(Un)Plugging Smart Cities with urban transformations: towards multi-stakeholder city-regional complex urbanity?

(Des)Conectando las smart cities con transformaciones urbanas: ¿Hacia una urbanidad ciudad-regional compleja con múltiples grupos de interés?

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Abstract. The author argues that the development of the so-called buzzword smart city and its use in planning inner cities are intimately bound up with required current urban transformations. In this attempt to deconstruct or unplug the buzzword, this paper shows a sample of the current EU Smart City universe by focusing on four projects the author is engaged in. The conclusion of the article revolves around the necessity to plug stakeholders in by setting up a new, complex, multi-stakeholder, city-regional urbanity as a way to transit towards real smartness in cities and regions. To plug in, or connect, stakeholders, one should consider: the interdependencies among them; the need of democratic mechanisms to manage data; the need to scale up urban solutions to metropolitan/city-regional levels; the intent to provide comparative evidence-based data; and finally, the tendency to establish not only quantitative but also qualitative rankings and city dashboards that will enable adaptability rather than replicability.

Keywords. Smart cities; urban transformations; multi-stakeholder; penta helix; city-regions; data; replication.

Resumen. El autor sugiere que a la vista de los desarrollos del manido término *smart city* y su uso en el planeamiento de ciudades, es necesario vincularlo con las existentes transformaciones urbanas. Con ánimo de de-construir o *des-conectar* la palabra de moda *smart city,* el autor elabora en este artículo a la luz de cuatro proyectos Smart City de la UE actuales en el que ha estado trabajando. La conclusión del artículo radica en la clara necesidad de conectar a los grupos de interés estableciendo una nueva, compleja, y ciudad-regional urbanidad como una manera de transitar hacia un paradigma de ciudad y región inteligentes. Es por ello que, para conectar grupos de interés, se deberían considerar los siguientes elementos: las interdependencias entre ellos; la necesidad de mecanismos democráticos para gestionar los datos; el requerimiento de escalar soluciones urbanas a las escala metropolitana y ciudad-regional; el énfasis en proveer de datos comparativos basados en evidencias; y finalmente, la tendencia de establecer no únicamente analíticas cuantitativas, sino rankings cualitativos y tableros/cuadros de mando integrales de ciudad que favorezcan la adaptabilidad en vez de la replicabilidad.

Palabras clave. Smart cities; transformaciones urbanas; múltiples grupos de interés; ciudad-regional; datos; replicabilidad.

Introduction

> The trouble with modern theories of behaviourism, is not that they are wrong but that they could become true
> Hannah Arendt

> We may wish for easier, all-purpose analyses, and for simpler, magical, all-purpose cures, but wishing cannot change these problems into simpler matters than organised complexity, no matter how much we try to evade the realities and to handle them as something different
> Jane Jacobs

> Smartness cannot be more technocratic than democratic
> Jurgen Habermas

It is noteworthy that although smart cities are already being built around us, they differ considerably from the simplistic, *one-size-fits-all, smart-city-in-the-box* mainstream approach (Anthony Townsend, 2013) that has been hegemonic so far. This idea mostly hearkens back to basic notions of deconstructing the governance interactions that actively require a holistic

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approach considering urban transformation trends occurring in our cities in a different manner. No two cities are the same, and while many of the challenges facing our cities today and in the future are similar, there is no single solution to these. Cities have long wished for a greater ability to sense and actuate, in order to provide basic services more efficiently, but this is far more easily said than done. The design of such smart systems is not easily undertaken, and must be done so with sustainability and adaptability in mind rather than replicability *wishful thinking*.

Based on a previously published *Journal of Urban Technology* paper entitled 'Unplugging: Deconstructing the Smart City', the authors argue that such reimagining and repositioning need to occur across smart city technologies by avoiding pragmatic approaches that wrongly are assumed to be non-ideological and commonsensical. Hence, this paper is structured in five sections. First, the concept of the smart city as both a *buzzword* and a fetish term will be presented. Second, the author shows how smart city policy agendas should be unpacked and plugged in again in a wider and inclusive perspective by suggesting the Unplugging framework, which consists of 10 transitions. Third, based on on-going, EU-funded smart city project's intervention, which consist of *a whole smart-official universe*, the author underlines the importance of integrating urban transformations and research findings as a strategy that would enable more emancipatory and empowering visions of smart cities beyond simplistic market ambitions of companies or the control desires of states (Rob Kitchin, 2015, p. 30). Finally, five final remarks are presented as the future research agenda of (un)plugging smart cities with urban transformations: urban governance interdependencies via Penta Helix multi-stakeholder framework; urban data to decide; metropolitan and regional scaling-up; city-to-city learning and comparing smartness; benchmarking, city dashboards and rankings. As a result, an unanswered question will be left at the end of the paper to provoke further and deeper policy and research debate regarding Horizon 2020 (Igor Calzada, 2013): Should H2020 move towards multi-stakeholder city-regional complex urbanity?

Context

'Smart city' (Robert Hollands, 2008; Rob Kitchin, 2014; Vito Albino, Umberto Berardi & Rosa Maria Dangelico, 2015; Michael Batty, Kay Axhausen, Giannotti Fosca et al., 2015) has already become a *fetish* term to simplify complex urban debates in an uneven techno-deterministically-driven, hyper-connected society. Therefore, a mainstream wave of urban standardisation concerning the *one-size-fits-all, smart-city-in-the-box* paradigm has been dominating the EU policy agenda so far. Yet, this movement has failed to offer alternative, efficient policy tools to understand better and intervene in our daily urban realities while considering the whole range of stakeholders that determine whether or not a common solution is a 'smart' one for the city. Moreover, it is arguable that the smart city is already happening around us, but not in the way anticipated. Furthermore, the 'smart city' discourse has been shifted by academics in order to make proposals that produce realistic transitions in cities and to avoid a narrowly portrayed approach to governance and urbanisation processes.

Regarding the uneven techno-deterministically-driven society (Igor Calzada & Cristóbal Cobo, 2015), surprisingly, it's a society that seems to embrace information and

communication technologies (ICTs) enthusiastically as the key component of the infrastructure of modern cities and their internal governance strategies.

