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## Smart and sustainable cities?

### pipedreams, practicalities and possibilities

Evans, James; Karvonen, Andrew; Luque-Ayala, Andres; Martin, Chris; McCormick, Kes; Raven, Rob; Voytenko Palgan, Yuliya

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LUND UNIVERSITY

PO Box 117  
221 00 Lund  
+46 46-222 00 00

# Special Issue Introduction

## *Smart and Sustainable Cities?*

### *Pipedreams, Practicalities and Possibilities*

James Evans, Andrew Karvonen, Andres Luque-Ayala, Chris Martin,  
Kes McCormick, Rob Raven and Yuliya Voytenko Palgan

#### **1. Introduction**

Smart cities promise to generate economic, social and environmental value through the seamless connection of urban services and infrastructure by digital technologies (Hollands 2008, Viitanen and Kingston 2014), but there is scant evidence concerning their ability to enhance social well-being, build just and equitable communities, reduce resource consumption and waste generation, improve environmental quality or lower carbon emissions (Cavada *et al.* 2015). This special issue addresses the gap between the pipedream and the practice of smart cities, focusing on the social and environmental dimensions of real smart city initiatives, and the possibilities that they hold for creating more equitable and progressive cities. We argue that social equity and environmental sustainability are neither a-priori absent nor de-facto present in technological designs of smart city initiatives, but have to be made, nurtured and maintained as they materialise in particular places. This is the ‘possibility’ alluded to in our title, and where the focus of the Special Issue on the gap between the pipedreams and practicalities of smart cities leads. In this introduction we unpack this argument in greater detail and situate our six contributions within it.

Smart cities promise nothing less than an urban utopia for the 21<sup>st</sup> century (Datta 2015). Stoked by estimates of a global smart city market worth up to \$1.56 trillion by 2020 (Frost & Sullivan 2014), the concept has risen rapidly to prominence within industry, political and municipal discourses of urban development (Söderström *et al.* 2014). In 2015, de Jong and colleagues predicted that the smart city is ‘on its way to become [the] leading driver of urban sustainability and regeneration initiatives’ (p. 12). In the European Union, digital innovations now underpin the majority of urban sustainability funding, with the creation of smart cities commonly positioned as a vehicle to deliver urban sustainability and economic growth (European Parliament 2014). Across Africa, South Asia, North America and the Far East, national governments, municipalities and private companies are allocating considerable resources to develop digital innovations which they claim will promote a vibrant entrepreneurship culture in cities, advance more equitable and just community development through increased citizen participation, and solve a range of sustainability issues such as climate change.

The smart city pipedream diverges from other urban utopias in three quite distinctive ways. First, smart cities occupy mainstream policy and thinking, unlike the utopian settlements of the 19<sup>th</sup> century that were by definition counter cultural and limited to progressive colonial movements and the model villages of industrial philanthropists. Second, the smart city utopia reflects a close union between national government and private industry interests. The Corbuserian dream of towers in the countryside that inspired much post-war building in both the East and West in the 20<sup>th</sup> century was driven by government rather than industry. These government-led programmes underpinned the emergence of the welfare and communist states while today’s smart city visions are based firmly on entrepreneurialism and profit-seeking public-private partnerships. Finally, while previous urban utopias were inspired by explicit

political and social goals, smart cities foreground economic development as the main driver to realise future cities (Haarstad 2016).

These differences are significant when we start to think about the power of digital technologies to make cities more sustainable. The idea of smart and sustainable cities promises to use digital technologies to make infrastructure services more efficient and reactive to user behaviour, lower resource consumption, increase environmental quality, and cut down on carbon emissions. It is this alleged convergence of ‘smartness’ with urban sustainability that provides the starting point for this special issue. While the rise of the smart city approach places digital innovation, the digital economy and urban growth at the centre of efforts to create sustainable cities (Viitanen and Kingston 2014), the ability of smart technology to deliver social and environmental sustainability remains little more than an article of faith.

