

2017 – 2018



Smart Cambridge

Smart Cambridge is exploring how data, innovative technology and better connectivity can be used to transform the way people live, work and travel in the Greater Cambridge area and beyond.

Supported by the Greater Cambridge City Deal, this rapidly evolving programme is harnessing emerging technologies to improve the economic strength and sustainability of the area.

Local councils, technology businesses, university researchers and partner organisations are working collaboratively to find smart ways to tackle city challenges, such as transport and air quality.

The pioneering research is managed through the Connecting Cambridgeshire partnership programme, which is improving the county's digital infrastructure with better broadband, free public WiFi and wider mobile coverage.

Who is involved?

Smart Cambridge is overseen by a Project Board and an Advisory Group to steer the work and give

technical guidance. The programme is working with a wide range of cutting edge tech' businesses and is keen to collaborate with anyone who can contribute.

Greater Cambridge City Deal partnership includes: Cambridgeshire County Council, Cambridge City Council, South Cambridgeshire District Council, University of Cambridge, Greater Cambridge and Greater Peterborough Local Enterprise Partnership.

Smart Cambridge Advisory Group includes: ARM, Anglia Ruskin University, BT, Cambridge Wireless, CCS, University of Cambridge Computing Laboratory, Information Services and Engineering Departments, Cambridge Cleantech - Smart Cities SIG, Microsoft Research, Redgate, Thingful, TTP and others.

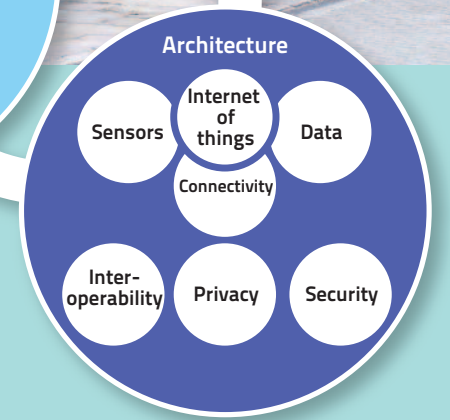
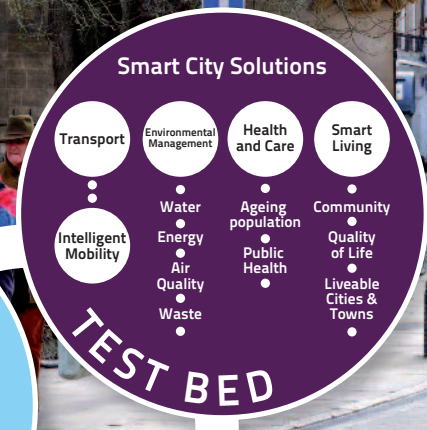
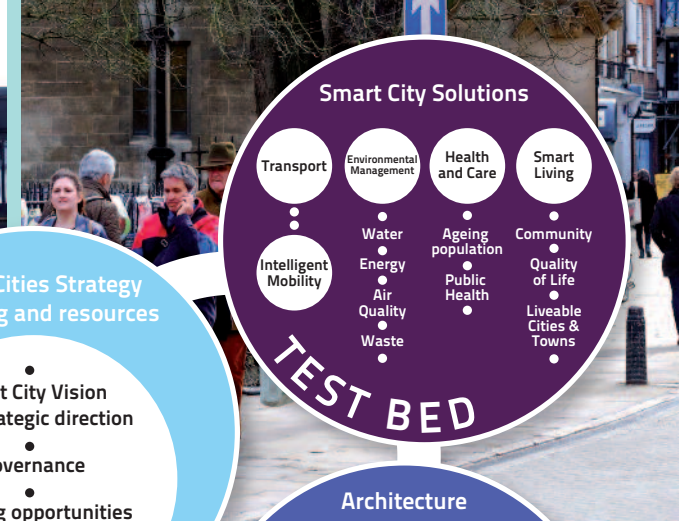
“ We have a unique opportunity to harness the brainpower and business might of Greater Cambridge to find innovative solutions to challenges faced by our region, and indeed all growing cities. That's why taking a collaborative approach is the best way forward for Smart Cambridge and could lead the way for other smart cities. ”

Cllr. Francis Burkitt, Vice-Chairman, Greater Cambridge City Deal Executive Board.



