



Analysing the potential for wide scale roll out of integrated Smart Cities and Communities solutions

*The role of citizens, local businesses and the
mobilization and activation of communities in
creating sustainable integrated SCC solutions*

Report D7

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Acronyms

EC: European Commission

ICT: Information and Communication Technologies

MS: Member State

PPI: Public Procurement of Innovation

PPP: Public Private Partnership

PPPP: Public, Private and People Partnership

R&D&I: Research Development and Innovation

SC: Smart City

SCC: Smart Cities and Communities

SME: Small and Medium-sized enterprises

1. Introduction and general context

1.1. Introduction

There is growing recognition amongst Smart City practitioners and policy makers that the shift required to achieve sustainable smart city solutions that produce outcomes such as higher resilience of cities, liveability of cities and less resource consumption is a momentous **paradigm shift for most cities**. At the heart of this paradigm shift is the role of citizens, local businesses and communities in developing, implementing and maintaining sustainable and high-impact smart city solutions.

There are a number of trends that are shaping the landscape of integrated solutions between energy, transport & mobility and ICTs:

- **Competitiveness of cities** drives cities to consider liveability, happiness, “great place to do business” as key indicators for being a smart city. There is a rise of smart city relevant indices such as the smart cities benchmarks¹, innovation cities rankings², the UN habitat index or specific quality of life indexes³, as well as indices measuring the quality of cities to support start-ups and entrepreneurs.
- City visions of achieving future **resource efficiency and reduction of CO2**. Climate change is affecting how cities need to operate in future. Priorities for cities are therefore to use their own resources more efficiently, design integrated solutions that allow the tracking and ultimate reduction of CO2 across major infrastructure, as well as transport considerations. These solutions of the future often also require a shift in behaviour and mind-set of citizens and businesses locally, and thus are an integral part of the solutions we investigated. In regards to climate change, clear commitment has been made by mayors⁴ across Europe to deliver 40% CO2 reductions, which currently drive integrated smart city solutions across the energy and transport domains.
- Emergence of **new business models in the energy and transport market which fundamentally see consumers as pro-sumers**, particularly driven by the smart grid and the IoT that provide opportunities for future integrated solutions. Here citizens and businesses do not only receive services and resources but contribute to them too, for instance by balancing the energy grid or feeding renewable energy into the grid. Shared car-schemes would be the equivalent business model for future mobility.
- Smarter ways to use city resources: the **sharing economy** and supporting **social innovation** - A particular driver of cities of all sizes are new ICT-enabled business and market models such as the sharing economy and the circular economy to drive new resource-efficient industrial value chains of the future across Europe. Such radical transformation mechanisms are often accompanied by social innovation

¹ European smart city benchmark - <http://www.smart-cities.eu/benchmarking.html>

² Innovation index for cities, established in 2006 - <http://www.innovation-cities.com/innovation-cities-index-2015-global/9609>

³ The Monocle quality of life survey has for instance been running since 2007 <https://monocle.com/film/affairs/the-monocle-quality-of-life-survey-2015/>

⁴ Heralded as the “world’s biggest urban climate and energy initiative” by Commissioner Miguel Arias Cañete, the Covenant of Mayors for Climate & Energy brings together thousands of local and regional authorities voluntarily committed to implementing EU climate and energy objectives on their territory. <http://www.covenantofmayors.eu/The-Covenant-of-Mayors-for-Climate.html>

models that are enabling new welfare regimes across Europe to address aging, but also the complex issue of climate change.

- The **emergence of big data and data-analytics driven cities** and the new deal this brings for cities with their citizens. With the increasing pervasiveness of new technologies such as sensor technologies, data analytics, IoT and mobile devices, new opportunities are arising to govern the city differently but also for citizens to provide cities with data to steer integrated services in a more outcome focussed manner.

The purpose of this report is to describe the role of the citizen. In the context of this study we have chosen to interpret the citizen widely to include local business partners and the role of communities. In particular the following questions guided this research:

- What are current trends in participatory planning and engagement approaches to involving citizens in the development and implementation of integrated SCC solutions?
- What were the participatory planning & engagement approaches used across the best practice examples?
- What were their positive/ negative effects? What are challenges associated with these approaches?
- What concrete guidelines and best practices of practical approaches in supporting sustainable SCC solutions can be identified?

For the purpose of this report, the best practises identified by this study were considered, as well as examples highlighted in the literature review.

1.2. General context

There is a rich literature on the benefits of participatory approaches to city design, yet there is little consensus on what exactly these benefits are. Integrated solutions must acknowledge the different views and harmonize approaches effectively to maximize the impact for Smart City solutions.

Lack of consistency between stakeholder views of the role of citizens, local businesses and communities

What has been striking is the lack of evidence of what works and what doesn't work in terms of engaging citizens and most importantly involving citizens, businesses and communities in sustainable solutions. Instead what has become clear is that different stakeholders have very different relationships to citizens, business and communities and very different aspirations, tools and aims in involving them. Across the existing literature – from academic to grey literature, one can summarize the following **roles** discussed for the citizen in smart city solutions:

1. **Political versus the a-political role** – A lot of literature focusses on the role of the citizen in his or her democratic role or as an active member of a physical community or increasingly virtual interest-led communities. The aim of integrated smart city solutions often is to activate communities, hence this dimension seems key for the development and implementation of long-term sustainable solutions and particularly solutions that should drive concrete outcome such as CO2 reduction, improve the liveability or even economic activity of places or improve specific outcomes such as "smart mobility". From a city administration perspective, citizen

engagement is often seen as a fundamental part of democracy in general and the election cycle in particular and thus its tools and measures are often discussed in terms of representativeness, equal access and opportunity, inclusiveness, activation and the support of democratic processes. In the context of integrated SCC solutions however, the role of the city increasingly needs to set standards for innovating with citizens and communities and to govern particularly data standards, experimentation with data and privacy concerns.

2. ***Co-creator and collaborator*** – Proponents of the open innovation paradigm hail the role of citizens, businesses and communities as essential partners in service design and successful implementation. What is key to this perspective is the clear requirement to identify needs and benefits for citizens, businesses and communities in successful service redesign, and the consistent and continuous involvement of the citizen as a key stakeholder. In the wider context of innovation literature, one can identify decades of citizen-led innovation theory both in the context of public service redesign, and product innovation. New technologies in particular represent new frontiers for user-led research, active engagement of citizens and co-creation of products and services. However, evidence from the case studies shows that co-creation and collaborative solution design are rare in the real world.
3. ***Consumer to prosumer*** – The sectors associated with energy, transport and the built environment generally see the citizen, business and community as their consumer, client or tenant. However, this relationship is undergoing a transformation. The energy sector in particular, through investments in smart grids, is grappling with the distributed network and the potential of entirely new relationships with citizens, businesses and communities, as these turn into more active decision makers of when to use energy, and also potentially produce energy themselves or can offer storage options for instance. The same principle can be applied to other resources such as water, waste and air pollution too, which are essential to integrated smart city solutions of the future.
4. ***The vendor view of the user in the context of tech innovation*** – Smart cities by definition use ICTs to implement the Smart City vision, and therefore it is unsurprising to find most integrated solutions to have emerged from a demonstrator or pilot project to develop and test integrated solutions before they are scaled and possibly replicated. Particularly the early phases of project development and piloting are often driven and dominated by the tech innovation aspect and therefore citizens are reduced to users of new services rather than co-creators. Also, the existing business models of vendors often add to the complexity, fragmentation and non-integratedness of smart city solutions rather than the development of services that create noticeable smart outcomes from a citizen perspective. An example here are generations of e-government services that were impossible or frustrating to use before principles such as “provision of data only once” or “prefilled data” significantly simplified services and made them attractive.
5. ***Social innovators & community activists*** - A relatively new phenomenon is the innovator for social good who can emerge in private sector, third sector or the public sector setting for the community and the city as a hub for innovation. For integrated smart city solutions these roles are particularly relevant for the type of solutions aiming to “innovate towards zero” and thus requiring significant behavioural change. Further in particular types of services such as car sharing or in district

redevelopments, social innovation may be an important mechanism to engage the elderly or marginalised and thus key to the sustainability of integrated SCC solutions.

When analysing the level of involvement of citizens across the best practice case studies, the different views of the role of the citizen became very apparent in the approaches chosen to engage citizens by different stakeholders. Generally, **most best practices analysed for this study claim to want to be highly participatory but actually display rather piece-meal approaches to involving the citizen.** At the same time there is clear evidence that **citizen participation and engagement are a key success factor of the development of sustainable solutions and business models.** The mix of right approaches however depends very much on the solution, contextual factors as well as local factors such as the culture, the partners involved, budget and ambition as well as technology mix of the solution.

