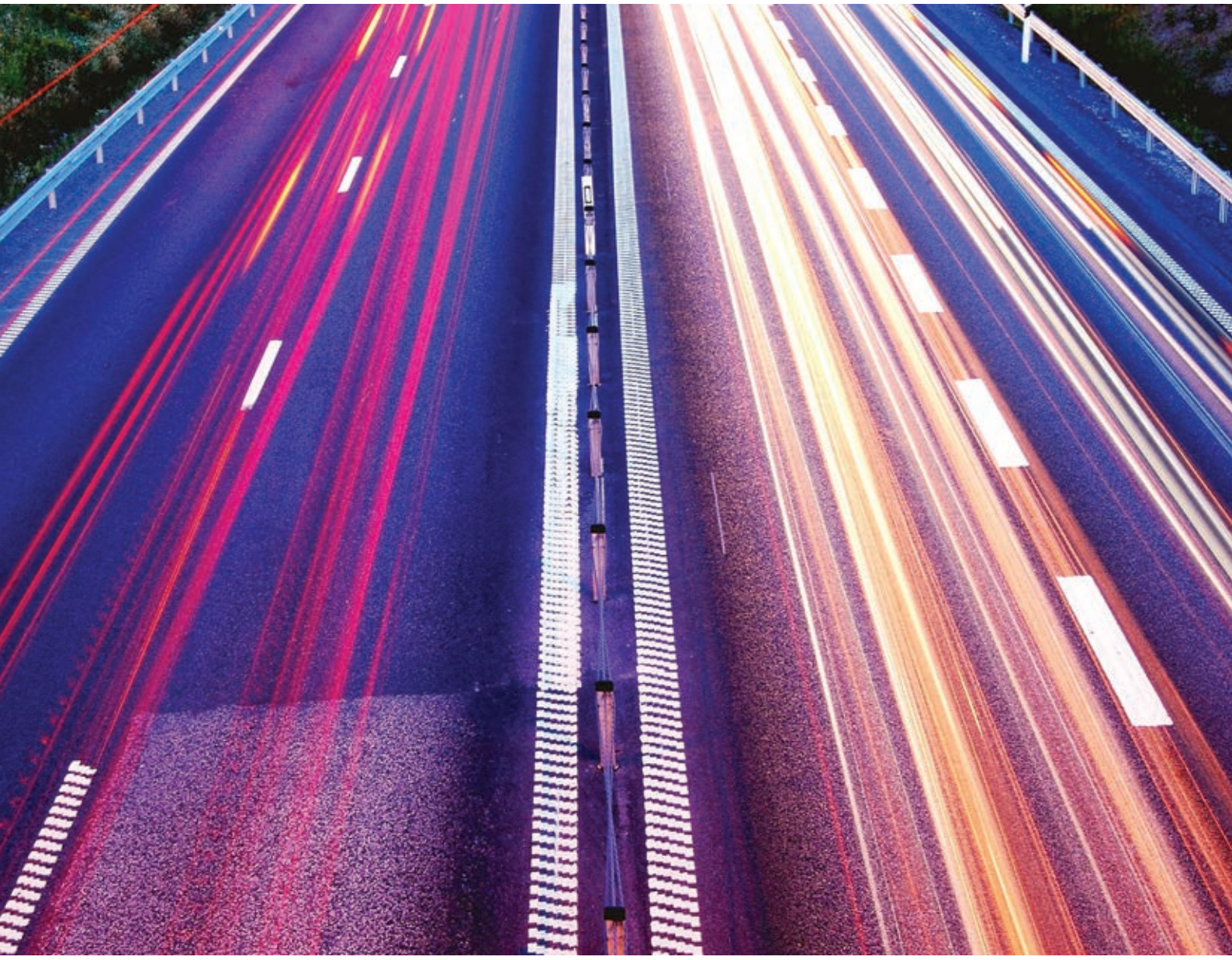
Policy Briefing

The National Infrastructure Commission (NIC)



Association for Project Management
April 2018

THE CHARTERED BODY FOR THE PROJECT PROFESSION

Introduction

When published in November 2017, the Industrial Strategy White Paper sought to provide a policy framework against which major private and public-sector investment decisions could be made. It was a strategy that government said was "being implemented with, not just for, British enterprise – with the full involvement of innovators, investors, job creators, workers and consumers in England, Scotland, Wales and Northern Ireland." The consultation on the Industrial Strategy green paper reinforced the importance of five foundations of productivity – the essential attributes of every successful economy – with Infrastructure recognised as one of these five foundations.

With government estimating the UK's National Infrastructure and Construction Pipeline to be worth around £600bn and with the expectation that public infrastructure investment will have doubled in a decade by 2022/23, the importance of unbiased assessment and expert advice cannot be overstated. The National Infrastructure Commission is therefore a critical part of a "more strategic approach to infrastructure investment" and the following briefing aims to provide an insight into the development and remit of the NIC in addition to examining some of its key publications to date. Summaries within this briefing directly draw upon NIC content.

The creation of the commission:

The creation of the National Infrastructure Commission (NIC) was announced on 5 October 2015 by then-chancellor George Osborne. Formally launched at York's National Railway Museum, the genesis of the commission was the fulfilment of a pledge made by the chancellor in 2013.

The NIC was created to provide *unbiased* analysis of the UK's long-term infrastructure needs with a remit to provide an assessment of the UK's infrastructure needs every 5 years, looking 30 years ahead, in a formal *National Infrastructure Assessment* (NIA) examining the evidence across all key sectors of economic infrastructure – including: energy; roads; rail transport; ports and airports; water supply; waste; flood defences; digital; and broadband.

Timeline:

OCTOBER 2015	Creation of NIC
7 JANUARY 2016	NIC consultation on the governance, structure and operation of the commission.
26 MAY 2016	NIC consultation on the process and methodology of the National Infrastructure Assessment.
12 OCTOBER 2016	Chancellor Philip Hammond announces that NIC is to become an executive agency of HM Treasury.
27 OCTOBER 2016	NIC response to the consultation on the process and methodology of the National Infrastructure Assessment.
24 JANUARY 2017	NIC *formally* established as an executive agency of HM Treasury, with corporate plan published.
21 APRIL 2017	Lord Adonis and Sir John Armitt, formerly interim chair and deputy chair respectively, appointed on a permanent basis.
13 OCTOBER 2017	Key speech *Congestion, Capacity Carbon* delivered by Lord Adonis at the launch of the interim National Infrastructure Assessment.
29 DECEMBER 2017	Lord Adonis announces his resignation as chair.
18 JANUARY 2018	Sir John Armitt appointed chair of the NIC.

Consultation and development of the NIC:

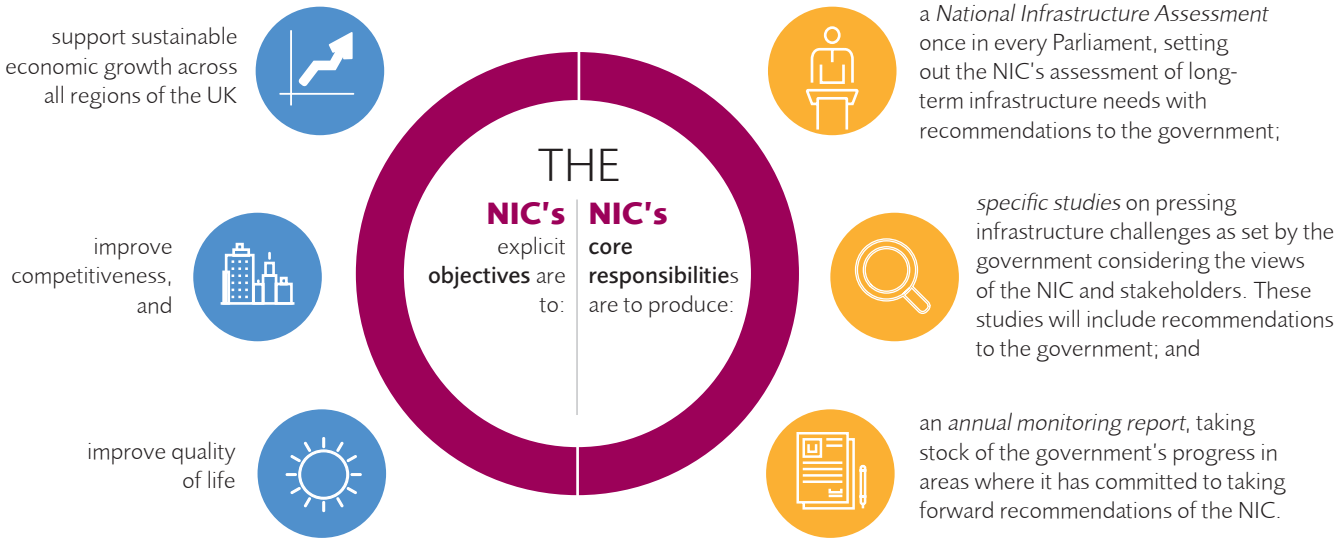
In early 2016, the NIC announced a consultation on its governance, structure, and operation. Shortly after the ten week consultation opened, the Confederation of British Industry (CBI) published its report *Plotting the course* in which it called for the NIC to be "given teeth" – identifying eight key areas that should be prioritised including: delivering a low-carbon energy supply, preparing for the roll-out of 5G, factoring in climate change when planning water supplies and flood defences, and devising creative solutions to meet the growing demand on roads, rails and ports.