One need not look far to find a series of underlying tensions between the logics of the smart city and sustainable urban development (Martin *et al.* 2018, Marvin *et al.* 2019). Some contradictions are so great they have inspired active resistance against the smart city dream (Greenfield 2013). For example, smart urban development tends to reinforce neoliberal economic growth and consumerist culture (Vanolo 2014), focusing on more affluent populations who are able to access private services like Uber and Airbnb. Smartness reframes urban sustainability challenges as market opportunities for corporations to sell digital solutions (Viitanen and Kingston 2014). This has implications for how we conceptualise urban sustainability. For example, the challenge of providing clean energy to large urban populations becomes a question of providing smart meters, deploying smart grids and managing them using some form of digital urban operating system rather than developing

new forms of community energy provision or use (see Britton in this issue); the challenge of managing urban waste is reframed as a matter of optimising urban logistical flows through algorithmic calculation (i.e. the optimization of waste collection routes) rather than considering issues of resource consumption. These tendencies mean that smart cities risk marginalising citizens, prioritising end-of-pipe solutions, and driving further economic development that runs counter to stated environmental or social objectives.

This special issue brings together an interdisciplinary collection of articles to present a detailed empirical analysis of how smart city approaches are reshaping the social and environmental dimensions of sustainable urban development on the ground. There is a shared focus on how the contradictions between sustainability and digital urbanism are being negotiated in practice. The motivations for the special issue are twofold. First, the issue responds to a genuine trend within both government and corporate smart city discourse towards collapsing smart and sustainability narratives, a move that is often heralded through the inclusion of citizens and communities as key stakeholders within the making of ‘smart’ plans and initiatives. The second motivation is a response to the lack of detailed studies on how smart initiatives are unfolding on the ground, particularly through a focused consideration of issues of social and environmental sustainability. Rather than remaining fixated on the endless iterations of technological triumphalism found in strategy documents and corporate brochures, there is a growing need to understand how the smart city discourse is actually landing in and transforming ordinary cities and communities (Luque-Ayala and Marvin, 2015; Shelton *et al.* 2015, Wiig and Wyly 2016, Karvonen *et al.* 2019).

Of particular interest is how smart cities are influencing social issues of equity, justice, citizen participation, health and wellbeing. Identifying and assessing the deficits and

potentialities of different forms of smart and sustainable urban development to address social and environmental challenges is the first step in providing an evidence base for alternative and potentially more progressive approaches to smart city development at local levels (Glasmeier and Christopherson 2015, Glasmeier and Neibolo 2016). For example, digital technologies present significant potential to improve access to basic services like water and fuel in informal settlements — a move that would free up time for education and work, enhance safety and health and enrol residents in collaborative modes of governance. Similar arguments can be made concerning the potential of technology to improve social care and facilitate sharing schemes in developed world contexts. The challenge here is that while social impacts are considerable, direct economic benefits of the kind value by government decision-makers are more difficult to capture.

Despite the relative newness of the smart city concept, the contributions of the special issue both acknowledge and interrogate the extent to which conceptualizations and practices of smart city development have changed over time — and continue to do so. An initial technological push version of smart city development (c.f. Luque-Ayala and Marvin 2016; McNeill 2015), characterised as a form of ‘solutionism’ (Morozov 2013) whereby private companies offer municipalities large scale digital solutions, often looking for urban problems to solve, failed to take hold. Meanwhile cash-strapped municipalities, hesitant to part with large amounts of cash for systems that they are neither sure they need nor keen to become locked into, have started to seek alternative mechanisms to procure, adopt and promote digital technologies. An emerging ecosystem of urban digital technologies, often made up of small start-ups and experimental projects, transcended the market space initially created by big players such as IBM, Cisco or Hitachi.

