



GREEN DIGITAL CHARTER



MONITORING REPORT

Overview of signatory
cities' steps towards
meeting GDC objectives

FEBRUARY 2018



List of abbreviations

DSS	Decision Support System
GDC	Green Digital Charter
EU	European Union
H2020	Horizon 2020, the European funding programme for research and innovation (2014-2020)
ICT	Information and communication technologies
IoT	Internet of Things
IT	Information technologies
JASPERS	Joint Assistance to Support Projects in European Regions (European funding programme)
KSF	Knowledge Society Forum (EUROCITIES)
LED	Light-emitting diode
LoRaWAN	Long Range Wide-Area Network
M2M	Machine-to-machine
MaaS	Mobility as a Service
PEB	Positive Energy Block
PPP	Public-private partnership
PUE	Power Usage Effectiveness
SOA	Service Oriented Architecture
STP	Science and Technological Parc
UNESCO	United Nations Educational, Scientific and Cultural Organization
WLAN	Wireless Local Area Network

Disclaimer: The information and views set out in this publication are those of the authors and do not necessarily reflect the official opinion of the European Union. Neither the European Union institutions and bodies nor any person acting on their behalf may be held responsible for the use which may be made of the information contained therein.

GREEN
DIGITAL
CHARTER



GuiDanCe

Support the coordination of cities' activities
via the Green Digital Charter

MONITORING REPORT

Overview of signatory cities' steps
towards meeting GDC objectives

FEBRUARY 2018



GuiDanCe has received funding from
the European Union's Horizon 2020
research and innovation programme
under Grant Agreement N° 653640

TABLE OF CONTENTS

EXECUTIVE SUMMARY	5
SECTION I POLICY TRENDS AND DEVELOPMENT	8
The national and regional contexts	9
Main urban strategies and priorities	11
Benefits from the Green Digital Charter	15
A broader picture: city-to-city cooperation in Europe	17
SECTION II CITIES CO-CREATE	20
Connecting city leaders, citizens and stakeholders	21
Engaging citizens in co creating their own ‘smart city’	23
Accessing, using and re-using data in an open data environment	24
An equal access to the digital society	26
SECTION III CITIES INNOVATE	28
Building smart infrastructures, delivering smart services	30
Towards an integrated city management	34
An innovative administration	36
SECTION IV CITIES MEASURE	38
Measuring energy savings	39
Low carbon ICT	39
Assessing the effectiveness of smart policies and projects	41
SECTION V CHALLENGES AND RECOMMENDATIONS	42
REFERENCES	45

EXECUTIVE SUMMARY

Two years after the first monitoring report, this second document reports on the progress of signatory cities of the Green Digital Charter (GDC) towards their commitment to use digital technologies to meet their energy goals and contribute to the fight against climate change.

This document is based on evidence collected through a survey and interviews with data officers and smart city project managers, as well as GDC case studies and desk research. The main findings confirm the trends seen in the previous report and highlight new challenges for cities.

First and foremost, policy trends are undoubtedly shaped by national and regional contexts. In issues like broadband connectivity, a high priority for cities, national law can be slow to facilitate progress. Conversely, some national governments are funding infrastructure projects that encourage investment and innovation.

Meanwhile, some regions are organising to benefit from economies of scale, with cities developing common strategies to foster enterprise. The European Union (EU) is contributing to this end through funding programmes enabling cities to cooperate across national boundaries.

Cities have different ideas about what it means to be smart, and are at very different stages in realising their various visions. GuiDanCe, the project supporting the implementation of the charter, has helped signatory cities to plan their sustainable urban development. Through visits and training activities, the most popular being webinars, cities have been able to clear many common hurdles.

Cities are deploying Information and Communication Technologies (ICT) to meet their targets: improving energy efficiency and reducing their overall carbon footprint while improving governance. Urban management can be more efficient with city platforms that integrate data flows across departments, but it remains up to the administration to break silos.

Cities achieve longer lasting and more innovative results when they collaborate with other stakeholders. Through apps, online platforms and hackathons, cities are tapping into citizens' potential, speeding up services and improving governance. There remains a lot of work to be done, however, in getting citizens equipped for digital engagement. Relying more on such platforms, cities must ensure that residents can access the digital world, both through infrastructural development and training for digital skills.

Common key challenges faced by cities relate to:

- finance (cities have started to explore new ways to finance urban development projects, through public private partnerships and new procurement practices)
- measuring progress remains difficult, so agreeing on key performance indicators is a must. Intangible aims, however, like social inclusion, often have crude quantitative proxies
- internal working culture and competencies of city staff
- data management
- dealing with the wide variety of standards on the market to get the best results while ensuring interoperability

Overall, the cities are keen to improve by sharing experiences and best practices and opening up knowledge gained through concrete measures. This report will feed this collective effort for mutual learning and strengthen collaboration between European cities.

SIGNATORY CITIES



BACKGROUND AND METHODOLOGY

About the Green Digital Charter

The Green Digital Charter is a declaration committing cities to working together to deliver on the EU climate objectives through the use of information and communication technologies.

Launched in 2009 by **Manchester** City Council and Clicks and Links Ltd., the Green Digital Charter is a EUROCITIES initiative supported by the GuiDanCe project for the period 2015-2018.

The initiative adapts to current trends, and in particular to the impact of ICT on the lives and needs of citizens. Updated in 2015, the revised Green Digital Charter commits cities to work together to deliver on the EU's objective of expanding the use of digital technologies that improve the life of their citizens and address the challenges of growth, sustainability and resilience.

The Charter has been signed by 53 major European cities and is open to local authorities regardless of the stage of implementation of their energy and climate policies.

Visit: <http://www.greendigitalcharter.eu/>

Methodology

This is the second edition of the Green Digital Charter monitoring report, which provides a snapshot of the trends and development in the use of digital solutions by European cities, their strategic approach to building smarter cities and next steps to ensure a sustainable and inclusive urban future.

Its main conclusions are based on evidence collected through the Green Digital Charter survey, which was developed under the Horizon 2020-funded GuiDanCe¹ project and through all activities held under the work package dedicated to technical training events (WP3), mainly onsite trainings, work shadowing visits and online training (webinars). Evidence collected through the GDC case-studies, has also been included.

The survey gathered evidence-based self-assessments of progress on the GDC commitment. The questionnaire served as a basis for more in-depth phone interviews held with data officers and smart city project managers.

A total of 12 Green Digital Charter signatory cities participated in the survey, providing a wealth of information on ICT-related developments and the evolution of their sustainability and smart city strategies at local and national levels.

Responses were received from: **Burgas**, **Edinburgh**, **Gdynia**, **Guimaraes**, Malmö, **Prague**, **Rennes**, **Rijeka**, **Tampere**, **Turin**, **Vienna** and **Zaragoza**.

The report also builds on peer-learning activities held since the release of the first edition of the Green Digital Charter monitoring report released in January 2016, in particular work shadowing visits, webinars and Green Digital Charter annual collections of case-studies gathering more than 80 case-studies submitted from 38 different cities.

The present report does not aim to provide a complete overview of all digital developments and projects taking place at local level in Europe. It only analyses the situations in European cities involved in the activities of the project.

SECTION I POLICY TRENDS AND DEVELOPMENT

All cities have a different
understanding of what a
‘smart city’ is.

As such, the approach adopted
by cities often relies on what
makes them special.

In 2017, digitalisation has entered most European streets and city administrations are in the game too, increasingly using digital solutions to modernise their service delivery and develop new public services.

If ICT is really to be useful to cities, the latter must take a strategic approach. The danger of spending money on gimmicks, or on duplicate systems that cannot evolve or be augmented, is real. More and more cities are seeing this risk, and adopting an approach to becoming 'smart' based on notions like 'open' and 'interoperable'. To ensure this, an overarching political vision driving the concrete action of all departments, and ensuring communication every step of the way is needed. A document detailing the vision and priorities should be put in writing, so that citizens can understand and scrutinise this vision, and industry can innovate to facilitate it.

THE NATIONAL AND REGIONAL CONTEXTS

National strategies and regulatory frameworks have a major impact on the way cities formulate their policies and decide on their actions as well as the way local development projects are funded. It cannot be denied that policy changes taking place at regional and national level impact the way European cities develop their digital and smart city concepts and strategies, as well as in setting their priorities.

Modernising the infrastructure

An example of how national strategies impact local policies in the knowledge society relates to broadband and connectivity. Today, access to Internet networks or fixed broadband connections varies significantly across Europe, and largely depends on national policies and telecommunication operators. For cities to function as open urban innovation platforms in the future, new generation of wireless networks are needed. Nevertheless, the telecommunication market is highly regulated and therefore require national government to take action.

In March 2017, **Malmö** adopted a new strategic document: 'Det Digitala Malmö' (in English 'the digitalisation of the city of **Malmö**') and will have to update its ICT and broadband strategy. This new strategic priority for the city comes after the publication by the Swedish government of an ambitious broadband policy setting up the short-term target of 95 per cent of all households and business to have access to broadband at a minimum capacity of 100Mbit/s by 2025. The strategic document, titled 'A Completely Connected Sweden by 2025 - a Broadband strategy'², refers to the European Commission's broadband targets for 2025³.

According to Jonas Onland, Program Manager 'Digital Transition & Urban Agenda' for the city of **Eindhoven**, it is important for cities to have a good strategy on how to implement new technologies such as 5G, virtual reality, augmented reality, machine-learning etc. The city of **Eindhoven** is currently working on 5G with the national government, and **Eindhoven** University of Technology is leading SILIKA, a European research project developing and testing a future '5G network'.

Pooling investment

National governments are also key in directing investment towards specific sectors. The 'Edinburgh and South-East Scotland City Region Deal' is an example of how the national government (here altogether the UK and the Scottish governments) are directing investment to fund major infrastructure projects in a region. Approved in November 2017, the 'Deal' intends to encourage new forms of investment in innovation and culture characterised by a data-driven approach. In January 2018, business cases for all projects were submitted, including initiative on digital skills and literacy programmes to create high-level skilled jobs.

Attracting innovation

Attracting tech start-ups to some regions can also be driven by national schemes. In **Prague**, municipal companies have signed a memorandum with the Czech Smart City Cluster⁴ representing companies active in research and development activities and the implementation of smart city technologies. **Rennes** Métropole is one of the main 'French Tech' cluster⁵, a state-label for dynamic start-up ecosystems. At the occasion of EUROCITIES' Knowledge Society Forum meeting in April 2016⁶, **Rennes** demonstrated that its digital ecosystem is helping planners to optimise urban sustainability.

Regional cooperation

Digital transformation of societies goes beyond the administrative limits of municipalities, and the potential of ICT for economic growth can be extended to a whole region.

Collaboration between municipalities through the sharing of resources and capacity-building brings opportunities to strengthen sustainable development at a regional scale and economic growth across the territory.

This principle is well illustrated by the six largest cities in Finland (**Helsinki**, Espoo, **Oulu**, **Tampere**, Turku and Vantaa), who have joined forces to tackle common urban challenges. The Six City Strategy (6Aika)⁷ sets up a national collaboration framework to create jobs and business in Finland. With a budget of approximately €100 million, the strategy focuses on open innovation platforms, open data and interfaces and open participation. This common, regional, large-scale ICT infrastructure platform for about 25,000 users is a unique approach in Finland, and in Europe.