In academia, urban studies have a long tradition of critically examining the interface between space and digital technologies, and information studies have targeted the city as one of its principal domains of research. However, narratives and practices around notions of smartness have been largely absent.

Having said that, some could argue that the smart city exists (or is already happening around us), but not in the way it was anticipated. Two deeply researched main paradigmatic examples illustrate the way this trend has been orchestrated as a mainstream wave of urban standardisation: Masdar (Federico Cugurullo, 2013) in Abu Dhabi and Songdo (Sofia Shwayri, 2012) in South Korea.

On the one hand, according to Cugurullo (2013), behind the Masdar City project, there is a much bigger project aimed at capital accumulation, and little attention is paid to what is unrelated to the business plan. At the core of Masdar City lies a powerful mechanism fuelled by technology-driven capital flows pumped directly into the development to become part of it. Thus, there is little space for the social aspects of sustainable development and the social dimension of the city (2013, p, 34). To sum up, Masdar City is what Augé (2008) calls a non-place: a non-anthropological spatial entity bereft of an organic society.

On the other hand, according to Sofia Shwayri (2013), Songdo is a clear case of building cities from scratch as a result of a persistent belief by governments that newly constructed cities can set their nations on a fast path to the future. Songdo, however, is built on inherent contradictions (2013, p. 52): the making of Songdo as eco-city has seen adverse effects by producing significant price contrasts that in effect only allow the affluent class to avail themselves of the newly emerging city.

Hence, we could argue that in some senses, the smart city narrative can be seen as a three-act Shakespearean tragegy. In the Act I, Songdo, Masdar and PlanIT Valley developments posited a utopian vision of the future, in which tech is the benign, all-powerful master. They were lifeless pilots, unrealistic models that existing cities were not interested in, but whose often unsuitable innovations they were nevertheless obliged to adopt, due to financial constraints. In the Act II, there is no route from these pilots to scaled-up long-term solutions. Their unviability, and the mode of financing –perpetual pilots– results in very little concrete interest. Tech companies respond to the lack of demand with layoffs. And in the Act III, two models are now emerging in a new transition (as it was argued in the article Unplugging): the city as platform model and more open agile approaches to urban innovation. These are both bottom-up and entrepreneurial by assuming the urban society as a new city-regional complex urbanity.

Urban buzzwords in the last 30 years

The smart city seems to be the urban buzzword for the 2010s. However, as Martin de Jong, Simon Joss, Zhan Daan et al. (2015) suggested in the graph shown in figure 1, over the last three decades, metropolitan areas around the world have been engaged in a multitude of initiatives aimed at upgrading urban infrastructure and services, with a view to creating better

environmental, social and economic conditions and enhancing cities' attractiveness and competitiveness. As depicted in the graph, many new categories of cities have entered the policy discourse: sustainable cities, green cities, digital cities, smart cities, intelligent cities, information cities, knowledge cities, resilient cities, eco-cities, low carbon cities, liveable cities and even combinations, such as low carbon eco-cities and ubiquitous eco cities. The point is these terms often appear to be used interchangeably by policy makers, planners and developers. However, the question arises whether these categories nevertheless each embody distinct conceptual perspectives, which would have implications for how they are applied in policy.

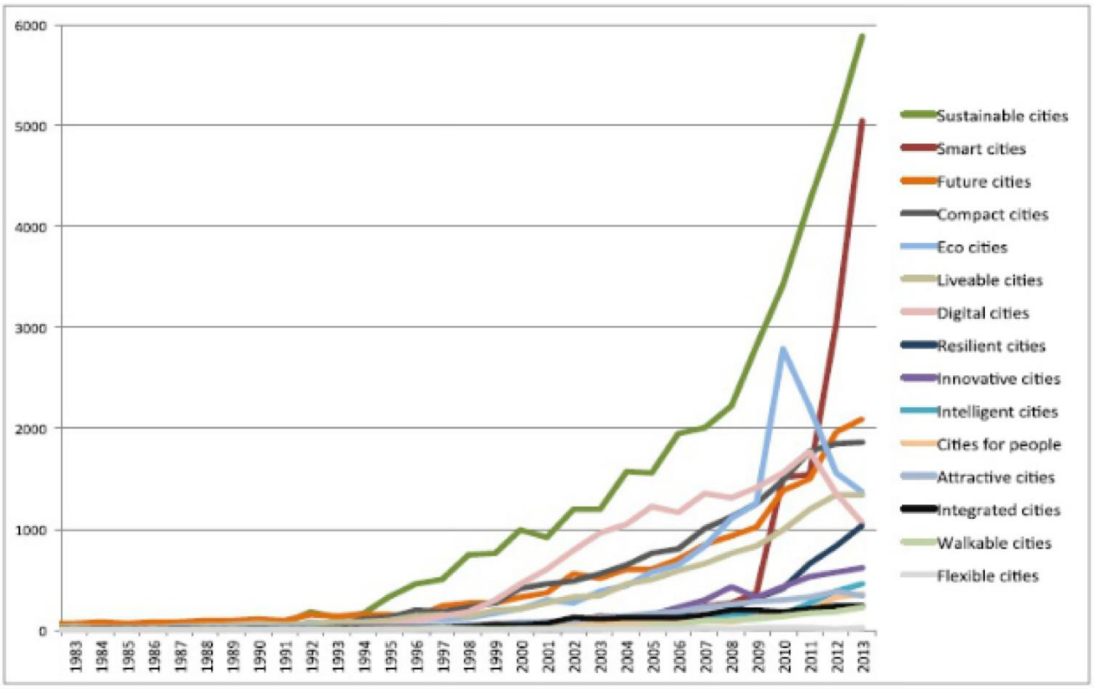


Figure 1: Urban buzzwords in the last 30 years

Source: Martin de Jong, Simon Joss, Zhan Daan et al. (2015). http://dx.doi.org/10.1016/j.jclepro.2015.02.004

Evolution of the smart city term

Hence, we could argue that this mainstream wave of urban standardisation concerning the smart city paradigm has so far been dominating policy agendas since the mid-1990s: as shown in figure 2, initially, since the 1960s, the different terms were used as described before. Actually, it was in the mid-1990s, when the smart city term emerged in newspapers and media.

