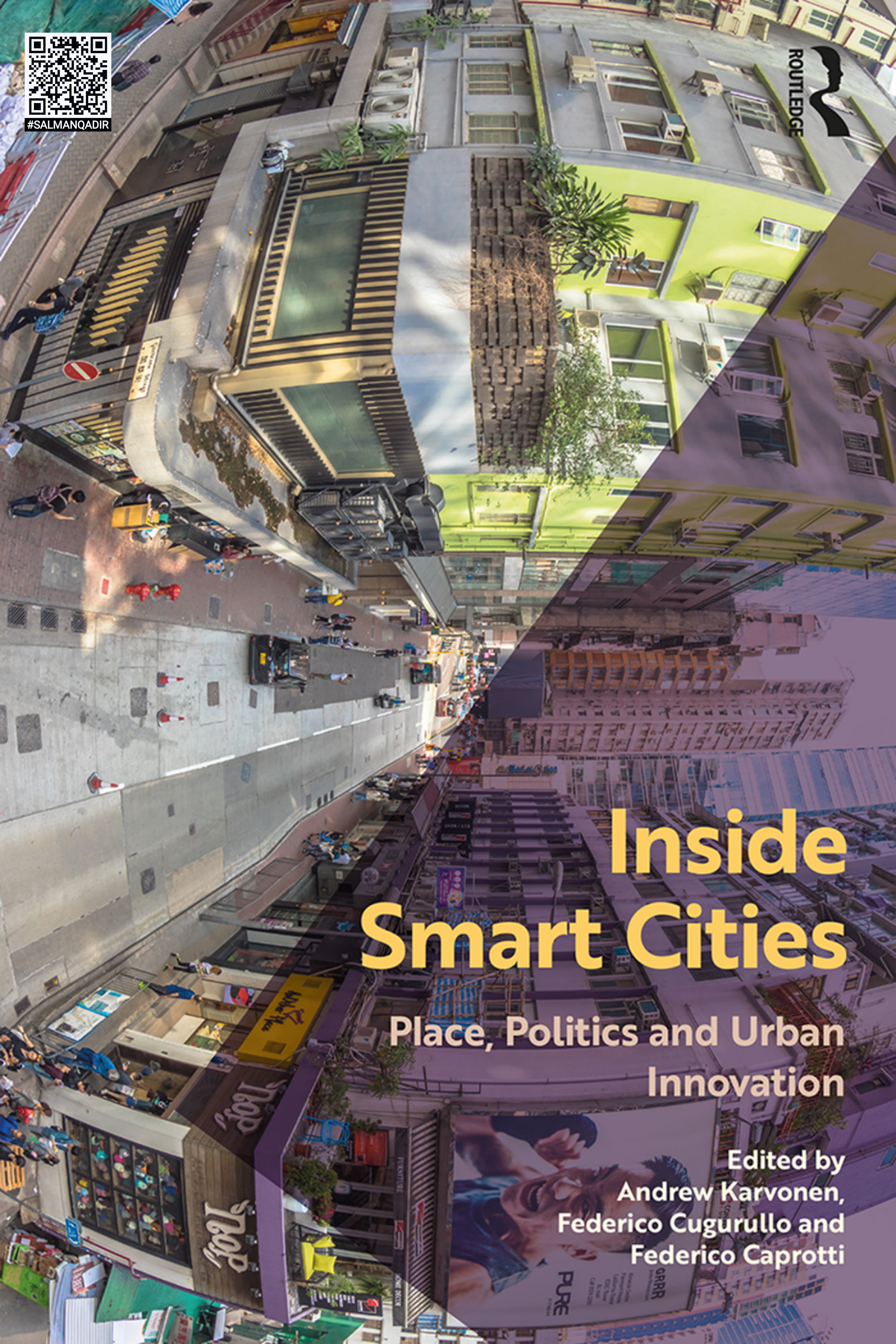

ROUTLEDGE

Inside Smart Cities

Place, Politics and Urban Innovation

Edited by
Andrew Karvonen,
Federico Cugurullo and
Federico Caprotti

INSIDE SMART CITIES

The era of the smart city has arrived. Only a decade ago, the promise of optimising urban services through the widespread application of information and communication technologies was largely a techno-utopian fantasy. Today, smart urbanisation is occurring via urban projects, policies and visions in hundreds of cities around the globe.

Inside Smart Cities provides real-world evidence on how local authorities, small and medium enterprises, corporations, utility providers and civil society groups are creating smart cities at the neighbourhood, city and regional scales. Twenty three empirically detailed case studies from the Global North and South – ranging from Cape Town, Stockholm and Abu Dhabi to Philadelphia, Hong Kong and Santiago – illustrate the multiple and diverse incarnations of smart urbanism. The contributors draw on ideas from urban studies, geography, urban planning, science and technology studies and innovation studies to go beyond the rhetoric of technological innovation and reveal the political, social and physical implications of digitalising the built environment.

Collectively, the practices of smart urbanism raise fundamental questions about the sustainability, liveability and resilience of cities in the future. The findings are relevant to academics, students, practitioners and urban stakeholders who are questioning how urban innovation relates to politics and place.

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INSIDE SMART CITIES

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FOREWORD

Simon Joss

The smart city seems to attract interest and critique in equal measure. It has rapidly evolved into a dominant paradigm of urban development and has become a major branding tool for global cities, and increasingly also a multitude of 'follower' cities and towns. This surge in interest is similarly reflected in the scholarly and policy literature, which has seen an exponential growth in publications making a foray into this fast-growing phenomenon. The accompanying debate, though, reveals a persistent paradox: while the smart city has entered the mainstream policy vocabulary, its meaning remains strangely elusive; and while it is widely embraced by cities, it frequently provokes scepticism among commentators and activists.

That the smart city remains surprisingly difficult to define conceptually and capture practically – hence, inviting critical questioning – has several underlying reasons. First, the term itself is inherently vague (some would argue deliberately so). At its base, it implies a superior state of urban development and urban life. Tellingly, according to the dictionary, the adjective 'smart' denotes, on one hand, being sharp and intelligent and, on the other, being fashionable and exclusive. The smart city thus manages to capture concurrently the technological meaning of the intelligent, digital city and the socio-economic meaning of the regenerated, internationally competitive city. However, beyond this basic, implicit understanding, the term remains characteristically unspecific. What is more, its positive normative stance makes it hard to counter with a negative: after all, who would want to advocate the 'dumb city'? Consequently, the smart city can be, and is being, invested with a broad range of ideas, concepts and discourses. Occasionally, rather absurdly tautological definitions are offered up ('the smart city is a city with a smart economy, smart transport, smart energy, smart people …'). Even the more sceptical voices are compelled, if reluctantly, to engage with the concept in an attempt to infuse it with critical, substantive

meaning. Of course, as floating signifier, the smart city has its strategic and political usefulness, by introducing a seemingly compelling discourse of implied positive transformation without the need to state specifics and discuss implications.

A second reason why the smart city evades easy categorisation relates to its as yet loose anchoring in the urban policy landscape. It is not unusual for smart city initiatives to be spearheaded by economic development agencies or innovation agencies, rather than by traditional planning departments. This contrasts with, for example, the sustainable city or eco city, which have been more closely tied in with traditional planning: the garden city (and later eco city) evolved in concert with town and planning policies; and the sustainable city emerged through the broadly established sustainable development agenda (e.g. internationally UN Habitat, and subnationally Local Agenda 21). For its part, the smart city seems to evolve on the periphery of mainstream planning. Interestingly, the key champions of the smart city agenda on both the international and national stages now include technical standards agencies, such as the International Organization for Standardization (ISO) and its respective national counterparts, which previously had little dealings in urban matters. In short, the smart city does not fit in easily with established urban planning functions: at the policy level, too, it requires new orientation.

A third reason relates to the central premise from which the smart city derives its diverse meanings and functions: the application of digital technology and related big data. In their essence, smart city technologies are both ubiquitous and pervasive – everywhere, and in everything. As such, the smart city may permeate deeply into and across existing urban infrastructures, services and institutions without, however, necessarily being visibly manifest. It may well actualise without being noticed. Consequently, it should not be surprising that locating and capturing the smart city, and rendering it concrete and accountable, has turned out to be so challenging.

There is, then, an important, ongoing task of probing into the smart city; and this has to be accomplished in conceptual terms while at the same time focusing on detailed, context-sensitive description and analysis of emergent local practices. In response, this volume arrives at a timely point and makes an invaluable contribution to this task. It does so in the form of a unique collection of empirical case studies from across global regions, taking in a rich variety of urban types and locales. This is particularly welcome in that it helps move beyond an otherwise often limiting abstract debate and, thus, takes the reader inside the 'actually existing smart city' to explore different approaches to, and experiences of, the place of urban innovation. Both individual case studies and the comparative reading across the diverse exemplars reveal how technological innovation – typically based on universal notions – has to be variously interpreted, negotiated and applied within unique settings. In situating the smart city within specific locales and socio-political contexts, its particular urban character comes to the fore.

This also reveals the complex and often messy and contentious process of aligning and integrating smart city interventions within pre-existing urban

structures and dynamics. From such a grounded perspective, it quickly becomes evident that the smart city is far from the unproblematic, smooth proposition enthusiastically presented in the promotional literature. In turn, it becomes clear that apparent tensions, contradictions and contestations are an integral part of actualising and scrutinising the smart city; and this process should include the possibility of diverging from, and resisting, propagated smart city interventions (even allowing for an 'idiotic', anti-smart stance, as suggested by one contribution in this volume).