Edinburgh also takes part in the Scottish Cities Alliance⁸, a collaboration of Scotland's seven cities (Aberdeen, Dundee, **Edinburgh**, **Glasgow**, Inverness, Perth and Stirling) and the Scottish government, working together to establish collaboration on Smart City opportunities and to promote the country's great economic potential.

Zaragoza is a member of the Spanish Network of Intelligent Cities⁹. This city has signed the 'Manifesto for smart cities: innovation for progress', committing them to create an open network working together to develop a sustainable management model and improve the quality of life of citizens through innovation, knowledge and integration of ICT.



MAIN URBAN STRATEGIES AND PRIORITIES

It has been said time and time again that all cities have a different understanding of what a ‘smart’ city is, depending on local circumstances, challenges and objectives. This can even be true of different actors within cities. As such, the approach adopted by cities often relies on what makes these cities special.

Across Europe, cities are working at different speeds. While some, such as **Burgas** and **Rijeka**, are still in the process of drafting a strategy, other cities have adopted a ‘smart city’ strategy in the recent years. **Prague** has already conducted a total reshuffle of administrative responsibility for ICT development as a result of its ‘Smart **Prague** strategy’ adopted on 14 September 2017.

Developing a strategic approach goes through different steps, and various horizons (2020 in implementing the EU Energy Targets, 2025, 2030, 2050) reflecting a different maturity and/or approach to mid- or long-term sustainable development:

<p>ACTION PLANS AND ROADMAPS</p> <p>are set up by the city administration to provide guidelines for all departments on how to work together to deliver on their objectives. The 2030 Guimaraes Sustainable Plan, created a collaborative ‘Mission Structure’ driving sustainable urban policies to ultimately reduce its carbon footprint.</p>	<p>Guimaraes, as the oldest city in Portugal, focusses on its well preserved historic centre, which is a UNESCO World Heritage site³¹. This doesn’t mean being mired in the past, but rather allying modern technologies with the preservation of cultural heritage. With an innovative approach, heritage buildings can be equipped with Internet of Things (IoT) just as modern ones.</p>
<p>STRATEGIES AND POLICY PLANS</p> <p>set up targets driving the cities’ actions (Malmö, Vienna,) as well as concrete measures (Zaragoza) and assessment from the past measures (Tampere).</p> <p>Overall, strategies are there to provide guidelines on using ICT to counter current and future challenges.</p>	<p>Vienna has come to the final year of its ‘Digital Agenda’, which set up clear targets, such as reducing energy consumption per capita by 40% by 2050.</p> <p>Other cities have already updated their strategies and moved forward to new targets. ‘Det Digital Malmö’ fosters digitalisation, requiring the city of Malmö to update its ICT and broadband strategy.</p> <p>Tampere new city strategy assesses that for the period 2014-2017, the use of ICT has enhanced productivity, improved well-being at work and added incentives to employees and work communities.</p>
<p>VISIONS</p> <p>are there to ensure that long term urban planning meets imperatives of sustainability, economic growth and inclusivity (‘2050 Edinburgh City Vision’)</p>	<p>Edinburgh is looking at the future. In 2016 the city began a conversation involving thousands of stakeholders to identify the core values some of which are aspirations for tomorrow while others are today’s key strenghts.</p>

Involvement in European projects and programmes incentivises cities to adopt a strategic document. Despite not yet having developed a smart city strategy, **Burgas** has already produced a baseline report in the frame of the Smart Cities & Communities 'Sharing Cities' project. **Burgas** is currently working on a roadmap, expected for March 2018, and benefits from the JASPERS programme to elaborate a smart city strategy by 2019.

Do all cities need to adopt an explicit strategic document to become 'smart'? Alternative approaches exist, such as in **Rennes**, where there is no plan to adopt any dated document. Instead, **Rennes** Métropole has set up a 'smart city' steering committee composed of technicians, experts, politicians and partners. New projects are being discussed in this dynamic structure.

The city's urban development is aligned on the objectives of a broader environmental plan (Plan Climat) translating on the local ground the EU climate and energy 20-20-20 targets. The same incentive kicked-started **Turin**'s path to becoming a 'smart city' when, in 2009, the city council took the decision to take part in the Covenant of Mayors initiative and engage itself to elaborate an Action Plan for Energy in order to reduce its carbon emissions.

WHAT IS JASPERS?

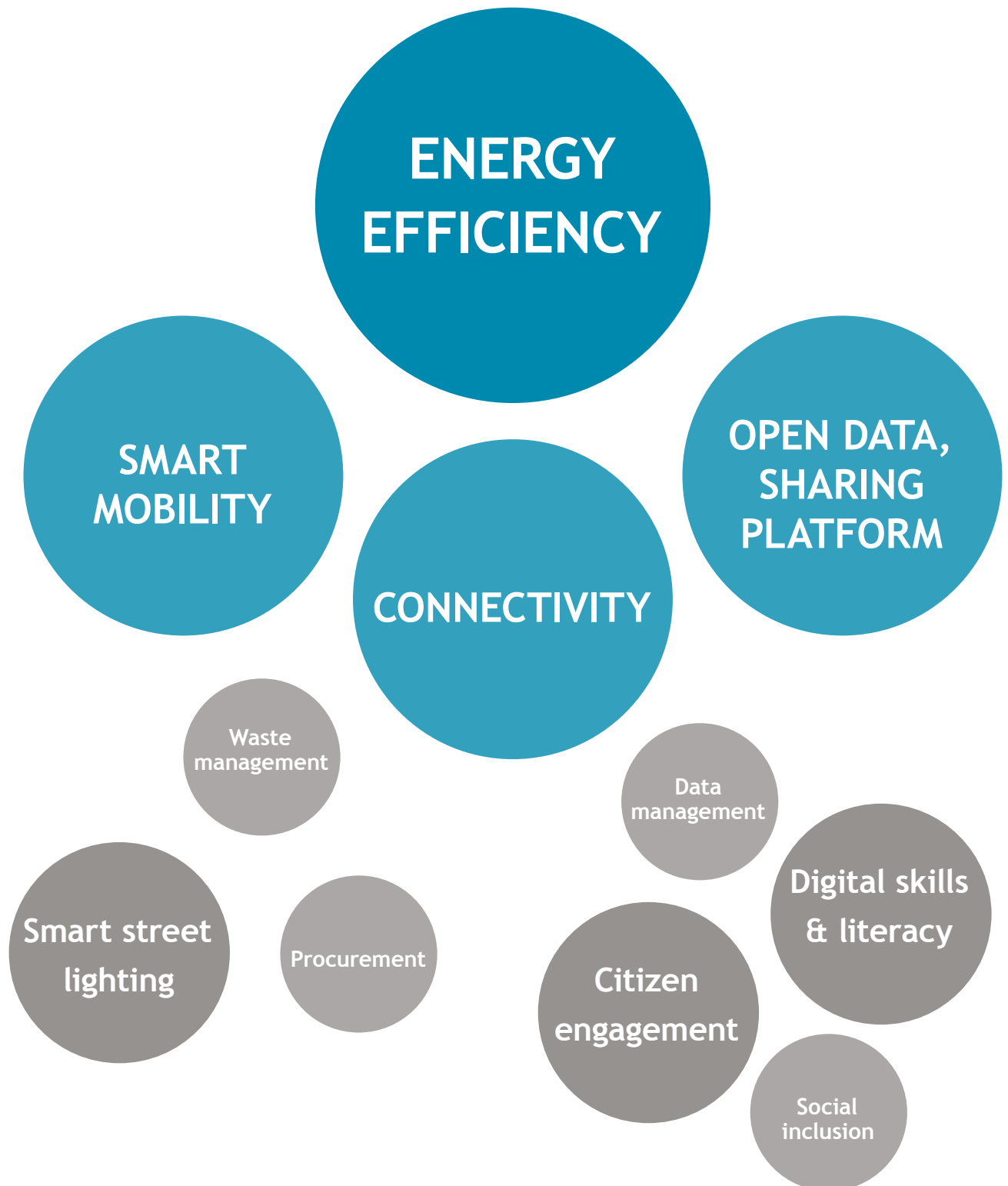
The Joint Assistance to Support Projects in European Regions (JASPERS) programme is a technical assistance partnership between the European Commission, the European Investment Bank (EIB) and the European Bank for Research and Development (EBRD). The programme targets assistance on major infrastructure projects - for example, roads, rail, water, waste, energy and urban transport projects. The holistic approach to **Burgas**' 'smart' development, linked to the Sharing Cities project, encompasses all aforementioned areas of urban development.

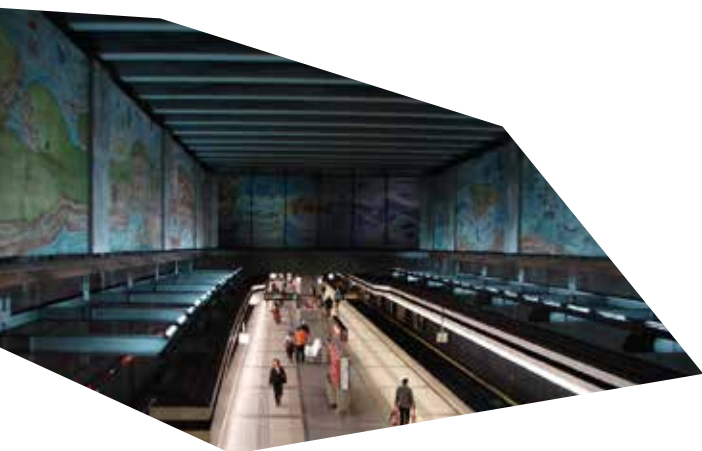
Visit: http://ec.europa.eu/regional_policy/en/funding/special-support-instruments/jaspers/



The signatory cities consider the Green Digital Charter a major European initiative that guides their sustainable urban development planning process at local level

The survey and interviews identified a series of priorities shared among cities. These are:





Drafting strategies is also a way to democratically involve citizens in setting up the priorities for the future.

The ‘Digital Agenda **Vienna**’ is the result of a collective work process between citizens, **Vienna** city administration and entrepreneurs. It was written with the help of a participatory platform, still available for feedback and discussion. During several months, interested citizens could submit and discuss ideas via this platform. The final text of the Digital Agenda was then drafted with public participation.

‘**Tampere**, Working Together for a Bright Future’ was also built based on valuable insights collected from residents. Key issues mentioned by citizens included: providing more jobs and opportunities for education and training, delivering smooth public transport and well-functioning social and health services as well as balanced public finances.

