



# What should be in the National Infrastructure Strategy?

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# What should be in the National Infrastructure Strategy?

## Executive summary

The complexity of the UK's infrastructure needs to 2050 is unprecedented. By this point the population could hit 75m people and will have aged dramatically.<sup>1</sup> Growth in the economy, although not always linear, is expected to continue.<sup>2</sup> The effects of climate change are likely to become more noticeable, with extreme weather expected to increase the number of flooding and water shortage events that occur.<sup>3</sup>

Each of these factors will place new and challenging demands on the UK's infrastructure, from the way we travel, through to our energy generating capabilities and consumption habits, water provision and flood defence systems. The nature of the relationships between these networks will also change as a consequence, whilst achieving net-zero emissions by 2050<sup>4</sup> will also create a number of challenges that cut across the infrastructure sector.

The Government's National Infrastructure Strategy must take into consideration the ways in which infrastructure demand profiles are evolving and their complex interdependencies as 'systems of systems'. It is paramount that in doing so both existing and future infrastructure is considered.

Overall, the strategy must set out a joined-up plan for the UK's core economic infrastructure sectors rather than a list of individual and dis-jointed projects. The need for a strategy is also not lost on the public, with 75% of the GB public agreeing with the statement "The UK is in need of a new national strategy for infrastructure"<sup>5</sup>.

This paper is drawn from the body of policy work that the ICE has undertaken over the last three years, particularly the National Needs Assessment that was published in 2016 and our State of the Nation report series, including:

- State of the Nation 2016: Devolution
- State of the Nation 2017: Digital Transformation
- State of the Nation 2018: Infrastructure Investment

It also reflects the discussions that took place at a meeting of the All-Party Parliamentary Group on Infrastructure in May of this year. The meeting was attended by a wide-range of senior industry figures, each

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<sup>1</sup> ICE (2016) [National Needs Assessment](#)

<sup>2</sup> Ibid

<sup>3</sup> Ibid

<sup>4</sup> BEIS (2019) [UK becomes first major economy to pass net zero emissions law](#)

<sup>5</sup> YouGov survey conducted for ICE. Total sample size was 2089 adults. Fieldwork was undertaken between 15th - 16th July 2019. The survey was carried out online. The figures have been weighted and are representative of all GB adults (aged 18+).

with a desire for the National Infrastructure Strategy to deliver a long-term and stable plan for the UK's infrastructure sector.

The recommendations set out in the National Infrastructure Assessment that was published by the National Infrastructure Commission in July 2018 are also complementary to the interventions set out in this paper and ICE would urge the Government to adopt these as part of its strategy. Likewise, opposition parties should use these as the basis for developing their own policies on long-term infrastructure planning.

## Recommendations

To be as effective as possible the National Infrastructure Strategy should:

- 1) Adopt the recommendations put forward by the National Infrastructure Assessment in full and demonstrate in detail how each will be delivered.
- 2) Set out support for new approaches to funding and financing infrastructure, including:
  - a pay as you go model for England's strategic road network by 2030
  - the need for a UK financial institution to provide infrastructure finance in the event that the UK loses access to the European Investment Bank as a consequence of Brexit
- 3) Mandate the development of regional infrastructure strategies across England to ensure effective integration of infrastructure planning at multiple geographic scales.
- 4) Set out support for the principles of Project 13 as a new model to improve the delivery of major infrastructure projects and programmes.
- 5) Include a robust plan for driving up the use of digital technologies and innovative approaches to infrastructure delivery, including: offsite construction, standardisation and design for manufacture and assembly.

## Introduction: the importance of good infrastructure to businesses and society

Both the economic and societal cases for infrastructure and the need to secure long-term investment for future provision have been well voiced by the ICE, the National Infrastructure Commission (NIC) and many of the other key built environment organisations. The positive impacts of infrastructure on the nation are indeed huge.

