Smart Cities Maturity Model and Self-Assessment Tool

Guidance Note for completion of Self-Assessment Tool

October 2014

The Scottish Government
Riaghaltas na h-Alba

scottishcitiesalliance
Aberdeen • Dundee • Edinburgh • Glasgow • Inverness • Perth • Stirling

URBAN TIDE
SMART CITY & DIGITAL EXPERTS


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Low Carbon

1. Background

The Scottish Government, working in conjunction with the Scottish Cities Alliance and on behalf of Scotland's Cities, has commissioned consultants to jointly develop a Smart Cities Maturity Model and Self-Assessment Tool that will help Scotland's cities:

- Assess where you currently are on the journey to being a smart city;
- Decide where you want to be by 2020 aligned to your strategic priorities;
- Identify what investments and adjustments are required to get you there; and,
- Consider whether any parts of your forward programme might be better advanced in collaboration with other cities and wider partners.

A key driver for this work is to support the development of an outline investment roadmap that the Scottish Cities Alliance can advance collaboratively and that will inform a funding application for the European Structural Funds 2014-2020 Programme in the first half of 2015.

The outline Investment Roadmap will also be useful for cities in identifying future priorities for investment that can be targeted towards funding available from other sources and in providing a focus for future funding calls.

The Scottish Cities Alliance Leadership Group endorsed the development of this programme since approval of the Strategic Work Programme in April 2013. In June 2014 the Scottish Cities Alliance refocused its Operational Plan to concentrate on three programmes: Infrastructure, Low Carbon and Smart Cities.

The Smart Cities Maturity Model and Self-Assessment Tool has been 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.

1.1 Timescales

The timescale to 2020 has been selected to align with:

- Scotland's Digital Strategy that sets out an ambition to be a world leading digital nation by 2020, and
- The European Structural Funds 2014 – 2020 Programme as it is intended that accessing this funding will pump-prime the delivery of the investment roadmap.

1.2 Funding

A range of investment is available to finance and pump-prime Smart City initiatives, including:

- European Structural Funds
- EU Horizon 2020
- Other public funding such as the Technology Strategy Board

In addition, experience suggests that a number of large blue chip companies are willing to share or indeed carry the risk of financing smart cities projects as they seek to partner with cities to 'trial' new products and services for a growing global market.

Investment of €15m has been prioritised within Scotland's 2014-2020 European Structural Funds Programme that will require to be match-funded. European Structural Funds will support investment in collaborative projects, such as the enabling data infrastructure, which will position Scotland's cities to compete for these other sources of investment, along with supporting the initial project priorities of individual cities. For example, priorities within Single Outcome Agreements, City Investment Plans or other strategies within cities.

2. 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.

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 community 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.

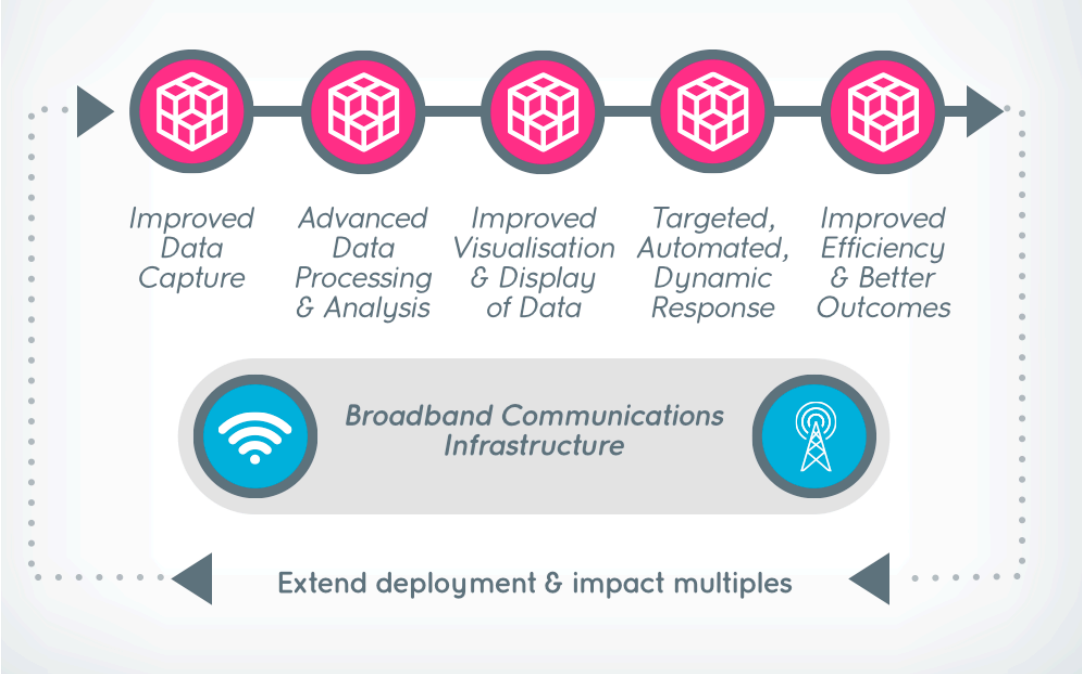
EXAMPLE 1: Real-time Information – integration and adaptation
Cities are integrating real-time information on vehicle flows, air quality and noise pollution allowing dynamic and adaptive optimisation of the road network. Linking air pollution and traffic flow information to public health data allows planners and policy makers to gain valuable insight and better plan new developments in the city – enhancing the quality of life. Bringing together traffic information from a range of sources allows proactive co-ordination of plans and responses to incidents and emergencies in the city. Providing this information in real-time to citizens, businesses and visitors allows them to make better travel choices and get around more easily in the city.

EXAMPLE 2: Sensor information – integration and adaptation
As energy networks are upgraded with sensors a wealth of information on supply, consumption and emission levels at a local level is becoming available. As cities move to distributed energy networks with local and community based generation then forecasting peaks and dynamically balancing energy supply and demand will become increasingly important. Providing data to energy users will allow them to make informed choices and to adapt and change behaviour. Data on energy usage is being integrated with public health data to better understand issues such as fuel poverty and to allow policy makers to design more effective interventions.

EXAMPLE 3: **Digital Technologies & Data – user-led access and self-management**
Cities are using digital technologies to transform health, wellbeing and care bringing people with needs closer to the people who can shape their outcomes. Technology is supporting user-led access, navigation of complex services and self-management. Video-based consultation and telehealth/ telecare is supporting independent living and reducing dependency on primary care resources. Greater visibility of data is being used to design more effective strategies but also encourage patient and public participation and stimulate behavior change.

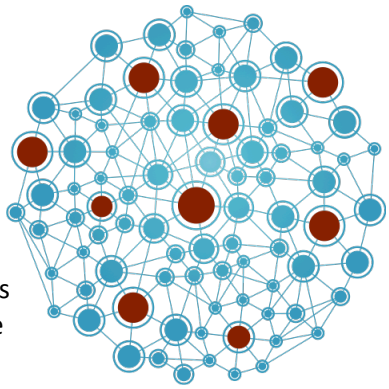
2.1 Data and Systems

Adopting a systems approach to city management that is enabled by optimising data assets lies at the core of the smart cities approach. At the heart of smart cities is therefore a simple process:



Recent research[1] suggests that those businesses and organisations that use 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.



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

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.

