

CITY INNOVATION BRIEF



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FOREWORD

Cities matter. Harvard economist Ed Glaeser calls cities ‘our greatest invention’. They are already home to more than half of humanity, because living and working cheek-by-jowl has massive benefits. Urban living is not just more efficient; we have more and better ideas, and we are able to implement and commercialise them faster. But density also has downsides: pollution, congestion, worse mental health to name a few.

Managing the ongoing growth and complexity of our cities will require the very best of human ingenuity. Fortunately, here in the UK we have a wealth of innovative companies that can help. We call this the Advanced Urban Services sector. At Future Cities Catapult, we are working to support this emerging sector to flourish by better connecting the suppliers, customers and users. In doing so we are seeking to equip cities to be more informed and confident buyers of innovative solutions, to develop meaningful use cases that allow businesses to grow in response to need, and to generate robust evidence of impact that unlocks further investment and implementation.



To that end, I am delighted to introduce our new quarterly publication, *City Innovation Brief*.

In this and in future issues, we will show how cities across the UK are harnessing advanced urban services to help them become more productive, more sustainable, more inclusive, more resilient, and more livable. Through the latest sector trends and deep-dive insights from city officials we will share and champion best practice in the sector, providing opportunities for cities to learn from one and another.

We hope you find it useful.

Nicola Yates OBE – Chief Executive Officer, Future Cities Catapult

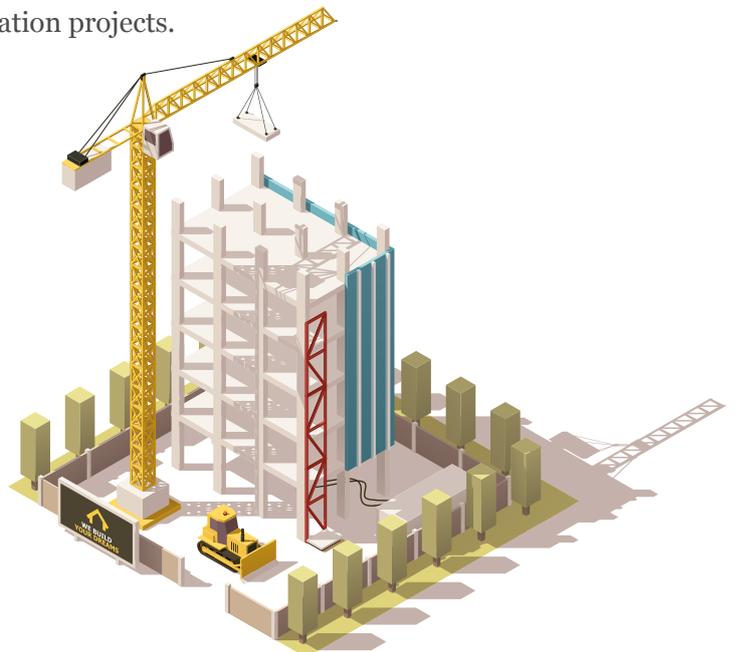
WHAT'S INSIDE?

Issue one starts with a **digest** of key developments this quarter, with highlights including:

- The government launches investment strategies for energy, transport and a £3bn plan to improve air quality.
- Devolution deals are finalised in Edinburgh and stalled in South Yorkshire.
- Belfast and Aberdeen take steps forward with their smart city plans and Milton Keynes announces a new partnership with Huawei.
- Questions are raised on the ability of local authorities to manage personal data and deal with cyber security attacks.
- Electric vehicles see a 50% year on year increase in registrations, with new pledges to phase out fossil fuels from vehicle manufacturers and government.
- The UK's largest autonomous vehicles trial is given the green light to move onto city streets, while Uber is informed that its licence will not be renewed in London.

Our **activity tracker** identifies over £227m of public sector contracts advertised this quarter related to advanced urban services, with 35% of tenders attributed to the digitalisation of services and 47% to intelligent systems. It also lists £2.8bn of funding announced this quarter to support investments in housing, air quality improvements, mobility technologies, tackling litter and cultural regeneration.

Two feature articles profile developments in **air quality** and **smart high streets**. And finally, we summarise **insights** from our first cities roundtable, which reflected on the challenges and opportunities faced in deploying advanced urban services. This identified a common focus on a range of issues, including funding, systems integration, digital inclusion and managing the inherent risks of innovation projects.

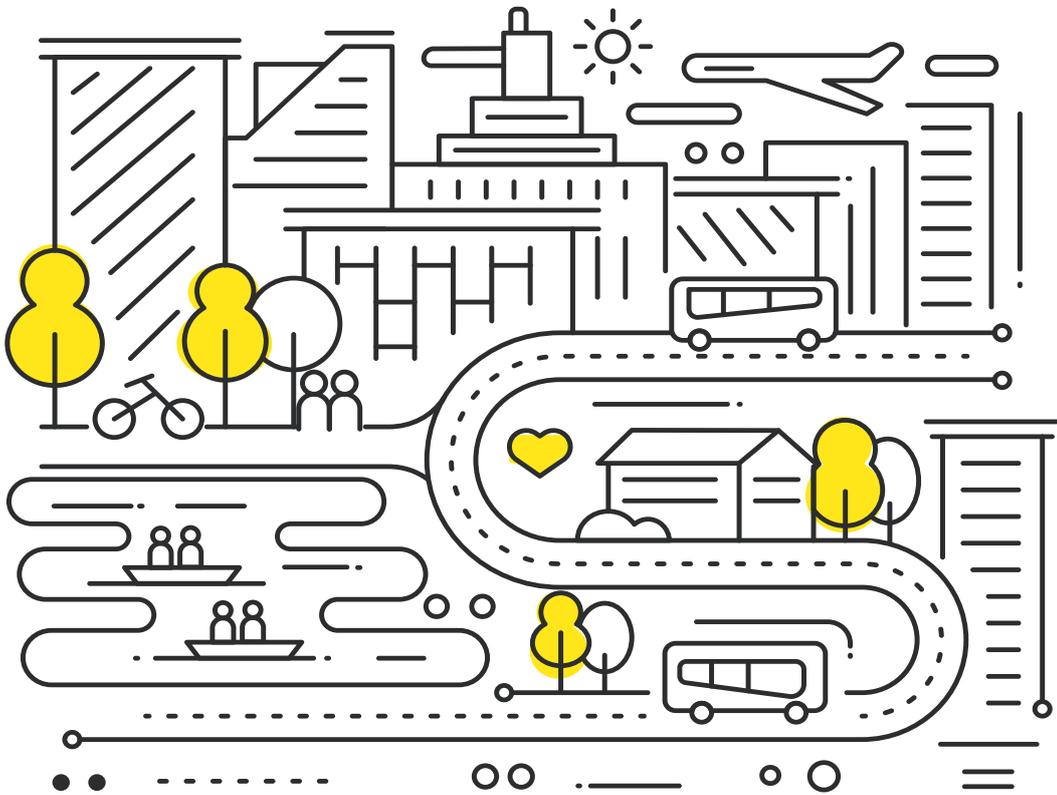


Digest

Key developments in Advanced Urban Services in the UK this quarter



A green paper published by the Core Cities Group calls government to invest in cities to stimulate inclusive growth and allow further devolution



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SOCIAL

TECHNOLOGICAL

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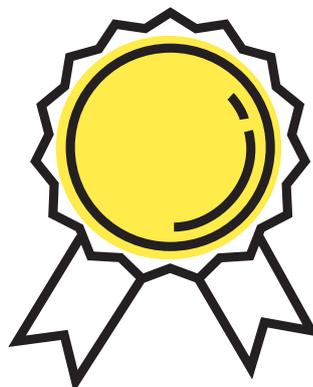
POLITICAL

This quarter saw a number of developments that built on the UK government's new active approach to investing in the industries of the future. This included the Upgrading our Energy System Plan, which aims to give consumers greater control over their energy use and support innovative technologies. It was adopted by the Transport Investment Strategy, which seeks to create a more reliable, less congested and better-connected transport network.

