



UrbanTide

Overview of the Smart Cities Maturity Model



Joining the dots of Smart Cities

Based on international best practice, including PAS 181 the first Smart Cities standard

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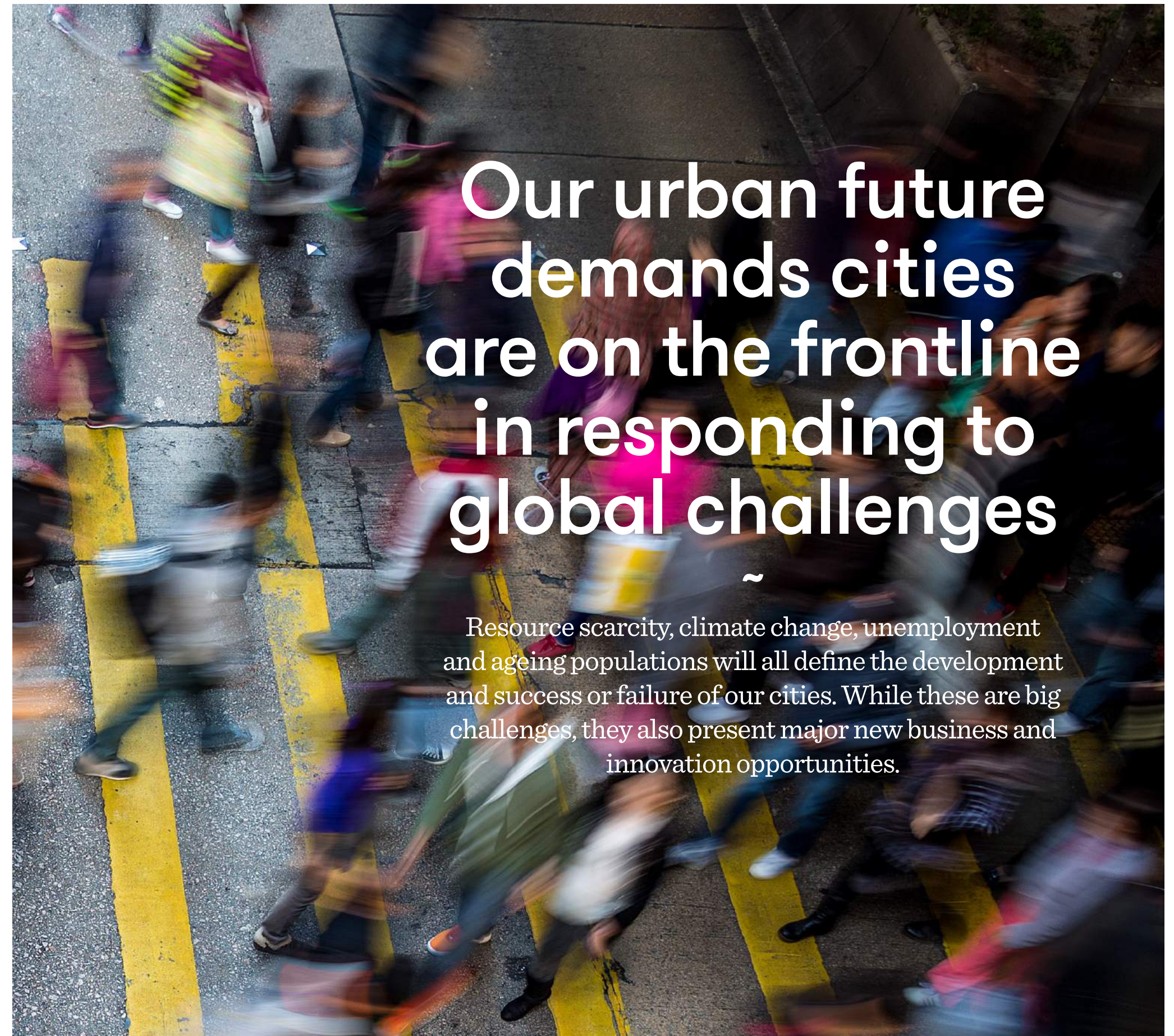
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Joining the dots of Smart Cities.
Overview of the Smart Cities Maturity Model.

Developed for and with The Scottish Government by Urban Tide



Our urban future demands cities are on the frontline in responding to global challenges

Resource scarcity, climate change, unemployment and ageing populations will all define the development and success or failure of our cities. While these are big challenges, they also present major new business and innovation opportunities.

What is a Smart City?



The Smart City can be defined as the integration of data and digital technologies into a strategic approach to sustainability, citizen well-being and economic development – *Scottish Government*

Smart Cities adopt a ‘system-of-systems’ approach to service delivery and develop collaborative service models to focus on shared outcomes across organisational boundaries.