This comprehensive collection of case studies provides unprecedented empirical evidence of emergent smart city practices from around the world. The findings, beyond their immediate significance of presenting unique in-depth insights of individual exemplars as well as essential cross-comparative perspectives, have ramifications for future research, too. On one hand, they point to the need for longitudinal analyses of smart city interventions on the ground. This should shed further light on the processes of normalisation as smart city initiatives become increasingly embedded in urban policy and practice; and it should help evaluate the long-term impact of related innovation strategies. On the other, the findings also point to the need for extrapolating from individual insights and learning. While it is essential to understand and analyse the smart city within particular contexts, it is equally important to situate the smart city within wider conceptual debates and advance relevant theoretical and normative perspectives. A grounded approach, as charted in this volume, would seem particularly productive with both these goals in mind. If, as the Introduction to this collection makes the case, every city is gradually becoming a smart city, then the wider implications for contemporary societies are clearly profound, and point to a pressing need for ongoing open debate over our collective expectations for the city and beyond.

1

INTRODUCTION

Situating smart cities

Andrew Karvonen, Federico Cugurullo and Federico Caprotti

Introduction

The era of the smart city has arrived. Only a decade ago, the promise of improving and optimising urban services through the application of information and communication technologies (ICT) was largely a techno-utopian fantasy. Today, smart urbanisation is part and parcel of thousands of urban projects around the world. Canonical examples of smart cities such as Songdo, Masdar City, PlanIT and Rio de Janeiro (Halpern *et al.* 2013, Carvalho 2015, Cugurullo 2016, Luque-Ayala and Marvin 2016, Pinna *et al.* 2017, Wu *et al.* 2018, Datta forthcoming) have given way to 'the actually existing smart city' (Shelton *et al.* 2015) where ICT is rapidly being woven into new and existing urban policies, agendas, narratives and aspirations. March and Ribera-Fumaz (2016: 816) note that 'every city wants to be a Smart City nowadays'. And, more importantly, a plethora of cities are gradually turning the rhetoric into reality: they are *becoming* smart cities.

This collection responds to recent appeals for empirical and comparative accounts of contemporary smart cities (Kitchin 2015, Shelton *et al.* 2015, Wiig and Wyly 2016). While the smart city is being realised in tangible and ordinary locales, there is scant evidence and critical reflection on how this is taking place. From an empirical perspective, this is understandable as the smart city is difficult to pin down and assess when compared with the more tangible elements of contemporary cities such as skyscrapers, reinforced concrete and sewer networks. The sensors and datahubs of smart urbanisation are largely invisible and tend to lurk in the background. However, they have fundamental implications for how cities will operate and how they will be experienced by residents in the future. Thus, there is a need to get inside smart cities to reveal the influence of digitalisation on broader urban dynamics.

The contributions in this volume provide real-world evidence on how the notion of smart urbanism is rapidly being interpreted and applied in 23 cities across the globe. Drawing upon theories from urban geography and planning, innovation studies, science and technology studies and related disciplines, the contributors reveal how the digitalisation agenda is being situated in particular political, social and material contexts. The chapters span the Global North and Global South; involve projects and initiatives with both high and low profiles; describe combinations of mundane and cutting-edge technologies; and reveal how consortia of local and non-local actors from the public, private and third sectors (as well as urban residents) are grappling with the rapidly emerging smart city in its various forms.

The empirical findings reflect the diversity of contemporary applications of smart urbanisation, shifting the focus of smart city scholarship from its technological promise to its real-world application. It is important to stress that innovation is not only *technological*. Instead, it involves a series of changes that are economic, sociocultural, architectural, ecological and political. These different forms of innovation collectively feed into the larger dynamics of urban planning, development and operation (McFarlane and Söderström 2017, Cugurullo 2018). Moreover, these innovation processes are recursive: smart changes cities and cities change smart through iterative processes of situating, embedding and learning (Carvalho 2015, Kong and Woods 2018).

In the following sections, we briefly summarise the rapid evolution in smart urbanisation from aspiration to application. We then summarise the contributions in this volume, using a thematic framework to characterise the situating of smart as processes of grounding and contextualising, integrating and aligning, contradicting and challenging, and experiencing and encountering. As a whole, the chapters illustrate how urban innovation is being negotiated and interpreted in a wide range of contexts, while also raising more fundamental questions about the rapidly evolving relationship between society and ICT. As such, this is a fundamentally socio-technical perspective on contemporary cities that explores both the positive and negative implications of smart urbanisation. The findings are relevant to academics, policymakers, practitioners and other urban stakeholders who are grappling with the present and future implications of smart cities.

Smart cities: from aspiration to application

Smart urbanisation is an increasingly common way for cities to innovate in the twenty-first century. Smart technologies are frequently promoted as universal, rational and apolitical solutions to address the myriad problems of contemporary cities (Shelton *et al.* 2015). Proponents suggest that ICT can simultaneously address issues of resource efficiency, surveillance and security, citizenship and participation, evidence-based policy making, behavioural change and social cohesion, and more. For example, a recurring mantra of smart cities' advocates is that integrated ICT deployment is the key to realising the knowledge economies

of the twenty-first century (Martin *et al.* 2018). However, beyond these vague ideas about innovation and collective urban services, there is little agreement on a single definition of smart cities, because of the numerous ways that it is being interpreted and applied. Various authors have characterised the notion of smart cities as 'ambiguous' (Vanolo 2014: 883), 'elusive' (Carvalho 2015: 45), 'chaotic' (Glasmeier and Christopherson 2015: 5) and 'unstable' (McFarlane and Söderström 2017: 315).

Haarstad (2016) contends that the smart city label is an empty signifier (similar to sustainability), and suggests that the definition is much less important than what smart cities achieve in practice. When considering what smart cities actually 'do' rather than how they are defined and promoted, it is clear that there is common drive to rationalise cities to make them more efficient, resulting in significant long-term cost savings. As Goodspeed notes, 'The city is a *system* to be *optimised* or run *efficiently*' (2015: 83, emphasis in original). The modern notion of rationalising the city through cutting-edge technologies and effective governance has been around for centuries (Graham and Marvin 2001). Ubiquitous infrastructure networks, comprehensive urban planning and municipal governance, capitalist expansion plans and sustainable urban development agendas have all promised to tame the unruly city. Today's smart city advocates proclaim that ICT will finally integrate the various functions of cities into manageable and coherent wholes (Allwinkle and Cruickshank 2011, Luque-Ayala and Marvin 2015). This suggests that smart is much more than an opportunity for technology developers to position cities as primary marketplaces for their products. Instead, smart is being promoted as the fundamental ethos to manage and govern cities of the future.

For many urban stakeholders, the promise of rationalising cities and optimising collective services through innovation is an alluring proposition. Today, one-third of UK cities with populations over 100,000 have smart city ambitions (Caprotti *et al.* 2016) while two-thirds of US cities are investing in some form of smart technology (NLC 2017). The national governments of India, China and Singapore are promoting smart cities through competitions, funding programmes, policy agendas and pilot projects with support from transnational organisations (e.g., Joint Programming Initiative Urban Europe, Bloomberg Philanthropies) and technology providers (IBM, Cisco, Google). The European Union (EU) has been a particularly strong proponent of smart cities through the European Commission's Horizon 2020 programme on Smart Cities and Communities, and has funded a network of over 50 'Lighthouse' and 'Follower' cities since 2014 (Vanolo 2014, 2016, Haarstad 2016).

Municipalities are keen to use the enthusiasm for smart cities to reinforce and extend their existing development ambitions while enhancing their global rankings (Vanolo 2014). Innovation districts, urban laboratories, platforms and specialised districts serve as publicly visible showcases to provide tangible evidence that local authorities are forward-thinking and proactive urban actors (Karvonen and van Heur 2014, Goodspeed 2015, Evans *et al.* 2016). As Glasmeier and Christopherson

(2015: 4) note, 'The race to get on the bandwagon and become a smart city has encouraged city policymakers to endogenise the process of technology-led growth, directing municipal budgets toward investments that bestow smart city status.' It is through smart urbanisation that cities can develop their global reputations as progressive (at least in techno-economic terms) and liveable places where companies and residents can thrive. In this way, 'smart urbanism has become a normative aspiration for the urban future' (Kong and Woods 2018: 681).

Of course, the 'smartification' of cities has also attracted significant criticism, largely from academics in the social sciences (e.g., Hollands 2008, 2015, Sennett 2012, Greenfield 2013, Söderström *et al.* 2014, Vanolo 2014, 2016, Viitanen and Kingston 2014, Kitchin 2015, Luque-Ayala and Marvin 2015, McFarlane and Söderström 2017). These authors argue that smart city visions and practices amplify and extend the contemporary neoliberal economic agendas of cities. They critique smart cities for their singular focus on efficiency and economic development through technological innovation. While the focus on problem solving and solutionism has obvious economic benefits to technology providers and urban authorities, it often fails to address the issues that are central to everyday life (Glasmeier and Nebiolo 2016, Saiu 2017, Cardullo and Kitchin 2018).

