Smart Cities toolkit

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Fun facts: did you know?

- In 1950, 30% of the world's population was urban. By 2050, more than 6 billion people will live in urban areas
- Each year the world generates about **53.6 million tonnes of e-waste:** the fastest-growing waste stream in the world
- The UK is one of the top 10 countries in the world for electric vehicle growth and penetration rates
- In 2020 a new tech business launched every 30 minutes[1]
- The UK now has more than **1,300 AI companies** and employs more than **30,000 people**[2]

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Introduction

The evolution of Smart Cities might be one of the most impactful changes to benefit urban communities in decades. Covid lockdowns taught us that technologically driven sustainable living is very much the here and now. Working patterns have evolved, and with that, lifestyles and expectations. It has never been more important to make our urban environments, and infrastructure connectivity, work for us.

According to the Open Business Council[3] over half of the planet now lives in cities, and **more than two-thirds of the world's population will be urbanised by 2050**. Over the next two decades an estimated **global infrastructure investment of £25 trillion** is required to address key urban challenges and ensure sustainable urban futures.

Back in the 18th century Britain led the way in the creation of global, market-driven industrial cities. Manchester's booming cotton industry put it at the heart of a global network of manufacturing and trade. Centuries on, the UK continues to be a **leader in innovative technology** and in **designing and creating the cities of the future**. It is home to world-leading expertise in all sectors of Smart Cities.

According to the IESE Cities in Motion Index, **London**[4] is ranked **the top Smart City in the world**, ahead of New York and Paris. London also led the Index in 2015, 2019 and 2020. The research platform looked at 183 cities worldwide, evaluating them against nine key dimensions: economy, human capital, technology, environment, international profile, social cohesion, mobility and transportation, governance and urban planning.

Smart Cities provide a **better quality of life** and more **sustainable living**. To move forward efficiently and sustainably, in a way that harnesses digital technologies for its inhabitants, cities require smarter urban transport networks, smart water and waste management and more efficient ways to heat and light buildings.

Smart solutions also need an interactive and responsive city administration and safer public spaces. The needs of an ageing population must also be met.[5]

Recent technological advances have put maps on our phones, wearable sensors around our wrists and smart devices in our homes. Information defines who we are and how we interact with the world and is transforming how we live our lives.[6] Urban spaces are becoming a **living and learning environment** as technology makes it possible to record data on everything from traffic, air quality and energy usage to occupancy and activity (over time), security and environmental changes.

The UK has a proud record of innovation. It gave the world the steam engine and the jet engine; railways and Tarmac roads and the game-changing information-sharing tool: the **World Wide Web**. The structure of DNA was unravelled in a UK laboratory, as was penicillin, and the Oxford AstraZeneca vaccine.

In the "smart" world our expertise is focused on the convergence and integration of healthcare, transport, energy, smart grids, location data, digital media and the built environment. There is a huge opportunity to develop liveable and resilient urban infrastructures using smart financing and business models.

AI will play a huge role in the development of liveable, sustainable cities. In 2021 the UK unveiled its 10-year **National Artificial Intelligence Strategy**, with the aim of securing the country's place as a global AI (artificial intelligence) superpower.

World-leading net-zero ambitions send clear signals to businesses and investors about the **UK's commitment to clean growth** and its transition to sustainable energy. In 2019 it introduced a legally binding target to reduce greenhouse gas emissions to net zero by 2050 – making the UK the first major economy in the world to legislate a zero net emissions target.

The UK has developed **best practice** in engineering, design, architecture, the digital economy, finance, legal and insurance. We have a strong research base with some of the best universities in the world. We are well placed to lead the world over the next decade as a genuine research and innovation powerhouse, a hive of global talent and a progressive regulatory and business environment.[7]

