

CONGESTION, CAPACITY, CARBON: PRIORITIES FOR NATIONAL INFRASTRUCTURE

Consultation on a National Infrastructure Assessment

CIBSE Response

Submitted 14th January 2018 (following initial communication 12th January 2018)

Note – for clarity, the consultation questions are in non-italic black, and *CIBSE response in italic green*.

Introduction

*The respondent is **The Chartered Institution of Building Services Engineers (CIBSE)**.*

The Chartered Institution of Building Services Engineers is the professional body that exists to:

‘support the Science, Art and Practice of building services engineering, by providing our members and the public with first class information’

CIBSE members are the engineers who design, install, operate, maintain and refurbish the energy using systems installed in buildings, including homes, and are specifically trained in the assessment of heat loss from building fabric and the design of energy using systems for the provision of heating and hot water, lighting, ventilation and cooling and small power distribution in homes. Many CIBSE members work in the public sector in general and in higher education in particular.

CIBSE has over 20,000 members, of whom around 75% operate in the UK and many of the remainder in the Gulf, Hong Kong and Australasia. Many are actively involved in the energy management of commercial buildings for larger businesses, and so this consultation is highly relevant to us and to our members.

CIBSE is the sixth largest professional engineering Institution, and along with the Institution of Structural Engineers is the largest dedicated to engineering in the built environment. Our members design, install, manufacture, maintain, manage, operate and replace all the energy using systems in buildings as well as public health systems.

As an Institution CIBSE publishes Guidance and Codes which provide best practice advice and are internationally recognised as authoritative. The CIBSE Knowledge Portal, makes our Guidance available online to all CIBSE members and is the leading systematic engineering resource for the building services sector. Over the last twentyone months it has been accessed over 200,000 times, and is used regularly by our members to access the latest guidance material for the profession. Currently we have users in over 170 countries, demonstrating the world leading position of UK engineering expertise in this field.

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Consultation Questions

We welcome this consultation, the general objectives to enhance the natural environment, apply long-term decisions, and create pleasant and healthy places to live, and the stated intent to collaborate across government departments.

We also welcome the recognition that green infrastructure can provide benefits in terms of quality of life (page 78) and water management (page 19); however, there is limited mention of green infrastructure beyond these general statements, and we feel the proposals could and should be strengthened in this area. The importance of the natural environment should be recognised not only in the need to protect it, but also in view of the

multiple potential benefits it can bring, helping to meet the government’s objectives in areas such as carbon emissions, air quality, health and wellbeing. The recently launched Health and Safety Strategy identifies mental health as a priority area for workplace health and safety, and green infrastructure can deliver tangible benefits in this respect.

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

As pointed out in the introduction to the consultation (page 12), “Infrastructure quality also depends on the availability of the right skills, the approach to construction and project management, the depth of the supply base, and the capability of Government and other infrastructure owners and operators, to act as an intelligent client”.

A significant existing risk which Brexit will exacerbate is in the availability of engineering skills and expertise to deliver infrastructure projects; this applies to civil engineering as well as construction, including housing. We recommend referring to recent work of the professional institutions on this issue, in particular the Royal Academy of Engineering’s report for the Migration Advisory Committee¹, as well as the submission of the Construction Industry Council to the MAC²

2. How might an expert national infrastructure design panel best add value and support good design in UK infrastructure? What other measures could support these aims?

We support the desire to plan infrastructure that can “improve the quality of people’s lives and of the wider environment”, and the recognition of the role of design to achieve this.

We would stress the need for the panel to be multi-disciplinary, including expertise in the natural environment, in order to maximise the opportunities and benefits of green infrastructure. The panel should also include members with operational expertise in order for whole-life considerations to be taken into account, including costs, noise, disruption, congestion etc associated with maintenance and replacement.

We would also strongly support the appointment of a member with specific expertise in the natural environment as part of the National Infrastructure Commission, to complement the current range of expertise. CIBSE signed a letter to the Chancellor of the Exchequer to put forward this proposal in Autumn 2017, alongside a wide range of professional and other not-for-profit bodies. We wish to re-iterate this call in response to the current consultation.