Infrastructure networks are critical in order to connect people, businesses and for society more widely to function on a daily basis. Every year in the UK 1.7bn people travel by rail,<sup>6</sup> whilst figures for road traffic highlight that 328.9bn vehicle miles were covered on Great Britain's roads for the year ending March 2019.<sup>7</sup>

In 2017 infrastructure accounted for £19.7bn of GB construction output.<sup>8</sup> In the same year the energy sector generated £31.7bn in economic Value for the UK,<sup>9</sup> whilst the rail industry contributes £36.4bn annually and employs 600,000 people.<sup>10</sup> Individual projects like HS2 and a third runway at Heathrow have been forecast to create 30,000<sup>11</sup> and 77,000<sup>12</sup> jobs respectively.

It is difficult to argue with these numbers when assessing the significance of infrastructure to the UK's economy. Yet at the same time they do not mean that there isn't a need to improve the way in which infrastructure is actually 'done'. This includes the ways in which infrastructure need is identified, alongside improving the design and delivery of networks.

The National Infrastructure Strategy is an opportunity for the Government to set out a strategic approach to UK infrastructure provision; not a list of projects, but a plan for optimising the many benefits that we already know good infrastructure generates for the UK.

## The need for evidence-based approaches to infrastructure policy

In a democracy politicians and governments are elected to take complex policy decisions that often have profound impacts on the citizens that they represent. To improve the quality of decision-making it is important that expert advice is sought, in order that final decisions on policy are based around a robust projection of what the future implications of pursuing a specific course of action are likely to be. As with any other area of public policy, this logic holds firm for infrastructure policymaking.

The Government has a unique opportunity in relation to the development of its National Infrastructure Strategy; there is an abundance of expert and independent evidence available to help shape its thinking. This includes the interventions set out in the National Infrastructure Assessment (NIA) published by the NIC in 2018, which the ICE fully supports in line with the other recommendations being put forward in this short policy paper. In addition, ICE's own National Needs Assessment (NNA), a pre-cursor to the NIA, also provides expert insight on the UK's infrastructure needs to 2050.

<sup>6</sup> Network Rail (2019) [Passengers](#)

<sup>7</sup> DfT (2019) [Provisional Road Traffic Estimates Great Britain: April 2018 – March 2019](#)

<sup>8</sup> ONS (2018) [Output in the construction industry](#)

<sup>9</sup> ONS (2018) [Gross Value Added \(GVA\)](#)

<sup>10</sup> Oxford Economics (2018) [The Economic Contribution of UK Rail](#)

<sup>11</sup> HS2 (2019) [HS2's vision to be a catalyst for growth across Britain](#)

<sup>12</sup> DfT (2016) [Heathrow Northwest Runway: economic benefits](#)

Given the uncertainty that Brexit continues to cause for UK politics, expert and independent advice, is perhaps worth more now than it ever has been before. The work undertaken by the ICE and the NIC provides the basis for this Government to publish a comprehensive National Infrastructure Strategy (NIS) that benefits businesses and society for the long-term, whilst opposition parties should also be particularly mindful of these resources in developing their positions on infrastructure policy.

## What are the demand drivers for UK infrastructure?

The drivers of future UK infrastructure demand are ranging and complex. The NNA<sup>13</sup> central projection for population growth to 2050 is positioned at 75 million, whilst under all scenarios the age of the population is likely to increase significantly. Such growth will impact demand profiles across all key economic infrastructure networks. Meanwhile, the balance of urban and rural population growth is a key uncertainty that will also have a significant impact on infrastructure policymaking.

There are economic growth factors to consider. A recent IMF sample of advanced economies revealed that a 1 percentage point increase in infrastructure spending translates to a 1.5% increase in overall economic output over a four year period.<sup>14</sup> As the UK's economy grows new demand pressures will be placed on its infrastructure networks in order to keep up.

Climate change and resilience are also key infrastructure demand drivers. The Committee on Climate Change<sup>15</sup> have consistently forecast an increase in the risk of extreme weather events as result of climate change (i.e. heavy rainfall and higher average temperatures) leading to more frequent instances of flooding and seasonal water shortages. The former will require new thinking around flood management infrastructure, whilst the more effective use of demand-side techniques will be necessary to counter the latter.