Types of roles attributed to citizens, businesses and communities in the development and implementation of integrated smart city solutions

A common way to investigate the role of the citizen is to classify the role played by the citizen, business or community in the integrated smart city solution. There is a general trend towards open innovation paradigms for cities and the maximum involvement of citizens but very little consistent evidence of what type of role actually works and who to involve when. Also, the role may vary for the different phases of the project from idea development, to piloting, implementation, and large scale roll-out. In particular, ICTs are adding new dimensions to the roles classically attributed to citizens, business and communities, both in terms of passive opportunities, for instance the measuring of behaviour through data points, or active involvement for instance through usage of platform modules and the active community building.

Generally roles attributed to citizens, business and communities can be summarized as:

- ***Providing insight, information & resources*** – Whilst user-led research in the innovation and hence project design and planning stage is very established, new trends include data analytics as well as crowdsourcing of insight and behavioural information at consumer level, thematic policy level or city level. This category also includes awareness raising, promotion and education, which particularly for participatory planning exercises and brown field redevelopment is a significant method to deeply engage citizens and to move towards behavioural change.
- ***Co-design, co-creation, collaborative problem solving*** – It is particularly design-led thinking approaches that are revolutionizing the role of citizens, businesses and communities in co-design and co-creation of integrated smart city solutions – at the design stage we are witnessing strategic approaches to open innovation and collaborative solutions in the conceptualization of pilots & demonstrations as well as the trend of cities embedding living labs to inform their future services. A similar revolution has been taken place in urban planning as well as policy making – concepts such as participatory planning as well as dynamic master planning⁵ are emerging as supportive methods. However, there is a dynamic

⁵ A Dynamic Master Planning approach should be the vital key to a successful Smart City, primarily in a developing country. Dynamic Planning encompasses inputs for Social, Economic and Environmental Benefits along with master planning principals, an approach which should be to fully understand the site and its context and create an innovative dynamic design solution backed up by a substantial objectives and quantifiable

debate ongoing what methods achieve which results and how this is representative of whom. Finally we are seeing new incubation & acceleration techniques; public sector research laboratories to support public sector innovation including service innovation and city collaborations as some examples to support scaling and replication of integrated solutions.

- **Collaborative governance; open innovation; joint decision-making** – Most integrated solutions in our best practise examples are based on multi-stakeholder public private and people partnership models (PPPPs) and thus require multi-sided business models as well as holistic smart city visions and operational models and frameworks. Such collaborative governance models can also be supported in the design phase by crowdsourcing of ideas; participatory budgeting or for example Civic crowd funding. Joint decision making are often accompanied by new governance standards such as representation of citizens on local boards or on national boards. A category in its own right were further the often EC-financed city collaborations that develop common templates, services or support tools as well as cross-border smart city services.
- **Collective action; social innovation** – Whilst this is a newer category it is gaining momentum in the reform of social policy, the welfare state and specific areas such as climate change. Within the sample of best practises for smart cities we can find community-based solutions as well as support & investment in independent community solutions. Shared action plan and manifestoes as well as impact investing with a view to radical change are also part of this category requiring visionary leadership.

Integrated smart city solutions come in different sizes, develop different services and have different roles for citizens, business and communities. In the following chapter, examples from the sample of best practices are investigated along with examples from literature to illustrate the emerging role of citizens, business and communities.

Is there clear evidence of outcomes achieved with high citizen engagement?

The idea that citizen engagement is critical to the development and implementation of smart cities is regarded by many as a self-evident truth. **Citizen engagement leads to increased levels of trust in institutions: this holds true even when controlling for other factors**⁶. Indeed, in some cases, one of the strongest effects of participatory processes is precisely that of increased trust in institutions⁷. There is further evidence that participatory approaches lead to increased tax revenue for cities / reduction of tax delinquency⁸, increased efficiency/better allocation of resources for instance through

benchmarks. See for instance this discussion of key principles <https://www.linkedin.com/pulse/smart-city-blueprint-confluence-dynamic-master-plan-chakrabarti>

⁶ See for instance Keele, L. (2007) "Social Capital and the Dynamics of Trust in Government", American Journal of Political Science, Vol.51, No.2 : 241-257.

⁷ A point made for instance in Altschuller, D., Corrales, J. (2009) "The Spillover Effects of Participation in Development Projects: Evidence from Honduras and Guatemala." Working paper, CCEUP.

⁸ As shown in a cross-national analysis by Torgler & Schneider (2009), citizens are more willing to pay taxes when they perceive that their preferences are properly taken into account by public institutions. Along these lines, the existing evidence suggests the existence of a causal relationship between citizen participation processes and levels of tax compliance. For instance, studies show that Swiss cantons with higher levels of democratic participation present lower tax evasion rates, even when controlling for other factors. This effect is particularly strong when it comes to direct citizen participation in budgetary decisions, i.e. fiscal referendum (Frey & Feld 2002, Frey et al. 2004, Torgler 2005). Source: <https://democracyspot.net/2012/11/24/the-benefits-of-citizen-engagement-a-brief-review-of-the-evidence/>

participatory budgeting processes⁹ and better decision making through inclusive planning processes¹⁰.

However, many researchers have also noted the paucity of evidence related to these concepts and the heavy reliance on case studies rather than systematic research. For example, Linda Nicholson, who conducted a review of a range of new forms of political engagement argued that “the rapid increase in both use and nature of civic participation activity in public policy making does not appear to be grounded in empirical evidence of what works and why”.¹¹ The UN report (2008), *People Matter*, which is otherwise very positive about the role of participation, concedes that “globally, no systematic study is available to demonstrate the associational relationships, positive or otherwise, between participation and developmental or ‘instrumental’ benefits.”¹²

In other words, direct evidence of the benefits of engagement and participation is often patchy, and the value tends to depend on the form and practise of the activity, the context in which it is performed and the supporting structures around it. Moreover, research suggests that engagement and participation activities which are poorly executed can generate harms or negative outcomes – for example, unmet expectations can lead to cynicism and further disengagement.

⁹ See for instance Sintomer, Herberg & Roecke “Participatory Budgeting in Europe: Potentials and Challenges, *International Journal of Urban and Regional Research*; Volume 32 (1), March 2008

¹⁰ See for instance the popular Terrados, Almonacid, Hontoria; “Regional energy planning through SWOT analysis and strategic planning tools.: Impact on renewables development”, *Renewable and Sustainable Energy Reviews* Volume 11, Issue 6, August 2007, Pages 1275–1287

¹¹ Nicholson, L., ‘Civic Participation in Public: Policy-Making: A Literature Review’, *Scottish Executive Social Research*, p. 4, 2005

¹² UN, (2008) ‘People Matter: Civic Engagement in Public Governance’, New York, UN Department of Economic and Social Affairs

2. Evidence from real examples

The citizen, business and community are seen as a key partners for smart cities to co-create the future – yet the interpretation of what that means is very different in different cities, different policy areas, and in the context of different integrated solutions, and as our evidence shows also in the different development phases of integrated solutions.

In the following section we present **citizen participation & engagement approaches in key phases** of the development and integration of integrated solutions:

- Co-developing city solutions – giving the citizens a voice in local matters
- Crowdsourcing the city
- Co-designing tomorrow's cities – the role of the citizen in living labs, test-beds, demonstrators
- Community-driven SCC solutions
- Smart neighbourhoods and districts
- Inclusive innovation
- Outside-in innovation - tapping into collective community action.

These participatory and engagement approaches have been identified through a keyword clustering exercise across the 80 best practise examples. The examples of key approaches that describe the role of the citizen in more detail have been derived from the sample of 80 best practice examples or have been identified through the literature review / desktop research.

This mapping exercise led to the mapping of key methods used within the context of integrated SCCs in three key phases of integrated solutions design – I) the design & development phase, II) implementation & management phase and III) scaling & replication phase (see below table).

