Institution of Civil Engineers


# Submission for the 2015 Spending Review

From the Institution of Civil Engineers

**Executive summary**

Continuity enables success. ICE welcomes the Government's commitment to investing £100billion in infrastructure by the end of the Parliament[1]. Industry must ensure this investment delivers economic growth and benefits to society, while raising the UK's competitiveness on the global stage. Government has made clear commitments to deliver growth, productivity and employment opportunities. ICE will continue its role as the industry's voice to help realise these ambitions.

Over the next five years infrastructure policy should focus on two overarching objectives:

- Maximising infrastructure's contribution to greater prosperity through improved productivity and higher economic growth;
- Building resilience into the UK's infrastructure networks so that they are able to sustain UK economic growth in the long term.

To achieve these goals the UK needs:

- High performing infrastructure networks and assets to support economic growth;
- A world class engineering workforce that is flexible and can easily be redeployed between projects in the infrastructure pipeline.

ICE will help to achieve these by:

- Highlighting the importance of resilience and a "systems approach" [2] through our policy reports and knowledge outputs;
- Advancing engineers' technical expertise, business skills, people skills and personal development through the forthcoming ICE Academy;
- Establishing an independent coalition to examine the performance of our infrastructure systems and help to establish what the UK needs from its infrastructure in the longer term.

To enable delivery of these, Government should prioritise the following in its spending plans for this Parliament:

- Capital programmes in strategic transport and flooding should remain in place. Six year investment programmes in these sectors provide the building blocks for growth, productivity and employment;
- Approaches to maintenance investment should mirror those for capital. A shift to a whole life, or Total Expenditure approach allows for improved performance and reduces the overall cost of maintenance;
- A consistent approach to energy policy incentivises investment, achieves security of supply and allows for affordability. Energy efficiency policy requires attention;
- Apprenticeships which provide recognisable, high quality and *transferrable* qualifications and incentives to upskill the existing workforce;
- Incentives to promote engineering and science in schools and deliver a knowledge based economy.

[1] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/443898/Productivity_Plan_web.pdf
[2] http://www.itrc.org.uk/the-future-of-national-infrastructure-a-system-of-systems-approach/

**Summary of ICE recommendations for the 2015 Spending Review**

| | |
|---|---|
|  | The six year £2.3billion capital investment programme for flood risk management should be protected from spending cuts |
|  | Flood risk should be managed on a whole life approach |
|  | Local Road Revenue budgets should be linked to the capital investment programme |
|  | Maintenance budgets for local roads should be increased and determined on a multiyear basis so that the benefits of a preventative approach can be realised |
|  | A Total Expenditure or whole life approach for local roads should be implemented |
|  | The £15billion investment package for the Strategic Roads Network should be protected |
|  | Increase the number of maths and physics teachers in schools so that all children have the opportunity to take Science, Technology, Engineering and Maths (STEM) subjects |
|  | Ofsted rigorously inspects schools' careers guidance so that the range of modern STEM paths available, including vocational and technician roles, are communicated to students |

**Introduction**

The Government has set out priorities to deliver a more productive economy, rebalance growth through devolution and make the UK an attractive destination for foreign investment. ICE will support the implementation of these aspirations by outlining a set of objectives and performance metrics for infrastructure, and advancing the skills of the UK's engineers. These two activities will support long term decision making while outlining the interventions required every five years.

The spending decisions taken by this Government will impact on the future performance of infrastructure systems and the skilled workforce delivering and operating them. ICE's submission to the Spending Review sets out the priorities for spending over the next five years, but also takes into account longer term objectives.

**High performing infrastructure networks and assets**

Resilience of the UK's infrastructure networks is fundamental if we are to continue to provide high quality services to users. Quality of life will decline if the public cannot travel freely, gain access to affordable electricity, communicate instantly, benefit from safe drinking water and sanitation, and lack protection from flooding. This is not acceptable in a modern economy.

Both productivity and growth will improve if infrastructure networks and assets function effectively. Our infrastructure should be viewed as an interlinked system. Performance of one group of assets has an effect on others and therefore the productivity of the system cannot be determined by focusing on just one element at a time. In times of extreme weather, when one part fails it creates a "domino effect", resulting in failure of the system. Decision making for infrastructure will become more diffuse as devolution unfolds. This makes a "systems approach" more pressing. The investment required to manage such a system should be factored into the Government's spending plans.