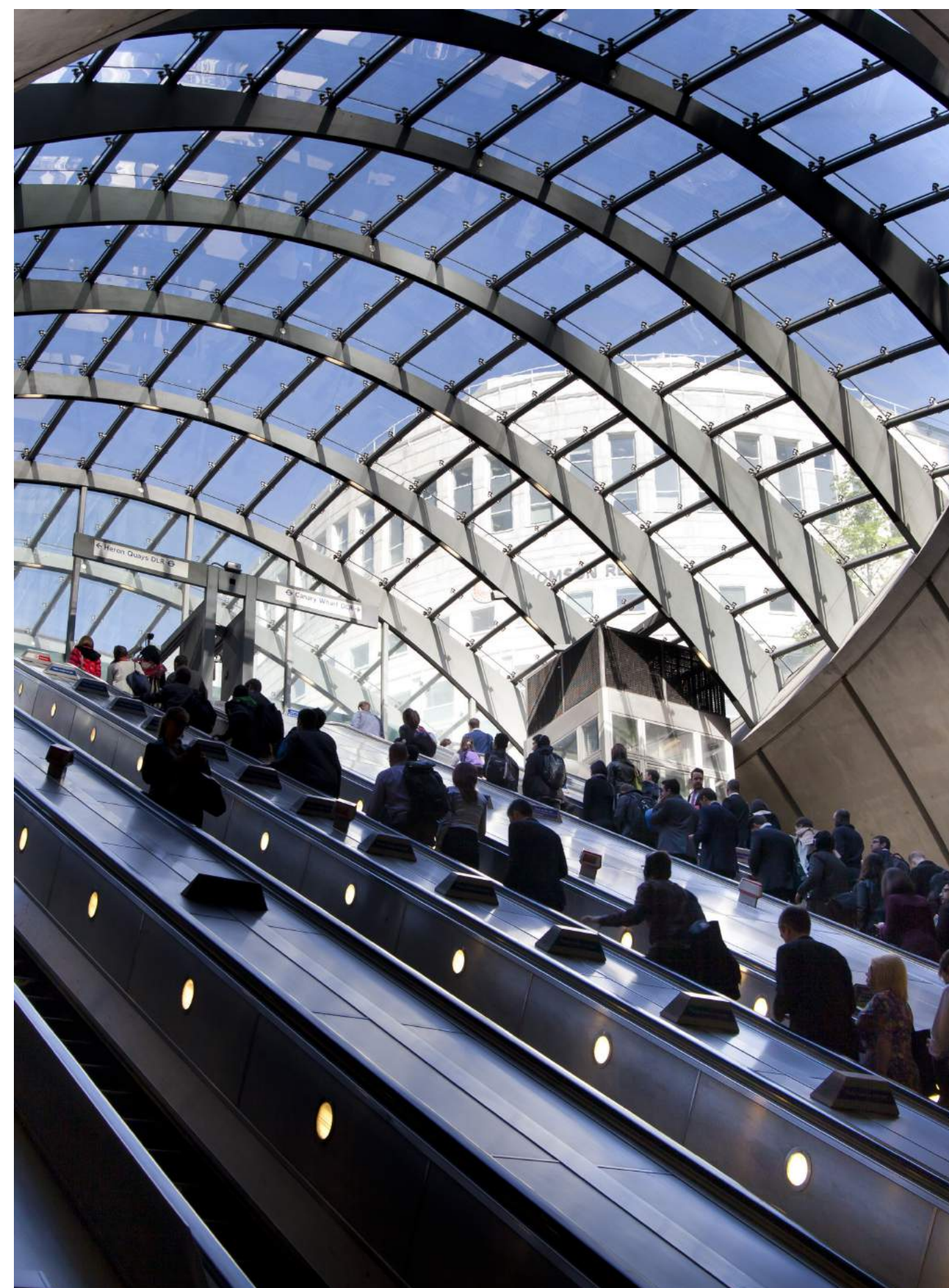
They make best use of data and digital technologies to invest in enhanced openness and transparency that promotes citizen and business engagement in, and ownership of, service reform.

The prospect is of cities and their regions using data and digital technologies to manage urban congestion, maximise energy efficiency through smart grid

technology, enhance public security and resilience, allocate scarce resources based on real-time evidence and turn operational data into insight, information and knowledge.

The Smart Cities concept is based on replicating this data process across multiple systems delivering exponentially greater benefits with fuller deployment across service areas.

Smart Cities bring data, technology and people together



Benefits for data users

Recent research suggests that those businesses and organisations using data effectively are:

- 2x more likely to be in the top quartile for financial performance
- 5x faster in decision making
- 3x as likely to execute as intended

There are significant benefits to be realised from the ‘network effect’ – as data, technology and people are joined together. This exponentially magnifies the potential benefits, impact and value that can be delivered.

Investment in digital technologies and improved data management alone will not however deliver the Smart City. Cities need to consider the strategic intent, governance and service delivery models that exist together with their approach to citizen and business engagement if they are to secure the maximum impact from their investments.