Contents

What makes a smart city?	3
How smart is Greater Cambridge?	4
Sensors and open data	5
The Intelligent City Platform	6
Using data to plan smart solutions	7
What does it mean for communities?	8
What does it mean for businesses?	9
What's next?	10
Contacts	12



What makes a smart city?

Digital technology underpins almost every aspect of modern living across work, travel, leisure and health, and increasingly impacts on the economic strength, sustainability and quality of life of our communities.

Smart cities technology builds on this, using digital connectivity and data in innovative ways to address city challenges in four key areas:

- **Transport:** making travel easier, reducing congestion, and exploring intelligent mobility
- **Environment:** managing our water, energy, air quality and waste
- **Healthcare:** catering for an ageing population and providing public health
- **Smart living:** improving the quality of life for communities in and around the city.

Smart Cambridge aims to ensure that Greater Cambridge is a 'smart city region' by providing the

infrastructure needed to collect and analyse data that can be used to develop innovative solutions to some of the area's challenges.

The work supports the wider economic ambition of the Greater Cambridge City Deal, which is investing in transport, housing and skills to facilitate sustainable economic growth in the area.

With investment from the City Deal, the Smart Cambridge programme is being scaled up from 2017-2020, to focus on maximising the impact of transport-related work through:

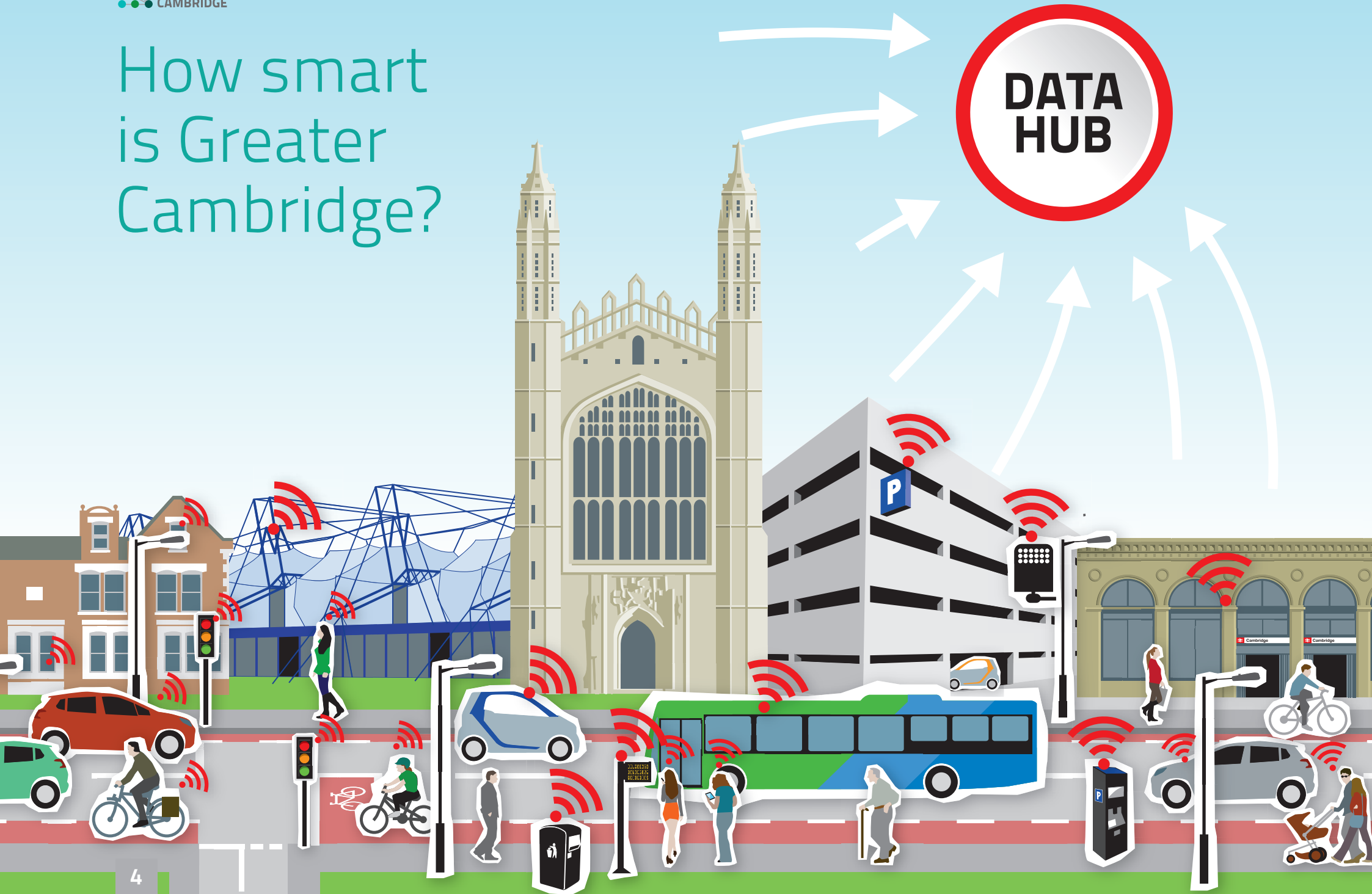
- Better quantity, quality and use of data
- Embedding digital solutions and emerging technology

