🏆 *reviewed paper*

Deconstructing Smart Cities: An Intertextual Reading of Concepts and Practices for Integrated Urban and ICT Development

Marc Wolfram

(Dr. Marc Wolfram, Leibniz Institute of Ecological Urban and Regional Development, Weberplatz 1, 01217 Dresden, m.wolfram@ioer.de)

1 ABSTRACT

Concepts of 'smart' or 'intelligent' cities currently enjoy great popularity. They offer frameworks for interpreting certain linkages between information and communication technology (ICT) and urban development, and put forward a particular agenda for action. In this, they claim a broad legitimacy for guiding stakeholders, drawing on findings from a number of strands of scientific inquiry. Furthermore, building on the everlasting albeit problematic promise of technology as a key to resolve pressing societal problems, they equally constitute an attractive reference for actors at all levels and across sectors. But despite their striking virulence in research, policy and practice, it remains rather open what the actual pursuit of a 'smart city' is, and therefore, which winners and losers we are to expect from realization.

Against this backdrop this paper puts forward an intertextual reading of recent contributions to the 'smart city' discourse, probing in particular the context conditions under which it has emerged, the conceptual orientations developed, and the implementation strategies derived. It appears that, while suffering from affinities to technological determinism and urban entrepreneurialism, 'smart cities' largely neglect the need to select and balance goals for integrated urban and ICT development, and to develop suitable approaches for actually doing so. Instead, by conflating the descriptive and the normative, 'smart cities' tend to substitute an orientation at societal ends by an orientation at selected means, thus supporting path optimization but structurally evading radical urban change. Hence, in order to become meaningful for enhancing sustainable and resilient local development, such concepts need to be embedded within a much wider cultural change perspective that should underpin especially the social, ecological and political dimensions of 'smart' urban development. In particular, they need to strengthen their focus on and engagement with the governance of integrated urban and ICT development.

2 INTRODUCTION: CONDITIONS FOR THE RISE OF SMART CITIES

Relationships between urban development and networked information and communication technologies (ICT) have increasingly gained attention in research, policy and practice since the early 1990s. As visionary writings on digital urban futures started to influence our cognitive maps (Mitchell 1996; 2000; Negroponte 1996), and notions of the "global city" (Sassen 2001) and the "network society"' (Castells 2000) have gradually developed into common places, this has triggered the emergence of a new field of activity, "populated by researchers and practitioners at the intersection of people, place and technology" (Foth 2009, xxix). The discussion in this field has thus revolved around diverse concepts and issues such as 'digital-', 'cyber-', 'wired-' or 'intelligent' cities and communities, local 'innovation systems' and their constitution, multiple 'e' applications (e-government, e-participation, e-mobility, e-learning, e-health, e-inclusion, etc.), increasingly including the use of pervasive computing and future internet technologies within urban areas. In this context, a mainstream appears to be concerned with shaping and deploying new technologies in cities for a range of sectoral and/or actor-specific objectives. But also more critical and empirical analyses of the socio-economic, spatial and cultural implications and interrelations of networked ICT and cities have been undertaken (Graham & Marvin 1996; 2001; Rutherford 2011). The boundaries of the object in question are therefore still rather loosely defined e.g. by conference titles referring to 'communities and technologies' or overview publications under the heading of 'urban informatics', including contributions from a wide range of (inter-) disciplinary perspectives and world regions (Ellison et al. 2007; Foth 2009).

More recently, however, a growing part of this debate about the co-evolution of urban areas and ICT appears to have centered around 'smart' or 'intelligent' cities – two concepts that are mostly used as synonyms. The very materialisation of this discourse prompts the question of what may have changed in the context conditions that shape the relationship between cities and ICT that would explain the emergence of this distinctive label? Not unexpectedly, there is no straightforward answer to this question. Rather, one has to account for a number of factors that have gradually converged towards each other, nourishing todays 'smart city' narrative and its virulence:

ISBN: 978-3-9503110-2-0 (CD-ROM); ISBN: 978-3-9503110-3-7 (Print)
Editors: Manfred SCHRENK, Vasily V. POPOVICH, Peter ZEILE, Pietro ELISEI

- Grand environmental challenges: Climate change and global resource scarcity have become dominant on policy agendas across all levels. However, key knowledge on the dynamics of these challenges and their complex interactions with socio-economic structural change has become available only during the past decade (Stern 2007), creating increasing pressures for action. The 2009 financial crisis has added to this picture, drawing attention to the vulnerabilities of the existing regime and in particular the role of cities in this (Harvey 2010);
- Urbanisation: With a growing share of urban population (e.g. in the EU from currently 75% to 85% by 2050, globally 81% by 2030) and the related increase and spatial differentiation of resource demands, environmental pressures and socio-economic inequalities, cities and urban regions are gaining further quantitative and qualitative importance when it comes to designing policy reponses to the above challenges;
- Technology convergence: ICT system components are subject to enhanced convergence and miniaturisation, facilitating the interconnection of data, soft- and hardware, as well as users. objects and environments in large-scale (mobile) networks, e.g. regarding the development of future internet and embedded systems concepts and applications (mobile broadband, cloud computing, internet of things, service-oriented architectures, Web2.0, etc.);
- Industrial convergence: As ICT components become increasingly integrated with other infrastructures and technologies (electricity grids, transport networks, building components, household applicances, etc.), major industrial branches are moving closer together. This "convergence of industrial value chains for smart urban infrastructure and applications" (EC 2011, 13) is therefore pushed by industry and governments alike to secure participation in emerging growth markets;
- Informatisation of society: Drawing on selected novel ICT solutions and their adaptation, social practices at individual, organisation (public and private) and inter-organisation level are changing, exploring new decentralised options for networked data and information collection, exchange, analysis and communication. Especially in urban contexts, new networked ICT usages are thus becoming self-evident parts of everyday practices in both professional and private milieus;

While actually none of these factors is entirely new or can be convincingly claimed to have triggered 'smart city' thinking all alone, together they have created a dynamic context within which this discourse has been able to unfold through continued reproduction across levels and sectors. Most importantly, it illustrates that the 'smart city' can hardly be claimed to represent a neutral frame for any urban ICT activities, or define merely a certain epistemological perspective in research. Rather, it clearly establishes a normative reference, since a 'smart city' should be implemented, and it demands the creation of policy addressing this need. In this sense, and before entering a detailed discussion of the concept and its current reiterations, a 'smart city' represents a positively valued, multi-objective policy strategy of integrated urban and ICT development, promising to tackle problems of economic competitiveness, social equity and environmental performance - somehow. Such a strategy attracts stakeholders for its ability to reduce complexity and provide capacity to act in situations characterised by wicked problems and uncertainty, claiming efficient (time and resource constraints) and effective intervention (extent of impacts). It is therefore also a proposition that is rather difficult to reject, thus paving the way for political majorities and implementation alliances.