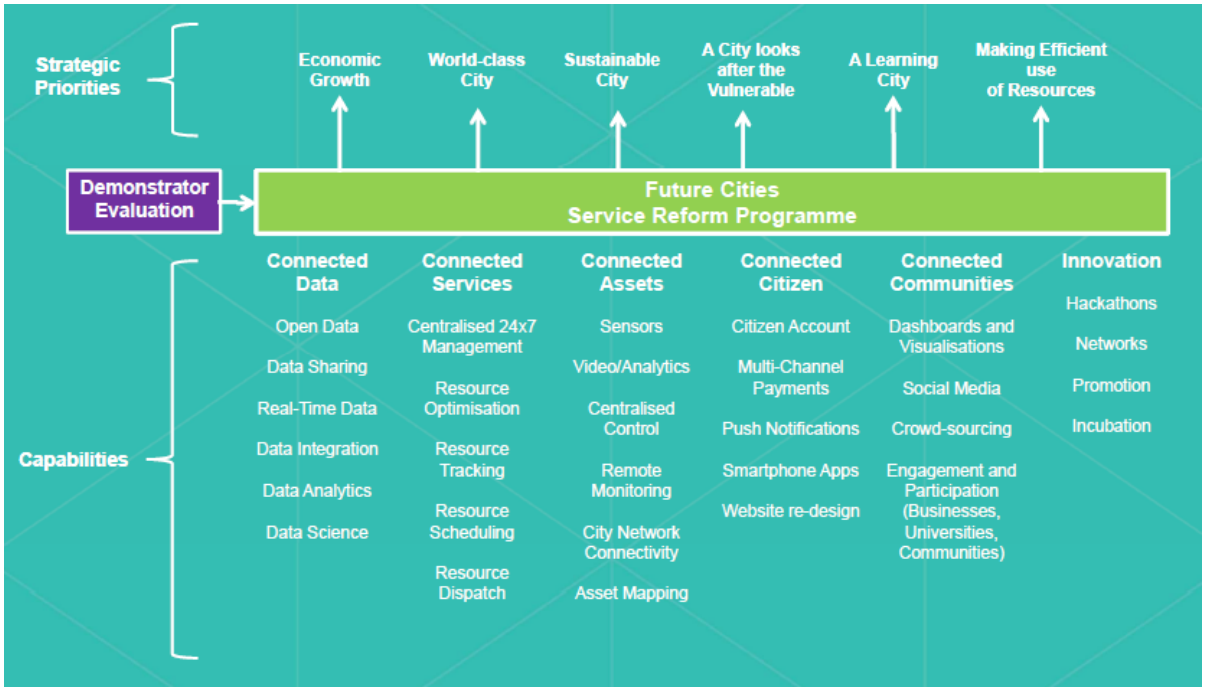
Investment in digital technologies and improved data management alone will not however deliver the Smart City. Cities need to consider the strategic intent, governance/ service delivery models and their approach to stakeholder engagement if they are to secure the maximum impact from their investments.

[1] *Reference: http://www.bain.com/Images/BAIN%20_BRIEF_The_value_of_Big_Data.pdf*

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 competiveness.

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.

A good example of this is the work that Glasgow City Council are doing following on from the Technology Strategy Board Future Cities Demonstrator Programme (detailed below) – integrating this with the strategic priorities of the city and the wider Service Reform Programme agenda that was already established.



Reference: Glasgow City Council – Future Cities Programme (2014)

2.2 What are the benefits of a Smart Cities Approach?

A Smart City programme aims to secure a wide range of benefits as outlined in the diagram below:

Reference: 'An analysis of the feasibility studies from the Future Cities Demonstrator Programme' (Arup & TSB, 2013)

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 Scotland's 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 Scotland's cities can position themselves to access investment, accelerate progress through learning and identify local innovations which could be scaled.

2.3 Further information

Links to Smart Cities Models and Reference Material has been included in Appendix A.

Links to Smart Cities Case Study websites from other cities across the world has been included in Appendix B.

A Smart Cities Glossary for use in conjunction with the Self-Assessment Tool has been included in Appendix C.

3. Smart Cities Maturity Model and Self-Assessment Tool

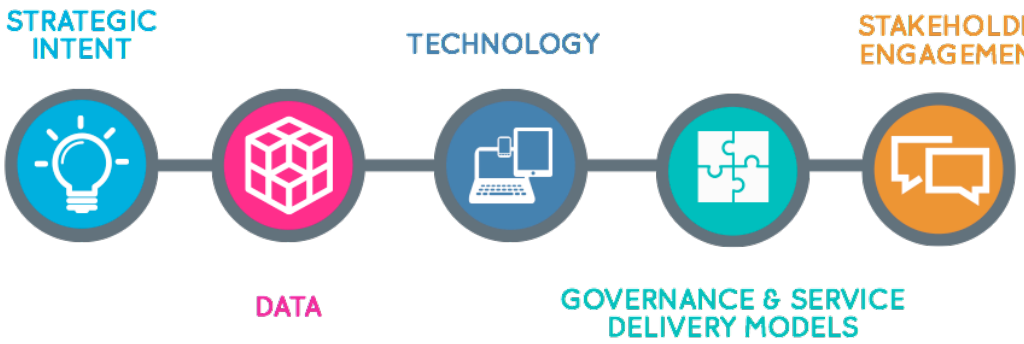
The Smart Cities Maturity Model and Self-Assessment Tool has been developed to meet the objectives set out in the background section. The Maturity Model and Self- Assessment Tool draws on and adapts existing models and frameworks in this field. In particular a focus has been placed on the best practice model developed by IDC[2] and the British Standards Institution PAS181 (2014) publicly available specification – Smart City Framework – Guide to Establishing Strategies for Smart Cities and Communities.

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

3.1 Introduction to the Smart Cities Maturity Model

To aid the self-assessment process IDC's Maturity Model has been adapted to help you identify which level you are currently at. The table below provides a high level overview of the Maturity Model.

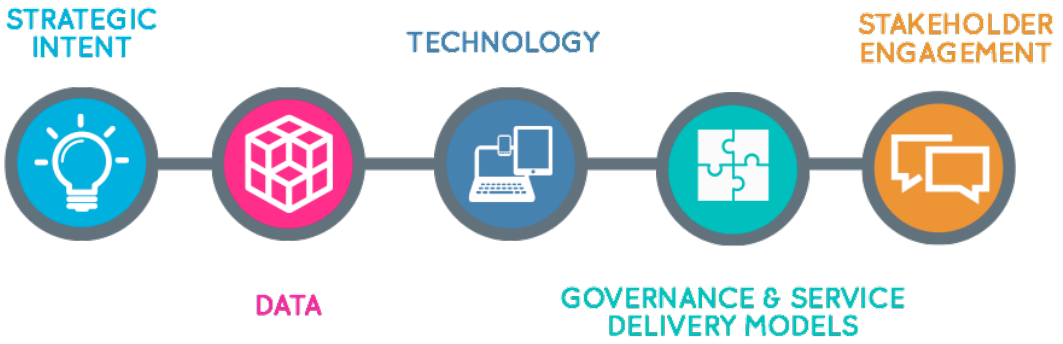
	Level 1 Ad-Hoc	**Level 2 Opportunistic**	**Level 3 Purposeful & Repeatable**	**Level 4 Operationalised**	**Level 5 Optimised**
City Management Status	Siloed	System Collaboration	System Integration	Managed System	Sustainable and Open 'System of Systems'
Smart City Status **digital technologies as an enable*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



[2] *Reference: Smart City Maturity Model – A Roadmap for Assessment and Action on the Path to Maturity within the publication Smarter Cities for a Bright Sustainable Future – A Global Perspective (Public Technology Institute – 2014)*

3.2 Key Dimensions

The Smart Cities Maturity Model outlined above considers maturity across five dimensions:



Concept	Outline
Strategic Intent	Successful smart cities have a strategy and roadmap setting out how investment in data & digital technologies enables service reform and partner collaboration. An effective strategy focuses on delivering improved outcomes aligned to the city's strategic priorities.
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.
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.
Governance & Service Delivery Models	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.
Stakeholder Engagement	Successful smart cities make best use of data and digital technologies to invest in enhanced openness and transparency. Stakeholder engagement and stakeholder ownership of service reform is central within a smart city. Smart cities are proactive in improving take up of digital services while supporting the digitally excluded.

These dimensions provide the frame of reference for the series of self-assessment questions.

3.3 Applying the Smart Cities Maturity Model

The Smart Cities Maturity Model outlines five maturing levels that lead to an optimised smart cities approach. It outlines 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 (bus, rail, car). This systems approach is enabled by increasing use of *data* and *digital technologies* to transform *governance & service delivery models* and *stakeholder 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 competiveness.

It should be said at the outset that no city in the world could currently be assessed as realising level 5 of maturity on this model, and indeed few if any could claim to have reached levels 3 and 4 of maturity even in a specific domain such as mobility.

In particular, maturity sees increasing levels of integration in strategy development and planning, partnership working and investment in shared technology platforms and data assets. The maturing smart city builds capabilities (within the dimensions noted above) through investments that are increasingly reused on a city-wide basis to transform a range of services. The ongoing work within Glasgow City Council to develop cross-cutting city-wide capabilities that contribute towards strategic priorities is a strong example of this in practice (referenced earlier in section 2.1).

The self-assessment process requires cities to consider their maturity and identify future investment 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.