- Collaboration with business, community and academic sectors

Over the next three years, the wider work of the programme will cover:

- Better travel and transport information for journeys
- Easier payment options including integrated ticketing and online payments
- Smarter signalling
- Monitoring of air quality
- Future transport initiatives including driverless vehicles

How smart is Greater Cambridge?



Sensors and open data

Greater Cambridge already has significant infrastructure that is connected and produces valuable data - laying the foundations for more smart city technologies.

Traffic lights, parking meters, passenger information screens, waste bins, CCTV cameras, air quality monitors, street lights and bus times are just some of the networked services connecting the city.



The sensors collect the following data:

- **Buses** – real time locations in Long/Lat and time stamped
- **Bus Stops** – real time displays show how many minutes until the next bus is due
- **Air Quality** – shows the levels of various gases
- **Traffic Lights** – number of cars crossing a set point

- **Blue tooth detectors** – number of cars and average speed between two points (real-time)
- **Car Park sensors** – show the main council-operated and Park & Ride car parks filling up and emptying – number of available spaces (real-time)
- **Bike sensors** – number of bikes that have crossed a point

- **Bin sensors** – how full the bin is to inform collection
- **Flood sensors** – on the river that show river level (real-time)
- **Weather Stations** – give real time weather reporting (temp/humidity/rainfall etc).

Smart Cambridge is working with others to build upon this by joining these networks up and using the data in a smarter way.



Cambridgeshire Insight Open Data

Other static and more contextual data can be found on Cambridgeshire Insight an open data portal that has been recognised by the Cabinet Office as one of the UK's leading sources of open data. This partnership platform provides an easy way for users to access and share data, information and research for deeper insights into the local area.