The ultimate vision is of a Smart City that strategically manages multiple systems at a city-wide level and through increased transparency, openness and shared accountability creates an innovation system that improves outcomes and enhances city competitiveness.

To secure this vision a Smart City invests in assets or capabilities that are increasingly reused on a city-wide basis to transform a range of services rather than ‘one-off’ improvements to a single service.

The Scottish Government, working in conjunction with the Scottish Cities Alliance and on behalf of Scotland’s Cities, commissioned Urban Tide to jointly develop a Smart Cities Maturity Model and Self-Assessment Tool.

This Smart Cities Maturity Model and Self-Assessment Tool helped Scottish cities to:

- **Assess their current position on the journey to being a Smart City.**
- **Decide where they wanted to be by 2020 aligned to strategic priorities.**
- **Identify what investments and adjustments were required to get them there.**
- **Consider whether any parts of their forward programme might be better advanced in collaboration with other cities and wider partners.**

A key driver for this work was to support the development of an outline Investment Roadmap targeted towards funding available and also opportunities to provide a focus for future funding.

The Smart Cities Maturity Model and Self-Assessment Tool was developed to meet the objectives above but also as an asset that can be re-used over time by cities and by other communities.

Continual assessment, review of alignment with strategic priorities, identification of investments required and consideration of collaboration opportunities is critical to achieving Smart City Maturity.

Six examples of Smart City solutions

New approaches to urban living utilising Smart City thinking



Lighting

Intelligent street lights with dimming control and sensor capability that can detect motion and gather information.



Social

Technology in the home to support independent living. Detection algorithms which can track daily routines and sensing a lack of movement can alert carers to any unexpected behaviour patterns.



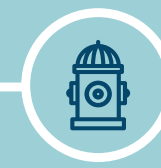
Parking

Parking sensors detecting availability of spaces in real-time to prevent the build-up of traffic as motorists look for spaces.



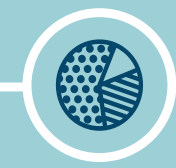
Waste

Bins with wireless sensors to measure and forecast the fill-level of waste containers. Generates smart collection plans using the most efficient schedules and routes.



Citizens

Citizens 'adopting' street furniture and notifying the local authority when repairs are required, for example: street lamps that need replaced, 'adopt a hydrant' in New York.



Data

Citizens providing data to enhance the efficient running of the city, for example: cycle routes travelled, home and business energy meter readings, fault reporting and service usage.