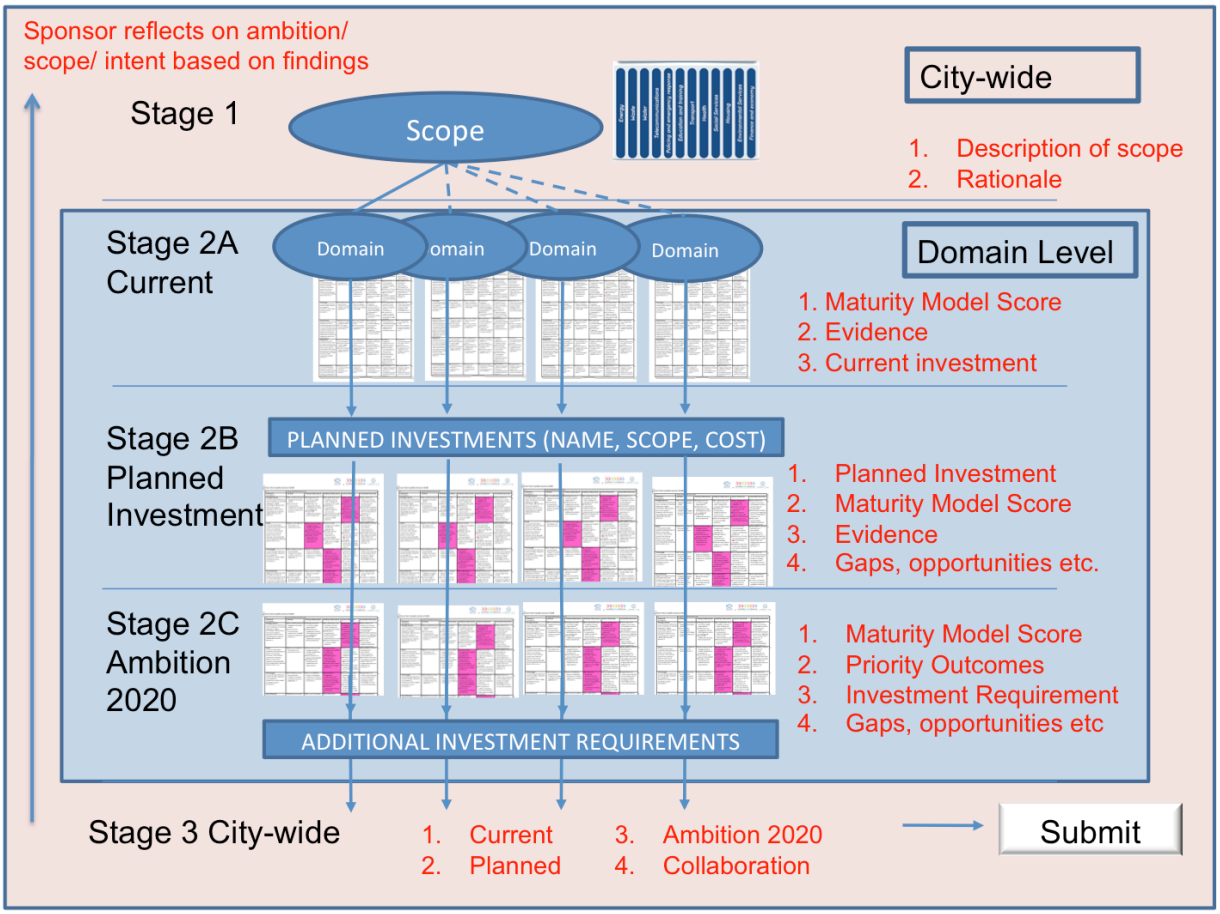
"A domain is a 'field or scope of knowledge or activity'."
Reference: Collins Reference Dictionary

The Smart Cities Maturity Model is detailed in full on the following page.

Smart Cities Maturity Model	Level 1 Ad-Hoc	Level 2 Opportunistic	Level 3 Purposeful & Repeatable	Level 4 Operationalised	Level 5 Optimised
City Management Status	Siloed	System Collaboration	System Integration	Managed System	Sustainable and Open 'System-of-Systems'
Smart City Status **digital technologies as an enabler*	Operation focused digital and data driven service improvement.	Holistic system thinking and emergent sharing of data.	Strategy led and outcome driven. Enabled by system-wide technology investment.	Technology and data enabled dynamic sense and response systems.	Continuously adaptive city-wide 'smart' deployment.
Effect on Outcomes	Capturing evidence and building business case.	Cross boundary partnerships emerging to focus on shared outcomes.	Shared accountability for outcomes and joint system-wide investment programme.	Improved prediction, prevention and real-time response delivers improved outcomes.	City-wide open 'system-of-systems' approach drives innovation that enhances city competitiveness.
Strategic Intent Successful smart cities have a strategy and roadmap setting out how investment in data & digital technologies enables service reform and partner collaboration. An effective strategy focusses on delivering improved outcomes aligned to the city's strategic priorities.	• No overall roadmap for digital transformation exists yet. • Investment in discrete areas only, with view to establishing evidence & business case.	• Strategy and investment largely at departmental level. • Emerging sharing of strategic intent and business case with partners. • Some initial shared service transformation between partners.	• A shared vision, strategy and roadmap for the 'smart' city in place with multiple partners across multiple domains. • Business case established & shared investments in place to secure scalable improvements to agreed outcomes.	• Vision, strategy and roadmap established at city-wide level. • Improved service outcomes evidenced and underpinning future service improvements at scale.	• Strategy is optimised and evolves based on clear evidence of impact on city competiveness. • Smart investments have clear impact on city's strategic priorities.
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.	• 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.	• Barriers to optimising data assets being discussed between partners and solutions emerging. • Some advanced data sharing and analytics applications in place. • Some data sets are opened to the public.	• Data management & 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.	• Data assets used to provide actionable information. • Extended data capture & analytics leads 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.	• Data analytics used for dynamic & 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.
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.	• ICT architectures are predominantly designed to support each line of business application. • Limited investment in sensor networks for particular service applications.	• 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.	• Investment in integrating architectures between organisations is taking place. • Joint investment plans in city-wide deployment of connected assets.	• 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.	• Organisations are continuously reviewing, adapting and investing in ICT architecture to drive service transformation. • A networked built environment across the city.
Governance & Service Delivery Models 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.	• 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.	• 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.	• Leadership and governance models evolve to share accountability for delivering system-wide outcomes. • Greater input to problem solving and service design from providers/ suppliers & users. • Organisational budgets and structures adapt to ensure effective and transparent delivery of system-wide approach.	• 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 & performance contracting.	• 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.
Stakeholder Engagement Successful smart cities make best use of data and digital technologies to invest in enhanced openness and transparency. Stakeholder engagement and stakeholder ownership of service reform is central within a smart city. Smart cities are proactive in improving take up of digital services while supporting the digitally excluded.	• Stakeholder participation in reform 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 and social network channels is recognised and discrete initiatives are underway.	• 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.	• 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.	• City uses multiple channels to engage with citizens tailored to their needs. • Views and ideas of citizens and stakeholders systematically captured through multiple channels to improve services. • Citizens benefit from integrated services across organisations using the best digital technology for them.	• City has embedded inclusive & personalised engagement models that stimulate innovation and collaborative approaches across the public and private sectors. • Digital literacy across the population is high and support or alternative provision is in place for those that need it.

4. Self-Assessment Tool

The following diagram outlines the overall self-assessment framework and each section is described in more detail over the following pages.



An online self-assessment survey will guide you through the individual questions within each stage – links to this are provided in Section 6. The Self-Assessment Tool questions are outlined in Appendix D and are also available separately in PDF format.

Stages 1 and 3 require city-wide scoping and analysis. Stage 2 is designed to capture domain specific analysis that can give greater granularity to Stage 3 city-wide analysis.

The City Sponsor has an important role in co-ordinating the completion of the self-assessment exercise within each city – getting the right people involved, participating in workshops, and providing as much relevant information as possible to inform the baseline assessment and the outline Investment Roadmap. They also have a critical part to play in co-ordinating the city-wide analysis that draws on findings following the detailed domain assessments.

It is expected that the City Sponsor will co-ordinate completion of the Stage 1: City-wide Scope and Stage 3: City-wide Analysis sections of the self-assessment following wide consultation with city stakeholders. The City Sponsor may choose to select Domain experts to complete the Stage 2: Domain Specific Analysis.

