ESPON

EUROPEAN UNION

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Inspire Policy Making with Territorial Evidence

POLICY BRIEF

Digital innovation in urban environments

Solutions for sustainable and fluently working cities

Cities need the right attitude, knowledge, skills and tools to lay the right foundation for digital transformation. It is important to recognise the culture, processes and structures that support and accelerate innovation. Simple digital improvements applied to existing solutions alone are insufficient, and being creative is often not enough. Moreover, transformation cannot be based on the success of a technology, policy area, agency, department or third-party service provider alone.

Instead, transformation must, in a holistic manner, take into account the interplay of the various challenges and innovation drivers, both horizontally and vertically, at local, regional, national and international levels. Cities must join forces, work together with businesses, academia, civic society and, above all, citizens. The aspirations for digital transition to solve many of the urban challenges should come from the residents and must be echoed in the strategies and carried through procurement and facilitation to allow new digital urban ecosystems to develop and evolve.

KEY POLICY MESSAGES

- A human-centric and holistic approach to digital transformation is the key to success, with technology acting as an enabling platform for innovation.
- Good urban governance and leadership are crucial in bringing together stakeholders and linking the different policies under the digital umbrella.
- Citizens can play a central role in identifying or actively intervening in urban challenges, often providing new perspectives and solutions.
- The openness and co-creation of strategies and solutions ensure their usefulness and guarantees the buy-in of end users.
- Platform-based solutions are becoming default arenas for collaborative value-creating interactions to take place and can significantly improve citizen participation and effective engagement.
- Open data, standards and interoperability foster digital innovation, allow for the faster delivery of services, stimulate businesses and empower citizens and governments.
- Innovation procurement brings about economies of scale and enables digital innovation to have a bigger impact.
- International and national networks and commitments are significantly empowering cities and accelerating the creation and adoption of digital innovation.
- The digital integration of urban development policies allows for a cross-sectoral and more integrated approach to urban governance and the better use of resources.

1. Introduction

The global landscape is rapidly changing and Europe is facing many social, environmental, economic and political challenges. Dramatic changes in climate, technology, society, global production and value chains are pressuring government leaders, businesses, scientists and citizens alike to rethink, not only how they interact with one another, but also how they develop, deliver and consume goods and services.

The emergence of the widespread deployment of advanced technologies, such as artificial intelligence, sensor technologies, cloud computing, open data, the Internet Of Things and blockchain, has re-invented the way we can manage growth and respond to these challenges. Cities are at the centre of these developments because of the proximity and concentration of people, consumption, construction and mobility. Thus, cities need to harness the new tools to enable them to lead the transformation, sustain growth and leverage high-tech innovations to better serve their citizens.

Yet, these emerging new technologies should not be an end product or a goal in themselves, but rather an enabler to transform cities into platforms that allow continuous process of co-creation, development and modification. In a similar fashion, running a city is no longer only a question of efficient administration, but has essentially become a continuous co-design process, involving engagement with different stakeholders and exploring new solutions together with a human-centric and more holistic approach to a digital city. Through openness and co-creation and by acting as a social glue enhancing democracy, cities can deliver better services and steer new business development opportunities in the digital era.

While the introduction of many digital solutions has had positive impacts for cities and citizens, it can also manifest unintended consequences. Some technologies could have detrimental effects on parts of the urban population, and maximising societal benefit will require careful regulation and forward-looking planning.

The activities and concepts required to address specific challenges are still taking shape, although some cities are already quite advanced. Many cities are engaged in platform development, which is aimed at engaging various stakeholders, including citizens, at local, regional, national and transnational levels, in the daily organisation of city life, services, procurement practices and business models. If it succeeds, a platform approach will enable cities to fulfil the role of pioneers in national and European innovation policy development, as well as provide new tools for managing the structural change that is shaking up the information economy and delivering digital cohesion.

This ESPON policy brief aims to help European, national, regional and urban authorities, businesses, academia and citizens to better understand how digitalisation and new technologies can be harnessed. It promotes the transformation of cities into platforms of open innovation and, further on, envisages development that we could call ‘digital urbanism’. It calls for cities to work together with their citizens and collaborate both vertically and horizontally with their partners to co-design strategies and actions for the future.

This policy brief aims to support discussions surrounding digital innovation in cities and urban policy during the Finnish Presidency of the Council of the European Union’s (EU’s) second semester of 2019.

2.
Moving beyond the smart city

Digital technologies have been shaping our cities for more than a decade. They have brought about a number of new solutions that have enabled the delivery of mobility, housing, waste management, public services and governance in a smarter way, thus allowing cities to use their infrastructure more efficiently and with fewer resources, and better address the growing number of challenges.

Among the shortcomings of current models of the smart city is that many of the **solutions witnessed have been largely dominated by a technology push.** Linked to this, the development of technology-oriented solutions by private companies has played a major role in the development of smart cities, **rather than innovation driven by public demand, i.e. based on city needs.** At the same time, innovation increasingly tends to happen as a result of collaborative set-ups between citizens, the city, the private sector, civic society and knowledge institutions, often called **ecosystems of innovation.** This highlights the role of cities as **platforms for innovation,** particularly in the case of digital innovation. Moreover, some smart solutions developed have ended up being fragmented and isolated from each other without proper links to an overall digital strategy and infrastructure. One more dimension is the upscaling of digital city solutions, e.g. from single cities to multiple cities, which has not yet fully taken place. **Therefore, the impact of the smart city endeavour on society has remained limited** (Finnish Ministry of Economic Affairs, 2019).

Taking these issues and challenges as a starting point, the Finnish Presidency aims to go 'beyond the smart city', re-focusing the perspective from a technology-dominated approach to a **human-centric and more holistic approach** to a digital city. From this viewpoint, opportunities arising from the digitalisation of cities are perceived as tools for achieving the diverse, positive effects of sustainable urban development rather than digitalisation itself being perceived as a goal.

EXAMPLE 1

Barcelona: towards a more open and inclusive city

The Barcelona Digital City 2017–2020 plan is the city's roadmap for driving technological sovereignty for citizens. Barcelona's priority is to go beyond the concept of the smart city and take full advantage of opportunities brought about by highly transformational data-driven technologies.

It aims to promote a more pluralistic digital economy and make a new urban innovation model possible based on the transformation and digital innovation of the public sector and the involvement of companies, administrations, the academic world, organisations, communities and people, with a public and citizen-based leadership.

As the city commits itself to putting people's needs at the centre of the digital agenda, it is not content with a narrow technology push approach, focused only on sensor networks, gadgets and connectivity – an approach that, all too often, results in important infrastructure being managed by large foreign corporations (Barcelona City Hall, 2016).