Benefits of a Smart Cities Approach

A Smart City programme aims to secure a wide range of benefits

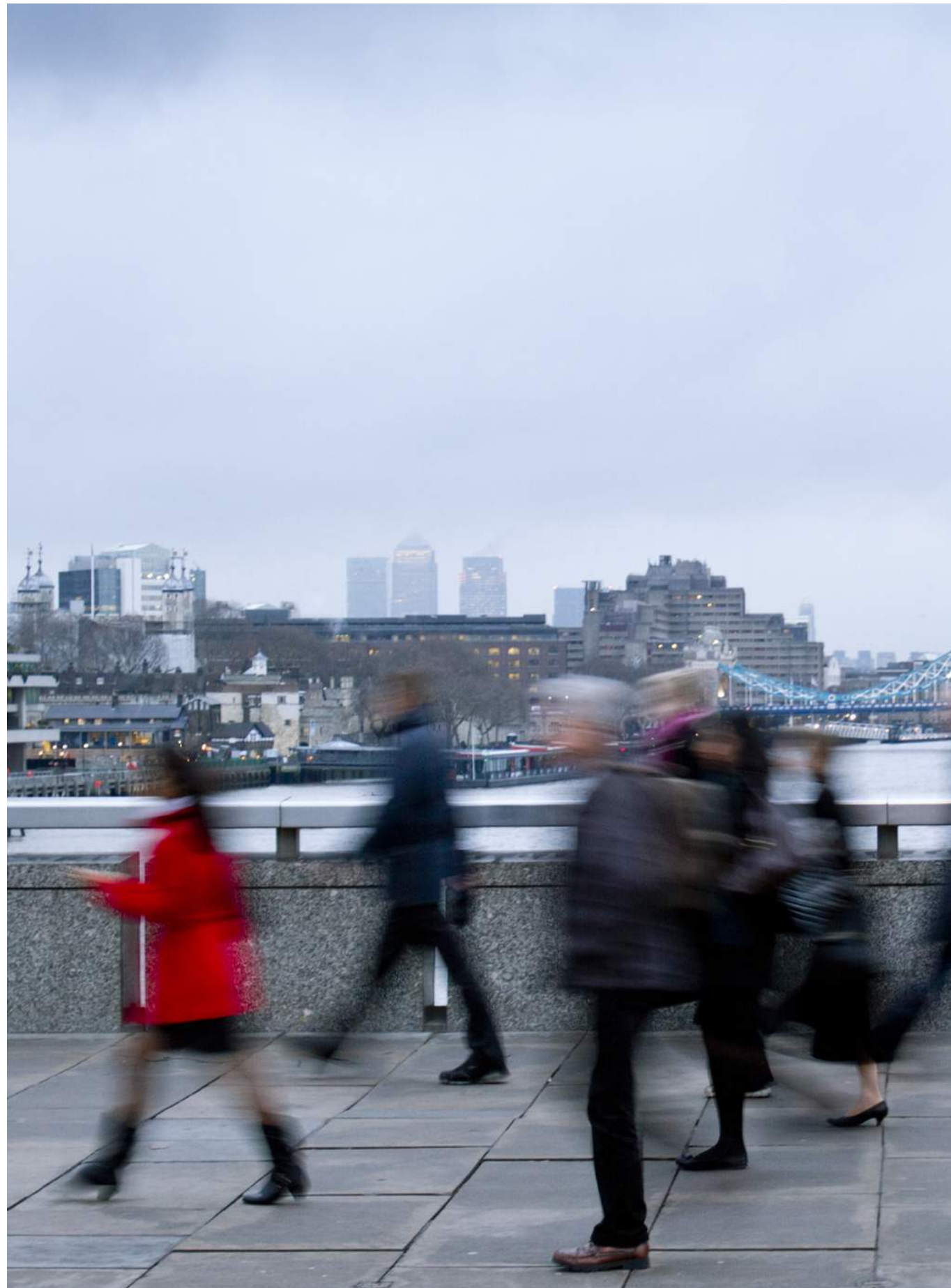


By working together cities can position themselves to access investment, accelerate progress through learning and identify local innovations

Cities that are adopting a Smart City strategy are making city services more effective and cities more attractive to investors, residents, visitors and the business community.

There are benefits for cities in working together on this emerging agenda in creating scale for investors and identifying common and transferable approaches and solutions across cities.

By working together cities can position themselves to access investment, accelerate progress through learning and identify local innovations which could be scaled.



How smart is your city?



The Smart Cities Maturity Model and Self-Assessment Tool helps cities understand their position on the journey to Smart

The Smart Cities Maturity Model and Self-Assessment Tool draws on and adapts existing models and frameworks in this field. In particular a focus has been placed on the best practice model developed by the British Standards Institution PAS181 ‘Smart City Framework: Guide to Establishing Strategies for Smart Cities and Communities’.

The Smart Cities Maturity Model remains compatible with these models but is designed to walk cities through the process of clearly identifying next steps, together with investment and resources required to realise their ambitions.

The Smart Cities Maturity Model is designed to walk cities through the process of becoming a Smart City

A maturing Smart City will increasingly plan and deliver services within an interconnected system

Applying the Smart Cities Maturity Model

The Smart Cities Maturity Model outlines five maturing levels that lead to an optimised Smart Cities approach. It describes that a maturing Smart City will increasingly plan and deliver services within an interconnected system (i.e. transport) as opposed to elements within the system (i.e. bus, rail, car).

This systems approach is enabled by increasing use of data and digital technologies to transform **governance and service delivery models** and **citizen and business engagement**. The Smart Cities Maturity Model identifies these as critical dimensions that a Smart City must invest and commit to as part of its **strategic intent**. Throughout the stages of the self-assessment you are therefore prompted to consider the extent to which these dimensions are maturing.

The ultimate vision is of a Smart City that strategically manages multiple systems at a city-wide level and through increased transparency, openness and shared accountability creates an innovation system that improves outcomes and enhances city competitiveness.

The maturing Smart City builds capabilities (*within the dimensions noted on page 17*) through investments that are increasingly reused on a city-wide basis to transform a range of services.

The self-assessment process requires cities to consider their maturity and identify future investments across these dimensions at a city-wide level.

To add granularity to this analysis, investment planning is also undertaken on a sector specific or 'domain' basis (such as public transport, energy, water, waste, health, finance and economy). Cities are asked to reflect on the findings from domain specific analysis identifying synergies, gaps and integrated actions.





Smart Cities Maturity Model

To aid the self-assessment process the Maturity Model has been adapted to help you identify your present level

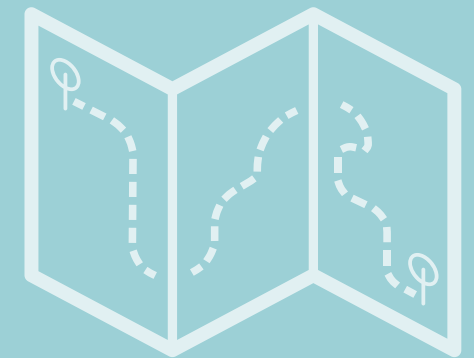
Level		City Management Status	Smart City Status	Effect on Outcomes
1	Ad-Hoc	Siloed	Operation focused digital and data driven service improvement.	Capturing evidence and building business case.
2	Opportunistic	System Collaboration	Holistic system thinking and emergent sharing of data.	Cross boundary partnerships emerging to focus on shared outcomes.
3	Purposeful & Repeatable	System Integration	Strategy led and outcome driven. Enabled by system-wide technology investment.	Shared accountability for outcomes and joint system-wide investment programme.
4	Operationalised	Managed System	Technology and data enabled dynamic sense and response systems.	Improved prediction, prevention and real-time response delivers improved outcomes.
5	Optimised	Sustainable and Open 'System of Systems'	Continuously adaptive city-wide 'smart' deployment.	City-wide open 'system of systems' approach drives innovation that enhances city competitiveness.

