



**UKCRIC**

UK COLLABORATORIUM  
FOR RESEARCH ON  
INFRASTRUCTURE & CITIES  
**Inspired infrastructure  
for better living**

# UKCRIC: An introduction

William Powrie  
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# UKCRIC



- 15 UK universities
- National focus for Infrastructure & Cities research
- Distributed around the UK
- Multi- / trans-disciplinary and multi-application
- 3 strands: laboratories, urban observatories, DAFNI

[www.ukcric.com](http://www.ukcric.com)  
[@ukcric](https://twitter.com/ukcric)

[hello@ukcric.com](mailto:hello@ukcric.com)



## Partner universities

University of Birmingham

University of Bristol

University of Cambridge

University College London

Cranfield University

University of Edinburgh

Heriot Watt University

Imperial College London

University of Leeds

University of Loughborough

University of Manchester

Newcastle University

University of Oxford

University of Sheffield

University of Southampton

## Affiliated facilities

V-Simulators labs at Bath and Exeter

**National Water & Wastewater Treatment Test Facility, Cranfield**



**National Infrastructure Laboratory, Southampton**



**National Green Infrastructure Facility, Newcastle**



**National Distributed Water Infrastructure Facility, Sheffield**



**National Research Facility for Infrastructure Sensing, Cambridge**



# Urban observatories

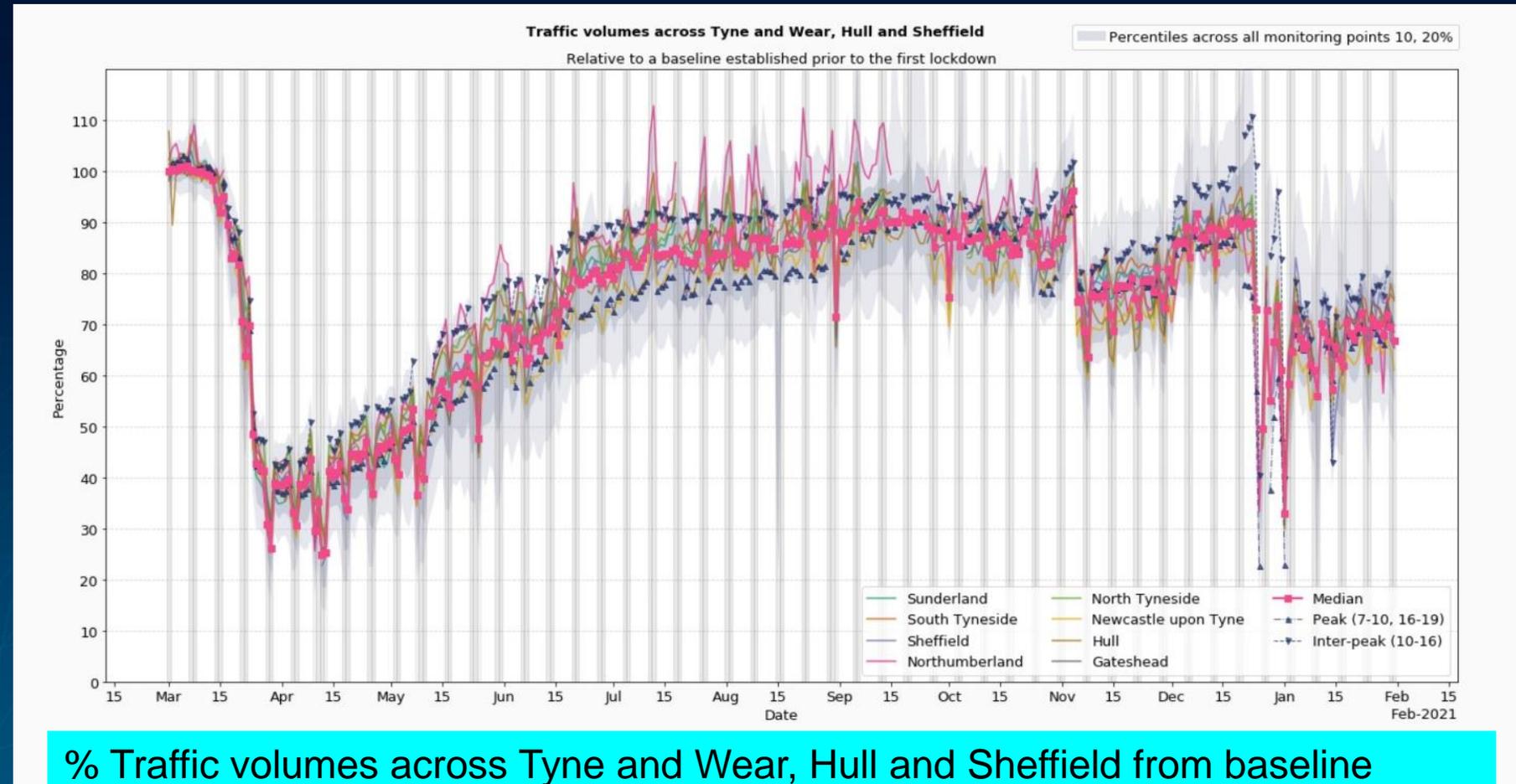
Birmingham, Bristol, Milton Keynes, Newcastle, Sheffield, Southampton