Table 1: Examples of methods used to engage citizens, businesses and communities in integrated Smart City solutions

	I Design & Development Phase		II Implementation & Management		III Scaling & Replication	
	Methods	Examples	Methods	Examples	Methods	Examples
I Providing insight, information & resources	<i>Design-thinking & user-led research; crowd sourcing; civic crowd funding; participatory planning</i>	<i>Employee Survey, Integrated bus management system, San Sebastian, Spain; App based reporting of issues, Citizens Connect, Boston, USA</i>	<i>Customer insight & action research; data analytics & solutions level; awareness raising, promotion & education</i>	<i>Real-time 2way communication for traffic management and emergency mgt, Rio, Brazil</i>	<i>Crowd sourcing; city level data analytics; awareness raising, promotion & education</i>	<i>Impact data to help change behaviour gathered around multiple cities, Urban Ecomap, San Francisco, USA/ Amsterdam, Netherlands (abandoned)</i>
II Co-design, co-creation, collaborative problem solving	<i>Design led thinking approaches applied in pilots & demonstrations; Living labs; participatory planning; participatory policy making</i>	<i>Early user inclusion in master planning, Barangaroo District, Sydney, Australia</i>	<i>Dynamic master planning; Co-creation of services; Civic technologies; open data;</i>	<i>Co-creation of public services, Santander City Brain, Urban Platform, Santander, Spain; Establishment of open data community groups & events, Hongkong</i>	<i>Incubation & acceleration techniques; Public sector research laboratories; city collaborations</i>	<i>Mindlab, Copenhagen, Denmark; European city network projects</i>
III Collaborative governance; open innovation; Joint decision-making;	<i>Crowdsourcing of ideas; participatory budgeting; Civic crowd funding;</i>	<i>Common goalsetting of the fossil free Växjö programme, Växjö, Sweden;</i>	<i>Multi-sided business models; multi-stakeholder partnership models (PPPPs); representation of citizens on local boards.</i>	<i>Co-ownership & governance of renewable energy plant; Vienna, Austria</i>	<i>Holistic Smart City vision; representation of citizens on national boards; city collaboration; cross-border Smart City services</i>	<i>Stakeholder Advisory Committee (SAC), Waterfront, Toronto, Canada; Permanent consultation in Lyon Smart Community, Lyon, France</i>
IV Collective action; social innovation	<i>Idea camps; Community-based solutions</i>	<i>Open Glasgow (Hackathons, mobile engagement hubs, community mapping), Future City, Glasgow, Scotland</i>	<i>Nudging methods</i>	<i>Peer benchmarking and proactive advice on how to be more energy efficient, Issy Grid, Issy-les-Moulineaux, France; Fare saver to encourage walking, Octopus Card, Hongkong</i>	<i>Impact investing; shared Smart City manifesto; support & investment in independent community solutions</i>	<i>Contests aimed at specific communities such as minorities & women owned businesses, Fiber Optics Smart Grid, Chattanooga, Tennessee, USA</i>

Source: Our compilation

From this overview key methods and approaches were further investigated:

2.1. Co-developing city solutions – giving the citizens a voice in local matters

Technological innovations allow for new and diverse forms of participation and therefore the co-developing of city solutions. Particularly relevant are applications that permit new ways of collecting data, gathering feedback, democratizing decision-making and creating built-in sustainability of solutions by creating community ownership. Improved information technology means that data can flow more freely than ever before. Instead of information only flowing “down” from decision-makers, data can move “horizontally”: to interested neighbourhood organisation, entrepreneurs, and citizens. This can be applied to the process of generating ideas for city improvement, the formal planning or budgeting procedures, or to the involvement of the citizen in local challenges or global policy making such as climate change.

Examples include:

- ***Integrated planning procedures*** – Integrated planning and management¹³ involves spatial, temporal and technical coordination of diverse policy areas and planning resources to achieve defined goals using specified instruments. It is critical to have the early and comprehensive involvement of multiple governmental and non-governmental players, private sector, and citizens. It involves managing long-term planning perspectives alongside short-term actions, dealing with new levels of integration, and addressing a diverse set of domains to achieve political and professional ambitions, addressing both existing and newly built urban territory. An example from the best practice cases of citizens being involved as active participants in the planning process is the Barangaroo District Renewal Project, Sydney, where the final design is a result of early user inclusion and community consultations to shape the master planning of the area, carried out mainly through stakeholder forums (meetings), an online forum, and a qualitative and quantitative interview consultation of over 2,000 people. Another example is Future Cities, a game-based methodology promoted by the British Council to engage citizens in key planning issues across cities worldwide. The Future City Game has been played all across Europe.
- ***Participatory budgeting*** is a process for directly involving citizens in making decisions about how public money should be spent. Usually, this means involving citizens in identifying spending priorities, making and then voting on proposals about how to spend the budget, and then involving citizens in overseeing and evaluating how the money was spent. The process can be organised geographically (e.g. by neighbourhood, local authority or municipality) or thematically (e.g. via school, health, housing or social care budgets). In Tower Hamlets, UK, a Participatory Budgeting project known as “You Decide!” was carried out across the whole Borough. In 2009, 815 local residents representing most communities took part in the process. As a result of the initial project, new plans are currently

¹³ This is a priority area identified by the EIP - <https://eu-smartcities.eu/priority-areas/integrated-planning-management>

underway to give citizens a far greater role in identifying spending priorities, co-producing plans and proposals and deciding how money should be spent.

- ***Idea banks and online deliberation & decision making*** – Online idea banks are emerging as a tool for cities to engage and activate citizens and communities to help with designing solutions to local issues. Online deliberation is very interdisciplinary, and includes practices such as online consultation, e-participation, online deliberative polling, online facilitation, online research communities, interactive e-learning, civic dialogue in Internet forums and online chat, and group decision making that utilizes collaborative software and other forms of computer-mediated communication. Idea banks have been established in a number of cities throughout the USA in recent years. For instance, the city of New York runs the platform ChangebyUs which invites New Yorkers to submit ideas on how their city could be improved. Similarly, the Cityflag app, which is currently being launched in Mexico City, Austin and San Antonio, offers an app-based platform for engaging citizens. Both of these approaches allow citizens to report issues, respond to challenges organised by theme as well as post ideas about how to resolve challenges. Online town hall meetings have been set up to facilitate engagement on priority areas such as climate change. An example is the 21st Century Town Meeting, a US based trademarked approach which brings together a public forum that links technology with small-group, face-to-face dialogue to allow hundreds or even thousands of people (typically 500 – 5000 participants) to deliberate simultaneously about complex public policy issues and express a shared message to decision-makers. The method has for instance been used to reach consensus on the development of the World Trade Center in New York and to decide on the re-building plans in New Orleans following the hurricane Katrina.
- ***Co-design set-ups often as intermediary agencies that facilitate co-design between citizens and public authorities*** – Although still in its early phases, terms such as design thinking, service design, co-design, human centered design and strategic design – which signify more collaborative approaches to design practice – are gaining prevalence in a growing number of countries, and at all levels of the public sector. In Denmark for instance, MindLab¹⁴ facilitates co-design across all levels of government.

Co-development of solutions at local level is not a new phenomenon - both participatory planning and budgeting for instance have their roots in the pre-digital era in the last century and can be described as a global phenomenon, with very different approaches being used in the individual cases. The UN Habitat¹⁵ for example developed a toolkit for local governments. The toolkit contains planning tools to increase collaboration and participation within local governments, NGOs, CBOs, leaders, staff, and citizen constituents. Participatory budgeting started in Porto Alegre in Brazil about 25 years ago. By now about 50,000 residents have been involved and 20% of the city's budget has been allocated in a participatory way. Evaluations show that there have been a number of shifts in how the city budget is allocated – for instance there is much greater investment in poorer neighbourhoods, especially in terms of education, transport, sanitation and water.

¹⁴ <http://mind-lab.dk/en/discovering-co-production-by-design/>

¹⁵ Fisher, Fred (2001). Building Bridges through Participatory Planning. UN-HABITAT. ISBN 92-1-131623-5.

However, the adaptations of this method in Europe so far show that neither participatory planning nor budgeting are used in such a fundamental way. Research indicates that they are more used as a means of public consultation rather than co-development.

Co-development applies mainly to the design and development phase of integrated solutions. ***The significance of co-developing the solutions lies both in building in preferences and local specificities, as well as achieving "buy-in" if not "co-ownership" by the key target constituents. Despite the potential of co-designing approaches, only very few best practice examples show an explicit usage of co-developing approaches both at the level of desk researched best practices and at the level of in-depth case study research.***

This could indicate that the methodological challenges associated with co-development still lead to hesitation to explore these methods further. These are mainly three-fold:

1. ***Representativeness of the participants*** – It is difficult to ensure that all sections of the community are able to participate.
2. ***Lack of real decision making power of process*** – Evidence can be found that such processes often are not linked with real decision making. This is either reflected by lack of funds or type of decisions actually allocated to these processes. This can lead to unwillingness of citizens to participate.
3. ***Lack of consistency of co-development approaches*** - Research indicates that participatory policy making in the context of building sustainable communities needs to be consistent otherwise one risks participation fatigue and frustration among communities.