Five Key Maturity Model Dimensions

These dimensions provide the frame of reference for the series of self-assessment questions. We detail of them at each level of Smart City maturity

Level

- 1 No overall roadmap for digital transformation exists yet.
Investment in discrete areas only, with view to establishing evidence and business case.
- 2 Strategy and investment largely at departmental level.
Emerging sharing of strategic intent and business case with partners.
Some initial shared service transformation between partners.
- 3 A shared vision, strategy and roadmap for the 'smart' city in place with multiple partners across multiple domains.
Business case established and shared investments in place to secure scalable improvements to agreed outcomes.
- 4 Vision, strategy and roadmap established at city-wide level.
Improved service outcomes evidenced and underpinning future service improvements at scale.
- 5 **Strategy is optimised and evolves based on clear evidence of impact on city competitiveness.**
Smart investments have clear impact on city's strategic priorities.



Strategic Intent

Successful Smart Cities have a strategy and roadmap setting out how investment in data and digital technologies enables service reform and partner collaboration. An effective strategy focusses on delivering improved outcomes aligned to the city's strategic priorities.

Level

- 1 Data re-use and integration is limited by the range of disparate systems in use for different operations.
Issues with data integrity, quality, privacy and security.
Data is used primarily for the delivery of a particular service.
- 2 Barriers to optimising data assets being discussed between partners and solutions emerging.
Some preliminary data sharing and analytics applications in place.
Some data sets are opened to the public.
- 3 Data management and optimisation strategy agreed between partners.
Investing in advanced data management, capture, analytics and big data applications.
Extensive range of open data published with strategic intent to leverage innovation.
Citizens sharing data in key areas.
- 4 Data assets used to provide actionable information.
Extended data capture and analytics leading to improved decision making and service design.
Established open data community is building new services valued by users.
Citizen willingness to share data is widespread.
- 5 **Data analytics used for dynamic and automated predictive and preventative improvements to service delivery and real-time response capabilities for non-predictable events.**
Open data community generating new market opportunities and building alternatives to public service provision.



Data

Successful Smart Cities make effective use of their data assets to secure better outcomes. They invest in system-wide data capture, integration and analytics capabilities. Open data underpins their commitment to transparency and innovation.

Level

- 1 ICT architectures are predominantly designed to support each line of business application.
Limited investment in sensor networks for particular service applications.
- 2 Some shared or integrated architectures exist but deployed on a limited set of services.
Barriers are understood and being addressed between partners.
Some shared use of sensor networks.
- 3 Investment in integrating architectures between organisations is taking place.
Joint investment plans in city-wide deployment of connected assets.
- 4 Cross-organisational ICT architectures are in place. These are being scaled and adapted.
The architecture enables accelerated service innovation.
City-wide deployment of connected assets.
- 5 **Organisations are continuously reviewing, adapting and investing in ICT architecture to drive service transformation.**
A networked built environment across the city.



Technology

Successful smart cities invest in open, flexible, integrated and scalable ICT architectures that enable accelerated service innovation such as provision of automated and real-time dynamic response capabilities.

Level

- 1 Leadership, governance and budgeting focuses on service transformation primarily within the boundaries of traditional organisational models.
Traditional client-provider-supplier-user relationships exist and are often managed separately.
- 2 Leadership and governance models test new ways of engaging with wider partners (including the private sector) to address cross department/organisation service transformation.
Shared budget accountability for some discrete initiatives.
- 3 Leadership and governance models evolve to share accountability for delivering system-wide outcomes.
Greater input to problem solving and service design from providers/suppliers and users.
Organisational budgets and structures adapt to ensure effective and transparent delivery of system-wide approach.
- 4 Transparent multi-partner governance model firmly embedded and delivering improved decision-making and outcomes at city-wide level. Service users are strong influencers.
Traditional supplier/contractor relationships evolve to include gain sharing, co-development and performance contracting.
- 5 **Leadership and governance model stimulates an innovation system that promotes new combinations of service delivery and greater effectiveness at impacting on city-wide strategic priorities.**



Governance and service delivery

Successful Smart Cities adapt traditional organisational models of delivery to realise the opportunities of data and digital technologies.

They invest in system-wide partnership models focused on shared outcomes.