Additionally, the impacts of climate change and population density are putting pressure on infrastructure services. Cuts to capital and maintenance budgets for infrastructure in the Spending Review could create serious problems for infrastructure services over the next five years.

*Flooding*

- **The six year £2.3billion capital investment programme for flood risk management should be protected from spending cuts.**
- **Flood risk should be managed on a whole life approach.**

Flooding is the greatest threat to the operation of the UK's assets. Annual flood damage costs are approximately £1.1billion[3][4]. Natural hazards such as storms, flooding, heavy snow and droughts already account for between 10-35% of all delays or service interruptions to electricity, road and rail customers every year[5]. The commitment to a six year capital investment programme for flood risk management should remain in place throughout the current Parliament. The Committee on Climate Change Adaptation Sub-Committee indicated that even if current spending levels were maintained, four times as many properties would be at risk of flooding in the next 20 years. Those at significant risk could increase from 330,000 today to 570,000 in 2035.

The maintenance regime for flooding remains a concern to ICE. Not including the one off payments made during the 2013/14 winter storms, revenue investment for flooding has reduced by £50m since 2011[6]. This reduction in investment means that some flood assets are being maintained only to a minimal level; consequently the useful lives of those assets will be reduced[7]. Revenue budgets are allocated on an annual basis, which makes long term planning and preventative interventions difficult. Preventative maintenance regimes allow for optimised use of assets and better value for money in capital investment.

Transport networks are particularly vulnerable to flooding. Roads built on floodplains or aquifers as well as urban roads and underpasses have an increased risk of flooding. Significant flood events continue to cause disruption long after the floodwaters subside, as road surfaces need repairing after the damage caused by scouring and washout. Flooding in the 2013/14 storms also caused significant disruption to the railway network throughout England[8]. The disruption to services was felt across the UK[9] and cost Network Rail an extra £75million in compensation due to delays[10].

[3] http://researchbriefings.files.parliament.uk/documents/SN05755/SN05755.pdf
[4] http://www.newstatesman.com/staggers/2014/06/counting-1bn-cost-winter-floods
[5] https://www.theccc.org.uk/wp-content/uploads/2014/07/Final_ASC-2014_web-version-4.pdf
[6] http://www.nao.org.uk/wp-content/uploads/2014/11/Strategic-flood-risk-management.pdf
[7] Ibid
[8] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/335115/transport-resilience-review-web.pdf

Flooding events also cause disruption to UK electricity transmission and distribution networks. Following flooding, supply cannot easily be restored and may cause customer disconnection for several days. Recovery time from such a loss can extend into weeks, with permanent repairs taking many months. Assets built now, and those already in place, will be expected to operate long into the future, potentially in a different environment to the one in which they currently operate.

Five of the UK's wettest years on record have occurred since 2000. Cascade failure of assets and networks is more likely as extreme weather events become more frequent and unpredictable. We must change our approach to managing infrastructure networks, adopting a more long-term, systems approach.

*Transport*

- **Local Road Revenue budgets should be linked to the capital investment programme.**
- **Maintenance budgets for local roads should be increased and determined on a multiyear basis so that the benefits of a preventative approach can be realised.**
- **A Total Expenditure or whole life approach for local roads should be implemented.**
- **The £15billion investment package for the Strategic Roads Network should be protected.**

Government has committed to investing £15billion in the Strategic Roads Network (SRN) from now until 2021. ICE welcomes the announcement of a second Roads Investment Strategy for 2021–25 and a funding model to support the commitment. The decision to give Highways England responsibility for the delivery of the SRN is also welcomed. ICE is supporting them through the Highways Supply Chain Group and the Highways England Design Panel.

However, nearly all journeys begin or end on local roads so this network plays an equally vital role in delivering better national connectivity, growth and productivity. Continued deterioration in the condition and performance of the network will limit its ability to deliver these benefits. Local roads suffer from a short term approach to investment and a largely reactive maintenance regime. While the shortfall in annual maintenance budgets has reduced, it remains significant at £3.7million for both England and Wales respectively[11]. Local authority highway maintenance programmes are managed against annual budgets. This means that there is a narrow time period in which to undertake preventative maintenance if it is to be effective. It has long been recognised that this hinders efficient planning of maintenance work, in particular, planned preventative maintenance, which is demonstrated to be 20 times less expensive per square metre than reactive work, such as patching and mending potholes[12].