An additional demand driver, with the legislation now having been agreed, is a new UK target for achieving net-zero emissions by 2050.<sup>16</sup> This will impact infrastructure significantly as life-cycle processes are adapted to decrease greenhouse gas emissions or resources are targeted to offset those that are created.

## Engaging effectively with the public

Understanding the demand drivers for infrastructure and articulating these as part of a thorough evidence base are both necessary steps for developing an effective infrastructure strategy. Equally, it is important that the NIS properly considers public sentiment around infrastructure need and that a campaign for building public support is at its heart.

The importance of infrastructure is well understood by the public. This is borne out by the fact that 75% of GB adults believe that more money should be spent on improving the UK's core infrastructure networks.<sup>17</sup> At the same time the public want investments to be made strategically, with more people concerned with the impact of infrastructure on regenerating communities, along with its long-term effects on economic growth, as opposed to the overall cost of constructing projects.<sup>18</sup> The need for a strategy is also not lost on the public,

<sup>13</sup> ICE (2016) [National Needs Assessment](#)

<sup>14</sup> International Monetary Fund (2015) in ICE (2016) [National Needs Assessment](#)

<sup>15</sup> Committee on Climate Change (2019) [Preparing for Climate Change](#)

<sup>16</sup> BEIS (2019) [UK becomes first major economy to pass net zero emissions law](#)

<sup>17</sup> ICE (2018) [State of the Nation 2018: Infrastructure Investment](#)

<sup>18</sup> ICE (2019) [Reducing the gap between cost estimates and outturns for major projects and programmes](#)

with 75% of the GB public agreeing with the statement “The UK is in need of a new national strategy for infrastructure”<sup>19</sup>.

There is also widespread support for politicians to communicate more with the public around the benefits of major infrastructure projects, with 74% of GB adults agreeing that more attention should be drawn to benefits such as job creation and improved living standards as opposed to project costs.<sup>20</sup>

Incorporating these views into the NIS and engaging the public around the long-term effects that it is seeking to achieve will facilitate the support that is necessary for meaningful impact. It will also help to ensure that the benefits that are communicated to the public are the ones that they want to hear about. This will help to avoid some of the problems that individual projects have encountered. HS2 is case in point whereby an appraisal method that focused too much on journey time savings as opposed to transformative impacts on local economies<sup>21</sup> has arguably struggled to resonate with the public.

## So, what should be in the National Infrastructure Strategy?

For the NIS to succeed ICE believes that it must:

- Adopt the recommendations set out in the National Infrastructure Assessment
- Provide a clear plan for funding and financing the UK’s infrastructure
- Strengthen the opportunities that devolution creates for infrastructure
- Support new infrastructure delivery models
- Set out a vision for harnessing data and emerging technologies to transform infrastructure delivery and operations

## Adoption of the National Infrastructure Assessment recommendations

The body of ICE policy work that has been set out in this paper is the culmination of extensive engagement with our UK membership over a three-year period. It represents a well-evidenced series of recommendations for improving infrastructure provision, so that it delivers a range of public benefits and boosts economic growth. With these objectives in mind ICE urges the Government to reflect the policy recommendations put forward here in the forthcoming NIS.

Equally, the ICE recognises the extensive evidence gathering processes that the NIC has been through in order to arrive at the NIA. Its own recommendations (detailed below) are complementary to ICE’s thinking. As a consequence, ICE would urge the Government to adopt its recommendations in full. The NIA is the first of its kind, it provides a unique opportunity for infrastructure policy to be set against an impartial and expert evidence base; enabling the delivery of the infrastructure that the nation actually requires in order to prosper.

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<sup>19</sup> YouGov survey conducted for ICE. Total sample size was 2089 adults. Fieldwork was undertaken between 15th - 16th July 2019. The survey was carried out online. The figures have been weighted and are representative of all GB adults (aged 18+).