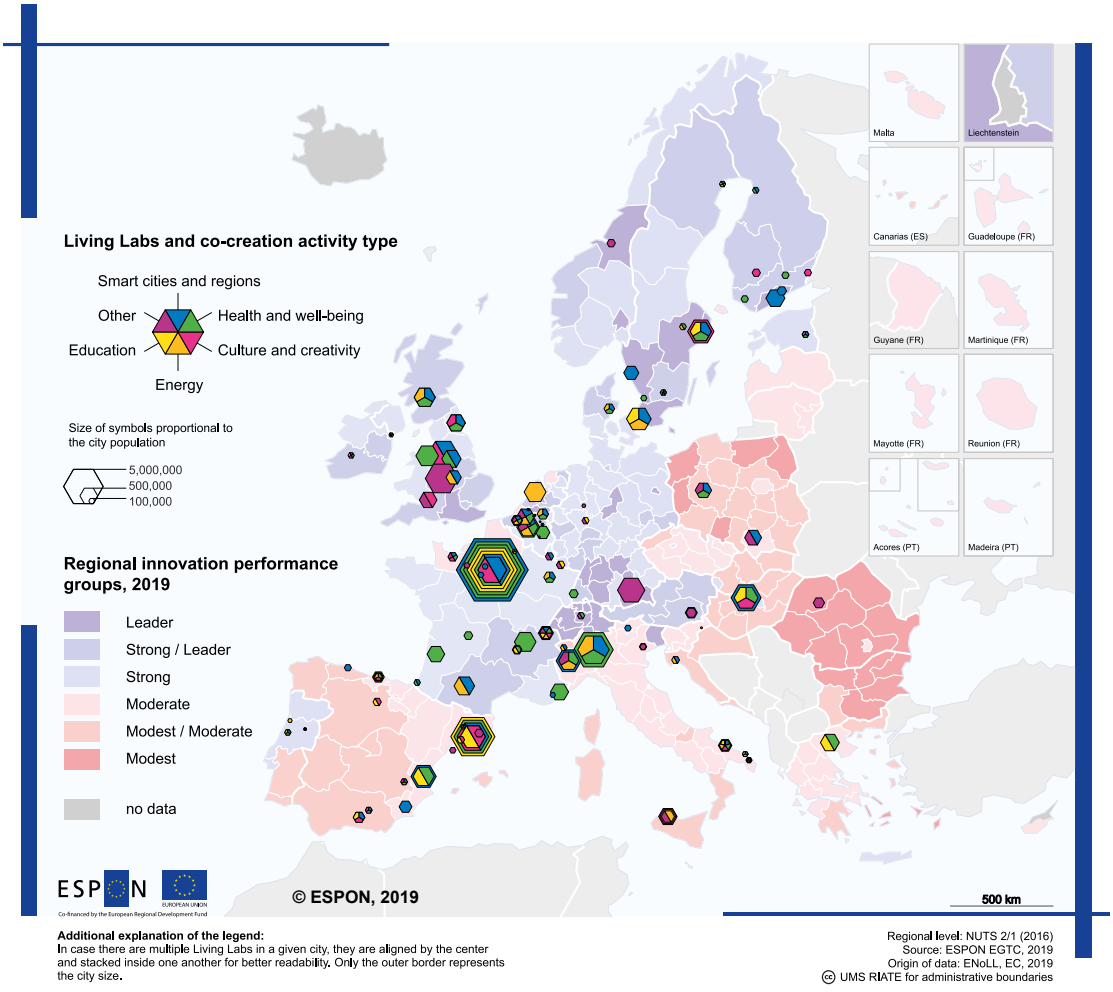
3.
The role of openness and collaborative creation

3.1.
Digitalisation fostering open innovation

Digital technology allows citizens to connect and exchange knowledge and experiences more and more. It has given them a stronger voice and the necessary means to actively participate in urban life and related decision making. Technological transformation triggers a **new way of thinking and allows people to exchange values, concepts and practices in real time, enabling cities to become spaces for engagement, regardless of size, density or complexity** (JRC, European Commission, 2019).

It builds on the concept of open innovation, or **Open Innovation 2.0** as it is currently referred to, which provides a new approach for tackling the complex challenges we face in our societies by including the end-users in the development processes. It brings together the multidisciplinary viewpoints of traditional silos of **government, industry, academia, civil society and citizens** in an environment that promotes teamwork, collaboration and the sharing of ideas. **Technology plays, for that reason, a key role in creating networks and connectivity. A platform-based approach and user-oriented interfaces facilitate interactions and ensure the flow of data.** By working together, this quadruple-helix approach can create new shared values that benefit all participants in what becomes an **urban digital innovation ecosystem.**

Map 1
Co-creation in cities and regional innovation performance



Source: ESPON, 2019

Therefore, the value of the digital city approach is characterised by a long-term view, focusing on improved social conditions as well as on sustainability. **Success is thus measured against innovation in the ecosystem as a whole,** rather than against one policy area, agency, department or third-party service provider alone. Openness within public administration bodies boosts transparency, participation and collaboration not only among administration staff but also among citizens.

3.2. Engaging citizens in co-creating their cities

Cooperation between businesses, academics and public authorities and civic society is important for stimulating and steering digital transformation; however, involving the citizens who live and work in those cities is vital. **Citizens now have the means to take personal and collective responsibility for how they use their city, changing their mindset, behaviours and actions.**

Co-creation may be connected to different stages of the digital innovation process, from the conceptualisation of a new idea in a demonstration workshop, to testing and piloting the service or product in a living lab, all the way to testing in the market.

City platforms are increasingly and systematically becoming the default arena in which mutual value-creating interactions between different parties are successfully facilitated. Platforms provide open spaces for which anyone with a computer or a smartphone can register in seconds and start drafting an investment proposal, react to someone else's idea or comment on broader city plans. The users of a platform may also include other external parties, such as mentors, investors or other partners, that bring their competence to the development of activities. Online platforms can thus provide the means for seamless two-way interactions between citizens, experts, investors and city officials. Co-creation platforms represent workable solutions to inclusive urban planning by eliciting ideas from citizens and helping them translate thoughts into concrete proposals. To trigger users' thinking and facilitate interaction, the introduction of **coherent and simple user-oriented interfaces is necessary.**

Developing such interfaces in cities requires knowledge of the interaction with technology, and enhancing opportunities for education, training, support functions and continuous learning. For example, interfaces such as voice assistant or virtual reality and simulation technologies facilitate a more natural interaction between humans and technology.

EXAMPLE 2

Finland: personal carbon trading for more sustainable mobility in Lahti

The CitiCAP project is experimenting with a personal carbon trading (PCT) scheme to promote sustainable and low-carbon urban mobility by promoting and rewarding behavioural changes. Lahti was the first city in the world to launch a PCT scheme pilot in 2019.