In view of this rising discursive hegemony of smart cities, there is a growing need to reflect on this concept, its construction and underlying assumptions to enable transparency and new readings. What exactly is it that 'smart city' development aims to achieve, and in particular, how does it want to achieve this? Which actors and scales are involved in this agenda, and where will it lead us when implemented under real-life conditions? This paper therefore adopts a perspective of discursive deconstruction (cf. Derrida 1983; 1998; Hajer & Versteeg 2005), following intertextual relationships, in this case between science, policy and practice, in order to open up the 'smart city' label for a reinterpretation of its cultural, political, social and institutional bearings. Such relationships refer not only to text as a written expression, but also to context conditions and social practices that serve to attribute particular meanings. Discourse analysis can thus be usefully deployed here to help the identification of related effects of 'smart city' thinking and talking, such as a change of normative contents, constructing problems and solutions, supplying legitimacy and power, preparing consensus, coalitions and institutional arrangements, as well as affecting resource distribution.

To start with, section 3 will thus take a closer look at recent contributions on the topic from the scientific community to shed light on the conception of 'smart cities' and the strategies derived for their implementation. Against this backdrop, section 4 will acknowledge for the broader discursive construction of 'smart cities' in society, focusing on alignments and mutual influences between actors. Finally, this discussion will allow to draw some conclusions in section 5 on the need to question 'smart city' reiterations for the sake of transparency and accountability, and to pay increasing attention to the role of governance practices for shaping the multiple relationships between cities and ICT.

3 SCIENTIFIC CONCEPTIONS OF SMART CITIES

Reviewing scientific publications for the usage of 'smart city' notions quickly illustrates that so far very few have actually sought to theorise this concept or discuss its usage as such (Komninos 2002; 2006; Hollands 2008; Deakin 2011; Allwinkle & Cruickshank 2011). The current Wikipedia entry created as recently as in 2007 equally draws on these as central references (Wikipedia 2012). However, the vast majority of contributions referring to 'smart cities' today uses the concept only to discuss certain sectoral, technological or methodological aspects thereof, which does not contribute substantially to enhance the comprehension of the phenomenon in question. Nevertheless, such discursive 'free-riding' serves of course to indicate topicality and relevance of the respective research undertaken vis-a-vis a booming societal discourse (Figure 1). At the same time, it indicates that 'smart city' operates as an empty signifier in that conceptually almost any issue of ICT in an urban context may be framed by it, ranging e.g. from electricity grids and public lighting to spatial data infrastructures or social media.

Notwithstanding the large amount of work that has dealt with the broader issue of co-evolution between society, cities and ICT from a variety of perspectives (cf. Graham 2004; Foth 2009), the question here is whether a distinctive understanding of 'smart cities' as a scientific object and program can be recognised already. As we will see, this is increasingly the case, although some important indefinitions remain. The following two paragraphs will thus briefly trace those contributions that have sought to conceptualise 'smart cities', first asking for the research perspective constructed, and second for the approaches derived to implement such concepts in practice.

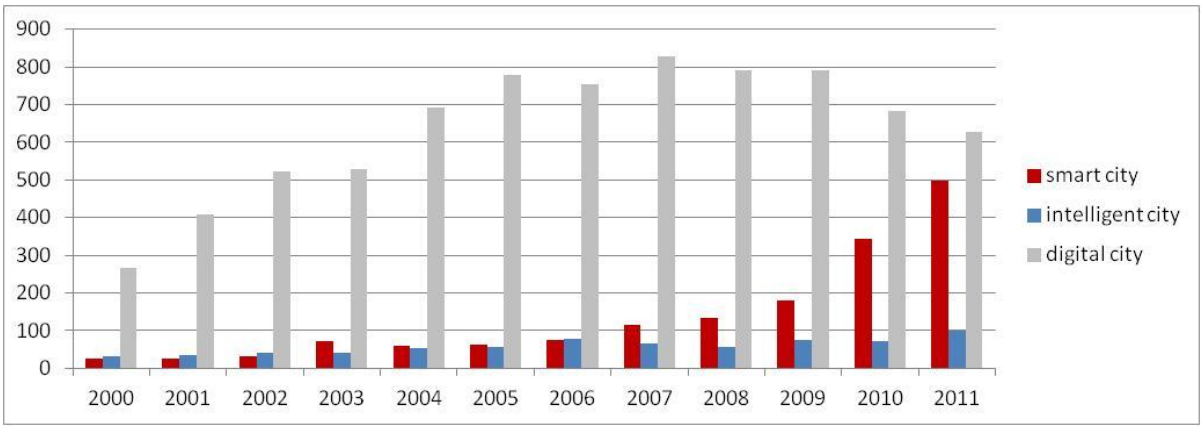

Figure 1: Rise of the „smart city" concept in scientific discourse - total search results (http://scholar.google.de - 2.3.2012)