Table 1: ICT-related smart city strategies or ones with an impact on these policies

BURGAS	<ul style="list-style-type: none"> • Municipal development plan for 2014-2020¹⁰ • Sharing Cities baseline report
EDINBURGH	<ul style="list-style-type: none"> • ICT & Digital Strategy¹¹ • Edinburgh and South East Scotland City Region Deal¹² • Edinburgh 2050 City Vision¹³
GUIMARAES	<ul style="list-style-type: none"> • 2030 Guimaraes Sustainable Plan
MALMO	<ul style="list-style-type: none"> • 2009-2020 Environmental Programme¹⁴ • Updated version (2015-2018) of the environmental programme¹⁵ • ‘Det Digitala Malmö’¹⁶ • A Completely Connected Sweden by 2025 - a Broadband strategy¹⁷
PRAGUE	<ul style="list-style-type: none"> • Smart Prague strategy¹⁸ • Territorial Energy Concept (TEC) of the City of Prague
RENNES METROPOLE	<ul style="list-style-type: none"> • Plan Climat Air Energy Territorial (PCAET)¹⁹
TAMPERE	<ul style="list-style-type: none"> • Tampere, Working Together for a Bright Future 2025²⁰
TURIN	<ul style="list-style-type: none"> • Agenda Digitale del Piemonte²¹
VIENNA	<ul style="list-style-type: none"> • Smart City Wien Framework²² • Digital Agenda Vienna²³
ZARAGOZA	<ul style="list-style-type: none"> • Open Government Strategy 2012-2015 ‘Towards a smart citizenship’²⁴

BENEFITS FROM THE GREEN DIGITAL CHARTER

The signatory cities use the Green Digital Charter initiative to guide their sustainable urban development planning process at local level.

Overall, signatory cities were interested in training activities offered by the GuiDanCe project, supporting the implementation of the Green Digital Charter for the period 2015-2018. Participation in these training activities helped them to further develop their digital and smart city strategies.

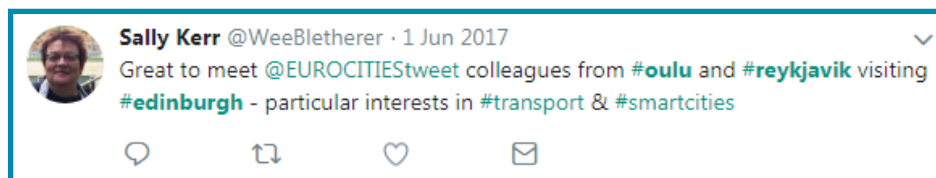
Webinars are particularly attractive formats since they typically last one hour. Interested experts can then connect and participate while sitting and working in their office. Topics of interest mentioned as useful were energy efficiency, procurement and competences (how to develop the skills of the staff), IoT sensor data as well as proportionality vs. human rights.

Physical meetings between practitioners and on-site visits are more productive in terms of mutual exchange. They gave more time to in-depth discussions and allowed participants to grasp a broader vision of the city management. Unfortunately, these activities need a substantial investment of time and budget to be organised, something not always available from cities and/or experts.

The first GuiDanCe work-shadowing visit (30-31 May 2017) allowed experts from the cities of **Oulu** and **Reykjavik** to learn more from the holistic approach adopted by **Edinburgh**.

Oulu expressed a specific interest in **Edinburgh's** comprehensive plans and guidelines for sustainable transport and how digitalisation has been utilised to achieve these targets.

Similarities between **Reykjavik** and **Edinburgh** in terms of size, location, demographics and weather led **Reykjavik** to consider learning from **Edinburgh's** SMART transformation, especially in the areas of transport, lighting, waste-management, health and education.



The Green Digital Charter 'label'

Signing the Green Digital Charter is a commitment taken by political leaders to promoting innovative use of digital technologies in cities to tackle climate change.

It can be a message transmitted to Europe about the signing city getting onboard the digital transition to meet the EU Climate objectives. It was the case for **Guimaraes** signing the Green Digital Charter during the 2020 European Green Capital Applicant (ECGA) workshop organised in Brussels on 27 June 2017²⁵.

It can also be a baseline for dialogue with local stakeholders in building urban projects. In **Malmo**, the city ambitious to be 'the best city in the world for sustainable urban development by 2020', the Green Digital Charter is used as the catalyst for meeting with other municipal and private businesses in the development of Smart Hyllie, the new big district in **Malmo**. Along the same lines, **Malmo** also cites the Green Digital Charter when procuring products and services.

One commitment drew particular attention: decreasing 30% of the ICT direct carbon footprint caught the eyes of citizens curious to know more about 'Green ICT'. The city of **Malmo** has been involved in several reports, studies and theses, providing support and feedback to students within the area of Green ICT.

Cities also appreciate the dissemination and networking opportunities, which enable them to reach other European stakeholders, promote their local achievements and the results of their European projects, exchange best practices and attend international events. Each year, a publication gathering signatories' best practices is published. In total, the three GDC collections of case-studies (2015, 2016, 2017)²⁶ gathered 89 projects implemented in 38 signatory cities.

Through its communication activities, the Green Digital Charter also aims at providing extra visibility to its signatories, amplifying their voices in European events. In **Barcelona**, for the 2017 edition of the Smart City Expo World Congress, six cities exhibiting at the Expo received promotion in the form of a video and individual interviews²⁷.

Working in the frame of EUROCITIES

Active members of EUROCITIES' Knowledge Society Forum (KSF) find it easier to get involved in the initiative, in particular in the two roadshows events and GDC Award ceremonies organised in Brussels alongside the annual winter forum meetings²⁸.

New projects or policies on local agendas are incentives for joining future activities. It is particularly the case when new challenges arise in terms of data management, as for **Burgas**, currently working on an integrated urban shared data platform and which could then be interested to join KSF discussions.

Activities organised by the GuiDanCe project (training events, webinars, work-shadowing visits) were often discussed during forum meetings, and outcomes further discussed during working-group meetings.

The move towards the adoption of holistic approaches to smartening cities echoes in the involvement of cities in EUROCITIES' thematic fora for cooperation. Cities are not only involved in the Knowledge Society Forum (KSF) dedicated to the digital transition, but also EUROCITIES' Environment Forum (EEF) where a whole working-group is working on energy efficiency and the European Mobility Forum (EMF) where concepts such as Intelligent Transportation Services (ITS) and Mobility-as-a-Service (MaaS) are gaining in importance.

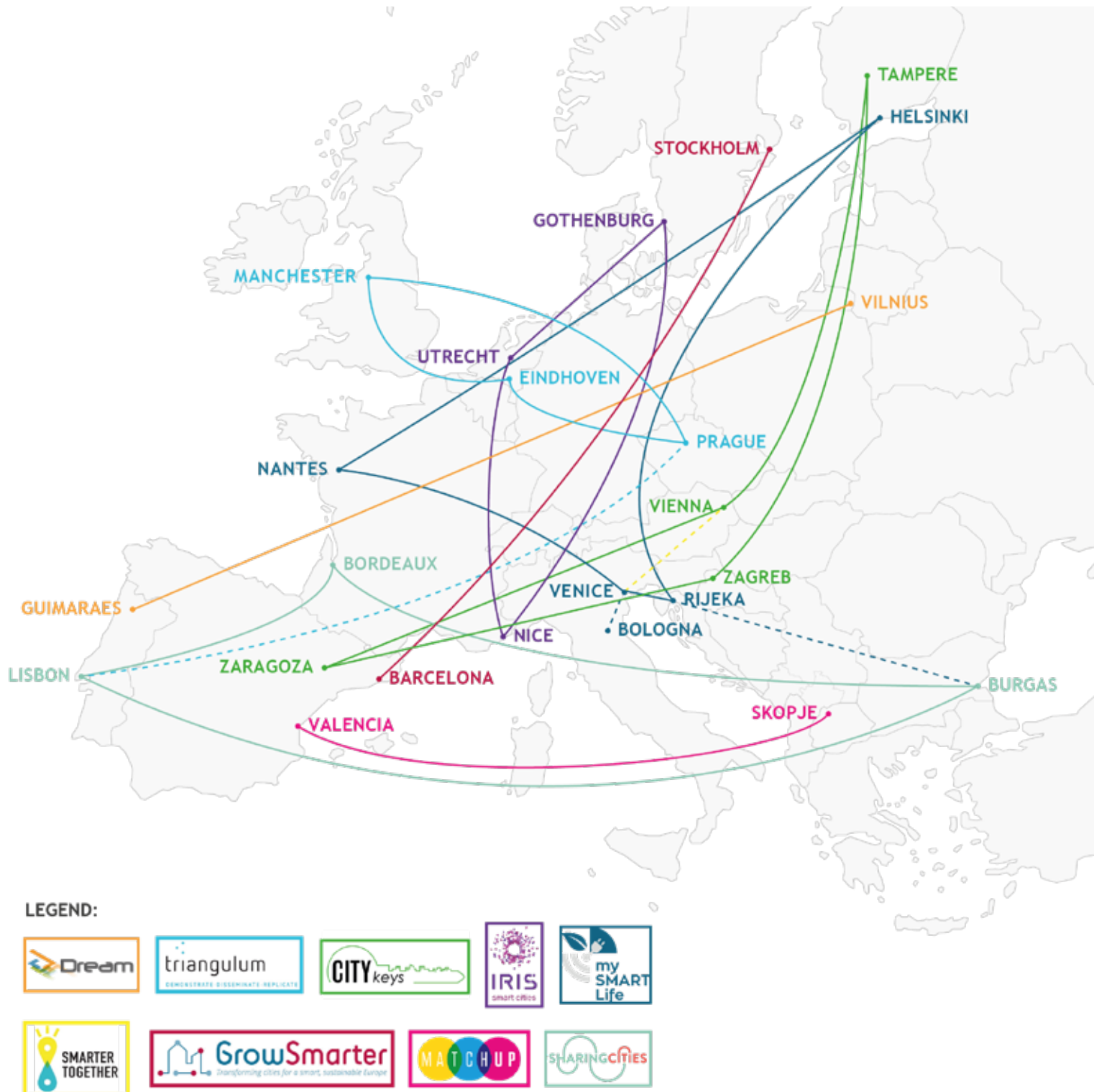
Tampere signed the Charter in October 2016 at the occasion of a joint meeting organised by EUROCITIES Knowledge Society and Mobility Forums.

Tilburg became the 52nd European city to sign the Green Digital Charter at the occasion of EUROCITIES' Environment Forum meeting in Antwerp attended by 145 participants coming from 57 cities to debate on 'localising the energy transition' and the EU 'Clean Energy for All' package.

Before signing the Charter, **Tilburg** Deputy Mayor Berend de Vried highlighted an 'interesting dilemma: with increasing ICT applications, we can create flexibility, avoid mobility and thus reduce CO². On the other hand, ICT is growing to be a large user of energy'.

A BROADER PICTURE: CITY-TO-CITY COOPERATION IN EUROPE

The Green Digital Charter appears to function as a bridge between cities, connecting signatories in their quest to develop European projects.



Horizon 2020: the Smart Cities & Communities

In total, 20 signatory cities are now involved in one of the 'Smart Cities & Communities' projects funded under the Horizon 2020 programme, among which 14²⁹ have been testing technologies as 'lighthouse' pilot cities while 6³⁰ are benefitting from mentoring visits before testing the replicability of developed technologies.

However, it can still prove difficult for some others to position themselves in terms of technological readiness. For instance, it was shared during an interview that the level of maturity of **Rennes** makes it difficult to meet the criteria to become either 'follower' or 'lighthouse' city.