A more recent incarnation of the smart city discourse flips the technological push version of the smart city on its head to start from the needs and requirements of citizens, preferably with citizen involvement (Trencher forthcoming). This version of the smart city aims to improve living standards but requires social awareness from citizens to work (Bhagya *et al.* 2018). A range of tools have emerged to promote citizen involvement, including data platforms and urban living labs, which are intended to empower the public to engage with processes of urban governance via digital technologies (Voytenko *et al.* 2016). The ‘Smart with a Heart’ tagline from the 2018 Nordic Edge Smart City Expo captures this trend toward the people-centred smart city perfectly. Yet, the catch with citizen involvement in practice is that the major players (industry, local government) often lack the resources, time, skills or aspirations to engage people effectively, or only do so in the later stages of innovations when citizens have limited power to shape change (Menny *et al.* 2018). Smart city initiatives that have been genuinely steered through engagement with residents, or advanced alternative or novel notions of urban and economic development, social and political inclusion, or greater environmental stewardship are thin on the ground (Martin *et al.* 2018).

## **2. Contributions to the special issue**

Thrust by public and corporate interests into the front and centre of current urban practice, smart cities are at something of a cross roads. While enjoying something of a ‘moment’ it remains unclear whether they will be a force either for or against sustainability. This special issue emerges from paper sessions at three academic conferences in 2016: the American Association of Geographers (AAG) Annual Meeting in San Francisco, the Royal Geographical Society with the Institute of British Geographers (RGS-IBG), Annual International Conference in London, and the joint meeting of the Society for the Social Study of Science (4S) and the European Association for the Study of Science and Technology

(EASST) in Barcelona. The aim of these sessions was to go beyond the corporate and policy hype that surrounds smart cities to understand what is actually happening on the ground in cities. It reflects an increasing interest in understanding the social and environmental dimensions of smart city developments that engage national and municipal policies and politics in shaping the agenda over time and space, and the role of different forms of smart technology in producing new kinds of social, economic and political relations.

At the outset, we asked what role visions, discourses and practices of smart design and thinking are playing in changing how we imagine a sustainable city will look like, how it will function, and who it will serve. It is commonplace to find smart demonstration projects, districts and experiments in cities around the globe (Voytenko et al. 2016). Increasingly smart sustainable urbanism is synonymous with local, project-driven actions that are intended to demonstrate how smart can deliver sustainability and, on the basis of this, promote the subsequent rolling out, replicating or upscaling of solutions (Evans *et al.* 2016). We ask how these phenomena are reshaping cities and what their implications for urban sustainability are. Which groups of people and organisations are empowered or disempowered by smart approaches to sustainability and with what effects? What types of interests, values, competencies and evidence are being privileged and neglected by smart sustainability? Finally, we are interested in what all this amounts to for cities and their residents. Is there a distinct form of smart sustainable governance emerging and if so what kind of city is it creating?

The six articles in this special issue reveal key dimensions of urban smart-sustainability and their social and environmental implications from a range of different perspectives and in a range of different contexts. The contributions are international, comprising cases from



Germany, Australia, the UK, the USA, Japan, India and China. They are also interdisciplinary, with authors drawing on debates from the fields of Urban Studies, Geography, Environmental Sciences, Political Science, Planning, and Science and Technology Studies. The first three articles focus on local demonstrations of smart technology that are intended to enhance sustainability, and reflect on their social and environmental aspects. The fourth and fifth articles explore ways in which smart-sustainability is being stretched in specific cities, to address public health and resource sharing respectively. The final article zooms out to examine how smart-sustainability is shaping new forms of governance at the national scale in India and China.

In our first contribution, Anthony Levenda investigates a smart grid experimentation and demonstration site in a residential neighbourhood in Austin, Texas. The analysis shows how this urban living lab is a product of Austin's 'technopolis', and interprets this form of smart grid experimentation as a form of governmentality that devolves urban imperatives into individual responsibilities for socio-environmental change. The management of carbon and electricity use through energy efficiency, renewable energy, and conservation is promoted as a form of self-management, wherein households must reconfigure everyday practices and/or adopt new technologies. At the same time, the majority of these interventions are created in a top-down fashion, shaped by technology companies, researchers, and policy-makers. This skews the potential of active co-production, and instead relies on the delegation of responsibility for action to a limited assemblage of smart technologies and smart users.