"Mr Hammond's announcement was accompanied by publication of the *Charter for the National Infrastructure Commission* summarising the commission's purpose and remit."

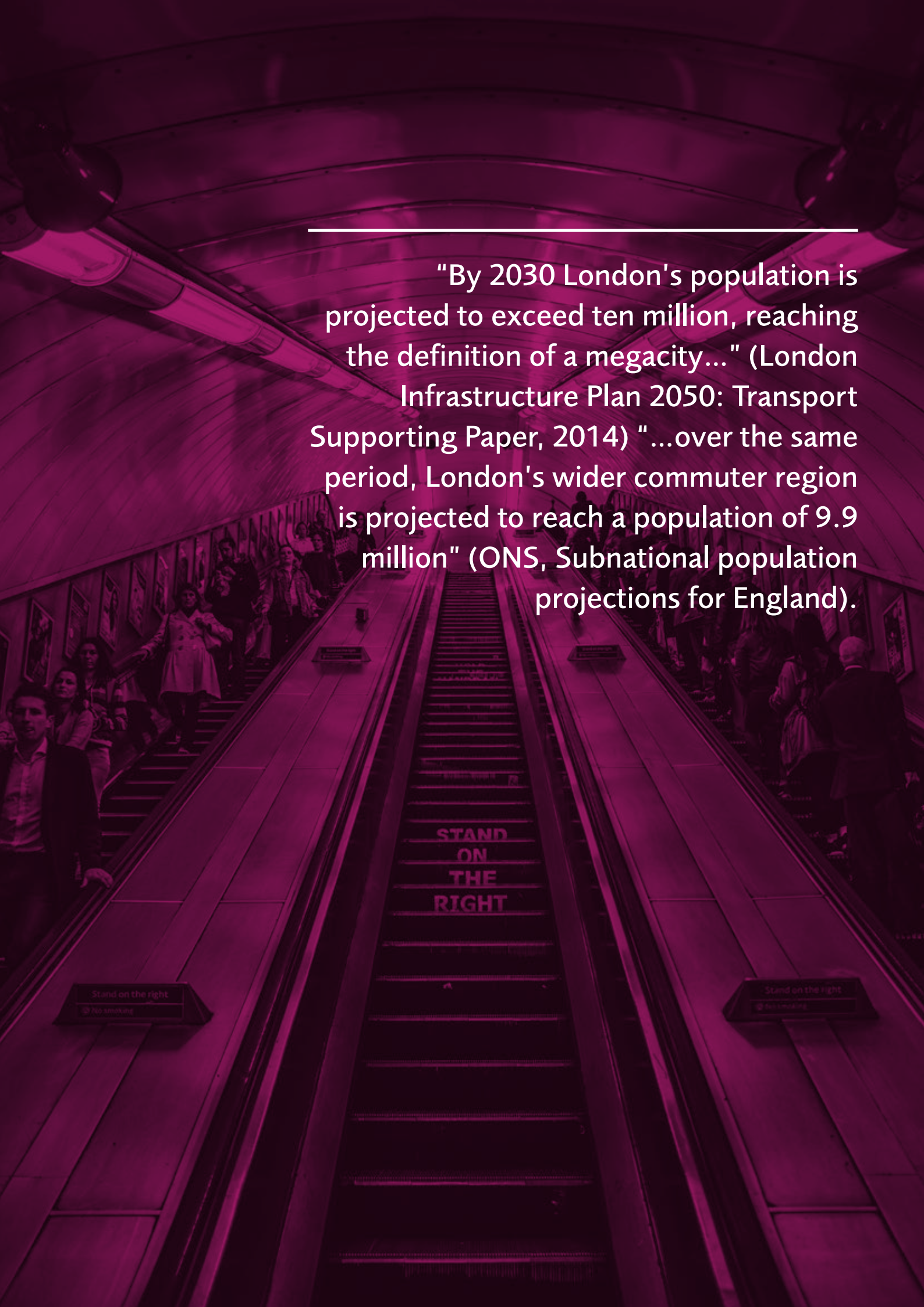
A further consultation was launched by the NIC in May 2016 seeking views on the *process* and *methodology* of the National Infrastructure Assessment. More than nine months later, in October 2016, the commission published its response to the consultation. Shortly before the publication of this response, the chancellor (Philip Hammond) announced that the NIC would become an executive agency "with its own budget, freedom and autonomy" although this announcement was met by calls from industry for the commission to be made a *statutory body*, with the CBI, British Chambers of Commerce, London First, and the Infrastructure Forum Advisory Council writing an open letter to Mr Hammond to this end. Mr Hammond's announcement was accompanied by publication of the *Charter for the National Infrastructure Commission* summarising the commission's purpose and remit.

At the end of October 2016, the NIC put out a further call for evidence setting out twenty eight questions in relation to the National Infrastructure Assessment in addition to establishing a Technical Panel and an Analytical Panel.

In January 2017 the NIC was *formally* established as an executive agency of HM Treasury, with a corporate plan published. The objectives and core objectives of the NIC are described in the NIC Charter as follows:



The first National Infrastructure Assessment is due to be published in Summer 2018.



"By 2030 London's population is projected to exceed ten million, reaching the definition of a megacity..." (London Infrastructure Plan 2050: Transport Supporting Paper, 2014) "...over the same period, London's wider commuter region is projected to reach a population of 9.9 million" (ONS, Subnational population projections for England).

Commissioners and staff:

At its inception, the commission was led by Lord Adonis – then a Labour peer – and overseen by a small board appointed by the chancellor, George Osborne. To maintain independence, Lord Adonis resigned the Labour whip in the House of Lords to chair the commission, sitting instead as a cross-bench peer. In April 2017, following the formal establishment of the NIC as an executive agency of HM Treasury, it was confirmed that Lord Adonis and Sir John Armitt would become chair and deputy chair respectively on a permanent basis. Following the resignation of Lord Adonis as chair of the commission in December 2017, former *Deputy Chair* Sir John Armitt assumed full chairmanship of the commission.

Currently the NIC is supported by a team of approximately 40 staff combining a range of public and private sector skills and experience, relevant to the specific projects and work streams it is undertaking. Current staff are comprised of direct employees of the NIC, civil servants on loan from several relevant departments (including DfT, BEIS and Defra), and secondees from local authorities, regulators and the private sector.

The 8 commissioners and chair (as at April 2018) are:

CHAIR:

Sir John Armitt CBE

an Honorary Fellow of the Association for Project Management, Sir John is Chairman of the National Express Group, the City & Guilds Group, Deputy Chairman of the Berkeley Group, and former Chair of the *Olympic Delivery Authority*.

Dame Kate Barker DBE

non-executive director of Taylor Wimpey plc and Man Group plc, a former member of the Bank of England's *Monetary Policy Committee* (2001 - 2010), and former Chief Economic Adviser at the Confederation of British Industry.

Professor Sir Tim Besley CBE

Professor of Economics and Political Science at LSE, President of the International Economic Association, a former external member of the Bank of England's *Monetary Policy Committee* (2006 - 2009), and soon to serve as President of the Econometric Society.

Professor David Fisk CB

Emeritus Professor of Systems Engineering Innovation at the Centre for Systems Engineering and Infrastructure at Imperial College London and past President of the Chartered Institution of Building Services Engineers. Professor Fisk formerly served as Chief Scientist and policy director across several government departments including Education, Transport and Environment and was Chief Scientific Adviser to the Office of the Deputy Prime Minister.

Andy Green

President of UK Space, co-chair of the UK Space Leadership Council a member of the CBI President's Committee, in addition to holding a number of Chairman, Non-Executive Director and advisory roles.

Professor Sadie Morgan

Professor at the University of Westminster and founding director of leading architectural practice dRMM. Professor Morgan is chair of the Independent Design Panel for High Speed Two (HS2), reporting directly to the Secretary of State.

Julia Prescot

co-founder and Chief Strategy Officer of Meridiam, co-founder of the Women Leaders in Infrastructure Group, and visiting Professor at the Bartlett School, UCL.

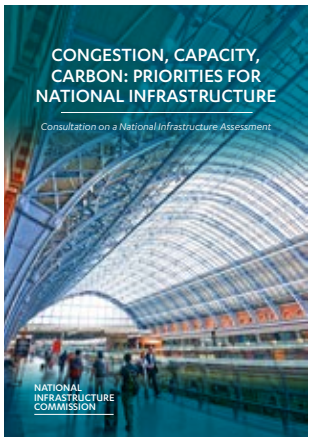
Bridget Rosewell OBE

founder and Senior Adviser of Volterra Partners, and a non-executive director of Network Rail and of Atom Bank. Formerly Chief Economic Adviser to the Greater London Authority (2002 to 2012) – responsible for all transport and economic impact analysis.

Philip Graham

led the development of the government's high speed rail strategy from its inception.

The National Infrastructure Commission framework document provides a fuller description of the roles and responsibilities of the NIC's Chair, Commissioners and staff.