More recent scholarship on smart cities has moved beyond critique to observe and assess the processes and outcomes of those activities that are currently unfolding on the ground (**Table 1.1**). This shifts the smart city research agenda to focus on the situated characteristics of smart cities, bringing the *urban* qualities of the smart city into sharp focus (Wiig and Wyly 2016, McFarlane and Söderström 2017). Smart urbanisation becomes one of many influential drivers of urban development as it becomes embroiled in debates about politics, culture and society in 'ordinary' cities (Amin and Graham 1997, Robinson 2006). Corporations continue to play a significant role in the roll-out of smart city functions; but they have been joined by other stakeholders, including local governments, utility providers, small and medium enterprises, and civil society organisations. In this way, smart loses some of its novel and utopian character while becoming more relevant and applicable to the existing dynamics of urban development.

Situating smart cities

The contributions in this volume provide empirical evidence on how smart is being interpreted and embedded in particular material and social contexts. These are not comprehensive accounts, but instead serve as snapshots to illustrate the various activities that constitute contemporary smart urbanisation. They reflect a wide diversity of technologies and actors, and demonstrate how broader processes of urban development are being conceptualised, funded, designed and realised under the banner of 'smart'. In other words, the contributors show how 'smart' is doing different work in different places (McFarlane and Söderström 2017).

TABLE 1.1 Examples of empirical studies of smart cities

City/Cities (Country)	*Author(s)*
Austin (USA)	McLean *et al.* 2016
Barcelona (Spain)	March and Ribera-Fumaz 2016
Bristol, Glasgow, London, Manchester, Milton Keynes and Peterborough (UK)	Cowley *et al.* 2018
Cagliari (Italy)	Garau and Pavan 2018
Camden (USA)	Wiig 2018
Cape Town (South Africa)	Odendaal 2016
Copenhagen (Denmark)	Ipsen *et al.* forthcoming
Dubai (UAE)	Khan *et al.* 2017
Genoa (Italy)	Grossi and Pianezzi 2017
Gujarat (India)	Datta 2015
Hong Kong (China)	Cugurullo 2017
Kashiwanoha (Japan)	Trencher and Karvonen forthcoming
Manchester (UK)	Karvonen *et al.* forthcoming
Malmö (Sweden)	Parks forthcoming
Masdar City (UAE)	Cugurullo 2016
Milan (Italy)	Trivellato 2017
Milton Keynes (UK)	Valdez *et al.* forthcoming
Munich (Germany)	Farías and Widmer 2018
Philadelphia (USA)	Wiig 2015
San Francisco (USA) and Seoul (South Korea)	Lee *et al.* 2014
Seoul (South Korea)	Shwayri 2013
Singapore	Kong and Woods 2018
Stavanger (Norway)	Haarstad 2016
Turin (Italy)	Crivello 2015
Vienna (Austria)	Fernandez-Anez *et al.* 2018
Yanbu and Jubail (Saudi Arabia)	Aina 2017

The challenge with empirical accounts of actually existing smart cities (and cities more generally) is that they are unavoidably complex and multifaceted. We have tentatively divided this volume into four thematic sections to highlight the prominent urban dynamics being addressed in each chapter: 1) grounding and contextualising; 2) integrating and aligning; 3) contradicting and challenging; and 4) experiencing and encountering. We characterise these categories as 'tentative' rather than definitive or absolute because the findings in each city resist discrete categorisation and address all of these themes to some extent. Thus, the themes serve as a heuristic tool to organise the contributions, while readers will undoubtedly identify other crosscutting themes of smart urbanisation.

Grounding and contextualising

Smart urbanisation does not occur in a vacuum. Cities are messy, diverse and heterogeneous. Therefore, smart technologies cannot be implemented and applied

universally to the urban landscape. Instead, they need to be translated and configured to fit within their specific contextual conditions. Shelton and colleagues (2015: 14) note that 'smart city interventions are always the outcomes of, and awkwardly integrated into, existing social and spatial constellations of urban governance and the built environment'. This requires a move away from a one-size-fits-all approach and towards piecemeal retrofitting through activities of tailoring and customising (Carvalho 2015, Glasmeier and Christopherson 2015, Kitchin 2015, Eames *et al.* 2018). Here, the smart technologies are less important than how they are applied in particular places. This also suggests that smart urbanisation is producing highly variegated urban landscapes with different levels of and approaches to service provision (Graham and Marvin 2001, Kong and Woods 2018).

The chapters in the first section of the book are organised under the theme of grounding and contextualising. Robyn Dowling, Pauline McGuirk and Sophia Maalsen describe how smart urbanisation in Newcastle, Australia involves the slow and incremental roll-out of technologies to supplement existing local government agendas. Federico Cugurullo uses the metaphor of Frankenstein to characterise the hybrid landscape created by the laissez-faire property development system in Hong Kong. Rob Cowley, Federico Caprotti, Michele Ferretti and Chen Zhong provide insights on how smart is being implemented in the 'ordinary' Chinese city of Wuhan, and argue that ICT innovation has shed its novelty and emerged as a commonplace activity of urban development. Finally, Alan Wiig examines the territorial politics of Philadelphia, and emphasises the emergent properties formed through the translation of smart technologies to fit in with other visions and agendas.

Integrating and aligning

The notions of grounding and contextualising are closely related to the second theme of the book, integrating and aligning. Smart urbanisation does not involve the complete reinvention of cities. In many cases, it is used to enhance and extend existing policy agendas and collective visions of the future. As Vanolo (2014: 886) argues, the smart agenda is 'used by urban managers and political and economic urban elites to support specific development policies'. At the same time, smart urbanisation opens up cities to new configurations of stakeholders (Carvalho and Campos 2013, Carvalho 2015). Public–private partnerships (PPPs) involving local authorities, technology developers and utility providers are a prerequisite of most if not all smart city projects. More recently, there have been calls for smart cities that are 'citizen-focused' or 'people-centric' (Cowley *et al.* 2018). The democratic turn is an attempt to make smart cities inclusive, empowering and relevant to residents (Hill 2013, Townsend 2013, Glasmeier and Christopherson 2015, Kitchin 2015, Luque-Ayala and Marvin 2015, Trencher forthcoming). Processes of integration and alignment bring together local and non-local stakeholders through a set of shared objectives (Vanolo 2014, Shelton *et al.* 2015, Haarstad 2016) to transform the fragmented city into a coherent whole.

In this section, Rob Kitchin, Claudio Coletta and Liam Heaphy use Dublin as a case study to demonstrate how the smart agenda is being used to strategically re-brand the city's long-term economic development agenda while raising its international profile. Håvard Haarstad and Marikken Wathne examine a particularly dominant smart city proponent, the European Union, to reveal how its Smart and Sustainable Communities programme creates different stakeholder configurations in the 'Lighthouse' cities of Stavanger, Stockholm and Newcastle. Kerry Burton, Andrew Karvonen and Federico Caprotti examine how the smart agenda supplements the existing environmental agendas in Bristol and Manchester through the development and promotion of centrally located green innovation districts. Meanwhile, Marie Valetz, Jonathan Rutherford and Antoine Picon argue that the smart agendas in the French cities of Issy-les-Moulineaux and Nice reconfigure urban service provision through multiple organisational adjustments. And, finally, Federico Cugurullo and Davide Ponzini examine the renowned eco city of Masdar City and describe how the developers appropriated the smart agenda to extend and enhance their existing global reputation as an exemplar of sustainable development.

Contradicting and challenging

While smart urbanisation processes are often about integrating and aligning, they also produce misalignments, cleavages and contradictions. Cowley and colleagues (2018: 4) note that it is commonplace to experience 'frictions and frustrations in times of rapid technological change'. There are always tensions among urban stakeholders, their agendas and existing urban configurations, but smart advocates rarely acknowledge the existence of apathy, non-compliance and direct resistance to their activities. Disharmony is important because it reveals the marginalisation and exclusion of some stakeholders (Kong and Woods 2018). At the same time, it highlights different interpretations of desired urban futures, and suggests the need for agonistic modes of urban planning and development where difference is encouraged and valued rather than suppressed and discarded (Pløger 2004, Brand and Gaffikin 2007).

The chapters in the third section of the book provide examples of contradiction in the smart city, highlighting how innovation agendas are challenged and resisted by various urban stakeholders. Martín Tironi and Matías Valderrama examine a temporary shared street intervention in Santiago de Chile, and describe the multiple frictions arising from the combination of social activism, democratic ideals and citizen sensing. They advocate for an 'idiotic' perspective to learn from divergences and non-conformance. Ignacio Farías and Claudia Mendes provide a detailed analysis of the contested collaborations within the Munich municipal government and with its corporate partner, Siemens. The chapter by Sarah Barns and Andrea Pollio notes the success in marketing the Parramatta suburb of Sydney as a leading Australian smart city and the simultaneous institutional challenges of the municipal government to fulfil its smart

promises. Finally, Luís Carvalho and Mário Vale examine the inherent tensions between transparent governance and entrepreneurial urbanism in Lisbon as the promotion of local start-ups clashes with civic participation and data openness.

Experiencing and encountering

The final section of the book is about experiences and encounters in the smart city. Over the last two decades, the digital world has rapidly infiltrated the spheres of the individual (e.g., mobile phones, smart watches) and the domestic (smart speakers, home automation systems). However, there are few empirical accounts of the implications of the ICT-enabled city to urban residents. There is a need to understand the 'functional domains of urban living' (Neirotti *et al.* 2014: 26) and how urban residents are being 'encapsulated and standardised' (Tironi and Sánchez Criado 2015: 96) through the roll-out of smart city agendas. The empirical accounts in this section provide insights on how smart is being designed and implemented to shape the lives of urban residents.