Level

- 1 Stakeholder participation is focused on particular services and is limited by the lack of clear and accessible information on the performance of city services.
Opportunities to enhance participation using web-based platforms is recognised and discrete initiatives are underway.
- 2 Departmental-level commitment to investing in digital channels to enhance citizen engagement.
The approach predominantly focuses on using digital means to provide improved information and transparency to stimulate engagement.
Approaches to address digital exclusion in specific service areas underway.
- 3 System-wide/multi partner strategies for enhanced citizen engagement in place that make effective use of digital technologies and address digital inclusion.
The engagement tools and approaches adopted enhance the voice of stakeholders and citizens across a range of city services.
- 4 City uses multiple channels to engage with citizens tailored to their needs.
Views and ideas of citizens and stake-holders systematically captured through multiple channels to improve services.
Citizens benefit from integrated services across organisations using the best digital technology for them.
- 5 **City has embedded inclusive and personalised engagement models that stimulate innovation and collaborative approaches across the all sectors.**
Digital literacy across the population is high and support or alternative provision is in place for those that need it.

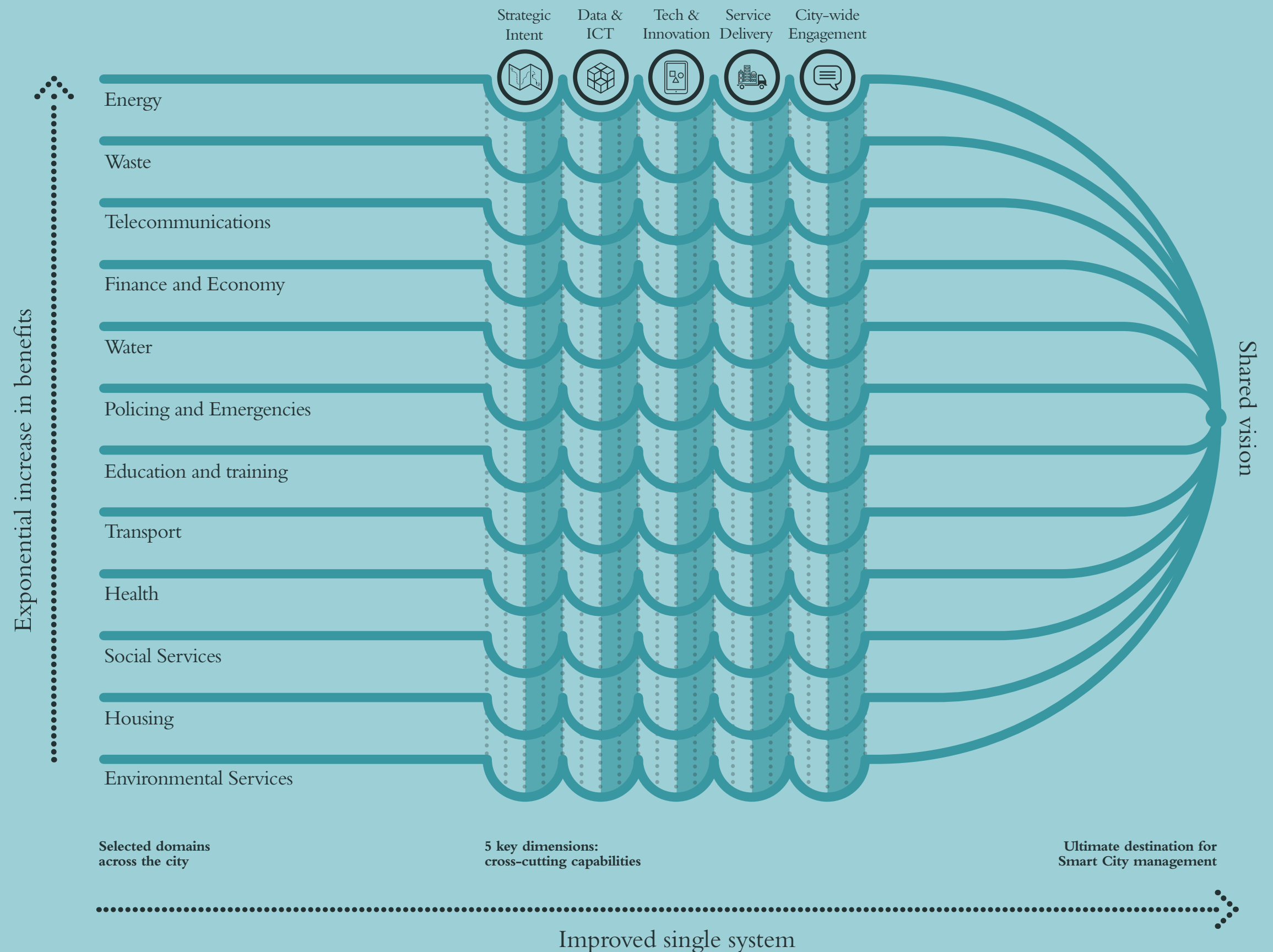


Citizen and business engagement

Successful Smart Cities make best use of data and digital technologies to invest in enhanced openness and transparency. Citizen and business engagement and stakeholder ownership of service reform is central within a Smart City.