<sup>20</sup> Ibid

<sup>21</sup> House of Lords Economic Affairs Committee (2019) [Rethinking High Speed 2](#)

- Nationwide full fibre broadband by 2033
- Half of the UK's power provided by renewables by 2030
- Three quarters of plastic packaging recycled by 2030
- £43 billion of stable long term transport funding for regional cities
- Preparing for 100 per cent electric vehicle sales by 2030
- Ensuring resilience to extreme drought
- A national standard of flood resilience for all communities by 2050

Should the NIS not take forward ICE's recommendations and those set out in the NIA, then it must provide a robust account of why alternative solutions for the nation's infrastructure provision have been selected. To reiterate, the NIS must not be presented as a list of dis-jointed projects, rather it should provide a joined-up and strategic vision for infrastructure through a 'systems of systems' approach.

**Recommendation 1: The National Infrastructure Strategy should adopt the recommendations put forward by the National Infrastructure Assessment in full and demonstrate in detail how each will be delivered.**

## A clear plan for funding and financing the UK's infrastructure

Infrastructure networks require huge investment. The current National Infrastructure and Construction Pipeline (NICP) shows projects and programmes with a combined value of over £600bn, with funding split evenly between the public and private sectors.<sup>22</sup> To sustain this level of investment it is essential that Government has the right policies in place to bring online the variety of funding and financing mechanisms that are necessary for the long-term stability of different infrastructure sectors.

Put simply, for the NIS to succeed it must be robust in its approach to setting out how the nation is to pay for its infrastructure, now, and in the years to come. ICE's recent report *State of the Nation 2018: Infrastructure Investment*<sup>23</sup> makes a number of recommendations to Government for delivering a stable UK infrastructure landscape. A number of these focus on specific infrastructure sectors, whilst others are cross-cutting.

### Cross-cutting interventions

Key amongst the cross-cutting recommendations is the need to establish a UK financial institution to replicate the functionality of the European Investment Bank (EIB) in the event that the UK loses access as a consequence of Brexit. The EIB invested some €14.8bn in the UK's economy between 2015 and 2016,<sup>24</sup> with much of this being spent on key infrastructure projects around the UK. However, investment between 2017 and 2018 was just €2.8bn<sup>25</sup> representing an 80% decrease.

<sup>22</sup> IPA (2018) [Analysis of the National Infrastructure and Construction Pipeline](#)

<sup>23</sup> ICE (2018) [State of the Nation 2018: Infrastructure Investment](#)

<sup>24</sup> EIB (2019) [United Kingdom and the EIB](#)

<sup>25</sup> Ibid

The concern around losing access to the EIB is not merely related to the volume of investments that it makes in UK infrastructure. As detailed in the ICE's response to the Government's Infrastructure Finance Review,<sup>26</sup> the Bank provides anchor finance that 'crowds in' other private investors to infrastructure projects with risk profiles that may have otherwise prohibited their involvement.

The EIB also has a mandate to invest in projects that demonstrate good value beyond commercial considerations i.e. for socio-economic or environmental benefit. The Bank also played an important role following the 2008 recession; continuing to invest in projects during a period when others had withdrawn from the market.

The report also made a recommendation for the NIC to be placed on a statutory footing in the future in order to provide investors with more certainty around long-term infrastructure planning; enabling them to more effectively plan their activities. If the initial steps to make this happen were taken as part of the publication of the NIS this would send an emphatic signal to the infrastructure sector that it really is a meaningful strategy.

Other overarching interventions focused on the need for new approaches to funding and financing to be introduced to the infrastructure sector in order to plug any future gaps in investment. These include asset recycling, which has been used to great effect in Australia,<sup>27</sup> alongside land value capture and the increased participation at community level in crowdfunded projects.