Peer-learning and collaboration to support local transformation

EU-funded cooperation can act as a real engine, seen as an opportunity for medium-sized cities willing to capitalise on different funding programmes to develop or improve a sector of their urban planning.

Burgas is one of the 'follower cities' of the Sharing Cities project in which two other GDC signatories are involved: **Lisbon** (as lighthouse) and **Bordeaux** (another follower city). Thanks to peer-learning visits organised by the project, **Burgas** is benefitting from other cities' experiences both from a technological and a governance perspective.

Burgas will try to replicate two solutions already deployed in the lighthouse cities: the energy management system for buildings and some smart parking solutions. **Burgas** is also interested in the evolution of the e-bike sharing system procured in **Lisbon**.

Burgas is exchanging best practices with **Bordeaux Métropole**, in particular about bike-sharing and urban data sharing platforms.

Visit: <http://www.sharingcities.eu/>



Rijeka could be considered as the champion for mid-sized cities involved in European projects. Receiving first place in the GDC 2016 award in the category 'promoting open and interoperable solutions' for its pilot of the iURBAN smart decision support system, **Rijeka** is involved in a series of European projects supporting the modernisation of its infrastructure.

In the frame of mySMARTlife, **Rijeka** is learning from technologically-advanced cities (**Helsinki** and **Nantes**), a Horizon 2020 funded project aiming at increasing the use of renewable energy sources. **Rijeka** is testing the replicability of technologies developed in bigger cities.

Through peer-learning initiatives, **Rijeka** learns from other European cities, similar in size and those which may face similar challenges, such as in the FIESTA project, in which **Burgas** and **Zaragoza** were also involved.

Funded by the Intelligent Energy Europe programme, the project brought 19 partners from five Southern European countries committed to reducing energy use and related emissions by fostering improvements in daily habits.

Rijeka also benefits from EU funds to foster its collaboration with neighbouring cities such as **Bologna** (SULPITER project on freight in functional urban areas) and **Venice** (on how to improve the environmental management of an un- or under-used industrial area as part of GreenerSites).



SECTION II CITIES CO-CREATE

Mayors and leaders who signed
the Green Digital Charter
pledged to forge connections
between city leaders, citizens
and stakeholders

Why co-create? Because it has been shown time and time again that the wider the base of stakeholders involved in design, the longer lasting and stronger the effects. For this reason, mayors and leaders who signed the Green Digital Charter have pledged to forge connections between city leaders, citizens and stakeholders.

CONNECTING CITY LEADERS, CITIZENS AND STAKEHOLDERS

All but one of the cities have established local partnerships to implement GDC commitments and/or as part of a broader strategy. Each of the main stakeholders engaged in close collaboration with city authorities in the implementation of local and digital strategies can represent its own specific interests, creating solutions that work for everyone.

Universities and technological parks

The rise of the knowledge society has intensified the need for strategic partnerships between the traditional research actors (universities), the industry and the public sector willing to gain socio-economic benefits from new technologies.

Getting onboard research and innovations project with the academic sector brings scientific and technical knowledge into the debate, feeding decision making with substance and expertise, bringing the promise of a more efficient delivery of public services in the future.

In **Prague**, the municipality have used ‘memorandums of cooperation’ to create synergies with universities, for example one with the Czech Technical University focused on conceptual city development, transport and ICT. They have employed the same instrument to connect to cities in other countries across Europe, such as in **Vienna**. Younger citizens can also benefit from collaborations of the city with primary and secondary schools.

Partnerships are also being reached with other research and innovation actors. Science parks, innovation centres and technopoles (in French) are places where researchers meet industry to develop and test innovative, sometimes disruptive, technologies before entering the market. The European Smart Specialisation Platform includes science and technology parks (STPs) as part of the smart specialisation of a region.

In **Guimaraes**, the City Hall is part of the board of TecMinho, an interface of the University of Minho covering 1,141 young entrepreneurs. **Guimaraes’** AvePark-Science and Technology Park include smaller units and centres dedicated to specific issues such as the ‘Discoveries Centre for Regeneration and Precision Medicine’ and the ‘Spin-off Park of UMinho’.



Start-up incubators and living labs

Through living/fab/creative labs and start-up incubators, cities are calling on young entrepreneurs and interested companies to take part in the digital transition of the local economy. Living Labs stimulate urban innovation, allowing businesses to develop and test digital solutions in a real-life context with the involvement of the public administration, academia and local communities. As such, living labs appear as key facilitators for open innovation.



In the recent years, **Prague** has established a Start-up Centre and an IoT Centre/Smart City Incubator. In doing so, the municipality is providing facilities with subsidised rent to innovative early-stage entrepreneurs (the so-called start-ups) with the objective of supporting their growth and take-off onto the national, European and even international market.

All over Europe, living labs are helping local authorities to co-create smart city initiatives with and for their citizens: **Edinburgh** Living Lab³² focuses on data science and citizen participation; while **Nice**, in its Urban Health Living Lab³³, is using digital health innovation to improve healthcare for its aging population.

In **Zaragoza's** ETOPIA centre for arts and technology³⁴, 50 start-ups are permanently involved in the design and operation of new public services via the organisation of hackathons, open challenges and open innovation sessions. **Vienna** is currently trialling an interesting new collaboration: 'Industry meets Makers'³⁵ matching the industry and the creative maker scene.

An evolution of the living lab, 'FabLabs', developed in cities like **Rennes**³⁶, go beyond the walls of an experimental building to the whole innovation ecosystem. They form network of places sharing human time, knowledge and tools, teaching people to teach each other, developing platforms for sharing and co-creation, using collective intelligence to find solutions and new methods to solve identified challenges.

In **Zaragoza**, the smart city department of the city administration established a partnership with the housing authority to provide social, energy efficient and inclusive shelter. Together, they work to introduce digital technologies into the Housing Authority's initiatives on fighting energy poverty.

In this context, a group of hackers came to **Zaragoza's** Open Urban Lab with the objective of helping people regain some of their 'electricity sovereignty'. In six months, they came up with a device called 'Prometeo', an open-source project which can help non-advanced users to understand their electricity contract, thus reducing overpricing. On the privacy side, the user has full control of the data collected by 'Prometeo', unlike the vast majority of other smart meters.

Source: <https://openyourcity.com/2018/01/the-electron-shepherds/#more-3379>

ENGAGING CITIZENS IN CO CREATING THEIR OWN ‘SMART CITY’

In a model of open governance, engaging the public enables the city administration to make more democratic and inclusive decisions and generate stronger solutions to urban challenges. Local authorities benefit in various ways of involving citizen. First, engaging citizens allows to gather knowledge, experiences and opinions about the context where decisions are implemented, thus setting up priorities in line with citizens’ needs and expectations. Public participation also increases mutual understanding and increase the sense of belonging to the city as a community.

Inputs collected from signatory cities show that local authorities use both top-down and bottom-up approaches to engage citizens in the design, development and use of digital services and smart city solutions.

e-services: online platforms, mobile apps and smart cards

Online platforms make it easy for citizens to exercise their right to access administrative registries and other administrative procedures. A pilot project run by **Edinburgh**³⁷ used an Open Data Portal make Freedom of Information requests smoother for citizens and the administration. Meanwhile, **Prague** is testing the use of chat-bots to answer questions raised by citizens.

Some cities, like **Burgas** and **Vienna**, have put in place a free mobile application allowing citizens to use e-signature to send documents to the administration. Online interfaces are also a simple way for cities to promote sustainability programmes and projects and reach out to citizens (**Guimaraes** Mais Verde³⁸).



In **Vienna**, where digitalisation of the administration has been a priority for years, almost 600 e-government services (administrative assistance pages) save citizens a journey to the municipal office. When a signature might be required for a clear identification, as could be the case to sign a petition or make some specific requests, citizens can use a mobile phone signature or their citizen card.

In **Zaragoza**, the Citizen Card offers access to around 20 municipal services, including payment processing. To date, over half of **Zaragoza**’s adult population have applied for the card.

Open innovation and hackathons

Along with urban labs, hackathons are a great way to tap into local innovation. Hackathons and open data days are events organised by cities to promote co-creation of public services and user-driven innovation.



Through hackathons, citizens become city makers, an idea widely promoted through the ‘100ideasZGZ’ umbrella programme³⁹ in **Zaragoza**. In **Burgas**, **Dublin**, **Edinburgh** and **Prague** hackathons have been initiated by cities to generate ideas around mobile public services⁴⁰, air quality⁴¹, road safety⁴², and smart mobility infrastructure⁴³.

The ‘Service Public Métropolitain de la Donnée’ is an innovative governance project launched by **Rennes** in September 2017. In the footsteps of the city’s open data platform, this new service organises data collection and processing, establishing partnerships for data-sharing and supporting reuse of data. The platform includes data on energy consumption, water management, air quality, mobility and traffic data, urban works etc.

Data management is at the heart of this project: beyond involving private partners, local authorities and citizens, the platform is about improving data combination.

Visit: <https://data.rennesmetropole.fr/page/home/>

Smartphone, the ‘smart city’ tool in citizens’ pockets

By deploying ICTs to engage with citizens, cities can change the way communities link to each other and the environment. Cities and citizens can cooperate to improve communities through mobile apps that let locals report on any problem encountered in streets and public space. Examples include **FixBurgas**⁴⁴ - **Sags Wien** app - **Dublin**’s **Fix my Street**, **Bordeaux** - **ma ville dans ma poche** and **Rijeka**’s **Interreg-funded Citizen Collaboration Platform**⁴⁵.

Game apps are increasingly seen as a potential medium to reach out to citizens. Gamification can increase end-user awareness, helping people save energy in their daily activities by adopting energy efficient lifestyles. **Bristol**, **Gothenburg** and **Helsinki** (**EMPOWER** project⁴⁶), **Malmo**, **Murcia** (**Entropy** project⁴⁷), **Tampere** and many others are experimenting with gamification as an enabler for citizens to adopt more sustainable behaviours.

ACCESSING, USING AND RE-USING DATA IN AN OPEN DATA ENVIRONMENT

Data is the backbone of the economic and social growth of cities. City authorities are pioneers in opening and re-using public sector data to innovate, creating new and advanced data-driven services and solutions for their citizens, while empowering and engaging with them. Data access, availability and usability are vital for city authorities to ensure effective management of their cities.

Collected data enables city authorities to improve decision-making and better target priorities according to citizens’ needs while opening up datasets to promote co-creation of innovative solutions and services by SMEs and entrepreneurs. Open data is driving innovation and growth in the public sector, attracting new businesses with the promise of new jobs and creating savings through new services and improved operations. To support the emergence of the data economy, governments need to publish, open and share key datasets.

Open data portals

The potential benefits of open data collaboration between public administration, citizens and the private sector are far-reaching. First, opening up public sector data and making use of available resources can unlock significant business opportunities and foster local innovation ecosystems. Publishing public data such as budget data and development proposals can increase transparency and bring the city government closer to its citizens who may exercise a bigger impact on the orientation of policy making. Moreover, local authorities can themselves use data to provide information and improve the delivery of public services or even create new services targeting citizens' needs.

Many heritage organisations have difficulties compiling photographs. **Edinburgh** Collected is a crowdsourcing hub that lets both local people and visitors to libraries make their photographs part of the city's heritage collection. All these images become open data, available to be viewed, reused and shared through social media.