In the PCT testing phase, each user is assigned the permissible quantity of emissions in accordance with the city's emission reduction targets. Each user has access to a weekly renewable emissions budget, which is consumed in a manner dependent on the user's mobility choices. By choosing sustainable mobility modes, users can lower their emissions budgets and earn virtual money. When the emissions budget is exceeded, the savings dwindle, but they cannot fall below zero. With road barriers, it is possible to redeem local businesses as well as the city's sustainable products and services from the application's marketplace. The current testing does not yet test the functionality of the marketplace and virtual money.

The PCT scheme was co-designed within the framework of the sustainable urban mobility plan and through a participatory and user-led process. Different experimental PCT models will be compared, in which citizens will be able to monitor their emissions and budget their carbon use via an open mobility data platform. The urban mobility data gathered though the platform will be relevant for public authorities, as well as for fostering sustainable mobility services and business opportunities. In parallel, a package of incentives will be put in place to encourage the use of the PCT scheme, and carbon-neutral bicycle highway lanes investments will be carried out in order to support low-carbon choices of transport (UIA, 2019).

4.
Open data, standards and interoperability

City governments are playing a leading role in implementing open data policies and driving forward open data movements. The ability to capture data and exploit them for more informed **data-driven decision making and digital innovation** is an area in which cities have started investing heavily. Local authorities, together with different stakeholders, are increasingly tapping into this to **deliver new services, improve liveability, stimulate business, and engage and empower citizens.** Opening up data leads to more open and modern government that is able to innovate and transform.

The benefits of opening up data can be economic as well as social. It allows for greater citizen engagement, as well as **increased transparency and accountability,** and enhanced communication channels. For instance, citizens gain greater insights into how their tax payments are being spent. The real-time availability of data also allows for the development of a **broader range of public as well as private services** and the development of novel applications. It supports innovation by diminishing bureaucracy and friction in data exchange and demolishing the competitive advantage gained by proprietary access to data.

Innovation is most likely to occur when data are available online in open, structured, computer-friendly formats for anyone to download. To make use of the vast data sets available, cities need to ensure interoperability via open standards, so that data can flow between agencies, departments and companies.

For the flow of data to be unlocked, citizens must be in control of their data, trust data handlers and **know who is using their data and what is happening to the data.** This will be one major challenge for the coming years.

EXAMPLE 3

Dubrovnik: adopting smart censors and an open data approach

In 2016, Dubrovnik was awarded “Best Smart City in Croatia”. Unlike many cities, the municipality did not turn to large tech companies to help solve its city’s challenges. Instead, it asked the citizens to get involved and help find the best local solutions.

The two main challenges for citizens are the flows of tourists and parking. As the numbers of tourists, for instance, can overwhelm the city, digital cameras have been set up to monitor the flows.

To address parking issues, the city installed smart parking sensors to help manage parking availability and drivers’ expectations of finding a space via a mobile app. The sensor is designed to be robust and easy to install and is now being used across the city.

Lots of other smart projects have emerged, including solar-powered benches where people can charge their phones and a mobile app, called “Dubrovnik Eye”, through which any problems around the city can be reported to the municipality by citizens or visitors. Reports are confirmed by a city administrator and delegated to the correct department, and people are then notified about how their issues are being rectified.

All data are public and available online, something that reflects the open data approach, which underpins the smart city programme (Techplace, 2019).

5.
Cities turning into platforms of open innovation

Digital cities are no longer deploying technologies as an end product, but rather as **platforms allowing a continuous process of creation, development and modification.** This is an approach that systematically facilitates external actors' innovation with the purpose of developing solutions to address the platform owners' problems and needs. **When citizens are considered merely as 'end users' and not as an integral part of the system itself, they end up doing things differently than the developers expected.** In a similar fashion, running a city is no longer only a question of efficient administration, but has essentially become a continuous co-design process, involving engagement with different stakeholders and exploring new solutions together.

The platform-based approach is an operating method empowered by the technological revolution and is supported by cultural change. In urban development work, it is more a paradigm shift than an individual programme. Instead of separate islands of software, cities must imagine a **platform that supports and interconnects all the digital functionalities that the city needs to serve internal operating requirements and to engage with citizens.** Platform-based activities chiefly mean the reorganisation of collaboration on innovation among the city's community. To make the right choices about designing such a platform, cities need to **apply platform thinking.**

In the context of cities, the platform owner is typically a city and it **enables digital interactions between the city and external actors and thus facilitates their collaborative innovation** (Ojasalo and Jässi, 2016).

EXAMPLE 4

Perugia: smart city platform

The City of Perugia, in Italy, adopted the FIWARE-based WiseTown platform to facilitate collaboration in urban planning processes. For this, they used a specific feature of WiseTown, 'WiseTown Crowd Planning'.

'Crowd planning' allows local governments to inform their citizens about several topics, in this case the possible improvements they plan to implement. The citizens can then react and add information, or offer further suggestions, on how to improve these ideas.

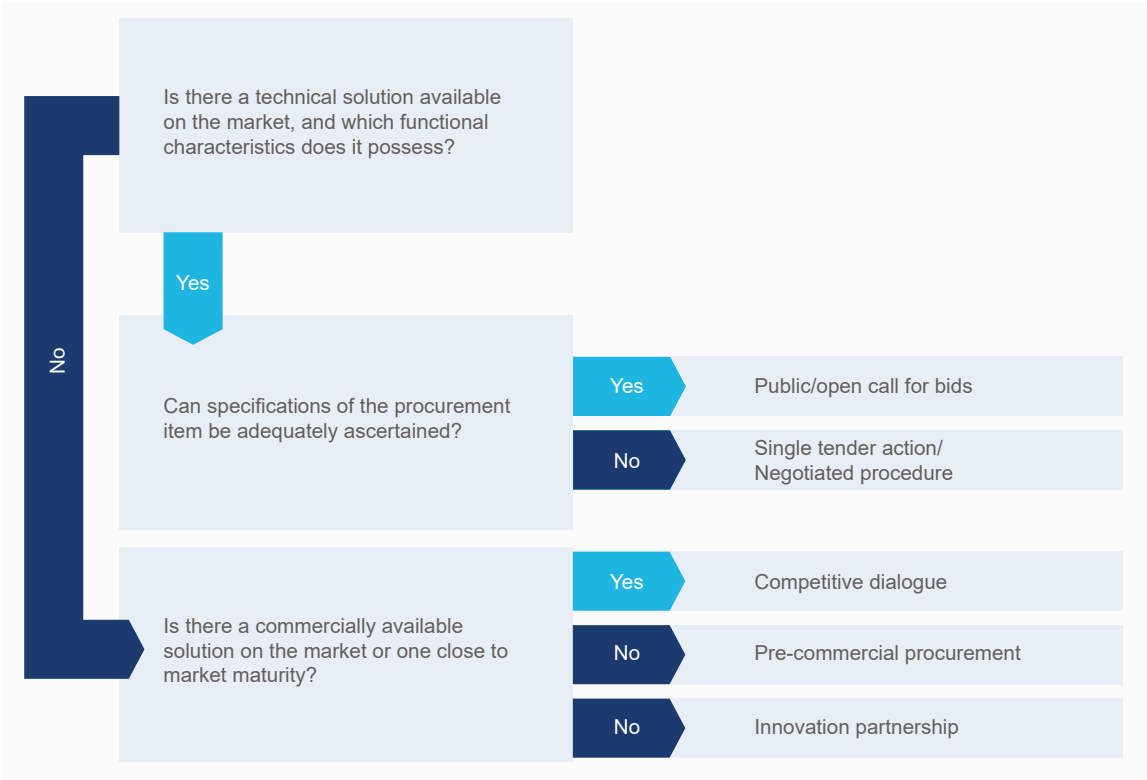
The City of Perugia used WiseTown to collect information from sensors, from its citizens and from third-party solutions. It then analysed them together to detect potential issues with the aim of improving the quality of life of its citizens. The data model that it built using WiseTown will remain useful in the future because even third parties, such as private businesses, will be able to use the information collected for their own purposes.