3. How can the set of proposed metrics for infrastructure performance (set out in Annex A) be improved?

We support the retention of sustainability performance metrics such as energy efficiency of buildings and peak load shifting, water leakage, air quality, and carbon emissions.

From the limited details available, we understand that the “costs” metrics referred to are largely capital costs. We would strongly recommend the use of whole-life costs. For example, the future costs of utilities maintenance and replacement, with associated roadworks, noise, congestion etc, need to be accounted for when planning utilities and roads.

*We note the intention to work with the Natural Capital committee “with a view to including one or more measures of the interaction between infrastructure and natural capital in future”. We strongly stress the need for considering the **full integration of green infrastructure within the infrastructure strategy**; without any information at this stage, we are unsure whether the approach of including one or two parameters on natural capital would be either appropriate or sufficient. We would very much welcome future engagement on this issue. We would stress the urgency of this issue as major infrastructure projects are currently underway, with the latest example the apparent proposals for mature healthy trees in central London to be removed in order to accommodate temporary construction facilities for the HS2 project. This would not, in our view, follow good*

¹ <https://www.gov.uk/government/consultations/call-for-evidence-and-briefing-note-eea-workers-in-the-uk-labour-market>

² Not available online and so attached with this response

practice principles, let alone set a best practice example for future projects to follow³.

4. Cost-benefit analysis too often focuses on producing too much detail about too few alternatives. What sort of tools would best ensure the full range of options are identified to inform the selection of future projects?

See response to Q3 – we would encourage the use of whole-life costing. There are British and International Standards on this topic in the BS ISO 15686 series which were developed with significant UK input and which should be considered for whole life costing of infrastructure projects.

5. What changes are needed to the regulatory framework or role of Government to ensure the UK invests for the long-term in globally competitive digital infrastructure?

The work of the new centre for Digital Built Britain at Cambridge University is likely to be very significant here. They have only recently been awarded the contract or grant to operate this centre. However, it is important that they engage with all the relevant stakeholders in the construction sector in an open and transparent way, to work with the full supply side to develop, deliver and embed digital technologies in construction. It is worth noting that the Landscape Institute has been active over several years in seeking to introduce digital technology, including BIM, into the discipline.

6. What are the implications for digital infrastructure of increasing fixed and mobile convergence? What are the relative merits of adding more fibre incrementally over time compared to pursuing a comprehensive fibre to the premises strategy?

There is a clear need for both cable and mobile connectivity and both need to be pursued with vigour to maintain the competitiveness of UK plc. Digital technology in construction will involve very large data files which will need cable connections to efficiently transfer and data in real time of live projects.

7. What are the key factors including planning, coordination and funding, which would encourage the commercial deployment of ubiquitous connectivity (including, but not only, in rural areas)? How can Government, Ofcom and the industry ensure this keeps pace with an increasingly digital society?

No comment

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

There is a clear need for security and resilience to be considered at the earliest stages. Smart infrastructure needs to resilient infrastructure and this needs to be considered throughout the project.

9. What strategic plans for transport, housing and the urban environment are needed? How can they be developed to reflect the specific needs of different city regions?

We do not have specific recommendations on strategic planning, but stress that the objectives should be the same across the UK: infrastructure that supports productivity, health and wellbeing, and the natural environment now and in the long-term. This should be done following a whole-systems approach in collaboration across government departments. Long-term benefits need to be considered alongside simple capital costs; in particular the value of ecosystem services is often not taken into account.

There is also a need to consider infrastructure and the wider built environment in a systems based way, and not see them as two distinct strands of development.

We do not have comments on how the delivery of these objectives should vary due to regional or local

³ Priest to chain herself to tree at Euston in protest against HS2 felling plans, The Guardian, 11th January 2018
<https://www.theguardian.com/environment/2018/jan/11/priest-chain-tree-protest-euston-hs2-felling-plans-london>

specificities.

10. What sort of funding arrangements are needed for city transport and how far should they be focused on the areas with the greatest pressures from growth?