The scope for Smart Cities

This is only provided for illustrative purposes. Each city is structured differently and cities may also wish to undertake the Self-Assessment at a more detailed level of activity within a domain (for example, public transport within transport, low carbon within energy) or in a domain that cuts across a number of different service areas (for example social transport or tourism).



Your journey starts here

Urban Tide help build smarter, sustainable and more liveable cities for everyone

Smart City Toolkits

We help you develop a vision, strategy and roadmap that delivers tangible benefits for your smart cities. Our Toolkits guide you step by step



Smart City Roadmaps:

Urban Tide's Roadmaps help you establish an effective long term roadmap for your smart city.



Innovation and Delivery:

We help you deliver smart cities projects and initiatives to build innovation engines for the future.



Community Engagement:

We create and support the development of smart communities which is essential for success as a smart city.



Unlocking City Data and ICT:

We help you bring the data within your city to life and maximise its value across departments.

Get in touch & make our cities smart

Exploring smart strategies?

Pippa.Gardner@TheUrbanTide.com

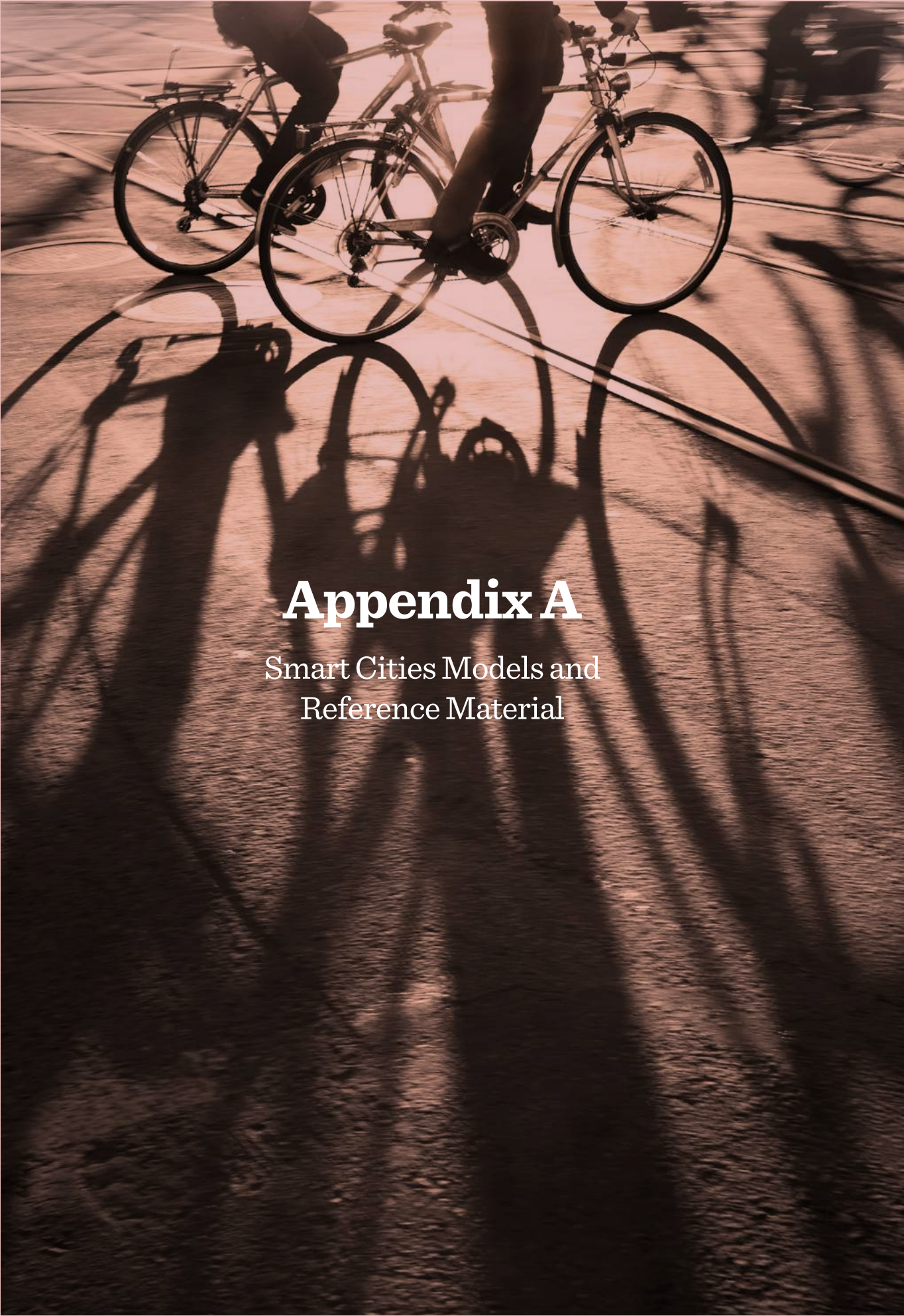
Need data solutions?