The FIWARE is an independent open community whose members are committed to building an open sustainable ecosystem based on public, royalty-free and implementation-driven software platform standards that will ease the development of new smart applications in multiple sectors. The FIWARE community is formed by not only contributors to the technology (the FIWARE platform) but also those who contribute to building the FIWARE ecosystem and making it sustainable over time.

6.
Procuring digital innovations

Currently, public authorities in the EU spend nearly 14% of gross domestic product (GDP) procuring services and products, playing, therefore, an important role in the supply and demand market. If some of this purchasing power is combined through partnerships and used strategically to procure innovative solutions, the **public sector** could invert the current tendency for digital-oriented solutions to be developed by the private sector and put itself in the **driving seat of digital innovation.**

Figure 1
Decision tool for innovation procurement



Source: BMWi, 2017

To procure digital solutions, cities should determine whether they already exist on the market or whether innovation is necessary. By using the modernised EU public procurement directive, for example, cities can make optimal use of collective purchasing arrangements to **respond to unmet needs,** creating greater benefits for citizens living in urban environments and improving the public service experience beyond merely satisfying primary needs. Urban actors must consider **"how to buy", as opposed to "what to buy",** and bring in public opinion, therefore opening up the discussion about whether or not the procurement of a digital solution will lead to higher quality and efficiency and deliver environmental and social benefits.

Public procurement tools can also be used to enhance the **cost efficiency** of digital products and services by considering life-cycle costs over the long term and boosting performance. Studies have shown that innovation procurement leads, on average, to cost savings of 20% on public procurement expenditure (which constitutes about one fifth of GDP in Europe, or around EUR 2 400 billion a year). Savings may also occur because of the **lower staff and energy-consumption** costs that digitalisation may bring about, the use of auxiliary and operating materials or the disposal of products, thereby making **cities more resilient and sustainable.**

To successfully engage in procuring innovative digital solutions, cities must make use of networking. Cities are natural candidates for jointly procuring digital innovation, not only because they currently face common needs, but also because they can **pool expertise and the necessary purchasing power** to facilitate procurement, as well as attract innovators, in particular high-tech start-ups and innovative small and medium-sized enterprises (SMEs). In addition, collective procurement arrangements bring clear benefits, as **they bring about economies of scale, enabling digital innovation to have a bigger impact, as it can be deployed by several procurers, and reducing administrative costs.**

EXAMPLE 5

Cities teaming up to procure the large-scale testing, validation and roll-out of innovative products and services

Currently in the third stage of pre-commercial procurement (PCP), Antwerp, Copenhagen and Helsinki through the SELECT for Cities project have launched a competition, open to all European companies, to develop an open, standardised, data-driven, service-oriented and user-centric platform that enables the large-scale co-creation, testing and validation of urban Internet of Everything (IoE) applications and services. The competition is based on the premise that cities across the world are seeking new methods, technology and tools to foster open innovation to solve challenges, create value for their citizens and business, and become 'smart cities'.

Cities of Helsinki, Gjesdal, Helmond, Lamia, Porto and the government of Estonia have teamed under the FABULOS (future automated bus urban level operation systems) project, which focuses on how cities can use automated buses in a systematic way. The goal is for cities and villages to join forces to procure the operations of an autonomous bus line. Self-driving minibuses have already been tested in technical demonstrations in various countries, but a proof of concept for the management of autonomous fleets as part of the public transportation provision is not yet available.

The partner cities are therefore embracing this challenge by collectively procuring research and development (R&D) services for the prototyping and testing of smart systems that are capable of operating a fleet of self-driving minibuses in urban environments. These solutions should be all-inclusive: software, hardware, fleet and services. The cities play an important role by combining their efforts in supporting the market to develop such systems. This kind of intelligent transportation system and integrated transportation approach is key to facilitating the sustainable development of public transportation and to enabling cities to become car-free in the foreseeable future.

7. Scaling up digital innovation through urban partnerships

Through both top-down and bottom-up initiatives, cities across Europe are becoming increasingly drawn to the idea that the **best results are achieved collaboratively.** From the digital city perspective, it is all about **networking and sharing knowledge, to scale up and adopt new innovative digital solutions for cities.** Being part of a European network of cities of different maturity levels can also act as a **catalyst for motivating and engaging** cities' decision makers and ambassadors for transformation (EASME, 2019).

7.1. Digital theme linking the partnerships of the Urban Agenda

The Urban Agenda represents a multi-level working method promoting cooperation between Member States, cities, the European Commission and other stakeholders to stimulate growth, liveability and innovation in the cities of Europe and to identify and successfully tackle social challenges. Thematic partnerships representing various

governmental levels and stakeholders are key to the delivery mechanism of the Urban Agenda for the EU. **Several thematic partnerships are linked to digitalisation,** for example the digital transition, urban mobility, energy transition and circular economy partnerships.

Urban Agenda Partnership on Digital Transition

This partnership focuses on the topics related to urban policies that can have a significant effect on transforming urban governance to fit 21st century needs. It promotes a transformation to **citizen-centric e-government** working on generating value through **free and fair access to open, public and personal data,** by accelerating and **adopting emerging digital technologies, by adopting business-model thinking in cities** and by strengthening the overall ability of cities to transform. The creation of digital services to enhance the competitiveness of enterprises and improve the quality of life of people is at the core of the partnership.

One of the horizontal themes to be addressed is the **data and standardisation** theme. Beyond the implementation of e-government services, citizens nowadays also expect open government: the use of open data, application programming interfaces (APIs) and data models that enable human-centric mobile and digital services.