Visit: <https://edinburghopendata.info/edinburgh-collected/>

Cities experiment with different ways of collecting data for use in urban planning and operational management. Non-personal data is increasingly generated through IoT and machine-to-machine (M2M) solutions. Today, access by the city administration to data generated by machines or through products and services is often limited, or unavailable, when the data is managed by private companies.

Building 'sensing' cities

The use of sensors in cities, or letting citizens become data producers through crowdsourcing, can allow data-driven planning and management of local policies and services with a focus on the environment, mobility, energy and security.

The municipality of **Turin** is currently creating a new data policy and infrastructure through 'Torino as a platform'⁴⁸. Through an IoT network, the public authority will collect real-time data (traffic, air quality, noise, etc.) and respond with appropriate policy and planning.

Since launching its first living lab through a public call in 2016, **Turin** has used this approach as a 'window on the market of urban innovation' to inform innovative public policy. In the 'Living Lab Campidoglio'⁴⁹, 32 innovative solutions are currently being tested, such as the deployment of IoT networks for new 'networked smart squares'. Due to its success, the city has launched a second public call aimed at establishing a horizontal service-level Living Lab to test mobile payment solutions.

Participatory platforms

Online platforms are a cheap and easy to maintain tool to provide information of public interest to citizens. An open data map is an attractive medium to inform residents about what is going on in their neighbourhood and give them additional information on how to participate in the local planning process (**Edinburgh** open data map⁵⁰).

An online platform can also serve as tool for open government and citizen participation in local public policies as shows **Rennes**' 'Fabrique Citoyenne'⁵¹. This online platform for public consultation and co-creation also facilitates **Rennes**' participatory budgeting.

Cities use participatory budgeting to different degrees: in **Rennes**, it makes up 5% of the investment budget (approximately €3.5 million every year) while **Edinburgh** allocates only a small part of the budget, although there is a statutory requirement to commit 1% by 2021. An obstacle, underlined during the interview with **Edinburgh**, is that the cost of the software for participatory budgeting and its deployment is greater than the budget share allocated to this measure. As the proportion grows, this will likely be resolved.

AN EQUAL ACCESS TO THE DIGITAL SOCIETY

Information and Communication Technologies are enablers for civic participation as part of a broader strategy to encourage citizens to get involved in shaping their environment.

Here again, digitalisation is seen as one of the pillar of a broader building designed to welcome all citizens, whether they are connected or not. **Rennes** has published a Local Democracy Charter⁵² planning different levels of participation, groups of actors and processes to engage with citizens, including (but not limited to) the intensification of the use of digital.

However, cities must first ensure equal access to ICT-enabled initiatives, coupling them with work to promote social cohesion. Large parts of society are excluded from the digital world, and enormous sections of Europe's workforce remain digitally illiterate.

Accessibility, connectivity and public networks

Deploying free wireless is a great way to let citizens connect with each other, and increase the uptake of digital solutions, as well as equalising access opportunities and providing great positive publicity for local government. Such networks are being deployed throughout several European cities, all with their own capacity.

Examples include **Guimaraes**, where 23 Wi-Fi hotspots cover the main areas of public interest in the historic centre; while **Dublin** is in the process of relaunching free Wi-Fi for the city, after an initial programme was discontinued in 2014.

Vienna also has an increasing number of 'wien.at' public WLAN access points located in public places and leisure areas offer location-based information and free-of-charge access to the Internet. Since 2014, the city of **Vienna** has deployed 412 LAN hotspots in public spaces, used by around 80,000 people. The development and operation of the WLAN access points is the responsibility of the municipal department for public lighting. Through the usage of existing infrastructure such traffic lights, cost-optimisation is ensured⁵³. Since 2009, the same municipal department began to install LED systems along secondary roads and paths. LEDs were also used for the retrofitting of the globe lights on the Danauinsel (Danube Island), completed in 2013.

A small number of cities are investigating the benefits of deploying a LoRa network to support their IoT use-cases. LoRa is a promising technology for cities because it is open-source, has low maintenance costs and is natively secure. **Rennes** is currently testing a small network using LoRa within the frame of the 'Open Energy Data'⁵⁴ project aiming at reducing energy consumption in public buildings. **Malmo** and **Turin** are also considering the LoRa technology to support their sensor networks.

Digital skills and literacy

This is a cornerstone for inclusive cities of the future. Yet it remains an enormous problem, despite educational programmes that attempt to bridge the digital gap. Cities cannot consider themselves democracies if they move towards digital jobs, online participation, and an ICT-based ‘knowledge society’, while whole sections of their society still cannot send an email unassisted.

In **Vienna**, the positioning and visibility of ICT and digital skills in all education and training departments and institutions is a central issue. Started in 2014, the ‘DigitalCity.Wien’⁵⁵ initiative is an independent and not-for-profit initiative of the city committed to adopting measures to combat the lack of skilled specialists, to support digital skills and excellence, and to inspire more people, particularly women, to take up careers in IT.

Guimaraes invested in a large-scale ‘Digital Transformation Educational Programme’ aiming to increase access to digital devices. 156 notebooks, 64 desktop computers, 14 interactive tables and 595 tablets were distributed, an investment totalling €400,000.

Smart ageing

Digital social innovation brings new opportunities to improve the quality of life of all citizens, including those in situation of social exclusion.

In particular, ICT can be used to combat the social isolation of elderly people and increase the safety of those alone, allowing them autonomy in familiar surroundings with a high quality of life. Programmes such as ‘**Guimaraes** 3000’, and the WAALTeR project (Viennese Active & Assisted Living Test Region, December 2016 - November 2019)⁵⁶ are putting this in action. The latter is testing technologies with accompanying services in 83 households. Mobile emergency systems, indoor tumble detection sensors, tumble prevention systems, health information and telemedicine are being tested.

Conclusion

A ‘participatory culture’ is undoubtedly growing within European city administrations. For many of them, the question of which actors to involve depends on the project. Many cities are now seeing the clear advantages of shifting from the triple-helix to the quadruple helix model by directly involving citizens in their projects. An example is Open Incet⁵⁷, the first Italian centre for open innovation, where the strands of the quadruple helix collaborate to solve urban challenges and redesign public services. This quadruple helix approach is one of several kinds of collaboration that cities can enter into to spark greater innovation



SECTION III CITIES INNOVATE

Digital technologies play a key enabling role in the move towards an efficient use of energy, a smooth running of public transportation services and the development of new innovative services to build healthy and sustainable cities

When signing the Green Digital Charter, cities are asked to deploy five large-scale and replicable ICT pilots within five years, and to communicate their impact to citizens and local stakeholders.

By signing the Charter, mayors commit to:

- Develop cities into platforms for innovation and experimentation through digital planning and new smart infrastructures and services, including connectivity and data integration
- Foster the Smart City initiative and technological innovation; Support open innovation by encouraging and promoting open standards and interfaces, the creation of interoperable urban platforms, R&D activities and the deployment of projects in user-driven and open innovation environments
- Develop and support new business models and procurement processes that facilitate innovation, local growth and the implementation of socially responsible policies

The commitment to deploy five large-scale ICT pilots per city is a great challenge for local administrations. While most respondents to our survey have partially met this commitment, less than half have managed to initiate five pilots, and two have not managed to launch any.

Still, almost all cities have adopted an integrated approach to improve energy efficient throughout the city and promote ICT innovation for climate change mitigation and the reduction of carbon emissions.

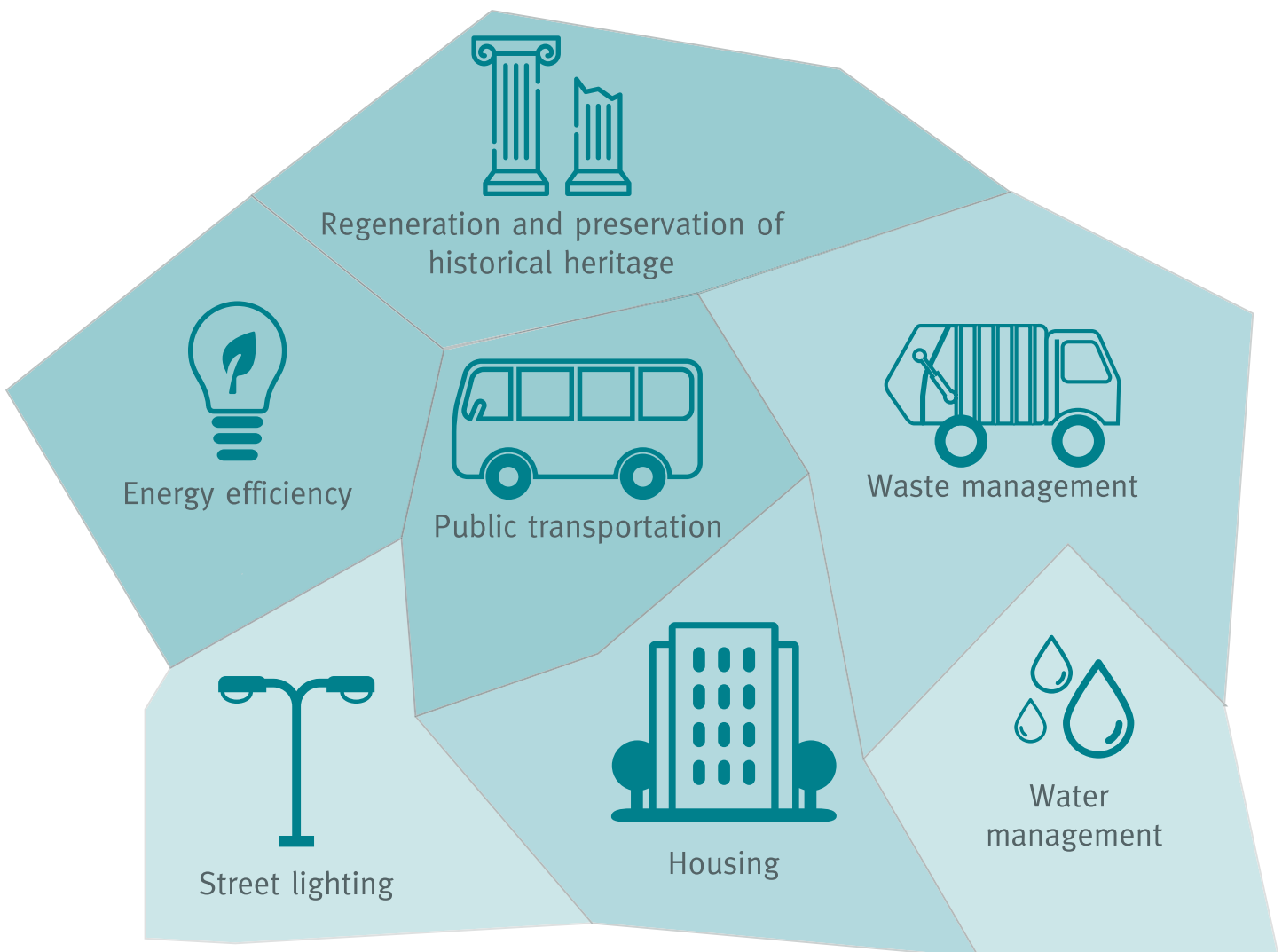
Almost all cities have adopted an integrated approach to improve energy efficient throughout the city and promote ICT innovation for climate change mitigation and the reduction of carbon emissions



BUILDING SMART INFRASTRUCTURES, DELIVERING SMART SERVICES

The term ‘smart city’ has no single definition. Rather, cities use smart technologies to face local challenges in different ways. Common challenges still undoubtedly persist, while others depend on the geographic and demographic situation as well the priorities of each administration. The following pages will further detail local projects piloted in signatory cities in their effort to solve challenges in different sectors.