3.1 Ontological and epistemological orientations

Considering the topics addressed and references used, it is the gradual convergence of two major strands of research and their core concepts that appears to characterize present 'smart city' thinking (Komninos 2006, 4). In the first place, evolving out of administrative and information system sciences, there is a broad concern with digital cities. These are conceived of as an open repository of diverse online applications linked to local government, although without necessarily addressing any relationships between them. This includes especially virtual city representations, e-government services, as well as interactive platforms and their combinations in support of various public policy goals, such as place marketing, social inclusion or environmental awareness (cf. Ishida & Isbister 2000). On this subject, the main research orientations are to identify and develop new internet applications for local governments, and to assess their efficiency and effectiveness in the light of the respective policy goals addressed. The digital city strand of research has therefore tended towards technological determinism, following the hypothesis that ICT will somehow impact

on social and cultural urban practices in cities, rather than vice versa, while also being highly optimistic about this impact. This perspective has increasingly been criticised for its disregard of the social construction processes that shape technology usage (Aurigi 2005, 200) - a criticism that has given rise to more qualitative approaches, analysing the interplay of ICT, developers, users and institutions in local settings (see contributions in: Tanabe et al. 2002; Koizumi & van den Besselaar 2005). Also mainstream digital city research now usually includes at least some form of a 'disclaimer' in terms of technological determinism, but its basic positive assumption that ICT usage will improve a city's performance in the policy areas addressed, which in turn requires the identification of barriers to implementation and measures to overcome them, has largely been maintained. At present, we find this perspective reified through future internet research, driven by new technologies seeking for (urban) problems to be solved (cf. Komninos et al. 2011; Pallot et al. 2011).

The second important research strand has been inspired by Lundvall's conception of innovation systems (Lundvall 1985; Lundvall & Johnson 1994), echoed especially in business studies, economics and economic geography. Here, the starting point is the identification of 'innovation' as the main trigger of economic growth under conditions of globalisation. Such innovation is characterised as a socially embedded and spatially structured learning process determined by the formation of knowledge networks between key actors - government agencies, knowledge organisations, businesses, funding bodies, intermediaries (Morgan 1997). These networks in turn are seen to depend on social and human capital, local institutional settings, as well as culture and ICT, reaching out from the local to the global scale (Cooke & Morgan 1993; Lundvall & Johnson 1994; Komninos 2009a). Research in this field has therefore been trying to identify, describe and model these networks and their conditioning factors in a systemic perspective in order to provide orientations for urban policy, with the ultimate aim to strengthen the competitive position of cities and regions (cf. Moulaert & Sekia 2003). Apparently, this perspective implies a normative selectivity in terms of both the goals addressed and the actors involved.

As illustrated especially through the work of Komninos (2002; 2006; 2008; 2009b), the idea of the 'smart city' emerges from linking the ontological and epistemological perspectives of the innovation system with those of the digital city. Hence, a 'smart city' is conceived of as a specific type of innovation system, namely one that is deeply rooted in urban spaces, their institutions and actor networks, while also fostering the use of novel web-based ICT applications to support the pertinent interaction processes, learning and creativity. As the digital city, its development is therefore principally open to any societal goals linked to it, but due to its focus on innovation systems, priority is given implicitly to competitiveness and economic growth. Furthermore, 'smart cities' coincide with both conceptual sources in identifying enhanced ICT adoption as a core instrument to achieve societal objectives, while largely neglecting related negative or rebound effects (e.g. social exclusion, overcompensation, ICT carbon footprint). Consequently, 'smart city' research is addressing especially the identification and analysis of the preconditions and factors that influence a successful implementation of this agenda in order to guide practical development. Alternative pathways that would not strongly focus on the exploitation of ICT are even discarded from the outset as an existential threat for cities and regions (Eger & Becker 2000, 2).

This basic orientation already formed the starting point of the influential "Smart Communities" program, initiated in 1997 by the International Center for Communication at San Diego University. It says to respond to the need "to help communities worldwide better understand the important role of technology, economic development and importantly, creativity and innovation to success and survival in the new global economy." (Smart Communities 2011). More recently, the same perspective has been presented as a "new planning paradigm" for urban-regional development and innovation management that "updates older arguments about telcoms in the city, cybercities and digital cities" (Komninos 2009b, 338), thus underlining the above normative assertion and promptly doing away with more critical approaches (here referring explicitly to Graham & Marvin 1996).

Some authors have also tried to provide more specific directions regarding the selection of policy domains a smart city should address. For instance, Giffinger et al. (2007) identify six characteristics - economy, people, governance, mobility, environment, living – in which a smart city should be "well performing in a forward-looking way" (ibid. 6), measured by a total of 73 indicators. These six characteristics are then used as a "solid background" by Caragliu et al. (2011) to analyse correlations between urban wealth and five other selected indicators, namely employment in culture and entertainment industry, multimodal accessibility, length of public transport network, e-government services and education levels. Although this selection

exposes major gaps regarding both the six domains referred to (e.g. environment, living) and key sustainability issues (e.g. inclusion, equity, quality of life), the positive correlations identified are then seen to "clearly define a policy agenda for smart cities" (ibid. 77). It is interesting to denote that although ICT does actually not play a prominent role in these two interpretations of 'smart cities' (only two of the indicators identified by Giffinger et al. (2007) relate to "ICT infrastructure availability", while Caragliu et al. (2011) consider just "transactional e-government services" in this respect), both references figure in the context of the technology-led 'smart city' debate. Here it appears that, technology aside, what remains of the 'smart city' seems to be an investment program for strengthening certain location factors or "capital stocks" (ibid. 77) that does clearly support urban competitiveness, but leaves entirely unclear whether or how urban sustainability is also supported. Rather, by establishing policy priorities and instruments, 'smart cities' seem to replace sustainability as a development goal and problem-solving concept, including its much more demanding requirements of balancing ecological, social and economic development, ensuring intra- and intergenerational equity, and fostering cultural and institutional change (cf. Majer 2007; Nielsen et al. 2010).