Urban Agenda Partnership on Urban Mobility

The Partnership on Urban Mobility seeks to facilitate joint efforts to ensure more sustainable and efficient urban mobility. To achieve this ambition, the partnership focuses on governance and planning, public transport, active modes of transport and **new mobility services and innovation.** The new mobility services theme reflects a dynamic change in the sector through digital transformation. The partnership's action in this regard aims to investigate how the deployment of new mobility services (NMSs) can deliver solutions to citizens and support transport authorities in dealing with mobility challenges. It focuses on a combination of transport services by **aggregating travel data and communicating with the entire (digital) transport infrastructure.** In addition, it aims to set up a **European framework for fostering urban mobility innovation to make it easier for cities and regions to apply for and finance innovative projects.**

Urban Agenda Partnership on Circular Economy

The Partnership on Circular Economy covers a variety of aspects of the circular economy from a city perspective. The partnership focuses on specific actions and recommendations that would fit into existing plans for most cities. **The theme of a "collaborative or sharing economy" links the circular economy theme to digital innovation.** In this regard, the partnership is developing a knowledge pack on the urban circular collaborative economy. It will be a **holistic, co-created and living guide for city officials and other partners and stakeholders.** With this pack, stakeholders are expected to be able to make the most of the collaborative economy's benefits as well as anticipate and mitigate possible negative impacts.

EXAMPLE 6

ESPON projects supporting the Partnership on Circular Economy

Digital transformation allows us to scale up business models for collaborative economy swiftly and disseminate them widely to put us on course for a more sustainable future. The Partnership on Circular Economy and ESPON are currently jointly developing a research activity project, ESPON SHARING. The aim of this project is to better understand how urban circular collaborative economy initiatives are being implemented in different EU cities and how they are influenced by regulations at different levels of government, from the local level to the national and EU levels.

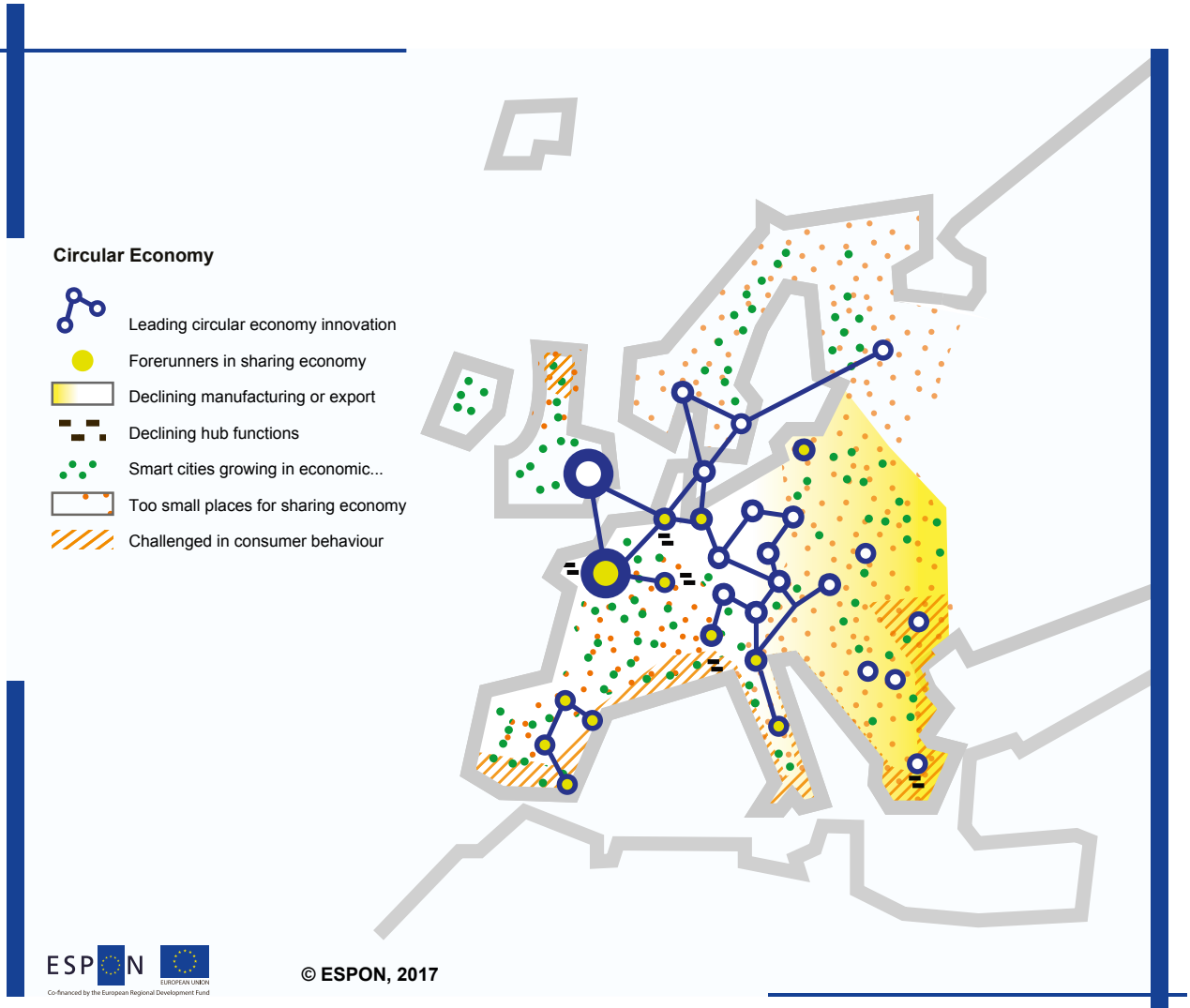
This new research activity complements some other recent ESPON projects on the collaborative economy. The ESPON FUTURES (2017) project results tell us that among the potential collaborative economy front runners are urban agglomerations in Croatia, Estonia, France, Germany, Ireland, Italy, Latvia, Romania and Spain. Areas that have limited use of sharing and collaboration platforms, low population densities and/or low levels of societal trust face more dramatic challenges in terms of a digital transition. Among these areas are rural regions in Cyprus, Czechia, Finland, Lithuania, Malta and Portugal.

The ESPON CIRCTER (2019) project results further complement these findings by indicating that agglomeration and proximity factors provide businesses with benefits due to shared access to information, networks, suppliers, distributors and resources. Urban proximity can promote strategies such as take-back programmes,

reverse logistics and a reliable stream of secondary materials. Knowledge centres, universities and R&D initiatives are important in boosting innovation capacities and can be a decisive factor for the development of disruptive products and/or resource-efficient processes. Actors with specialised knowledge within a territory cannot only provide a distinct advantage compared with other regions, but can also act as a strong driver for the design and implementation of effective policies for a circular economy, informed by the territorial characteristics of a city or region.

These projects emphasise the importance of open innovation and incorporating end consumers into circular strategies, as they need to be convinced of the reliability of repurposed products as well as prompted to use circular business models at a peer-to-peer level. Similarly, shifting towards a circular economy, through a greater focus on product design and the remanufacturing of products, for instance, will result in an increased need for a skilled labour force with specific competences.