The National Infrastructure Assessment (NIA)

As mentioned above – and stated explicitly as a core objective in the NIC's Charter – a central responsibility of the NIC is to carry out an overall assessment of the UK's infrastructure requirements *once every five years*. The first *National Infrastructure Assessment* will analyse the UK's long-term infrastructure needs, outline a strategic vision to 2050 and set out recommendations to strengthen the nation's infrastructure. On 13 October 2017, the NIC published a draft/interim NIA – which it lauded as a major step towards fulfilling that responsibility.

The NIA covers all key sectors of economic infrastructure encompassing: transport; energy; water and sewerage; flood risk; digital; and waste. It is guided by the commission's objectives to support sustainable economic growth across all regions of the UK, improve competitiveness and improve quality of life. To provide greater clarity around future investment in infrastructure, the commission has been given by government a long-term funding guideline, known as its 'fiscal remit'. This states that it should plan on the basis of annual public capital investment in infrastructure of 1.0 - 1.2 per cent of GDP over the period of the Assessment – an increase over current levels. Where the commission makes recommendations with public spending implications, these must be consistent with the *fiscal remit*. Where infrastructure is funded by the private sector and the costs of any recommendations will ultimately be met by consumers, the commission is required to provide a transparent assessment of the overall impact on bills.

Identifying seven priorities:

In its draft assessment, *Congestion, Capacity, Carbon: Priorities for National Infrastructure* published in October 2017, the commission identified seven priority areas in which it believes current plans and policy frameworks fall short of what will be required if the UK is to have the infrastructure it needs to support its long-term prosperity and quality of life:

- Building a digital society: fast, reliable data services everywhere.
- Connected, liveable city-regions: linking homes and jobs.
- New homes and communities: supporting delivery of new homes.
- Low-cost, low-carbon: ending emissions from power, heat and waste.
- Revolutionising road transport: seizing the opportunities of electric and autonomous vehicles.
- Reducing the risks of extreme weather: making sure the UK can stand up to drought and flooding.
- Financing infrastructure in efficient ways: getting the right balance between public and private sectors.

As pointed out by Lord Adonis in the foreword to the draft NIA, no public authority has previously reviewed the UK's infrastructure needs in this way – looking across sectors and taking a long-term perspective. The assessment offers the opportunity to inject vision and purpose into how the UK plans, funds, delivers and operates the networks which underpin the economy and society and is therefore a milestone in that process, with the draft identifying key priorities for consideration and consultation in preparation for the commission's 2018 National Infrastructure Strategy. The 'three Cs' – congestion, capacity, carbon – are the key challenges highlighted in this interim assessment. In the next phase of the NIA, the commission will develop a strategy to address each of them.

Interim National Infrastructure Assessment – Summary:

1. Building a digital society: fast, reliable data services everywhere:

The UK needs world class digital infrastructure for its world leading digital economy. People and technology need to be able to connect with anyone or anything, anywhere at any time. This connectivity will be at the heart of a successful 21st century economy, just as electricity or railways were in earlier eras. Over the next few years, the UK will need substantial investment in digital infrastructure. Much of this will be in the deployment of fibre optic cables, which are needed to support future requirements for both broadband and mobile networks. Fibre is the best available technology, but there are choices about how best to deploy it, because of costs and because there is a range of complementary technologies available.

Whilst other countries prepare for 5G, the UK continues to lag behind in 4G availability. With Britain leaving the European Union, there is scope to reconsider the framework within which the regulator, Ofcom, is required to operate. The UK will not be able to fully realise its digital ambitions whilst areas remain excluded. Problems are not limited to rural areas: many small and medium businesses also have their digital connectivity needs unmet. As the requirements of participating in a digital society increase, ubiquitous connectivity becomes essential. However, digital infrastructure is more costly to deploy in rural rather than urban areas. Bespoke solutions will be required.

In the next stage of the Assessment, the commission will consider how to reduce the costs and maximise the benefits of deploying more fibre, whether the regulatory framework is sufficiently focused on investment and how to ensure rural areas do not continue to lose out in the long term.

"Smart infrastructure systems need to be resilient from the outset."

Smart infrastructure systems need to be resilient from the outset. The commission will look at how to mitigate the increased potential for "system accidents" as infrastructure becomes increasingly reliant on digital technology. Wider resilience issues, including cyber security, are clearly also relevant to infrastructure, although other organisations, such as GCHQ, are leading work on these issues

2. Connected, liveable city-regions: linking homes and jobs:

The benefits of living and working in cities, along with the growing importance of the clustered, knowledge-intensive jobs located in them, have seen them recover and grow. For the UK's cities to succeed, they need *effective* infrastructure – including high-quality urban and intercity transport systems, integrated with wider strategies for housing and economic development.

The importance of connectivity between cities has been recognised and there is a strong pipeline of infrastructure investment to address some of the most urgent issues on the UK's strategic transport networks. After a long period of underinvestment, the *Roads Investment Strategy* is beginning to bring a longer- term perspective, backed up with increases in funding and a move to longer-term funding in place of stop-start. On the railways, major projects such as HS2 and East West Rail are in development or underway.

The UK needs successful cities in which people want to work and live in every part of the country. This will require a much greater focus on increasing the capacity of urban infrastructure, to deal with rising levels of traffic and reduce its impact on cities' economies, environment and quality of life. Congestion will never be eliminated in growing and productive cities – it is in many ways a sign of success – but effective strategies are needed to manage and reduce it, if such cities are to remain attractive places to live and work.

Technology will have an important role to play – the commission's new technology study is looking at the potential impact of smart traffic management systems, and new ways of accessing transport, such as 'mobility as a service', will enable travellers to make better-informed choices. But technology alone will not solve these problems. City leaders will also need to consider how to allocate road infrastructure as efficiently as possible. It will also be crucial to consider how to

ensure that city leaders have access to funding and resources to improve the operation of their infrastructure and support new capital projects. This could include prioritising funding towards city transport as the major intercity investments currently underway are completed, and increasing locally raised revenue through capturing some of the increased land value from improved transport connections. However, the potential for land value uplift varies significantly across the country.

The commission also wants to work directly with some individual cities to explore what strategies may be most appropriate in the context of different patterns of economic development and population and employment growth. Given the opportunities opened up by their new powers and increased autonomy, its direct engagement will focus in the first instance on supporting the recently elected metro mayors. In parallel with the Assessment the commission will work with them on developing integrated and comprehensive infrastructure strategies. Whilst transport planning will be central to this work, the Commission will also aim to take a broader perspective, encouraging metro mayors to consider the full spectrum of potential priorities for each city-region.

3. New homes and communities: supporting delivery of new homes:

Housing supply has failed to keep pace with demand in the UK, especially in the highest demand areas. This has contributed to the difficulties, in particular for many young people, in finding suitable homes at an affordable cost. Infrastructure can make a contribution to accelerating house building if the right frameworks are put in place. Housing cannot be created without the underpinning of transport and utilities, and smart, sustainable and liveable communities depend upon reliable and high-quality infrastructure. In turn, the value of new and existing infrastructure is enhanced if it enables new housing to be built, giving people greater choices of where to live and work. The mutual benefits of infrastructure and housing have been frustrated by systemic limitations, in particular:

- Poor coordination between how new infrastructure is planned, invested in and delivered in relation to housing supply.
- A lack of responsiveness within some infrastructure frameworks to market signals, leaving infrastructure development out of kilter with local growth.

There are clear benefits to putting this right: Infrastructure and housing development should work *together* to help shape attractive, well-connected communities where people want to live and work. Better coordination is needed. New technologies, such as digital mapping of existing and proposed infrastructure and developments across a broad strategic region, can be useful tools. A stronger understanding of the infrastructure landscape should enable better choices of location for new housing. Better incentives and understanding of planned development should enable infrastructure to be put in place in good time so that housing is not delayed.

4. Low-cost, low-carbon: ending emissions from power, heat and waste:

The need to limit the potential impacts of climate change has led the UK to put in place strong long-term targets for the reduction of greenhouse gas emissions. The costs of some energy supply options, in particular renewables, have decreased far more rapidly than originally predicted. New storage and demand management technologies will enable higher levels of renewable power to be used whilst retaining the flexibility to deal with peaks and troughs in demand. This presents an opportunity to transition to a low-carbon energy system more cheaply than predicted even five years ago. But done badly, it could lead to unnecessarily high costs: low cost, low carbon is the best industrial strategy for energy.

The commission has identified that unfortunately, there is a gap between existing government policies and achieving the UK's emission targets. Policies have not been implemented to enable a lowest cost transition. Despite the stability of having a long-term goal, policies have often been subject to sudden change, creating a challenging environment for private investors. The UK needs to create efficient, low-cost infrastructure which makes the most of both emerging and existing technologies. The commission's Smart Power report encouraged the removal of barriers to technologies such as storage and demand flexibility, as well as a review of the governance of electricity distribution networks.