Steven.Revill@TheUrbanTide.com

Seeking creative engagement?

Simon.Tricker@TheUrbanTide.com

www.TheUrbanTide.com



Appendix A

Smart Cities Models and Reference Material

Model	Link for further information
Smart City Rankings (Boyd Cohen)	www.boydcohen.com/smartcities.html
Smart Cities – Ranking of European Medium Sized Cities (Vienna University of Technology)	www.smart-cities.eu/index2.html
Smart City Framework/Smart Cities Analysis in Spain (IDC)	www.portalidc.com/resources/white_papers/IDC_Smart_City_Analysis_Spain_EN.pdf
PAS 180 – Smart Cities Vocabulary (BSI)	shop.bsigroup.com/en/ProductDetail/?pid=000000000030298436
PAS 181 – Smart City Framework (BSI)	shop.bsigroup.com/en/ProductDetail/?pid=000000000030277667
PAS 182 - Smart Cities Concept Model (BSI)	www.bsigroup.com/en-GB/smart-cities/Smart-Cities-Standards-and-Publication/PAS-182-smart-cities-data-concept-model/
Smart Cities Readiness Guide (Smart Cities Council)	smartcitiescouncil.com/system/files/premium_resources/SmartCitiesCouncil-ReadinessGuide-11.18.13a.pdf?file=1&type=node&id=615
Mapping Smart Cities in the EU (European Parliament)	www.europarl.europa.eu/RegData/etudes/etudes/join/2014/507480/IPOL-ITRE_ET(2014)507480_EN.pdf
European Innovation Partnership on Smart Cities and Communities – Operational Implementation Plan	ec.europa.eu/eip/smartcities/files/operational-implementation-plan-oip-v2_en.pdf
Information Marketplaces – the New Economics of Cities (The Climate Group, ARUP, Accenture & Horizon)	www.accenture.com/SiteCollectionDocuments/PDF/Accenture-Information-Marketplaces.pdf
The Morgenstadt Approach (Morgenstadt & Fraunhofer)	www.corp.at/archive/CORP2014_51.pdf www.unescap.org/sites/default/files/Session-3-Fraunhofer-IAO-Heydkamp.pdf
Understanding Smart Cities – An Integrative Framework (Chourabi)	www.ctg.albany.edu/publications/journals/hicss_2012_smartcities/hicss_2012_smartcities.pdf
Smart Cities – A Stochastic Frontier Analysis (Mundula)	www.grupposervizioambiente.it/aisre_sito/doc/papers/Auci_Mundula_AISRe_Roma_2012_paper.pdf
A Planet of Civic Laboratories/Economic Development Driven By Technology – Future Knowledge Ecosystems (Anthony Townsend, et al)	www.rockefellerfoundation.org/uploads/files/814a5087-542c-4353-9619-60ff913b4589-sr.pdf www.iff.org/uploads/media/SR-1236%20Future%20Knowledge%20Ecosystems.pdf
Intelligent Community Forum	https://www.intelligentcommunity.org/index.php?src=gendocs&ref=White_Papers&category=Research
Stanford/ Yonsei Universities – Towards A Smart City Framework	iis-db.stanford.edu/evnts/7239/Jung_Hoon_Lee_final.pdf
Smart City Market Opportunities (BIS)	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/249423/bis-13-1217-smart-city-market-opportunities-uk.pdf
Smart Cities and Communities Framework – Financing Models for Smart Cities	eu-smartcities.eu/sites/all/files/Guideline-%20Financing%20Models%20for%20smart%20cities-january.pdf



Appendix B
Smart Cities Case Study Examples
and Further Information

Cities	Link for further information
Amsterdam	amsterdamsmartcity.com
Barcelona	www.bcn.cat/inspira/en/innovation.html
Birmingham	www.birmingham.gov.uk/smartcity
Bristol	opendata.bristol.gov.uk www.bristolisopen.com
Connected Smart Cities Network (EU)	connectedsmartcities.eu
Copenhagen	stateofgreen.com/en/profiles/city-of-copenhagen www.cphcleantech.com/ccj2-copenhagensacarbonneutra/smartcity
Chicago	www.smartchicagocollaborative.org
Helsinki	www.forumvirium.fi/en/project-areas/smart-city
Glasgow	futurecity.glasgow.gov.uk open.glasgow.gov.uk
Leeds	www.leedsdatamill.org
London	www.london.gov.uk/priorities/business-economy/vision-and-strategy/smart-london
Manchester	www.manchesterdda.com
Milton Keynes	www.mksmart.org
New York	https://nycopendata.socrata.com https://www.cisco.com/web/about/ac79/docs/ps/motm/City-24x7_PoV.pdf
Paris	eu-smartcities.eu/place/paris
Peterborough	www.peterboroughdna.com
Toronto	www.smartcitiescanada.com
Vienna	https://smartcity.wien.at/site/en/



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