3.2 Strategies for implementation

Given the ontological and epistemological frame sketched above, 'smart city' conceptions also entail a particular understanding of how their implementation should be approached and enhanced in practice. While this question is hardly addressed as such, discussions mainly revolve around two complementary implementation settings in terms of the scale addressed and the type of actors involved, namely the triple-helix model and open innovation ecosystems. Drawing on empirical and analytical grounds, these two concepts are put forward in a prescriptive manner to guide 'smart city' development. Both types of implementation strategies display particular strengths for addressing certain aspects of integrated urban and ICT development, but they also raise questions concerning their legitimacy as specific modes of governance and their ensuing repercussions on urban planning and policy in general.

3.2.1 Shaping 'smart city' alliances: The triple-helix model

Following the engagement of innovation systems research with different modalities of knowledge production, the triple helix model focuses in particular on relations between universities, industry and government at an urban and regional scale (Shinn 2002). Its proponents maintain that the characteristics of the network formed by these three key actor groups is what conditions organised knowledge production, economic wealth creation as well as development control ("reflexive overlay") in urban regions (Leydesdorff & Deakin 2011, 56). The triple-helix is thus understood as a selection environment for knowledge creation and innovation, ushering in place-based strategies to exploit local creativity and social capital to achieve a "new urban vitality" i.e. growth (Lombardi et al. 2012, 16). Particular attention is therefore paid to the design of interactions between industry and university with a view to knowledge generation, between university and government regarding mutual learning, and between government and industry for creating market affine institutions (Lombardi et al. 2012, 8). In this, ICT is attributed a crucial importance mainly because it can configure and intensify such interactions e.g. through corresponding knowledge management and exchange platforms.

While the triple-helix model is formally conceived of as an analytical device to measure and compare the degree of 'smartness' cities have achieved, it equally aspires to outline a framework for action (Caragliu et al. 2011, 77). For instance, arguing strictly against "entrepreneurship-based" and "market-dependent" approaches, Leydesdorff and Deakin suggest that these should be "replaced with a learning organisation of policy makers, academic leaders and corporate strategists" (2011, 59). This particular alliance is stipulated to form a new kind of governance blueprint for steering 'smart' urban development, emphasising reflexive arrangements to generate and exploit intellectual capital. Yet, whether such elitist and corporatist coalitions do reflect the demanded "cultural reconstruction at the bottom" (ibid. 57) certainly depends on where that 'bottom' line is drawn. In practice, they are unlikely to be less biased by the respective motives and resources of the parties involved than the 'entrepreneurial city' or 'urban growth coalitions' criticized (cf. Hall & Hubbard 1996; Harding 1991). Hence, if informed by the triple-helix model, urban planning and policy making runs the risk of reifying the kind of neo-liberal distorsions it (hopefully) wants to avoid. And while the model implicitly assumes that by focusing on ICT-enhanced knowledge production, creativity and learning, cities could simply "grow smarter", doubts remain regarding its capacity to resolve fundamental

goal conflicts in urban development, ensure representation and legitimacy, and thus direct urban innovations towards sustainability.

3.2.2 Designing service incubators: Open innovation ecosystems

While the triple-helix addresses the creation of an urban-regional governance framework and practices that enable smart growth, open innovation ecosystems focus on the concrete identification and design of new products, services or infrastructures at the scale of real-life settings. They draw on a variety of concepts and approaches developed in business and information system studies such as 'open innovation', 'lead-user involvement', 'crowdsourcing' or 'participatory design' (cf. von Hippel 1986; Asaro 2000; Chesbrough 2003). In addition to the interaction environment itself, such ecosystems also encompass the required technologies and infrastructures, partners providing specific expertises, as well as a supporting organization and methodologies for iterative co-creation and learning. They build on a partnership among businesses, government and academia, while also involving citizens and civil society stakeholders in as far as they represent certain end-user groups. Typically, the design process then runs through several loops of needs analysis, system design and evaluation, oriented at the overall principles of "openness" (include new users), "realism" (focus on real users in real-life situations) and "empowerment" (motivate and engage users) (Bergvall-Kareborn & Stahlbröst 2009). At present, already a large number of examples for such open innovation ecosystems can be found in cities around the globe, addressing a variety of domains and applications (e.g. e-government, health, mobility, energy-efficiency, tourism - cf. ENoLL 2012; LivingLabs Global 2012).

Regardless whether the approach as such actually succeeds in creating innovative services that are meaningful for those users involved, and in developing a business cases for durable operation, it is clear that the focus on particular needs or opportunities has to be rather narrow from the outset. Hence, open innovation ecosystems such as living labs (Folstad 2008) or 'communities of practice' (Deakin et al. 2011) are only able to deliver innovations for objectives selected beforehand on the basis of the partnership arranged – they do not perform such selection themselves. The very creation of a living lab depends on the initiative of interested stakeholders interacting in an urban-regional selection environment, thus shaping their configuration and orientation. Moreover, there are further filters in place that format such open innovation ecosystems. For instance, a strong technology push from industry currently favours the creation of urban living labs around future internet applications (Pallot et al. 2011). Also, regarding the users involved it appears to be difficult to avoid domination by technically mature and curious people who seek to actively influence societal developments (Bergvall-Kareborn & Stahlbröst 2009, 367). In addition, with a view to "realism" as a principle the focus on products or services and taking selected end-user needs as a starting point, more systemic innovations cannot be addressed as such. This implies that despite a strong emphasis on openness, user involvement and empowerment, open innovation ecosystems remain rather limited in their scope, remit and aspirations. Ironically enough, the lack of a coherent typology or evaluation framework for open innovation ecosystems currently impedes learning from the plethora of experiments performed worldwide. It is therefore difficult to empirically assess even basic relations between innovation subjects, actor constellations, methods and outcomes.

4 SMART CITY DISCOURSE FORMATION AND LABELLING PRACTICE

As discussed above, researchers from a wide range of disciplines have contributed to gradually shape a scientific conception of 'smart cities' over the past decade, including a distinctive raison d'être and particular modes of implementation. Yet, rather than providing a framework for critical analysis, the key motive for this has been to establish the evidence basis for a growth-oriented and technology-driven policy agenda. As Allwinckle and Cruickshank argue for the selection of papers they discuss (2011, 9), research now appears to "offer a language, a syntax, and a vocabulary by which to understand the emerging policy debate on smart cities." Apparently, this perspective omits precisely the crucial role that policy and practice themselves have played in the production and reproduction of 'smart city' concepts - which renders the suggested analytical devices rather short-sighted. To explore such relationships we thus need to acknowledge for the contributions of other societal actors more explicitly and in an intertextual perspective.