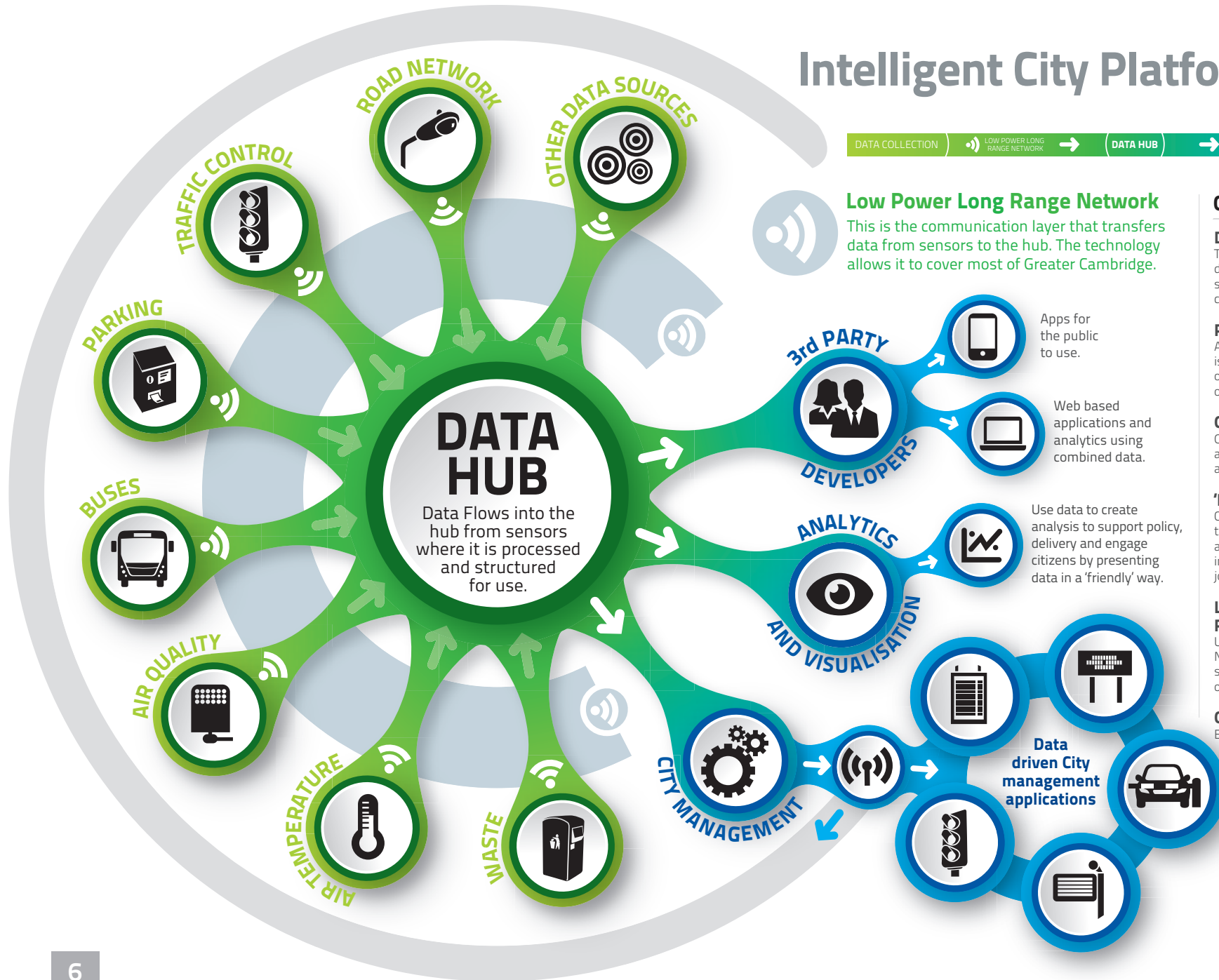
Find out more at: <http://opendata.cambridgeshireinsight.org.uk/>

Intelligent City Platform (iCP)



Low Power Long Range Network

This is the communication layer that transfers data from sensors to the hub. The technology allows it to cover most of Greater Cambridge.



Glossary

Data Hub

This includes storage for data on either the Cloud or server(s) and software to collate and analyse data.

Platform

A group of technologies that is used as a base on which other applications, processes or technologies are built.

Open Data

Open data is data that anyone can access, use and share.

'Internet of things'

Connection of physical objects to the internet which allows them to exchange information and be more joined up.

Low Power Long Range Network

Usually called a Wide Area Network used for sending small packages of data over a wide area.

Open Standards

Enables different systems to talk to each other and open to all.

Using data to plan smart solutions

Smart Cambridge is working with the University of Cambridge to develop a leading digital platform that will support myriad smart solutions.

Launched in March 2017, the Intelligent City Platform (iCP) is collating and processing real-time data from an array of sensors around the city that can be used in a host of applications.

The first phase of the platform involved setting up a data network to support 'Internet of Things' technology - allowing products to 'talk' to each other - and a data hub to collate and process the data.

The city-wide sensor network is gathering data from existing systems such as traffic lights, bus movements, and



car parks, together with new traffic monitoring cameras and air quality sensors. These can be used to monitor a range of measures including air quality, traffic, cycle and pedestrian movements.



A new **LoRaWAN (Low Power Long Range) network** has also been established in collaboration with the University of Cambridge to transfer the data flowing in from the sensors to the data hub. The combined data can then be analysed and visualised to plan smart solutions including making transport systems more reliable and easier to use.

The platform will also allow citizens, third-party developers and commercial partners to use the data to 'test bed' innovative applications, such as a new mobile travel app (see page 6).

