

Editorial

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To mark the formal launch the UK Collaboratorium for Research on Infrastructure and Cities (UKCRIC), UKCRIC hosted the 5th International Symposium for Next Generation Infrastructure (ISNGI) on 11–13 September 2017. ISNGI 2017 brought together an international community of interdisciplinary infrastructure practitioners from across academia, industry, professional bodies, infrastructure utilities, central and local government and policy makers to focus on systemic infrastructure research, challenges and opportunities. We are delighted to present this collection of research papers from ISNGI 2017 in this themed issue of *Smart Infrastructure and Construction*, because we believe there is a close alignment between the strategic objectives of UKCRIC, ISNGI and the role of the Institution of Civil Engineers (ICE) as an industry thought leader.

Infrastructure is a catalyst that enables economic and societal multiplier effects and underpins the normal operations of modern society (Figure 1). As a society, our quality of life, social cohesion, economic prosperity and productivity depend on a network of economic infrastructure networks (NoN) that include waste, water, energy, communications and transport networks. The NoN as an interdependent system generates a flow of infrastructure products and services (IP&S). This flow of IP&S then supports a range of infrastructure-enabled activity supporting social infrastructure facilities and services which could not otherwise happen. In turn, economic and social infrastructures enable wider economic and societal activity, creating multiplier effects in realising desired economic or societal outcomes, and societal missions.

It follows then that the success of all modern societies depends on ensuring that the flow of IP&S produced by economic infrastructure is fit for purpose – that is, capable of enabling the outcomes expected of it – sustainable and affordable, and that the NoN as a whole is resilient to the impacts of disruptive events, at all scales and lifecycle stages.

Therefore, making sure infrastructures are resilient, sustainable, affordable and liveable is a core objective of UKCRIC research and investment in infrastructure research facilities. This will require improved systemic infrastructure management and performance (financial, operational, environmental) over the lifecycle of infrastructure assets and systems. This strategic theme, and the aspiration for better infrastructure, provide the focus for the papers presented in this themed issue and the ISNGI series of international symposia as a whole.

Inspired by the scale of the challenge faced by the UK National Infrastructure Commission to undertake a systemic infrastructure

need assessment once per parliament, Dolan (2018) proposes a framework for infrastructure need assessment and decision-making. The framework proposed is systemic in scope and attempts to align the assessment of infrastructure need with the outcomes economic infrastructure is expected to enable, and, explicitly, with emphasis on systemic priorities such as resilience which, if ignored, can undermine the realisation of other strategic objectives and whole-system performance.

How to decommission and deconstruct end-of-life infrastructure assets cost-effectively and without excessive disruption to the performance of the infrastructure system of which they are an integral part is an important but often neglected challenge. Gourvenec (2018) provides a structured analysis of the current scale and drivers of this challenge for offshore energy infrastructure, demonstrating the need for a multicriteria, multisector and transdisciplinary approach to transform offshore decommissioning priorities and decision-making processes. Gourvenec introduces a conceptual framework developed for this purpose and makes a comprehensive set of recommendations.

The need to develop alternative infrastructure business models and re-examine the value proposition of investment in sustainable, resilient, adaptable, liveable, systemic, locally relevant, smart and innovative infrastructure and city systems is the focus of Bouch *et al.* (2018). Potential benefits are illustrated through a case study of an entrepreneurially driven energy park in which industrial and public sector energy consumers and a multi-modal array of energy producers from across multiple industry and infrastructure sectors are co-located. The work culminates with the proposal of a transferable process to support the identification of innovative alternative business models.

The development of self-healing ‘biomimetic’ construction materials for use in infrastructure systems is the focus of Al-Tabbaa *et al.* (2018). The potential for better infrastructure materials to reduce the repair and maintenance costs and mitigating the systemic impacts of disruption caused by poor material performance, and to improve the durability of repaired concrete structures are amongst the motivations for Al-Tabbaa *et al.* and the Materials for Life and Resilient Materials for Life research teams. Developments in this area have the potential to shape the future design, whole-life management, performance and resilience of the infrastructure assets, systems and the entire network of infrastructure networks on which modern societies depend.