The commission has identified two clear priorities for achieving low-cost, low carbon energy:

- **Improving energy efficiency** - The UK has old and leaky buildings, which means households and firms use far more heat than should be required, pushing up consumer bills and increasing the costs of moving towards low carbon heating in the longer term. The commission will consider how an ambitious programme of energy efficiency improvements could rectify this.
- **Maintaining a clear focus on consistently applied, well-designed competitive mechanisms, which can deliver lower cost energy than picking technologies**. This does not mean that current mechanisms cannot be improved, for example by making it easier for demand management, efficiency and storage measures to compete alongside traditional generation. But it does mean providing long-term clarity to investors about the continuing use of such schemes. However, the Commission also recognises that these approaches will not provide a complete solution in the energy sector and that for some parts of the system another approach will be needed.

This leaves three big, interlocking issues on which the commission is considering how to advise government: on heat, nuclear, and carbon capture and storage. The commission argues that it will not be possible to continue to use natural gas – which is carbon-based – to heat the UK's buildings and provide hot water in the long term. There is low public awareness of this. Options exist to change the UK's heating supply, but they are all disruptive and will all require investment. A large-scale change in how the majority of buildings are heated in the UK will not happen without Government intervention. The market has failed to deliver energy efficiency improvements despite the tangible benefits they offer. Different low carbon solutions for heat create different infrastructure needs, whether electricity or hydrogen (a carbon-free gas) is used as the primary energy source.

The costs of future options are currently unclear. The commission will be analysing this in more detail and looking at what is needed to ensure cost-effective options are available in future. The commission will also be looking at the potential long-term role of nuclear power and carbon capture and storage infrastructure in the energy system. These could both play a part in supporting system stability in electricity generation and providing sustainable heating, with the balance between them potentially affected by the strategic direction taken on the latter.

In the waste sector, energy from waste infrastructure has provided a more sustainable alternative to high-carbon forms of generation such as coal-fired power stations. As the carbon intensity of the energy grid falls, however, efficiency improvements will be needed to maintain this advantage. These could include siting such plants where the heat, as well as the electricity, produced could be used, or separating plastics from the waste provided to such facilities and sequestrating it. Other technologies, such as anaerobic digestion, could also play a role, particularly if the biogas produced can be used as an alternative to fossil fuels for transport.

Managing demand and incentivising behaviour change are as important in reducing emissions from waste as from energy. A central element will be to ensure that the right incentives are in place for producers to reduce packaging. The 'packaging recovery note' system seeks to achieve this, but its success depends on supporting policies such as recycling targets and the landfill tax. Getting the right mix of these in place will be crucial to achieving more in this area.

5. Revolutionising road transport: seizing the opportunities of electric and autonomous vehicles:

The commission has identified that most journeys are made by road, predominantly by car and that roads are central to freight distribution too. After 100 years of incremental change, the car is about to undergo a revolution. Connected and autonomous vehicles – even if there is still a driver at the wheel – will make road travel more comfortable and safer. Electric vehicles will change the terms of the transport debate in the UK. Removing the pollution created by road travel will radically improve air quality, as well as reducing carbon emissions. At the same time, growing use of electric vehicles will erode and eventually all but eliminate revenues from fuel duty, the main way that driving is taxed. This will require the government to develop a new way of ensuring road users contribute to the costs they create. Whilst new vehicles will be cleaner and safer, they will not solve the congestion problem. In fact, if driving is cheaper and more attractive, they may make it worse.

The government needs to support electric, connected and autonomous vehicles with the right infrastructure. At present, most work on connected and autonomous vehicles is focused on changes to the car, rather than the changes to the road and how people use it. This will not enable the potential large gains to the overall system to be realised.

Society will need to make choices about what changes in road design and use are acceptable to maximise the benefits of connected and autonomous vehicles. In particular, whether motorists are willing to give up some degree of individual control to improve the overall flow of traffic. The commission believes it is time to consider how road infrastructure and use should be re-planned or redesigned to maximise the benefits of connectivity and autonomy in the long term.

The environmental impacts of road transport are severe. The commission will also consider the best way to encourage uptake of electric vehicles to 100per cent of the car and van fleet by 2050, taking account of the government's recent commitment to ban the sale of conventional petrol and diesel vehicles by 2040. Key to this will be ensuring that the charging infrastructure is in place to allow widespread uptake of electric vehicles, while managing the challenges this presents for the energy system. Smart chargers, which can adjust the rate or timing at which a vehicle is charged in the light of wider pressures on the electricity distribution network, and potentially even provide power back into the grid during periods of peak demand, could significantly reduce the cost of network upgrades. The government needs to be planning for this now.

A new way of pricing road travel could also help tackle congestion. The Mayor of London's draft transport strategy contains suggestions for building on the London congestion charge, but elsewhere the congestion pricing debate is limited while congestion continues to increase. The ultimate goal should be to take fuller account of the costs associated with road travel, including environmental and congestion costs. This will need to be achieved incrementally, including by trialling new approaches at local and national level.

New forms of vehicle ownership and the increasing deployment and acceptance of 'black box' telematic technologies are already seeing shifts in how people think about the costs of road use, which could open up the opportunity for more transformative changes over time. If more efficient pricing systems could be introduced, many people would enjoy quicker, more reliable journeys, businesses would save costs on delays and society would benefit from fewer accidents and reduced noise. But any new system has to be accepted as fair by motorists.

"The UK relies on water and flood risk infrastructure that dates back in some cases more than a century."

6. Reducing the risks of extreme weather: making sure the UK can stand up to drought and flooding:

The UK relies on water and flood risk infrastructure that dates back in some cases more than a century. This has served it well in the past, and some significant investments and improvements, notably the Thames Tideway tunnel, are currently being made. Even so, risks are already apparent and climate change, a growing population and higher environmental standards are increasing pressures, exacerbated by ageing infrastructure.

Low public awareness and a focus on short-term value have constrained action. About a fifth of water is wasted through leakage and there are shortcomings in asset maintenance and replacement. Attention to drought, flood and coastal risk tends to be focused in the immediate aftermath of major events, and reduce significantly thereafter.

The commission will consider what action can be taken to improve efficiency and resilience by managing demand, reducing leakage and making water networks smarter. As in other sectors, technology will have an important role to play – water companies are beginning to deploy sensor technology to monitor flows through their networks and smart meters will also help with this, as well as encouraging consumers to reduce demand. Drones and satellite technology can assess infrastructure condition and search for potential leaks remotely. The commission's new technology study is looking in detail at the scope to improve the management of water networks and reduce the costs of maintenance.

Even assuming ambitious deployment of new technology and increased focus on maintaining assets and reducing leaks, new capital investment in water supply infrastructure is still likely to be needed, particularly in more water constrained areas of the country such as the South East

of England. The commission will examine whether and how quickly any such supply options, including reservoirs, desalination plants or inter-regional transfers, may be needed and how best to deliver them. Alongside this the commission will continue to explore how Government and the water industry can take a longer-term, more joined-up perspective on flooding, drainage and sewerage to stay ahead of risks and deliver on people's expectations and ambitions.

'Green infrastructure' approaches to drainage and flood risk management, which focus on land use and river catchment management, can have wider benefits for the environment, for example supporting improved water quality and biodiversity. Changes to agricultural subsidies may provide new opportunities to support these.

But they are not necessarily effective against extreme flooding events, for which investment in more traditional defences, such as walls and barriers may still be needed. In assessing the most effective approach, however, it will important to be clear about the protection that can be delivered for different levels of funding across the range of risk management approaches

"Too often, when people say a project lacks financing, it is really a symptom of the fact that there is no credible source of funding."

7. Financing infrastructure in efficient ways: getting the right balance between public and private sectors:

The UK's infrastructure is built, owned and run by a mix of the public and private sectors. Given the constraints set out by the Government in the fiscal remit, access to private finance will continue to be key to serving the UK's infrastructure needs. Projects can only be financed if there is a clear funding stream – a way to pay back the upfront costs. Too often, when people say a project lacks financing, it is really a symptom of the fact that there is no credible source of funding.

Finance itself is not in short supply. However, even where investors can identify the funding, Government support can improve the prospects and efficiency of financing. The private sector cannot and does not always act alone. The Government has a role to play in securing private finance: for example, mitigating the risk created by Government itself for rolling stock providers. The Government must act to maintain and strengthen the conditions for private sector investment in light of new uncertainties.

The European Investment Bank and the Green Investment Bank have played an important role in financing infrastructure by undertaking due diligence on complex and 'first of a kind' projects. The European Investment Bank may leave the UK market as a result of Brexit, however, and the role of the Green Investment Bank may also change after privatisation. The British pension fund market is more fragmented and at present has a lower target allocation in infrastructure assets than overseas counterparts, such as Canada. The Commission will look at the need to fill the gap and the options for doing so, including the potential for a new UK institution.

Different financing approaches and models can play a role in bringing more private finance into infrastructure, enabling projects to be built earlier or delivered better over their whole life. The UK was once a leader in public-private partnerships, but implementation has stalled. A lack of consistent evaluation of past projects makes it difficult to draw reliable conclusions on the whole life costs of comparable, publicly funded, projects using private finance compared to those wholly financed within the public sector. The Commission will consider where new procurement and financing mechanisms are best suited to help meet the UK's infrastructure needs.