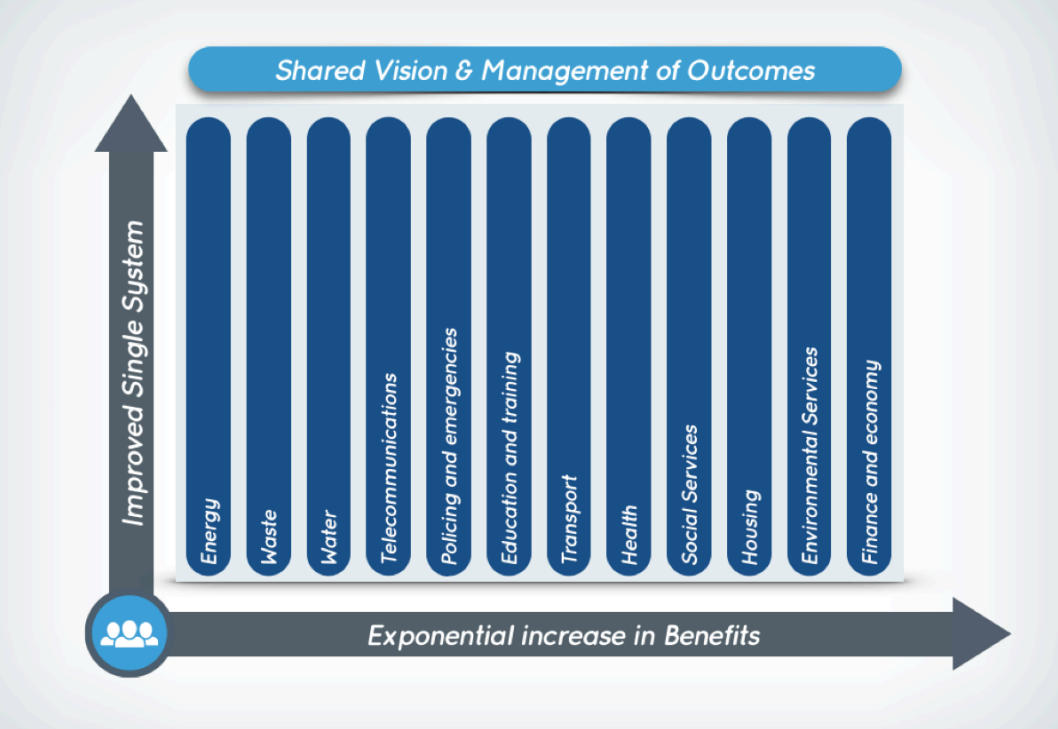
The Self-Assessment Tool has 3 key stages that require to be completed as illustrated in the table below:

City-wide Scope (Stage 1) **single submission per city*	This stage requires identification of the specific domains that you wish to assess within the Self-Assessment Tool. All cities are structured differently and are at varying stages of smart cities development. Taking a domain specific approach ensures that the Self-Assessment Tool can be adapted for use within individual cities and also ensures that, each time the Self-Assessment tool is used and re-used, it can focus on specific areas of strategic priority as appropriate. Activity here defines the scope of the Stage 2 Self-Assessment.
Domain Specific Analysis (Stage 2) **multiple submissions per city*	Most cities at the start of the smart cities journey will be thinking and acting at a service level rather than a city-wide level. It is also recognised that different service areas may be at different levels of maturity in their approach and may have different investment pipelines and ambition. The Self-Assessment Tool captures a detailed analysis at domain level and identifies current level of maturity and activity (Stage 2A), planned investments (Stage 2B) and ambition to 2020 (Stage 2C). It is important when completing this domain specific analysis to consider investments that have a wider applicability and reuse across the city. In addition, there are several supplementary questions relevant to each key dimension (Stage 2D). The responses to these will help obtain a further degree of granularity in relation to specific investment activity that is either taking place (Stage 2A), planned (Stage 2B) or within the ambition of cities 2020 (Stage 2C). Information included here provides a level of granularity for the Stage 3 city-wide analysis and will aid teasing out of issues and comparisons within the city system.
City-wide Analysis (Stage 3) **single submission per city*	This stage of the analysis considers the whole city response. It takes the output from Stage 2 and also asks respondents to take into account the domains that were not developed into a Stage 2 self-assessment as part of this exercise. The Self-Assessment Tool captures reflection at a city-wide level in relation to current level of maturity and activity (Stage 3A), planned investments (Stage 3B) and ambition to 2020 (Stage 3C). An important part of this analysis is to consider the findings from the Stage 2 self-assessments and identify any gaps or synergies that could be exploited or existing domain capabilities (that will have been identified within the key dimensions evaluated) which could be extended city-wide or combined into an integrated action. In addition, you are asked to identify investments where there may be benefit in collaborating with other cities to take forward (Stage 3D).

4.1 Stage 1: City-wide Scope

Please note: this section of the Self-Assessment Tool should be completed by a nominated city-wide expert following wide consultation with stakeholders across the city.

The diagram below illustrates potential scope across a whole city system providing examples of sector specific domains. 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).



Reference: Adapted from British Standards Institution Publicly Available Specification (PAS) 181 (2014) 'Smart City Framework – Guide to Establishing Strategies for Smart Cities and Communities'

In selecting domains for Stage 2, cities may want to consider:

- **Pragmatism:** Which domains have started on a smart cities journey and where analysis at Stage 2 would support completion of the Stage 3 city-wide assessment?
- **Effect on outcomes:** Which domains would benefit most from adopting a smart cities approach that impacts on the city's strategic priorities?
- **Resources:** What resources are available to complete assessments?
- **Current knowledge:** The knowledge to complete the assessment with easily accessible information.
- **Proportionate:** What is proportionate to make the assessment meaningful at this stage of the city's smart cities journey?

4.2 Stage 2: Domain Specific Analysis

Please note: this section of the Self-Assessment Tool should be completed by a nominated domain expert following wide consultation with stakeholders across the domain.

The Stage 2: Domain Specific Analysis is split into the following 4 sections:

- **Stage 2A: Current position** – describe the current level of maturity and document investments that have been made or programmes established which are already in place or being implemented at this time (procured and with budget secured). You are asked to provide evidence of the self-assessment scoring level allocated.

  The information collected in this section will be useful as a baseline assessment of the current position of cities in relation to smart cities readiness and also as an input to the outline Investment Roadmap. Successful smart cities often build new innovation from existing investments that have already been made. Sharing of best practice within and across cities from the information provided in this area will also be extremely beneficial.

- **Stage 2B: Planned investment position** – describe investments which have either secured or can be assumed to have secured local funding over the next three years (or longer planning period if that is available) but where delivery and procurement have not yet started. These are investments where revenue or capital budgets may have been assigned (or could be conservatively assumed) but where delivery and procurement is not yet underway.

  These planned investments are important to identify as potential sources of 'match funding' for new sources of investment (e.g. European Structural Funds). With additional funding – could these planned investments have extended impact? You are asked to reflect on the impact of these investments on the level of maturity and also to identify any gaps and barriers to delivery as well as the synergies and opportunities that should be considered.

  There are often legitimate barriers to improving capability in a specific area. It is critical that these are described so that the outline Investment Roadmap can be made more purposeful. Sharing the identification of barriers can lead to positive discussion and earlier resolution – the outline Investment Roadmap must be achievable and this can only be the case if barriers to improvement are known.

- **Stage 2C: Ambition to 2020** – detail the level of Smart City maturity you aspire to by 2020 and document the priority outcomes and city development challenges which are a focus for this domain. An outline of the opportunities for investment and potential programmes and actions to secure this ambition is also requested at this stage.