Regarding the role of industry, it is the large IT and telecom corporations that figure in a prominent position here. Already in 1995 the Intelligent Communities Forum (ICF) was set up by the World Teleport

Association (WTA), an organisation of satellite communication industries and businesses. As the organisation's name indicates, it is urban areas that were quickly identified to offer a crucial market development and growth potential for ICT products and services. Today the ICF forms a network also including about 90 local authorities. It conducts studies, disseminates results and grants an annual community award. Since 2006, a preselected group of 21 candidate authorities to this award is promoted under the label of "Smart21". The ICF posits that intelligent communities "are those which have [...] come to understand the enormous challenges of the Broadband Economy, and have taken conscious steps to create an economy capable of prospering in it." (ICF 2011). Correspondingly, broadband connectivity, knowledge workforce, innovation, digital inclusion and marketing are identified as the key factors for assessing progress on this path. Emphasis is put on collaboration "among government, businesses, universities and institutions", as well as on leadership and sustainability - although the latter refers essentially to durable service provision and business models (ICF 2011).

A qualiatively different message has then been launched by the Global e-Sustainability Initiative (GeSI), another influential network formed in 2001, bringing together the largest IT and telecom companies worldwide in partnership with NGOs as well as the UN Environment Program. GeSI declares to promote "products, services and access to ICT for the benefit of human development and sustainable development" (GeSI 2011). In 2008, GeSI commissioned the "Smart2020" study that has raised much interest. This study has attempted for the first time to quantify the global CO2 emission reduction potential of ICT usage, while also discussing the growth of ICTs own carbon footprint (The Climate Group 2008). The principal reduction potential was identified in the application domains of logistics, buildings, electricity grids, motor systems and dematerialisation. In particular, the study highlights the key role of urban areas since this is where the above domains converge, as well as the need for closer cooperations between industry and (local) government for implementing measures. Consequently, a "Smart2020" initiative was kicked off as a follow up on this study, promoting pilot and transfer projects in this field (The Climate Group 2012)

This specifically urban focus of ICT deployment linked to grand environmental challenges has increasingly been taken up by various major solution providers. For instance, Cisco Systems' "Connected Urban Development" initiative pursues "a future where the intelligent use of networking architectures can transform society not only by boosting productivity and spurring economic growth, but also by supporting environmental sustainability and enhancing the quality of life in urban environments" (Cisco 2012). Concretely, it addresses four application domains (work, mobility, energy and buildings) and is realised in partnership with cities from across multiple countries. In 2010, IBM launched its "Smarter Cities Challenge", offering a total of $50 million support for 100 cities worldwide, selected through a competition until 2013. The nominees need to cover a certain range of ICT applications in city management, infrastructure and human services (IBM 2012). Also Siemens has jumped the train, now promoting its products and services under the umbrella of "Sustainable Urban Development". The company has also published a "Green City Index" that ranks 30 European cities according to their performance in selected domains (CO2, energy, transport, buildings, water, waste and land use, air quality, environmental governance) (Siemens 2009).

While slightly differing in their scope, the core narrative of these industry-driven initiatives and networks seems clear: In order to maintain competitiveness and be able to respond to the grand environmental challenges, a turn towards networked urban ICT solutions is inevitable i.e. "cities must become smarter" (IBM 2012). Seeking to align with (local) government policy priorities in terms of energy efficiency and climate change mitigation, a supply-driven conception of smart cities thus emerges. It is promoted through global marketing campaigns, including instruments of city competition as well as tools for city self-assessment and benchmarking. But while considerable verbal pressure is put on urban decision makers to create 'smart' programs, a consistent conceptual frame for these is not suggested. Application domains vary simply depending on the respective company's product portfolio, and issues concerning the local process of 'smart' development are hardly addressed at all. The only constituent element necessary to drive implementation seems to be the kind of alliance demanded by the triple-helix model.

In Europe, this emphasis on urban ICT applications for both economic development and as a response to environmental challenges is equally what underpins recent government initiatives concerning smart cities. In particular the European Commission is leading the way in this matter, given the maturity of its initiatives and also due to English communication practice contributing to adjust terminology across member states. Two complementary EC initatives shall be highlighted here as they capture the prevailing ideas and objectives

ISBN: 978-3-9503110-2-0 (CD-ROM); ISBN: 978-3-9503110-3-7 (Print)
Editors: Manfred SCHRENK, Vasily V. POPOVICH, Peter ZEILE, Pietro ELISEI

linked to 'smart cities' at this level. Since 2009, the EC supports a large number of 'smart city' pilot projects demonstrating future internet applications through its "ICT Policy Support Program" (EC 2012a). As cities are free to address the local policy domain and goals they choose, this funding strand is guided only by particular technologies (i.e. future internet – each call also addresses selected technologies e.g. RFID, mobile LTE) and a certain partnership and development model (open innovation ecosystems). In 2011, the EC has additionally launched a major "Smart Cities and Communities Initiative" through its 7th Research Framework Program, supporting R&D projects that address the use of ICT for energy efficiency and climate change mitigation (EC 2012b). Here, the core aims are derived from environmental policy goals, but the means to achieve them are predefined as large-scale urban ICT deployment in the energy, transport and building domains. Cities are thus required to form networks and partnerships with industry and research in order to be able to benefit from EC funding. This not only illustrates how EC policy increasingly points towards urban ICT deployment as a key solution to resolve environmental problems and foster competitiveness. It equally underlines that this turn towards the 'smart city' is accompanied by particular approaches for implementation at the local level, contributing both conceptually and resourcewise to underpin the alleged synergetic coalitions to govern urban change.