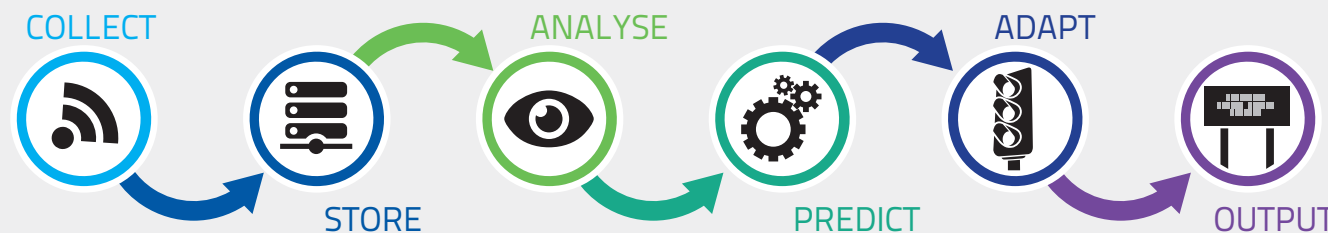
Watch this space

The Smart Cambridge team will be sharing the technology behind the digital platform as it develops at www.smartcambridge.org

“ This is just the first phase; we started with the construct that the modern city will need to adapt and we built it from there. It's complex and challenging but we're already seeing how the data can be used to predict traffic movements and provide real-time information to make our transport systems more reliable and easier to use. ”

Dr Ian Lewis, Director of Infrastructure Investment, University of Cambridge.

The process for developing the iCP and using the data



What does it mean for communities?

'Smart city' innovations are designed to improve the experience of all citizens living, working and travelling in and around the city - and also to engage them in the process.

A new mobile travel app, improved real-time bus updates and digital information screens are just some of the evolving practical applications being developed under the Smart Cambridge programme, together with opportunities for business growth.

New Mobile Travel App

Cambridge-based technology company Building Intellect is developing a new mobile travel app to help travellers to plan their journeys around the



“ As a Cambridge tech start up, it's great to be working with Smart Cambridge on a new mobile travel app that will help people plan their journeys in and around the city. We've worked with other cities and we know this app has huge potential to improve journey times and encourage people to use more sustainable transport. ”

Daniela Krug, Director of Building Intellect Ltd

city and encourage them to use more sustainable modes of transport.

Building Intellect Ltd was awarded the contract funded by the City Deal, having developed a first stage MotionMap system for the MK:Smart programme in Milton Keynes and working with other cities on similar projects.

Available from summer 2017, the free mobile app will use real-time local information to suggest optimum travel itineraries for travellers – combining walking, cycling, bus, train and car travel.

It will also have the potential to provide additional useful information such as how full the buses are, car-parking availability and weather conditions, together with a carbon counter to show the environmental impact of their journey.

Get involved in using data

Citizens and businesses can get involved in using the latest data and digital technology to find creative solutions to the city's challenges by taking part in a forthcoming series of Smart Cambridge community events and #hackathons.



Connecting people

Less visible, but just as vital, is the free Wifi now available in public buildings and open spaces in and around the city with the support of the University of Cambridge and Government funding, so people can work, socialise and access public services more flexibly.

Connecting Cambridgeshire is aiming to roll-out high speed fibre broadband access to 99% of homes and businesses by 2020, and is improving mobile and public wifi coverage to ensure Cambridgeshire is a leading digital county with a 21st Century digital infrastructure.

What does it mean for businesses?

World-class innovation

Greater Cambridge enjoys a vibrant, expanding economy and is one of the UK's top growth hot-spots.

The academic researchers and high-tech businesses which form 'Silicon Fen' represent one of the world's great entrepreneurial clusters.

Cambridge ideas can change the world and the city has a well-developed network of accelerators, incubators and business networks that can contribute considerable expertise to finding smart city solutions.

- Over 4,500 knowledge-intensive companies are registered within 25 miles of Cambridge and the city registers the most patents per head in the UK.
- Tech-based businesses have grown by 20% in Greater Cambridge since 2009 employing more than 60,000 staff, with more than £11 billion turnover.

Cambridge companies are leading the way in the development of the 'Internet of Things' (IoT) and Smart Cities, designing the chips to power devices, developing standards such as Hypercat, and on the ground solutions to city challenges.

The University of Cambridge is also pioneering smart city and IoT innovation, working with industry to realise the potential they have to transform design, construction and management of infrastructure in cities.

Cutting edge research across different departments includes: using large amounts of data collected through the 'Big Data' initiative, applying the latest sensor technologies and data management tools, and developing transport systems using driverless vehicles.