- **Stage 2D: Supplementary Questions** – identify if a number of statements either apply currently (Stage 2A), within planned investment (Stage 2B) or within your ambition to 2020 (Stage 2C). Only those that apply should be selected. The statements all require investment – in terms of resource time, process development, stakeholder buy-in, technology application etc and responses will provide either an acknowledgement of prior investment or a commitment for future

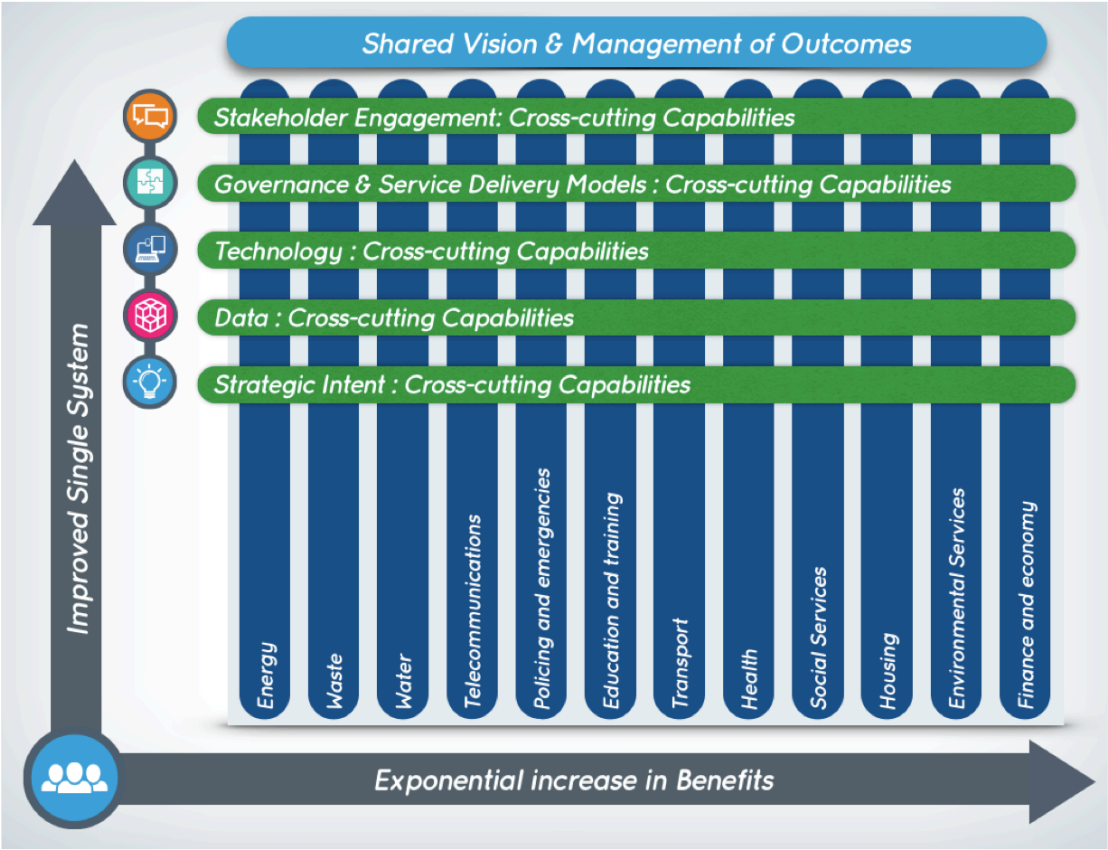
investment (planned or within the ambition of cities). The information provided here will be very useful for comparison across domains within a city and across cities. The supplementary questions have been included in Appendix E.

4.3 Stage 3: City-wide Analysis

Please note: this section of the Self-Assessment Tool should be completed by a nominated city-wide expert following wide consultation with stakeholders across the city.

This stage of the analysis asks you to consider the whole city response. You are asked to take the input from Stage 2 and also take into account the domains that were not developed into a Stage 2 assessment as part of this exercise. Smart Cities see increasing levels of integration within strategy development and planning, partnership working and investment in shared technology platforms and data assets as they mature. The maturing smart city builds capabilities (within the dimensions noted above) through investments that are increasingly reused on a city-wide basis to transform a range of services.

The Self-Assessment Tool captures reflection at a city-wide level in relation to current level of maturity and activity (Stage 3A), planned investments (Stage 3B) and ambition to 2020 (Stage 3C). This considers the information provided at domain-level and how this relates to a city-wide view – especially in relation to investments in domains and the opportunity to extend and/ or integrate these investments to form capabilities (identified within the key dimensions evaluated) on a city-wide basis. For example, investment in an operations centre may be a priority for transport but could in the future be reused for public safety or environmental services.



In addition, you are asked to identify investments where there may be benefit in collaborating with other cities (Stage 3D).

The city-wide Stage 3 Analysis is split into the following 4 sections:

- **Stage 3A: Current city-wide position** – describe the current level of aggregated maturity for the city, considering the context of the whole city. This should include reference to all domain areas within the city system regardless of whether a Stage 2 Self-Assessment has been undertaken.

- **Stage 3B: Planned investment city-wide position** – consider city-wide planned investments and also identify any gaps from within the Stage 2 individual domain responses. An analysis of the potential for synergies, which could be exploited or combined and extended, to other domains or city-wide is requested. You are asked to reflect on the impact of these planned investments on the city-wide level of maturity once these investments have been made.

- **Stage 3C: City-wide Ambition to 2020** – document the level of smart cities maturity that your city aspires to by 2020. You are asked to review and reflect on whether the ambition to 2020 aspirations of the domains selected within the Stage 2 Self-Assessment are appropriate and then comment on whether the priority outcomes and city development challenges identified at domain level translate to city-wide priority outcomes and city development challenges. An outline of additional investments or actions which need to be considered at Executive level in order to accelerate progress and secure the ambition is also requested together with consideration of resources and other constraints.

Please note: it may be appropriate at this point to update or provide further information within the Stage 2C (Ambition to 2020) assessment of selected domains.

- **Stage 3D: Collaboration** – reflect on the opportunities for collaboration with other cities in delivery of investments and programmes, and identify any existing best practice or capabilities which other cities could potentially benefit from or reuse. Other investments or programmes that are already scheduled could be enhanced through collaboration and it would be extremely beneficial to note if there are areas of collaboration and investment that you would specifically like to explore so that these can be considered within the outline Investment Roadmap.

5. Online Self-Assessment Tool

The online version of the Self-Assessment Tool is available at the following links:

Stage 1: City-wide Scope

This section of the Self-Assessment Tool should be completed by a nominated city-wide expert following wide consultation with stakeholders across the city.
A single submission is expected from each city.

https://www.surveymonkey.com/s/stage1_cityscoping

Stage 2: Domain Specific Analysis

This section of the Self-Assessment Tool should be completed by a nominated domain expert following wide consultation with stakeholders across the domain.
Multiple submissions are expected from each city, one per each nominated domain.

https://www.surveymonkey.com/s/stage2_domainspecific

Stage 3: City-wide Analysis

This section of the Self-Assessment Tool should be completed by a nominated city-wide expert following wide consultation with stakeholders across the city.
A single submission is expected from each city.

https://www.surveymonkey.com/s/stage3_cityanalysis

The links above allow you to obtain an understanding of each survey and share the question sets among stakeholders.

For submission, dedicated links will be issued to each city for Stage 1 (city-wide scope), Stage 2 (domain specific analysis, one for each domain) and Stage 3 (city wide-analysis). These links are specific to your submission and can be shared between stakeholders to facilitate iteration and collaborative responses. Amendments will be saved automatically when online **up until the point that the response is submitted**. It is not possible to return to amend previous answers once the survey response has been submitted.

An outline of the self-assessment tool questions has been included in Appendix D.

Appendix A Smart Cities Models and Reference Material

Model	Link for Further Information
Smart City Rankings (Boyd Cohen)	http://www.boydcohen.com/smartcities.html
Smart Cities – Ranking of European Medium Sized Cities (Vienna University of Technology)	http://www.smart-cities.eu/index2.html
Smart City Framework/ Smart Cities Analysis in Spain (IDC)	http://www.portalidc.com/resources/white_papers/IDC_Smart_City_Analysis_Spain_EN.pdf
PAS 180 – Smart Cities Vocabulary (BSI)	http://shop.bsigroup.com/en/ProductDetail/?pid=000000000030298436
PAS 181 – Smart City Framework (BSI)	http://shop.bsigroup.com/en/ProductDetail/?pid=000000000030277667
PAS 182 - Smart Cities Concept Model (BSI)	Guide to establishing a model for data interoperability. *Not yet publically available – final draft reviewed.*
Smart Cities Readiness Guide (Smart Cities Council)	http://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)	http://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	http://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)	http://www.accenture.com/SiteCollectionDocuments/PDF/Accenture-Information-Marketplaces.pdf
The Morgenstadt Approach (Morgenstadt & Fraunhofer)	http://www.corp.at/archive/CORP2014_51.pdf http://www.unescap.org/sites/default/files/Session-3-Fraunhofer-IAO-Heydkamp.pdf
Understanding Smart Cities – An Integrative Framework (Chourabi)	http://www.ctg.albany.edu/publications/journals/hicss_2012_smartcities/hicss_2012_smartcities.pdf
Smart Cities – A Stochastic Frontier Analysis (Mundula)	http://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)	http://www.rockefellerfoundation.org/uploads/files/814a5087-542c-4353-9619-60ff913b4589-sr.pdf http://www.iftf.org/uploads/media/SR-1236%20Future%20Knowledge%20Ecosystems.pdf