In addition to the papers presented in this themed issue, a range of outputs from 2017 including keynote presentations, a complete

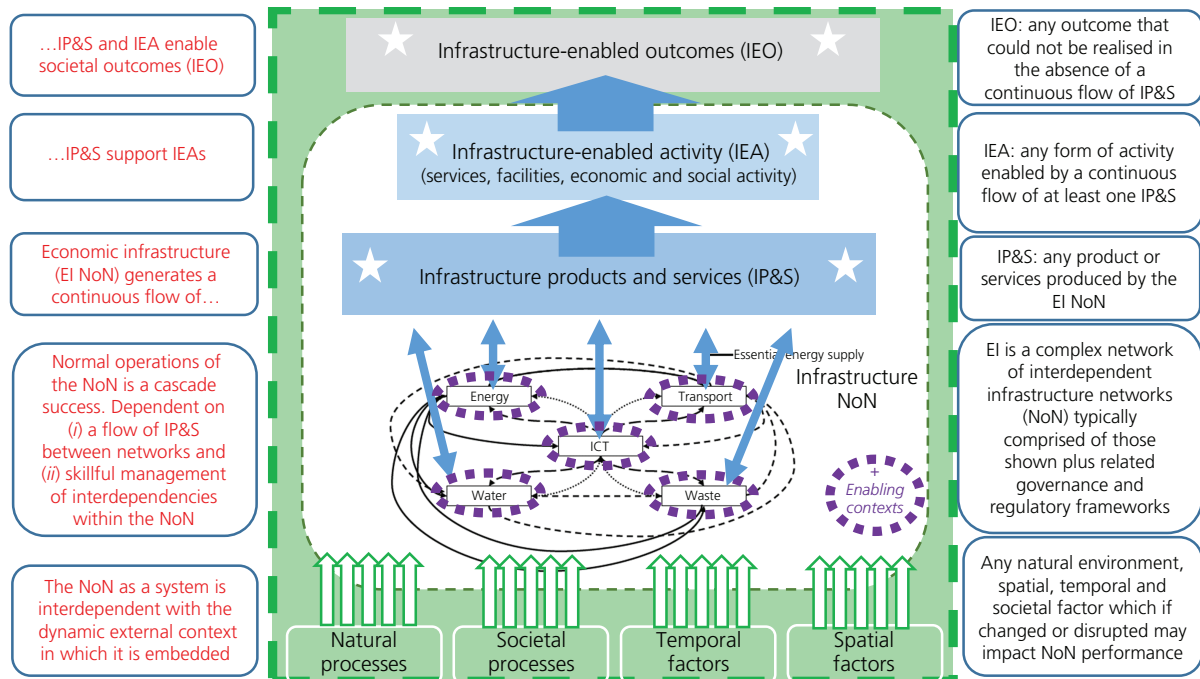


Figure 1. Infrastructure is a catalyst that enables economic and societal multiplier effects and underpins the normal operations of modern society

volume of conference proceedings and a back catalogue of outputs from ISNGI symposia in Wollongong, Vienna and Washington, DC are available at <http://www.isngi.org>.

Since its inception at the Smart Infrastructure Facility at the University of Wollongong (Australia), ISNGI has focused on promoting interdisciplinary research into, open-ended conversation on, shared understanding of and industry, government and academic collaboration to address future infrastructure challenges. ISNGI 2019 will be in Argentina in September 2019, and a call for papers will be available shortly at <http://www.isngi.org>.

More about UKCRIC, and the current portfolio of universities and UK Research and Innovation research grants collaborating as UKCRIC is available at www.ukcric.com. Additionally, UKCRIC was recently included in the ICE 200 People and Projects; an ICE 200 video overview of UKCRIC is available at <https://www.ice.org.uk/ice-200#projects-1>.

We believe the papers published in this themed issue complement the objectives of *Smart Infrastructure and Construction* and the

significant body of research published by the journal. We would like to remind readers that all papers published in *Smart Infrastructure and Construction* to date are currently available for free online at <https://www.icevirtuallibrary.com/toc/jsmic/0/0>.

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