Heather Lovell picks up this theme through her examination of smart grids in Australia, which highlights both the potential and pitfalls of digitally-enabled green urbanism. Empirical research on two Australian smart grid initiatives – the Smart Grid Smart City

project and the State of Victoria's Advanced Metering Infrastructure Programme – provides key insights into how and why the high-tech data-led intelligence of smart grids has encountered problems at the point of implementation. Conceptually, the article draws on the concept of governmentality to show how the promise of smart grids has not been realised in practice, in large part because new digital technologies have not 'behaved' in the way originally planned. This undermined assumptions that the smart technologies would work to support government programmes and created a failure of governance. The paper shows how greater understanding of and engagement with the people receiving and using these technologies is required in order to realise the societal benefits of smart cities.

In the third article, Jess Britton examines the installation of domestic gas and electricity smart meters across the UK. This state-led initiative is providing an unprecedented volume and granularity of energy consumption data with the aim of achieving ambitious energy efficiency and carbon emission reduction goals. Smart meter programmes typically target individual energy consumers while providing network-wide opportunities for commercial applications. Britton argues that in addition to these two scales, the city scale has the potential to unlock public interest benefits through applications to public policymaking, community energy projects, and fuel poverty campaigns. However, the current arrangements for the access and use of smart meter data present a number of challenges related to complexity, dominance of incumbent actors, data access and uncertainty that become barriers to city-scale actions. There is a need to overcome these barriers to realise the collective benefits of smart-sustainable cities for all of society rather than a select few.

A perennially overlooked objective in both smart and sustainable urban development projects is that of human experience and urban well-being. Can smart, sustainable cities move beyond

narrow ambitions of technological innovation, economic prosperity and reducing environmental impacts to actually facilitate healthier, happier and more fulfilling lifestyles? If so how? And what factors might stand in the way of such a ‘stretched’ smart city agenda? In their article, Gregory Trencher and Andrew Karvonen explore how health and lifestyle goals are being pursued in a Japanese smart city. The Kashiwa-no-ha Smart City in greater Tokyo uses ICT technologies to provide preventative health services for elderly residents whilst implementing various interventions to promote active, socially rich and environmentally aware lifestyles. The analysis reveals how smart technologies can be used to address widespread and relevant problems that are relevant to specific groups of urban residents.

A second important trend in terms of social and environmental applications involves the role of smart cities in facilitating the emergence and diffusion of sharing (McLaren and Agyeman, 2015). European cities, being attuned to the values of fairness, sustainability, and cooperation, are envisaged to catalyse the sharing economy and circumvent its corporatisation. However, there is a lack of knowledge on how cities are bringing smart, sustainable and sharing agendas together. Lucie Zvolska, Matthias Lehner, Yuliya Voytenko Palgan, Oksana Mont and Andrius Plepys explore the role of city governments in advancing sustainability via ICT-enabled sharing, focusing on the case studies of Berlin and London – two ICT-dense cities with clearly articulated smart city agendas and an abundance of sharing platforms. The article provides insights into how city governments in Berlin and London are supporting ICT-enabled sharing platforms, discussing the ways in which these platforms both advance and stand on the way of urban sustainability.

The final article broadens the perspective to look at how smart sustainability varies across different national contexts and how this influences the governance of cities. Johanna Höffken

and Agnes Kneitz give us a glimpse into the current political landscape of India and China, where technological visions of the sustainable city are currently being turned into political and concrete reality through India's Smart City Mission and China's Ecological Civilization. Though there are clear differences in their respective approach to the mutual problem of population growth and social change related to urbanization, both approaches share interesting similarities and allow for a rich transnational comparison. In India under the leadership of Prime Minister Narendra Modi, 100 cities are to be transformed into smart habitats. Meanwhile, Chinese president Xi Jinping modestly aims at transforming its entire society into a green life form, and envisions becoming a global beacon for ecological civilization and citizenship. This article contributes important non-Western perspectives on the politics of participation in the smart-sustainable city. The authors ask what groups of actors participate in negotiating and realizing the eco-smart approaches to urban sustainability, and analyses the way they are doing so. Why are they invested in their national projects of greening themselves in a potentially smart way? How does that reflect back into policy making and is there potential to learn from each other?