It was just after the recession boosted in 2008 when corporations begin to stake their claims. Back in 2008, when the smart city movement was taking its first steps, Robert G. Hollands (2008) asked for *the real smart city to stand up.* Since then, there has been an intense debate, as well as a number of projects self-proclaiming their smartness. It should also be said, great steps have been taken in some leading cities to explore how we turn digital innovation into public service improvements and entrepreneurial activities. However,

comparative and city-to-city learning urban transformation applied research is required, as this paper will suggest in sections 4 and 5.

Since 2011, a critical discourse has gained momentum.

Yet, it should be said, this paradigm has failed to offer alternative and efficient policy tools to understand better and intervene in our daily urban realities, while also considering the whole range of stakeholders.

Particularly in the European Commission H2020 Framework Programme, the urban smartness is simplified, assuming that the technical system is an efficient interdependent bubble made up of three factors: mobility, energy, and ICTs.

As it has been pointed out before, this approach is known as the *one-size-fits-all*, *smart-city-in-the-box* paradigm. This paradigm is creating a new lexicon through which the development of cities is being forged with elements like urban apps, big data, intelligent infrastructure, city sensors, urban dashboards, Internet of Things (IoT), connected homes, smart meters, smart buildings and smart grids (Igor Calzada, 2016b).

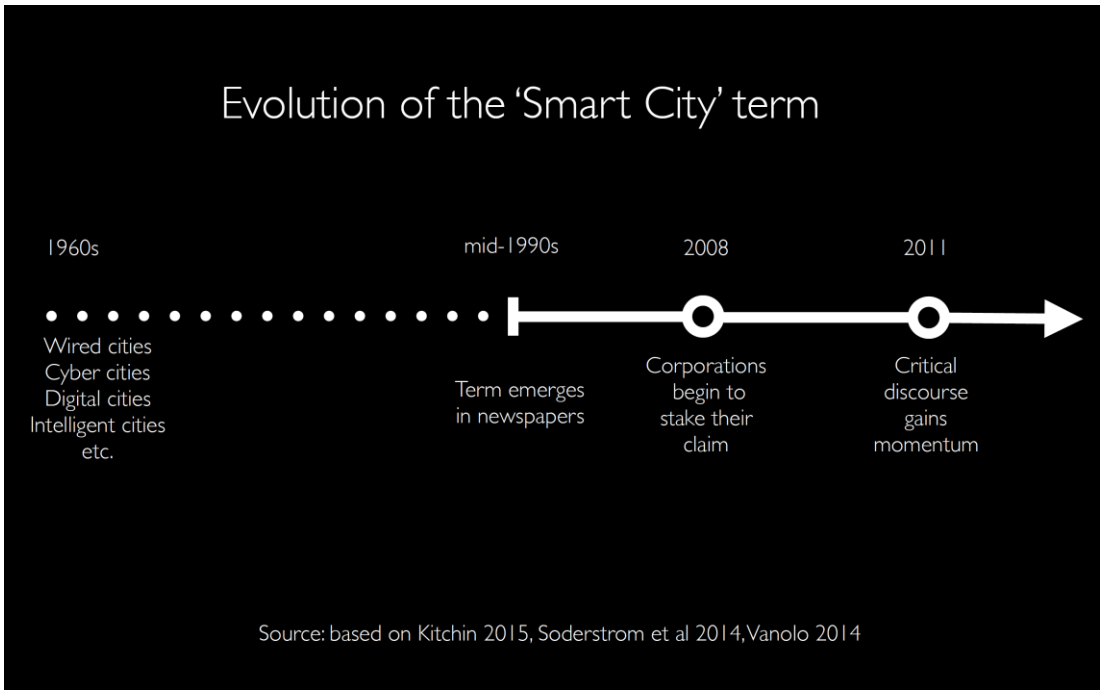


Figure 2: Evolution of the 'Smart City' term. Source: Andrew Karvonen (2016)

Nevertheless, in this paper, a less dystopic and rather more constructive perspective will be provided in order to strike a balance between self-promotional examples by stressing the underlying pro-business bias and those biases underpinning sustainability and social innovation in a more democratic way. Actually, there is a wrong assumption that the smart city's economy should be increasingly driven by technology-inspired innovation and entrepreneurship that, in turn, will attract businesses and jobs, create efficiencies and save

and raise the productivity and competitiveness of government and businesses (Andrea Caragliu, Chiara Del Bo & Peter Nijkamp, 2009).

Smartness that is just in line with techno-economic growth will not develop further itself, provoking potential boomerang side-effect to the cause that has not been systemically anticipated before 2008 crisis (Igor Calzada, 2013). According to the Urban Transformations research portfolio funded by the ESRC (2016), the changing geographies of urban studies reflect the reordering of the global economy. The sheer scale of urbanisation in the global south, the tiger economy's maturity in Asia and the growth of the BRICs undermines a conventional urban studies narrative that focuses on the metropolitan experiences of the global north (Michael Keith, Andreza de Souza Santos & Nicholas Simcik Arese, 2016). Thus, geo-economics is already requiring a systemically smart response to the geo-politics and geo-democratics. Considering cities as isolated technical systems is clearly insufficient for the urban challenges that they are already facing. Cities and regions are complex adaptive systems (John Abbott, 2016; Marlon Barbehön & Sybille Münch, 2016), combining spatiotemporal and behavioural structures that are affected by and affect individual and collective agents.