Ultimately, the decisive pull for the 'smart city' discourse to thrive had to come from cities themselves. In fact, the number of cities adopting policies that target 'smart' development has been growing fast, without necessarily referring to a shared understanding of this concept. In his review of practical examples from around the globe, Hollands (2008) underlines that at the core of the 'smart city' label used by local authorities lies a focus on networked infrastructures and ICT in particular as an instrument for urban development and for improving the economic, social and cultural condition of cities in a global marketplace. Furthermore, he identifies four distinctive features of such policies 1) Market-led development, granting businesses, research organisations and technology providers a prominent place in the design of new governance arrangements; 2) High-tech and creative industries, following concepts of the 'learning region' and 'creative city' (Florida 1995; 2003; Landry 2000); 3) Learning, education and social capital, to enable the local workforce to be part of the 'knowledge economy', and to develop e-government applications for local communities to "learn how to learn" (Coe et al. 2001, 13); and 4) Social and environmental sustainability, maintaining that ICT can make important contributions to address issues of social inclusion, ressource consumption and emission reduction. Considering the recent wave of EC-funded smart city projects in Europe, an update of this spectrum may well reflect a shift in emphasis here from creativity and learning towards global environmental challenges, thus echoing the more recent initiatives from ICT industries.

Most importantly, while the above seems to depict a certain spectrum of objectives and approaches, Hollands emphasises that "not all the elements mentioned here have equal weighting in the labelling process" (2008, 310). He criticises that, behind the self-congratulatory rethoric of cities claiming to be or become 'smart', there is an underlying agenda that matters when it comes to implementation: In the absence of a widely recognised definition of what it means to become a 'smart city' and without any effective mechanisms to balance community, government and business goals, 'smart city' policies in practice thus tend to foster a particular kind of urban entrepreneurialism, seeking to strengthen hard and soft location factors (Hollands 2008, 304). In this context, what falls especially short of consideration are not only the wider implications of ICT for social, cultural and political development in cities e.g. regarding participation, transparency, social inclusion or spatial segregation. Also in environmental terms the almost exclusive focus on selected grand challenges deflects from a range of urban environmental issues that escape the logic of energy and carbon reduction actions, partly or entirely, such as ecosystem service provision, environmental risk management, climate change adaptation or biodiversity maintenance.

5 CONCLUSIONS: DECONSTRUCTING SMART CITIES

This paper has presented an intertextual reading of current contributions to a broad societal discourse referring to the development of 'smart cities'. The starting point has been the recognition of a number of driving factors and pressures that contribute to defining a distinctive issue called 'smart city', placing it high on the agenda of research, policy and practice. This includes especially the imminent grand environmental challenges, pointing towards cities and urban areas as a key to address them; the convergence between information and communication technologies and between major industry branches, enabling increasingly

mobile and networked ICT while also opening up new growth markets for multinational corporations; and finally the diffusion and adoption of ICT applications in urban society, linked to a widening range of social practices. This context has provided a fertile ground on which the current discourse around 'smart cities' has been able to grow dynamically - and with a good prospect for further expansion in the years to come.

To initiate a fruitful deconstruction of this dominant discourse, the focus has been twofold: On the one hand, scientific conceptions of 'smart cities' and related research agendas have been reviewed in order to capture the various genuine knowledge sources upon which 'smart city' claims are built and justified. On the other hand, the propositions and initiatives devised by key industry players, the European Commission and cities have been discussed with a view to the respective motives linked to 'smart cities' and the mechanisms in place for practical realisation, affecting resource availability, partnerships and institutional arrangements.

By juxtaposing the above components it appeared that at the surface, the narrative of the 'smart city' is addressing the broad deployment of advanced ICT applications potentially affecting a wide array of urban sustainability issues. It evokes a picture of urban areas and activities highly networked through infrastructures and devices to enable more efficient operations and informed decision making in key domains – energy, mobility, buildings, governance – while enhancing the attractiveness and competitiveness of the location. It is this everlasting promise of technology as a key to resolve pressing societal problems that constitutes the ultimate vision of the 'smart city'. And it is this vision that results to be sufficiently attractive and convincing for public and private actors across scales, capable of mediating between their interests.

Nevertheless, even though the 'smart city' operates as a floating signifier that paves the way for broad implementation coalitions, it may not necessarily be an empty one. Looking at its trajectory in scientific work, industry initiatives and policy design, there is an underlying agenda which results to be be far more narrow but at the same time well equipped with the means required for enhanced realisation: 'Smart cities' have to respond by priority to the imperatives of economic competitiveness and global environmental change. To achieve the related policy goals, they must turn to ICT deployment as a key policy instrument, valued exclusively for its expected positive contribution. Further, to foster implementation 'smart cities' are required to push for veritable innovation systems through triple-helix alliances that select application fields and enable implementation, using open innovation ecosystems for creating new products and services.

While necessarily simplifying, this synthesis illustrates that the current 'smart city' discourse may in fact imply a less visible but ultimately heavy burden for cities, their stakeholders and citizens. At a time where urban areas are facing complex uncertainties and struggle to become more sustainable and resilient, it promotes a rather particular and uniform development pathway that in fact tends to marginalise complementary objectives, alternative approaches, as well as likely negative effects. It equally raises doubts whether or how the supply-driven logic promoting specific application fields and technology solutions can be overcome, which represents a major risk of creating lock-in situations and preventing more systemic and radical urban change. Furthermore, with a view to the specific design of the related governance structures and practices, 'smart cities' inherently suffer from a limited capacity to deal with contradictory goals and broader sustainability issues. As a result, they equally lack a proper legitimacy that could firmly root them in the wider context of urban development and its challenges.