### Sector specific recommendations

Sector specific interventions in State of the Nation 2018: Infrastructure Investment,<sup>28</sup> which have since been built on in subsequent ICE policy papers<sup>29</sup>, included calls for the introduction of a pay as you go system for England's strategic road network (SRN) by 2030. This is in view of the likelihood that without government intervention revenues from Vehicle Excise Duty (VED) and fuel duty will diminish in the future; as a result of the proliferation of electric vehicles and their current exemption from VED.

The second road investment strategy is due to be funded via the hypothecation of VED, but the NIS should give some thought to whether or not this approach is viable in the longer term, whilst also setting out the Government's view on a pay as you go system for the SRN.

The NIS should also address investment in other sectors, including energy and rail. Contracts for Difference (CfD) have helped the renewables market grow considerably and this method of incentivisation (and other similar mechanisms) should be used to aid the development of emerging technologies like energy storage.

Finally, the funding model for the UK's railways is ripe for reform in order to bring more private investment into the network. ICE supports the use of market-led proposals, but to gain buy-in from the private sector and increase their use the current framework requires simplification so that the intellectual property associated with different bids is fairly rewarded.

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<sup>26</sup> ICE (2019) [ICE's submission to the Infrastructure Finance Review](#)

<sup>27</sup> Government of Australia (2014) [The Asset Recycling Initiative](#)

<sup>28</sup> ICE (2018) [State of the Nation 2018: Infrastructure Investment](#)

<sup>29</sup> ICE (2019) [Pay As You Go – Achieving Sustainable Roads Funding in England](#)

Recommendation 2: The National Infrastructure Strategy should set out support for new approaches to funding and financing infrastructure, including:

- a pay as you go model for England’s strategic road network by 2030
- the need for a UK financial institution to provide infrastructure finance in the event that the UK loses access to the European Investment Bank as a consequence of Brexit

## Strengthening the opportunities that devolution creates for infrastructure

ICE has and continues to be an advocate of the devolution of infrastructure policy and service delivery. As set out in State of the Nation 2016: Devolution,<sup>30</sup> the benefits of devolution are as follows:

- Local stakeholders (such as local government, service providers and businesses) are best placed to take integrated approaches to the planning and delivery of infrastructure networks
- Local and regional service providers have a superior understanding of infrastructure networks in their own areas and can therefore scale services more effectively
- Devolution brings local communities closer to the decisions on infrastructure that impact their daily lives

Devolution in England has focused on city-regions and on the conceptualisation of new economic geographies such as the Northern Powerhouse and Midlands Engine. As the programme of devolution progresses it is critical that the different levels of decision-making and service delivery are effectively joined-up – with one another and with strategic developments at the national level.

### City-regions

The distribution of powers to the new city-regions like the Greater Manchester Combined Authority<sup>31</sup> and Liverpool City Region Combined Authority<sup>32</sup> has predominantly focused on policy areas like transport and skills. The packages that have been agreed each represent a step in the right direction in terms of decentralising powers to the appropriate level of delivery.

Despite this there do remain question marks over the extent to which the amount of funding that has been devolved is enough for England’s city-regions to take impactful decisions. As outlined previously in this paper, ICE supports the NIC’s recommendation for further long-term funding settlements for the city-regions to be reflected in the forthcoming NIS.

<sup>30</sup> ICE (2016) [State of the Nation 2016: Devolution](#)

<sup>31</sup> HM Treasury (2014) [Devolution to the Greater Manchester Combined Authority and transition to a directly elected mayor](#)

<sup>32</sup> HM Treasury (2015) [Liverpool devolution deal](#)

### The need for regional infrastructure strategies

In parallel to the devolution that has taken place at the city-regional level have been efforts to develop new economic geographies such as the Northern Powerhouse and Midlands Engine. Although largely associated with the Cameron-Osborne Government, work to formalise a coalition of key stakeholders (such as local government, businesses and service providers) in both instances are ongoing.<sup>3334</sup>

The purpose of these coalitions (and others like England's Economic Heartland)<sup>35</sup> is multi-faceted, but in general terms includes the following aims:

- To drive economic growth through greater trade and inward investment
- Increase innovation and entrepreneurship
- Improve skills provision
- Create better living spaces

High-performing infrastructure is a key enabler for each of these aims. They are simply not possible without it. To support the delivery of these aims it is necessary that a regional infrastructure strategy is in place for each of England's new economic geographies.<sup>36</sup> These strategies should be the product of regional stakeholder collaboration, whereby key service providers come together with other local actors to determine the infrastructure need of a given region. ICE's State of the Nation 2016: Devolution<sup>37</sup> outlines how this should work in greater detail via the appointment of regional infrastructure forums.

As per the development of the NIS, a key concern here is that these strategies are evidence-based and that they take a cross-sector or systems approach to ensure holistic infrastructure development; spatial plans will be central to this, as exists in London and the devolved nations. It is also important that that any future regional infrastructure strategies are compatible with one another i.e. across service-level boundaries, be that transport, energy or water networks.

At the national level the NIS must include provision for any regional infrastructure strategies to plug into its own delivery, providing overall system stewardship to optimise the prioritisation and provision of infrastructure at different geographic levels. A scenario whereby the relationship between strategic thinking on infrastructure at the national level is disconnected from that of the regional level will result in the poor integration of services, underperforming networks and greater expense to the public.

**Recommendation 3: The National Infrastructure Strategy should mandate the development of regional infrastructure strategies across England to ensure effective integration of infrastructure planning at multiple geographic scales.**

<sup>33</sup> The Northern Powerhouse Partnership (2019) [About Us](#)

<sup>34</sup> Midlands Engine (2019) [About](#)

<sup>35</sup> England's Economic Heartland (2019) [About us](#)

<sup>36</sup> ICE (2016) [State of the Nation 2016: Devolution](#)

<sup>37</sup> Ibid

## Support for new infrastructure delivery models

Identifying and prioritising infrastructure need, putting in place the funding streams and considering the different geographic levels at which it is managed are all fundamental processes in ensuring that infrastructure positively affects people and places. Yet the processes that dictate the ways in which infrastructure is built and consequently operated are of equal importance. It is these that can truly optimise the effects of infrastructure on the economy, society and the environment. At present, infrastructure delivery models are falling short.

### The case for a new delivery model

The more efficient the delivery of infrastructure is, the more likely it is to increase economic productivity. The delivery models currently in place in the UK's built environment sector are preventing the realisation of this scenario. The latest ONS comparisons of UK productivity with other G7 economies put the UK approximately 16.3% behind the average of its counterparts.<sup>38</sup> If the UK is to remain competitive on the international stage this is not sustainable in the long-term. There is then a burning platform for improving the delivery of UK infrastructure networks and this should be central to the NIS.

The underlying problems with current delivery models include, but are not restricted to, the following:

- Approaches to procurement that prioritise lowest capital cost over whole-life benefits
- A contracting market whereby crippling low margins are now commonplace as the largest contracting organisations race one another to the bottom on price to secure work
- A highly transactional supply chain, which promotes adversarial behaviours and the poor allocation of project risks
- Low levels of investment in innovation and skills development

To overcome these problems ICE has been working with the Infrastructure Client Group (ICG) to develop new thinking around major project and programme delivery in the form of Project 13.

### Project 13

The Project 13<sup>39</sup> approach to infrastructure delivery seeks to transform current behaviors in relation to procurement, risk allocation, innovation and skills investment. On procurement value appraisal is considered in terms of whole life cost, plus the wider outcomes and benefits of a given project (be they economic, social or environmental).

Supply chain relationships are characterised by collaboration and enterprise as opposed to the transactional behaviors associated with traditional contracting models. The purpose is to ensure a more equitable distribution of risk from the outset, whilst putting in place appropriate incentives and rewards based on the performance of an overall project organisation i.e. an enterprise constituted of a range of project organisations.