No comment

11. How can the Section 106 and Community Infrastructure Levy regimes be improved to capture land and property value uplift efficiently and help fund infrastructure? Under what conditions are new mechanisms needed?

Feedback from our members and the wider industry points out that Section 106 agreements often fail to capture the longer-term benefits of creating sustainable places and incorporating sustainable infrastructure. This reduces the incentives to do so.

For example, design decisions such as the incorporation of green infrastructure or the creation of a mixed-use housing scheme with good access to public transport, walking, and cycling facilities will have long-term impacts on air quality, health and wellbeing; these lend themselves to long-term impact assessments such as Health Impact Assessments (HIAs). Feedback from our members indicates that the adoption of HIAs is limited, and that Local Authorities would greatly benefit from additional resources (e.g. staff, training, guidance) on the application of HIAs.

In the future, as knowledge and evidence build on the long-term impact of decisions in the planning process, this could be incorporated into the planning process, for example through the use of S106 contributions, in order to better reward and incentivise the decisions which support better long-term outcomes for the public good.

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

We do not have a comment on this, but we would recommend to also consider what can be done to prioritise the delivery of new homes where good infrastructure, especially public transport, is already available.

13. What will the critical decision factors be for determining the future of the gas grid? What should the process for deciding its future role be and when do decisions need to be made?

*First of all, investment in new capacity needs to be considered only after opportunities for **reducing demand and for energy efficiency** have been maximized – see responses to Questions 14 and 16.*

The future of the gas grid needs to be considered as part of a whole energy system approach, including options for heat decarbonisation. Could battery charging be used to stabilize the electricity grid at times of excess renewables generation, or would this excess be better used to generate hydrogen for use in fuel cells or injection into the gas grid? There may also be a role for thermal storage in balancing supply and demand. Our understanding of the consensus at this stage is that a single solution is very unlikely to meet the challenges of air quality, carbon emissions, energy affordability, and reliability, and a combination of approaches will be required.

14. What should be the ambition and timeline for greater energy efficiency in buildings? What combination of funding, incentives and regulation will be most effective for delivering this ambition?

*CIBSE strongly support greater energy efficiency in buildings as a matter of urgency, and have consistently done so over many years. In particular, we stress the need to harness the opportunities for better efficiency of the **existing** building stock, both domestic and non-domestic.*

A range of solutions are available to achieve this, including market-led mechanisms, financial incentives and,

crucially, more stringent minimum energy efficiency levels in the building regulations.

The potential benefits are numerous and range wider than energy and carbon alone, including reduced air polluting emissions, improved comfort, and reduced fuel poverty. All of these in turn could reduce the pressures and burdens on the health service by reducing episodes of ill health related to cold and poor air quality. Improved energy efficiency therefore delivers benefits across several national policy areas and budgets.

Objectives therefore need to be ambitious, and support needs to be consistent over time, rather than subject to short political cycles. This is essential to build confidence in the investment community and to foster the development of capacity in the sector.

CIBSE have provided substantial and consistent advice on this issue, most recently in a number of consultation responses and calls for evidence to BEIS, all related to the Clean Growth Strategy. See for example:

- *Building a Market for Energy Efficiency, January 2018: <https://cibse.org/getmedia/a348b374-a8f7-48da-a477-29ac78329618/CIBSE-response-to-Call-for-Evidence-on-Building-a-Market-for-Energy-Efficiency-Final.pdf.aspx>*
- *Streamlined Energy and Carbon Reporting, January 2018: <https://cibse.org/getmedia/f035d181-2fb9-4249-ae82-daa3e998862c/CIBSE-response-to-consultation-on-Streamlined-Energy-and-Carbon-Reporting.pdf.aspx>*
- *Leading by Example: Cutting Energy Bills and Carbon Emissions in the Wider Public And Higher Education Sector, December 2017 <https://cibse.org/getmedia/280ff2eb-c7be-4f02-a425-1639d39d0411/CIBSE-Response-to-Leading-by-Example-Call-for-Evidence.pdf.aspx>*