A green paper published by the Core Cities Group called for the government to invest in cities to stimulate inclusive growth and allow further devolution. The £1.1bn Edinburgh and South East Scotland City Region Deal was finalised and included a £300m investment in data innovation centres. By contrast council leaders voted against South Yorkshire devolution owing to competing strategic priorities within the region.

At the regional level, new partnerships were announced with the launch of Transport for the South East (TfSE) and Transport for the North (TfN), with the common goals of better regional connectivity and exploitation of innovative digital technologies.

Mayor of London Sadiq Khan outlined an ambition to make London the world's leading smart city and appointed London's first Chief Digital Officer. This quarter also saw the launch of the Smart Belfast framework and publication of a business case for Smart Aberdeen, which claimed that £273m in investment would bring £563m in benefits over 35 years.



Cambridge named top city for GVA growth in quarter one

ECONOMIC

The UK's economy is estimated to have grown by 0.3% in the second quarter of 2017, slightly above the 0.2% reported in Q1 but a marked drop from the 0.7% reported in Q4 2016. The slowdown in Gross Domestic product (GDP) was attributed to a weakened performance in the services sector, with consumer-facing industries such as accommodation and retail being hit hard by the tightening squeeze on household incomes over Q1.

Analysis of economic growth in UK cities cited Cambridge as the top-ranking city for Gross Value Added (GVA) growth in Q1, while Milton Keynes experienced the greatest job growth.

Brexit continues to dominate the economic agenda. Centre for Cities predicted that higher trade costs after Brexit would have a negative impact ▶

The LGA forecast that congestion is set to cost the UK economy **£300bn** by 2030



on GVA growth in UK cities over the next ten years. The think tank also reported that cities account for 51% and 74% of Britain's total goods and services exports respectively. London is the largest contributor in absolute terms (28%) with the gap between the capital and the rest of the UK predicted to get wider.

The Local Government Association (LGA) forecast that congestion is set to cost the UK economy £300bn by 2030, rising from the current estimate of £30.8bn. A number of UK cities feature in worldwide congestion rankings, with London placed 25th, Manchester 39th and Newcastle-Sunderland 64th.

According to Intel, autonomous vehicles could free up 250 million hours per year of commuters' time in the world's most congested cities and the Transport Systems Catapult believe the industry could be worth between £28–52bn to the UK by 2035.

SOCIAL

The London Mayor's office launched two related strategies: 'Better Health for all Londoners' setting out ambitions to tackle fuel poverty and the 'London Environment Strategy' including plans to improve energy efficiency in low income homes by investing in renewables and trialling new generation technology. This comes in a context of research published this quarter that drew attention to the problem of pensioner poverty, reporting that three million over-65s are in financial difficulty and more than half a million are unable to keep their homes adequately warm. Greater Manchester Combined Authority also signalled a similar intent, awarding smart battery firm Moixa a £1m loan to boost solar storage solutions for social housing.

The LGA awarded up to £50,000 funding to projects by 16 local authorities using information and technology to transform social care services and support integration with health partners. This was in response to a report that half of older people with care needs are inadequately supported. This is due to local authorities in England reducing overall spending on social care by 11% between 2009/10 and 2015/16, with a forecasted £2.6bn funding gap for social care by 2020.

Local councils continued to face rising numbers of people presenting as homeless and the associated challenges in housing, ▶



Cities account for **51%** and **74%** of Britain's total goods and services exports respectively

health, education and social care. In Cambridge, a challenge weekend took a grassroots approach to tackling these problems, bringing together local charities, entrepreneurs and residents to develop ideas to support those affected. It was reported by the charity Crisis that homelessness stood at 160,000 across Britain in 2016 and the number of homeless children housed in temporary accommodation has increased by more than a third in the last three years.

The role of the arts in urban renewal also featured prominently this quarter, with the announcement of the shortlist for UK City of Culture 2021. Coventry, Paisley, Stoke-on-Trent, Sunderland and Swansea in the running for the £3m Heritage Lottery Fund grant and the potential to attract the £1bn additional investment reported by Hull, the 2017 winner. The Department for Digital, Culture, Media and Sport also confirmed that it is proceeding under the assumption that a UK city will host the European Capital of Culture in 2023, with Belfast, Dundee, Leeds, Milton Keynes and Nottingham planning to enter the competition. A £15m Northern Cultural Regeneration Fund was also announced to boost the region's tech, creative and cultural industries and build a lasting legacy from the Great Exhibition of the North, which will take place in Newcastle and Gateshead in 2018.

TECHNOLOGICAL

Huawei and Milton Keynes Council signed a Memorandum of Understanding to design and build innovative ICT concepts for smart cities. This brings together Huawei's expertise in smart city solutions, with Milton Keynes' culture of innovation and enabling infrastructure to build a strategic relationship and develop a robust methodology of solving city challenges.

The global WannaCry ransomware attacks contributed to a sharpened focus on cyber security this quarter. The Department for Transport published guidance on cyber security for connected and automated vehicles and it was reported that just over half of UK local authorities are prepared to deal with a cyber attack.

The capacity of local authorities to manage data was also brought into question. A survey found that just 34% of respondents trusted their council to manage their personal data. This was also exposed by reports of data breaches in Newcastle, Nottinghamshire and Plymouth. Similar concerns were raised in a survey on the Internet of Things (IoT), which found that citizens largely support the convenience and benefits of connected devices but had concerns over security.

The Department for Transport published a response to the consultation on the safe use of drones. It set an ambition to place the UK at the forefront of the global drones applications market and identified measures to increase the accountability of drone users. ▶

The UK's largest trial of connected and autonomous vehicle technology was given the green light to move out onto city streets, after the UK Autodrive consortium successfully completed its proving ground trials.

PwC published this quarter predicted that artificial intelligence will increase UK GDP by 10.3% by 2030, primarily through enhanced consumer products. Funding was also confirmed for a new £30m National Innovation Centre for Data, which will be based in Newcastle.

LEGAL

The 2017 Queen's Speech announced 27 (draft) bills in the government's legislative programme for 2017-19. Those with a potential impact on advanced urban services include:

- The **Automated and Electric Vehicles Bill** which will set out a regulatory for electric cars, charging points and extend compulsory motor vehicle insurance to cover the use of automated vehicles.

- The **Space Industry Bill** which will create new powers to license a wide range of new commercial spaceflight, including satellite operation.
- The **Smart Meter Bill** which will extend powers to make changes to smart meter regulations by five years, and make sure the rollout is delivered effectively; and
- The **Data Protection Bill** which will ensure that the UK's data protection framework is suitable for the new digital age.