2.2. Crowdsourcing the city

Crowdsourcing is an umbrella term for a broad range of relatively disperse activities. ***Crowdsourcing takes place when the public (as opposed to experts for instance) provide information or means. The key features of this model are that it is online, open and distributed. For integrated smart city solutions we are interested in how the collective intelligence of the crowd can be harnessed and brought together to achieve, for instance, behavioural change or to tackle pressing social challenges as a community. Also, ways how to activate resources and means, are of interest in this context (for instance through crowd funding, or contributions to the sharing economy).***

Examples include:

- Recent years have seen a proliferation of online platforms in the context of cities that provide a simple, low-cost way for large groups of citizens to contribute data on their experiences. This allows ***citizen led issue reporting or the contribution of citizen data***. In the civic sphere, FixMyStreet¹⁶ for example invites users to report potholes, broken street lights and other issues they observe in their neighbourhood. The app Citizens Connect, Boston, gives citizens the possibility to report problems and issues via their smart phones. The City's work order management system redirects the message to the person in the city who is supposed to deal with the problem. When the problem is fixed, information about the completed work is provided on the app. The German platform Wheelmap¹⁷ asks

¹⁶ <https://www.fixmystreet.com/>

¹⁷ <http://wheelmap.org/en/map#/?zoom=14>

citizens to contribute data on the wheelchair accessibility of public locations such as cafes and restaurants in their city. There are also many examples of platforms that enable citizens to upload crime information, such as the independent community initiative StreetViolence.org¹⁸ which invites victims of crime to map incidents, alert the community and post appeals for witnesses.

- **Crowdsourcing data initiatives** are particularly useful for understanding the relationship between space and social issues. For example, a project from the London School of Economics uses a mobile app to get citizens to report regularly on their mental well-being in different locations, helping to build up a body of understanding of how wellbeing is affected by the local environment – air pollution, noise, green spaces etc. Another initiative, from US company Asthmapolis/Propeller¹⁹, uses a sensor added to participant inhalers to track when and where they are used in order to build up an accurate picture of where there are particular issues with air quality in a city.
- A new trend is further **crowdfunding** both for smart city initiatives directly but also as available capital to start-ups and SMEs or in the form of peer-to-peer lending mechanisms to enable start-ups / SMEs. In 2014 Amsterdam financed 386 projects through crowdfunding, all together with a sum of 8.3 million euros. This represents a doubling in comparison to the year 2013, according to an investigation of crowdfunding consultancy Douw&Koren.

Crowdsourcing can be a powerful and effective means of gathering information which would be difficult or impossible to gather using traditional methods and approaches. This is critical for instance in the context of resilient smart cities, disaster relief and for instance organization of cities in times of crisis. A majority of the integrated SCC solutions already include an element of crowdsourcing. This is particularly prevalent in the platform solutions, the smart mobility solutions, as well as the solutions that started within the built environment (smart homes, smart districts) and in place-making²⁰ solutions.

The approach of crowdsourcing, however, remains explorative at the moment, as one of the challenges with crowdsourcing is to ensure that the information collected is reliable and accurate, and that data privacy and security are respected (cf. section 3.5).

2.3. Co-designing tomorrow's cities – the role of the citizen in living labs, test-beds, demonstrators

City centres and neighbourhoods increasingly exhibit a number of district level innovation spaces such as largescale demonstrators, living labs or smart streets, which are ideal platforms to explore the needs of users as residents and citizens. In theory these district level innovation spaces operate as intermediaries among cities, regions, firms, third sector and research organisations as well as citizens for joint value co-creation, rapid prototyping or validation to scale up and speed up innovation and businesses. Urban areas, particularly those that are newly built, offer opportunities to implement novel infrastructure, conduct longitudinal research studies, and

¹⁸ <http://www.streetviolence.org/>

¹⁹ <https://www.propellerhealth.com/2013/09/10/asthmapolis-relaunches-as-propeller-health-to-advance-broader-respiratory-mission/>

²⁰ Placemaking is defined as a multi-faceted approach to the planning, design and management of public spaces. Placemaking capitalizes on a local community's assets, inspiration, and potential, with the intention of creating public spaces that promote people's health, happiness, and wellbeing. For a description of placemaking please see http://www.pps.org/reference/what_is_placemaking/

co-create innovation with an engaged and readily identifiable set of users. In addition, urban areas with active living lab projects are often attractive to residents, because innovation activities create added value for them. Even though living labs have different focuses and their innovation activities represent diverse goals, urban living labs fit Westerlund and Leminen's (2011) definition of the living lab as a virtual reality or a physical region in which different stakeholders form public-private-people partnerships of public agencies, firms, universities, and users collaborate to create, prototype, validate, and test new technologies, services, products, and systems in real-life contexts.

At least three types of urban living labs can be distinguished, which display the following roles for citizens for participatory & engagement approaches:

1. Urban areas can serve as **technology-assisted research environments**, in which users give feedback on products and services through webpages or sensor-based methods. In this context, the goal of a living lab is to improve an urban environment or local services, such as housing or public transformation. An example is the Climate Street in Amsterdam, which was a test bed for entrepreneurs to install their respective smart solutions in a city environment, where the local community could interact by using the solutions and providing feedback.
2. Users can **co-create urban artifacts and local services**, such as communal yards, garden allotments, or daycare services.
3. A living lab can develop new kinds of **urban planning using new tools and processes with the engagement of citizens**. In this case, the goal is to facilitate the vision-making of the area and planning procedures, and increase the access and mutual learning of stakeholders.

In these R&D set-ups users act as informants and testers as well as contributors and co-creators. Often coupled with an open innovation paradigm, smart cities are trying to encourage real time testing grounds and co-developmental spaces to develop sustainable solutions that deliver real value to the citizens, businesses and communities inflicted.

However, the evidence of the best practise case studies shows that the multiple roles residents could play in regional and urban living labs is not utilized. In fact emphasis is often on the innovative technological aspects but not on innovating the engagement process with citizens. Citizens are often seen as "numbers" to recruit and as citizens to inform, but not necessarily as partners to co-design integrated solutions.

Evidence across the best practice examples collected for this study shows that there is no co-ordination between experimentation projects, nor that there is any systematic reporting on added value reached through citizen engagement across experimentation projects and the subsequent development of principles, rules, standards and guidelines other cities may benefit from. In contrast with a testbed, a Living Lab constitutes a "4P" (Public, Private and People Partnership) ecosystem that provides opportunities to users/citizens to co-create innovative scenarios based on technology platforms, and hence could in future become linked to more sustainable forms of experimentation. The challenge in this layer is to create a collaborative approach to innovation ecosystems based on sustainable partnerships among the main stakeholders from business, research, policy and citizen groups and achieve an alignment of local, regional and European policy levels and resources.

Yet evidence does show that emphasis seems to be slowly shifting from the perspective of the next generation ICT innovation to the need to develop sustainable business models and services. This requires open access conditions as well as the inclusion of bottom-up innovation and more consistent approaches to participation and engagement of citizens in experimentation set-ups of integrated SCCs. A recent guidebook²¹ for mayors investigates examples of potential key elements.

2.4. Community-driven integrated SCC solutions

Community-driven innovation in cities can have many facets. It can be innovation owned and driven by a community, aimed at a community and more recently has enabled new business models based on community platform applications supported by mobile technologies such as sharing economy services and solutions.