Hug March and Ramon Ribera-Fumaz describe the evolution of smart urbanism in Barcelona from a strongly technological focus to a citizen-centric agenda, and illustrate how multi-actor constellations are increasingly focusing on the needs of urban residents rather than technology providers. Nancy Odendaal provides evidence from Cape Town on how civil society groups and residents are appropriating smart technologies through grassroots mapping, social activism and community engagement activities. Gregory Trencher and Andrew Karvonen examine smart initiatives in two Japanese cities designed to improve the quality of life for older residents. Finally, Sofia Shwayri highlights the role of gender in smart urbanisation with her focus on the municipality of Seoul and its multi-pronged efforts to address women's safety issues through ICT applications.

Conclusions

In 1995, the futurist Bill Mitchell published the ground-breaking and highly influential volume, *City of Bits: Space, Place, and the Infobahn*. He predicted how the digitalisation of society would be manifested in cities, arguing that:

> The emergent civic structures and spatial arrangements of the digital era will profoundly affect our access to economic opportunities and public services, the character and content of public discourse, the forms of cultural activity, the enaction of power, and the experiences that give shape and texture to our daily routines.
>
> *(Mitchell 1995: 5)*

Two decades later, many of Mitchell's predictions about the convergence of cities and digital technologies are quickly becoming a reality. This volume provides early insights on how this dynamic is being played out in today's cities. Collectively, the contributors emphasise how, 'far from being passive backdrops,

cities variously complicate, enable, disrupt, resist and translate [smart urbanism]' (Luque-Ayala and Marvin 2015: 208). The digitalisation of cities is occurring through processes of grounding and contextualising, integrating and aligning, contradicting and challenging, and experiencing and encountering. Together, these processes create different urban realities.

While the smart city has not come to fruition as quickly and smoothly as Mitchell and other futurists predicted, it appears to be accelerating the pace of urban change while producing mixed outcomes. In the coming decades, smart applications and agendas will result in fundamental changes in the way that cities operate and how they are experienced by inhabitants. This process will undoubtedly involve a mix of complementary and contradictory currents that make the smart city simultaneously frustrating and fascinating to study. Will smart urbanism ultimately improve the cities of the future? The contributions in this volume do not attempt to answer this question. However, they do provide early insights on the messy and multiple dynamics that are involved in digitalising the urban landscape, while contributing to our collective understanding of how smart urbanism is related to place, politics and the future of our cities.

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References

Aina, Y.A. (2017). Achieving smart sustainable cities with GeoICT support: the Saudi evolving smart cities. *Cities 71*: 49–58.

Allwinkle, S. and Cruickshank, P. (2011). Creating smart-er cities: an overview. *Journal of Urban Technology 18*: 1–16.

Amin, A. and Graham, S. (1997). The ordinary city. *Transactions of the Institute of British Geographers 22*: 411–429.

Brand, R. and Gaffikin, F. (2007). Collaborative planning in an uncollaborative world. *Planning Theory 6*: 282–313.

Caprotti, F., Cowley, R., Flynn, A., Joss, S. and Yu, L. (2016). *Smart-Eco Cities in the UK: Trends and City Profiles 2016* [Online]. Available: www.smart-eco-cities.org/wp-content/uploads/2016/08/Smart-Eco-Cities-in-the-UK-2016.pdf. [Last accessed 4 March 2018].

Cardullo, P. and Kitchin, R. (2018). Smart urbanism and smart citizenship: the neoliberal logic of 'citizen-focused' smart cities in Europe. [Online]. Available: file:///C:/Users/CUGURULF/Downloads/PCP%20WP%2039%20smart%20citizenship%20(1).pdf [Last accessed 4 March 2018].

Carvalho, L. (2015). Smart cities from scratch? A socio-technical perspective. *Cambridge Journal of Regions, Economy and Society 8*: 43–60.

Carvalho, L. and Campos, J. (2013). Developing the PlanIT Valley: a view on the governance and societal embedding of u-eco city pilots. *International Journal of Knowledge-Based Development 4*: 109–125.

Cowley, R., Joss, S. and Dayot, Y. (2018). The smart city and its publics: insights from across six UK cities. *Urban Research & Practice 11*: 53–77.

Crivello, S. (2015). Urban policy mobilities: the case of Turin as a smart city. *European Planning Studies 23*: 909–921.

Cugurullo, F. (2016). Urban eco-modernisation and the policy context of new eco-city projects: where Masdar City fails and why. *Urban Studies 53*: 2417–2433.

Cugurullo, F. (2017). Exposing smart cities and eco-cities: Frankenstein urbanism and the sustainability challenges of the experimental city. *Environment and Planning A: Economy and Space 50*: 73–92.

Cugurullo, F. (2018). The smart city imaginary: from the dawn of modernity to the eclipse of reason. In C. Lindner and M. Meissner (eds), *The Routledge Companion to Urban Imaginaries*. London: Routledge.

Datta, A. (2015). New urban utopias of postcolonial India: 'entrepreneurial urbanization' in Dholera smart city, Gujarat. *Dialogues in Human Geography 5*: 3–22.

Datta, A. (forthcoming). The digital turn in postcolonial urbanism: smart citizenship in the making of India's 100 smart cities. *Transactions of the Institute of British Geographers*.

Eames, M., Dixon, T., Hunt, M. and Lannon, S. (eds) (2018). *Retrofitting Cities for Tomorrow's World*. London: Wiley-Blackwell.

Evans, J., Karvonen, A. and Raven, R. (eds) (2016). *The Experimental City*. London: Routledge.

Farías, I. and Widmer, S. (2018). Ordinary smart cities: how calculated users, professional citizens, technology companies and city administrations engage in a more-than-digital politics. *Tecnoscienza 8*: 43–60.

Fernandez-Anez, V., Fernández-Güell, J.M. and Giffinger, R. (2018). Smart city implementation and discourses: an integrated conceptual model. The case of Vienna. *Cities 78*: 4–16.

Garau, C. and Pavan, V.M. (2018). Evaluating urban quality: indicators and assessment tools for smart sustainable cities. *Sustainability 10*: 575.

Glasmeier, A. and Christopherson, S. (2015). Thinking about smart cities. *Cambridge Journal of Regions, Economy and Society 8*: 3–12.

Glasmeier, A.K. and Nebiolo, M. (2016). Thinking about smart cities: the travels of a policy idea that promises a great deal, but so far has delivered modest results. *Sustainability 8*: 1122–1133.

Goodspeed, R. (2015). Smart cities: moving beyond urban cybernetics to tackle wicked problems. *Cambridge Journal of Regions, Economy and Society 8*: 79–92.

Graham, S. and Marvin, S. (2001). *Splintering Urbanism: Networked Infrastructures, Technological Mobilities and the Urban Condition*. London: Routledge.

Greenfield, A. (2013). *Against the Smart City*. New York: Do Projects.

Grossi, G. and Pianezzi, D. (2017). Smart cities: utopia or neoliberal ideology? *Cities 69*: 79–85.

Haarstad, H. (2016). Constructing the sustainable city: examining the role of sustainability in the 'smart city' discourse. *Journal of Environment Policy & Planning 19*: 423–437.

Halpern, O., LeCavalier, J., Calvillo, N. and Pietsch, W. (2013). Test-bed urbanism. *Public Culture 25*: 271–306.

Hill, D. (2013). On the smart city: or, a 'manifesto' for smart citizens instead [Online]. Available: www.cityofsound.com/blog/2013/02/on-the-smart-city-a-call-for-smart-citizens-instead.html [Last accessed 4 March 2018].

Hollands, R.G. (2008). Will the real smart city please stand up? Intelligent, progressive or entrepreneurial? *City 12*: 303–320.

Hollands, R.G. (2015). Critical interventions into the corporate smart city. *Cambridge Journal of Regions, Economy and Society 8*: 61–77.

Ipsen, K.L., Zimmermann, R.K., Nielsen, P.S. and Birkved, M. (forthcoming). Environmental assessment of smart city solutions using a coupled urban metabolism–life cycle impact assessment approach. *International Journal of Life Cycle Assessment*.

Karvonen, A. and van Heur, B. (2014). Urban laboratories: experiments in reworking cities. *International Journal of Urban and Regional Research 38*: 379–392.

Karvonen, A., Martin, C. and Evans, J. (forthcoming). University campuses as bounded sites of smart-city co-production. In C. Coletta, L. Heaphy, L. Evans and R. Kitchin (eds), *Creating Smart Cities*. London: Routledge.

Khan, M.S., Woo, M., Nam, K. and Chathoth, P.K. (2017). Smart city and smart tourism: a case of Dubai. *Sustainability 9*: 2279.

Kitchin, R. (2015). Making sense of smart cities: addressing present shortcomings. *Cambridge Journal of Regions, Economy and Society 8*: 131–136.

Kong, L. and Woods, O. (2018). The ideological alignment of smart urbanism in Singapore: critical reflections on a political paradox. *Urban Studies 55*: 679–701.

Lee, J.H., Hancock, M.G. and Hu, M.C. (2014). Towards an effective framework for building smart cities: lessons from Seoul and San Francisco. *Technological Forecasting and Social Change 89*: 80–99.