[1]Tech Nation

[2]The UK and Artificial Intelligence: what's next, Tech Nation

[3]Open Business Council

[4]IESE Business School

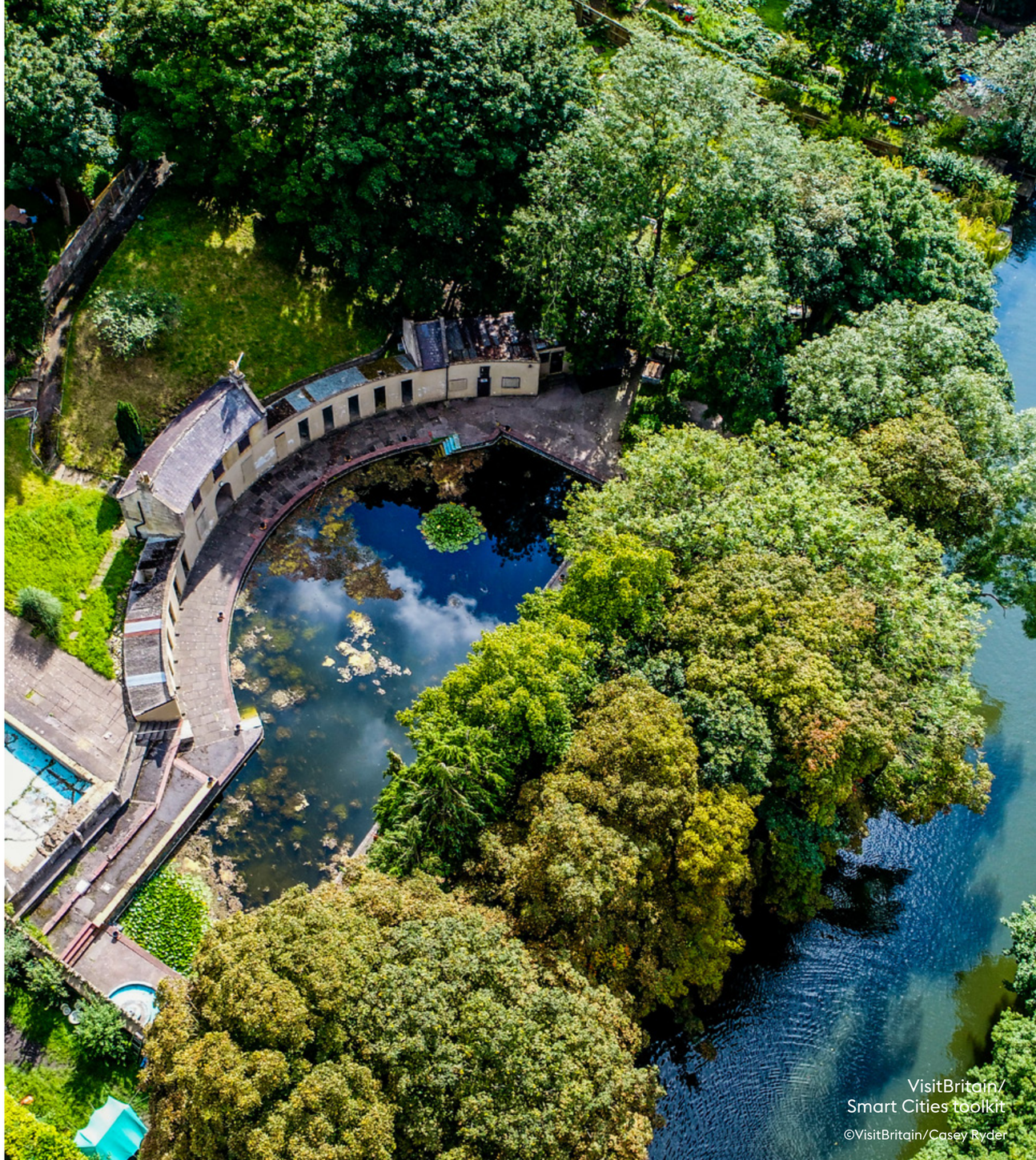
[5]What are smart cities, European Commission

[6]Unlocking the power of location: the UK's geospatial strategy, gov.uk

[7]National AI strategy, gov.uk

Sector in Stats

- Petrol, diesel car and van sales will be phased out by 2030 and all new cars and vans must be fully **zero emission** at the tailpipe **by 2035**
- Jaguar Land Rover has reduced global manufacturing CO2 per vehicle by 46%
- The UK's ICT (Information and Communications Technology) industry supports 1.3 million jobs and contributes 8% of the country's GVA
- Machine learning is set to add **£630bn to the UK economy by 2035**
- **£1.6bn GVA** could be added by alternative fuels like hydrogen by 2030, creating 7,000 jobs
- The heat network project pipeline is valued at £1.2bn
- As part of the UK government's commitment to cleaner energy, **600,000 heat pumps** are to be installed every year by 2028
- The impact of advanced metals and materials could be worth an estimated £2.6bn GVA to the Midlands by 2030
- UK civil engineering firms account for 197,000 jobs; more than 19,000 enterprises and between them they turn over £39bn
- The advanced vehicle assistance systems market is forecasted to **grow to £70.5 bn by 2025**



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Sub-sectors

Smart Infrastructure

Smart infrastructure makes cities work more smoothly, efficiently and sustainably, and it is increasingly becoming digital.

Intelligent technology – transit networks, energy grids, lighting systems and sensors – working in real time and in tandem with Cloud computing services, AI, 5G and the Internet of Things is the foundation on which smart cities are built. Without smartphones and high-speed connectivity there would be no enabling of data.

The UK has one of the **strongest software and technology infrastructures** in the world and the best **superfast broadband** of any major European economy. Money continues to flow into UK tech and the outlook for start-ups is healthy. In 2021 venture capital investment into the sector grew **2.3 times**, to £27.4bn (from £11.7bn in 2020), according to the Bank of England's annual average spot exchange rate.

The £27.4bn raised by **UK start-ups and scale-ups** was almost double the figure raised in Germany (£13.8bn) and over three times that raised in France (£8.7bn), making it well placed to build a digital infrastructure for a super-connected future.

With potential to rewrite the rules of entire industries, and transform all areas of life, Artificial Intelligence (AI) is the fastest growing deep technology globally. The UK has the third-highest number of AI companies in the world after the US and China[8] with the likes of DeepMind, Benevolent AI, Graphcore, Darktrace, Oxbotica and Behavox helping to put the UK at the forefront.