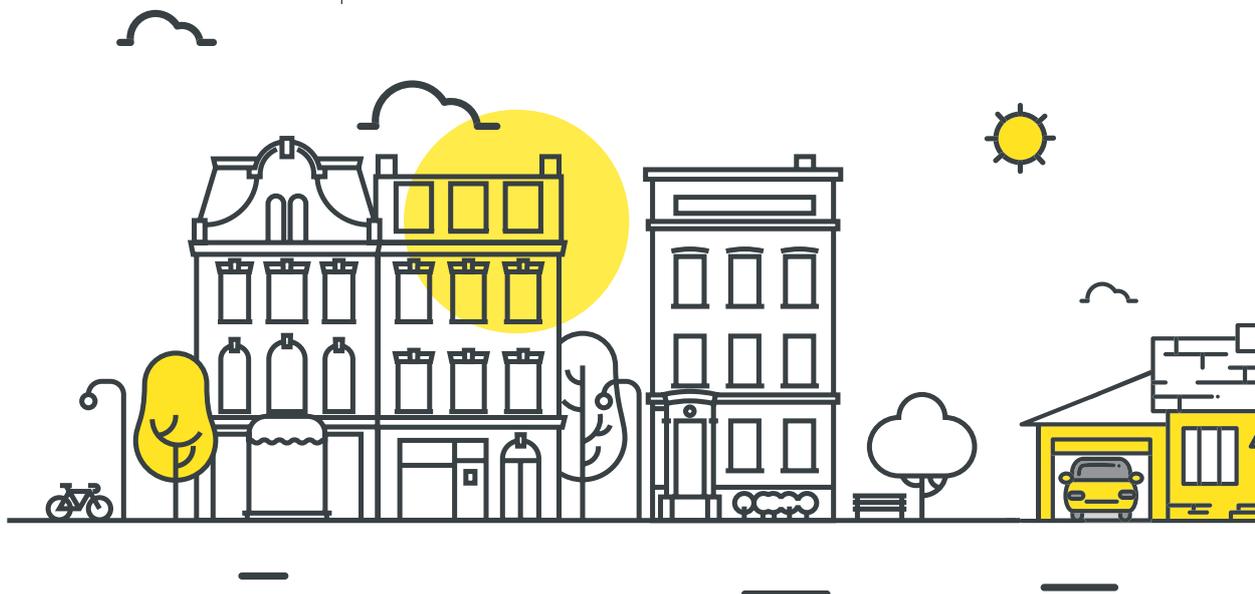
The Scottish Government began consulting on plans to introduce a legal duty on local authorities to reduce poverty. This would make Scotland the first part of the UK to take such action, despite a socio-economic duty being placed on public bodies in the UK Government's Equality Act in 2010.

The London Mayor announced plans to ask the government for new powers to introduce licensing schemes for landlords across the capital and to scrap Right to Rent. A number of councils also announced plans for stricter licensing for private rental properties, including: Salford, Hackney and Birmingham. ▶



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of citizens trust their council to manage their personal data



It was also announced that Uber will not be issued with a private hire operator licence in London after the expiry of its current licence on 30 September. Uber is appealing the decision and a petition against the ban was signed by over 800,000 people.

ENVIRONMENTAL

Plans to eliminate fossil fuels from road transport featured prominently this quarter. The UK Plan for Tackling Roadside Nitrogen Dioxide Concentrations was published, which includes the ban on the sale of all new conventional petrol and diesel cars and vans by 2040 and requires specific action from local authorities. This was followed by the Scottish Government committing to phase out the need for new petrol and diesel cars and vans by 2032.

Electric and alternatively fuelled vehicles saw a near 50% year-on-year increase in August, taking a 5.2% share of the overall car market. England's first electric vehicle experience centre opened in Milton Keynes and there were commitments to end development of new

fossil fuelled vehicles by Volvo and Jaguar Land Rover. Transport Scotland awarded £3.25m to four projects to develop low carbon travel and transport hubs, and plans were announced to install charging points at forecourts across the UK by the Motor Fuel Group and Shell.

Several community-wide renewable energy projects were launched this quarter. A 12 megawatt (MW) solar farm in Cambridgeshire was completed and funding was secured for the UK's biggest community energy scheme, a 14.7MW solar farm at Drayton Manor to provide electricity for 4,500 homes and £4.8m in benefits to the local community.

The Environmental Industries Commission launched a free to access cross-sector smart cities platform, bringing together all those using smart technologies or big data with an aim of creating cleaner, greener, and more sustainable city environments. Examples of related developments in the UK this quarter include: smart bins in Dundee, a GPS FlyMapper app to combat fly-tipping in Wales, and an app to collect data to improve urban spaces for people and wildlife launched by the University of Sheffield. ●



ACTIVITYTRACKER

Over £227m of public sector contracts advertised this quarter related to Advanced Urban Services

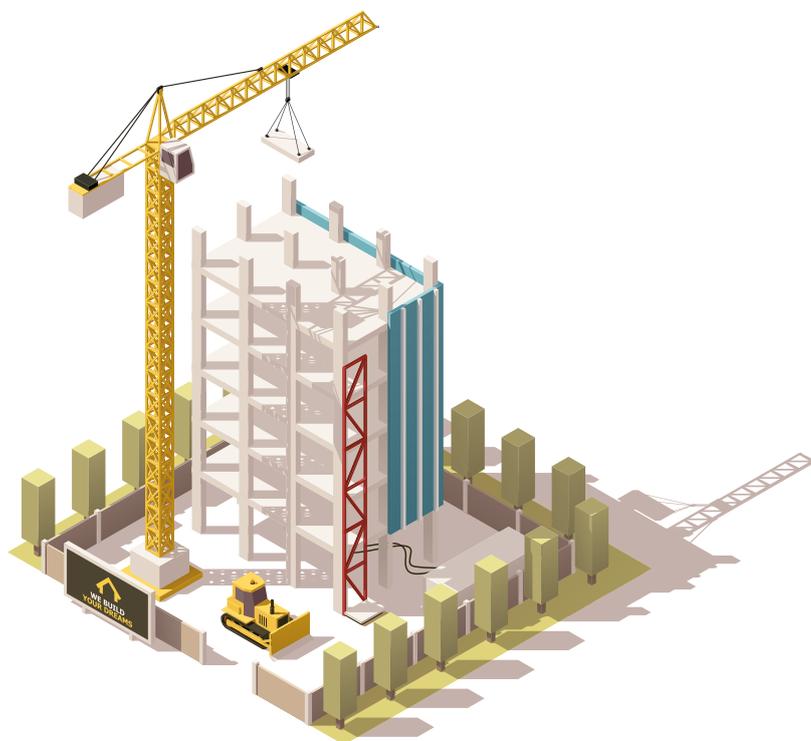
FUNDING ANNOUNCED THIS QUARTER

Just over £2.8bn of funding was announced this quarter. Almost £2.5bn of these funding programmes were open immediately, with the rest becoming available later in 2017 or 2018.

The bulk of this comes from the £2.3bn housing infrastructure fund which will support up to 100,000 new homes over the next four years. Advanced urban services will be just one of several sectors to benefit, with the fund targeting marginal viability schemes of up to £10m which are holding up housing development, and bids up to £250m to forward-fund strategic infrastructure.

Other significant funding announced is the £255m Air Quality Plan Implementation Fund, which requires final plans from local authorities by December 2018.

All other funding calls were for pots of £60m or less, including support for autonomous vehicles, grid integration of electric vehicles, security, litter and cultural regeneration. ●



£2.3bn

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UK funding programmes announced and open