Nevertheless, digital technologies play a key enabling role in the move towards an efficient use of energy, a smooth running of public transportation services and the development of new innovative services to build healthy and sustainable cities.



Energy efficiency

Nearly-zero emissions buildings

Buildings represent enormous potential savings for cities. Measures such as improving insulation and converting to renewable sources of electricity can represent huge savings for administration and residents alike.

In **Prague**, for instance, the ‘Territorial Energy Concept’ (2013-2033) is seeing the renovation of publicly owned buildings with measures such as these to create a stock of ‘intelligent buildings’ which includes schools, buildings for the delivery of social services and an administrative building. Cooperation between the city, local gas and electricity distributors and the transport company, has been vital for speeding this process along and realising significant changes in energy use since 2001.

Meanwhile **Zaragoza** is piloting zero-emission buildings, such as the one which houses their CIEM start-up incubator⁵⁸.

Analysing data thanks to smart decision support systems

As the quantity of data made available in cities increases, it can be difficult to keep track of and interpret it all. A smart decision support system has the power to unlock data-driven insights for the use in day-to-day decision making. **Lisbon** is using its BESOS project to increase energy efficiency by creating an open platform that can share real-time data with third party applications, such as the Business Balanced score Card.

Similar systems are being implemented by **Rennes** with their Open Energy Data programme, and in **Turin** where the FACTOTUM project⁵⁹ is enabling the local administration to better control the electric and thermic consumption of their building.

Self-sufficient districts and positive energy blocks (PEBs)

Smart energy systems and buildings are being built in Hyllie⁶⁰, **Malmo**’s brand new smart and sustainable district. Energy system owners, property owners and home users will be able to control the energy and recycling flows so that everyone can save money, help increase the share of renewable energy and reduce energy consumption. The target has been set: by early 2020, Hyllie will be 100% sustained by renewable or recycled energy. Once complete, the neighbourhood will have about 10,000 homes and an equivalent number of workplaces.

Rennes Grid is a pilot project monitoring the electricity consumption of an entire zone to better integrate renewable energy sources produced locally, mainly solar panels. It promotes consumption of self-produced energy, local energy supply and new services to become a ‘self-sufficient’ district. The project comes under the Smile (smart ideas to link energies) programme which provides extra visibility on the national (French) level.

CITIES IN TRANSITION

GDC recognises the vital importance for cities to develop smart solutions to monitor their energy consumption.

In January 2017, **Rijeka** was awarded best GDC project in the category ‘open and interoperable solutions’ for the iURBAN smart Decision Support System (DSS), which among other functions can forecast city-wide energy consumption and production patterns. The same year, **Lisbon**’s BESOS project received the GDC award on ‘creating European added-value’.

Visit: <http://bit.ly/2kaQUYG>

In **Tampere**, Hiedanranta is aiming even further than zero emissions: this future city district will produce more resources than it consumes. The first circular economy experiments have already started: there are currently about 20 development projects on-going in Hiedanranta⁶¹.

Distributed technologies: empowering citizens on the energy market

In 2017, blockchain emerged as the technology which will disrupt the energy market and radically transform the way the industry, as well as citizens, deal with energy production and consumption. Distributed energy grids and cryptocurrencies have dominated the debate, although the vast energy consumption induced by the blockchain technological process itself managed to go almost unnoticed.

IMAGINE THE URBAN FUTURE

GDC 2017 award was handed over to **Amsterdam's** 'CITY-zen project' for its innovative virtual power plant, an online ICT-platform which aggregates people's production and consumption of solar energy. The installation of home batteries let citizens store the surplus of energy produced locally and decide when they want to consume it. Connected to the energy partner's grid (Alliander), home batteries are expected to support the local grid network during peak moments.

This combination of trading on the energy market and supporting the local grid with battery systems installed in households within a single neighbourhood is indeed quite new.

Visit: <http://bit.ly/2Bqg0IE>

Public transportation

ICT can provide effective measures for encouraging low carbon mobility. Smart public transportation cards which give holders access to multiple services make them more likely to try those services out. This can mean a single card for train, tram, bus and bicycles, as in **Zaragoza**⁶² and **Burgas** (bicycle element planned), or one that gives access to a whole host of public services.

In **Prague**, your transport card also gives you access to the municipal library, and discounts for outings to museums or the zoo. In **Rennes** the pilot for such a card has now achieved scale up for the whole Brittany region, and the city now has the ambition of increasing the scope of their 'KorriGO' card to swimming pools, public parking and e-vehicle charging stations.

Just improving information flow through ICT can be a great way of getting people on their bikes. Apps like Géo-Vélo, provided by **Rennes**, promoting cycling throughout the city with a simple itinerary map for cyclists.

Street lighting

Street lighting is often the biggest drain on municipal energy supplies, but a simple solution being implemented in cities like **Vienna** and **Tampere**, the installation of LED lights in combination with intelligent control systems, can generate savings of around 60%. **Burgas** plans to replace 1,236 incandescent light bulbs with LEDs by the end of 2018. 1000 new lamp posts will also house innovative and intelligent services, such as public wifi, and sensors for air quality, noise and humidity.

The cities of Copenhagen and **Malmo**/Lund are engaging in a major cooperation on smart lighting. Sensors will not only allow LED streetlamps to brighten when cars and bicycles approach and to dim after they pass, but even alert the sanitation department when public rubbish bins are full and need collection.

Waste management

Smart waste sensors located in on-street bins are cheap tools allowing a better understanding of patterns of waste across the city and therefore improving the efficiency of waste collection. Following in the footsteps of **Barcelona** and **Dublin**, **Edinburgh** is testing its own sensors in on-street litter bins⁶³.

Housing

Private homes, especially as relates to heat-loss, pose a huge challenge to cities looking to save energy. In **Zaragoza**, Ecocity Valdespartera⁶⁵ is a residential urbanisation project that has been totally designed and constructed to achieve environmental, economic, social and cultural sustainability, through energy efficiency. This means decreasing energy consumptions and using renewable energies, decreasing urban waste and emissions and the efficient use of resources such as water. An ICT network and dashboard gathers and provides information on 10,000 housing unit projects.

Water management

Each city uses smart technology to adapt to local challenges.

Burgas is a city at risk of serious flooding. The city has therefore developed a system of integrated flood risk management, including an early-warning information system which uses forecasting models in combination with monitoring points for water levels in rivers and dams. All information is made available real-time on the open data portal⁶⁴. The city has also created a system implementing new technologies for marine litter detection and classification in coastal areas; regular near real-time surface water eutrophication (excess nutrient level) monitoring and underwater noise monitoring.

Regeneration and preservation of historical heritage

Conservation of historical and cultural heritage is a challenge for many European cities wanting to modernise their infrastructures while keeping hold of their legacy and identity, and for many also their tourist appeal.

In response, many cities are retrofitting these grand attractions. **Guimaraes'** smart city strategy, for instance, is oriented towards cultural heritage. The city will benefit from the HeritageCARE project⁶⁶ co-funded by the European Regional Development Fund (ERDF). Its goal is to unfold an integrated and sustainable methodology for the preventative conservation and maintenance of historic and cultural built heritage.

TOWARDS AN INTEGRATED CITY MANAGEMENT

Building a city platform

So-called ‘urban platforms’⁶⁷, are an approach to bringing together and integrating data flows and city operations across departments and silos, thus tapping into the important potential city data holds: they facilitate the interoperability of municipal services, and offer an integrated view of the city’s operations and management. Such systems show the pulse of the city and help keep track of resources.

Turin’s ALMANAC project⁶⁸ (Reliable Smart Secure Internet of Things for Smart Cities) is developing a smart city platform collecting, aggregating and analysing real-time or near real-time data from heterogenous sensors and actuators. The key element of the platform is middleware based on service oriented architecture (SOA) supporting semantic interoperability of heterogeneous resources, devices, services and data management - meaning that it allows different kinds of devices to communicate with each other.

In **Valencia**, 600 indicators are included in the VLCi Platform⁶⁹, which enables the city to check itself against other cities and to improve its strategic and operational decision-making processes over time.

Visualisation software is particularly helpful for urban planners, developers and engineers to represent flows crossing the city, as well as for the administration to communicate large-scale urban development projects to the public. **Rennes** have entered a 3D modelling project, ‘3DEXPERIENCECity’⁷⁰ with Image & Réseaux (an industrial research cluster) and Dassault Systèmes (a big French industrial group). This 3D collaborative environment combines data from sensors and city systems, allowing officials to model technology to simulate ‘what if’ scenarios to test concepts and improve planning; business to offer goods and services in a virtual marketplace; and citizens to access a virtual community space that serves as a collaborative hub, conversation forum and information portal.

Breaking silos

To effectively implement a smart system, open channels of communication and shared knowledge must exist across administrative departments. This, however, remains one of the main challenges encountered by city authorities, which come up against tremendous inertia in breaking up silos and changing work practices.

Pilot projects with limited scope are an example of tangible solutions, experiments and research undertaken as part of a broader, holistic, thinking. Successful pilots bring the promise of mainstreaming sustainability in the administration’s working mentality. For instance, the Saughton Park Restoration

AN ‘URBAN PLATFORM’ IS:

- the implemented realisation of a logical architecture / design that brings together (integrates) data flows within and across city systems
- and exploits modern technologies (IoT/ sensors, cloud, mobile, analytics, social media etc.)
- providing the building blocks that enable cities to rapidly shift from fragmented operations to include predictive effective operations, and novel ways of engaging and serving city stakeholders
- in order to transform, in a way that is tangible and measurable, outcomes at local level (e.g. increase energy efficiency, reduce traffic congestion and emissions, create (digital) innovation ecosystems, efficient city operations for administrations and services).

project⁷¹ is part of **Edinburgh**'s trial model to integrate, in a limited area, different technologies linking energy production with energy demand, including battery storage facilities. The pilot expects to integrate charging points for electric vehicles.

Other cities are rather changing mentality from within, by creating a new structure or unit charged with promoting transversal thinking through the use of ICT. Cities like **Zaragoza**, through its transversal Smart City Department, or **Rennes** with its Smart City Steering Committee, are pursuing an integrated approach which links all relevant stakeholders across the vertical axis.

Dealing with cross-sectorial urban challenges

Air quality

Creating breathable air for citizens is an important goal for European cities, one that often lies behind measures for low carbon mobility and increased reliance through sustainable energy. For some cities, this is considered the main challenge they wish to address, while for others it is paired with other aims.

