

Making cities work - the application of technology, science and infrastructure improvements to create a place where citizens wish to live

Date and Location:	24th May, 2017 at The Royal Society
Chair:	The Earl of Selborne GBE FRS Chair, The Foundation for Science and Technology
Speakers:	Professor The Lord Mair CBE FRS FREng Sir Kirby Laing Professor of Civil Engineering, Department of Engineering, University of Cambridge Tom Saunders Senior Researcher, International Innovation, NESTA Councillor Peter Marland Leader, Milton Keynes Council
Sponsors:	BRE Group, Cranfield University, the Knowledge Transfer Network (KTN) and The Royal Commission for the Exhibition of 1851
Audio Files:	www.foundation.org.uk
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PROFESSOR LORD MAIR opened by saying that he would focus on the contribution of physical infrastructure to what made a Smart City attractive to citizens. Smart infrastructure responded intelligently to changes in its environment, and needed to overcome the challenges of ageing, loading and uncertainties like climate change. There had been many recent examples of vulnerable City infrastructure, including the collapse of the Mississippi River Bridge in Minneapolis only 40 years after it had been built in 1967. It had collapsed with no immediate warning, although a deformed gusset plate on the bridge had been photographed four years earlier.

Recent advances in sensor technology presented major opportunities for im-

proved health monitoring of infrastructure, making it more resilient. Instead of human inspection, which could be dangerous, real time monitoring by sensors and drones provided the prospect of “Smarter Information”. He is principal investigator for the Cambridge Centre for Smart Infrastructure and Construction, which has £22m of funding over ten years to 2021 and partnerships with infrastructure clients, contractors and asset managers and the technological and information supply chains. This was leading to the development of Smart City standards, and whole life approaches to asset management.

He then focussed on two specific areas. First, innovative fibre optic sensing which allowed remote detection of where infra-

structure was under greater strain. It had been used in massive Crossrail shafts and tunnels to allow understanding of aspects which had been overdesigned, so that safe construction on another occasion would be much more cost effective. It had also been used for monitoring historic masonry arches, and had allowed decisions to be made that, although the masonry was cracked, immediate repair or speed restrictions were not needed. Second, wireless sensor networks and Micro Electrical Mechanical Systems (MEMS) on London Underground tunnels and the Hammersmith Flyover had provided sophisticated remote measurement of strain. Such approaches offered huge potential to deliver value as part of investment in Smart City infrastructure.

TOM SAUNDERS spoke of supporting innovation for social good in Smart Cities. As city budgets were declining technology would be needed to improve efficiency and reduce costs. The pace of change in new technology was increasing with, for example, virtual reality visualisation, artificial intelligence devices and driverless cars. Application of new technology needed to be combined with citizen engagement in decisions to improve public services in cities. Such engagement led to better understanding of what services might be required, for example in planning a small number of night bus routes in a city which would meet the needs of the maximum number of likely users.

FixMyStreet¹ allowed citizens to identify street infrastructure problems more immediately and without the cost of Council inspectors. A combination of sensor data and Twitter data on floods in Jakarta had led to better real time alleviation of city flooding than the previous approach of checks by local officers.

Citizen engagement also led to better development of options and ideas. Nesta had run a series of challenge prizes with interesting applications. Better Reykjavik had generated 200 ideas on improving parks through open engagement, but it was necessary to reach out to citizens who were not technologically engaged, so that their ideas were also incorporated, and that narrower forms of consultation did not just identify the proposals of benefit to those who participated. The Mayor of Paris had provided a budget of 500m euros over five years to build ideas supported by citizens. Such budgeting could be challenging for Councils, as it delegated decision making authority away from them.

1 www.fixmystreet.com

Citizen involvement could lead to better oversight, learning and improvement. Lewisham Council had provided a model for citizens to use in understanding the Council's challenge of living within a reduced budget. Overall it was important to start with a problem facing a city, not with a technology project, but to find novel ways of collaborating with citizens through technology. Approaches should be simple, and use open innovation. So far as possible the city's own staff should be engaged, rather than external consultants. Experimentation was good, but should not exclude those not connected digitally, as the goal was inclusivity.