Model	Link for Further Information
Intelligent Community Forum	https://www.intelligentcommunity.org/index.php?src=gendocs&ref=White_Papers&category=Research
Stanford/ Yonsei Universities – Towards A Smart City Framework	http://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-opportunties-uk.pdf
Smart Cities and Communities Framework – Financing Models for Smart Cities	http://eu-smartcities.eu/sites/all/files/Guideline-%20Financing%20Models%20for%20smart%20cities-january.pdf

Appendix B Smart Cities Case Study Examples and Further Information

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

Appendix C Glossary

API (Application Programming Interface)	An API is a set of commands, functions, and protocols which programmers can use when building software for a specific operating system. The API allows programmers to use predefined functions to interact with the operating system, instead of writing them from scratch. http://www.techterms.com/definition/api
Big Data	High volume, high velocity, and or high variety of information assets that require new forms of processing to enable enhanced decision making, insight discovery and process optimisation. http://www.gartner.com/DisplayDocument?id=2057415
Capability Maturity Model	It has long been accepted that continuous process improvement is based on many small evolutionary steps rather than larger revolutionary innovations. The Capability Maturity Model (CMM) provides a framework for organising these evolutionary steps into five maturity levels that lay successive foundations for continuous process improvement. This methodology is at the heart of most management systems which are designed to improve the quality of the development and delivery of all products and services. www.itgovernance.co.uk
Capital	Expenditure of the authority which falls to be capitalised in accordance with proper practices. Local Government in Scotland Act 2003
Cloud Computing	Scalable IT services accessible via the internet for a potentially large number of external customers, providing facilities for the storing and use of data and information on facilities remote from local computing facilities. http://www.gartner.com/newsroom/id/707508
Crowd-Sourced	Obtain (information or input into a particular task or project) by enlisting the services of a number of people, either paid or unpaid, typically via the Internet. The practice of obtaining needed services, ideas, or content by soliciting contributions from a large group of people and especially from the online community rather than from traditional employees or suppliers. http://www.merriam-webster.com/dictionary/crowdsourcing
Domain	A field or scope of knowledge or activity. http://www.collinsdictionary.com/dictionary/english/domain

European Structural Funds Programme	European Structural Funds provide EU Member States and regions with assistance to overcome structural deficiencies and to enable them to strengthen competitiveness and increase employment. The Scottish Government is the 'Managing Authority' for Structural Funds in Scotland and has overall responsibility for supervising the implementation; ongoing management; and effectiveness of the programmes. More information is available at the following links: http://www.scotland.gov.uk/Topics/Business-Industry/support/17404
Innovation	Changes made to something established, or a new introduction as new methods, ideas, or products, to achieve desirable outcomes that result in small but significant improvement.
Integrated	Combined and compatible operation of different city systems and exchange of data and information with the aim of achieving more effective outcomes with least resource input.
Inter-operability	The ability to make systems and organisations work together (inter-operate). While the term was initially defined by information technology or systems engineering services to allow for information exchange, a more broad definition takes into account social, political, and organisational factors that impact system to system performance. Task of building coherent services for users when the individual components are technically different and managed by different organisations. Definition adapted from www.bsigroup.com.
Internet of things	State where things (e.g. objects, environments, vehicles and clothing) have more and more information associated with them and may have the ability to sense, communicate, network and produce new information, becoming an integral part of the internet. https://connect.innovateuk.org/c/document_library/get_file?p_l_id=2140879andfolderId=2543615andname=DLFE-73702.pdf
Management information system	Information processing system that supports the decision-making of a community, city or organisation.
Master Data Management	A technology-enabled discipline in which business and IT work together to ensure the uniformity, accuracy, stewardship, semantic consistency and accountability of the enterprise's official shared master data assets. Master data is the consistent and uniform set of identifiers and extended attributes that describes the core entities of the enterprise including customers, prospects, citizens, suppliers, sites, hierarchies and chart of accounts. http://www.gartner.com/it-glossary/master-data-management-mdm/

Open data	Content or data that is free to use, reuse, and be redistributed, subject only, at most, to the requirement to attribute and/or share-alike http://opendefinition.org/
Open innovation	Paradigm that assumes that firms can and should use external and internal ideas, and internal and external paths to market Chesbrough, Henry, *Open Innovation*, Harvard Business School Press, 2003
Open platform	Software system based on open standards.
Open standard	Standards for software interoperability, data and document formats.
System-of-systems	Large system that delivers unique capabilities, formed by integrating independently useful systems. ISO/IEC/IEEE 24765:2010, 3.2991 (Systems and Software Engineering, Vocabulary).

A full Smart Cities Vocabulary has been published by the British Standards Institution (BSI) in PAS 180 (2014) and is recommended for review while undertaking the Self-Assessment exercise. It is available at the following link:

http://shop.bsigroup.com/en/ProductDetail/?pid=000000000030298436

Definitions included above that do not have a specific reference are drawn from PAS 180: Smart City Vocabulary.

Appendix D Outline of Self-Assessment Tool Questions

Stage 1, City-wide Scope

(1.1) Consider how your city is currently organised/ operates and define the preferred city-wide domains which will be used for analysis in Stage 2.
(1.2) What is your rationale for selecting these domains?
(1.3) What is your rationale for not including other domains for review within this particular Self-Assessment exercise?

Stage 2, Domain Specific Analysis

This self-assessment should be completed for each domain selected within **Stage 1, City-wide Scope**:

(2.1) Description of domain.
(2.2) Detail organisations/ partners involved in delivery of domain across the city. This could include local authority, public sector, private sector, voluntary sector, academia and any other relevant organisations or stakeholder groups as appropriate.
(2.3) Revenue/ capital expenditure within domain (if known).

Stage 2A: Current Position

(2A.1) Consider the Smart Cities Maturity Model and identify for each of the five dimensions which level (1-5) best describes the current approach within the domain?
Provide rationale and evidence.
**note the online tool allows you to indicate the individual statements that apply within levels*

Dimensions	**Score (1-5)**	**Rationale/ Evidence**
Strategic Intent		
Data		
Technology		
Governance & Service Delivery Models		
Stakeholder Engagement		

(2A.2) Document the key smart investments or programmes that are either in place or being implemented at this time (procured or sourced and have budget secured) that support the assessment of the current position (2A.1 above).
Provide details including description, policy/ service objective, impact across key dimensions, partners and value (if known).

Investment or Programme (Name & Description)	**Policy/ service objective**	**Impact across dimensions (SI, D, T, G&SDM, SE)**	**Partners**	**Value** (if known)

(2A.3) Provide any further information or commentary to support the assessment of the current position within the domain (e.g. links to key documents):

Stage 2B: Planned Investment Position

(2B.1) Document the key smart investments or programmes that are anticipated over the next three years (or longer planning period if that is available). These are investments where revenue or capital budgets may have been assigned (or could be conservatively assumed) but where delivery and procurement is not yet underway.
Provide details including description, policy/ service objective, impact across key dimensions, partners and revenue/ capital value (if known).