(Un)Plugging the smart city

Thus, this paper goes beyond the trend of hyper-connected societies (Guardian, 2014). As such, while the creation of smart cities has many supporters, most notably governments that hope to address and manage the many issues cities face using ICT-based solutions and businesses that seek to profit from selling new smart city technologies and services, smart urbanism has not been universally welcomed (Rob Kitchin, 2015). As Alberto Vanolo (2016) argued recently, the reasons why the smart city is so popular in Europe are based mainly on a mix of various forces, to be found, first, in the availability of substantial European financial resources to fund the eco-restructuring of cities; second, in the tendency of the major private companies to invest in urban digitisation projects; third, in the construction of a persuasive rhetoric including salvation visions of technology; and finally, in the image of clean, liveable, technologically advanced cities far removed from the economic crisis. Albeit this article advocates that new tools and practices to facilitate co-operation and learning rather than mere replication must be experimented upon and found (Claudia Casbarra, Cristina Amitrano, Annunziata Alfano & Francesco Bifulco, 2014; Brett Goldstein & Christopher Mele, 2016). As of yet, no national government has attempted to undertake an urban innovation programme on a scale which would influence the market. To some extent, it seems that the H2020 programme could wrongly follow Singapore's and India's large-scale programmes (Amitabh Satyam & Igor Calzada, 2016; Clarke Osborne, 2015; UK Government Foreign and Commenwealth Office, 2016). These two programmes, Singapore's Smart Nation and India's 100 Smart Cities, seem to be repeating many of the mistakes seen with the *smart-city-in-the-box* paradigm (Masdar, Songdo and PlanIT Valley). It could be argued that sustainable business models have been largely absent, with the majority of projects occuring in the EU, including, pilots, testbeds and lighthouses. However, some European cities (Dublin, Bristol, Barcelona, Glasgow, Amsterdam, among others) are particularly proactive in their pursuits of

heterogenous smart initiatives, such as those embracing experimental (Andrew Karvonen & Bas Van Heur, 2014) unification of top-down and bottom-up approaches like *Massive Small* (Kelvin Campbell, 2011), among others.

Beyond hyper-connected societies

There is a wrong belief that complex open systems can be disassembled into neatly defined problems that can be solved or optimised through data computation. This is what Evgeny Morozov (2014) calls solutionism as the expansion of technological development, which includes reductions in the cost of connectivity, has increased the deployment of information-centric schemes (Bengt Ahlgren, Christian Dannewitz, Claudio Imbrenda, Dirk Kutscher & Borje Ohlman, 2012). Thus, smart cities represent a set of hyper-connected societies that enthusiastically embrace ICTs as a key component of the infrastructure of modern cities. However, the social adoption of technology and technological evolution occur at highly dissimilar rates, suggesting significant socio-technical misalignment (Igor Calzada & Cristóbal Cobo, 2015).

Being digitally connected/plugged in is no guarantee of being smart

Thus, the notion of unplugging lies in two notions:

The first notion means the fact of *being digitally connected or plugged in is no guarantee of being smart* as Yara Evans suggested in 2002 (Igor Calzada, 2015, p. 36). In urban planning, there is a well-established notion of wicked problems, 'lock-ins' and 'path-dependencies'. They aren't solvable due to technical limits or a lack of data; rather, they aren't solvable because they are big and complex and so wracked with political conflicts that stakeholders can't even agree what success looks like or how to measure it. Yet the smart city promised that, given enough data and enough processing power, we could directly compute solutions to any problem (Alasdair Rae & Alex Singleton, 2015). This shows a lack of understanding of how cities work, and, at worst, it was a disaster in the making.

The second notion is a consequence of the first one; as Williams noted in 1983, *technology is never neutral, and it has the potential and capacity to be used socially and politically for quite different purposes*. This idea is explicitly advocated by Rob Kitchin when he refers to data (2015, p. 17) by arguing that the data within these systems are not neutral and objective in nature. Instead, they are situated, contingent and relational, framed by the ideas, techniques, technologies, people and contexts that conceive, produce, process, manage, analyse and store them.

(Un)plugging the smart city: 10 transitions

In order to overcome the reductionist mainstream smart city direction from a critical urban transformational perspective, the author of this paper suggested in an previous article, which ranks as the sixth most-read article in the *Journal of Urban Technology*, to use of a 10-transition-based framework entitled Unplugging. With Unplugging, instead of merely accepting the technology or refusing it totally, it suggests implementing a transition in 10 different dimensions, as shown in Figure 3.

	1 WHO	2 HOW	3 SYSTEMS	4 GOVERNANCE	5 INFORMATION	6 FOCUS	7 SPACE	8 DESIGN	9 SOCIO-POLITICAL PROCESSES	10 POLITICAL ECONOMY
UNPLUGGING the SMART CITY	Social & Digital Divide	Individualism vs Collectivism	Socio-Technical Systems	Master Planning vs. Emergent Plan and Top Down vs. Bottom Up	Overload vs Scarcity	Social Netking vs Social Capital	Context Collapse	Ambient Commons	Control & Normative vs Free & Emergent	Profitable vs Non-Profitable

Fig. 3: Unplugging: Deconstructing the Smart City. 10 Transitions/Dimensions

The main aim of the paper is to present a way in which we could unfold the real practices and consequences of the smart city initiatives (Igor Calzada & Cristobal Cobo, 2015) rather than providing a taxonomy of definitions (Vito Albino et al., 2015; Andrea Caragliu et al. 2009; ARUP, 2011, 2014). According to some widely spread critical perspective about smart cities (Nick Buck & Aidan While, 2015; Tim Campbell, 2012; Jennifer Gabrys, 2014; Amy Glasmeier & Susan Christopherson, 2015; Adam Greenfield 2013; Maarten Hajer & Ton Dassen, 2014; Robert Hollands, 2008, 2014; Bob Kitchin, 2015; Andrés Luque-Ayala & Simon Marvin 2015; Simon Marvin, Andrés Luque-Ayala & Colin McFalrlane, 2015; Taylor Shelton, Matthew Zook & Alan Wiig, 2015; Ola Soderström, Till Paasche & Francisco Klauser, 2014; Anthony Townsend, 2015; Alberto Vanolo, 2014; Jenni Vitanen & Richard Kingston, 2014), despite the significant political, economic and social consequences, research on smart technologies to date has focused on their technical components. Albeit, there has been limited discussions of the social and geographical dimensions of urban processes.