15. How could existing mechanisms to ensure low carbon electricity is delivered at the lowest cost be improved through:

- Being technology neutral as far as possible
- Avoiding the costs of being locked in to excessively long contracts
- Treating smaller and larger generators equally
- Participants paying the costs they impose on the system
- Bringing forward the highest value smart grid solutions

All of these may have a role to play, although the arrangements to support Hinckley Point C hardly avoid excessive costs and long term contracts, and certainly give the impression of favouring one technology and larger generator. It is not clear what the fourth bullet means – if it means that where new infrastructure is needed then it must be fully funded by developers then that may serve to inhibit development in some areas. Where costs are high due to legacy issues then it may not be appropriate to adopt this approach. Bringing forward the highest value smart grid solutions sounds promising, as long as the overall system is defined sufficiently widely, value is clearly defined and is assessed on a whole life basis and encompassing parameters beyond costs alone, and the assessment takes full account of the costs of the proposed solution.

16. What are the critical decision factors for determining the role of new nuclear plants in the UK in scenarios where electricity either does, or does not, play a major role in the decarbonisation of heat? What would be the most cost- effective way to bring forward new generation capacity? How important would it be for cost-effectiveness to have a fleet of nuclear plants?

*The full opportunities for energy savings from **energy efficiency must** be considered before investment in new generating capacity, whether nuclear or other. This must be analysed and given proper consideration, prior to assessing how best to meet remaining generating needs and which technologies should be considered. This is a fundamental best practice principle in engineering and in environmental protection; it would facilitate the achievement of targets such as carbon emissions and air quality, while bringing long-term cost saving benefits to consumers, businesses, and the wide UK economy.*

This should apply to all sectors, including buildings and transport (e.g. supporting public transport to reduce reliance on individual vehicles).

The 2017 report to Parliament from the Committee for Climate Change sets out in tables 1 and 2 what policies are required in various sectors to achieve the targets set out in the fourth and fifth carbon budgets⁴.

17. What are the critical decision factors for determining the role of carbon capture and storage in the UK in scenarios where electricity either does, or does not, play a major role in the decarbonisation of heat? What would be the most cost-effective way to bring it forward?

See also response to Q16 on the need for energy efficiency first.

There is limited experience on carbon capture and storage in practice. International collaboration is crucial in the research and development of this technology in order to maximise learnings and cost efficiency. We strongly recommend continued collaboration with European partners after the UK's withdrawal from the EU.

At this stage it is not clear whether CCS will play a major role going forward, although it seems likely that it will. It is therefore necessary to press on with research into the application of this technology and not wait until it becomes obvious that it is needed, by which time the UK will be behind others and will not have any lead in the technology.

18. How should the residual waste stream be separated and sorted amongst anaerobic digestion, energy from waste facilities and alternatives to maximise the benefits to society and minimise the environmental costs?

We do not have specific comments on individual options, but would make the following points of best practice in engineering and environmental protection:

- *we recommend following the waste hierarchy i.e. energy from waste should be considered AFTER opportunities for waste reduction and recycling have been maximised*
- *a whole systems approach is needed, including carbon and air quality considerations.*

19. Could the packaging regulations be reformed to sharpen the incentives on producers to reduce packaging, without placing disproportionate costs on businesses or creating significant market distortions?

The introduction of the 5p bag charge has had a very substantial impact on usage and waste arising. Tighter regulation of packaging should be pursued: it follows the polluter pays principle as any regulatory casts from minimising waste reduce the costs to third parties, generally the taxpayer, of dealing with the waste.

20. What changes to the design and use of the road would be needed to maximise the opportunities from connected and autonomous vehicles on:

- motorways and 'A' roads outside of cities?
- roads in the urban environment?

How should it be established which changes are socially acceptable and how could they be brought about?

Charging points should be capable of being controlled to allow the management of demand and reduce peak demands on the grid.

*Opportunities and the impact on total vehicle numbers arising from **shared vehicles** need to be considered.*

*We recommend the use of **pilot trials**, and the incorporation of lessons from **behavioural change** studies.*

⁴ Meeting Carbon Budgets: Closing the policy gap 2017 Report to Parliament: Committee on Climate Change, June 2017

Lessons from international projects should also be sought.