Britain's infrastructure must overcome major challenges if it is to meet the needs of future generations. Chief amongst these over the coming decades will be the threats posed to the country's prosperity and quality of life by congestion, lack of capacity and carbon.

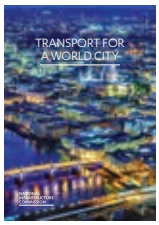
The commission asserts that addressing these seven priorities will equip the UK with the infrastructure it most needs. As previously mentioned, the commission's final Assessment will be published in Summer 2018, setting out recommendations for how to do this.

Publications:

The commission has produced a steady flow of publications since its creation – primarily as reports but also discussion papers seeking to inform the final NIA:

Reports:

SMART POWER
4 March 2016

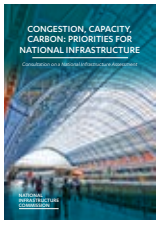


TRANSPORT FOR A WORLD CITY
10 March 2016

HIGH SPEED NORTH
15 March 2016

CAMBRIDGE - MILTON KEYNES - OXFORD CORRIDOR INTERIM REPORT
16 November 2016

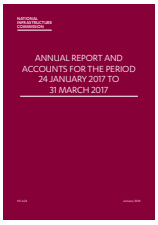
CONNECTED FUTURE
14 December 2016



INTERIM NATIONAL INFRASTRUCTURE ASSESSMENT – CONGESTION, CAPACITY, CARBON: PRIORITIES FOR NATIONAL INFRASTRUCTURE
13 October 2017

CAMBRIDGE, MILTON KEYNES AND OXFORD FUTURE PLANNING OPTIONS PROJECT FINAL REPORT
November 2017

DATA FOR THE PUBLIC GOOD
14 December 2017



ANNUAL REPORT
31 January 2018

Discussion papers:

THE IMPACT OF THE ENVIRONMENT AND CLIMATE CHANGE ON FUTURE INFRASTRUCTURE SUPPLY AND DEMAND
12 June 2017

ECONOMIC GROWTH AND DEMAND FOR INFRASTRUCTURE SERVICES
3 March 2017

THE IMPACT OF POPULATION CHANGE AND DEMOGRAPHY ON FUTURE INFRASTRUCTURE DEMAND
22 December 2016

THE IMPACT OF TECHNOLOGICAL CHANGE ON FUTURE INFRASTRUCTURE SUPPLY AND DEMAND
9 December 2016

Smart Power:

(4 MARCH 2016)

The NIC was tasked with considering how infrastructure and policies to promote interconnection, storage and demand flexibility could create a *more efficient* and *cheaper* electricity system. The commission engaged with a range of stakeholders across industry, government, and civil society, and received more than 130 formal submissions to its call for evidence.

The resulting report was divided into three sections:

- All Change;
- A Smart Power Revolution; and
- Maximising the benefits of a more flexible market.

Summary:

All Change:
Within the first section, the commission sets out how the UK's existing infrastructure was designed for a post-war world where homes and businesses were supplied almost exclusively from large fossil fuel generators. As we modernise and decarbonise our energy system we need to find new ways to manage the network in the most efficient way possible. This represents a serious challenge and an enormous opportunity. If the UK can get this right, it will provide the efficient, flexible and secure energy infrastructure that it will need to thrive.

A Smart Power Revolution:
In the coming decades the UK is uniquely placed to benefit from three innovations which could help fire a smart power revolution:

Interconnection – connecting our electricity network to our continental neighbours is already bringing down bills and helping to balance the system. More connections to cheap, green power supplies, such as Norway and Iceland could bring great benefits to the UK. Government should redouble its efforts to open new connections.

"The Commission's evidence suggests that this pipeline of interconnectors will deliver significant net benefits to the UK. Analysis conducted by National Grid [National Grid report *Getting more Connected*, 2014] identifies the expected net benefits of 8-9 GW of interconnection to be equivalent to nearly £3m every day, from a reduction in the wholesale price of electricity."

Storage – technology is accelerating at a remarkable speed. The UK could become a world leader in making use of these technologies, not through subsidies, but by ensuring that better regulation creates a level playing field between generation and storage.

Demand flexibility – A new generation of hi-tech systems means consumers can save money and cut emissions without inconvenience. Government should ensure the UK benefits by improving regulation, informing the public of its benefits and piloting schemes on its own estate.

Maximising the benefits of a more flexible market:
For the smart power revolution to realise its full potential the NIC asserts that the UK must ensure that its networks and systems keep up. This requires more active management of local electricity networks, a national system operator able to keep up with an increasingly complex system, and a strategic approach to upgrading the network. The UK is uniquely placed to lead the world in a smart power revolution. Failing to take advantage would be an expensive mistake.

Key finding and recommendations:

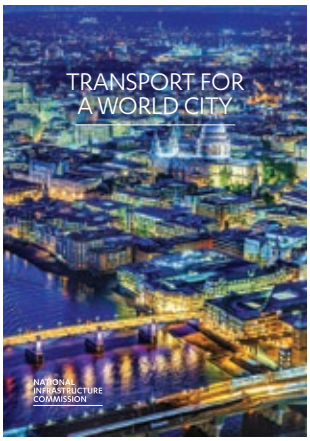
The commission's central finding is that *Smart Power* – principally built around three innovations

Interconnection, Storage, and *Demand Flexibility* as above – could save consumers up to £8 billion a year by 2030, help the UK meet its 2050 carbon targets, and secure the UK's energy supply for generations.

The report contains six recommendations:

- Government should pursue additional interconnectors with other European countries where the benefits are most significant.
- The UK should become a world leader in electricity storage systems.
- The UK should make full use of demand flexibility by improving regulation, informing the public of its benefits it can provide and piloting business models.
- The System Operator must create new markets that will allow open competition for the services it procures and ensure it keeps pace with the network it oversees.
- Enabling the transition to more actively managed local networks should be a government priority.
- Where upgrades to our networks are needed Ofgem should continue its work in encouraging network companies to make long term strategic decisions.

In the foreword, Lord Adonis emphasised that this report "does not attempt to address all of the challenges facing our energy sector, but rather it focuses on the benefits we can achieve through building a more flexible electricity system and the steps that will get us there."



Transport for a World City:

(10 MARCH 2016)

London's transport systems are under growing pressure, and there is a critical need to open up new areas for housing growth in and around the capital. In this context the NIC was asked to review the strategic case for additional large-scale transport infrastructure in the capital and its region, with reference to proposals for a new north-east to south-west "Crossrail 2" line.

During the four months preceding the report, the commission engaged with a range of stakeholders including: the Mayor of London; the Greater London Authority (GLA); Transport for London (TfL); Network Rail; the Department for Transport (DfT); HM Treasury; and local authorities in and around London. This included assessing the current proposed plans for transport in London – as well as the business case for Crossrail 2 – and evaluating over 130 responses to the NIC's call for evidence which covered Crossrail 2 and a range of other schemes.

The resulting report was divided into three parts:

- Part one: Planning for the 2030s;
- Part two: Developing the plan; and
- Part three: From development to delivery.

Summary:

Part one:
The NIC recognised that current and proposed transport investment – including on the Underground network and Crossrail 1 (the 'Elizabeth Line') – is essential, but that greater investment will be needed. In the first part of this report, the commission identified four specific challenges from the late 2020s:

- lack of capacity and major overcrowding on key central London Underground lines, particularly the north-south **Victoria** and **Northern** lines;
- Lack of capacity and major overcrowding on key radial rail routes into central London and at key terminal and interchange stations, particularly at Clapham Junction and Waterloo;
- Insufficient orbital links, in particular in east London, where limited river crossings by road are a major barrier to growth
- the need for transport to promote significant housing growth within and around the capital.

Part two:
Faced with these challenges, a second Crossrail line, running south-west to north-east, is a priority for London and its region. The NIC concluded that Crossrail 2 would provide a new central London artery linking the suburban railway network in the south-west to lines in the north-east via a brand-new tunnel from Wimbledon to Tottenham Hale. This would relieve or reinforces major suburban and Underground lines and a string of Network Rail's busiest stations, whilst opening up new areas for housing and regeneration.

Part three:
Acknowledging that considerable work has already been done to develop the case for Crossrail 2, the NIC recommends four steps to develop the scheme further:

- Identify proposals to phase costs and increase affordability
- Develop a strategy to unlock significant housing growth
- Deliver a funding plan in which London contributes its fair share to the project
- Maximise private sector involvement in the development and funding of stations and their surrounding areas

Following a resolution on the areas above, the NIC envisaged that the aim should be for a hybrid bill to be submitted by autumn 2019 – the first step towards the railway opening in 2033.

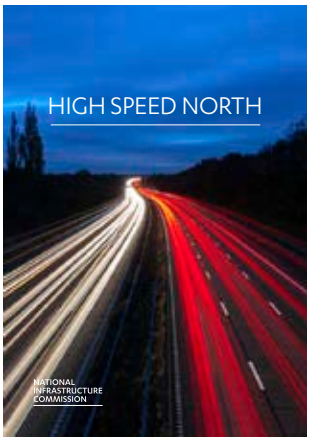
Key finding and recommendations:

The commission's central finding was that Crossrail 2 should be taken forward *as a priority*. Funding should be made available to develop the scheme fully with the aim of submitting a hybrid bill by autumn 2019, enabling Crossrail 2 to open in 2033.