Fund	Provider	Value	Purpose
Housing Infrastructure Fund	Department for Communities and Local Government	£2.3bn	To provide funding for marginal viability infrastructure needed to unlock housing sites and to forward-fund infrastructure schemes needed to enable urban development. The remit of this fund is broad, and advanced urban services is just one of several sectors which will benefit.
Land Release Fund	Department for Communities and Local Government / One Public Estate	£54m	To ensure local councils release some of their unused or surplus land for housing and small-scale infrastructure. The ambition is to unlock enough council-owned land for at least 160,000 homes by 2020, which would not otherwise be forthcoming.
Emerging and enabling round 3	Innovate UK	£25m	For innovation projects that inspire new products and services, disrupt markets and find new revenue sources. Funding applications must include an SME and demonstrate how the project will contribute to economic growth. With a focus on emerging technologies, digital, enabling capabilities and space application.
Connected and Autonomous Vehicles 3	Centre for Connected and Autonomous Vehicles	£25m	Industry-led research and development projects on connected and autonomous vehicles (AV). Projects need to develop AV solutions with real-world benefits, demonstrate how AVs will be integrated into current networks, have clear business models and commercial benefits.
Innovation in vehicle-to-grid (V2G) systems	Office for Low Emission Vehicles / Innovate UK / Department for Business, Energy and Industrial Strategy	£20m	V2G is a system for plug-in electric vehicles to return electricity to the power grid. £14m of this funding competition is for V2G demonstrator trials in real-world environments at scale. Projects must be business-led, and large projects should feature actors from across the advanced urban services sector such as energy companies, local authorities, service providers and infrastructure providers.
Northern Cultural Regeneration Fund	Department for Digital, Culture, Media and Sport	£15m	To build a lasting regional legacy from the Great Exhibition of the North
Accelerating innovation in rail 5	Innovate UK / Department for Transport	£7.9m	To create innovations that address disruption to train services and creating 'intelligent trains' – the two main goals of the 'Rail Technical Strategy Capability Delivery Plan'. Lead applicants must be a UK business, with a high level of technology maturity so that innovations can be implemented and exploited by railway companies quickly to realise benefits to passengers.
Improving Crowd Resilience	Home Office / Defence and Security Accelerator	£2m	The focus of this funding is to identify solutions to reduce the threat from the terrorists and the malicious use of explosives and weapons, as to enhance detection of threats in our public spaces. Project outputs should provide innovative ideas to develop an enhanced catalogue of options for operators and managers of public places and transport locations (as well as and security and law enforcement agencies).
Litter Innovation Fund	Department for Communities and Local Government / Department for Environment, Food & Rural Affairs	£450K	This fund aims to reduce litter by funding innovative approaches to pilot, implement and evaluate small scale local research projects that could be replicated more widely. Organisations from across the whole spectrum of advanced urban services are eligible, including local authorities, businesses, NGOs and social enterprises, education institutions and other public bodies.
People Mobility	European Space Agency (ESA) / UK Space Agency	TBC	Projects on the theme of urban mobility using one or more space assets. The call is within ESA Kickstarter Activities, to which the UK contributes a share of funds for UK projects.

European funding programmes announced and open

Fund	Provider	Value	Purpose
CEF Telecom Calls eInvoicing eTranslation Europeana Public Open Data	EU – Connecting Europe Facility	£20m	To provide funding for marginal viability infrastructure needed to unlock housing sites and to forward-fund infrastructure schemes needed to enable urban development. The remit of this fund is broad, and advanced urban services is just one of several sectors which will benefit.
Pilot project – European platform on vulnerable people in the Information Society: mapping best practices and socio-economic impact for the empowerment	EU – Pilot Projects and Preparatory Actions	£669K	Interactive catalogue and map of existing best practices at local, regional or national level to better integrate vulnerable and disadvantaged groups in the digital society. This will provide advanced urban services practitioners with examples of best practice and help them identify and fill gaps in their own service provision.

European funding programmes announced and open

Fund	Provider	Value	Purpose
Air Quality Plan Implementation Fund	Department for Environment, Food and Rural Affairs / Department for Transport	£255m	Focused on ensuring local authorities produce plans to achieve nitrogen dioxide (NO ₂) compliance at the roadside in the shortest amount of time, which the funding will help implement across towns and cities.
Clean Bus Technology Fund	Department for Environment, Food and Rural Affairs, Department for Transport	£40m	Funding for local authorities to invest in measures to reduce and limit emissions from up to 2,350 older buses.
Innovation Fund	Scottish Government	£60m	To increase innovation in new technologies, including low carbon projects and digital projects, including finding innovative solutions to the challenge of charging electric vehicles in densely populated towns and cities.

PUBLIC SECTOR TENDERS ADVERTISED

The largest proportion of UK public sector tenders in the advanced urban services sector have been in relation to intelligent systems, that exploit sensors and analytics to respond to environmental stimuli in real time.



Announced funding programmes yet to open

Category	Number of tenders advertised	Percentage of total	Number of tenders where the budget value is stated	Total budget value, where stated
Automation	3	3%	1	£0.8m
Intelligent / Smart Systems	48	47%	37	£140m
Digital Transformation	36	35%	21	£76.9m
Telecoms Infrastructure	9	9%	5	£4.9m
Regeneration	4	4%	4	£3.1m
Circular Economy	3	3%	1	£0.7m
TOTAL	103	100%	69	£226.5m

TENDERS IN EACH CATEGORY



AUTOMATION



INTELLIGENT /
SMART SYSTEMS



DIGITAL
TRANSFORMATION



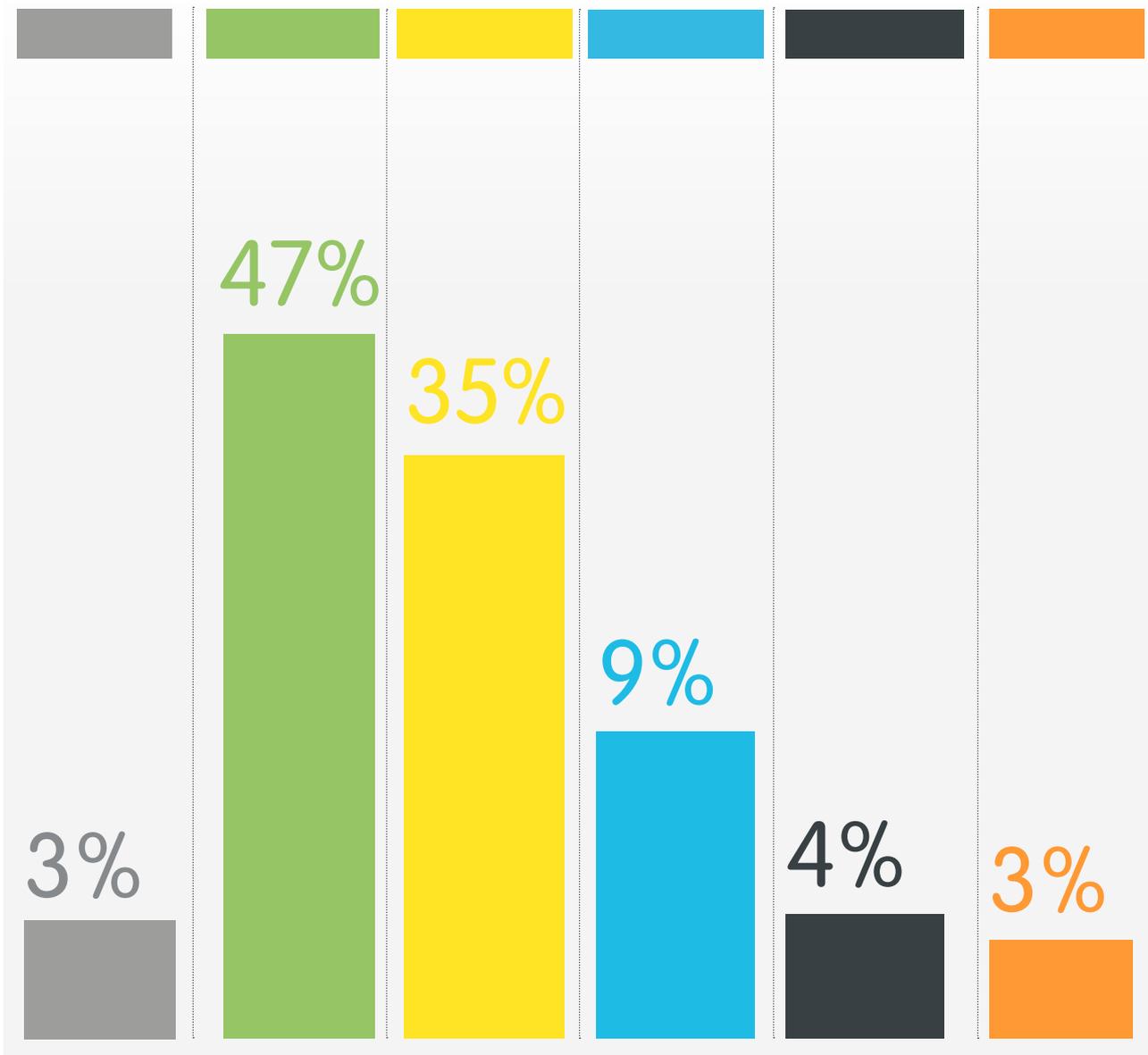
TELECOMS
INFRASTRUCTURE



REGENERATION



CIRCULAR
ECONOMY



Notable appointments this quarter

Job Title	Name	Date Appointed
<u>Chief Operating Officer for Government Digital Services</u>	Alison Pritchard	August 2017
<u>Chair of the UK Data Forum</u>	Guy Goodwin	August 2017
<u>Medical Director for Primary Care and Digital Transformation for NHS England (London)</u>	Dr Jonty Heaversedge	August 2017
<u>Chair of Scottish Cities Alliance</u>	Councillor John Alexander	September 2017
<u>Chair of West Yorkshire Combined Authority</u>	Councillor Susan Hinchcliffe	August 2017
<u>Chief Digital Officer for London</u>	Theo Blackwell	August 2017
<u>Chief Executive for Kirklees Council</u>	Jacqui Gedman	July 2017