Examples include:

- ***Co-operative governance structures*** are jointly owned and democratically controlled organisations that are established to meet common economic, social and cultural needs. Across Europe there are now 160,000 co-operatives, employing nearly 5.4 million people²². These organisations work in many different sectors including agriculture, retail, housing, health, education, travel, banking and energy infrastructure.
- ***Grassroots community projects*** – Particularly in the context of climate change there are plenty examples of grassroots community projects transforming smart cities. One example is the transition town movement²³ in the context of the low carbon community initiatives which for instance promote community-driven organic food markets, cyclist unions, city acupuncture, urban gardens and social entrepreneurship.
- ***Community-based business models as part of the Sharing Economy***²⁴ - The sharing economy is also commonly referred to as collaborative consumption, the collaborative economy, or the peer-to-peer economy. This term refers to business models that enable providers and consumers to share resources and services, from housing to vehicles and more. These business models typically take the form of an online and/or application-based platform for business transactions. There are vast differences in the types of sharing economy platforms. Cities play a central role in deciding which sharing economy practices are adopted and which are rejected. A

²¹ Eskelinen et al (eds) Citizen-Driven Innovation - A guidebook for city mayors and public administrators (2015), World Bank and the European Network of Living Labs http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2016/03/18/090224b082ec8143/1_0/Rendered/PDF/Citizen0driven0ublic0administrators.pdf

²² Co-ops UK, the UK CO-operative Economy: Britains return to co-operation, Co-ops UK, Manchester, 2012

²³ A Transition town, or more generally a transition initiative, is a grassroots community project that seeks to build resilience in response to peak oil, climate destruction, and economic instability by creating local groups that uphold the values of the transition network. Local projects must be based on the model's initial '12 ingredients' which include setting up a steering group; awareness raising; creating working groups; developing visible practical manifestations of the project; being inclusive and re-skilling. The Transition Network was founded in the UK in 2006, and by September 2013, there were 1130 initiatives registered in 43 countries. The main aim of the movement is to raise awareness of sustainable living and to build local ecological resilience in the near future. See <http://transitionus.org/transition-town-movement>

²⁴ See for instance the report CITIES, THE SHARING ECONOMY and WHAT'S NEXT by the National League of Cities – Center for City solutions and Applied Research (2015) <http://www.nlc.org/Documents/Find%20City%20Solutions/City-Solutions-and-Applied-Research/Report%20-%20%20Cities%20the%20Sharing%20Economy%20and%20Whats%20Next%20final.pdf>

feature of many of the best practices reviewed for this study is the emergence of sharing economy business models as an integral part of the integrated SCC solution. For instance, Lyon Smart Community launched a car sharing service. Most major cities also have ride sharing and bike sharing services either as private services or semi-public services.

Issues with community-driven integrated SCC solutions

Whilst community involvement is one of the key success factors of sustainable business models underlying integrated SCC solutions, community driven innovation is not without issues. The relationship between co-operative governance and capacity for innovation is not straightforward. While on the one hand, a citizen or worker co-operative may be a sign of greater autonomy, citizen involvement and professional freedom, this may not be the most conducive model to ensure ongoing innovation at infrastructure or business model level.

Furthermore, the ***sharing economy*** is a topic of much discussion amongst city leaders as cities weigh the pros and cons of the disruption of traditional services with the benefits of potentially improved and expanded shared services. From an economic perspective issues can include revenue capture, job creation or the impact of tourism. From a governance perspective regulatory issues such as safety, licensing, access and equity potentially need to be updated to enable shared community services. The unanticipated surge in sharing economy business models and the proliferation of companies that serve as catalysts for collaborative consumption has created a disruption of existing systems. Traditional industries are being upended with the growth of innovative sharing economy models that do not fit neatly into existing local regulatory environments. The Uber transportation services app and its impact on (and resulting conflicts with) traditional taxi services is a prime example; AirBnB vs. the hotel industry is another. Implications of such new emerging business models can have significant impact on resource efficiency, smart goals such as CO2 reduction and potentially increase the cohesiveness of society through digital means. Many US American cities have used the rise of the sharing economy as an ignition to revise their community involvement procedures in setting legislation, the report "Cities, the sharing economy and what's next?" by the National League of Cities (2015) finds.

The European Commission is committed to developing a European agenda for the sharing or collaborative economy by 2016. The European Committee of the Regions on 4 December 2015 became the first EU body to adopt a formal position²⁵ on the subject.

2.5. Smart neighbourhoods and districts

A common feature in smart cities is the brown-field development – a re-development of an often former industrial estate for mixed use. These are often regeneration projects – for instance harbour redevelopments that come with the vision and design of smart districts and thus become an important feature (and driver) of the smart city they are part of. ***It is at smart neighbourhood or district level that we see most integrated SCC solutions being implemented.***

An example is the Blue Gate, an eco-effective business park (a brownfield redevelopment) in Antwerp, Belgium, which targets and admits only companies that work

²⁵ <http://cor.europa.eu/en/activities/opinions/pages/opinion-factsheet.aspx?OpinionNumber=CDR%202698/2015>

with eco-innovation to create an active community and new synergies between companies.

Intelligent energy solutions are also often found at neighbourhood or district level. Districts co-operate across Europe at a sub-city level to exchange insights and best practises for developing and demonstrating replicable strategies for designing, constructing and managing large scale district renovation projects, for example for achieving nearly zero energy cities. The results will open the way for new refurbishments that bring the EU closer to its 2020 goal of ensuring that all new buildings consume very little energy. One example of a relevant scaling and replication mechanism is the R2CITIES project, a collaboration project of sixteen research institutes, which hopes to develop cost-effective, high performance retrofitting solutions to improve the quality of city renovation and increase the energy efficiency of buildings.

2.6. Ensuring inclusive innovation

In simple terms, ***inclusive innovation is the means by which new goods and services are developed for and/or by those who have been excluded from the development mainstream; particularly the billions living on lowest incomes. New technologies for the base of the pyramid – mobile phones, mobile services, telecentres, better seed varieties, vaccines, etc – can all be included.*** In the context of integrated smart city and community solutions this means the city's role and ambition to make the future city inclusive for all, including the elderly, the marginalized and especially the poor and unemployed.

Best practice examples were found to focus particularly on the following dimensions of inclusive innovation:

- ***Aimed at affordable & inclusive housing*** – Social housing has become a target area for smart city innovation to enable efficiency savings both for the city and for the tenants but also to investigate further potential of integrative solution designs. In this case emphasis is on the provision of public services.
- ***Supportive of social innovation & community innovation*** – Sustainable integrated SCC solutions need to include social innovation and community innovation mechanisms to insure inclusiveness particularly if solutions operate at district or neighbourhood level.
- ***Empowering the individual*** – Marginalized groups often have special needs such as accessibility, simplicity of interface design with ICTs, or generally access issues to ICT infrastructure. Inclusive innovation needs to take these into consideration.

Examples from the best practice cases with elements of social innovation include 3e-Houses that trialled ICT-enabled energy efficiency measures in the context of social housing in Bristol, UK, providing real-time monitoring and management of the energy consumption, integration of renewable energies, and creating awareness for lower energy consumption. Likewise, one of the four tasks of the Lyon Smart Community project focuses on energy consumption monitoring on a micro level through the instalment of energy monitoring systems in social housing, as well as actions aimed at raising awareness and promoting behavioural change of the inhabitants.

Evidence however presents a mixed picture in terms of achieving inclusive outcomes, and/or promoting behavioural change in energy use. This may have multiple reasons: the

solution design was not user-focussed enough, the services do not provide direct benefits to the user groups or there is no buy-in from the user groups. Adding inclusive design to the potential of cities leading by design and reforming their own building stock (schools, hospitals, prisons, administrative buildings, etc) requires more work to support such city efforts. This includes the necessity for parallel policy considerations to reach marginalised target groups; evidence for instance points to the importance of personalised budgets to empower individuals and communities.

2.7. Outside-in innovation - tapping into collective community action

"Outside-in" innovation is innovation brought into the city by actors other than the city administration (and budgets) themselves. This could be community-led innovation, or private sector-led innovation. Particularly the opening up of data banks and public sector data in recent years has enabled many more people and actors to access data, combine it with other sources and present it in interesting ways that can reveal new perspectives. The US pioneered the **open data movement** with its data.gov website launched in May 2009, closely followed by the UK in early 2010. Many countries have followed since. There are also examples of city data portals such as Parisdata²⁶, the open data policy of Barcelona or international examples such as NYC open data²⁷ or the Hongkong open data initiative²⁸.

This shift is not limited to the public sector, but also includes a growing number of third sector institutions and private initiatives. For instance:

- The donor community is starting to publish data in common formats such as the International Aid Transparency Initiative (IATI) standard²⁹. Data like this could be of interest to the aim to build resilient cities.
- Internet-based tools and platforms are enabling new open formats of providing information for instance in the area of climate change. An example is the UrbanEcoMap, an Internet-based tool that enables cities around the world to provide smarter climate change information for their citizens. Urban EcoMap provides information on carbon emissions from transportation, energy and waste among neighbourhoods, organized by ZIP codes.

Also, cities are experimenting with open platforms to enable citizens to provide their own data and solutions.

Finally, cities are trying to link to communities of interest and activate innovation and support for integrated smart city solutions, and to encourage more bottom-up innovation.