Given the design life of some assets in the road network, highways authorities need a long-term management plan for each type of asset to allow them to schedule maintenance at the optimal time and minimise whole-life costs[13].

[9] http://www.metoffice.gov.uk/climate/uk/interesting/2013-decwind
[10] http://www.networkrail.co.uk/publications/weather-and-climate-change-resilience/
[11] http://www.asphaltindustryalliance.com/images/library/files/ALARM%202015/ALARM_survey_2015.pdf
[12] http://www.asphaltindustryalliance.com/images/library/files/ALARM%202015/ALARM_survey_2015.pdf
[13] http://www.nao.org.uk/wp-content/uploads/2015/06/Maintaining-Strategic-Infrastructure-Roads.pdf

*Energy and Digital*

Investment in Energy and Digital infrastructure is largely provided by the private sector; however, Government policy and spending plans impact on investor confidence. Both energy and digital infrastructure underpin the management of all other sectors. If these two sectors lack resilience, the rest of the system is at threat.

National Grid scenarios indicate that the gap between total electricity generating capacity and peak demand could fall to just 1.2%[14] this winter. The energy trilemma – affordability, security and decarbonisation – continues as a problem for the UK. The importance of energy to all other sectors means that this requires attention. ICE has concerns about the consistency on energy policy in the UK. The removal of subsidies for onshore wind and solar has created uncertainty for investors. The cancellation of the Green Deal means that the Government has no clear policy for energy efficiency and demand management.

ICE will publish its report on electricity storage in October 2015. This report will highlight the important role of electricity storage in supporting UK growth, stemming increasing costs in the energy sector and easing tight capacity margins. This report will make recommendations to Government for how it can help turn the potential for this technology into a reality and position the country as a leading innovator, whilst keeping costs to Government at a minimum.

While the UK has progressed rollout of high speed broadband in recent years, uptake is below that of the best performing EU countries[15]. There are also inconsistencies and variability in bandwidth speed, coverage and service quality. These reduce productivity, stifle innovation and make UK firms less competitive[16]. ICE supports the Government's ambition of providing universal access to broadband by 2017 and it should address regional disparities through devolution settlements.

**A world class engineering workforce that can drive innovation and productivity**

Costs of delivering infrastructure in the UK are higher than in other European countries[17]. Productivity within the construction sector is poor; this is a global issue but an acute challenge in the UK. Over the last twenty years productivity in the manufacturing sector has almost doubled, yet it has remained flat in construction.[18] In the UK, between 1997 and 2008 (pre-recession) productivity in the construction sector was 0.8% compared to 4.2% in manufacturing[19]. We welcome Government's ongoing interest in this issue and recognise that it is time for the industry to step up to the challenge.

The use of innovation, technology and digitisation can improve the productivity of the sector, for example:

- The management of data through tools such as Building Information Modeling (BIM) enables efficient information management in one location.
- A whole life approach to project costs[20] and asset management[21] allows for a better understanding of the entire costs of a project. This approach can achieve long term efficiencies and avoid unforeseen costs.

[14] https://www.emrdeliverybody.com/Capacity%20Markets%20Document%20Library/Electricity%20Capacity%20Report%202015.pdf
[15] http://www.oecd.org/unitedkingdom/economic-survey-united-kingdom.htm#chart
[16] http://www.fsb.org.uk/policy/assets/FSB-The-Fourth-Utility.pdf
[17] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/330380/PU1684_-_Infrastructure_cost_review.pdf
[18] http://www.mckinsey.com/insights/infrastructure/the_construction_productivity_imperative
[19] http://www.ons.gov.uk/ons/dcp171766_283259.pdf
[20] http://constructingexcellence.org.uk/resources/whole-life-costing/

- Use of modular, offsite design and standardisation can save costs and time. Simplification of site operations, reduced dependence on weather and the reduction of defects, based on controlled factory-based assembly processes, all contribute to savings.
- The shift to low carbon technologies and greater use of green infrastructure means that we do not have to build all of our solutions.