The principles of Project 13 are already being trialed by six early adopters in the UK,<sup>40</sup> which are: Anglian Water on their Capital Delivery Alliances programme; the Environment Agency's Next Generation Supplier Agreements; National Grid's London Power Tunnels; expansion at Heathrow; Network Rail's Track Alliances; and Sellafield. In addition, Sydney Water in Australia is also part of the early adopter programme.<sup>41</sup>

<sup>38</sup> ONS (2018) [International comparisons of UK productivity \(ICP\), final estimates: 2016](#)

<sup>39</sup> Infrastructure Client Group (2019) [What is Project 13?](#)

<sup>40</sup> Infrastructure Client Group (2019) [Project 13: Library](#)

<sup>41</sup> ICE (2019) [ICE Director General meets with first international Project 13 early adopter](#)

The NIS should set out support for the principles of Project 13 in order to help drive their adoption throughout the infrastructure sector; leading to the more efficient delivery of projects and programmes across the piece.

**Recommendation 4: The National Infrastructure Strategy should set out support for the principles of Project 13 as a new model to improve the delivery of major infrastructure projects and programmes.**

## **A vision for harnessing data and digital technologies to improve infrastructure delivery and operations**

The increased use of data and emerging technologies can both contribute to major improvements across lifecycles in the infrastructure sector, from prioritisation and delivery through to operation. Addressing both physical and digital assets, the NIS must clearly outline how innovations in these areas will be used to help drive performance enhancements in current and next generation infrastructure networks.

### **Infrastructure prioritisation**

Platforms developed by the Infrastructure Transitions Research Consortium (ITRC), such as the NISMOD<sup>42</sup> (National Infrastructure Systems MODel) database, provide rich data around demographic trends and future demand profiles. It is this data that both the NIA and the NNA relied on in order to set out their respective recommendations on infrastructure provision to 2050. It is critical that the development of the NIS properly considers this data, so as to ensure that the strategy also makes robust conclusions based on the best available evidence; prioritising what the nation needs systematically rather than focusing on individual and disjointed projects.

Future NIA cycles should also seek to take into consideration other emerging data platforms such as DAFNI<sup>43</sup> (Data and Analytics Facility for National Infrastructure). As the efficacy of data platforms improves, it follows that the ability of future governments to make decisions on infrastructure policy (and indeed other areas of public policy) will improve in tandem. Policymakers must put trust in these platforms in order for them to succeed.

### **Infrastructure delivery and operation**

In terms of the wider infrastructure lifecycle, including delivery and operation, ICE's State of the Nation 2017: Digital Transformation<sup>44</sup> sets out three key areas where policy action is required.

The first is on the need to improve productivity and the degree to which digital technologies can help to manage capacity constraints and improve performance across a range of infrastructure networks. The rollout of the smart meter and smart motorway programmes are already delivering these benefits on the operations side. Capturing data from such programmes also helps to improve the performance of existing and future infrastructure networks as user patterns can be analysed to predict and manage future behaviours.

<sup>42</sup> Infrastructure Transitions Research Consortium (2019) [NISMOD](#)

<sup>43</sup> Infrastructure Transitions Research Consortium (2019) [DAFNI](#)

<sup>44</sup> ICE (2017) [State of the Nation 2017: Digital Transformation](#)

However, the NIS must demonstrate how emerging technologies and approaches – like offsite construction, standardisation and design for manufacture and assembly (DfMA) - can be harnessed more widely to achieve major efficiency improvements in infrastructure delivery. Particularly as the benefits of these approaches have already been demonstrated. For example, DfMA saved approximately 40,000 manhours in platform construction at the Liverpool Street Crossrail station in London versus the traditional solutions that were used for Tottenham Court Road.<sup>45</sup>

To enable the Government's preferred approach to offsite construction – platform DfMA – to succeed, the ICE has already made recommendations to the Infrastructure Projects Authority.<sup>46</sup> These include putting trailblazers in place in order to enable effective lesson sharing and that a mandate approach (as previously used for BIM Level 2) is specified for relevant projects.