Investment or Programme (Name & Description)	**Policy/ service objective**	**Impact across dimensions (SI, D, T, G&SDM, SE)**	**Partners**	**Revenue Value** (if known)	**Capital Value** (if known)

(2B.2) Provide detail of gaps and barriers that could prevent effective delivery within each planned investment identified.	
Strategic Intent	
Data	
Technology	
Governance & Service Delivery Models	
Stakeholder Engagement	
(2B.3) Provide detail of synergies and opportunities that should be considered to maximise the impact of each planned investment identified.	
Strategic Intent	
Data	
Technology	
Governance & Service Delivery Models	
Stakeholder Engagement	

(2B.4) Consider the Smart Cities Maturity Model and identify which level best describes the planned investment position (Stage 2B) within your domain? Provide rationale and evidence. **note the online tool allows you to indicate the individual statements that apply within levels*		
Dimensions	**Score (1-5)**	**Rationale/ Evidence**
Strategic Intent		
Data		
Technology		
Governance & Service Delivery Models		
Stakeholder Engagement		

(2B.5) Provide any further information or commentary to support the assessment of the planned position within the domain (e.g. links to key documents):

Stage 2C: Ambition to 2020

(2C.1) Consider the Smart Cities Maturity Model and identify which level best describes the ambition to 2020 (Stage 2C) within your domain? Provide rationale. **note the online tool allows you to indicate the individual statements that apply within levels*		
Dimensions	**Score (1-5)**	**Rationale**
Strategic Intent		
Data		
Technology		
Governance & Service Delivery Models		
Stakeholder Engagement		

(2C.2) What are the priority outcomes or critical development challenges that are important to this domain? You may wish to draw on city strategy and vision documents already published if appropriate.	
Priority outcome/ critical development challenge	**Description**

(2C.3) Document the key smart investments or programmes that would be required to support your ambition to 2020.
Provide details including description, policy/ service objective, impact across key dimensions, partners and revenue/ capital value (if known).
Include details of domain-level and city-wide investment as appropriate.

Investment or Programme (Name & Description)	**Policy/ service objective**	**Impact across dimensions (SI, D, T, G&SDM, SE)**	**Partners**	**Revenue Value** (if known)	**Capital Value** (if known)	**City-wide or Domain**

(2C.4) Provide detail of gaps and barriers that could prevent effective delivery within each ambition investment identified.

Strategic Intent	
Data	
Technology	
Governance & Service Delivery Models	
Stakeholder Engagement	

(2C.5) Provide detail of synergies and opportunities that should be considered to maximise the impact of each ambition investment identified.

Strategic Intent	
Data	
Technology	
Governance & Service Delivery Models	
Stakeholder Engagement	

(2C.6) Provide any further information or commentary to support the assessment of the ambition to 2020 position within the domain (e.g. links to key documents):

Stage 2D: Supplementary Questions

Note the investment areas that apply within your domain from a number of statements that are aligned to Smart City maturity – either currently, within planned investment or within the ambition to 2020. Only the statements that apply should be indicated – it is not expected that investments will have taken place or be expected in all of these areas within each domain. The investment areas have been identified within each key dimension:

- (2D.1) Strategic Intent
- (2D.2) Data
- (2D.3) Technology
- (2D.4) Governance & Service Delivery Models
- (2D.5) Stakeholder Engagement

The supplementary questions have been included in full within Appendix E.

Stage 3, City-wide Analysis

The city-wide analysis takes the input from Stage 2 to aid granularity but considers the aggregate whole city response – also taking account of those domains that did not develop a Stage 2 self-assessment. You may also wish to reflect on whether there are other priority domains that your city should assess at this point.

Stage 3A: Current Position

This stage aggregates the outputs of the Stage 2A analysis at a domain level and considers in the context of the whole city.

(3A.1) What are the key similarities/ differences across the domains you have selected? Do you have a sense for how these issues might be reflected in domains not selected for Stage 2 analysis?

(3A.2) Consider the Smart Cities Maturity Model and identify which level best describes the current aggregated position (Stage 3A) for your city against each dimension. Provide rationale.
**note the online tool asks you to indicate the overall level in Stage 3 rather than individual statements*

Dimensions	**Score (1-5)**	**Rationale**
Strategic Intent		
Data		
Technology		
Governance & Service Delivery Models		
Stakeholder Engagement		

Stage 3B: Planned Investment Position

(3B.1) Consider planned investments identified in individual domain assessments that could be combined/ extended to other domains or city-wide in order to maximise the impact. Are there gaps or synergies that could be exploited or existing capabilities in a specific domain which could be extended city-wide? Provide description, gaps/ synergies, opportunity for integrated action, domains of relevance and revenue/ capital value (if known).

NOTE – You may consider it useful to involve those in corporate planning, service reform, ICT or data management roles to support this assessment.

Investment or Programme (Name & Description)	**Gaps/ Synergies**	**Opportunity for integrated action**	**Domains of relevance**	**Revenue Value** (if known)	**Capital Value** (if known)

(3B.2) Consider the Smart Cities Maturity Model and identify which level best describes the planned investment position (Stage 3B) on a city-wide basis once these investments have been made? Provide rationale. **note the online tool asks you to indicate the overall level in Stage 3 rather than individual statements*		
Dimensions	**Score (1-5)**	**Rationale**
Strategic Intent		
Data		
Technology		
Governance & Service Delivery Models		
Stakeholder Engagement		

Stage 3C: Ambition to 2020

(3C.1) Consider the Smart Cities Maturity Model and identify which level best describes where you aspire to be as a city by 2020? Provide rationale. **note the online tool asks you to indicate the overall level in Stage 3 rather than individual statements*		
Dimensions	**Score (1-5)**	**Rationale**
Strategic Intent		
Data		
Technology		
Governance & Service Delivery Models		
Stakeholder Engagement		
(3C.2) Are ambitions set at domain level appropriate? Do they impact on priority outcomes for the city?		

You may wish at this stage to reflect on the responses at Stage 2C for particular domains and suggest edits.

(3C.3) Are there additional investments or programmes that need to be considered at Executive level to accelerate progress? Provide details including description, policy/ service objective, impact across key dimensions, partners and revenue/ capital value (if known). Include details of domain-level and city-wide investment as appropriate.					
Investment or Programme (Name & Description)	**Policy/ service objective**	**Partners**	**Revenue Value** (if known)	**Capital Value** (if known)	**City-wide or Domain**

(3C.4) Are there capabilities within the dimensions of strategic intent, data, technology, governance & service delivery models and engagement that you would benefit from investing in on a city-wide basis? These may have been identified within a Stage 2 Domain Assessment or otherwise. NOTE – You may consider it useful to involve those in corporate planning, service reform, ICT or data management roles to support this assessment.

Stage 3D: Collaboration

(3D.1) Are there investments identified in Stage 2B, Stage 2C, Stage 3B and Stage 3C where there may be benefits in collaborating with other cities to take forward? Provide details of investment, domain and opportunity for collaborative action.		
Investment or Programme (Name & Description)	**Domain Name**	**Opportunity for Collaborative Action**

(3D.2) Are there investments identified in Stage 2A and Stage 2C which other cities would benefit from considering/ reusing? Provide details of investment, domain and opportunity for collaborative action.		
Investment or Programme (Name & Description)	**Domain Name**	**Opportunity for Collaborative Action**

Appendix E Stage 2D: Domain Supplementary Questions

Please note the statements that apply within your domain – either currently (Stage 2A), within planned investment (Stage 2B) or within your ambition to 2020 (Stage 2C)?

Please only tick those that apply.

Question 1: Strategic Intent	**Stage 2A Existing**	**Stage 2B Planned Investment**	**Stage 2C Ambition 2020**	**N/A**
Delivery: Barriers to smart cities development are identified and documented.				
Collaboration: Cross-sector group(s) have been formed to take forward smart and digital collaboration investments.				
Business Case: Business cases which span departments, agencies or organisations are developed for smart city projects.				
Business Case: Business cases recognise the potential for long-term scalability. The options for reuse of capabilities designed for one project are considered for future development within investment decisions.				
Financing: Departments, agencies and organisations in the city have established investment management processes – for example, joint budgeting for programmes.				
Vision & Strategy: A vision, strategy and roadmap for smart cities is in place which has been developed inclusively drawing on the skills of a range of partners.				
Delivery Skills: Skills needed to deliver smart cities projects or investments have been mapped and plans to build capacity are in place.				
Reference Model: A common and shared terminology and reference model is established and agreed among all stakeholders involved in smart delivery.				
Delivery Skills: The skills and expertise to support smart cities delivery are in place at all levels.				
Management: Cross-organisational governance, budgetary and performance management structures are in place to direct delivery of the smart cities vision and strategy.				

Management: Progress is continuously measured, monitored and published - KPIs exist. Lessons learned are adopted. Vision, strategy and roadmap continually evolve.				
Management: Framework of performance and impact measurement is in place to ensure accountability in delivering outcomes.				