## Investigating

- Air quality
- Flood Management
- Public Health
- Transport
- Machine learning
- Smart Buildings
- Effects of Covid-19

Open source real time urban data



% Traffic volumes across Tyne and Wear, Hull and Sheffield from baseline March 2020 (pre 1<sup>st</sup> lockdown) to Feb 2021 (Phil James; Newcastle University)

# Data Analytics Facility for National Infrastructure



- Part of the UKRIC community
- Computational platform to support data analysis and infrastructure research
- Large scale analysis, data access, software and visualisation

## MISSION

UKCRIC's integrated research capability underpins the renewal, sustainment and improvement of infrastructure and cities in the UK and elsewhere.

By engaging government, industry, academia and end users, UKCRIC is de-risking, helping to prioritise, and providing evidence, analysis and innovation for future national infrastructure and urban investments in a safer, more resilient and more sustainable future.

# UKCRIC Scientific Missions



UKCRIC is driven by research in four Scientific Missions, each working to develop and deliver breakthrough research for the benefit of society.

The Scientific Missions are designed to facilitate the delivery of interconnected, integrated and transdisciplinary research programmes and projects.

Cross cutting themes within each Mission, alongside links with UKCRIC's facilities and industry, are central to achieving UKCRIC's vision.

## Infrastructure and urban systems for one planet living

- Accelerating **sustainability** through advances in responsible consumption, resource efficiency and sustainable growth and helping the UK meet its carbon targets.

### Research Routemap

- Low-carbon materials
- Lean infrastructure

## Transformational infrastructure and urban systems for a changing world

- Pioneering methods in infrastructure and urban systems design to meet the challenges of **resilience and adaptation** to changes in climate, patterns of use, societal expectations and emergent technologies.

### Research Routemap

- Digital twin and smart infrastructure
- Resilience – soil and water

## Ownership, governance and business models for infrastructure and urban systems

- Developing innovative models for coping with greater system interdependencies, changing patterns of use and new, disruptive technologies while at the same time delivering social justice and **affordability**.

### Research Routemap

- Balancing Risks and Responsibilities
- Responsiveness to innovation and change

## Infrastructure and urban systems as drivers of equity, inclusion and social justice

- Providing the underpinning, transdisciplinary research platforms for forging healthy, happy and productive lives for all through urban design, planning, policy and infrastructure.

### Research Routemap

- Accessible affordable urban mobility
- Socially just utility service provision

# Stakeholder engagement



- Net Zero Coalition Working group/Mott MacDonald
- Resilience Shift/ARUP; NIC resilience consultation; London Resilience Forum
- ICE, IET, RAEng, NIC, IPA, I3P, TTAG, CIRIA, BEIS, DfT
- Digital Framework Task Group, Digital Twin Working Group, CDBB, STFC
- Greater Metropolitan Region Strategy, Newcastle, NSW, Australia
- Singapore: NTU, Govt., National Research Foundation, A\*STAR
- Local Authority Workshops: Key Cities, Southampton; Core Cities, Manchester
- PAS 186 Smart Cities Consultation
- National Preparedness Commission
- HS2 Innovation Framework Agreement

.....among others.....