This immediately raises the question of how cities could possibly escape such formatting of their activities? Strategies are needed that allow to leave the trodden path of 'smart city' development in order to effectively balance objectives in terms of local and global sustainability, and create novel justifications for integrated urban and ICT development practices. To start with, this requires placing the different options and implications of urban ICT usage next to other policies and measures. It implies to open up 'smart city' development to citizen and stakeholder deliberation, developing a shared understanding of problems and risks and contributing to the co-creation of local visions. It demands to conceive of this as an integral part of a much broader governance system designed for instigating urban change. Such a collective deconstruction of 'smart cities' seems necessary in order to respond to place-specific conditions and requirements, considering e.g. different world regions, contexts of growth or shrinkage, or diverging sustainability levels, and therefore to equilibrate the 'smart city' agenda in terms of actor coalitions and policies devised. In particular, to transcend current mainstream thinking also requires to acknowledge for diverging interpretations of 'smart cities' more explicitly. Faint signs of these have started to emerge already in dispersed arenas, focusing e.g. on social and institutional conditions for learning and innovation processes in

ISBN: 978-3-9503110-2-0 (CD-ROM); ISBN: 978-3-9503110-3-7 (Print)
Editors: Manfred SCHRENK, Vasily V. POPOVICH, Peter ZEILE, Pietro ELISEI

cities (Campbell 2012), on "green" technologies for improved environmental performance (Ercoskun 2011), or on urban ecosystem services and sufficiency (Lim & Liu 2010). Another good example is the Californian "Smart Communities Network", which displays a rather different notion of city 'smartness', essentially providing examples, guidance and tools for practitioners to develop local urban sustainability projects (NCAT 2012). Seemingly, this suggests a very different definition of a 'smart city' that may in fact help to recalibrate ongoing efforts in this direction: A 'smart' city is a city that knows how to become sustainable and resilient – which will most probably imply, but not depend on, the usage of advanced ICT.

6 BIBLIOGRAPHY

Allwinkle, S. & Cruickshank, P., 2011. Creating Smart-er Cities: An Overview. Journal of Urban Technology, 18(2), pp.1-16. Special Issue

Asaro, P., 2000. Transforming society by transforming technology: the science and politics of participatory design. Accounting, Management and Information Technologies, 10(4), pp.257-290.

Aurigi, A., 2005. Making the digital city: The early shaping of urban Internet space, Aldershot: Ashgate.

Bergvall-Kareborn, B. & Stahlbröst, A., 2009. Living Lab: An open and citizen-centric approach. International Journal of Innovation and Regional Development, 1(4), pp.356-370.

Campbell, T., 2012. Beyond smart cities: how cities network, learn and innovate, Abingdon: Earthscan.

Caragliu, A., del Bo, C. & Nijkamp, P., 2011. Smart Cities in Europe. Journal of Urban Technology, 18(2), pp.65-82.

Castells, M., 2000. The rise of the network society, Oxford: Blackwell Publishers.

Chesbrough, H., 2003. Open innovation: The new imperative for creating and profiting from technology, Boston Mass.: Harvard Business School Press.

Cisco 2012. Connected Urban Development Initiative. http://www.connectedurbandevelopment.org/ Accessed on 15.1.2012.

Coe, A., Paquet, G. & Roy, J., 2001. E-Governance and Smart Communities: A Social Learning Challenge. Social Science Computer Review, 19(1), pp.80-93.

Cooke, P. & Morgan, K., 1993. The network paradigm: new departures in corporate and regional development. Environment and Planning D: Society and Space, 11(5), pp.543-564.

Deakin, M. 2011. ed. Creating Smart-er Cities. Journal of Urban Technology, 18(2), special issue guest edited by M. Deakin.

Deakin, M., Lombardi, P. & Cooper, I., 2011. The IntelCities Community of Practice: The Capacity-Building, Co-Design, Evaluation, and Monitoring of E-Government Services. Journal of Urban Technology, 18(2), pp.17-38.

Derrida, J. 1983. The time of a thesis: punctuations. In A. Montefiore, ed. Philosophy in France today. Cambridge: Cambridge University Press.

Derrida, J. 1998. Of grammatology. Baltimore: Johns Hopkins Univ Press.

EC. 2012a. European Commission. ICT Policy Support Programme. http://ec.europa.eu/cip/ict-psp/index_en.htm/ Accessed on 21.1.2012.

EC. 2012a. European Commission. Smart cities and communities initiative. http://ec.europa.eu/energy/technology/initiatives/smart_cities_en.htm/ Accessed on 21.1.2012.

Eger, J.M. & Becker, A.M., 2000. Telecommunications and Municipal Utilities: Cooperation and Competition in the new Economy, Washington D.C.: American Public Power Association.

Ellison, N., Burrows, R. & Parker, S., 2007. Special issue: Urban Informatics - Software, Cities and the New Cartographies of Knowing Capitalism. Editorial comment. Information, Communication & Society, 10(6), pp.785-788.

EnoLL 2012. European Network of Living Labs. http://www.openlivinglabs.eu/ Accessed on 1.3.2012.

Ercoskun, O.Y. ed., 2011. Green and Ecological Technologies for Urban Planning, IGI Global.

Feenberg, A., 1990. The ambivalence of technology. Sociological Perspectives, 33(1), pp.35-50.

Florida, R., 2003. Cities and the creative class. City & Community, 2(1), pp.3-19.

Florida, R., 1995. Toward the learning region. Futures, 27(5), pp.527–536.

Folstad, A., 2008. Living Labs for innovation and development of information and communication technology: A literature review. The Electronic Journal for Virtual Organizations and Networks, (10).

Foth, M., 2009. Handbook of research on urban informatics: The practice and promise of the real-time city, Hershey PA: Information Science Reference.

Giffinger, R. et al., 2007. Smart cities - Ranking of European medium-sized cities, Wien. http://www.smart-cities.eu/download/smart_cities_final_report.pdf. Accessed on 11.5.2011.

Graham, S., 2004. The cybercities reader, London: Routledge.

Graham, S. & Marvin, S., 2001. Splintering urbanism: networked infrastructures, technological mobilities and the urban condition, London: Routledge.

Graham, S. & Marvin, S., 1996. Telecommunications and the city: Electronic spaces, urban places, London: Routledge.