COUNCILLOR PETER MARLAND said that the future of Milton Keynes, recently set out in the vision MK Futures 2050², lay in people not in grid roads and roundabouts. From a collection of 13 villages and a population of 40,000 in 1967, Milton Keynes had grown by its 50th anniversary this year to 300,000 people and was now the biggest city between London and Birmingham. To succeed Milton Keynes needed to be important, to have connectivity, rather than being important in a former age. Adapting to the future needed to be about culture and resilience, particularly as 60% of local jobs were in danger of being lost due to automation over the next 20 years. Milton Keynes had twice as many children in the first year of nursery than in the last year of school, but it was also beginning to have a significant elderly population. Overall the population could reach 500,000 by 2050.

The future vision involved promoting young entrepreneurs, having a local undergraduate university, and removing traffic from some streets. MK Smart provided open data about local services, so citizens could put forward disruptive ideas through their interpretation of the data. Ultimate outcomes needed to be the focus, for example not collecting more rubbish efficiently but reducing the amount of rubbish having to be collected. In a Smart City citizens should be encouraged to solve the community's problems themselves, rather than expecting the Council to do so. Spending should be shifted from managing failure to preventative services. Predictive technology was on the verge of becoming available. Would it become sufficiently reliable to be able to make Criminal Behaviour orders in advance of violence?

City leaders needed trust to operate, but to do so based on their mutual trust of members of their communities. Smart Cities had to be for the people who

2 www.mkfutures2050.com/

lived in them.

In the subsequent discussion, there was a call for the regulatory environment for Smart Cities to be based on outcomes rather than technologies. These responsible for driving forward innovation had to recognise that Government legislation and regulation often lagged behind. Open data did generate power struggles between public sector data providers and private companies, whose subsequent use of the data was not provided on an open basis. Greater availability of transport data to users was creating major benefits.

Earth observation data from satellites was already saving money for Councils in their enforcement of permitted planning developments. China was leading innovation in monitoring air quality data via mobile devices. By contrast, London was a long way behind in installing widespread air quality sensors.

The most successful cities were inexorably drawing in more people. Shifting people to other cities was challenging. The rapid decline of Rome at the end of the Roman Empire showed that people only stayed for good reasons. Greater on-line working from home could disrupt city growth significantly. Some substantial world cities faced great challenges from climate change. Climate change also created significant issues for some physical infrastructure, but was slipping from the political agenda in the UK. Citizen feedback might halt such decline, particularly in some cities. There were still substantial benefits to be secured for citizens through energy efficiency investment.

Inevitably there were risks with dependence on technology, as the recent global problems with ransomware had shown. Pilots undertaken by city

authorities had to make their findings openly available. The reliability and security of data was very important, particularly in areas of critical infrastructure such as nuclear power stations.

Inclusive growth, based on use of technologies, had been a major theme of the MK Futures 2050 vision. Inclusivity meant incorporating the perspectives of those not using the internet, for example through community meetings. Implementing City visions was much harder when planning powers remained highly centralised. Possibly a benefit of Brexit might be that procurement frameworks for cities might move away from best value to allow more consideration of socially advantageous tenders.

Universities could generate substantial benefits to the cities in which they were located, because they attracted globally talented researchers and their families. They were also likely to generate innovative use of technology locally.

Although different views were expressed on how much cities in other countries provided helpful perspectives for this country, some admired the long term perspective inherent in Singapore's approach to planning. This was linked to skills, in that from primary school age upwards education in digital technologies needed to move forward at speed.

The debate had provided a useful reminder of the great potential of technology for monitoring the physical infrastructure, on which Smart Cities were so dependent. Citizens should be fully involved in how technology should be applied, and those responsible for leading cities sought greater freedom to determine their own affairs.