Focus on: Air Quality



Air pollution has been named the single greatest environmental risk to health globally. As of 2014, about 92% of the world's population were living in places where air quality levels exceeded recommended safe limits. The health problems resulting from exposure to air pollution can include stroke, heart disease, lung cancer, chronic and acute respiratory diseases and mental illness such as dementia.

In the UK, the costs associated with air pollution add up to more than £20bn every year to the National Health Service and businesses. Poor air quality causes 40,000 deaths a year with nearly 40 million people living in areas where air pollution

exceeds legal limits and almost 1,000 schools within 150 metres of roads where pollution levels are unsafe and illegal.

This is particularly damaging to the health of children. Exposure to vehicular air pollution during pregnancy, infancy or childhood has been associated with delays in cognitive development. Studies have found that children who attend primary schools in neighbourhoods with high pollution have up to 10% less lung capacity than their peers. As well as shortening life-expectancies, this makes them more likely to suffer from increased rates of respiratory illnesses such as asthma and bronchitis.

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Low Emission Zones have been implemented in London, Brighton, Norwich, Nottingham and Oxford as a means to support cleaner forms of travel and the uptake of cleaner vehicles.



What do cities currently do?

Low Emission Zones have been implemented in London, Brighton, Norwich, Nottingham and Oxford as a means to support cleaner forms of travel and the uptake of cleaner vehicles. London plans to expand to an ultra-low emission zone in 2019, and implemented the Emissions Surcharge, also known as T-Charge in October 2017, and the Scottish government has committed to collaborate with a local authority to pilot a low emission zone by 2018.

Though all of these measures are a step in the right direction, some argue that they should go much further. For example, according to a Transport for London (TfL) assessment the T-Charge,

will save 1-3% of NOx (nitrogen oxides) emissions – which it describes as only ‘a minor improvement’.

Looking to data collection, **low cost sensor networks** supplement data from large environmental monitoring stations using small, less expensive and more localised sensor nodes with wireless communications. For example, the University of Strathclyde’s ‘Sensing the City’ project has developed a low cost mobile sensor system that complements static sensing, with the ability to use transport systems as a dynamic sensing network.

Gyorgyi Galik, Design Researcher at Future Cities Catapult, says: “Whilst low-cost sensors can be useful for raising awareness about air ▶

The costs associated with air pollution add up to more than

£20bn

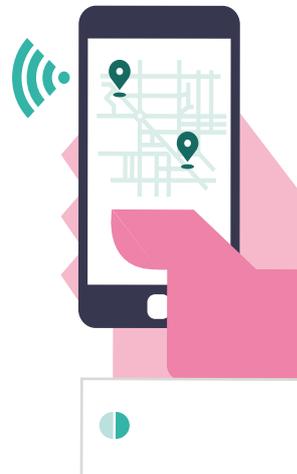
every year to the National Health Service and businesses.

“Finding a cleaner route to work can also be beneficial for health but we shouldn’t encourage people to look away and turn their backs on pollution. This narrative gives the false impression that we don’t have control over pollution.” Gyorgyi Galik, Design Researcher at Future Cities Catapult

pollution, it’s important to emphasise and understand the steps needed to move from monitoring air pollution to improving air quality. Before deploying low-cost sensor networks, cities, technology vendors, and activists should be aware of how costly and time-consuming it can be to maintain these networks – such as data analytics, calibration, and battery life. But more importantly, data should be produced in the service of a hypothesis or decision and not just for the sake of data spectatorship.”

She adds: “if data is being produced in order to decide between two courses of action, then evaluation can be undertaken to decide which action was more impactful. All too often air quality experiments reveal something we already know – the very fact that the air is polluted – and citizens get quickly disillusioned with no further change in the qualities of air. We need to know precisely what decision is waiting for the data. There are many political and economic barriers to why more radical decisions to improve air quality have not yet been made. People working with these technologies could benefit from a better understanding of the political context which they work within, and how political and economic interests often determine how cities respond to pollution.”

Crowdsourcing data from consumer products enables more accurate and hyper- local air pollution maps. For example, cycle couriers were provided with smart tags to track air pollution levels across London and a Fitbit-style wearable sensor with a companion smartphone app was recently commissioned by Plymouth City Council’s DATA Play initiative.



Real-time data is central to a range of air quality management strategies. For example, project ACCRA uses real-time air quality data to trigger hybrid vehicles to switch to zero-emission mode when driving in heavily polluted areas and the CleanSpace app allows cyclists to choose cleaner routes. ▶

The majority of Air Quality Management Areas in the UK are urban and in **96%** of these road transport is the main source of pollution.

Cooperative Intelligent Transport Systems (C-ITS) are being used to reduce vehicle idling time, improve driving efficiency and reduce emissions. For example, Cambridge and Newcastle are advancing systems that allow buses to communicate with traffic signals. As well as providing air quality benefits, intelligent traffic light systems generated economic benefits of £29m a year between 2009 and 2014.

Pollution filtering through technology and natural measures to improve air quality. For example, Glasgow recently deployed two CityTrees, temporary vertical gardens were installed around some CrossRail worksites in Central London, and the Body Shop trialled new technology to deliver up to 95% cleaner air at three bus stops in London.

While many interventions are currently looking at introducing green walls in different public spaces in the City, it's good to keep in mind that the cost of green walls can be forty times more than exhaust abatement technologies per kg of pollutants removed. "Finding a cleaner route to work can also be beneficial for health but we shouldn't encourage people to look away and turn their backs on pollution. This narrative gives the false impression that we don't have control over pollution. We should go beyond interventions that only have a marginal impact" says Gyorgyi.



What can cities do? Challenges and opportunities

The majority of Air Quality Management Areas in the UK are urban and in 96% of these road transport is the main source of pollution. Local authorities can employ a range of measures to encourage the uptake of low emission vehicles and government has earmarked funding to support such action. This includes an £11m investment in greener buses and a £15m research fund to tackle emissions from freight. Similarly, leadership at the local level and informed communications will be essential in motivating the necessary changes to behaviours and accelerating the introduction of policies to address this serious issue.

"The impact of air pollution could be greatly reduced by enforcing stricter emissions standards on both diesel and petrol cars. Private and public vehicles should be ▶



“Those who pollute the most should be incentivised to either change their practices or face much higher costs.”