²⁶ <http://opendata.paris.fr/page/home/>

²⁷ <https://nycopendata.socrata.com/>

²⁸ <https://opendatahk.com/>

²⁹ <http://www.aidtransparency.net/>

3. Existing guidelines in supporting sustainable, people-centred, integrated solutions

This chapter maps, describes and assesses already existing guidelines to support smart integrated solutions by looking at five key areas of **guidelines** that either city officials or key stakeholders issue:

- Smarter planning centred around the engaged citizen, businesses and communities
- Guidelines for participatory design processes and co-creation
- How to run a people-centred smart city pilot
- Nudging it! Supporting behavioural change
- The next frontier is respectful data management

The examples of guidelines provided in this chapter are based on desk research and correspond to key challenges that stakeholders face in designing and implementing integrated SCC solutions.

3.1. Smarter planning centred around the engaged citizen, businesses and communities

According to findings from the literature review, ***smarter planning includes three key aspects in the current urban development debate – integrated planning for long term outcomes and the engagement of citizens, businesses and communities in the planning process, as well as new digital opportunities to collect data of relevance to the next generation of planning processes:***

1. An ***integrated plan for sustainable urban development*** comprises a system of interlinked actions which seeks to bring about a lasting improvement in the economic, physical, social and environmental conditions of a city or an area within the city. The key to the process is “integration”, meaning that all policies, projects and proposals are considered in relation to one another. In this regard, the synergies between the elements of the plan should be such that the impact of the plan as a whole adds up to more than would the sum of the individual parts if implemented in isolation. An example of a manual for integrated urban planning in Berlin is mentioned in the box below.
2. ***Citizen participation and open government*** - Good governance of smart city solutions requires integration of the knowledge, experiences, views and values of the public. Research shows that unless citizens understand and are engaged in the decision themselves, trust is easily lost (OECD, 2009). Experience of cities shows that citizen engagement needs to be well designed and properly resourced.
3. ***Crowdsourcing in the planning context*** - Technological advances in sensor technology, smartphones and networks as well as the evolution of web 2.0 and social media enable new digital opportunities for urban planning. These possibilities are not limited to geoinformatics and spatial planning; the potential applications for urban planners are manifold and lie especially in urban design processes, but also in safety issues in traffic planning for example. A vision, from a planning perspective, is that the results of these measurements will be part of public decision processes in the future. Examples of crowdsourcing pilots in “real time cities” include projects like Real-Time Rome, LIVE-Singapore! and the Copenhagen Wheel that use

ubiquitous sensor technology (eg. in smartphones or over collected mobile network data sets) for a better understanding of human interaction and mobility in cities. The repertoire of methods for urban planning is significantly enriched by the use of such "sensor" technology; traditional deductive planning approaches are enriched by inductive ones, which are an expression of crowdsourcing processes in bottom-up planning mode.

Eurocity's manual on integrated planning

To help cities the city of Berlin has published a Manual on Integrated Urban Governance. The manual gives guidance to decision makers and practitioners on how to move forward in the direction of policy integration and Integrated Urban Governance. Most of the suggested steps, tools and instruments were derived from day-to-day practice in cities all over the world. This practice shows that integrated policy making has four core elements or fields of action:

- public participation
- political and organisational arrangements beyond city boundaries
- political and organisational arrangements within city boundaries
- capacity building

At the heart of the manual is public participation. Procedures are described to show how the variety of stakeholders, who need to be included, can be identified, and motivated to collaborate in a project. A variety of public participation methods and opportunities to apply them are described. A distinction is made between three project – or participation - phases: informing the public; participating in developing the project; and participating in implementing the project. As a final point, conditions are described which must be met in order to have successful public participation.

Administrative and fiscal tools and instruments are described, incl. benchmarking and monitoring. Capacity building and awareness raising instruments and methods are introduced. In doing so, a distinction is made between methods that may be applied in the public sector and those that are appropriate for capacity building and awareness raising in the community. The manual also includes concrete guidance on how to decide on methods.

Dealing with sensitive data is a huge challenge for digital urban planning. The user is permanently in a kind of conflict between participative motivation and concern for privacy. The postulated freedom in the network is equally exposed by commercial companies who use the data for their own purposes. Also, wide-scale and representative participation is needed to be able to integrate digital urban planning successfully into the urban planning process. Here a significant barrier is the lack of understanding of the value of participation. Campaigns, public debates and blogs can contribute to social acceptance, as well as accountable consent forms. However evidence points towards caution of overreliance on crowdsourcing techniques: When there is a well-defined problem in need of solving, and the expertise of planners and institutions could benefit from engaging a creative and motivated crowd, then crowdsourcing makes sense. When, however, the purposes and aims for planning remain vague, crowd-sourcing may be more manipulative than constructive³⁰.

³⁰ <http://thegovlab.org/the-potential-and-challenge-of-citizen-engagement-open-innovation-and-crowdsourcing-for-urban-planning-purposes/>

3.2. Guidelines for participatory design processes and co-creation

Participatory design originated in the Nordic countries during the 1970s as a movement with a strong political background. The idea was to involve the users of the service in the design process. New systems were brought into cities (and into industrial design processes) with the help of the users' expertise, fostering commitment to the systems. There are many (possibly conflicting) stakeholders, goals, perspectives and interests involved in service development; the aim of co-design is to create a route that allows all to make constructive contributions, and it does not start with the assumption that any stakeholder is more important than any other. Co-design is more than just simple user testing: stakeholders need to have an active role in the design and implementation processes. Co-design can be seen in the wider context of the co-production of services, where citizens continue to have active roles in delivering a service once the design stage is complete.

Experience in participatory platform design suggests that **to guide the design process certain principles are needed**. City officials should implement them whenever they devise a new policy, rule or project. The successful application of some of these design rules to governance can, for example, be seen in participatory budgeting, collaborative urban planning and distributed energy production initiatives. The Waag Society in the Netherlands has collected key rules for city officials (shown in the textbox below).

Guidelines for city officials by Waag Society¹

The key rules are (in abbreviated form):

- Your citizens know more than you. Don't coerce or just pretend to listen, but engage in a dialogue about what should be done, and how.
- Don't separate the design and development process: they are one. Prototype early and fast, engage the stakeholders, iterate quickly and be prepared to start all over.
- Embrace self-organisation and civic initiative, but help to make the results sustainable and scalable.
- Know what you are talking about in the face of technology. If you procure a platform, product or service, have people that built them in the procurement team.
- Have binding decisions made at the lowest level possible and actively preach self-governance.
- Favour loosely coupled, smaller systems over monoliths and mastodons, and use peer-defined standards to glue together the parts.
- To raise and deserve trust, build systems based on data reciprocity and transparency. Be open of what it captures and who has access, and let the people be in control of their data.
- Reuse existing parts and design your additions for reuse, adding to the public domain and thereby strengthening its capacity to act and learn. Use open content, open source and open data.

¹ <http://waag.org/en/blog/design-rules-smarter-cities>

Involving citizens in the design process creates significant challenges in collecting ideas and moving them into action. In solving this dilemma, Smart Cities partners have found segmentation and customer insight useful in helping to efficiently prioritise and target groups, for instance in deciding where to start with the co-design process.

Effective co-design covers many different approaches and ways of working, and not all municipalities are ready to embark on citizen-led co-design processes. One of the issues underlying the different levels of adoption of co-design may be organisational capability – an organisation’s ability to define the process, to carry out the process and how the process is actually performed and the management of the process improvement. Different municipalities and cities have different capabilities and needs.

3.3. How to run a people-centred smart city pilot

Recent paradigms, such as *open innovation and open business models*³¹, as well as *Living Labs*³² **promote a more proactive and co-creative role of users in the research and innovation process of integrated smart city solutions.** These paradigms can be seen as drivers behind the current generation of experimentation in smart cities – particularly those aimed at the future of the Internet.

The Living Labs concept represents a powerful view of how user-driven open innovation ecosystems could be organised. As a concept applied to smart cities it embodies open business models of collaboration between citizens, enterprises and local governments, and the willingness of all parties -including citizens and SMEs- to engage actively in innovation. The Living Lab concept should be considered also as a methodology, a model for organising specific innovation programmes and innovation projects and conducting innovation experiments. Based on an analysis of challenges of smart cities on the one hand and current projects in the domain of Future Internet research and Living Labs on the other, common resources for research and innovation can be identified, such as testbeds, Living Lab facilities, user communities, technologies and know-how, data, and innovation methods. Such common resources potentially can be shared in open innovation environments. The challenge in this layer is to create a collaborative approach to innovation ecosystems based on sustainable partnerships among the main stakeholders from business, research, policy and citizen groups and achieve an alignment of local, regional and European policy levels and resources.