The report contains eight recommendations:

- Crossrail 2 should be taken forward as a priority with the aim of opening in 2033
- Crossrail 2 should be at the heart of the new London Plan, alongside existing commitments to upgrades and other pieces of new infrastructure
- Sufficient development funds should be released in order for TfL and DfT to submit a revised business case for Crossrail 2 by March 2017 and aim to introduce a hybrid bill by autumn 2019.
- In developing the business case, it is crucial that TfL and DfT identify clear proposals to maximise its benefits and increase deliverability.
- A 'London deal for Crossrail 2' funding agreement, through which London contributes more than half the costs of the scheme and which includes substantial measures to realise the full housing benefits, should be agreed ahead of hybrid bill submission.
- TfL and DfT in conjunction with other government departments and relevant bodies, should use the next stage of development to set out a clear, transformative plan to turn the proposed 200,000 homes into a reality
- The opportunity should be taken to maximise private sector involvement in the development and funding of stations and their surrounding areas
- Following the submission of a revised business case and agreement on the conditions above, the aim should be for a hybrid bill to be submitted by autumn 2019 – the first step towards the railway opening in 2033.

The commission's assessment of the case for Crossrail 2 and a number of alternative proposals for investment indicates that Crossrail 2 is uniquely able to address the most important strategic challenges that London faces – the need for additional Underground capacity across central London, the need to tackle congestion on the National Rail network and at key terminal and interchange stations, and the need to provide better transport access to unlock areas of housing growth.



High Speed North:

(15 March 2016)

Following the establishment of **Transport for the North (TfN)** in October 2014 – with an objective to improve connections between the economic centres in the North – the commission was asked to advise on the strategy for taking this work forward.

The NIC's assessment begins with two stark observations – one for *rail* and one for *road*:

- It takes longer to get from Liverpool to Hull by train than to travel twice the distance from London to Paris; and
- Manchester and Leeds are less than 40 miles apart and yet on the congested M62 this often takes more than two hours by car.

"These poor connections make the North a less attractive place to live and do business."

This report is divided into four parts:

- The North in perspective;
- Opportunities and the role of transport;
- A High-Speed Rail Network for the North; and
- Enhancing the Road Network in the North;

Recommendations fall broadly into three categories:

- Transforming the Rail Network: Immediate action, leading to long-term transformation;
- Roads for the future; and
- Big investment for real change.

Summary:

Transforming the Rail Network: Immediate action, leading to long-term transformation
In this section, the commission identified three immediate priorities for constructing 'HS3': a transformed east-west network from Liverpool in the west to Hull and Newcastle in the east.

1) **Kick-start HS3** between Manchester and Leeds, the two largest economies of the north. Phase one should reduce journey times from 49 to 40 minutes and increase capacity by 2022. Phase two could cut times to just 30 minutes. HS3 should make use of key northern sections of HS2 – for example between Leeds and Sheffield where journey times could be reduced to just 30 minutes – upgraded lines, and sections of new track where necessary.

2) **Harness HS2:** Route decisions on the northern sections of HS2 should support enhanced high-speed connections within the north, including between Leeds-Sheffield, Liverpool-Manchester, and Sheffield-Newcastle.

3) **Redevelop Manchester Piccadilly:** A long-term transformation of the station, combined with shorter-term delivery of additional east-west platforms, would unlock this hub and stimulate significant regeneration.

Urgent improvements: the commission advises that Highways England should accelerate enhancements to the M62 between Liverpool, Manchester and Leeds. Comparable work on the M25 delivered up to a 33per cent increase in capacity and a 19per cent reduction in journey time.

Long-term strategy: the commission urges that development funding should be provided to accelerate the design of further enhancements to the road network, and better connections to Manchester Airport – the North's international hub – should be prioritised.

Big investment for real change:
This report recommends a *very significant* and *immediate* investment in the North. This includes:

- sufficient development funding to prepare a plan for the multi-modal transformation of the North's connectivity, and
- very substantial capital funding to bring forwards vital strategic works on the M62, both in the west from Liverpool-Manchester and in the east from Manchester-Leeds.

Key finding and recommendations:

The commission's central finding in this report is that the North needs *immediate* and *very significant* investment for action now and a plan for longer term transformation to reduce journey times, increase capacity and improve reliability. On rail, this means kick-starting HS3, integrating it with HS2 and planning for the redevelopment of the North's gateway stations. On roads, investment should be brought forwards for an early boost in capacity on the M62, the North's most important east-west link, alongside funding to identify and assess proposals for tackling a range of other strategic challenges.

Among the eleven recommendations contained within the report are the following:

- Transformations in transport connectivity should form part of a *broader strategy* incorporating improvements in education, workforce training, research and innovation, spatial planning and wider infrastructure investment.
- To connect northern cities faster and more reliably than today, the Commission recommends that funding be provided to further develop the long-term plan for HS3, which should be conceived as a high capacity rail network, rather than a single piece of entirely new infrastructure.
- TfN should work with the Department for Transport, Network Rail, HS2 Ltd, and other stakeholders to prepare by the end of 2017 a single integrated strategy, combining short-term action with an ambitious long-term vision, which supports the overall plan for the HS3 network.
- The design of the northern phase of HS2 should be taken forward by HS2 Ltd, working closely with TfN, to ensure that this is planned and delivered to facilitate the development of the HS3 network, enhancing connectivity between Leeds – Sheffield, Liverpool – Manchester (and its airport), and between Sheffield – Newcastle, as well as to onward destinations.
- TfN should follow an approach that seeks to maximise the benefits of current and planned investments and integrates them with an ambitious longer-term plan, in developing and prioritising proposals for other major inter-city links through its Northern Powerhouse Rail strategy.
- Development funding should be prioritised for a package of further enhancements to the northern road network, so that these can be completed as early as possible in the next Roads Investment Period.
- Sufficient funding should be made available by government to support the development of an ambitious cross-modal strategy for northern transport with HS3 at its heart.

Connected Future:
(14 December 2016)

The NIC was asked to advise government on the steps the UK should take to become a *world leader* in the deployment of 5G mobile telecommunications networks, and ensure that the UK can take early advantage of the applications those networks may enable. The NIC engaged extensively with a wide range of stakeholders across industry, government, and civil society to inform an analysis of future mobile telecommunications in the UK.

Fifth Generation:
5G is expected to deliver a step change of ultrafast, low latency, reliable, mobile connectivity, able to support society's ever larger data requirements as well as wide ranging new applications. From connected and autonomous vehicles to an *Internet of Things*, 5G has the potential to be transformative across a number of sectors including health, transport, and education, and will bring new innovations as unknowable today as the mobile apps and services we now take for granted were a decade ago. The NIC asserts that securing the mobile networks necessary to put the UK at the forefront of this emerging technology will be critical to the UK's growth and to drive our industrial base into the internet applications and services economy.

This report is divided into three sections:

- Part one: The Mobile Revolution in Context;
- Part two: Digital Infrastructure at the Heart of Government; and
- Part three: Enabling the Market to Deliver what we need.

Summary:

The Mobile Revolution in Context:
The UK mobile market has transformed from a luxury in the 1980s to an *essential* today. 93 per cent of adults in the UK own a mobile phone, smartphones have overtaken laptops as internet users' device of choice, and there are more mobile devices than people. Yet the UK's networks are not complete. There are too many 'digital deserts' across the country and the availability of our 4G network is worse than many countries including Albania, Panama and Peru. The commission sees that the next generation of mobile connectivity will need to deliver the right type of networks, in the right places, for the services that people and business need. This means that 5G networks cannot be thought of in isolation but must be considered as part of a wider ecosystem of mobile connectivity. Delivering the connectivity the UK requires for the future must start by ensuring that we have the networks we need for today – this will not only provide a basic level of service to consumers now but also the backbone of the network infrastructure we need for the new services of the future.

Digital Infrastructure at the Heart of Government:
The commission emphasises that the market has driven enormous change – but now government must take responsibility to secure the UK's digital future, starting with the creation of a strong digital champion backed by a dedicated cabinet committee. Government must ensure that the UK has the infrastructure in place to deliver 5G across our major centres and transport networks.

Major roads: the UK's motorways must have roadside networks fit for the future. The infrastructure should be in place by 2025.

Key rail routes: The railway network must rapidly improve connectivity. This will be best delivered in future by a trackside network. Government should provide a plan by 2017, and the infrastructure should be in place on main rail routes by 2025.

Towns and cities: Local Authorities and LEPs should work with network providers to develop approaches that enable the deployment of the tens of thousands of small wireless cells we expect to need in our urban centres.

Enabling the Market to deliver what we need:
Government and Ofcom must ensure basic outdoor mobile services are available wherever we live, work and travel. Regulation must keep pace with the rapid evolution of the mobile communications markets, allowing innovative new firms to provide services that the existing market has not delivered. Greater connectivity is inevitable and essential.

Key finding and recommendations:

The commission's central finding is that mobile connectivity has now become a necessity. The market has driven great advances since the advent of the mobile phone but government must now play an active role to ensure that basic services are available wherever we live, work and travel, and our roads, railways and city centres must be made 5G ready as quickly as possible.