*As a general principle, we also recommend that the **public sector should lead by example**.*

*More widely, and regardless of the types of vehicles using the roads, we strongly encourage the adoption of **best practice guidance on the design of roads and utilities**, including that from the Trees Design and Action Group⁵ and the Joint Utilities Group⁶. This can bring significant benefits in reducing long-term maintenance costs, noise, congestion, and use of resources. It also ensures that streets and roads are planned to fully integrate the needs of cyclists, pedestrians, and green infrastructure, especially trees, as well as vehicles.*

See also response to Question 21.

21. What Government policies are needed to support the take-up of electric vehicles? What is the role of Government in ensuring a rapid rollout of charging infrastructure? What is the most cost-effective way of ensuring the electricity distribution network can cope?

The response below is consistent with that previously submitted by CIBSE in response to the government's consultation on Electric Vehicles, November.

We broadly welcome plans to phase out diesel and petrol vehicles, due to their effect on air quality and carbon emissions. Electric vehicles have the potential to support a transition to cleaner transport modes, however we would stress this should be considered as part of a whole system approach.

Electricity Grid: *There is a strong and wide-ranging consensus that the adoption of electric vehicles could put significant pressure on the electricity grid, both locally and nationally (e.g. grid stability, availability at times of peak demand). In addition, and when considered alongside the development of household battery storage and small-scale generation, they could disrupt current models of revenue generation for energy companies (which are typically based on charging per kWh used) and therefore require new financing models (e.g. based on availability).*

We would suggest the following points:

- *Electric vehicles require a change in thinking and a more coordinated approach between the transport and **built environment sectors**. The implications for how buildings, neighbourhoods and cities are planned need to be considered, including the technical, safety and financial implications of integrating charging points and batteries within individual homes.*
- *A small number of pilots have been announced into **smart charging points** allowing the network operator to control the timing of vehicle charging, with rewards for consumers adopting this option. We would expect the barriers not to be solely technical, but also related to consumer attitudes, and we would recommend research into this as well as into the technical and financial aspects. The very large majority of existing charging points do not have this "smart" capacity. Subject to positive trials, this could be required of all new charging points. EVs represent a significant change for consumers, and it is important that pilots address issues of consumer acceptability.*
- *The **public sector should lead by example** and commit to an early phasing-out of petrol and diesel vehicles. This could contribute to consumer awareness, while offering early feedback and driving commercial development. Early public sector commitment has the potential to drive investment and wider uptake.*
- *Research should be done into potential **early adopters**, for example construction sites: non-road vehicles and equipment can significantly contribute to noise and air pollution in urban areas, and a switch to electric or hybrid models could therefore bring significant benefits; they are typically un-used at night, therefore being able to be charged at night of low demand. Incentives should be researched in order not to burden the sector.*

⁵ Trees in Hard Landscapes: A Guide for Delivery, 2014 <http://www.tdag.org.uk/trees-in-hard-landscapes.html>

⁶ NJUG Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees, 2007 <http://streetworks.org.uk/wp-content/uploads/V4-Trees-Issue-2-16-11-2007.pdf>

- As a chartered engineering institution we generally encourage government policies to be **technology-agnostic and focus instead on desired outcomes (e.g. air quality, carbon emissions, enhancements to the environment)**. This applies to this consultation, as we are aware of several options in battery development (i.e. solid state as well as the currently more common lithium options), and other types of vehicles (e.g. fuel cell-based).

Whole system approach: the complexity of the challenges and the inter-relation between transport, built environment, electricity and heat infrastructure make a whole system approach crucial. This also represents an opportunity for the UK to demonstrate leadership in multi-disciplinary long-term approaches:

