MOTT MACDONALD

Output document from a roundtable discussion convened by UKCRIC at 13 Fitzroy Street, London on 15 March 2017

Building tomorrow's world

Exploring solutions to the UK's infrastructure challenge

In March 2017, a group of infrastructure leaders, experts and ambassadors was convened to articulate the challenges to infrastructure research and innovation in the UK and to develop a 'collective' vision for research to drive investment.

The aim was to promote better communication and to foster engagement between industry and academia at the highest level. It also sought to improve understanding of the UK Collaboratorium for Research on Infrastructure and Cities (UKCRIC) and its vision to create and operate a national and international multidisciplinary research programme that addresses the issues of unaffordable and unsustainable infrastructure development.

Three key infrastructure challenges provided focus for the roundtable discussion, allowing different social, economic and technological dimensions to be aired:

- Solving the housing crisis
- Driving economic growth
- Use of technology

The purpose was to identify persistent challenges and to explore potential research projects.

As a result of the discussion, four key themes emerged:

- The need to define socio-economic issues before setting the engineering problems
- Establishing what constitutes a good result
- Focus on demand forecasting
- Developing the 'concept car' for infrastructure

Event organised and led by UKCRIC and chaired by Arup and Mott MacDonald with support from:

Balfour Beatty
Buro Happold Engineering
Infrastructure Projects Authority
Laing O'Rourke

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The infrastructure challenge

The UK government is pressing ahead with its strategy of driving growth and rebalancing the economy through investment in transport, energy and communications infrastructure and by tackling the ongoing housing crisis with a target to construct 1M new homes by 2020.

Foreign investors consistently identify infrastructure quality as a key driver of investment decisions. The government's latest industrial strategy consultation highlights the need to invest in the skills and sectors that will boost this overseas attractiveness in a post-Brexit world.

The recent industrial strategy underlines a commitment to invest in the nation's assets. But it also highlights the need to invest in new skills and technologies to maintain global competitiveness across a number of key sectors.

As the UK embarks on the long process of leaving the EU, it is important that the infrastructure industry unites behind a strategy that will deliver the vital investment needed to secure the future infrastructure needs of the UK.

With large amounts of public and private funding earmarked to fund research and innovation, it is crucial that all parts of the UK infrastructure industry work together to identify a vision for where – and at what scale – research investment is necessary to underpin this strategy.

UKCRIC will support a step-change in the nation's approach to infrastructure investment

What is UKCRIC?

The UK Collaboratorium for Research on Infrastructure and Cities (UKCRIC) is a collaboration that provides leadership and support for the development and growth of a world class, UK-based national infrastructure research community, currently spanning at least 14 universities.

The UKCRIC programme was launched in 2016 through capital investment of £276M in shared facilities in academic institutions, and will involve further development of a wide range of multidisciplinary research and teaching programmes.

UKCRIC will engage with government, industry, city and commercial policy makers, investors, citizens and academia in a joint venture that drives innovation and value creation in the use of services provided by national infrastructure. By providing a focal point for knowledge transfer, UKCRIC will support a step-change in the nation's approach to infrastructure investment. It will also develop a commercial resource with considerable export potential for an international market valued at US$57trn in the period up to 2030.

UKCRIC aims to address the insufficient and unsustainable value extracted by services using national infrastructure. It also aims to understand how to make the system of systems that constitutes the nation's infrastructure more resilient to extreme events, more adaptable to changing circumstances and contexts, and how it can provide services that are more affordable and accessible to the whole population.

For more information visit www.ukcric.com

Solving the housing crisis

Discussion points

1.

The housing industry needs disruptive change – it is a broken business model in which developers are not incentivised to build to meet demand.

2.

Are there ways to stimulate faster release of housing land by linking its taxation to the value of its potential?

3.

Housing is really a social issue with solutions driven by economic decisions, not an engineering problem. We need to consider what social outcomes we are trying to achieve and what economic structures most support them.

4.

Are developers keeping up with society's changing lifestyle needs and what people want from their communities?

5.

Do we understand where or how the next generation really wants to live – in cities or in rural areas?

6.

Do we really understand all the dimensions required to determine what society wants as a housing model?

7.

Can we imagine ways to develop better infrastructure to meet society's needs in the future?

8.

We need to examine what kind of incentives will create win-win scenarios across the housing supply chain.

9.

There is further benefit in standardising housing without losing the aesthetic and character of the façade – a car industry approach to housing.

10.

We need to develop entirely new methods of construction and delivery models – not just better 'business as usual'.

11.

Past experience of developing new towns and ecotowns has taught us much, but what have we really learned about getting development right?

12.

There is a clear shift from ownership to rental – are young people more interested in spending their money on less permanent investments?

13.

Getting housing development right requires coordination across transport planning, water and energy supply, social services and other sectors. Who is best placed to coordinate and align policy?

14.

What is the impact on housing need from an ageing population?

Possible research projects:

What can be learnt from past experiences (and failures) of developing new towns and ecotowns as a route to boosting development on greenfield sites?

Work is needed to understand the co-production process to better understand and transform why we do what we do and for a better understanding of how we solve the housing problem.

Driving infrastructure and economic growth

Discussion points

1.

Inclusive growth matters if we are to create a balanced and successful economy.

2.

Do we understand the current model of how we work, where we work and why?

3.