Luque-Ayala, A. and Marvin, S. (2015). Developing a critical understanding of smart urbanism. *Urban Studies 52*: 2105–2116.

Luque-Ayala, A. and Marvin, S. (2016). The maintenance of urban circulation: an operational logic of infrastructural control. *Environment and Planning D: Society and Space 34*: 191–208.

McFarlane, C. and Söderström, O. (2017). On alternative smart cities: from a technology-intensive to a knowledge-intensive smart urbanism. *City 21*: 312–328.

McLean, A., Bulkeley, H. and Crang, M. (2016). Negotiating the urban smart grid: socio-technical experimentation in the city of Austin. *Urban Studies 53*: 3246–3263.

March, H. and Ribera-Fumaz, R. (2016). Smart contradictions: the politics of making Barcelona a self-sufficient city. *European Urban and Regional Studies 23*: 816–830.

Martin, C.J., Evans, J. and Karvonen, A. (2018). Smart and sustainable? Five tensions in the visions and practices of the smart-sustainable city in Europe and North America. *Technological Forecasting and Social Change 133*: 269–278.

Mitchell, W.J. (1995). *City of Bits: Space, Place, and the Infobahn*. Cambridge, MA: MIT Press.

NLC. (2017). *Cities and the Innovation Economy: Perceptions of Local Leaders*. Washington, DC: National League of Cities.

Neirotti, P., Cagliano De Marco, A., Mangano, G. and Scorrano, F. (2014). Current trends in smart city initiatives: some stylised facts. *Cities 38*: 25–36.

Odendaal, N. (2016). Getting smart about smart cities in Cape Town: beyond the rhetoric. In S. Marvin, A. Luque-Ayala and C. McFarlane (eds), *Smart Urbanism: Utopian Vision or False Dawn?* London: Routledge, 71–87.

Parks, D. (2018). Energy efficiency left behind? Policy assemblages in Sweden's most climate-smart city. *European Planning Studies*. https://doi.org/10.1080/09654313.2018.1455807.

Pinna, F., Masala, F. and Garau, C. (2017). Urban policies and mobility trends in Italian smart cities. *Sustainability 9*: 494.

Pløger, J. (2004). Strife: urban planning and agonism. *Planning Theory 3*: 71–92.

Robinson, J. (2006). *Ordinary Cities: Between Modernity and Development*. London: Routledge.

Saiu, V. (2017). The three pitfalls of sustainable city: a conceptual framework for evaluating the theory-practice gap. *Sustainability 9*: 2311.

Sennett, R. (2012). No one likes a city that's too smart. *The Guardian*, 4 December 2012. [Online]. Available: www.theguardian.com/commentisfree/2012/dec/04/smart-city-rio-songdo-masdar [Last accessed 4 March 2018].

Shelton, T., Wiig, A. and Zook, M. (2015). The 'actually existing smart city'. *Cambridge Journal of Region, Economy and Society 8*: 13–25.

Shwayri, S.T. (2013). A model Korean ubiquitous eco-city? The politics of making Songdo. *Journal of Urban Technology 20*: 39–55.

Söderström, O., Paasche, T. and Klauser, F. (2014). Smart cities as corporate storytelling. *City 18*: 307–320.

Tironi, M. and Sánchez Criado, T. (2015). Of sensors and sensitivities: towards a cosmopolitics of 'smart cities'. *TECNOSCIENZA: Italian Journal of Science & Technology Studies 6*: 89–108.

Townsend, A.M. (2013). *Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia*. New York: Norton.

Trencher, G. (forthcoming). Towards a Smart City 2.0: smartness as a tool for tackling social problems. *Technological Forecasting and Social Change*.

Trencher, G. and Karvonen, A. (forthcoming). Stretching 'smart': advancing health and well-being through the smart city agenda. *Local Environment*.

Trivellato, B. (2017). How can 'smart' also be socially sustainable? Insights from the case of Milan. *European Urban and Regional Studies 24*: 337–351.

Valdez, A.-M., Cook, M. and Potter, S. (forthcoming). Roadmaps to Utopia: tales of the smart city. *Urban Studies*.

Vanolo, A. (2014). Smartmentality: the smart city as disciplinary strategy. *Urban Studies 51*: 883–898.

Vanolo, A. (2016). Is there anybody out there? The place and role of citizens in tomorrow's smart cities. *Futures 82*: 26–36.

Viitanen, J. and Kingston, R. (2014). Smart cities and green growth: outsourcing democratic and environmental resilience to the global technology sector. *Environment and Planning A: Economy and Space 46*: 803–819.

Wiig, A. (2015). IBM's Smart City as techno-utopian policy mobility. *City 19*: 258–273.

Wiig, A. (2018). Secure the city, revitalize the zone: smart urbanization in Camden, New Jersey. *Environment and Planning C: Politics and Space 36*: 403–422.

Wiig, A. and Wyly, E. (2016). Introduction: thinking through the politics of the smart city. *Urban Geography 37*: 485–493.

Wu, Y., Zhang, W., Shen, J., Mo, Z. and Peng, Y. (2018). Smart city with Chinese characteristics against the background of big data: idea, action and risk. *Journal of Cleaner Production 173*: 60–66.

PART 1

Grounding and contextualising

2

REALISING SMART CITIES

Partnerships and economic development in the emergence and practices of smart in Newcastle, Australia

Robyn Dowling, Pauline McGuirk and Sophia Maalsen

Introduction

In this chapter, we explore smart city roll-out in Newcastle, a regional centre in the Hunter Valley of New South Wales (NSW) which is rapidly becoming a showcase for smart urbanism in Australia. Smart urbanism has proliferated internationally and is fast becoming the preferred policy solution for enabling more productive, cohesive and resilient cities and citizens (Datta 2015); but little attention has been paid to smart city adoption in Australia (but see Barns and Pollio, this volume), as a relative latecomer to the global smart uptake. As critical reflection on the smart city agenda, politics, implementation and effects have matured, key debates have emerged concerning neoliberal ontologies, the privileging and embedding of technological solutions, the influence of technology companies on urban policy, data access and ownership and related concerns regarding privacy and surveillance, and implications for urban social justice and urban citizenship (Gabrys 2014, Vanolo 2014, Kitchin 2015, McNeill 2015, Luque-Ayala and Marvin 2016, Wiig 2016, this volume, Wiig and Wyly 2016). Even as these debates have gained attention, geographers in particular have prioritised analysing the variegated roll-out of 'the actually existing smart city' (Hollands 2008, Shelton *et al.* 2015).

As Australia's sixth largest city, Newcastle is a former industrial city in the throes of post-industrial transition, and is seeking to position itself as a centre of urban innovation. While on the surface Newcastle's smart city transition appears to chart similar trajectories to other smart cities, its unique economic and historical context, combined with its specific vision of the smart city, offers an important contribution to our understanding of smart cities. This pivots off the empirical question of what happens when 'the smart city' meets the city. How do local context, political priorities and political and institutional histories shape the

materialisation and actualisation of specific smart cities and their uneven impacts (see Bulkeley *et al.* 2016b)? This question is grounded in the recognition that smart cities are a political project embroiled in existing city governance aspirations (Cugurullo 2016, Burton *et al.* and Cowley *et al.* this volume).

Through a focus on the specific context of Newcastle, we aim to critically chart the social, spatial and political means through which smart cities are being made in the Australian context. Using publicly available information on smart, alongside supplemental interviews, we sketch the type of smart city approach and initiatives that are taking hold in Newcastle, and explore the discrepancies between this and more abstract visions of the smart city. We chart the way in which the city's conscious decision to take a slow and iterative approach to developing a smart city plan, and its prioritisation of partnerships with local groups and with the community, has seen smart Newcastle emerge from the city's version of smart rather than the city conforming to corporate visions of the smart city. The chapter suggests that while Australian cities are broadly using smart as a way of retaining or driving economic growth and revitalisation, this is implemented in ways specific to each city's specific needs. By demanding that smart solutions are tailored to the specific needs of their city and by retaining ownership of infrastructure, our analysis specifically suggests the need for nuance in interpretations of the corporate role in the smart city.

The diverse roll-out of smart cities in Australia

Compared to its widespread international adoption, Australia's embrace of strategic frameworks to support smart cities has lagged. Australia's fragmented federal, state and local government structure produces a complex multi-level context for urban governance and strategic and infrastructural planning (Alizadeh and Shearer 2015). The lack of metro-scale governance and, relatedly, of integrated spatial authority over urban strategic and infrastructure planning have acted as deterrents to any one level of government advancing smart city strategies or policies (Barns *et al.* 2017). State and regional agencies began advancing general digital economy strategies in the early 2010s; but it is primarily since 2015 that formal policy action, framed around a smart city discourse, has accelerated. In 2015, smart cities were celebrated in the National Innovation Agenda, followed in 2016 by a national Smart Cities Plan to be delivered through multi-level government City Deals. Industry commentators welcomed the plan's launch by proclaiming 'better late than never for smart cities in Australia' (Citron 2016). While this plan is explicitly aimed at orchestrating cross-government collaboration to underpin smart city initiatives, its financial resources are comparatively small and are constrained by the limited purchase of the national government in urban affairs in Australia.