Hajer, M. & Versteeg, W., 2005. A decade of discourse analysis of environmental politics: Achievements, challenges, perspectives. Journal of Environmental Policy & Planning, 7, pp.175-184.

Hall, T. & Hubbard, P., 1996. The entrepreneurial city: new urban politics, new urban geographies? Progress in Human Geography, 20(2), pp.153-174.

Harding, A., 1991. The rise of urban growth coalitions, UK-style? Environment and Planning C: Government and Policy, 9(3), pp.295-317.

Harvey, D., 2010. The enigma of capital and the crises of capitalism, London / New York: Oxford University Press.

von Hippel, E., 1986. Lead user: A source of novel product concepts. Management Science, 32(7), pp.791-805.

Hollands, R., 2008. Will the real smart city please stand up? City, 12(3), pp.303-320.

IBM. 2012. Smarter Cities Challenge. http://smartercitieschallenge.org/ Accessed on 1.3.2012.

ICF. 2011. Intelligent Community Forum. http://www.intelligentcommunity.org/ Accessed on 21.1.2012.

Ishida, T. & Isbister, K. eds., 2000. Digital cities: technologies, experiences, and future perspectives, Berlin / New York: Springer.

Koizumi, S. & van den Besselaar, P. eds., 2005. Digital Cities III: Information Technologies for Social Capital - Cross-cultural Perspectives, New York: Springer-Verlag Berlin/Heidelberg.
Komninos, N., 2008. Intelligent cities and globalisation of innovation networks, London / New York: Routledge.
Komninos, N., 2002. Intelligent cities: innovation, knowledge systems, and digital spaces.
Komninos, N., 2009a. Intelligent cities: towards interactive and global innovation environments. International Journal of Innovation and Regional Development, 1(4), pp.337-354.
Komninos, N., 2009b. Introduction (Special Issue on Intelligent Clusters, Communities and Cities: Enhancing Innovation with Virtual Environments and Embedded Systems). International Journal of Innovation and Regional Development, 1(4), pp.335-336.
Komninos, N., 2006. The architecture of intelligent cities: integrating human, collective and artificial intelligence to enhance knowledge and innovation. In IEE, pp. v1-13.
Komninos, N., Schaffers, H. & Pallot, M., 2011. Developing a Policy Roadmap for Smart Cities and the Future Internet. In P. Cunningham & M. Cunningham, eds. eChallenges e-2011 Conference Proceedings. eChallenges. Florence: IIMC International Information Management Corporation.
Landry, C., 2000. The creative city a toolkit for urban innovators, Near Stroud / London: Comedia / Earthscan.
Leydesdorff, L. & Deakin, M., 2011. The Triple-Helix Model of Smart Cities: A Neo-Evolutionary Perspective. Journal of Urban Technology, 18(2), pp.53-63.
Lim, C.J. & Liu, E., 2010. Smart-cities and Eco-warriors, Abingdon: Routledge.
LivingLabs Global. 2012. http://www.livinglabs-global.com/ Accessed on 1.3.2012.
Lombardi, P. et al., 2012. An Advanced Triple-Helix Network Model for Smart Cities Performance. In Ercoskun (2011): Green and Ecological Technologies for Urban Planning.
Lundvall, B.-A., 1985. Product Innovation and User-Producer Interaction, Aalborg: Aalborg University.
Lundvall, B.-A. & Johnson, B., 1994. The Learning Economy. Journal of Industry Studies, 1(2), pp.23-42.
Majer, H., 2007. Happy new times: Sustainability as a problem-solving concept. In Wiedervorlage dringend□: Ansätze für eine Ökonomie der Nachhaltigkeit. München: Oekom, pp. 238-253.
Mitchell, W., 1996. City of bits: space, place, and the infobahn 1st ed., Cambridge: MIT Press.
Mitchell, W., 2000. E-topia, Cambridge: MIT Press.
Morgan, K., 1997. The Learning Region: Institutions, Innovation and Regional Renewal. Regional Studies, 31(5), pp.491-503.
Moulaert, F. & Sekia, F., 2003. Territorial Innovation Models: A Critical Survey. Regional Studies, 37(3), pp.289-302.
NCAT. 2012. National Center for Appropriate Technology. http://www.ncat.org/ Accessed on 15.1.2012.
Negroponte, N., 1996. Being digital 1st ed., New York: Vintage Books.
Nielsen, K.A. et al. eds., 2010. A new agenda for sustainability, Farnham / Burlington: Ashgate.
Pallot, M. et al., 2011. Developing a Policy Roadmap for Smart Cities and the Future Internet. In P. Cunningham & M. Cunningham, eds. eChallenges e-2011 Conference Proceedings. eChallenges. Florence: IIMC International Information Management Corporation.
Rutherford, J., 2011. Rethinking the Relational Socio-Technical Materialities of Cities and ICTs. Journal of Urban Technology, 18(1), pp.21-33.
Sassen, S., 2001. The global city: London, New York , Tokyo, Princeton: Princeton University Press.
Shinn, T., 2002. The Triple Helix and New Production of Knowledge: Prepackaged Thinking on Science and Technology. Social Studies of Science, 32(4), pp.599-614.
Siemens, 2009. European Green City Index Assessing the environmental impact of Europe's major cities, München: Siemens AG.
Smart Communities. 2011. http://www.smartcommunities.org/ Accessed on 28.12.2011.
Smart Communities Network. 2012. http://www.smartcommunities.ncat.org/ Accessed on 15.1.2012.
Stern, N.H., 2007. The economics of climate change. The Stern Review, Cambridge: Cambridge University Press.
Tanabe, M., van den Besselaar, P. & Ishida, T. eds., 2002. Digital cities II: computational and sociological approaches, Berlin: Springer.
The Climate Group, 2008. SMART 2020: Enabling the low carbon economy in the information age, London.
The Climate Group. 2012. http://www.smart2020.org/ Accessed on 15.1.2012.
Wikipedia. 2012. Smart city entry. http://en.wikipedia.org/wiki/Smart_city. Accessed on 1.3.2012