includes infrastructure owners undertaking should-cost modelling to help inform their expectations and knowledge of appropriate tender prices during the procurement process.

- It should be mandatory for all public infrastructure owners undertaking procurement to award contracts based on a cost estimate range, using a should-cost estimate as a reference point, with an amount of contingency allocated appropriate to the level of project maturity.

The publication of the Construction Playbook in December 2020 does reflect a number of these recommendations, including how to avoid guesswork on project costs and forecasts, improving the focus on outcomes from projects, and decarbonising the delivery of infrastructure. Notably, the Playbook will help by converting existing small pockets of good practice into an industry-wide change programme.

## Enterprise-based delivery models

The Infrastructure Client Group's Project 13, which ICE has been supporting, is an industry-wide change programme to shift the industry from a transactional business model to an enterprise model, which could also play a part in enabling greater use of off-site manufacture and enhancing industry productivity.

Enterprise-based delivery models provide an example of the type of initiative that could gain traction and define the way in which major infrastructure projects are delivered in the future. The main differences between an enterprise-based delivery model and a more traditional construction delivery model are as follows:

- Reward/profit in the enterprise is based on value added to the overall outcomes, not time spent. The relationships between organisations last over a longer period, incentivising investment in skills and tailoring of supply-chain business models.

- There is greater understanding of cost drivers and risk across all organisations in the enterprise, with commercial incentives for collaboration to jointly mitigate risk, not transfer it.

- Establishing a high-performing enterprise requires fundamentally different leadership, governance, behaviours and skills to succeed.

Project 13 looks to shape the delivery of major projects into an enterprise model with a 'capable owner' at its helm. Rather than the adversarial culture associated with traditional one-off transactional relationships, the idea is that the 'capable owner' invests in selecting the right partners based on capabilities and behaviours, and develops appropriate value-based incentive mechanisms that focus on outcomes and the performance of infrastructure assets over the entirety of the life of those assets.

This approach requires investment in a governance framework that enables effective and collective decision making, with high levels of transparency and layers of assurance built into the process, ensuring that quality of outcome remains at the core of the enterprise's objectives.

Wider adoption requires progress on many fronts, including better understanding of assets through should-cost modelling, a culture of all parties being held to account through strategic stakeholder engagement and a focus on outcomes as part of the investment programme.

A standardised scorecard should be made available to facilitate this shift, with that scorecard emphasising the value and importance placed on working together to drive up productivity and drive down carbon footprint.

## Systems thinking

It is important that major transport projects are not considered in isolation. New or expanded infrastructure services are delivered via complex projects that bring together physical assets, technology and digital information in the form of a Building Information Model (BIM) or a digital twin.

The majority of these assets will need to be integrated into existing networks and services. The dominant leadership and delivery model for infrastructure projects has not evolved to reflect these changes.

A recent ICE-commissioned review explains how systems thinking can be used to improve the delivery of complex infrastructure projects, through a Systems Approach to Infrastructure Delivery (SAID).[13] There are strong links between Project 13 and SAID, however, Project 13 supports the creation of enterprises, while SAID is a model for applying systems thinking to project delivery.

Systems thinking, systems engineering and systems integration are at the heart of SAID. The review found that these practices have been extremely effective in other project-based industries such as oil and gas, and aerospace. Adopting what works from these sectors can help the infrastructure sector to make rapid progress in the short term.

In the medium term, it needs to look at how the technology and software industries have taken advantage of an intense continuous development mindset to help systems adapt to rapidly changing user needs, and the opportunities created by technological change.

The model stresses the importance of committing resource to the front end of projects to minimise delivery risks, while using high-quality, timely data as the 'golden loop' that runs throughout the project and feeds into future improvements.

It is important for project owners to clearly define the user outcome, so that engineers and technology developers can deliver for that use. Many contributors to the review noted that Crossrail's pre-2018 communications centred on the engineering achievements of the project, and not the goal of connecting up engines of economic growth at Heathrow, the City of London and Canary Wharf. Indeed, in its 2019 Completing Crossrail report, the National Audit Office also questioned Crossrail's approach to systems integration.[14] This phenomenon is not new or unique: the Channel Tunnel project in the 1980s and 1990s, for example, ran into similar issues as the focus was on delivering a tunnel instead of a railway system.

[13] ICE (2020) Doing a Better Job: A Systems Approach to Infrastructure Delivery
[14] National Audit Office (2019) Completing Crossrail