At the same time, cities need to tap more structurally into bottom-up trends and activities shaping the smart cities of tomorrow. Nesta, the UK based innovation fund recently published a “how to report”³³ on how to solve urban challenges from the ground up: by instrumentalizing crowdsourcing, collective intelligence, crowdfunding and collaborative consumption. The report identifies **five golden rules for policy makers to run better Smart City pilots:**

1. Set up a civic innovation lab to drive innovation in collaborative technology
2. Use open data and open platforms to mobilize collective knowledge
3. Take human behaviour as seriously as technology
4. Invest in people not just in technology
5. Spread the potential of collaborative technologies to all parts of society

³¹ See for instance Chesbrough, H.W.: *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Harvard Business School Press, Boston (2003)

³² European Commission, DG INFSO: *Advancing and Applying Living Lab Methodologies* (2010)

³³ Saunders & Beck (2015) *Rethinking Cities from the Ground Up*, Nesta
https://www.nesta.org.uk/sites/default/files/rethinking_smart_cities_from_the_ground_up_2015.pdf

Research into city pilots finds that city policy-makers, citizens and enterprises are primarily interested in concrete and short-term solutions, benefiting business creation, stimulation of SMEs and social participation. While many cities have initiated ICT innovation programmes to stimulate business and societal applications, scaling-up of pilot projects to large-scale, real-life deployment is nowadays crucial. Therefore, ***the concept of open and user-driven innovation ecosystems, which are close to the interests and needs of cities and their stakeholders may bridge the gap between short-term city development priorities and longer term technological research and experimentation.***

3.4. Nudging it! Supporting behavioural change

Nudge theory (or Nudge) is a concept in behavioural science, political theory and economics which argues that positive reinforcement and indirect suggestions to try to achieve non-forced compliance can influence the motives, incentives and decision making of groups and individuals, at least as effectively – if not more effectively – than direct instruction, legislation, or enforcement.

In the policy context nudging has been applied and formalized both at national level and at city level. For instance, the UK created a British Behavioural Insights Team, often called the 'Nudge Unit'³⁴, which investigated the relevance of nudging in application areas in health & well-being policy, public safety and climate change. This method has not been without criticism³⁵, however, the unit has produced evidence of success.

At city level, ***nudging may be one of many tools to consider to support behavioural change required to achieve ambitious global targets in emissions reduction and energy (and other resource) savings.*** Here, nudging may include creating better conditions for citizens to use bikes or public transport as a means of transport, or it may include smart applications that will remind citizens to optimize their energy consumption patterns. This could also include the stimulation of eco-innovation for example.

Most of the case studies of integrated SCC solutions investigated as part of this study include information, training, and forms of engagement to foster change of behaviour of citizens. Some integrated solutions go further than that: for instance the Blue Gate "green business" park operates with a shared responsibility framework and clear pre-defined contribution targets. It has published a charter that local business sign up to, committing themselves to actively contribute to eco-innovations, integrated solutions in the field of energy efficiency and "innovating towards zero" are also experimenting with options to encourage change of behaviour. Currently such approaches have only been tested in very specific pilot setting however, for instance with the target group of social housing tenants with very mixed results.

Whilst often criticised for being paternalistic, nudging methods do display clear benefits³⁶:

1. ***People's situations are highly diverse.*** By allowing people to go their own way, nudges reduce the costs of one-size-fits-all solutions.

³⁴ See more about the Nudge Unit here - <https://www.gov.uk/government/organisations/behavioural-insights-team/about#responsibilities>

³⁵ See for instance <http://www.independent.co.uk/life-style/health-and-families/health-news/unhealthy-lifestyles-here-to-stay-in-spite-of-costly-campaigns-1055693.html>

³⁶ <http://www.theguardian.com/commentisfree/2014/apr/24/nudge-backlash-free-society-dignity-coercion>

2. **Public officials have limited information.** If official nudges are based on mistakes, the damage is far less severe than in the case of bans, because people remain free to ignore them.
3. **Public officials do not always have the purest of motivations.** They may be affected by the influence of well-organised private groups. If so, it is a major safeguard that people can go their own way.
4. **People may feel frustrated and angry if deprived of the ability to choose.** When a government provides information or offers a warning, it simultaneously tells citizens that in the end they have the right to make their own decisions.
5. **Freedom of choice can be, and often is, seen as an intrinsic good that a government should honour if it is to treat people with dignity.** This is not a point about the subjective experience of frustration and anger. It is a matter of respect.

Particularly integrated SCC solutions that aim to create social, economic and environmental impact may benefit from considering nudging methods, or working closely with the city to partner on approaches to changing people's behaviours in a long-lasting way.

3.5. The next frontier is respectful data management

Most integrated SCC solutions operate with an aspect of data management. The Responsive City³⁷, co-authored by Stephen Goldsmith and Susan Crawford, serves as a guide to governance in data-transforming cities. The book highlights several key themes that will be essential for governments moving forward, including data-driven enterprises, empowered employees, and engaged citizens. **Data management is a new way to operate efficiently across silos in city structures and to develop smarter solutions for the future.** At an operational level this can mean:

- **Interoperability of operating systems** - Digital systems in cities will become increasingly diverse and numerous, with many owners. Cities therefore need an open, vendor-neutral standards platform for communicating spatial and temporal data. Some cities have defined open business standards to ensure flexibility and agility in the future and to avoid vendor lock-in.
- **Data standards to share data** - Data is often labelled using language and terms from the sector that initially collected it. This a barrier to interoperability with other sectors and to the development of integrated solutions in the first place.
- **Open data** – to enable private innovation – both from businesses and individuals, public sector data needs to be accessible and publically available. Open data has been high on the agenda for many cities, including encouraging the usage of open data through app contests and hackathons.

With data becoming an increasingly hot topic there are many examples of developments of approaches to data management that will improve the conditions to create integrated SCC solutions. For example, the British Standards Institution (BSI) has published a guide (PAS182) to standardise data and systems in order to help local government, and particularly policy developers, address the creation of Smart Cities³⁸. The UK standards body defines the PAS182 document as a new guide to data interoperability which will define "an overarching model of concepts and relationships that

³⁷ <http://datasmart.ash.harvard.edu/news/article/the-responsive-city-cases-788>

³⁸ See further information here <http://shop.bsigroup.com/ProductDetail?pid=00000000030290059>

can be used to describe data from any sector” making it easier for the public and private sector to share information to promote economic growth.

The benefits of data standardisation include:

- Reduced cost as the need to recollect and verify data is removed
- Integrated city systems and services driven by data
- Common understanding of the needs of communities
- Shared objectives, collaboratively developed
- Evidenced using data and businesses/communities creating innovation and improved quality of life for citizens.

The BSI guide establishes an interoperability framework for smart cities in which:

- Information can be shared and understood between organisation and people at each level
- The derivation of data in each layer can be linked back to data in the previous layer (i.e. the assumptions upon which a decision was taken)
- The impact of a decision can be observed back in operational data

There are however **concerns that need to be addressed for better data management. Key amongst these are the data privacy, data protection, and data security issues that arise from the creation of smart cities.** Many smart city technologies capture personally identifiable information (PII) and household level data about citizens – their characteristics, their location and movements, and their activities – and link these data together to produce new derived data, and use them to create profiles of people and places and to make decisions about them. As such, there are concerns about what a smart city means for people’s privacy and what privacy harms might arise from the sharing, analysis and misuse of urban big data. In addition, there are questions as to how secure smart city technologies and the data they generate are from hacking and theft and what the implications of a data breach are for citizens. While successful cyberattacks on cities are still relatively rare, it is clear that smart city technologies raise a number of cybersecurity concerns that require attention.

A recent report “Getting smarter about smart cities: Improving data privacy and data security”³⁹ (2016) argues that there is no single solution for ensuring that the benefits of creating smart cities are realised and any negative effects are neutralised. Rather, it advocates a multi-pronged approach that uses a suite of solutions. Some of these solutions are market driven, some more technical in nature (privacy enhancement technologies), others more policy, regulatory and legally focused (revised fair information practice principles, privacy by design, security by design, education and training), and some more governance and management orientated (at three levels: vision and strategy – smart city advisory board and smart city strategy; oversight of delivery and compliance – smart city governance, ethics and security oversight committee; and day-to-day delivery – core privacy/security team, smart city privacy/security assessments, and computer emergency response team).