While the national agenda was being developed, city governments had independently begun experimenting with diverse governance visions for urban smartness articulated across an array of early-adopter cities (Burgoyne and Maalsen 2016). By 2017, a plethora of local authorities had articulated smart city

strategies across the gamut of urban geo-political contexts, including state capital cities Melbourne, Sydney and Adelaide, suburban centre Parramatta and regional cities Townsville, the Sunshine Coast and Newcastle, many of which connect through the recently formed Australian Smart Communities Association. And, of course, there are multiple smart city projects emerging beyond these formal strategies. Across these strategies there are common broad commitments to pursue smart improvements to the city in terms of efficient management, liveability, sustainability and prosperity. But beyond this, there is no standard approach. Each city comes to the smart city idea from a different starting point that arises from the local setting, local development agenda, local context and local need (Burgoyne and Maalsen 2016, Haarstad 2017). As the notion of the 'actually existing smart city' suggests, the political agendas pursued through the notion of smart and the partnerships and institutional configurations that it draws together vary in context-specific ways. A brief overview of the smart city frameworks of two cities illustrates this point.

The smart city approach of the Sunshine Coast – a Queensland regional city – is geared towards cultivating a transition away from its regional consumer services economic base (tourism, retail and construction) and ageing population profile towards a digital economy with higher-value industries, including health, education and research, aviation and aerospace and clean technologies. This underpins the smart city strategic priority of upgrading communications networks and smart renewable power. The strategy also includes a series of smart city management solutions (e.g. city Wi-Fi, lighting, and waste and water management) which are to be trialled at a greenfield smart city precinct being developed as a living lab on a centrally located former golf course. The living lab is intended to play a key role in communicating the value of smart city solutions and to educate the community on the potential of data. The city is aiming to scale up and mainstream its 'smart approach' as a model for wider development across the region, using the city centre as a key catalyst. In turn, this regional development aspiration reinforces the city's smart strategy focus on maintaining control of network connectivity and securing the connectivity of its future business nodes to data centres in Brisbane, Sydney and further afield.

Melbourne's socio-material context is different, and so too is its smart city roll-out. Melbourne's flourishing downtown economy is historically a knowledge economy arising from a cluster of universities and research institutions. There is a large young, educated population – including nearly a quarter of a million students – and strong population growth. Melbourne has been ranked the world's most liveable city for seven consecutive years by *The Economist* (2017). Its relative prosperity and related growth pressures underpins Melbourne's smart city configuration around making smarter use of existing infrastructure for city management and maintaining liveability to retain its young, educated population. There is smart monitoring of pedestrian congestion; experimentation with a smart transport zone; and the creation of a Smart City Office to diffuse smart across local government practices. And there is a focus on entrepreneurial

activity to leverage the potential of young, creative graduates, for example via a Citylab to involve tech-savvy community members in hackathons to develop smart solutions to redesign city services. This is all cast as future-proofing the city infrastructurally, both in terms of liveability and in anticipation of economic digital disruption.

In the Australian context, these two early-adopter cities reinforce the proposition that when the infinite variety of smart city technologies hit the ground they encounter and are crafted by the material, social and political realities of the city (Bulkeley *et al.* 2016b). Thus smart city roll-out is contextualised, piecemeal and incremental (Shelton *et al.* 2015). Moreover, it suggests that when tech corporates and smart city consulting firms' discourse suggests that smart cities are 'different in essence to the twentieth century city' (Arup 2010, cited in Townsend 2013: 32), this overplays the notion of a radical break with and separation from existing urban conditions. Rather, as we explore in more detail via treatment of the emergence of Newcastle's smart city, smart city strategies, technologies and discourses become woven through existing geographies and governance structures and through the uneven social geographies of the city.

The evolution, purposes and practices of smart in Newcastle

Newcastle is among Australia's early adopters of smart city strategies whose distinctive approach reflects not only the contemporary realities of Newcastle's economy, society and material reality but also its social, institutional and political history. The city, approximately 160 kilometres north of Sydney, has a long history as an industrial city, dominated by steel-making and related manufacturing and coal mining in the surrounding Hunter Valley. Since the late 1990s, and particularly since the BHP steelworks' closure in 1999, Newcastle has struggled with post-industrial transition, and experienced multiple formal urban regeneration strategies and plans. Approximately 50 reports, plans and strategies were produced between 2005 and 2015 alone, many of them seeking to nurture a culture-based, creative city transition (Gentle and M^{c}Guirk 2018). These regeneration aspirations had promised much but delivered little, often saw political decision-making power removed from local councils and ceded to state government or to special-purpose redevelopment authorities and, latterly, became mired in formal corruption investigations (Ruming *et al.* 2016, Gentle and M^{c}Guirk 2018). While the city's regeneration has advanced significantly since 2015, Newcastle's fractious history of multiple, minimally successful redevelopment strategies has left a legacy of planning fatigue, a strong sense of cynicism and suspicion around consultation processes, and lack of faith in government capabilities to deliver on development aspirations (Jones *et al.* 2014, Gordon 2015). Using publicly available reports and strategies, and interviews conducted by one of the authors in 2016, in this section we illustrate how this context has shaped Newcastle City Council's Smart City Strategy in at least three ways.[1]

'Pre' history of the Newcastle Smart City Strategy: struggles with post-industrial revitalisation

Firstly, context shaped the long gestation of Newcastle's Smart City Strategy, summarised in **Figure 2.1**. Newcastle City Council endorsed a Smart City Strategy in late 2017, but this emerged only after the tentative establishment of a Smart City Initiative in 2015 and an even longer period of experimentation with smart urban technologies to fulfil economic development aspirations. In 2010 the city council, mindful of the city's fatigue, cynical outlook on revitalisation strategies and scepticism around democratic planning, undertook a broad-ranging consultation process to establish the parameters of a new strategic plan. Building on adoption of strategies to nurture the creative industries in the city through cultural planning policies during the early 2000s (Bavinton 2010), a community ambition to shape Newcastle's economy as smart and innovative 'bubbled to the top' as a potential pathway to revitalisation reflecting the city's 'ongoing quest for new economic foundations in the city post-BHP' (interview with council employee).

Buoyed by community endorsement of smart innovation as a potential revitalization pathway (Burgoyne and Maalsen 2016), the city began to experiment, first by trialling smart surveillance options in a community safety project operationalized via a Smart Crime Prevention Platform based on multi-sensor analytics, urban noise mapping and pedestrian mobility data analytics. This was initially connected to an aspiration to revive the city's nighttime economy. The city employed a community safety officer with a PhD in the nighttime economy and a strong interest in urban technologies. His initial role extended as a confluence of factors led to growing interest in smart initiatives: notably the University of Newcastle's (UON) growing interest in creative and digital industries, which overlapped with the development of a central business district (CBD) campus and a growing tide of business interests seeking to undertake smart pilots in the city.

One business approach proved catalytic. Tech company VIMOC launched an Internet of Things (IoT) pilot with the city's business improvement association, Newcastle Now, which works closely with the City Council. When the project was entered into a global IoT innovation challenge organised by Cisco in 2014, a team from the city, including the council's General Manager and Acting Lord Mayor, travelled to the competition and returned intent on mobilising smart city opportunities as a driver of Newcastle's revitalisation, and networked with key players, including Cisco. These pilots led to a growing political momentum behind the 'smart city' idea, which saw the community safety officer's role morph into a formal position as 'smart city co-ordinator'. Reflecting the growing centrality of smart city to the governance of Newcastle's economic development trajectory, this co-ordinator position was institutionally relocated into the Council's strategic planning unit alongside city revitalisation, economic development, visitor economy, public domain design and place-making.