How can we encourage growth patterns that result in less pressure on infrastructure?

4.

Can multidirectional commutes be encouraged to relieve pressure on transport infrastructure?

5.

Agile hubs will encourage mobile or flexible work.

6.

The ageing demographic brings growth opportunities as well as challenges.

7.

What is the most effective size of universities to maximise effective research?

8.

Can we capture the value of research and have the patience to wait before our investments become profitable?

9.

How do we implement all the ideas that flow from UKCRIC and our need for infrastructure investment?

10.

Governance – do we need a department for infrastructure?

Possible research projects:

How do we capture the value of land?

How long should we be prepared to wait for returns on infrastructure investment?

Multicriteria analysis – are there better ways of approaching projects to deliver happiness?

Use of technology in infrastructure

Discussion points

1.

How do we harness the power of data to transform infrastructure?

2.

Should we be future-proofing when designing new development corridors, and is this even possible?

3.

Technology will continue to change in rapid and unpredictable ways, yet infrastructure has a very long lifecycle. How do we integrate the two to avoid wasting money on assets which soon become outdated?

4.

Communication technology is critical to enabling better collaboration for growth across all regions and to reduce the nation's reliance on major cities.

5.

How will new technologies such as battery development affect future infrastructure requirements?

Possible research projects:

- What is the impact of infrastructure investment on both the local and national economies?
- How do we achieve better predictive modelling?
- How can we make use of prototypes in infrastructure?
- Can we find ways to incentivise developers for social outcomes rather than just physical outputs?
- What would it take to stop relying on standards and start believing in data and technology?

6.

Do we understand enough about what constitutes a 'good outcome'?

7.

The automotive industry is successful at prototyping its ideas to drive development – how can the infrastructure industry replicate this model?

8.

Prototyping is considered too difficult in infrastructure so we rely on standards.

9.

What impact does changing technology have on people – does access to more technology mean access to better living?

10.

Changing technology allows us to do more and to do things differently – do we understand enough about how that enables and disables infrastructure?

11.

Data enables a focus on whole-life value – but value to who? Misalignment between CapEx and OpEx means the value uplift does not always bring reward.

Core themes

While each challenge produced much wide-ranging discussion, four key themes emerged

1. Understand and define the socio-economic issues before solving the engineering problems: putting the 'why' before the 'what'.

- What are the positive and negative impacts of changing issues such as an ageing population or the increasing growth in automation?
- Engineering alone cannot be left to solve and understand problems. New research needs to be multidisciplinary, mixing social sciences, economics and geography with engineering.
- What does this mean for our current economic models and how can we build social improvement as we adjust?
- How can we modify our business models so that the whole-life benefits enabled by data bring rewards to the most appropriate parts of the value chain?
- Can we find ways to incentivise developers for social outcomes created rather than just physical outputs?
- Will taxing land according to the value of potential development help kickstart housing?
- What is the link between infrastructure investment, local economic performance and national economic growth? If we understand this better can we safeguard inclusive growth?
- How long should we be prepared to wait before expecting dividends on infrastructure investment?

2. What does society really want from its infrastructure? Establishing what constitutes a 'good outcome'.

- Infrastructure provides a service to society, so understanding society and its needs is fundamental to understanding what solutions are required.
- Do we understand enough about what a good result looks like, and who it really benefits?
- There is a clear shift from ownership to rental – what is driving this shift and how does it impact investments?
- Do we understand the current model of how we work, where we work and why?
- Can we imagine new ways to develop better infrastructure to meet society's future needs?

3. Relentless focus on realistic and meaningful demand forecasting: will what we are planning today be fit for purpose tomorrow?

- Economic growth today centres on major cities. Change that and you change our infrastructure needs altogether.
- Rapidly changing technology will allow us to do more and do things differently, but do we really understand enough about how that enables and disables infrastructure?
- Technology continuously changes, but what is most useful is the valuable information it gives us access to.
- What impact will new technologies have on future infrastructure needs?
- To extract meaningful decisions about uncertain futures requires greater use of scenario envelopes and whole system modelling; improvements in processing power should bring this closer to everyday planning.

4. Creating space and freedom to explore and break from the status quo: developing the 'concept car' for infrastructure.

- New methods of construction and new delivery models won't just enable better 'business as usual', but new ideas fit for the future.
- Can we use more prototyping to improve decision making (and societal outcomes) for infrastructure?
- Prototyping is considered too difficult in infrastructure so we rely on standards. How do we break free from standards to boost performance by relying on and trusting data and technology?
- How can we benefit from increased standardisation in housing development without losing out on aesthetic value?

Moving forward

UKCRIC's goal is to provide a safe place for industry and academia to experiment; a place where we can attempt to find solutions to multidisciplinary and society-led problems.

This roundtable discussion was the start of our conversation. It is the beginning of a richer and deeper engagement concerned with how the world actually works and what new knowledge and solutions are needed to achieve sustained infrastructure investment.

Future activities for 2017 include:

- Stakeholder engagement to continue the dialogue and identify where and how future research investment might be targeted to drive forward UK infrastructure investment.
- UKCRIC strategic research roadmapping with stakeholders (UKCRIC and wider).
- The International Symposium for Next Generation Infrastructure 2017 Conference (ISNGI) 11-13 September 2017, Institute of Civil Engineers, London. Full details can be found at www.isngi.org

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