Boost for businesses

Tech-based businesses in and around Cambridge are being challenged to drive forward Internet of Things (IoT) innovation to help find real world solutions to address city issues.

Ten small and medium sized (SMEs) companies will be supported through the national Digital Catapult IoTUK Boost programme being delivered by Cambridge Wireless (CW) with winning solutions showcased during 2017.

The businesses will use the city-wide low power wide area network (LoRaWAN) set up through the Smart Cambridge programme to develop and test technology solutions for one of three core



challenges in air quality monitoring, transport, and ill health among older people.

With longer range, decreased power requirements and lower costs, LPWAN networks enable a much wider range of IoT business applications to support business innovation.

CW has formed a core partnership with Smart Cambridge, Everynet, LoRa Alliance, and Iotic Labs. Sponsors include Arkessa, Eastern Academic Health Science Network, and Flex.

“ A key role of CW is to bring together companies – both large and small – to share knowledge and insights. We are thrilled to be joining up with Smart Cambridge so that the developed solutions can have a direct impact on the city. We hope this is just the first step in encouraging all the main LPWAN technologies to test and explore the delivery of real world solutions in Cambridge. ”

Robert Driver, CEO of CW (Cambridge Wireless).

What's next?

Smart Cambridge is paving the way for ground-breaking research to support the Greater Cambridge City Deal's aims to improve the transport infrastructure in and around the city.

As with all leading edge technology, it involves lots of testing and trialling to find the best solution, and there is always a risk it will not prove viable.

The next phase of the programme will build upon the studies already underway to investigate the future use of 'intelligent mobility'. These include:

Smart ticketing

'Smart ticketing' - using a single ticket, which can be bought online, for a complete journey to simplify switching from one mode of transport to another - could be the way forward for city commuters.

ARUP has been appointed by the City Deal to carry out a study into the possibility of integrated and



'smart' ticketing in Greater Cambridge to encourage more people to use public transport instead of cars to reduce congestion.

Autonomous vehicles

The University of Cambridge is researching the potential for using autonomous (driverless) mini-buses to link academic, medical and business campuses with the city's rail stations and Park & Ride carparks.

The study has been commissioned through the City Deal as part of a bid for further funding from the UK Government's Office for Connected Cars and Automotive Vehicles (C-CAV), which has pledged more than £100million to support innovative projects over the next five years.



Autonomous vehicles

Intelligent Mobility

Smart Cambridge is paving the way for research into 'intelligent mobility' including:

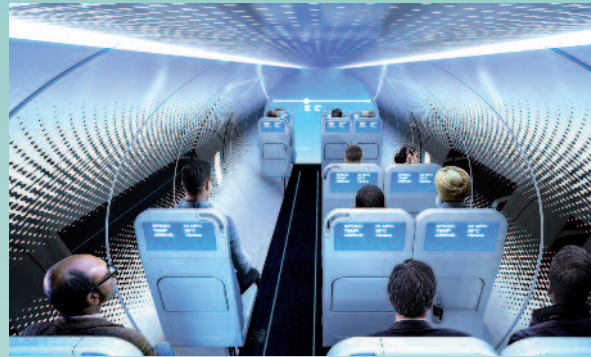
- gathering better transport data to help model future schemes
- integrated ticketing to make public transport quicker and more attractive to use
- digital 'wayfinding' to help people move around the city more easily
- exploring the potential for autonomous vehicles (driverless cars).