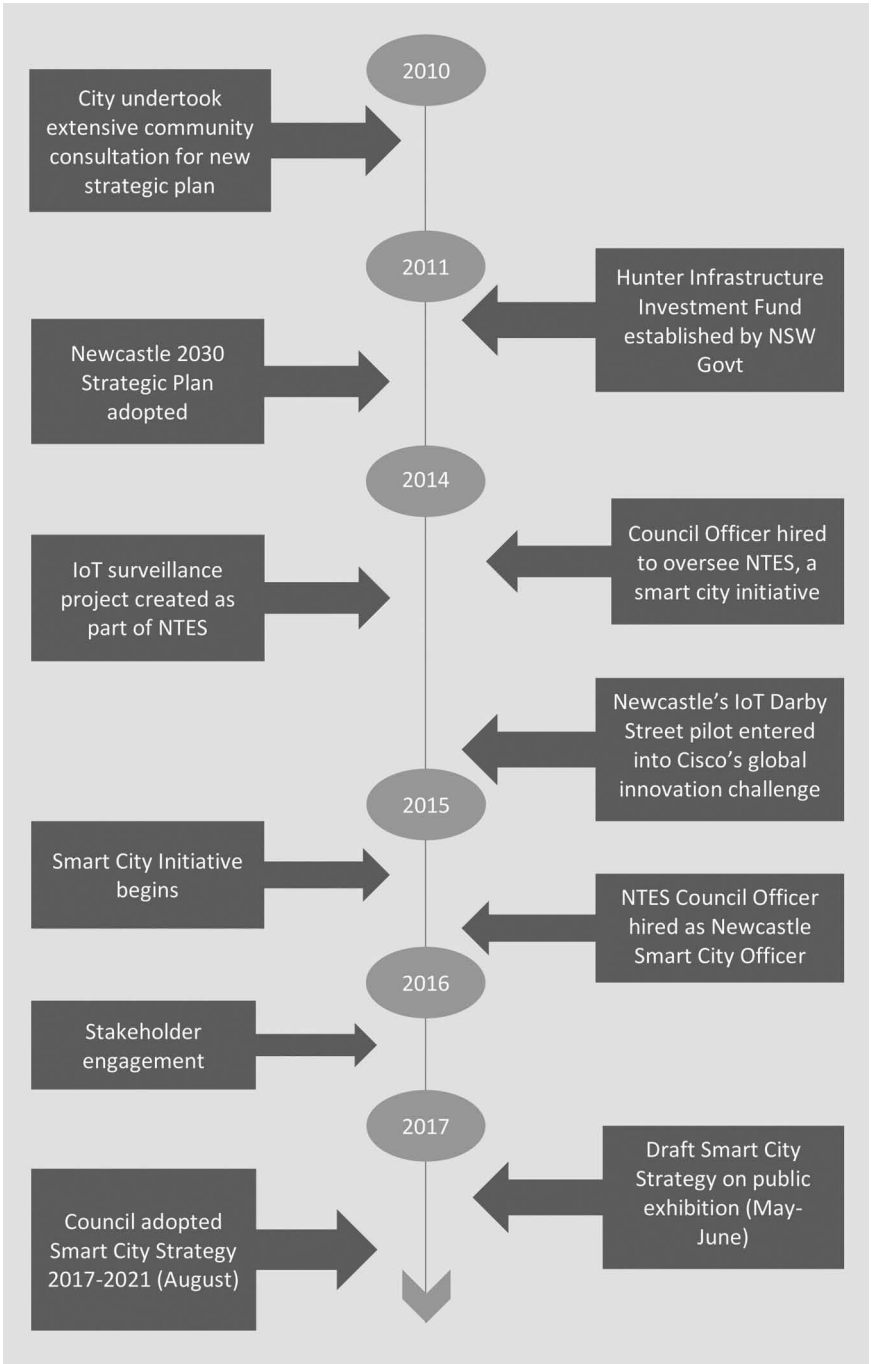

FIGURE 2.1 Development timeline, Newcastle Smart City Strategy.

Nonetheless, in a political context of a city deeply sceptical of 'big plans' on the back of two decades of experience of such plans promising economic revitalization but ultimately floundering (Ruming *et al.* 2016), the Council moved forward cautiously. According to one council employee:

> In the early days before we finally got traction, one of the risks was talking about smart city when we didn't even have Wi-Fi! So it was kind of overselling. We purposefully were under the radar for a long time, until the momentum got to the point where it couldn't stay under the radar anymore. So I guess there's one that's being careful about citizen expectation and that kind of thing.

Thus for more than five years, Newcastle pursued a number of smart initiatives experimentally, slowly crafting new relations and modes of coordination as it went (see Bulkeley *et al.* 2016a) before finally formally adopting its smart city strategy in 2017.

Economic revitalisation and under-the-radar experimentation with smart

The second way in which Newcastle's context has shaped the particularity of its smart city is through the tight coupling of its strategies with ongoing attempts to secure the city's post-industrial transition and economic revitalisation. Indeed, as **Table 2.1** summarises, three of the five motivations identified as driving Newcastle's formal Smart City Strategy are related to economic development. This is not solely a local priority but a wider regional political imperative for a Liberal state government that has had to secure support in the Labor-voting heartland of the Hunter Valley. Until recently, regional economic development efforts remained focused on attracting investment to progress the area's traditional areas of competitive advantage while also seeking diversification beyond and industrial assemblage grounded on manufacturing and fossil-fuel extraction. However, 2015 witnessed the adoption of the language of smart innovation for job creation and growth via the state-funded Hunter Regional Development Authority's 'Smart Happens Here' initiative.[2]

In 2014, the state government identified Newcastle as a priority revitalisation project which was quickly entwined with the shift towards smart innovation as a conduit for economic recovery and growth. As noted by the smart city coordinator in 2016, 'our smart city strategy is entwined with our revitalisation strategy and that's about jobs creation, talent attraction, talent retention, those economic development actions' (Burgoyne and Maalsen 2016: 33). A key accelerator for Newcastle's smart city is the Hunter Innovation Project (HIP), discussed in more detail below. The HIP, launched in 2016, is not only underwriting the provision of smart infrastructure, but

TABLE 2.1 Aspirations of Newcastle Smart City Strategy

Motivation	*Examples of initiatives/projects*
Attract and retain smart people	• Regional Incubator Strategy • Hunter Innovation Project • Science, technology, engineering and mathematics (STEM) schools initiative
Innovation and creativity	• Renew Newcastle cultural incubator • Star4000 collaboration between University of Newcastle and Slingshot • I2N, University of Newcastle's regional network of innovation hubs
Collaboration, education and training	• University of Newcastle's innovation and entrepreneurship degree • NSW TAFE's Newcastle SkillsPoint Centre in manufacturing and robotics • STEM schools programme featuring industry collaboration • NCC libraries partnership with TAFE to deliver mechatronics and coding workshops
Increased liveability, amenity and attractiveness	• Smart parking, lighting and free public Wi-Fi • Transport network upgrades including CBD light • Coastal revitalisation projects • City-centre light rail and new connectivity between the city and harbour • Public domain upgrades
Pride and promotion	• World-class research institutes • Repeat winner of World Festival and Events City awards • Acknowledgement by *Lonely Planet* and *National Geographic* as a must-see destination • Global interest in the homegrown Renew Newcastle, cultural-led revitalisation model

Source: Newcastle City (2017b).

is also providing physical spaces for multi-sectoral collaboration, incubation and innovation, aligned with a high-profile digital precinct. HIP's smart city activation provides an accelerative thrust to a longer trajectory of seeking economic diversification towards revitalization as a creative and innovative knowledge economy. As the project's webpage pronounces, 'we now face a choice whether to maintain our attachment to the past and the competitive advantage of yesteryear, or to build on our emerging strengths in services and a knowledge economy' (HIP 2018). This embrace of innovation-led growth, sutured to the digital, provides a politically feasible trajectory – a plausible political fix – for a state government seeking to identify larger-scale regional development futures pathways for a region whose traditional economic foundations have long been under threat.

Governing through partnership

Thirdly, Newcastle's smart city is being shaped by the specific nature of the partnerships that underpin its evolution and implementation. Smart city conception and implementation requires innovation – technological, knowledge-based, processual and political – but it also requires capital and, in particular, infrastructure. In Newcastle, as in other places, these requirements of multi-dimensional innovation and infrastructure provision are met by a 'triple helix': partnerships between government, industry and universities (Lombardi *et al.* 2012, Hambleton 2014). The triple helix underlying Newcastle's smart city strategy is informed by the city's historical record of developing innovative partnerships as part of governance responses to challenges such as climate change (Bulkeley and Betsill 2003), and of harnessing federal and state resources to achieve its goals (Bulkeley *et al.* 2016b).

While Australian smart cities all invest in industry, government and community partnerships, Newcastle's partnership approach is fuelled by long-standing partnerships that have readily allied around a unified vision of future Newcastle. This is in part attributable to the long-recognised need to develop a city that can thrive beyond its traditional industrial economy. Below we address how the evolution of Newcastle smart city has been shaped by: 1) the strategic cultivation of key partnerships with other governance actors to leverage specific funding opportunities; and 2) the fortuitous synchronicities between the future aspirations of key partners.

Newcastle's starting point was the necessity for long-term partner collaboration: 'The City understands that this is not something that we can do alone, it's really about coordinated and long-term commitment of a whole range of stakeholders. Collaborative strategy is a really important component' (interview with council employee). The city council's core strategic partnership has been with the University of Newcastle. As the coordinator put it, 'that marriage is at the heart of it … that's the core of the value proposition' (Burgoyne and Maalsen 2016: 35). This partnership rests on a strong history of university collaboration with the city: as with many regional universities, the town–gown relationship in Newcastle is strong (Addie *et al.* 2015), and has been since the community and council's campaign that led to the University's foundation in the 1950s. But it has been buoyed by the significant synchronicities between the city's smart city aspirations and broader university aspirations.

The Council's smart aspirations have, in many respects, mirrored the University's pursuit of strategic developments around 'smart innovation' and the digital and creative industries. These aspirations have been given material form through the University's expansion via a CBD campus development, itself informed by familiar smart city tropes: smart innovation, entrepreneurship, start-ups, smart hubs (Söderström *et al.* 2014, Marvin *et al.* 2016). The material development of the campus itself, and the networks of investment flows likely to stem from this, has been widely supported in an inner city long plagued by

built environment decline and property vacancy (Ruming *et al.* 2016, Gentle and McGuirk 2018). This particular town–gown relationship, channelled in part through actualising Newcastle's smart city strategy, is likely to become a key vector through which the University contributes to reshaping Newcastle's urban space through developments styled as part of the smart city (see Addie *et al.* 2015).

This synchronicity between the city's need for built environment renewal, the aspirations of the University and those of the Council helped the city secure one of the key planks of the Smart City Strategy: the Hunter Innovation Project. The Hunter Infrastructure Investment Fund (HIIF) was established in 2011 by the State Government to enhance regional infrastructure to support economic growth. The Council and the University led the formation of an alliance of regional actors with common interests in innovation to submit a unified single bid. The bid drew together a core partnership of the city, the University, *Newcastle Now* representing the broader business community and Hunter DiGiT (a multi-faceted digital sector network), allied with a series of stakeholders across interested government agencies and industry groups. The bid aimed to address 'the infrastructure needs of the city and the region and … [the design of] a set of components that are going to really catapult us into the 21st century' (interview with council employee).