Gyorgyi Galik, Design Researcher at Future Cities Catapult

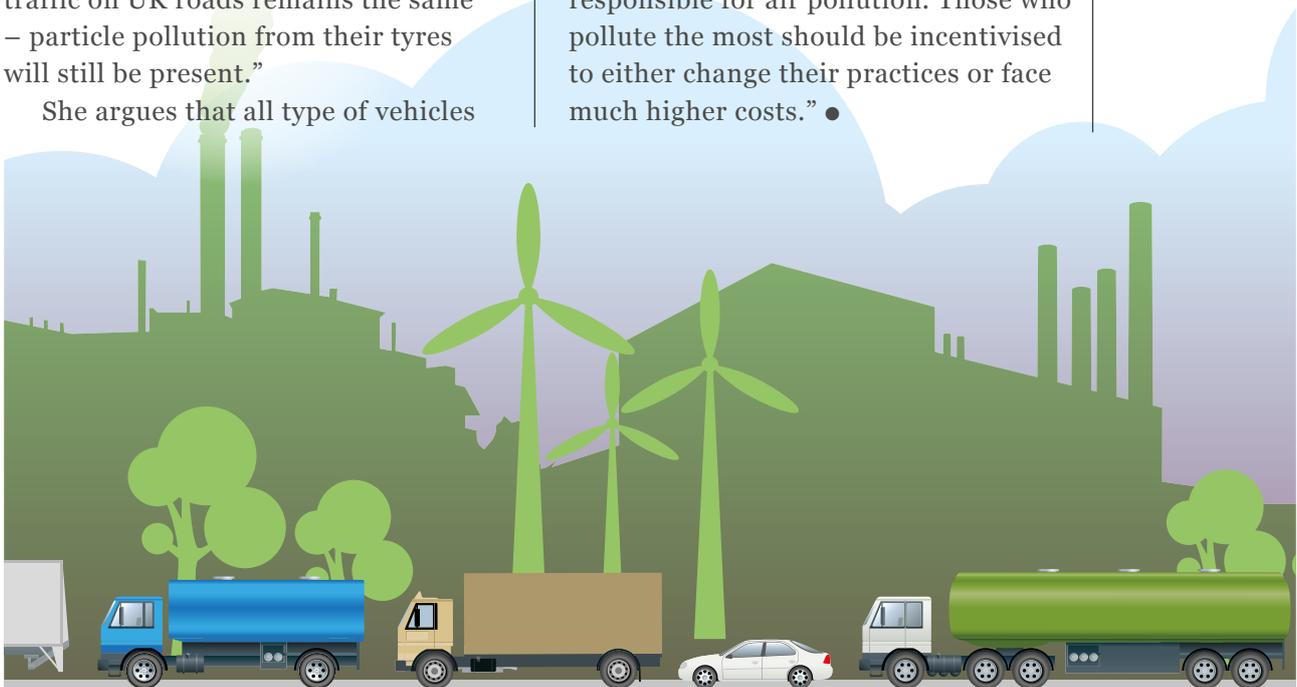
tested more frequently, based on real-world rather than laboratory emissions” says Gyorgyi.

“Improved testing regimes would more effectively identify poorly performing vehicles and accelerate the transition to a cleaner fleet. However, ultimately cities will need to reduce vehicle traffic altogether. Much of the most harmful air pollution comes from tyre and brake wear – rather than exhaust fumes. In fact, as Timmers and Achten explain in a 2016 study, non-exhaust emissions already account for over 90% of PM10 (Particulate Matter) and 85% of PM2.5 emissions from traffic. Though hybrid and electric engines have the potential to reduce tailpipe emissions, if the volume of traffic on UK roads remains the same – particle pollution from their tyres will still be present.”

She argues that all type of vehicles

should, therefore, be carefully regulated while other modes of such as public transit, walking and cycling should be encouraged.

Gyorgyi concludes: “a future city designed to tackle air pollution would have less road space and parking for cars, more provision for cyclists and pedestrians, cleaner and more efficient public transit, and stricter regulations for delivery vehicles and taxi fleets. Companies also have a role to play in improving air quality. By adapting flexible working hours and encouraging their employees to work from home, they could reduce vehicle emissions and limit exposure to pollution during rush hour. Achieving these changes will rely on greater transparency about who is responsible for air pollution. Those who pollute the most should be incentivised to either change their practices or face much higher costs.” ●



Focus on: Smart High Streets

UK high streets have been in a state of flux in recent years. Consumer spending is on course for its weakest year since 2013 and most shopping locations are witnessing a year-on-year decline in visitors. In August, high street footfall was down by 2.6%, while online sales rose by 11%. As a result of these trends, 11% of all high street properties were empty between April to June 2017.

There is also an increasing gap between the vibrant and in-demand areas and those at the much more economically fragile end of the spectrum. London is home to 34% of the top 50 most vital commercial centres, while many of the bottom ranking areas are small high streets in deprived areas, struggling to compete with stronger commercial centres nearby. Plans for the introduction of a 100% business rates retention system will also not favour the most economically

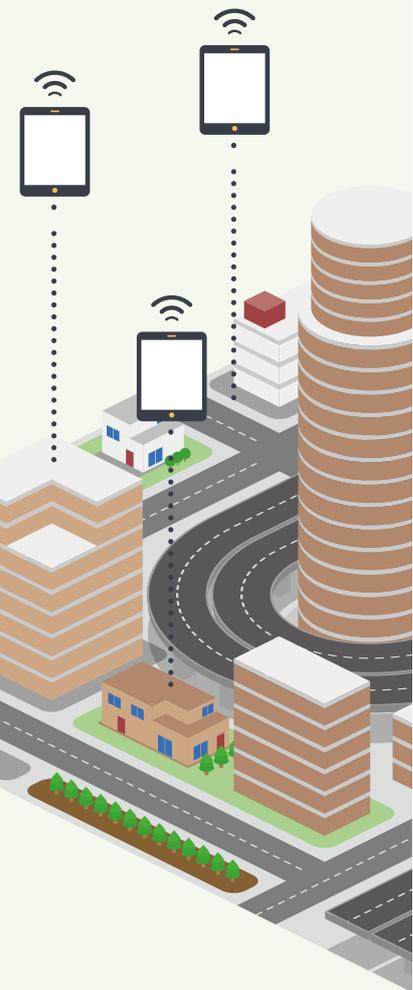
disadvantaged places.

Cities across the UK are therefore increasingly looking for ways to attract custom to high streets, facilitate convenient access to town centres, enhance visitor experiences and secure new investments in retail and leisure facilities.

What can cities do?

Free wi-fi is seen as an essential upgrade for most cities and provides important data and marketing information.

For example, payphones in Camden are being replaced by InLinkUK kiosks that provide free wi-fi, calls and phone charging services, which are all funded by the incorporated digital



advertising. A positive relationship has been reported between multiple wi-fi hotspots and digitally engaged consumers on the high street.

Footfall tracking technology can detect wi-fi enabled devices to measure the number of visitors, their movements and the frequency of visits. For example, the SmartStreetSensor project, a collaboration with University College London will install over 1,000 footfall sensors in 81 towns and cities, ▶



In August, high street footfall was down by 2.6%, while online sales rose by 11%.



80%

of all UK sales have a digital touchpoint and people are increasingly using smartphones and tablets during town centre visits, with 56% of in-store sales involving a digital device.

which will track passing devices every second.

Data analytics can determine the preferences and behaviour of high street visitors. For example, [Bringing Big Data to Small Users](#) is a project co-funded by Innovate UK. It develops tools for policy makers, retailers, property owners, and local partnerships to make informed and collaborative decisions about the future of town and city centres.

Real-time communications can also be used to offer promotions and incentives. For example, [Rewarding Visits](#) is a start-up that launched a platform in Mansfield in March 2017, which allows shoppers to print promotional vouchers from a network of digital “touch points” to use at high street shops. This generated nearly £25,000 of consumer spending in its first week, offering a potential £1.3m stimulus over the next year.

Proximity triggers detect customers as they approach targeted promotions, advertisements or news. For example, beacons

attached to buildings in [Manchester](#) are now sending news updates direct to mobile phones as part of a Google-funded trial which went live in July 2017.

Challenges and opportunities

The increasing use of technology on high streets is blurring the lines between physical and digital retail. Rather than representing the slow and inevitable decline of the high street, this provides an opportunity to enhance the convenience and experience of accessing retail and leisure facilities.