In this context, smart city discourse, at least in the EU (Andrea Caragliu, Chiara Del Bo & Peter Nijkamp, 2009; European Parliament 2014), has changed for the better since 2008. City leaders around the world have a much more informed understanding of what smart technologies can do. But little can be said about smart interventions by considering holistic frameworks. It is why this paper advocates deconstructing, from the policy perspective, which are the interactions among stakeholders while unpacking processes driven by smart technologies. It is just after unplugging when we could certainly build the smartness in cities—not just by adding another layer more by adapting the hardware to the software (Igor Calzada & Gavin McAdam, 2016), rather than vice versa. It is after that when joint smart and sustainable policy agendas could make complete sense of the particular smart urban challenges with relevant transformative consequences.

In the next section, the author will briefly present an initial overview of the current list of smart city EU projects, and then a list of on-going smart city EU projects in which the author is or has already been involved including STEEP, STEP UP, SMARTCITYREGIONS and REPLICATE. The author's participation has occurred at different levels: as a member of advisory boards, a lecturer, a WP leader, and a PI.

Plugging smart cities with urban transformations in the EU

FP7	SCC1 2014	SCC1 2015	Smart Cities Support Actions
CITyFiED www.cityfied.eu CITY-zen www.cityzen-smartcity.eu SINFONIA www.sinfonia-smartcities.eu STEEP www.smartsteep.eu STEP UP www.stepupsmartcities.eu SMARTCITYREGIONS-MARIECURIE www.smartcityregions.org	GrowSmarter www.grow-smarter.eu REMOURBAN www.remourban.eu Tringulum www.triangulum-project.eu	REPLICATE www.replicate-project-eu Sharing Cities www.sharingcities.eu SmartEnCity https://eu-smartcities.eu/content/vitoria-tartu-and-sonderborg-join-h2020-smartencity-project SMARTER TOGETHER https://ec.europa.eu/inea/en/horizon-2020/funded-projects/smart-cities	CITYkeys www.citykeys-project.eu ESPRESSO www.espresso.ru.unikl.de SCIS www.smartcities-infosystem.eu

EU Project	Cities involved	Timeframe & Title	Funding Institution
EU-H2020-SCC-1st Lighthouse: **REPLICATE**	Bristol (UK) St. Sebastian (ES) Florence (IT) Laussane (CH) Essen (DE) Nilüfer (TR) Bogotá (CO) Guangzhou (CN)	< 2015-2020 > REnaissance of PLaces with Innovative Citizenship And TEchnology	**EU-H2020-SCC-Lighthouse** www.replicate-project.com
EU-Marie Curie Actions-Cofund-Regional Programmes: **SMART CITY-REGIONS**	Bristol (UK) Glasgow (UK) Bilbao (ES) Barcelona (ES)	< 2015-2016 > Comparing Smart City-Regional Governance Strategies: Bilbao, Barcelona, Bristol & Glasgow	**EU-FP7** Marie Curie Actions-Cofund BilbaoMetropoli-30/Bizkaia Province Council
EU-FP7-314679 **STEP UP** Smart City Plan	Glasgow (UK) Riga (LT) Gothenburg (SE) Ghent (BE)	< 2014-2015 > Energy Planning for Cities *MSc Master in Global Sustainable Cities	**EU-FP7** www.stepupsmartcities.eu/
EU-FP7-314277- **STEEP** Smart City Plan	Bristol (UK) St. Sebastian (ES) Florence (IT)	< 2014-2015 > Systems Thinking for comprehensive city Efficient Energy Planning	**EU-FP7** http://www.smartsteep.eu/

Figure 4. Smart City EU Projects' Overview

Here some findings after working in the projects detailed in Figure 4.

It is obvious that the smart city concept has rapidly risen to prominence within the policy and governance discourses of urban development and is on its way to becoming the leading driver of urban sustainability and regeneration initiatives (Martin de Jong et al. 2014, p. 12).

However, as we have seen in the so-called *one-size-fits-all, smart-city-in-the-box* paradigm with Masdar and Songdo, rather than being constructed on tabula rasa according to the centralised plans of multinational technology corporations, smart city interventions are always the outcomes of, and awkwardly integrated into, the existing social and spatial constellations of urban governance and the built environment (Taylor Shelton et al., 2015, p. 14).

In the case of the two projects funded by the European Commission 7th FP, STEEP and STEP UP, interdependencies have been the unresolved issue so far.

In the case of STEEP (Systems Thinking for Efficient Energy Planning), partners spent months utilising the STEEP open-source methodology. As part of this process, a list of 50 KPIs was identified, against which the plan was measured. Nonetheless, along the development of the Energy Master Plan for districts for the three partner cities, St Sebastián (Spain), Florence (Italy) and Bristol (UK), the adoption of the system-thinking methodology in combination with open-data sourcing to achieve carbon reduction targets and overcome the barriers to energy efficiency showed the lack of vision and the urgent requirement for further interdependent actions among the stakeholders. This fact should remind us that the actions of citizens have less to do with individuals exercising rights and responsibilities and more to do with operationalizing the cybernetic functions of the smart city (Jennifer Gabrys, 2014, p. 38).

In the case of STEP UP, a number of projects were developed in each partner city. In Glasgow, the Commonwealth Games Athletes' Village and the Future City Glasgow programme awarded by Innovate UK and Clyde Waterfront as the biggest regeneration project ever undertaken in Scotland were developed. In Ghent, two initiatives were developed: a Car Free City Centre of approximately 35 hectares and a renewal project called Ledeberg Alive. In Gothenburg, a new sustainable urban district called Kvillebäcken was established, and two initiatives were implemented in parallel: Congestion Charge and New Travel Habits. Finally, in Riga, two interventions were undertaken: a smart card as a transport, social and education policy instrument and a new building complex in the Torknakalns district.