Map 2
Place-based circular economy – production and new economic systems



Source: ESPON TERRITORIAL FUTURES, 2017

Source: ESPON, Possible European Territorial Futures, 2017

7.2.
City networks foster and facilitate the scaling up of digital innovation

Cities are engaging in many cooperation processes related to digital transformation. These are the **Open & Agile Smart Cities (OASC) network, the Green Digital Charter and the European Innovation Partnership on Smart Cities and Communities (EIP-SCC), Eurocities, URBACT, European Network of Living Labs as well as the new Digital Europe and Horizon Europe programmes.** Moreover, the **Digital Cities Challenge, now known as the Intelligent Cities Challenge, Urban Innovative Actions and Digital Innovation Hubs** are other recent key European initiatives. Another major vehicle for networking and scaling up is the Cohesion Policy, of which sustainable urban development (Article 7) is playing a major part in supporting digital transformation in cities.

EXAMPLE 7

Cities and businesses rally around European large-scale Internet Of Things pilot – SynchroniCity

The OASC is a non-profit, international smart city network that has the goal of creating and shaping the nascent global smart city data and services market. The OASC bases its work on city needs with support from industry. Unlike any other city network, the OASC is driven by implementation and focuses on open platforms and citizen engagement.

The OASC has developed the minimal interoperability mechanisms (MIMs) needed to create a smart city market. Since cities and communities are quite different, but have many structural commonalities and common needs, the SynchroniCity pilot builds on a broad and inclusive baseline of inputs and requirements. The concept of minimal interoperability means that implementation can be different, as long as some pivotal points in any given architecture use the same interoperability mechanisms.

This philosophy and technical approach led to the launch of a EUR 3 million European large-scale Internet Of Things pilot for smart cities and communities called “SynchroniCity” to deploy these data-driven solutions.

Participating cities cooperate strongly with the communities of the OASC and EIP-SCC as well as other organisations and initiatives such as EUROCITIES, the Urban Agenda Partnership on Digital Transition and the European Committee of the Regions.

The MIMs have already been implemented through SynchroniCity in the cities of Antwerp (Belgium), Manchester (United Kingdom), Helsinki (Finland), Santander (Spain), Milan (Italy), Eindhoven (Netherlands), Carouge (Switzerland), Porto (Portugal), Seongnam (South Korea) and Bordeaux (France). Eighteen other cities are expected to follow suit shortly.

8.
Digital integration of urban development policies

Every city aspires and strives to be prosperous, liveable, sustainable, smart, safe and well administered. Technology and digitalisation are having more and more impact on urban life and the environment, on governance and service provision, and on everyday operations and business models. **The big question is how to connect aspirations and policies with technological solutions and make them a reality.**

Digital technology is among the most promising means to help cities meet these goals. However, under the current approach of implementation – a series of short-term decisions in silos across a wide range of sectors, agencies and departments and commercial third-party providers – technology is unlikely to achieve its full potential. City administrators need to ensure that information, expertise and data sources can be **brought together seamlessly through digital interoperability and integration,** and that it is implemented in an inclusive and holistic way to improve the overall functioning of cities.

In this sense, developing smart cities should focus not on top-down service provision through policies and programmes, but on **designing structures that facilitate broad collaborations to emerge in a bottom-up fashion.** Approaching digital innovation as if a city is a laboratory with diverse collaborations on new applications of data will effectively move smart city developments beyond finding singular solutions to isolated problems, **towards fostering innovation 'ecosystems'** that broaden entrepreneurial opportunities.

EXAMPLE 8

Amsterdam tackles urban challenges with cross-sector platform

Amsterdam has built a smart city innovation platform that encourages citizens, companies and municipalities to solve urban problems collaboratively. Amsterdam Smart City (ASC) is an online platform where entrepreneurs can build and test projects aimed at guiding the city's sustainable growth.

Through ASC, the City of Amsterdam aims to move away from government bureaucracy and siloed thinking, and capitalise on quick-moving public–private partnerships. Using the ASC platform, anyone can share an idea for a public project, request guidance and seek out partners and investment.

The platform has accelerated more than 90 projects with more than 130 partners. ASC was founded by the Amsterdam Economic Board and Dutch grid operator Liander in 2009, with the goal of testing solutions on a small scale before launching the most successful solution city wide. One of the first steps was taking stock of the city and its services, which the Amsterdam Economic Board did by building 12,000 open source data sets across 32 city departments. The cornerstone of ASC is open-source, shareable data that cross-sector partners can use and contribute to.

The partnerships focus on finding solutions to challenges such as sustainable, inclusive economic growth, satisfying diverse populations, contending with climate change and building a metropolis that accommodates both residents and tourists (Municipality of Amsterdam, 2019).

To put digital innovation to use and integrate it into urban development policies, a city needs:

- **overarching digital strategies, policies and legislation,** and strong **leadership** to establish the framework;
- **engagement and cooperation mechanisms** among governmental silos within and across different territorial levels, from local to EU level, involving citizens, civil society, businesses and academia, for successful design and implementation;
- **to promote the free flow of data** and make use of data-driven intelligence, based on trust and privacy;
- **tools and infrastructure** that connect stakeholders, digital solutions and data to facilitate innovation.

Even though many cities are already addressing some of these elements, only a few are doing so in a holistic and cross-sectoral manner or in limited capacity. The results in the ESPON policy brief *The territorial and urban dimensions of the digital transition of public services* (ESPON, 2017), for instance, reveal that **one in three surveyed cities participate in international networks related to digital transformation or smart cities, and one in four in public–private partnerships.** In addition, the findings show that fewer than **one in three cities have adopted digital strategies and have appointed a digital leader.** It is also notable, however, that **two thirds of the cities already use at least some data** gathered using a digitalised service to improve services or decision-making processes.

EXAMPLE 9

Rural areas following suit

Even though cities are taking the lead in integrating different policy areas through digitalisation, there are also a few concrete examples of integrated policies that seek to overcome the fragmented focus and single-sector orientation in rural development policies.

One potential opportunity for a strategic, joined-up approach is the emerging “smart village” concept proposed as part of the EU’s “Cork 2.0 Declaration – A Better Life in Rural Areas”. The EU action for smart villages seeks to combine the actions of several policy areas relating to rural development, the environment, regional and urban development, transport and connectivity.

The smart villages action therefore aims to enhance traditional and new rural networks and services by means of digital and telecommunications technologies, innovations and the better use of knowledge, for the benefit of inhabitants and businesses. Focused investment in information and communications technology (ICT) can support a better quality of life; a higher standard of living; ensure basic access to public services and infrastructure; the better use of resources; lessen the impact on the environment, and provide new opportunities for rural value chains in terms of products and improved processes.

The concept of smart villages does not propose a space-blind or one-size-fits-all solution. Instead, it is territorially sensitive; responsive to the needs and potential of the respective regional contexts; and is supported by new or existing territorial strategies for surmounting local limitations and promoting balanced territorial development. Good governance, citizens’ involvement, enhancing human capital, capacity and community building are also key elements.