A reported [80% of all UK sales have a digital touchpoint and people are increasingly using smartphones and tablets during town centre visits](#), with 56% of in-store sales involving a digital device. However, recent research highlighted that [UK high street stores are failing to match the online shopping experience](#), with four in 10 consumers frequently disappointed by in-store technology.

Many of the efforts to address this change have been spearheaded by Business Improvement Districts. For example, Marketing Gloucester has positioned the city as a [test bed for digital high street initiatives](#).

Another way in which local authorities are rejuvenating high streets is by partnering with investment firms. For example, the 2017 Lexicon Project in [Bracknell](#) is a £240m scheme backed by Legal & General and Schroder UK Real Estate Fund. Legal & General is also working on large schemes covering parts of [Leeds, Cardiff and Cambridge](#).

[Retail-led regeneration](#) can revitalise communities by providing jobs, promoting economic growth and creating attractive places to draw people into an area. However, it is vitally important that this is embedded in a wider place-making and urban regeneration strategy, as [outlined in a research paper from UCL’s Bartlett School of Planning](#). ●

City Insights

Our first cities roundtable brought together three cities to discuss what they are doing, thinking and concerned about in relation to urban innovation. Representatives of local authorities in Dundee, Edinburgh and Sunderland gave an overview of the projects they are undertaking and shared insights on the challenges they face in deployment. Traditionally approaches to smart cities solutions have been developed by ICT managers which we have focused on in this issue. As we continue this series of quarterly reports we will consider more broadly the way in which urban innovation can be embedded into wider city strategies, with problems and challenges articulated by urban planners, place-makers and strategists.

Contributions were gratefully received from:

- Alan Dobson, Business Development Officer, Dundee City Council
- Gemma Cassells, ICT Relationship Manager, Edinburgh City Council

- Conn Crawford, Partnership Development Manager for ICT, Sunderland City Council
- Liz St Louis, Head of Customer Service, Intelligence and ICT, Sunderland City Council

Funding and investment

Each city has embraced advances in technology and new ways of working to upgrade urban infrastructure and to improve services. However, at a time of limited resources and scarce funding, innovation can be expensive. All three cities have found that project costs are often high, particularly when scaling-up trials to citywide initiatives.

Europe has been a major source of funding across the cities, with money secured from the European Regional Development Fund and Horizon 2020. However, administering this money can be challenging, with restrictions on eligible costs and state aid compliance. It can also take a long time for funding to be released, during which time politicians and service leads can change. ▶



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These challenges, along with the uncertainty related to Brexit, have sharpened the focus on private sector investment as an alternative source of funding. To make this a success, the cities advocate moving away from short-term engagements on single projects, to a sustained pipeline of projects that can support an ecosystem of private sector partners over a longer period.

Global corporates are increasingly looking to partner with cities to test out new products and services. Whilst this can be a welcome source of investment, local authorities also have an economic development remit and a strong motivation to enable SMEs to participate in the marketplace for advanced urban services.

Collaboration between cities is also a major opportunity to secure new investments, with partnerships such as the Scottish Cities Alliance offering a way to access funding for projects in cities that might otherwise be too small. Joint procurement can also combine purchasing power to enable delivery at scale, but requires each partner to be at the same state of readiness. ▶

Profile: Dundee



Overview

- **Population:** 148,300 (2016)
- **Percentage working age population with NVQ4+ level qualification:** 37.3%
- **Welfare spend per capita:** £3,852 (2014)
- **Percentage of high growth SMEs:** 8.8% (2014)



Challenges

- **Employment** – ensuring Dundee is an internationally recognised city at the heart of a vibrant region with more and better employment opportunities for citizens.
- **Education and skills** – improving education and training opportunities.
- **Health** – reducing health inequalities and physical and mental wellbeing, and improving the fitness of the younger generation.
- **Independent living** – enabled through support.
- **Sustainability** – creating a low carbon, sustainable city.
- **Accessibility** – delivering high quality and accessible local services and facilities.



Local innovation

- **Operations centre** – focused on up-scaling alarm systems and replacing CCTV with IP analytic-ready cameras for public safety.

- **Digital on the Move** – using gamification to help people dealing with welfare changes to consider how they can use their money.
- **Telecommunications** – various projects focused on increased connectivity including: the roll-out of superfast broadband (99% of households now have access to 10MB broadband); the R100 programme; a bid to the Local Full Fibre Network programme; and an ambition to become a 5G testbed.
- **Design for Business programme being developed by the V&A** – examining design-thinking as a key strategy for economic growth and innovation, linked to the Dundee's status as a UNESCO City of Design.
- **The MILL (Mobility Innovation Living Laboratory)** – innovation centre launched in 2017 to establish Dundee as a test-bed for innovative technologies and business models related to smart mobility.
- **Electric vehicles** – large-scale electrification of council fleet, city-wide charging network, infrastructure for taxis and three charging hubs with microrenewables and energy storage.
- **Smart street waste** – deploying a mixture of smart technology to increase efficiency and effectiveness and reduce CO2 emissions.
- **Open data platform** – joint procurement with other Scottish cities, as part of a wider initiative to promote ideas of open data and common standards in public sector procurement.

Profile: Edinburgh



Overview

- **Population:** 498,800 (2015)
- **Percentage working age population with NVQ4+ level qualification:** 57.7%
- **Welfare spend per capita:** £2,809 (2014)
- **Percentage of high growth SMEs:** 10.4% (2014)



Challenges

- **Growth** – a rapidly growing city that is running out of space for development.
- **Congestion** – ranks second most congested city in the UK, joint with London.
- **World Heritage Site** – this status brings development constraints.
- **Tourism** – spreading the benefits and pressure beyond the square mile.
- **Affordable housing and heating** – particularly pertinent in some of the old and poorly insulated tenement flats.



Local innovation

- **Smart litter bins** – installing sensors in bins has been particularly successful in addressing the challenge of spikes in city centre activity during the Edinburgh Festival.
- **Vehicle telematics** – enabling route optimisation for refuse collection vehicles and winter gritting spreaders.
- **LED street lighting** – it is estimated that this will save the city £77m over the next 20 years.

- **Robot mowers** – a trial to investigate ways of making better use of the horticultural skills of parks and green space staff whilst also collecting environmental data on micro-climates.
- **Off-grid applications** – planned trials for applications such as solar powered electric vehicle charge points with battery storage.
- **Contactless and m-tickets on buses** – a trial of contactless payment on the Lothian Buses Airlink service, and the launch of the Transport for Edinburgh app for m-tickets.
- **Applications for open data portals** – including investigating the potential for mitigating the volume of Freedom of Information requests.
- **Ultrafast full fibre broadband network rollout** – to serve both the business community and public sector across the city.

Profile: Sunderland



Overview

- **Population:** 277,200 (2015)
- **Percentage working age population with NVQ4+ level qualification:** 25.3%
- **Welfare spend per capita:** £3,924 (2014)
- **Percentage of high growth SMEs:** 8.9% (2014)



Challenges

- **Historic socio-economic problems** – recovery from the decline of traditional industries has been supported by the building technology sector in the 1990s and the software sector in the last five years.
- **Up-skilling** – moving the employment base up into higher skill levels, and using research, development and innovation as an engine for this.
- **Automotive workforce** – maintaining and developing the skills in the automotive industry to supply the next generation of employees and to progress emerging technology, such as electric and connected vehicles.
- **High street viability** – dealing with competition from both large-scale retail nearby and online sales.



Local innovation

- **5G** – the city developing a new approach to the co-ordination of digital infrastructure.