Regarding SMARTCITYREGIONS, this project understands 'smart cities' as, in essence, entrepreneurial cities that respond immediately and efficiently—in imaginative, novel ways—to continuous, complex, socio-technical changes caused externally by global market dynamics and internally by unequal stakeholders' power relations. Indeed, this project compares strategically and ethnographically four specific city-region cases located in two European nation-states: Bristol and Glasgow in the UK and Bilbao and Barcelona in Spain. This project focuses initially on how each case study has produced a particular discourse of 'smartness'. Through this analysis, a stakeholder analysis and its unique configuration are provided. Thus, a comparative analysis will proceed with multilevel governance and stakeholder analysis. It is noteworthy that scales of multilevel governance pluralise with intensifying patterns of European connectivity and accelerating economic restructuring. This gives rise to the notion of city-regional governance in nation-states. This may involve new concepts and narratives, mobilisation of different knowledge, and imaginative thinking about new governance strategies and use of institutions while employing more informal collaborative networks among regional stakeholders. Thus, in this paper, smart city-regional governance entails opening up and pressing for significant new ideas about democratic legitimacy and political inclusion (Igor Calzada, 2016a). Additionally, 'smartness' should be taken as an outcome of regional urban transformations in governance, reconciling seeming contradictions between established growth agendas and a rising concern with a broader range of qualitative parameters, such as societal and territorial cohesion. Nevertheless,

considering the nation-state's limited capacity to manage conflicting patterns of urban growth and decline, political demands regarding devolution of metropolitan and regional powers should be smartly taken into account (Igor Calzada, 2016e). This common trend remains crucial in four cases. While local governments increasingly are in charge of their own economic destiny, this paper compares city-regions to understand better stakeholders' dynamics in each socio-communitarian location. Socially and politically innovative processes are occurring at all scales, from neighbourhood participation interventions (micro) to city-regional strategic logics (macro). Hence, this paper establishes the 'smart city-region' term both as a unit of analysis and a mode of production among stakeholders (Igor Calzada, 2016d). However, one must acknowledge the particular histories, unique geographies and diverse power relations among stakeholders in different city-regions. This comparative analysis of the four cases will enhance two dimensions of the 'smartness' for each city-region. On the one hand, the focus will be on the metropolitan governance dynamics and the stakeholder interactions. On the other hand, it will tackle a special consideration for the devolution dynamics between the city-region and each referential nation-state. An analysis for the four cases follows:

- According to The Guardian, Bilbao depicts an outstanding context to be rebranded as a new modern icon of the smart urban renaissance. Its strategy has been led by a public and private partnership without any explicit strategy but with implicit corporate procedures. However, we should also point out that civic groups, social entrepreneurs, and academia have been absent in this strategy so far. Therefore, Bilbao requires well-funded interconnected niche experiments in a limited range of urban contexts, by mobilizing a multistakeholder approach (James Evans & Andrew Karvonen, 2014). Thus, the corporate strategy should evolve towards a more experimental transition by including bottom-up and top-down governance cycles.

- For a long time, Barcelona[2] has been investing and promoting itself as the first Spanish Smart City, the fourth in Europe and the 10th in the world. At present, due to a new city mayor –Ada Colau, who represents a radical new citizen platform called 'Barcelona in Common'–, an initial smart city strategy has been shifted towards an 'open source' strategy recently called BITS 'Barcelona Initiative for Technological Sovereignty'[3]. Hence, this new transition also could present some uncertainties insofar as the corporate corrective is taking a long time by altering the policy and investments intensification made in the previous era.

- In 2013, Glasgow[4] won £24m of funding from the UK Technology Strategy Board (TSB) to explore ways to use technology and data. At present, the strategy is being reviewed based on the demonstrator project, which focuses on four main areas of urban infrastructure: health, energy, transport and public safety. The question here is whether the 'urban governance' model has integrated the city-regional scale as suggested by The Scottish City Alliance.

[2] http://smartcity.bcn.cat/en/smart-city-areas.html
[3] http://bits.city
[4] http://futurecity.glasgow.gov.uk

- By contrast, Bristol[5] received £3m from the UK TSB, but its approach has followed 'open innovation' principles by its flagship operational organisation called 'Bristol is Open'. The university is playing a remarkable role in engaging stakeholders at the metropolitan level. However, how the city-regional devolution affects Bristol's smart-city strategy remains uncertain. In addition, a recent change in the leadership of the city council by appointing a new Major, may also incorporate new uncertainties.

Finally, the recently launched lighthouse project called REPLICATE, funded by the European Union's Horizon 2020 Research and Innovation programme, shows the following challenge from the urban transformation perspective: the project advocates innovative approaches to citizenship, with the aim of involving citizens as stakeholders at all stages of the activities to co-create appropriate solutions and services which celebrate and work successfully with the characteristics and context of each metropolitan area in each lighthouse and follower city. Having said that, there is a deep underlying issue regarding the understanding of 'replication of urban solutions to create a market' what suggests a very initial corrective in favour of problem-based interventions and city-to-city open learning processes, rather than simplistic copy-paste vendor push procedures.

Unanswered question: towards multi-stakeholder city-regional complex urbanity?

After presenting on-going EU projects, in this section, the paper concludes that despite the fact that smart city projects are indistinctively using the brand of the smartness, a deeper analysis is required by contrasting their findings with the cutting-edge research compiled by the ESRC Urban Transformations portfolio (ESRC, 2016). In this portfolio, projects regarding specific interventions on big data (Jonathan Bright, Stefano de Sabatta & Tom Heath, 2016), economic evolution of the transformations in cities (Ron Martin, 2016), urban living labs (Harriet Bulkeley et al., 2016), and neighbour and local development (Beth Perry, 2016) are showcased. Thus, in this last section, the author advocates that smartness in European cities should be critically complemented with an holistic urban transformation action research perspective (Igor Calzada, 2013; Yara Evans, 2014; David Harvey, 1997; Richard Sennett, 2012). A research perspective that could be summarised by two major urban challenges:

The first challenge reflects the changeable governance dynamics of our current urban societies. In our social systems, order is not sufficient. What is required is order entering upon novelty, so that the massiveness of order does not degenerate into mere repetition or replication, and so that novelty is reflected upon the background of the system. Actually, the nature, configuration, and interdependencies of stakeholders are entirely modifying these days. According to Elinor Ostrom (2010), beyond the markets (private sector) and nation-states (public sector), there is a vast polycentric governance of complex economic systems. And so, communities are able to devise ways to govern the commons to assure its survival for their needs and future generations. Thus, if we apply these findings to the current stage of the smart city discourse and practices, we would be able to suggest a reconsideration of

[5] http://www.bristolisopen.com

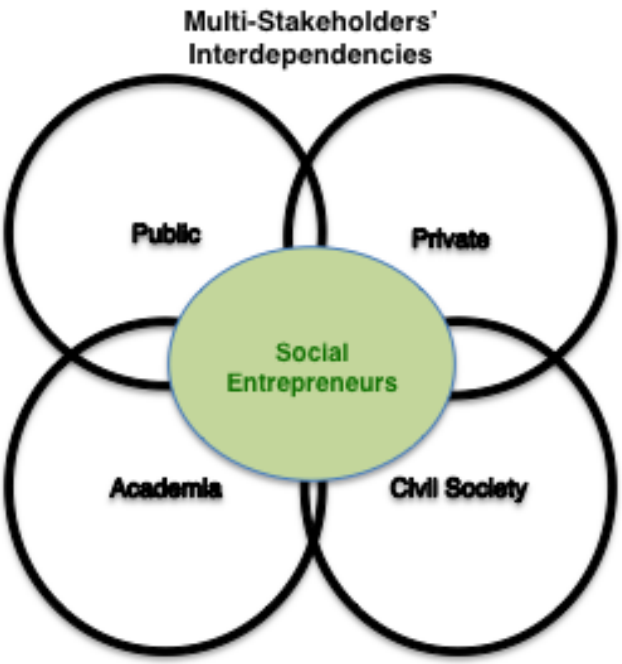
the private-public partnership as the only possible way to deal with urban governance. The author will suggest considering the multi-stakeholder approach via the Penta Helix framework that will be presented.

The second challenge is related to the pervasive metropolitan and regional scale of the inadequate cooperation between cities, and, indeed, the smart cities programmes they run. However, due to devolution being a key issue in some European countries (UK, Spain, Italy, France, Germany and so on), the sharing of technology, data and expertise is vital to their successful deployment.

In these final sections, the paper presents five intertwined research lines in order to leverage the transitions that smart cities require to align them with a systemic interpretation of the current urban challenges that are meant to be tackled in the upcoming years. The article is presented as a proposal for a further research agenda on smart urban transformations by leaving open the following question: Towards multi-stakeholder city-regional complex urbanity?

Multi-stakeholders' interdependencies: the hidden urban governance driver

If the crisis in 2008 underlined an evidence-based economic fact, it was that visions of smart cities are very diverse. Actually, how they dovetail with local and global economies, and how they unfold in practice, vary between places (Rob Kitchin, 2015, p. 3). But who is benefitting from the smart city investments? (Amy Glasmeier & Susan Christopherson, 2015). Who pays the bill at the end of the day? Some authors alert us to the fact that the design of an intervention has significant implications for its usability and accessibility and that each design gesture has an intended community. The assumption behind many smart city projects is that everyone owns a smart phone and knows how to operate it at maximum performance. Consequently, technology audits are necessary to reveal just how flexible, usable and accessible these technology designs are for different targeted stakeholders. So, to understand from smart city interventions, we need thoughtfully designed, rigorous comparative research by considering three main elements uniquely in each particular location. First, technology has reemerged as a prominent debate for urban



development as long as we reconsider the different role of specific stakeholders in the given location. Second, around the power relations and topics of discussion, the dominance of green growth and ecological modernisation will be such a recurrent subject. Third, a total reconfiguration of urban partnerships should be encouraged in our cities.

According to some findings in the STEEP, STEP UP and SMARTCITYREGIONS, and by considering the results of the Urban Governance and Its Discontents International Conference organised by the Future of Cities Programme at the University of Oxford in 2016 (Oxford City Debates, 2016), the potential, conflictive and deliberative stakeholders' interactions should be deeply considered before and during each smart city intervention. Actually, this is one of the main innovative aspects of the REPLICATE H2020 lighthouse project. As David Harvey (1997) pointed out, the smart city and new urbanism movements build an image of the community and a rhetoric of place-based civic pride and conciousness for those who do not need it while abandoning those that do to their underclass fate. In order to overcome this gap in the smart city discourse, this paper suggests using the Penta Helix multi-stakeholder framework (Igor Calzada 2013), which consists of the private sector, public sector, academia, civic society and social entrepreneurs. As has been said before, some signals show this direction. Especially, there are significant attempts (Tom Saunders & Peter Baeck, 2015; Smart Retro Project, 2015) coming from the social innovation field to uncover the hidden urban governance engine that could be defined as the way multi-stakeholders' interdependencies operate in diverse smart cities.

Urban data to decide

The second remark is a concern. In the context of the smart city, the data that are generated are the products of choices and constraints shaped by a system of thought, technical know-how, public and political opinion, ethical considerations, the regulatory environment and funding and resourcing (Rob Kitchin, 2015, p. 21). Thus, how can a sensor, a smartphone or a commercial transaction have politics? The UrbanData2Decide project (Jonathan Bright et al., 2016) found that, in public decision-making processes, stakeholders have opposite positions and advocate different solutions but have difficulty providing details about what the different positions are based on and what the consequences can be.