### **3. Conclusions: Equity and environment in the smart-sustainable city**

The 21<sup>st</sup> century has been hailed as the urban century, and one in which 'smartness' will shape urban responses to global challenges (McCormick et al. 2013). In the past few years scholars have been trying to understand 'why, how, for whom and with what consequences' the smart city paradigm emerges in different urban contexts (Luque-Ayala and Marvin 2015: 2106). This special issue focuses on how the smart agenda is being combined with notions of sustainable urban development. Both smart and sustainability narratives have been widely critiqued for promoting economic development while giving scant attention to environmental and social concerns. No doubt it is commonplace for proponents of the smart-sustainable city

to put forward a narrow and technocratic perspective that reduces sustainability to a series of ‘technical and economic fixes’ (Bulkeley and Betsill 2005: 58) while obscuring its political implications (Krueger and Gibbs 2007).

At the same time, there are synergies in smart-sustainable cities that either go beyond or could potentially go beyond broadly neoliberal ‘business as usual’. Making urban data widely available, developing a city-scale ‘Internet of Things’ and mobilizing smart and digital technologies has the potential to enhance social well-being, empower communities, reveal previously hidden urban environmental processes, enable resource and skills sharing, include citizens in co-creative governance processes, generate novel solutions to mundane urban problems, and underpin new models for more efficient use of idle assets (see Zvolska et al. in this issue; Menny et al. 2018; McLaren and Agyeman 2015, Martin *et al.* 2018). But this also requires the careful application of ICT technologies to avoid empowering corporate interests within urban visioning and management and further excluding those already marginalised by prevailing technocratic and entrepreneurial forms of urban governance (Vanolo 2014; Söderström et al. 2014; Hollands, 2016). The varieties of smart-sustainable agendas emerging on the ground in hundreds of cities around the world occupy a wide range of positions between (and beyond) these critiques and promises. Social equity and environmental sustainability are not a-priori absent or de-facto present in technological designs of smart city initiatives, but have to be made, nurtured and maintained, as they materialise in particular places.

As a whole, the articles in this collection represent an emerging agenda that has the potential to open up smart-sustainable urban development to a broader coalition of actors and achievements. But for this to happen, city governments, communities, tech-start-ups,

corporates and knowledge institutes need to steer smart urban development to address issues that are relevant to their particular contexts and matters of concern. Smart-sustainable applications need to be aligned with neighbourhood and city scales rather than focus only on individual consumer behaviour and international commercial agendas. If smart is to enable sustainable urban development, this suggests a scalar politics of smart-sustainable cities in which collective agendas and visions have to be constructed around particular issues of social and environmental relevance at the local and city level. Contextual factors such as historical development patterns, cultural norms and practices, and political structures have a significant influence on how smart-sustainable is rolling out and generating momentum in particular places (Raven et al., 2017). In this sense, ‘the relationship between smart technologies and urban environments is therefore recursive, with each serving to transform the other’ (Kong and Woods 2018: 685).

One of the most significant potential implications of the smart-sustainable city is its implications for the knowledge politics of urban development (Hoop et al., 2018; Cowley and Caprotti forthcoming). The articles in this special issue demonstrate how an economically informed (e.g. austerity-led) pursuit of innovation is disrupting traditional modes of governance in positive and negative ways, blindly reifying notions of efficiency and optimization — but also foregrounding the benefits of demonstration, testing, and co-production. This has implications for how cities are steered and by whom. Sensors, digital infrastructures, machine learning, urban dashboards, digital platforms and smart phone apps are changing the ways we get to see and know our cities and, if acted upon, may have far-reaching implications for how (and who) shapes urban change. Rather than simply suggesting a neo-liberal ‘takeover’ of urban governance occurring through the digitalisation of networked infrastructures, the emerging wave of smart urbanism potentially points towards a

post-networked form of urban governance (c.f. Coutard and Rutherford 2016), activated via material, social and political forms of decentralization operating in tandem and with implications that may both narrow as well as open up social and environmental urban sustainability. Ultimately, we as academics must engage with the often messy and frustrating processes of urban development and strategy in order to steer smart city agendas and actions in more progressive directions. If we do not ensure that social and environmental interests have a seat at this table, we will surely find them on the menu.

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