In **Dublin**, the iSCAPE project⁷² focuses on the use of 'passive control systems' in urban spaces, on policy intervention and behavioural changes of citizens' lives to tackle the problem of air pollution. Through a living lab approach, the team is deploying a network of air quality and meteorological sensors used to evaluate the benefits of interventions made in a neighbourhood and at city scale.

Food

Food is also part of the picture. An inspiring example of how ICT can enable a holistic strategy for sustainable development is the data-driven 'Edible **Edinburgh** Vision' supporting the city's action in six key areas: health and well-being, environment, economy, land use, buying food and cultural change.

Innovative and responsible procurement can be a double win for city authorities



AN INNOVATIVE ADMINISTRATION

As with any organisation, a city must know its strengths and weaknesses. Whether in relation to particular skill-sets, or to budgeting, there are some areas where the private sector often has the upper hand. Through private public partnerships, cities can take advantage of outside finance and expertise to achieve their green goals with the greatest possible efficiency - effective leadership is two-thirds effective delegation after all.

Public private partnerships (PPP)

Across Europe, digitisation is reinforcing the role of Public Private Partnerships (PPPs) to focus on key technologies and their implementation. Such partnerships allow local administrations to make use of industry smarts, innovation and finances to meet green targets and shared goals.

Malmo's neighbouring city of Lund uses PPPs for smart lighting and sensors; **Edinburgh** has partnered with the UK energy provider to deploy LEDs, e-management and measurement systems in nine historical public buildings through the project REFIT. **Prague**, similarly, is investigating PPP financing related to energy-consumption in buildings, and **Turin**, as part of its Living Lab, is designing a new administrative framework to allow PPPs to co-develop innovative solutions for smart cities.

Through its Business Incubator Center at the Digital Mile (CIEM), **Zaragoza** has partnered with the company INIT in a PPP with the objective of creating entrepreneurship, innovation and creativity. It has 3 areas of action: ICTs, energy efficiency and environmental sectors, and social innovation linked to technology⁷³.



New public procurement practices

Innovative and responsible procurement can be a double win for city authorities: it can enable administrations to modernise their structure as well as public services while creating growth opportunities for companies. Strategic procurement, including green, social and innovative considerations, also has the potential to drive the market towards sustainable solutions.

E-procurement

ICT plays a critical role in modernising public procurement processes. With e-procurement comes the promise to increase transparency and simplify administrative procedures, thus reducing costs and easing innovation. A procurement platform is a joint ‘maintenance and landscaping information system’ being developed in [Tallinn](#)⁷⁴. In addition to simplifying the process of maintenance, landscaping and repair across the city, this platform will allow public procurement to be conducted more easily by the municipality, and create greater transparency and accessibility for companies.

Joint procurement

In some cases, public bodies join forces to lower investment barriers or save costs. Joint procurement, in which a group of public authorities conduct a procurement together, can enable the public sector to achieve savings through bulk buying and can reduce administrative costs, pooling knowledge on environmental, technical and market perspectives. The city of [Tampere](#) opted for the joint procurement of ICT infrastructure and devices with eight neighbouring municipalities.

Green procurement

By using their purchasing power to choose environmentally-friendly goods and services, European public authorities have the potential to support the development of a market of sustainable products and services and reduce negative environmental impacts. In [Tampere](#), all parties agreed on environmental standards that purchased devices should fulfil. The procurement of the web hosting required for ICT was centralised, and the energy needs of the datacentre optimised. Part of the heat energy produced by the devices will even be used to heat the building which houses it⁷⁵. [Tampere](#) and its neighbouring municipalities are also jointly purchasing the Follow-Me printing solution to reduce paper waste linked to excessive printing⁷⁶.

SECTION IV CITIES MEASURE

Urban innovation is by definition intangible, and thus measurement presents a serious challenge. However, without reliable performance indicators and regular monitoring, it is impossible to know whether the solutions implemented are taking effect.

Urban innovation is by definition intangible, and thus measurement presents a serious challenge. However, without reliable performance indicators and regular monitoring, it is impossible to know whether the solutions implemented are taking effect. How can cities assess their progress towards a smarter urban future?

By signing the Charter, city administrations commit themselves to:

- Regularly review ways for cities to make the best use of ICT and innovation for the benefit of all their citizens;
- Demonstrate that cities can lead by example by ensuring the measurement, transparency and visibility of each city's use of ICT infrastructure and digital services in terms of carbon footprint, and by promoting these practices in the private sector and the wider community

MEASURING ENERGY SAVINGS

Most cities admitted that this objective had only been partially met. Less than half of the interviewees were able to provide details about energy-savings in their city. Some gave assurance that their municipality was leading a proactive policy in this field but were unable to provide numbers as they were not involved in the right department.

In some countries, reporting on energy consumption is a national legal obligation as it is for Scottish local authorities under the Public Bodies' Duties of the Climate Change (Scotland) Act of 2009.

Other cities are using measurements to communicate efforts to citizens. For instance, [Malmo's](#) digital Miljöbarometern⁷⁷ makes statistics and data covering climate, energy, traffic and noise available to the public.

LOW CARBON ICT

Digitalisation is growing exponentially, accompanied by increasing energy consumption. Estimations of the carbon footprint of the ICT sector are reaching 4% of the global carbon emissions by 2020, as much as the aviation sector.

The development of e-services occupies a large part of the digitalisation of city administrations. In all cases, e-government programmes have a clear connection with objectives of resource efficiency (paperless procedures, e-archives, virtual meetings etc).

In [Malmo](#), more than 90% of products are environmentally-labelled with third party certifications such as TCO-Development. At operational level, a living dialogue forum was created by the city of [Malmo](#) with the chosen ICT-distributor and logistics partner ATEA. An ICT product portfolio is developed and updated so that the municipality has access to the best assortment of desktops, computers, network printers, servers, screens, recycle toners etc. from a sustainable perspective.

GDC's third commitment to decrease the ICT's direct carbon footprint by 30% within ten years has proved to be the most problematic commitment, because measuring the carbon footprint of the ICT sector remains a challenging task. The challenge is to find a model for the measurement of environmental impacts related to e-services as the greatest impact occurs outside the public organisations. Moreover, it is often difficult to measure the carbon footprint of the whole value-chain.

Virtualisation and energy efficient datacentres

Datacentres represent by far the most important source of energy consumption of ICT infrastructure. Measuring the energy efficiency of existing datacentres is the first step to optimising servers' storage capacities.

In 2011, the city of **Malmo** asked its supplier Schneider Electric to deliver a report on the energy-efficiency of publicly owned datacentres. Results were relatively good in terms of Power Usage Effectiveness (PUE) but there was no flexibility to adjust the heat/coldness or lighting of the datacentre. In 2015, **Malmo** decided to close down the existing datacentres to shift towards collocation services from two external suppliers. Above 90% of the business systems have been virtualised, the number of physical servers was reduced from 29 racks to 16 which led to a lower energy consumption and a more environmentally friendly power mix from wind and water.

Whereas some cities adopt proactive behaviour to optimise the energy efficiency of their IT infrastructure (datacentres, servers), others simply outsource their data storage capacities. Compliance with energy efficiency standards therefore relies on the service supplier. **Edinburgh** City Council changed ICT supplied and is now procuring CGI to introduce integrated digital services within the administration. CGI is part of the Green Grid⁷⁸, a global consortium of leaders promoting energy-efficient datacentres.

A life-cycle perspective: assessing the overall environmental impact of the ICT sector

While the energy efficiency of IT equipment has remained an important focus for manufacturers in the past decade, it is now acknowledged that other stages in the lifecycle, and other environmental impacts, of the equipment should be considered. Depending on the lifetime of a product and the type of product, the manufacturing of IT equipment may contribute from 26% to 80% of the impact over the lifecycle.

The city of **Malmo** has for several years focused on the lifecycle perspective when purchasing ICT products and solutions. Energy and resource optimisation is very important in all demands to suppliers. The city also avoids purchasing equipment that contains hazardous substances or is produced in an unethical manner.

A major obstacle to reducing the output of the city administration's IT equipment lies in the current use of old devices that obviously perform less well and are less energy-efficient. ICT equipment refreshes are most of time put on hold due to reduced budgets or done through a progressive roll-out.

Finally, fighting electronic 'e-waste' is still a challenge. What happens to devices that have reached end-of-life or that have been replaced by better performing products before doing so? In the exemplary **Malmo**, a recycling service (defined as 'IT-loop') can be managed by an external vendor, but the city acknowledges still encountering the challenge of having a share of redundant old devices still functioning.

ASSESSING THE EFFECTIVENESS OF SMART POLICIES AND PROJECTS

In recent years, the definition of sustainability has become even more sophisticated and the concept of ‘smart city’ so broad that it encompasses extremely different realities. Metrics to measure sustainability have been widened to cover the environmental impact as well as the social and economic elements of urban development.

The use of key performance indicators (KPIs) to assess measures and projects implemented in the frame of smart city/digital strategies is spreading among cities. Still, only half of cities that have answered the questionnaire are using performance indicators.

A few cities have developed their own index, such as **Prague** whose ‘Smart **Prague** index’ helps maintain control over the progress of the Smart **Prague** strategy, based on specific indicators such as the share of electric mobility as a proportion of overall mobility.

Visualisation tools are essential to communicate these indicators to citizens. In **Zaragoza**, Ebropolis⁷⁹ is an urban observatory providing a city dashboard and a wide repository of high-quality accessible data.

Performance measurement usually has four objectives:

Demonstrate the accountability of projects and operations implemented and performed with public money

Support informed decision making for both strategies and projects

Inform the public about a city’s activity

Promote the continuous improvement of city-funded activities and of the administration of the city itself



SECTION V CHALLENGES AND RECOMMENDATIONS

By and large, the cities are on track to meeting their GDC commitments, although a few challenges remain

There are many challenges lying in wait for cities that want to move towards their goals. In the survey, cities were asked to identify the challenges and obstacles at local, national or European level that may prevent them from meeting their GDC commitments.

Their responses fell into five categories:

1. Human and financial resources

A lack of sufficient human resources and funding can delay projects, or even stop them at their design or early in their implementation phases.

2. Working culture within administration

Changing attitudes and behaviours is also a big challenge, in implementing ICT and digitalisation it is essential to motivate and reach out to citizens. Co-creation is a good way to surmount this obstacle, but it is difficult for some cities to effectively engage with citizens, if there is no previous traditional culture of participation. Citizens may be invited to events and targeted at physical meetings, but it has proven difficult for many cities to involve their residents at all stages of the project.

3. Access to data produced by private organisations

Cities experiment with different ways of collecting data for use in urban planning and operational management. Non-personal data is increasingly generated through IoT and machine-to-machine (M2M) solutions. Today, access by the city administration to data generated by machines or through products and services is often limited, or unavailable, when the data is managed by private organisations.

Furthermore, in many cases cities cannot foresee the amount or intrinsic value of data that will be produced during a PPP or outsourced public project. This is translated into a lack of provisions for data being available to the city administration so that it then needs to pay extra money to get access to data produced from an essentially public project. Increasingly, cities are getting experienced and aware of this problem and including and negotiating data-related terms in all contracts they sign.