According to Michael Batty (2015, p. 18), there are some new functionalities for urban data to decide: the acquisition of data from multiple distributed sources, the management of data streams, the integration of heterogeneous data into a coherent database, data transformations, definition of new observables, methods for distributed data mining and network analytics, the management of extracted models, tools for evaluating the quality, visual analytics, simulation and prediction methods and finally, incremental and distributed strategies needed to overcome the scalability issues that emerge when dealing with big data. Regarding the last idea about big data, it should be completed with the statement made by Alasdair Rae & Alex Singleton (2015), when they argue that the debate on big data often lacks clarity, direction and reason. In their attempt to define big data, the authors conclude that there is an indefinite definition of big data so far. However, according to the findings of

the EU projects presented before, interdisciplinary interventions are required to tailor open and big data platforms in each project. As such, the multi-stakeholders' interdependencies should be linked to data issues insofar as platforms will be developed on the basis of tackling the following urban transformations (Michael Batty, Kay Axhausen, Giannotti Fosca, Alexei Pozdnoukhov, Armando Bazzani, Monica Wachowicz, Georgios Ouzounis & Yuval Portugali, 2012, p. 35): housing booms and busts in large cities, impacts of changes in energy on urban transportation systems and mobility, the fracturing of transport networks, synthesis of different urban data sets, the impact of climate change on cities in Europe, the participation of citizens in the development of plans for smart cities and the impact of immigration phenomena in a global world.

In addition to all these functionalities and urban transformations, this paper concludes that data management should strongly fit the idea of governance that extends in this way to the many functions that we envisage being coordinated in the smart city. This relatively new prospect is part of the wider debate about the metropolitan and regional devolution of governance in the information age. Hence, as we can observe, multi-stakeholders' interdependencies, urban data to decide and metropolitan and regional scalability for smart cities are firmly intertwined.

Scalability: metropolitan & regional scales

According to the latest policy report by Habitat III Policy Unit (LSE Cities, 2016), there is an expansion of metropolitan areas that is producing at the same time a growing gap between these and intermediary cities by posing additional challenges to urban and national governance. This trend should be included in smart city interventions. So far, the smart city perspective has been understood and sold as a means to show better cities, just considering city centres and centric districts in the major metropolitan areas. However, as we have discovered in some on-going interventions in St. Sebastian, Florence, Bristol, Glasgow, Ghent, Riga, Gothenburg, Bilbao or Barcelona, among others, (Igor Calzada, 2016c) a realistic revision of the implementation of smart city interventions is required by incorporating the idea of strengthening decentralisation processes that could reinforce metropolitan- and also regional-scale governance (2016: 22). And here is where the smart city should become a smart metropolitan or city-regional entity by enhancing the institutional instrumentarium, as Simone Noveck (2015) suggests, by reviewing and improving the public services (WEF 2016). Similarly, Ron Martin (2016) pays attention to the role of city-regions in national development as a driver of urban growth and the way economic evolution in cities requires the scaling-up of policy solutions. Indeed, Salvador García-Ayllón & José Luis Miralles (2015) have even contributed a model of territorial analysis that consists of more than 50 indicators in the following areas: revitalisation of the urban system, R&D, crisis of rural, access to transport, access to ICT, sustainable energy, disaster risk prevention and management of natural resources, management of cultural resources, sustainability of regional and economic resources, governance and landscape management. Thus, we can observe that despite the fact that numerous protocols are appearing worldwide to develop these processes within smart cities, the real challenge for the future is to make the leap from

the urban scale to the metropolitan and city-regional scales and deploy and scale-up these policies in an integrated manner between the urban, the metropolitan and the city-regional domains.

Benchmarking: comparing smartness & city-to-city co-creation

There is a lack of comparative analysis and a dearth of knowledge about the range of urban, metropolitan and regional contexts within which forms of smart and digital urbanisation are emerging internationally. In this attempt, the author of this paper carried out a four-year comparative benchmarking between eight city-regions (www.cityregions.org). The main conclusions have been published in an article entitled 'Benchmarking Future City-Regions beyond Nation-States' in the RSRS open access journal (Igor Calzada 2015). If we dare to suggest a comparative basis for smartness, according to Leonidas Anthopoulos, Marijn Janssen & Vishanth Weerakkody (2015), we could be overwhelmed with the number of approaches we would find (IBM, ITU, UN-Habitat, ISO, etc.). Given the broadness of this field, it is not surprising that many benchmarking approaches have been developed. Nonetheless, few of them mention the distinctiveness of cities (Barbenhön et al. 2016), a fact that is very significant at this stage of the evolution of the smart cities. As Pablo Branchi, Carlos Fernández-Valdivieso & Ignacio Matías (2014, p. 62) stated, the history of a city cannot be detached from that of its citizens, who are the ones who have determined the city's location, spatial configuration, growth and development. These comprise the key aspects that should set the basis to compare smartness and city-to-city learning processes in the future.

Visualisation: rankings & city-dashboards

Finally, as we have suggested so far, including stakeholders' interaction seems to be particularly necessary, insofar as the data that cities will deal with require a vast amount of sectoral information that would cover not only the local scale but also the metropolitan and the city-regional scales. As such, urban indicators are recurrent quantified measures that can be tracked over time to provide a picture of stasis and change with respect to urban phenomena. Nevertheless, we should advocate the usage of benchmarking and the visualisation of the indicators in rankings and city-dashboards in a more contextual way. Rather than cities being understood as mechanical systems that can be disassembled into their component parts and fixed, or steered and controlled through data levers, cities are conceived as consisting of multiple, complex, interdependent systems that influence each other in often unpredictable ways. As a consequence, as we said in the second section, governance is seen as being complex and multi-level in nature, and the effects of policy measures are perceived as diverse and multifaceted, and neither is easily reducible to performance metrics and targets (Rob Kitchin, 2015, p. 25).

This paper aimed to (un)plug in or unpack the term 'smart city' in the light of some EU projects' findings. It attempted to overcome the smart city trend as a fetish buzzword in the hands of indistinctive place branding (Evan Cleave, Godwin Arku, Richard Sadler & Jason

Gilliland, 2016) in order to embrace the merger of sustainable and smart policy agendas in the direction of the sharing cities paradigm (Duncan McLaren & Julian Ageyman, 2015). In this endeavour, it suggests five alternatives for developing a further research and policy agenda from the urban transformations perspective: the stakeholders' interdependencies, the need for urban data need to focus on local specificities rather than global features, the requirement of the territorial scale-up, comparing smartness via benchmarking and city-to-city co-creation processes and holistic visualisation tools.

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