The report contains seven recommendations:

- Ultimate government responsibility for digital infrastructure should reside in one place under a single cabinet minister with the authority to shape policy and delivery across government, ensuring that it delivers the government's overarching digital strategy
- Our motorways must have mobile telecommunication networks fit for the future. The government should set out its plans for how to deliver this by the end of 2017. Ultimately, the government should ensure that the necessary infrastructure is in place on motorways by 2025 at the latest if it wants to offer a reasonable level of connectivity on a timescale consistent with the deployment of 5G networks.
- Rail passengers should have high capacity wireless connectivity. This should be achieved through a delivery model that utilises trackside infrastructure to provide an open and accessible mobile telecommunication and backhaul network that is fit for the future. The government should set out its plans for how to deliver this by the end of 2017.
- Local government should actively facilitate the deployment of mobile telecoms infrastructure.
- Government and Ofcom should develop a meaningful set of metrics that represent the coverage people actually receive and use these to determine a mobile universal service obligation setting out the minimum service level people should expect to receive.
- By the end of 2017 Ofcom and the government must review the existing regulatory regime to ensure that it supports the sharing of telecoms infrastructure.
- Ofcom and government must ensure they keep pace with the rapid evolution of the mobile communications market, and that the regulatory regime is fit for purpose. By the end of 2017 Ofcom and government must review the regulatory regime to ensure that spectrum allocation and regulatory decisions support a growth model in a world where technology developments enable greater shared access and interoperability.

Data for the public good:

(14 December 2017)

In the Autumn Budget 2016 the Chancellor asked the NIC how new technologies could improve the productivity of infrastructure – tasking the commission with producing this report. The commission has found that technologies which generate and use data such as sensors, machine learning, digital twins and IoT – all features of the 'Smart City' – are able to get more out of existing infrastructure.

Knowing where all the country's infrastructure is and how it is being used will help decision-makers and operators to plan and maintain these crucial national systems better. But simply having the data is not enough; it needs to be shared across the public and private sectors with the appropriate levels of secure access to enable its value to be fully leveraged for public benefit.

Summary:

The report is divided into six sections:

- Data for the public good
- Data creates value
- Data is infrastructure
- Sharing data
- A co-ordinated approach
- Digital twin

Data for the public good

The report begins by stating that having more information day-to day helps people make better decisions: knowing what the weather will do, what time the train will run or when that broadband outage might occur helps minimise wasted time in the day and allows people to work effectively and maximise their leisure time. No one enjoys spending time in a traffic jam because of a road closure they didn't know about or waiting in for the broadband engineer to arrive. The same is true for how the UK maintains and operates its infrastructure (digital, energy, flood defence, transport, waste and water). Having more information or data about infrastructure assets enables them to be used more productively. The UK can get more out of our existing infrastructure through the judicious use of sensors, data and machine learning and by sharing the resulting insights in an appropriate way.

Data creates value

New technologies, such as data capture and processing technologies (sensors, artificial intelligence and digital twins) can generate and manage better quality data about our infrastructure, which can be used to improve the way that assets are planned and maintained. Data science can help increase the productivity of infrastructure by extracting information from data about infrastructure assets, helping to optimise networks, preventing asset failures, and better targeting maintenance interventions or renewals.

Data is infrastructure

Data from infrastructure can be used to generate and send signals and instructions to change the way infrastructure functions, particularly when used as an input into artificial intelligence (AI) models and machine learning. For example, sensors on traffic lights generate data on traffic and pedestrian flow which can then be used to change the timing of the lights. "As data generates the behaviour of infrastructure, it can be said that data is in a sense also a hard infrastructure and that it needs to be maintained and managed through a formal approach, analogous to the way that physical infrastructure itself is managed".

Sharing data

The commission argues that data about our infrastructure assets needs to be shared in way that opens up the benefits yet maintains appropriate levels of privacy and security. Our culture must change from one of closed, siloed thinking to an open, transparent culture of effective data management. For example, private companies could make more data about their infrastructure networks, assets and organisation open whilst still protecting personal data. The model needs to

move from keeping all data confidential to minimum levels of commercial confidentiality. Regulators should ensure that operators take responsibility for collating this data, verifying its quality, making it available to the appropriate parties and using it in a safe and ethical way. The Centre for Digital Built Britain (CDBB) and Building Information Modelling (BIM) can provide the foundations for a more consistent and open approach to infrastructure data and underpin a move towards digitisation of the built environment which includes existing as well as new assets.

A co-ordinated approach

This report argues strongly that the UK needs a digital framework for data on infrastructure to harness the benefits from sharing better quality information about its infrastructure; how it is used, maintained and planned. The NIC asserts that a digital framework will enable better understanding of interdependencies between infrastructure sectors and help to break down silos. As private companies increasingly recognise the benefits of sharing performance data (anonymised in some contexts) with competitors and regulators, opening up more information to customers and in some cases selling specific datasets to realise the true value of data, it is likely that network operators and utilities will look to drive the increased sharing of data about infrastructure. But this is not yet happening across infrastructure sectors in a coordinated way. There is an opportunity right now to set a framework that will establish common standards of interoperability for sharing data about infrastructure so that the UK can realise the benefits sooner and at a lower cost.

Digital twin

A digital twin is a computer model which mirrors and simulates an asset or a system of assets and their surrounding environment. Digital twin models can help organise data and pull it into interoperable formats so that it can be used to optimise infrastructure use. Digital twins can also share this data, with defined levels of access, to inform better decisions about which future infrastructure to build and how to manage current and future infrastructure. The UK with its research capability across the university network is already making progress in this area along with the national institute for data science, the Alan Turing Institute (ATI), and is well placed to be a world leader in the development of digital twin infrastructure models.

The commission argues that to make this happen the country needs a *digital framework* for sharing data about our infrastructure assets. This would be a national resource and must be as open as possible, while still addressing security risks and concerns. I A digital twin pilot project would provide the opportunity to demonstrate the benefits that could be achieved from transforming data about infrastructure assets into a shared interoperable format and the gains that can be made from having a greater understanding of the interdependencies of our infrastructure system.

Key finding and recommendations:

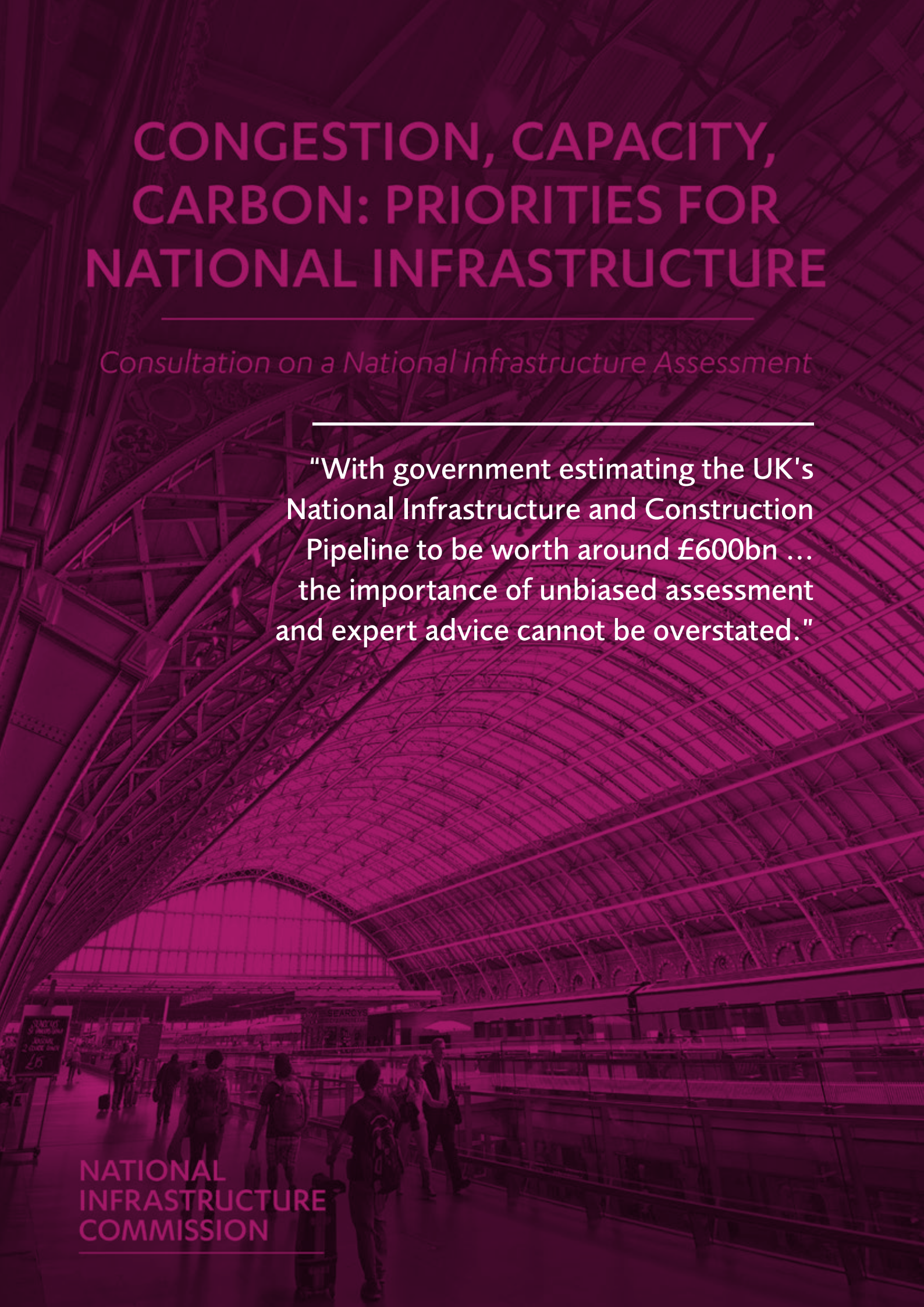
The commission's central finding is that the country can get more out of its existing infrastructure through the judicious use of sensors, data and machine learning but it will not be possible to fully realise the benefits unless the resulting insights are shared in a more open yet secure way.