The second area is behaviours and the extent to which a step change in leadership and organisational cultures are necessary across the infrastructure sector in order that digital transformation is effectively embraced. The low margins which are commonplace amongst the largest contracting organisations have resulted in a risk averse approach to technology and innovation. Building on policy initiatives such as the National Productivity Investment Fund<sup>47</sup> and the Construction Sector Deal,<sup>48</sup> it is necessary to create a policy and regulatory environment that incentivises behaviour change right throughout the supply chain.

Resilience is the third area that the SoN report for 2017 examined. As the interdependencies between our infrastructure networks become more digitally enabled there is an opportunity for more integrated approaches to service delivery to be taken. For example, real time data sharing between infrastructure sectors can both improve service delivery during peak demand or ease disruption when networks are impacted by major incidents.

At present cascade failure of infrastructure assets is common when incidents such as major flooding occur – roads, railways and power systems all brought to a standstill.<sup>49</sup> Digitally enabled and integrated infrastructure networks can help to prevent cascade failure, whilst also improving response and restoration strategies.

## Research and development

In the context of innovations that are still some way from commercialisation it is important that the NIS sets out a pathway for futureproofing the infrastructure that is delivered now, so that it is compatible with what comes in the future. Likewise, the NIS provides the Government with a further opportunity to reaffirm the importance of the initiatives that have been set up in these areas, including the Centre for Digital Built Britain.<sup>50</sup>

**Recommendation 5: The National Infrastructure Strategy should include a robust plan for driving up the use of digital technologies and innovative approaches to infrastructure delivery, including: offsite construction, standardisation and design for manufacture and assembly.**

<sup>45</sup> House of Lords Science and Technology Committee (2018) [Offsite manufacture for construction: Building for change](#)

<sup>46</sup> ICE (2019) [ICE's submission to Infrastructure and Projects Authority on proposal for new approach to building](#)

<sup>47</sup> HM Treasury (2018) [Productivity: Budget 2018 brief](#)

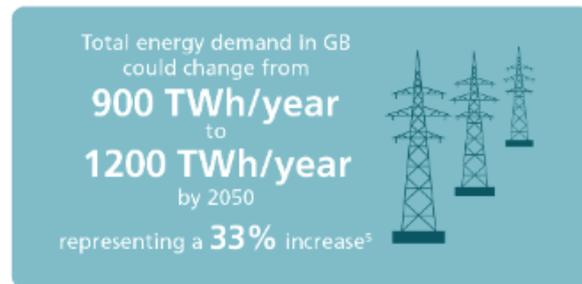
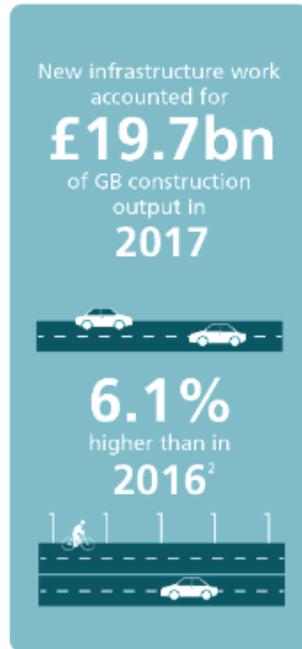
<sup>48</sup> BEIS (2018) [Construction Sector Deal](#)

<sup>49</sup> ICE (2019) [National Needs Assessment](#)

<sup>50</sup> Centre for Digital Built Britain (2019) [Mission](#)

## GB AND UK HEADLINES

From roads to railways and bridges to power stations, high-performing infrastructure is vital for economic growth and thriving communities.



1. ONS (2018) Construction statistics annual: Number 19, 2018 edition  
4. Oxford Economics (2018) The Economic Contribution of UK Rail

2. ONS (2018) Output in the construction industry  
5. ICE (2016) National Needs Assessment

3. ONS (2018) Gross Value Added (GVA)

## About ICE

Established in 1818 and with over 93,000 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.

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