John Neilson

USEFUL REPORTS AND URLS

Forum for the future: future cities dialogue
www.forumforthefuture.org/project/future-cities-dialogue/overview

Government Office of Science - Future of Cities Report
www.gov.uk/government/collections/future-of-cities

Government Office for Science - Future Cities: foresight for cities
www.gov.uk/government/publications/future-of-cities-foresight-for-cities

Milton Keynes Futures:2050
www.mkfutures2050.com

NESTA - Rethinking Smart Cities From The Ground Up
www.nesta.org.uk/sites/default/files/rethinking_smart_cities_from_the_ground_up_2015.pdf

NESTA - Governing with Collective Intelligence
www.nesta.org.uk/sites/default/files/governing_with_collective_intelligence.pdf

University of Reading report for RICS Research Trust on Big Data and Smart Cities
www.rics.org/uk/knowledge/research/research-reports/smart-cities-big-data-and-the-built-environment-whats-required

University of Reading position paper on smart and sustainable cities
[www.reading.ac.uk/web/files/cme/cme-Dixon_SCME_big_data_paper_AS_v_11_WEB_\(1\).pdf](http://www.reading.ac.uk/web/files/cme/cme-Dixon_SCME_big_data_paper_AS_v_11_WEB_(1).pdf)

ORGANISATIONS AND COMPANIES

Amey
www.amey.co.uk

Anglian Water
www.anglianwater.co.uk

Aralia Systems
www.araliasystems.com

Arup
www.arup.com

Atkins
www.atkinsglobal.com/en-gb

BRE Group
www.bre.co.uk

Buro Happold
www.burohappold.com

Centre for Smart Infrastructure and Construction, University of Cambridge
www-smartinfrasturcture.eng.cam.ac.uk

Centre for Advanced Spatial Analysis, UCL
www.ucl.ac.uk/bartlett/casa

Centre for Aging Better
www.ageing-better.org.uk

Centre for Cities
www.centreforcities.org

CH2M Hill
www.ch2m.com

Cisco
www.cisco.com

Costain
www.costain.com

Cranfield University
www.cranfield.ac.uk

CrossRail
www.crossrail.co.uk

Crown Estate
www.thecrownestate.co.uk

Design Council
www.designcouncil.org.uk

Digital Catapult
www.digital.catapult.org.uk

Digital Greenwich
www.digitalgreenwich.com

Energy Saving Trust
www.energysavingtrust.org.uk

Energy Systems Catapult
www.es.catapult.org.uk

Environment Agency
www.gov.uk/government/organisations/environment-agency

Fit for the Future
www.fftf.org.uk

Forum for the Future
www.forumforthefuture.org

The Foundation for Science and Technology
www.foundation.org.uk

Future Cities Catapult
www.futurecities.catapult.org.uk

Greater London Authority
www.london.gov.uk

Green Building Council
www.ukgbc.org

HS2
www.gov.uk/government/organisations/high-speed-two-limited

IBM Smart Cities
www.ibm.com/innovation/uk/smartercity/index.html

Infrastructure and Projects Authority, Cabinet Office
www.gov.uk/government/organisations/infrastructure-and-projects-authority

Innovate UK
www.gov.uk/government/organisations/innovate-uk

Institute of Future Cities, Strathclyde University
www.strath.ac.uk/cities

Institution of Civil Engineers
www.ice.org.uk

Institution of Mechanical Engineers
www.imeche.org

IoTUK
www.iotuk.org.uk

KTN
www.ktn-uk.co.uk

Laing O'Rourke
www.laingorourke.com

Local Enterprise Partnerships
www.lepnetwork.org.uk

Local Government Association
www.local.gov.uk

Microsoft Research
www.microsoft.com/en-us/research

Mott Macdonald
www.mottmac.com

Norwich Borough Council
www.norwich.gov.uk

NPL
www.npl.co.uk

Opportunity Peterborough
www.opportunitypeterborough.co.uk

Plymouth Future Cities
www.seachangeagency.com/project/plymouth-city-council

Public Health England
www.gov.uk/government/organisations/public-health-england

Research Councils UK
www.rcuk.ac.uk

Siemens
www.siemens.co.uk/en

Skanska
www.skanska.co.uk

Smart Homes and Buildings Association
www.shabawebsite.wordpress.com

Sustainability West Midlands
www.sustainabilitywestmidlands.org.uk

TechUK
www.techuk.org

Thames Tideway
www.tideway.london

The IET
www.theiet.org

The Royal Commission for the Exhibition of 1851
www.royalcommission1851.org

Town and Country Planning Association
www.tcpa.org.uk

Transport for London
www.tfl.gov.uk

Turing Institute
www.turing.ac.uk

UniversitiesUK
www.universitiesuk.ac.uk

Urban Big Data Centre
www.ubdc.ac.uk