9. Policy recommendations

City level

ASPIRE AND STRATEGISE Co-develop digital city strategies and action plans from the bottom up, rooted in what residents aspire to have, ensuring that different voices are well represented. Engage the public from the outset, not just after specific applications suddenly appear, to secure community buy-in and make digital transformation feel like natural transformation rather than change imposed from on high.

APPOINT DIGITAL LEADERS AND ADD THE NECESSARY SKILLS Appoint digital leaders to develop and oversee the implementation of digital policies across agencies and departments, and engage with stakeholders and networks. Add new roles, such as chief digital officer and chief data officer, and establish cross-disciplinary digital city units. Add civic tech talent to bring in new skills, and educate, encourage and reward employees.

COMBINE SMART TECHNOLOGIES WITH URBAN POLICIES Become more agile and responsive by utilising technology to take the pulse of public opinion on a wide range of issues, enabling residents to weigh in on urban issues. Use passive and active data and public feedback as the basis for steering the policies.

BREED A CULTURE OF DIGITAL INNOVATION Breed a culture under which digital innovation can flourish. It is the unspoken but understood way that things are done digitally by default, the way risks and decisions are dealt with, the undercurrents that determine what gets prioritised and the invisible measuring tape by which actions are measured and rewarded.

FOSTER A CIVIC INNOVATION ECOSYSTEM THROUGH OPEN INNOVATION Network, collaborate and coordinate to enable, orchestrate and encourage the development of a complete civic innovation ecosystem that engages with a diverse set of external stakeholders: citizens, businesses, civic society, academia and different agencies and departments of public administration. Support platforms that connect the different stakeholders and ease their collaborative work, as well as oversee the management of open innovation projects, to ensure the sustainability of the effort. Adopt instruments such as innovation clusters, intelligent hubs or living labs, hackathons and application development contests as well as civic accelerators.

BECOME CITIZEN-CENTRIC, ENGAGE AND EMPOWER Redefine digital city goals so that citizens and their intrinsic needs are at the centre of every objective, instead of the usual urban domains, such as utilities and transportation. Adopt and deliver the kinds of on-demand experiences that today's wired citizens expect, and encourage citizens to engage directly in dialogues with urban leaders.

Promote the participation of residents and communities in data collection and analysis processes, through do-it-yourself sensors or smartphones. Recognise data as a new power for citizens and empower them by giving complete access to and ownership of their data. Utilise new technologies to create new models of data sharing and citizen engagement through which citizens have the ability to share their data for public benefit. Adopt a human-centric approach to personal data such as the MyData approach.

CLOSE THE DIGITAL DIVIDE Put the needs of marginalised groups and disadvantaged neighbourhoods on the agenda when cities choose which applications and programmes to pursue. Develop initiatives to increase digital literacy and improve the penetration and affordability of internet access and smartphones to ensure access to the benefits of smart city solutions. Form partnerships with private and social sector players to deploy applications specifically designed to level the playing field for the most vulnerable.

INTEGRATE DIGITALLY, DRIVEN BY DATA Align digital innovation policies with urban development policies by establishing a professionalised, specialised cross-sectoral agency, or expert authority, to steer digital transformation and to ensure the free flow of data, strategic planning and monitoring at city level, together with a more holistic approach to the differing dimensions of digital innovation.

PROMOTE MULTI-LEVEL APPROACHES Work closely together with national and international counterparts. Seek out expertise and knowledge stored in competence centres and act within the framework of wider digital innovation polices. Efforts made at the city level alone will not be sufficient and more consolidated and collective actions at international, national and regional levels are essential, including for prioritising and allocating appropriate resources and funds and for formulating strategies. Digital innovation in urban environments can be facilitated holistically only through system-wide strategies on multiple scales, integrated both horizontally and vertically.

However, while strategic coordination is crucial, policies must always be responsive to local situations, which requires tailored instruments and strategies.

NETWORK WITH OTHER CITIES Work together with other cities to develop and coordinate multi-settlement strategic planning to strengthen intra-urban networks and markets, foster and facilitate digital innovation roll-out, and achieve a more efficient use of public resources through establishing incentives for cooperation among cities and limiting the negative impacts of intra-city competition.

LEVERAGE AND OPEN UP DATA Recognise the value of the data as a public good. Leverage the potential of data innovation, including smart, big, open and geospatial data, to ground urban policy decisions in up-to-date and quality information and evidence. Make data accessible to third parties (companies, entrepreneurs, residents, universities, etc.) to promote transparency, democracy and the development of innovative applications (open data) while safeguarding the privacy of the individual. Promote the dissemination of data and information through new visualisation techniques, such as maps and graphics (online dashboards), and make data available in public spaces.

EMPHASISE (FUTURE) INTEROPERABILITY AND STANDARDISATION Future-proof city tech deployments to ensure that they do not fall into lock-ins of potentially problematic data and technology silos and become obsolete or isolated. Cities need to ensure that their systems and data models are interoperable, by default, with new solutions and solutions that have not yet been thought of. Use open standard APIs for the development of all of a city's systems and establish a common framework and models for data, which allow for major changes to software or vendors without losing access to data. Team up with other cities through networks such as the OASC and adopting joint interoperability and data models such as MIMs and FIWARE allows for scaling up and the creation of a joint market for new solutions and a quick and wide-scale roll-out and adoption of innovation.

PROMOTE A PLATFORM APPROACH Systematically open up the development of cities' digital environments, systems, products and services to outside developers and value creation, the key aim of which is to allow platform users to benefit from each other, that is, benefit from the network effect brought about by participation. Since technology is always evolving, cities need to adopt a platform approach and develop a technology infrastructure that is modular and will be scalable as a city grows, and easily replaced or upgraded as underlying needs change.

IMPROVE GOVERNMENT PROCUREMENT POLICIES Highlight digital innovation in procurement strategy positions, procurement process or function in a strategic manner that utilises different tools, such as PCP and PPI, in a complementary way and encompasses principles of interoperability, open standards and data. Develop ways and learn how to design requests for proposals for digital city platforms and applications that allow for greater flexibility. Agree on a (limited) list of open standards and technical specifications with which procured digital solutions should comply. Consider data as key assets both as inputs and as outputs of a solution or system. The goal must be to optimise procurement itself, i.e. ensuring employees are better trained, to deploy more financial resources and offer incentives for innovative behaviour.

Capitalise on the opportunity to receive, free-of-charge, technical and legal assistance from the European Assistance for Innovation Procurement initiative (eafip.eu), which supports public procurers across Europe in developing and implementing innovation procurement. This support includes local assistance for PCP and PPI supported by local lawyers.

ADOPT AND SCALE-UP BEST SOLUTIONS Orchestrate or enable pilots to test what works and what does not at a limited cost. Scale up successful pilot activities to broader activities to be rolled out in the medium term. Promote successful pilots within city networks, conferences and through journalists. Ensure success is recognised and that highlights of a city's digitalisation are widely shared to enable further development and spin-off projects, so more cities can get involved.