- We strongly recommend a broader and comprehensive **strategy to reduce vehicle transport, especially single vehicle trips**. This should include better and more attractive walking and cycling infrastructure, starting with how we plan our built environment, how safe and attractive our streets are to cycling and walking, and where new development is located in relation to cycling, walking, and public transport infrastructure. We would draw attention to the fact that a very large proportion of trips in the UK are short and could be displaced by walking and cycling: “in 2014, 56% of car driver trips were under 5 miles”⁷. In addition to carbon and air pollution benefits, this could reduce congestion and noise and improve physical activity levels, with a wide range of associated health and wellbeing benefits.
- Links between the development of electric vehicles with **autonomous vehicles and with the shared economy** should be explored: car pool models could bring benefits by reducing the number of vehicles (i.e. more space recovered from un-required parking, less use of natural resources in manufacture); they could also, as a managed fleet, offer better control over the location and timing of charging. We would encourage research and pilots into these models, including technological development as well non-technical barriers such as consumer attitudes and behaviour change. It is important that developments in relation to charging of EVs are taken forward as far as possible without compromising the development of AVs.
- Options should be reviewed as part of the whole energy system, including options for **heat decarbonisation**: see response to Question 13.

We are aware of large **R&D efforts in Europe** in this area, including EU-funded research as well as private enterprises. We would encourage continued engagement and collaboration with European partners after April 2019.

22. How can the Government best replace fuel duty? How can any new system be designed in a way that is fair?

No comment

23. What should be done to reduce the demand for water and how quickly can this have effect?

Building Regulations currently include minimum water efficiency requirements in new housing. This could be expanded to include non-domestic buildings, as well as existing buildings subject to building regulations when going through qualifying extension, change of use, or refurbishment works.

While we have not analysed the topic in detail, we receive consistent anecdotal evidence from our members that, in practice, there is often little incentive for building users to manage water efficiently: water costs are typically a small proportion of overall operational costs and, crucially, a large proportion of the utilities bill is fixed, so that even significant water savings will only result in minor cost savings for the user. This could be explored with utilities and consumer groups.

⁷ <https://www.licencebureau.co.uk/wp-content/uploads/road-use-statistics.pdf>

24. What are the key factors that should be considered in taking decisions on new water supply infrastructure?

*As for energy infrastructure (see response to Questions 16 and 17), we would stress the need to maximise the opportunities from **demand reduction and efficiency first**, before investment in new capacity.*

We would also recommend referring to the latest recommendations from the Drinking Water Inspectorate⁸, which highlights two important points:

- the vulnerability of the water infrastructure to climate change, and*
- the close relationship with environmental management: better industrial, agricultural and land management practices have strong benefits in reducing the costs of water treatment and improving reliability, as well as offering other benefits to the natural environment.*

25. How can long-term plans for drainage and sewerage be put in place and what other priorities should be considered?

We would strongly encourage a whole-systems approach, including consideration to the contribution of green infrastructure.

26. What investment is needed to manage flood risk effectively over the next 10 to 30 years?

We would strongly encourage a whole-systems approach, including consideration to the contribution of green infrastructure. There has been a review of flood risk management in 2016 and the Environment Agency has undertaken considerable research on this topic.

27. What would be the most effective institutional means to fulfil the different functions currently undertaken by the European Investment Bank if the UK loses access? Is a new institution needed? Or could an expansion of existing programmes achieve the same objectives?

Extension of existing programmes should be thoroughly explored before any new institution is considered.

28. How could a comprehensive analysis of the costs and benefits of private and public financing models for publicly funded infrastructure be undertaken? Where might there be new opportunities for privately financed models to improve delivery??

Specifically with regards to green infrastructure and trees, we would refer to work by the Forestry Commission, including the adaptation of the i-Tree model to the UK; this model is a starting point to a whole-systems valuation of ecosystems services, which could help support long-term financing (capex and opex) mechanisms.

More broadly, we would encourage learning from abroad, including the recent report of the Environmental Defense Fund, "Unlocking Private Capital to Finance Sustainable Infrastructure", which summarises guidance to investors and new models of financing and evaluating sustainable infrastructure projects⁹.

END

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Please do not hesitate to contact us for more information on these responses.

⁸ DWI Annual Report, 2016 <http://www.dwi.gov.uk/about/annual-report/2016/index.html>

⁹ http://business.edf.org/files/2017/09/EDF_Unlocking-Private-Capital-to-Finance-Sustainable-Infrastructure_FINAL.pdf#page=24