# Case study: affordable railway electrification (with Network Rail)



- Rail is fundamental to reducing overall transport emissions
- Electrification is critical to rail traction decarbonisation
- Costs increased steeply in the 2010s, national programme curtailed
- UKCRIC undertook detailed analysis and highly instrumented field tests
- Piled foundation lengths halved, saving carbon, cost and time
- New findings embedded in mandatory standards, ensuring roll-out
- Collaborative research with Network Rail, major supplier and SME in high voltage labs has further reduced costs
- Transport Select Committee has endorsed roll-out of electrification over 13,000km of track by 2050
- Continuing research programme will produce further benefits

# International community



- UKCRIC Advisory board
- Conferences with strong UKCRIC presence
  - Urban Transitions Conference, Barcelona, 2018
  - ISNGI, Buenos Aires, 2022
  - International No Dig, Florence, Sept 2019
  - International Transdisciplinary Conference, Gothenburg, 2019
  - 4<sup>th</sup> International Conference on Transportation Geotechnics, Chicago 2021
  - *International Transdisciplinary Conference 2021*
  - *ISNGI, Rotterdam, September 2022*

# CDTs and early career researchers



## CDTs

- WiRe: Water Infrastructure and Resilience (Cranfield, Sheffield, Newcastle)
- Water Wiser (Leeds, Loughborough, Cranfield)
- Sustainable Infrastructure for Cities (Southampton, Birmingham, Loughborough, Sheffield: under development)

## C-DICE Centre for Postdoc Development in Infrastructure, Cities and Energy (Universities of Loughborough, Birmingham, Cranfield)

- Training – linked to UKCRIC and ERA facilities
- Development – funded placements and secondments
- Sandpit Programme – the net zero carbon challenge
- Impact – delivering knowledge exchange events

# Research projects involving UKCRIC universities



- PLEXUS (Priming Laboratory Experiments on Infrastructure and Urban Systems)
- CORONA (City Observatory Research platfOrm for iNnovation and Analytics)
- ACHILLES (Assessment, Costing and enHancement of long lIfe, Long Linear assEtS) programme grant
- Urban Green Design and Management of SUDs
- Pervasive Sensing of Buried Pipes (Pipebots) programme grant
- Transforming Construction Network Plus
- Twenty65 & Self-Repairing Cities Grand Challenge grants
- Network Rail CP6 research framework contracts (Southampton, Birmingham, Huddersfield, Newcastle, Notts, Loughborough, Heriot Watt, Sheffield)
- HS2 framework agreement (across UKCRIC)

# Examples of successful collaborative bids supported by UKCRIC



- UKRI Interdisciplinary Circular Economy Centre for Mineral Based Construction Materials (UCL, Imperial, Leeds, Loughborough, Sheffield)
- Transforming Construction Network Plus (UCL, Imperial)
- C-DICE Centre for Postdoc Development in Infrastructure, Cities and Energy (Universities of Loughborough, Birmingham, and Cranfield together with ERA)

# UKCRIC Vision



- Recognised nationally and internationally as THE UK Centre for Infrastructure and Cities Research
- Go-to place for advice to policymakers and government
- Intimate linkage with local authorities for delivery of 21<sup>st</sup> century cities and infrastructure
- Strong collaborations with industry to promote technological / technical advance
- Every major infrastructure / cities project engages with all relevant disciplines, sectors, other stakeholders; embraces systems thinking / practices; and works in a transdisciplinary manner towards true excellence and sustainability
- Every major infrastructure / cities project an informed learning experience

# “post”-Covid opportunities



- Reduce the volume of travel; improve the quality and lower the carbon footprint of the travel we do
- Re-purpose and re-balance city and town centre space, providing high quality living, working and recreational environments including green and blue space
- No need to size transportation infrastructure for peaks: balance demand over the day
- Encourage active travel (walking and cycling) for health and wellbeing, improved environment (air quality, noise) and quality of life (space for people not cars)
- Presumption against private personal motor vehicles in city centres (walking, bicycles and e-bikes, electric trains, trams and buses, and mobility devices)
- Move away from vehicle ownership towards a model of hire and use when needed

# Get in touch.....



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