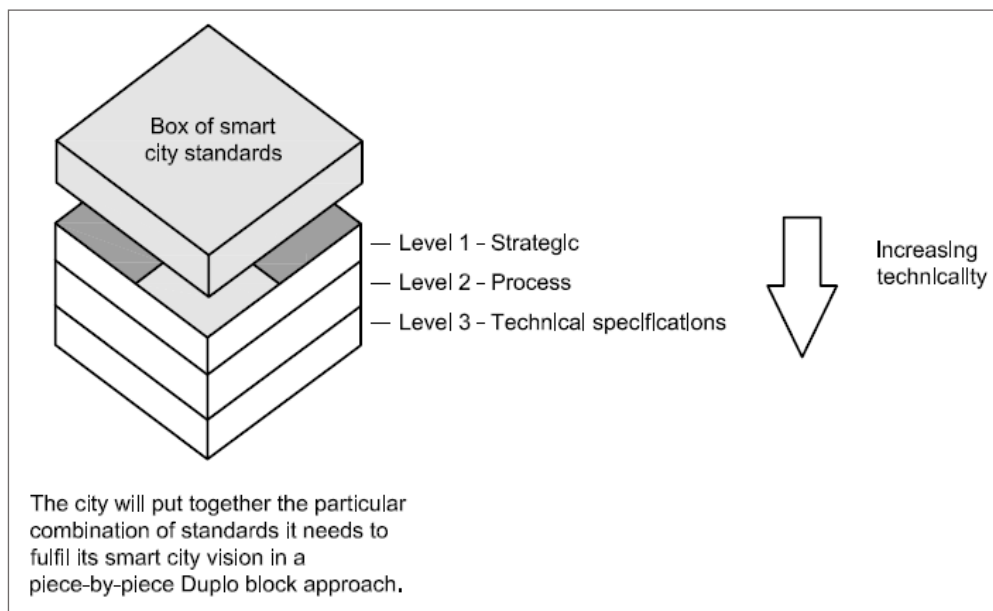
The same goes for data harvested by private organisations in public spaces. Ideally, cities would like to see this kind of data openly available to all interested stakeholders⁸⁰. However, a mix of legislation and common understanding or consensus between public and private stakeholders is needed before reaching this point.



4. Sustainable and smart city standards

The role of smart city standards is to support the widespread adoption of common approaches to the implementation of smart city products and services in order to facilitate the rapid development of an effective smart city market. From the three levels of standards relating to smart cities⁸¹ - that in total account for some thousands of standards - cities, at the highest level, would like to see progress in the definition and wide adoption of standards in the first two levels, namely strategic and process.

Then, city practitioners, in their specific fields of work are dealing with the challenge of identifying and using these widely adopted standards that are sufficiently supported by technology providers but at the same time allow for interoperability between departments or between different cities, avoid vendor lock-ins and cover basic city principles and objectives like openness, security and privacy, etc.



Source: BSI PD 8100:2015 'Smart cities overview - guide', p.21
<http://shop.bsigroup.com/upload/Shop/Download/PAS/30313208-PD8100-2015.pdf>

5. Measuring inclusiveness of implemented policies

Social engagement is a factor difficult to measure. Attempts by city councils to do so include specific indicators targeting social inclusion, such as quantitative analysis of reductions in homelessness. At project level, social inclusion mostly takes place in the design phase, rather than continuing throughout the project lifetime.

REFERENCES

- 1 <http://www.greendigitalcharter.eu/projects/guidance>
- 2 <http://www.government.se/496173/contentassets/afe9f1cfea4e39abdd3b82d9bee5d/sweden-completely-connected-by-2025-eng.pdf>
- 3 European Commission, Strategy 'Connectivity for a European Gigabit Society', 14 September 2016, <https://ec.europa.eu/digital-single-market/en/news/communication-connectivity-competitive-digital-single-market-towards-european-gigabit-society>
- 4 <http://czechsmartcitycluster.com/>
- 5 <http://lafrenchtech-rennes.fr/>
- 6 <http://www.eurocities.eu/eurocities/news/Lessons-from-the-EUROCITIES-Knowledge-Society-Forum-in-Rennes-WSP0-AABB7P>
- 7 <https://6aika.fi/in-english/>
- 8 <https://www.scottishcities.org.uk>
- 9 <http://www.redciudadesinteligentes.es>
- 10 <http://www.burgas.bg/uploads/433c86a046c569491a6321fb8fa19714.pdf>
- 11 <http://ictanddigitalstrategy.org.uk/>
- 12 <http://www.acceleratinggrowth.org.uk/>
- 13 <http://edinburgh.org/2050-edinburgh-city-vision/>
- 14 <http://malmo.se/download/18.6301369612700a2db9180006227/1491298650047/Environmental-Programme-for-the-City-of-Malmo-2009-2020.pdf>
- 15 http://malmo.se/download/18.5f3af0e314e7254d70e39f94/1491305192973/handlingsplan2015_150826_webb.pdf
- 16 <http://malmo.se/Kommun--politik/Sa-arbetar-vi-med.../IT-och-digitalisering/Det-digitala-Malmo.html>
- 17 <http://www.government.se/information-material/2017/03/a-completely-connected-sweden-by-2025--a-broadband-strategy/>
- 18 <https://www.smartprague.eu/en>
- 19 <http://metropole.rennes.fr/politiques-publiques/transports-urbanisme-environnement/l-environnement/le-plan-climat/>
- 20 https://www.tampere.fi/tiedostot/k/P1lFwM6Al/Tampere_City_Strategy.pdf
- 21 <http://www.agendadigitale.piemonte.it/web/>
- 22 <https://smartcity.wien.gv.at/site/en/the-initiative/framework-strategy/>
- 23 https://www.partizipation.wien.at/sites/default/files/1508_digital_agenda_vienna_eng.pdf
- 24 <http://www.zaragoza.es/contenidos/sectores/tecnologia/Estrategia-Ciencia-Tecnologia-en.pdf>
- 25 <http://www.greendigitalcharter.eu/guimaraes-signs-the-green-digital-charter-in-the-heart-of-europe>
- 26 <http://bit.ly/GDC-case-studies>
- 27 <http://www.greendigitalcharter.eu/video-meet-gdc-signatories-in-barcelona-for-the-smart-city-expo>
- 28 Cities in Transition (25 January 2017) and Imagine the Urban Future: Innovation, Collaboration, Trust (23 January 2018)
- 29 Barcelona and Stockholm (GrowSmarter), Eindhoven and Manchester (TRIANGULUM), Bristol (REPLICATE), Lisbon (Sharing Cities), Vienna (SmarterTogether), Helsinki and Nantes (mySMARTlife), Tampere (STARDUST) and Gothenburgh, Nice and Utrecht (IRIS).
- 30 Prague (TRIANGULUM), Burgas and Bordeaux (Sharing Cities), Venice (SmarterTogether), Rijeka (mySMARTlife) and Skopje (MatchUP).
- 31 <http://whc.unesco.org/en/list/1031>
- 32 <http://edinburghlivinglab.org/>
- 33 EUROCITIES video: <https://www.youtube.com/watch?v=zYu9MC2D8r8>
- 34 <https://www.zaragoza.es/ciudad/etopia/>
- 35 <https://www.industrymeetmakers.com/#home>

- 36 <http://www.labfab.fr/>
- 37 <https://edinburghopendata.info/story/foi-pilot-project/>
- 38 <http://www.cm-guimaraes.pt/pages/1092>
- 39 <http://www.100ideasgz.com/>
- 40 <https://www.burgas.bg/en/news/details/1/32483>
- 41 <https://www.iscapeproject.eu/>
- 42 <https://edinburghopendata.info/solution/edinburghapps-road-safety-hackathon/>
- 43 <http://www.ceehacks.com/>
- 44 <http://www.fixburgas.com/>
- 45 <http://www.interreg-central.eu/Content.Node/Rijeka.html>
- 46 <http://empowerproject.eu/>
- 47 <http://entropy-project.eu/>
- 48 <https://www.agendadigitale.eu/cittadinanza-digitale/torino-as-a-platform-fare-rete-per-valorizzare-i-dati-comunali/>
- 49 <http://torinolivinglab.it/>
- 50 <https://edinburghopendata.info/story/edinburgh-open-data-map/>
- 51 <https://fabriquecitoyenne.rennes.fr/>
- 52 <http://bit.ly/2ortpWj>
- 53 <https://smartcity.wien.gv.at/site/en/wien-at-public-wifi/>
- 54 <http://www.green.digitalcharter.eu/wp-content/uploads/2012/03/GDC-case-study-Rennes-Open-energy-data.pdf>
- 55 <https://smartcity.wien.gv.at/site/en/digitalcity-wien/>
- 56 <http://www.urbaninnovation.at/en/Projects/WAALTeR-Active-Ageing-in-the-City>
- 57 <http://openincet.it/>
- 58 <http://www.ciemzaragoza.es/>
- 59 <http://www.forumpa.it/smart-city/factotum-citta-di-torino>
- 60 http://www.hyllie.com/media/81309/hyllie_klimatkontrakt_en_ipad.pdf
- 61 Read more about Tampere's new Hiedanranta district in the 2017 collection of GDC case-studies <http://www.green.digitalcharter.eu/new-publication-gdc-2017-collection-of-case-studies-is-out-now>
- 62 Through the 'lazo' card: <https://tarjetalazo.es/>
- 63 GDC 2017 case-studies p42
- 64 <https://wms.burgas.bg/wmis-portal/>
- 65 Source: <http://www.eptisa.com/en/experience/ecocity-valdespartera-zaragoza/mercados/>
- 66 <http://heritagecare.eu/>
- 67 <http://eu-smartcities.eu/initiatives/68/description>
- 68 <http://www.almanac-project.eu/news.php>
- 69 <http://vici.inndeavalencia.com/index.php/vlciplatform/?lang=en>
- 70 <http://3d.rennes2030.fr/Rennes2030/>
- 71 http://www.edinburgh.gov.uk/info/20162/saughton_park_project/924/saughton_park_restoration_project
- 72 <https://www.iscapeproject.eu/>
- 73 Source: CIEM catalogue of services, 2014, published on issuu.com >> https://issuu.com/ciemzaragoza/docs/ciem_catalogue_of_services_eng_v4
- 74 GDC 2017 case-studies p12
- 75 GDC 2017 case-studies, p39
- 76 GDC 2017 case-studies, p38
- 77 <http://miljobarometern.malmo.se/>
- 78 <https://www.thegreengrid.org/>
- 79 <http://www.ebropolis.es/web/index.asp>
- 80 <http://nws.eurocities.eu/MediaShell/media/EUROCITIESstatementondataeconomy.pdf>
- 81 <https://www.bsigroup.com/en-GB/smart-cities/Smart-Cities-Standards-and-Publication/PD-8100-smart-cities-overview/>



GuiDanCe

Support the coordination of cities' activities
via the Green Digital Charter

Green Digital Charter contact point

info@greendigitalcharter.eu
www.greendigitalcharter.eu

c/o EUROCITIES
Square de Meeûs, 1
B-1000 Brussels
Tel: +32 2 552 08 88

February 2018



GuiDanCe has received funding from
the European Union's Horizon 2020
research and innovation programme
under Grant Agreement N° 653640