National level

STRENGTHEN INSTITUTIONAL CAPACITY Develop competence centres to provide necessary information, counselling and support for cities as well as rural areas in their digitalisation efforts, especially smaller cities with less capacity, through improving competence in the adoption of standards, data models and principles related to interoperability and procurement. Organise training, facilitate networking and find partners with which to solve similar problems. Although external financial support for a large number of cities is important, it is also important to maintain local competences and make sure cities do not lose their financial and decision-making autonomy.

PROMOTE NETWORKING Uplift genuine co-development by cities by supporting their networks through funding that encourages collaborative innovation. Bring local stakeholders directly into contact with international experts and stakeholders from other European cities. Inspire local stakeholders by involving them in meet-ups with other cities and experts.

REINFORCE THE IMPLEMENTATION OF INNOVATION STRATEGIES Invest in the creation or reinforcement of digital innovation hubs that support national or regional digitalisation strategies. Secure the necessary financial means, for instance through regional development funds.

CREATE AN OPEN AND INCLUSIVE ATMOSPHERE Ensure the greater transparency, openness and inclusiveness of government processes and operations by including open and inclusive processes, accessibility, transparency and accountability in the main goals of national digital government strategies and by updating accountability and transparency regulations, recognising the different contexts and expectations brought about by digital technologies and technology-driven approaches and taking steps to address existing "digital divides" and prevent the emergence of new forms of "digital exclusion" (OECD, 2019).

CREATE A DATA-DRIVEN CULTURE Develop national frameworks to enable, guide and foster access to the use and re-use of the increasing amount of evidence, statistics and data concerning operations, processes and results. Provide timely official data with and recognise the need to deliver trustworthy data, managing the risks of data misuse related to the increased availability of data in open formats (OECD, 2014).

COORDINATE THE IMPLEMENTATION OF THE DIGITAL STRATEGY WITHIN AND ACROSS LEVELS OF GOVERNMENT Identify clear responsibilities to ensure overall coordination of the implementation of the digital government strategy, increase the level of accountability and public trust, and improve decision making and management to minimise the risk of project failures and delays (OECD, 2014).

European level

HIGHLIGHT SUCCESS STORIES Highlight and promote the adaptation and scaling up of successful projects through networks such as the OASC, Urban Partnerships, URBACT, Eurocities and EIP-SCC.

SCALE UP FROM PILOTS TO GLOBAL MARKET Scale up successful pilot activities that contribute to the roll-out of a Digital Single Market. Promote the scale-up of successful local pilots at European level through knowledge exchange and prioritised funding.

IMPROVE FUNDING FOR DIGITAL INTEGRATION IN DIFFERENT POLICY AREAS Create financial instruments that mobilise investment towards digital integration. Simplify procedures and engage in extensive training and capacity building to allow the different EU funds (and financial instruments) available to cities to be deployed more effectively in a coordinated fashion through multi-funded, place-based integrated digital development strategies.

PROMOTE INTERNATIONAL STANDARDISATION Actively promote the principles of the European Interoperability Framework (EIF) and the opportunities of the initiatives stemming from the Connected Europe Facility and the EIP-SCC. The cross-border interoperability of digital systems and standard-based approaches and open data should be the cornerstone of future digital agendas and cohesion policy.

INTERCONNECT POLICY THEMES Link Urban Agenda partnerships in a cross-thematic manner under the umbrella of digitalisation. By cross-fertilising policy themes that usually work separately, value-adding combinations can be identified allowing the better integration of urban policies by using digital development as a bridge.

SUPPORT INTEGRATED DIGITAL POLICIES Recognise the potential of digital innovations for comprehensive urban development and continuously develop related initiatives, for example by identifying synergies between various instruments.

DEVELOP LOCAL DIGITAL ECONOMY AND SOCIETY INDEX (DESI) TO MEASURE DIGITAL TRANSFORMATION IN CITIES Develop DESI at regional and local level. The inability to measure progress at the level closest to citizens in a comparable manner undermines Europe's goals to increase its competitiveness globally.

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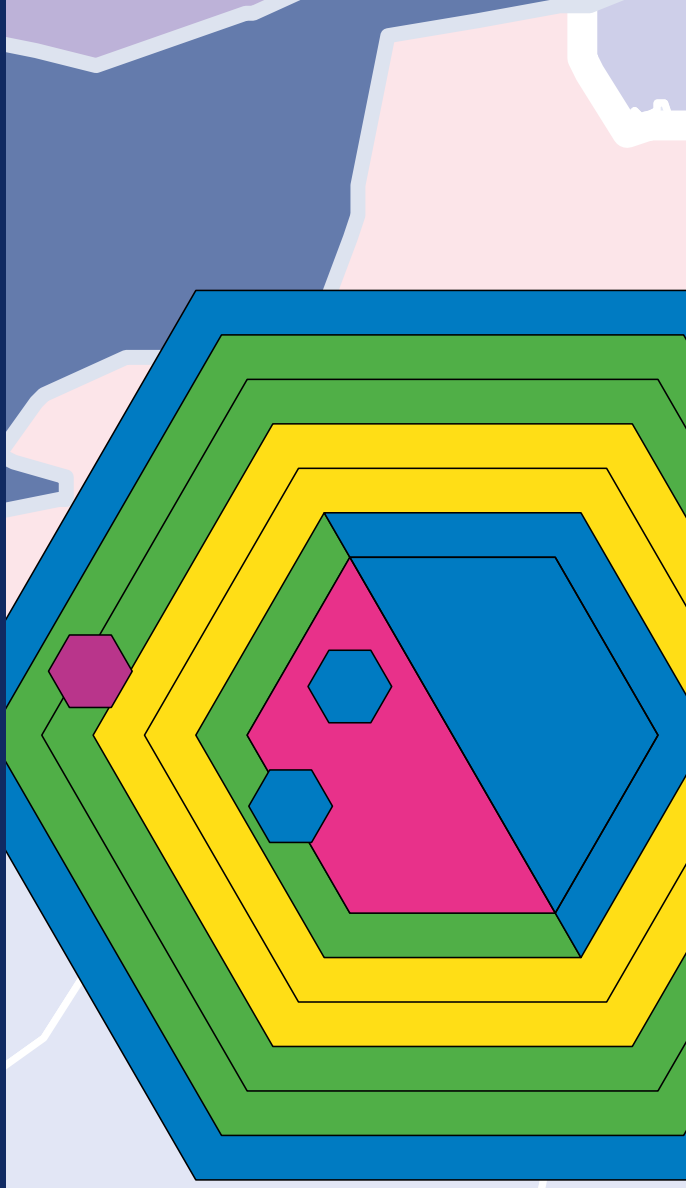

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