The UK's Artificial intelligence (AI) market is expected to experience significant growth over the next decade, with **machine learning set to add £630bn to the UK economy by 2035**.

The UK's AI sector now employs more than 30,000 people, and more than half of the top 10 scaling AI companies are based outside of London, highlighting the breadth of AI tech talent across the UK.

Smart Governance

The intelligent use of technology to improve decision-making is called Smart Governance. Through real-time and comprehensive data, it is possible to understand better citizen demand patterns and therefore respond more quickly and cost-effectively.

Geospatial and location data is the modern-day coal and iron fuelling a new revolution. Future technologies will be underpinned by data about events occurring at a time and place, making location data the unifying connection between services, systems, people and the environment.

In 2018 a **national location data framework** was set up to promote the best use of geospatial data. The Geospatial Commission is an expert committee with targeted interventions to help build economic, social and environmental value. The geospatial strategy, published in June 2020, outlines its vision for a coherent national location data framework by 2025.

Smart Health

With the help of data analytics and AI, health data can nowadays be analysed to extract valuable insights on individual patients, as well as the health of an entire city, region or country. Smart health uses the connectivity of a smart city to link patients to their health provider, and can tackle the treatment, management and prevention of illness. For example, in the fight against Coronavirus it helped to track the spread of the disease, evaluate interventions to slow its spread and distribute vital medical resources to where they were needed most.[9]

Smart Buildings

Demand for smart buildings is increasing. By adapting circular economy principles, using sustainable materials for construction and embracing digital technologies, the construction sector can play its part in meeting the UK's 2050 net-zero goals.

The UK is also developing modern methods of construction and investing in retrofitting our existing building stock with new technologies. The UKRI Transforming Construction Challenge is investing **£170m to accelerate the shift** in construction towards sustainable manufacturing and digital processes.

An example of **sustainable design and construction** opportunities is the Timber Square net-zero carbon scheme in London, which aims to be the largest commercial development to use cross-laminate timber. Timber Square's innovative use of construction techniques and ethical materials is a significant milestone for the wider construction community.

Sustainable infrastructure is development is vital to the **acceleration of the global clean growth and climate-resilience agenda** and UK infrastructure has a compelling offer for markets across the globe – as well as domestic opportunities in areas like mining, construction, rail and water.

Sub-sectors

Smart Mobility

A smart city needs efficient transport, enabled by new technologies. Smart mobility is environmentally friendly, integrated and automated travel.

The UK government has invested billions into the electrification and automation of road vehicles. By ending the sale of new petrol and diesel cars and vans by 2030 – ten years earlier than planned – the UK is leading the charge on **zero emissions vehicles**, aiming to be the fastest G7 nation to decarbonise vehicles.

All new cars and vans will be required to be fully zero emission at the tailpipe by 2035. With a £2.8bn package to support the phase out dates, this ambitious plan will accelerate demand for zero emission vehicles.

The UK car industry already manufactures a significant proportion of electric vehicles in Europe, including one of the most popular models. The Society of Motor Manufacturers and Traders reported that sales of battery and plug-in hybrid vehicles reached 10.7% of total vehicle sales in 2020. **Charging infrastructure** is also speeding ahead: the UK ranks **4th in Europe** for the number of AC and DC charging installations.

Annual sales of new battery electric vehicles are forecast to reach 2.5 million per year in the UK by 2030 and analysis by Deloitte suggests that investment of between £8bn and £18bn will be required in the electric vehicle charge point infrastructure.

The UK government has also pledged **£90m for Future Mobility Zones**, with the objective of stimulating the development of new and improved modes and services, and utilising mobility data to make journeys greener, easier, safer and more reliable.

Smart Energy

The evolution of Smart Cities is also linked to the need for greater use of l**ow carbon sources of energy**. Renewable energy, smart grids, flexible energy distribution is now more important than ever. For instance, new buildings in smart cities can be made more energy efficient through improved construction techniques, as well as innovative use of energy data.

Making buildings more energy efficient or "decarbonising" through **modern construction** methods and circular economy principles, and moving away from fossil-fuel boilers, is vital to achieving net-zero emissions by 2050. Smart solutions will be an essential part of the drive to improved energy efficiency.

The UK Green Building Council (UKGBC) has developed a framework definition for net zero carbon buildings, making it more accessible for companies to enter the sector.

All homes and businesses will need to meet rigorous new energy efficiency standards to lower energy consumption and bills[10] – a transition being driven by the cross-industry CO2nstructZero programme.[11] This was set up to remove carbon from the UK construction sector and provide a consolidated action plan, clear targets and a single ambitious vision.

The Government has set rigorous new targets for green buildings, with low carbon heating and zero-carbon targets for 2025. These homes are expected to produce **75-80% lower carbon emissions** compared to current levels.

[10]Chris Pincher, 2021

[11]Construction Leadership Council

[12]Smarter London Together, london.gov.uk

[12]IESE Cities in Motion Index 2022

[14]The London story: creating a smart city that delivers for citizens, business.london

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