These solutions provide a balanced, pragmatic approach that enable the rollout of smart city technologies and initiatives, but in a way that is not prejudicial to people’s privacy,

³⁹ See more at:

http://www.taoiseach.gov.ie/eng/News/Government_Press_Releases/Minister_Dara_Murphy_launches_new_report_on_privacy_and_security_implications_of_smart_cities_and_how_best_to_tackle_them.html#sthash.NFVj9bWv.dpuf

actively work to minimise privacy harms, curtail data breaches, and tackle cybersecurity issues. They also work across the entire life-cycle (from procurement to decommissioning) and span the whole system ecology (all its stakeholders and components). Collectively they promote fairness and equity, protect citizens and cities from harms, and enable improved governance and economic development. Moreover, they do so using an approach that is not heavy handed in nature and is relatively inexpensive to implement. They are by no means definitive, but build on and extend work to date, advance the debate, and detail a practical route forward.

4. Conclusions

Citizens, businesses and communities play a central role in the development and sustainable implementation of integrated SCC solutions. There is a rich literature on the benefits of participatory & engagement approaches to city design, but research shows that there is a **lack of consistency** between stakeholder views of the role of citizens, business and communities; **different types of roles** attributed to citizens, businesses and communities in the development and implementation of integrated smart city solutions and, not least, **mixed evidence of outcomes** of citizen engagement.

In this report we investigated examples of methods applied to engaging citizens, local businesses and local communities as part of key stages of the process of designing and implementing integrated SCC solutions. These are:

1. Co-developing city solutions – giving the citizens a voice in local matters
2. Crowdsourcing the city – citizen led issue reporting, data crowdsourcing, crowd-funding
3. Co-designing tomorrow's cities – the role of the citizen in living labs, test-beds, demonstrators
4. Community-driven SCC solutions – citizen owned energy grids, grassroots community projects, sharing economy
5. Smart neighbourhoods and districts - regeneration projects with the vision and design of smart districts
6. Ensuring inclusive innovation
7. Outside-in innovation - tapping into collective community action

We further review emerging guidelines in supporting sustainable, people-centred, integrated solutions, in five areas:

1. Smarter planning centred around the engaged citizen, businesses and communities.
2. Guidelines for participatory design processes and co-creation
3. How to run a people-centred smart city pilot
4. Nudging it! Supporting behavioural change
5. The next frontier is respectful data management.

The emphasis of this project has been on the potential of large scale roll-out of integrated SCC solutions. Provided that citizen engagement is one key success factor of sustainable integrated SCC solutions, consistent approaches to citizen participation could become part of the key differentiators of European solutions. Particularly multi-city roll-out projects present interesting research set-ups to investigate the local context of community and citizen participation, and their contributions to sustainable integrated SCC solutions.

5. Recommendations

A transversal theme across these participatory and engagement approaches is the shift towards co-designing integrated solutions with citizens, local business partners and communities. Effective co-design covers many different approaches and ways of working, and not all municipalities are ready to embark on citizen-led co-design processes. Different municipalities and cities have different capabilities and needs. The significance of co-developing the solutions lies both in building in preferences and local specificities, as well as achieving “buy-in” if not “co-ownership” by the key target constituents. Despite the potential of co-designing approaches, only very few best practice examples use co-developing approaches.

Recommendation 1

Build co-ownership of integrated solutions with citizens, businesses and communities

Insist on a consistent citizen engagement strategy and on making citizens, businesses and communities clear co-owners of integrated solutions in procurement processes. The city should lead by example and strive to provide citizens and businesses with public services that are built around user needs not the city’s organizational structures.

Recommendation relevant for regional, city or district leaders

Research into city pilots finds that city policy-makers, citizens and enterprises are primarily interested in concrete and short-term solutions, benefiting business creation, stimulation of SMEs and social participation. At the same time, scaling-up of pilot projects to large-scale, real-life deployment is crucial. The concept of open and user-driven innovation ecosystems, which are close to the interests and needs of cities and their stakeholders may bridge the gap between short-term city development priorities and longer term technological research and experimentation.

Whilst there are plenty of guidelines, methods and approaches to incorporate integrated planning and open government principles, there is little evidence of the most effective way to achieve the clear benefits attributed to citizen engagement. The link to the support of sustainable solutions remains underexplored and needs to be researched further.

Recommendation 2

Integrate citizens, businesses and communities into the entire project cycle from the development to implementation of integrated SCC solutions

Include citizens, businesses and communities into planning processes of integrated solutions and relevant urban planning procedures at city level. Ensure inclusive innovation in integrated SCC solutions, and work with stakeholders (for example ICT suppliers, SMEs and academic partners) to ensure a shared understanding of citizen engagement in the process of designing, testing and implementing integrated SCC solutions.

Recommendation relevant for all SCC stakeholders

The evidence of the best practise case studies shows that the multiple roles residents could play in regional and urban living labs is not utilized. In fact emphasis is often in the innovative technological aspects but not in innovating the engagement process. Evidence across the best practice examples shows that there is no co-ordination between experimentation projects, nor that there is any systematic reporting on added value reached through citizen engagement across experimentation projects and the subsequent development of principles, rules, standards and guidelines other cities may benefit from. Different city experimentation set-ups could form an innovation ecosystem consisting of citizens, ICT companies, research scientists and policy-makers. The challenge in this layer is to create a collaborative approach to innovation ecosystems based on sustainable partnerships among the main stakeholders from business, research, policy and citizen groups and achieve an alignment of local, regional and European policy levels and resources.

Emphasis seems to be slowly shifting from the perspective of the next generation ICT innovation to the need to develop sustainable business models and services. This increasingly requires open access conditions as well as the inclusion of bottom-up innovation and more and more consistent approaches to participation and engagement of citizens in experimentation set-ups of integrated SCCs. A recent guidebook⁴⁰ for mayors investigates examples of potential key elements.

Recommendation 3

Create an open innovation ecosystem between different experimentation set-ups

Consider synergies between living labs, smart city testbeds and testing facilities investigating the future of the internet, or smart grids (this may have local specificities) and consider how to support collaboration and efficiencies from a citizen perspective between these experimentation set-ups.

The European Commission could consider supporting the setting up of principles and guidelines for "good participation" projects across experimentation and pilots projects and to consider a consistent approach across its tender requirements to encourage better participation & engagement approaches.

Recommendation relevant for the EU Commission, EU Institutions and SCC organisation

The investigation of best practices has shown that there are bottom-up as well as outside-in solutions that are community-driven or driven by ICT-enabled business innovation. A particularly strong feature of business model innovation across the sample has been the emergence of sharing economy solutions as a means to achieve integrated SCC solutions. The sharing economy is a topic of much discussion amongst city leaders as cities weigh the pros and cons of the disruption of traditional services with the benefits of potentially improved and expanded shared services.

⁴⁰ Eskelinen et al (eds) Citizen-Driven Innovation - A guidebook for city mayors and public administrators (2015), World Bank and the European Network of Living Labs http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2016/03/18/090224b082ec8143/1_0/Rendered/PDF/Citizen0driven0ublic0administrators.pdf

The European Commission is committed to developing a European agenda for the sharing or collaborative economy by 2016. Cities and regions should be allowed to promote sharing-economy initiatives addressing the specific needs of local communities in fields such as sustainable mobility and tourism, health and social services and the environment.

Recommendation 4

Investigate the relevance of new ICT enabled business models such as the sharing and the circular resource economy for integrated SCC solutions

The EIB needs to consider leading the investigations of the relevance and the required conditionalities and associated best practice business models for emerging ICT enabled disruptive business models such as the sharing economy or the circular economy. The EIB could consider relevant position papers to address such emerging new business models.

Recommendation relevant for the EU Commission, EU Institutions, cities and SCC organisations

Recommendation 5

Enable and support bottom – up city solutions

To increase the rise of bottom up solutions, cities need to consider actively supporting social innovation processes and procedures. This includes the necessity to open up procurement to be able to buy integrated solutions that emerge outside of public funding, but also includes wider issues of enabling incubation, acceleration, celebration of successes, developing skills and reforming the financing system.

Work with the private sector to support the development of private sector led integrated solutions for instance through CSR financing.

Recommendation relevant for the EU Commission, EU Institutions, cities and SCC organisations

Most integrated SCC solutions operate with an aspect of data management and with data platforms as supporting and enabling features. The approach of crowdsourcing remains explorative though at the moment, as one of the challenges with crowdsourcing is to ensure that the information collected is reliable and accurate. Another is to ensure that the data gathered is secure that data privacy is respected. The management of data is one of the next governance frontiers in SCC solutions.

Recommendation 6

Address data management issues

Consider the formulation of a smart city framework which includes data considerations such as data management and data standards as well as security & privacy considerations.

Empower stakeholders to create new sorts of services and value, by opening up city data via open platforms. Develop open business standards to avoid vendor lock in.

Recommendation relevant for the EU Commission, EU Institutions, cities and SCC organisations

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