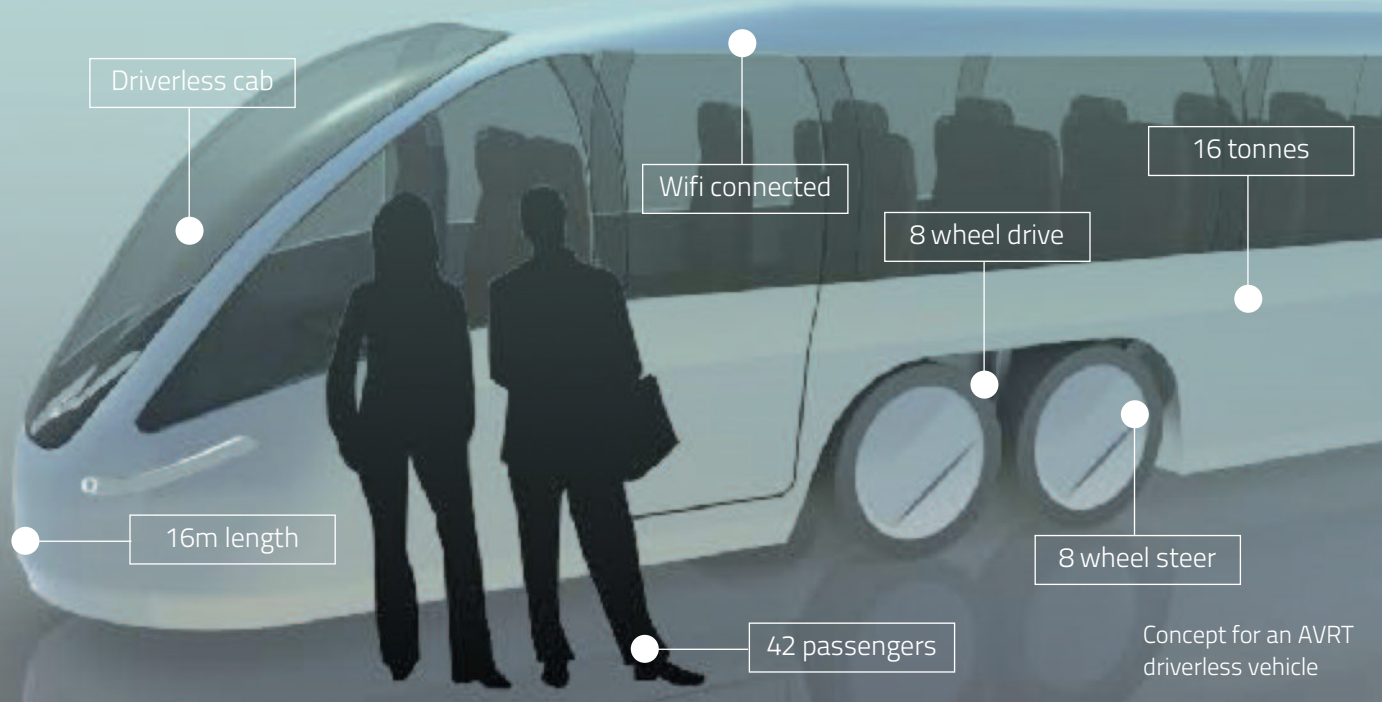
Future transport system

Transport experts at the University of Cambridge are researching the viability of an 'advanced very rapid transport' (AVRT) system that would mean people could travel rapidly across the city in a matter of minutes in decades to come.

Supported by the City Deal and Cambridge Ahead, the feasibility study is exploring the practicability of a rapid mass transit system using segregated track with a mix of above ground and underground segregated routes with high speed driverless vehicles.



The outcome of the research will help to future proof on-going investments and find cost-effective solutions to the city's transport issues, building on current and planned infrastructure.



Air Quality monitoring

Poor Air Quality impacts on the health of city residents and quality of life. Smart Cambridge is working with the City Council, University of Cambridge (chemistry and computer labs) and Cambridge Environmental Research Consultants to look at how air quality can be better measured within the city.



Twenty sensors were placed at key points around Cambridge using a larger number of measurement nodes to understand how air quality varies across the city, particularly in main transport corridors and areas of construction activity.

The first phase proved that the sensors compared well to the existing roadside monitoring stations. The second phase will see the project compare the air quality data with other sources of data such as weather and traffic flows to begin to really understand what the sources of pollution are. This will then feed into work to begin to improve air quality across the city.





Find out more

Smart Cambridge programme: www.connectingcambridgeshire.co.uk/smartcamb/

Smart Cambridge technology data www.smartcambridge.org

Greater Cambridge City Deal projects www.cambridgeshire.gov.uk/citydeal/smart

Cambridgeshire Insight Open Data: <http://opendata.cambridgeshireinsight.org.uk/>

Contact

Smart Cambridge Programme Team

Call: **01223 729079**

Email: smart.cambridge@cambridgeshire.gov.uk

Twitter: [@SmartCamb](https://twitter.com/SmartCamb) [@gccitydeal](https://twitter.com/gccitydeal)

Supported by:



Published March 2017.

PDF version available online.

Photos Richard Marsham by kind permission of: CCS, University of Cambridge, Mills & Reeve, Microsoft.

Designed by Rolando Ugolini

Collaborating with:



Microsoft Research