Question 2: Data	Stage 2A Existing	Stage 2B Planned Investment	Stage 2C Ambition 2020	N/A
Data Management: An asset register is in place with data and IT assets mapped.				
Data Skills: Resources with specific data skills are being actively developed or recruited.				
Real-Time Data: Opportunities to increase real-time data capture are identified and researched through a managed process.				
Crowd-Sourced Data: Crowd-sourced data is routinely collected and published. This involves the practice of obtaining needed services, ideas, or content by soliciting contributions from a large group of people and especially from the online community rather than from traditional employees or suppliers.				
Data Management: Partners have agreed data sharing, privacy and management policies linked to the data management and optimisation strategy.				
Open Data: Investments to improve the use of open data and help stimulate innovation take place regularly (for example, Hackathons, Service Jams, competitions).				
Open Data: An open data portal exists for sharing of open data.				
Open Data: Where services contracts are procured by the city then contract conditions have been adapted to ensure data is provided on an open basis for reuse and integration.				
Open Data: Physical spaces and virtual mechanisms (for example, online forums, collaborative workspaces) exist to support open data communities.				
Data Analytics: Data analytics are used widely and across organisational boundaries to support improved service delivery, information sharing or the better application of resources.				
Data Value: There is a formal policy in place and process for charging for data and purchasing of additional third-party data for use between partners.				

Real-Time Data: Real-time data is made available for re-use, including through APIs.				
Master Data Management (MDM): Master Data Management (MDM) is operational.				
Big Data: Big data integration requirements are understood and the tools are in place to integrate data from a multitude of sources. For example integration of all data from traditional transactional data, unstructured data to crowd-sourced/ citizen-generated data and real-time data from example a network of sensors.				
Real-time Data: A governance structure is in place to support cross-organisational capture and sharing of real-time data. All organisations that have command-control-response requirements are involved.				
Open Data: A managed process is in place for citizens and businesses to request additional datasets to be made open.				
Data Sharing: Data sharing targets exist and performance is measured.				
Data Management: Data processes are continually monitored, reviewed and developed in an agile manner to ensure optimisation.				

Question 3: Technology	Stage 2A Existing	Stage 2B Planned Investment	Stage 2C Ambition 2020	N/A
Delivery: Pilot services are considering interoperability of data between organisations and are establishing shared technology infrastructure.				
Connected Assets: Wireless sensors, cameras and other connected assets (for example, street lighting) are being adopted in pilot projects.				
System Architecture: System architecture maps are fully documented, widely shared and open where possible.				
Inter-operability: The city has identified the key areas for interoperability and has established both principles and the application of common languages between system architectures.				
Delivery: Barriers to system integration are identified and documented.				
Costs & Benefits: Costs and benefits of system integration have been identified and documented.				
Shared Architecture: Shared architecture solutions and inter-operability are prioritised, investment roadmaps documented and dedicated work is taking place to break down barriers. The strategy and investment plan for city-scale solutions is agreed.				
Shared Architecture: Investment has been made into shared architectures between organisations/ groups with separate budget streams and the benefits have been evidenced. A 'system-of-systems' approach is in operation.				
Connected Assets: Connected assets contribute to a 'system-of-systems' and provide real-time information for re-use. Connected assets are used for multiple purposes, for example, CCTV used for public safety and also monitor footfall, intelligent street lights monitoring multiple data flows.				
Digital Strategy: There is a formal process in place to identify new digital technologies for introduction in an iterative and agile manner across the city.				

Broadband: City-wide access to next generation broadband is in place providing both fixed and wireless provision to support a range of data-intensive applications.				
Digital Strategy: Technology investments are linked to outcomes and leveraged across multiple organisations.				
Scalability: The ICT infrastructure solution is scalable to support increased use and intuitive to predict and adapt to supply and demand.				
Benefits Realisation: Clear benefits of a 'system-of-systems' approach are evidenced.				

Question 4: Governance & Service Delivery Models	Stage 2A Existing	Stage 2B Planned Investment	Stage 2C Ambition 2020	N/A
Delivery: Smart cities pilot projects or demonstrators are taking place.				
Innovation: Formal mechanisms have been established to encourage new ideas, new forms of collaboration, new ways of working, new business models.				
Collaboration: Pilot collaboration projects between partners have been established that require reorganisation of departments and budgets.				
Research: Smart cities research and information gathering from other cities is undertaken.				
Supplier Market: Procurement policies are regularly reviewed to remove barriers to improvement. Suppliers are actively engaged in this process.				
Supplier Market: A formal process is in place to involve industry in procurement ***strategies*** (i.e. in early and iterative engagement with potential suppliers in advance of the publication of procurement opportunities).				
Supplier Market: Formal processes which engage providers/ suppliers and users at an early stage in service design are documented.				
Budgeting: Mechanisms are in place to integrate organisational budgets.				
Supplier Market: Cross-organisational procurements are widely implemented.				
Delivery: Levels of access and take-up of digital services are known, shared and understood. This information is used to prioritise the future development of digital services.				
Delivery: The costs and service levels associated with the channels used to deliver services is up-to-date and audited regularly. This information is used to shape future strategy.				
Supplier Market: Published pipelines of future investment opportunities are in place. Opportunities for early face-to-face discussion with suppliers are organised.				

Supplier Market: Inter-operability based on open standards and opening up of data is designed into all procurements from the outset. Supplier lock-in is avoided where possible.				
Collaboration: Collaboration, sharing and knowledge transfer is a formal and managed process. This includes sharing best practice and transfer of knowledge with other cities on a systematic basis.				
Budgeting: Budgets are allocated based on a whole-city view.				
Collaboration: New forms of collaboration and sharing are encouraged. This includes re-use of assets and services between organisations in the city, support for inter-organisational working, submitting joint applications for funding etc.				
Collaboration: Contractual arrangements encourage collaboration (for example, competitions, events or sharing of common assets, opening up data).				
Innovation: Leaders are focused on nurturing and managing an innovation ecosystem in the city.				
Outcomes: Target smart cities outcomes and service levels are defined, not just inputs and outputs.				
Performance Management: Framework of performance and impact measurement is in place to measure progress. KPIs exist and performance is regularly published. Service leaders are challenged to achieve smarter ways of working.				
Strategy: There is an integrated strategic approach to the commissioning of services.				
Innovation: Documentation and evidence is published that illustrates how new businesses have emerged based on the opportunity for open innovation in technological delivery in the city.				

Question 5: Stakeholder Engagement	Stage 2A Existing	Stage 2B Planned Investment	Stage 2C Ambition 2020	N/A
Delivery: A number of pilot engagement projects have been initiated for certain services using digital technologies such as social media.				
Engagement: Digital engagement strategies are documented across the city including how partners are addressing digital exclusion.				
Service Design: An up-to-date audit of the channels used to deliver services (digital and non-digital) exists.				
Delivery: Barriers to take-up of digital channels are understood.				
Service Design: Examples of integrated service delivery channels exist (e.g. one-stop shop websites, single phone numbers, centralised information hubs).				
Social Media: Formal processes are in place to, for example, ensure social media engagement informs service design.				
Service Design: The segmented needs of specific customer groups (for example, parents, commuters) are documented.				
Social Media: Social media and mobile apps are used to enable public participation, gather opinion and inform service design.				
Engagement: Physical spaces and virtual mechanisms have been created which provide opportunities for new engagement models and stimulate innovative development aimed at solving specific challenges. Virtual mechanisms provide an opportunity for online co-working through, for example: forums, tools such as Knowledgehub, Basecamp, virtual communities of practice etc.				
Engagement: Citizens and businesses have effective and inclusive routes to participate in the vision and strategy for smart cities development and delivery. New suggestions for engagement by citizens and businesses are considered and leveraged where appropriate.				

Digital Inclusion: A digital inclusion strategy is agreed to enable take-up of digital services by the segments of the customer population currently unable or unwilling to use them.				
Channel Management: Multiple channels are used to engage with citizens and businesses – based on user preference. This includes telephone, face-to-face, web, social media, mobile apps etc. Digital channels are integrated with non-digital (for example, face-to-face or paper-based) channels.				
Citizen accounts: Citizen accounts are available and applied across a full range of services in the city. Personal shared data is secure.				
Engagement: Community engagement models (for example, common co-design/ co-production) are documented to maximise citizen-led service redesign.				
Engagement: Stakeholder engagement is multi-directional and personalised.				
Performance Management: City-wide measurable performance metrics for stakeholder engagement are in place and actively monitored.				
Service Design: A whole-view of specific customer groups exists supported by an integrated business and information architecture.				