- **International Advanced Manufacturing Park** – a world class location where the automotive supply chain and advanced manufacturing businesses will innovate and thrive attracting over £300 m of private sector investment and exploring emerging vehicle technologies.
- **Water meters** – a network of over 300 meters across the public estate to collect data, enable better management of leakages and billing.
- **Health and social care integration** – an integrated operating model with local teams across health and social care, integrated commissioning intentions and the development of shared intelligence processes. Enhanced user focus and design is resulting in high levels of service users having their needs addressed by preventative and re-ablement pathways.
- **Community Safety** – a multi-agency approach through shared and integrated datasets supporting a range of early interventions and tackling crime and disorder. Intelligence profiles and risk stratification dashboards enable intelligence driven decision making to target resources and achieve better outcomes.
- **Community Re-Use Civic Accelerator** – an initiative involving SME's which has delivered a technical solution to reduce landfill and recycle unwanted goods.
- **Alcohol Harms** – a regional analytical approach sponsored by Nesta to tackling this wicked issue.

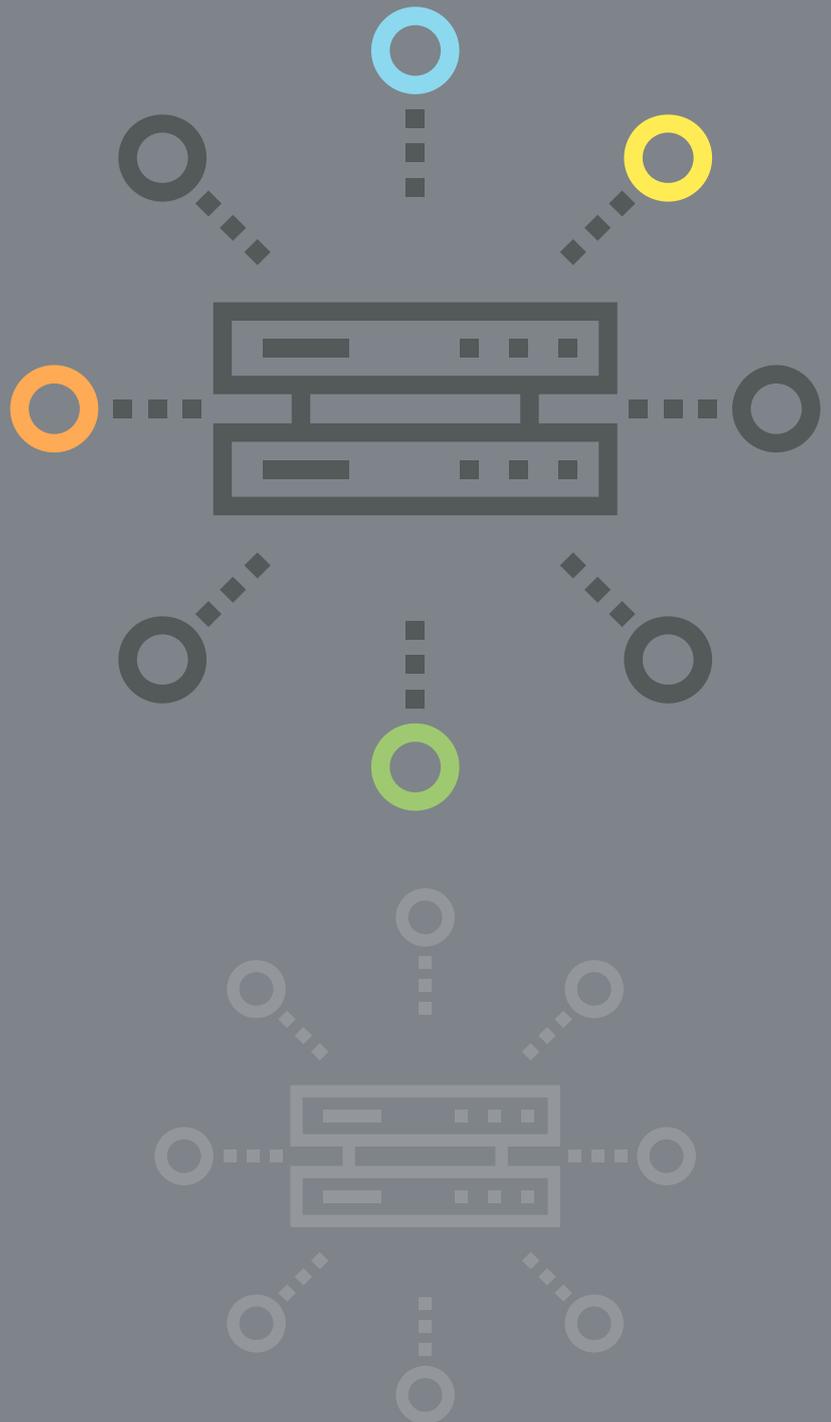
SYSTEM INTEGRATION

A shared priority of the cities is the desire to integrate systems. This is motivated by extracting more value from data, supporting better decision-making and improving service design. Whilst local authorities are beginning to understand the value of data, the speed of exploitation can be slow in comparison to the private sector.

The cities are working to address a number of technical challenges in integrating systems. This includes linking Internet of Things (IoT) networks, converting data managed on proprietary systems into usable open data and specifying interoperable technology to an appropriate and common standard. This can be particularly problematic as technology is emerging with a limited number of suppliers.

Cities also face governance challenges. This includes establishing joint boards, such as between health and social care, and managing data assets across multiple public and private partners.

Local authorities also face the very practical challenges of improving the digital skills of council staff to enable them to drive initiatives and to build open data communities that enable real value to be realised from their data assets.



CITIZEN ENGAGEMENT

There is a drive to enable smart citizens rather than just smart cities. This recognises that more value can be extracted where data is sourced from people as well as sensors. The goal is not just to make the services easier to deliver but to also make people part of a city's innovation engine.

At the most basic level, digital and data literacy is critical for participation. Improving participation also requires efforts to build trust and comfort in accessing services online.

A related challenge is the need to make the future cities agenda real to people. Many advanced urban services can be perceived as conceptual or divorced from everyday priorities. Effective engagement requires that innovation is directly connected to real

world problems and delivers tangible benefits to people's lives.

Improving citizen participation is often a more time-consuming process than putting in the technology. Systems such as block chain and distributed ledgers offer the potential to reshape the way citizens interact with city leadership mechanisms.



MANAGING RISKS

In practice, experimental projects with uncertain outcomes can only proceed where there is a back-up system or where it is not a critical service.

For example, it is much easier to experiment with staffing structure than with a critical system such as a benefits database.

The risk-appetite of organisations is another factor that impacts innovation. In general, local authorities are highly risk averse, especially with

larger schemes and investments.

To mitigate the risk of failure, ICT departments in local authorities are increasingly working in partnership with service leaders. Design thinking and innovation in services is providing a way to harness ICT as an enabler rather than an add-on to service delivery.

This process also empowers service leaders to make proactive decisions to enhance delivery and reduce risks.

WHAT CAN FUTURE CITIES CATAPULT DO TO HELP?

From Belfast to Belo Horizonte, Future Cities Catapult has helped public authorities, prime suppliers and other buyers of advanced urban services with expert, agnostic, pre-market advice and practical support to engage the innovation ecosystem and tackle thorny urban challenges. We do this through a combination of:

- Research and analysis into current trends and state of the art in advanced urban services
- Insight-driven problem definition, prioritisation and articulation
- Challenge-led innovation ‘open calls’ that harness the creativity of the market
- Implementable roadmaps to embed innovative approaches into organisations and realise change
- Robust impact evaluation of projects and interventions that unlock further investment.



LOOKING AHEAD

The second issue of *City Innovation Brief* will be published in February 2018, updating on the trends, issues and opportunities emerging in UK cities.

Our feature articles will review how advanced urban services are being used to improve the management of the public realm, create stronger local identities and the innovative ways that cities are securing investments for projects.

We will also update on developments in more UK cities and shine a light on emerging priorities and lessons learned.

City Innovation Brief is actively looking to crowdsource good ideas and good practice, so please do get in touch if you'd like to contribute to our next brief.

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