Each of these innovations and technical interventions will require a balanced, skilled workforce that is trained to use the technologies of tomorrow as well as today. The industry should seek to attract the best talent from both the UK and abroad. In this context, a drive towards more apprenticeships which provide recognisable, high quality and transferrable qualifications is welcome.

*Education and Skills*

- **Increase the number of maths and physics teachers in schools so that all children have the opportunity to take Science, Technology, Engineering and Maths (STEM) subjects.**
- **Ofsted rigorously inspects schools' careers guidance so that the range of modern STEM paths available, including vocational and technician roles, are communicated to students.**

Those currently in education will build the infrastructure in the next decade. We need to ensure that we have enough engineers coming through the pipeline with the right skills to deliver the projects of the future. We welcome the announcement to deliver 30,000 apprenticeships in the road and rail industry in this Parliament and the appointment of Terry Morgan to deliver a transport and infrastructure skills strategy. ICE will provide its views on the Apprenticeship Levy through the consultation process; however, we are keen to emphasise the need for whole life learning.

We should also incentivise the upskilling of the existing workforce. The role of technicians is important and ICE continues to work with the Institution of Mechanical Engineers and Institution of Engineering Technology to get 100,000 Engineering Technicians professionally registered by 2020.

ICE promotes all routes to industry. The forthcoming ICE Academy will be the focal point for drawing in UK talent and providing whole life learning through our global learning network. The Academy will aim to upskill the existing workforce and those who have taken career breaks by providing topical learning content, structured around four knowledge areas; technical, business skills, people skills and personal development. It will offer a growing range of mid-career qualifications to help our members maintain relevance in the market, some of which will be supported by training programmes.

**A long-term infrastructure decision-making framework**

Effective infrastructure drives economic growth, supports job creation and creates thriving, sustainable and innovative societies. Programmes such as Crossrail and Manchester Metrolink have created new jobs and increased property prices. But infrastructure is expensive, often disruptive during the construction phase, and requires fine political judgement so that resources are best used to meet society's needs.

[21] https://www.thomastelford.com/books/SampleChapters/00-prelims.pdf

The UK still sits just 27th in the World Economic Forum rankings for national infrastructure provision (having never been placed higher than 24th), and the decision-making process around complex projects remains prolonged.

The UK Government has worked closely with industry to address this challenge. Since 2012 a loose coalition of business, engineering, professional and legal services, academia and manufacturing has formed. A set of broad principles has emerged:

- Delivering effective infrastructure underpins successful socio-economic policies;
- Delivery is greatly eased by a consistent approach to macroeconomic forecasts;
- Attracting investment into UK infrastructure is essential for success;
- Infrastructure requires a "systems approach";
- Major infrastructure decisions benefit from broad political consensus.

Government, industry, investors and the public have to understand the contribution that infrastructure makes to the economy and society. We need to demonstrate the way infrastructure boosts productivity, grows the economy and improves health and well-being. We also need to know what infrastructure costs so that we can identify choices based on benefit, risk and opportunity. We need to set out a framework that allows us to take decisions on the use of public and private money, charges to customers, and investors' funds for best collective benefit. In essence we need a better understanding of what the UK needs from its infrastructure, taking into consideration a number of future uncertainties, such as climate change.

ICE is establishing a coalition of the willing - including representatives from across industry, business, academia and opinion formers - to examine the performance of our infrastructure systems and help Government to establish what the UK needs from its infrastructure in the longer term.

**About ICE**

Established in 1818 and with over 86,000 members worldwide, ICE is a leading source of expertise in infrastructure and engineering policy and is widely seen as the independent voice of infrastructure. ICE provides advice to all political parties and works with industry to ensure that civil engineering and construction remain major contributors to the UK economy.

**Contact us**

For more information, please contact:

Alex Green-Wilkes
Public Affairs Manager
alex.green-wilkes@ice.org.uk
+44 (0)207 665 2109

You can find out more information and comment about civil engineering issues via ICE's Infrastructure Blog.

Institution of Civil Engineers
One Great George Street
Westminster
London SW1P 3AA

t +44 (0)20 7665 2109
f +44 (0)20 7665 2189
ice.org.uk

Follow us on Twitter
@ICE_engineers

Registered charity number 210252.
Charity registered in Scotland number SC038629.

Design by ICE Marketing.
Think before you print to save energy and paper.