- The Government should task the Centre for Digital Built Britain (CDBB) with the establishment of a digital framework for infrastructure data, drawing together key organisations and existing initiatives both large scale (BIM) and smaller scale
- The Infrastructure Client Group (ICG) and the Digital Framework Task Group Chair should lead industry engagement in the framework and cultivate a shift towards minimum levels of commercial confidentiality
- The Digital Framework Task Group (see recommendation 1) should work with the UK Regulators Network and relevant Government departments to review and, where possible, strengthen the role of economic regulators in improving the quality and openness of infrastructure data.
- CDBB should collaborate with the Alan Turing Institute (ATI) and the UK Infrastructure Transitions Research Consortium (ITRC) in pioneering digital twin models with predictive capability in the UK. This initiative should draw upon the AI expertise concentrated in the UK across universities and the public and private sectors.

CONGESTION, CAPACITY, CARBON: PRIORITIES FOR NATIONAL INFRASTRUCTURE

Consultation on a National Infrastructure Assessment

"With government estimating the UK's National Infrastructure and Construction Pipeline to be worth around £600bn … the importance of unbiased assessment and expert advice cannot be overstated."



NATIONAL INFRASTRUCTURE COMMISSION

Informing the NIA - the Association for Project Management contribution:

The interim NIA report *Congestion, Capacity, Carbon: Priorities for National Infrastructure* contains a range of questions to which the NIC sought responses from stakeholders in order to inform the final NIA. APM's submission built upon previous submissions of evidence to the NIC during 2016 - 2017 – including the *National Infrastructure Commission Strategy* consultation and the *National Infrastructure Assessment* consultation.

Six of the key questions that APM's response sought to address were:

- How does the UK maximise the opportunities for its infrastructure, and mitigate the risks, from Brexit?
- How might an expert national infrastructure design panel best add value and support good design in UK infrastructure?
- How can the risks of 'system accidents' be mitigated when deploying smart infrastructure?
- What strategic plans for transport, housing and the urban environment are needed?
- What mechanisms are needed to deliver infrastructure on time to facilitate the provision of good quality new housing?
- How could a comprehensive analysis of the costs and benefits of private and public financing models for publicly funded infrastructure be undertaken?

How does the UK maximise the opportunities for its infrastructure, and mitigate the risks, from Brexit?

In considering how the UK could best maximise the opportunities for its infrastructure, and mitigate the risks, from Brexit, APM's response argued for the adoption of a whole system/whole portfolio view (top-down). Among the benefits of this approach would be that it could aid in cutting out duplication, focusing limited investment and resources on the most beneficial projects whilst ensuring all projects are correctly ordered and prioritised forming a coherent whole.

Arguing that highly qualified project professionals will be an essential resource across the civil service and private sector over the next few years as the UK attempts to make Brexit succeed, the submission asserted that given the likely increase in demand, APM argued that our new Chartered status could not be more timely for project managers looking to show their expertise and raise their profile in the new environment.

Skills are another key element of APM's submission which argues that skills are critical to the successful implementation of a whole range of major infrastructure challenges over the next few years. This includes a proper review of the *current* skills capability and *future* skills required for both specific projects and national infrastructure as a whole.

How might an expert national infrastructure design panel best add value and support good design in UK infrastructure?

APM's submission highlighted that an expert advisory panel could ensure that a range of stakeholders are incorporated at the front end of infrastructure planning and design, as well as those involved in implementation and delivery – such as project professionals, end users and academics who can draw upon the latest theory and practice both from infrastructure and beyond.

Drawing upon the example of Crossrail becoming the first megaproject within UK infrastructure when it introduced Innovate18 – developed in collaboration with Imperial College London – the submission proposed that the expert panel might be given a focus on innovation or formal innovation programmes.

How can the risks of 'system accidents' be mitigated when deploying smart infrastructure?

APM's submission argued that the risks of 'system accidents' could be mitigated by: adopting standards; through the training of users receiving smart infrastructure; through identifying good practice; through whole life costing and risk management; through effective knowledge management; through the sharing of lessons learnt; and through the analysis of data arising from smart infrastructure to monitor and evaluate their effectiveness through analytics.

In addition to the aforementioned, APM's submission argued that focussing upon improving the transition from project delivery into business as usual – known as 'project handover' – would be another way in which the risks of 'system accidents' could be mitigated. The handover of projects is often a neglected area and should be important for anyone involved in commissioning, delivering, or receiving the outputs of infrastructure projects. A recent APM research study *How can we handover projects better?* identified twelve recommendations to improve project handover, focused on commercial or contractual issues, processes, data and knowledge transfer and people drawn from a wide range of participating organisations.

APM's 12 factors for the successful handover of projects

A recent study from the Association for Project Management Research Fund identified four broad categories with three recommendations that emerge as factors that have been in place on multiple projects that have handed over successfully from transition to business-as-usual. As such these should be considered lessons learned and fall into the category of **'if you only do three things'** in each section:

Commercial/contractual

1 Requirements should be written into tender documentation/contracts in as much detail and as specifically as possible including engagement requirements, data environment and any standardisation of equipment or product that the client requires.

2 Whole life cost must be considered if at all possible. Does spending more now have an impact on the overall operating cost of the project throughout its life?

3 Incentivise success. If a scheme is well delivered, this should reward all parties.

Process

4 Handover is a process not a date. Planning for it should be from the start of the project and it should be viewed as an incremental transfer of knowledge and operation from project team to business as usual.

5 The benefits and deliverables must be measurable and communicable from the start. Ask why are we doing this project and how will we know when it is done?

6 involve end users from the outset. Through stakeholder analysis, understand who will benefit from the project, who will be required to facilitate the delivery of the benefits and how the project outputs will impact their role.

Data and knowledge transfer

7 Documentation must be written for the end users. It may require different sets of documentation for different users but for documentation to support knowledge transfer it needs to be meaningful, applicable and relevant to the end users.

8 Collate lessons learned as the project progresses. It provides more meaningful data for future projects, it can be tied to stage gateways or key deliverables.

9 Agree the information requirements at the outset. This ensures all parties have a clear deliverable, know what is expected of them and work towards achieving the goal from the start of project.

People

10 Often overlooked but put simply get good people on your project and keep them for as long as you are able.

11 Definition of stakeholders should be carried out throughout and in detail. Who will be impacted by the project and who is needed to make it a success?

12 The client role is pivotal including client engagement.

The full report can be read at apm.org.uk/resources/find-a-resource/project-handover

Source: APM research study – *How can we handover projects better?*

Figure 1

What strategic plans for transport, housing and the urban environment are needed?

APM's submission asserted that there is great potential for the strategic and economic plans of Local Enterprise Partnership's (LEP), Metro Mayors, and other bodies who work with local public and private organisations and businesses to become the blueprints for meeting local demand for transport, housing and the urban environment. Better national coordination of what is happening across the UK to identify opportunities and to share lessons learnt whilst also providing the support and assistance required to those at a more local level would further enhance effectiveness. The submission also lauded the example of Transport for the North for integrating transport alongside productivity, skills and wider economic growth.

What mechanisms are needed to deliver infrastructure on time to facilitate the provision of good quality new housing?

The importance of project management in designing and delivering infrastructure should not be underestimated. This includes the capability of project professionals who are equipped with the knowledge and skills alongside sufficient numbers of professionals to ensure effective project delivery on infrastructure projects. The attainment of Chartered status by APM in 2017 and the opening of the Chartered Register in spring 2018 should go some way in supporting this objective. In addition, an APM research report *Conditions for project success* also helps to identify the core factors which lead to the successful delivery of projects, programmes and portfolios. Open innovation or open source projects should also be explored as an alternative to traditional mechanisms in delivering good quality housing.

Next steps:

As previously mentioned, the National Infrastructure Assessment, pushed back from 'spring 2018' to 'summer 2018' publication, will be the first such review of the UK's infrastructure needs – looking across sectors and taking a long-term perspective. The assessment will build upon responses to its draft document and will set out the commission's plan to equip Britain to thrive and compete globally through to 2050.

Around the time of the NIA's publication, the Institute for Government will host a panel event in collaboration with APM which will be broadcast via a livestream.

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