The success of the bid secured the Hunter Innovation Project, valued at nearly $10m in HIIF funds and able to attract an additional $8m in local backing from the Council and the University. Its success demonstrated the city's capacity to leverage stakeholders, via a collaborative strategy, to win funding. The HIP is the infrastructural spine of Newcastle's Smart City Strategy, as noted above. Equally importantly in terms of partnerships, it has become a clearing house for the ongoing coordination of the smart city, and as such new sets of partnerships are emerging around its actualisation. As a member of council staff put it:

> HIP started as the grant application and has grown to encompass the mechanism for all of the collaborative strategic actions … Now it's doing stuff around incubation, data, Living Lab strategy, anything that involves a lot of organisations needing to come together. It's kind of the umbrella organisation for that.

The HIP was further boosted in 2017 with a $5 million grant from the Federal Government's Smart Cities and Suburbs program. The funds will be used to develop a digitally integrated multi-modal city transport system that is aimed to increase productivity and efficiency. (City of Newcastle 2017a)

Newcastle Smart City Strategy 2017

This geographical and historical context provides a crucial lens through which to finally interpret the recently released Smart City Strategy (City of Newcastle 2017b). The strategy liberally draws on the history and politics we

have just described to establish its legitimacy, emphasising, for example, the embeddedness of the strategy in regional priorities as well as a wide-ranging consultation process. It addresses the generic domains of intervention common across planning strategies – economy, mobility, people, living, environment, governance – alongside the increasingly ubiquitous actions frequently deployed by smart city strategies such as open data, e-governance, Wi-Fi provision and smart waste systems.

Yet the specific initiatives through which the strategy is implemented underpin the significance of the economic drivers and emphasis on business and community partnerships outlined above, alongside leveraging the city's previous policy investments in nurturing creativity and the cultural industries. Of the more than 100 initiatives identified in the strategy, 94 involve active partnerships, the majority of which are being led by the city. The planned community lab and collaborative living lab, for example, interleave partnerships with technology, while one of the e-governance initiatives focuses on leveraging technology to improve communication between local start-ups and local government. Emphases on economic innovation and creativity are woven across the domains of people, governance and economy through initiatives such as the creation of a digital precinct, a focus on start-up innovation and a 'digital creative Newcastle' focus. The strategy has been formally approved, though has yet to be comprehensively rolled out. Nonetheless, the imbrication of local context across its widespread smart initiatives is clear.

Discussion and conclusion

Critical urban studies is increasingly cognisant that what constitutes 'smart city' locally is tied to context-specific development agendas and needs (Haarstad 2017). The work that a smart agenda is expected to perform, the particular balance of purposes to which it is applied and the partnerships and institutional configuration through which it is mobilised are inseparable from its negotiation of socio-political and material dimensions. In the Newcastle case, formal aspirations for what the smart city will become are heavily inflected with the Smart City Strategy's harnessing to the agenda of advancing the city's revival and post-industrial transition (see **Figure 2.1**). In a broad sense, this relates to community expectations and demands for urban economic renewal, and to the political imperative to address this expectation. The particular pathway to economic development, with its distinctive emphasis on the creative and cultural industries (see **Table 2.1**), reflects Newcastle's previous successes in leveraging these industries toward urban revitalisation. In particular, the city's *Renew Newcastle* initiative – a temporary urbanism initiative – had made key strides in generating opportunities, drawn artists to the city and kick-started the re-occupation of the city's vacant commercial properties (Westbury 2015). The University's additional interest in connecting the creative to the innovative and the digital has dovetailed with this trajectory. The Newcastle Smart City Initiative bears the imprint

of these multiple agendas while simultaneously putting 'smart' to the work of economic development (see Angelidou 2015).

An enduring theme in critical urban analysis of smart cities is the significance of technology providers as dominant actors crafting and implementing generic smart city visions, such as IBM's Smarter Cities (McNeill 2015, Alizadeh 2017). The example of Newcastle and our analysis of it build upon an emerging recognition of more complex relations between local authorities and technology providers. As Barns and colleagues (2017: 28) point out, those associated with governing smart cities 'must have skills in negotiating with a wide range of actors, from multinational firms like Uber, Cisco and IBM, national technology giants like Telstra, and a wide range of start-ups and SMEs responding to procurement opportunities'. This is clearly the case in Newcastle. The implementation capacity of the partnership that underpins Newcastle's formal smart city strategy, now channelled via the HIP, has enabled the city to resist becoming tied to any single tech corporation or locked in to single integrated platforms. Rather, the city has been able to maintain relationships with other providers – both private and public – that drive the smart city strategy forward. Newcastle's cautious approach may have provided the opportunity for learning, and consolidated the Council's approach of aiming to avoid off-the-shelf smart city solutions and to find those suited to the city's particular context and aspirations. In one council employee's words:

> It's also about forcing them to stretch. We don't want an off-the-shelf product from Santander or whatever, we want to develop local solutions … we're not comfortable with the idea that any vendor would just pick up a vertically integrated model and just plonk it down on Newcastle when it's out of the local character and the local context … The word's out that Newcastle is making moves in this area and they're trying to get a piece of it, I guess. We'd like to welcome them all, but on our terms, not on their terms.

The 'vendor agnostic' stance demonstrated in Newcastle re-emphasises Shelton and colleagues' call to look more closely at the nature of tech corp/city relationships as part of assessing 'actually existing' smart cities.

Newcastle's case does indeed illustrate how a new set of private actors and capabilities are becoming increasingly embedded within urban governance settings, with related recalibrations to the governance priorities pursued (Barns *et al.* 2017: 25). Yet while much literature has suggested that tech corporations are at the heart of this recalibration, often in problematic ways (Vanolo 2014, McNeill 2016), the Newcastle case suggests the need to extend the lens to include universities and to consider how multiple development aims and political agenda might be woven together in the design, capacitation and implementation of the smart city in ways that are more deeply contextualised and incrementally constituted than previous analyses may have suggested.

We opened this chapter with the acknowledgement that Australia is a comparatively late adopter of smart city discourse. Rather than being seen as laggards, the cities considered in this chapter, and especially the Newcastle case, can shed light on ways that debate on smart cities may move forward. There is considerable critique of the fallibilities of smart cities, particularly when it comes to uneven power relationships between vendors and governments, lack of consultation and blindness towards the complexity of cities. The Australian smart city strategies profiled here, however, offer some interesting commentary on these critiques. Firstly, the cities remain vendor agnostic and are cautious not to be locked into contracts; they are also demanding more of the technology corporate vendors. This is partly because they are fully aware of keeping smart assets government owned, but also because the nature of Australia and its local governments demand different approaches: in some instances standard technologies will not function in the climatic extremes; in others local government population sizes do not represent a large enough return on investment to sustain public/private partnerships.

Secondly, the implementation of smart city policy in the profiled cities results from strategic considerations of community consultations, broader city visions and the prioritisation of economic reinvention. In confronting the institutional and material complexity of the city, smart transforms and becomes embedded across local government processes and institutions. Smart is becoming a new mode of urbanisation that certainly steers urban development under the guise of technological innovation but, in these cases at least, also in concert with economic development and institutional restructuring.

Notes

1 Interviews were conducted in 2016 by Sandy Burgoyne and Sophia Maalsen as part of a project that looked at how smart city initiatives were being rolled out in four Australian cities: Adelaide, Newcastle, Melbourne and the Sunshine Coast (Burgoyne and Maalsen 2016).
2 See www.smarthappenshere.com.au.

References

Addie, J.P. Keil, R. and Olds, K. (2015). Beyond town and town: universities, territoriality and the mobilization of new urban structures in Canada. *Territory, Politics, Governance 3*: 27–50.

Alizadeh, T. (2017). An investigation of IBM's Smarter Cities Challenge: what do participating cities want? *Cities 63 (Supplement C)*: 70–80.

Alizadeh, T. and Shearer, H. (2015). A snapshot of high-speed broadband responses at local government level in Australia: a marriage between federally funded initiatives and locally driven innovations? *Australian Planner 52*: 42–50.

Angelidou, M. (2015). Smart cities: a conjuncture of four forces. *Cities 47*: 95–106.

Arup (2010). *Smart City: Transforming the 21st Century via the Creative Use of Technology*. London: Arup.

Barns, S., Cosgrave, E., Acuto, M. and McNeill, D. (2017). Digital infrastructures and urban governance. *Urban Policy and Research 35*: 20–31.

Bavinton, N. (2010). Putting leisure to work: city image and representations of night-light. *Journal of Policy Research in Tourism, Leisure and Events 2*: 236–50.

Bulkeley, H. and Betsill, M. (2003). *Cities and Climate Change: Urban Sustainability and Global Environmental Governance*. New York: Routledge.

Bulkeley, H., Cohenen, L., Frantzeskaki, N., Hartmann, C., Kronsell, A., Mai, L., Marvin, S., McCormick, K., van Steenbergen, F. and Voytenko Palgan, Y. (2016a). Urban living labs: governing urban sustainability transitions. *Current Opinion in Environmental Sustainability 22*: 13–17.

Bulkeley, H., McGuirk, P.M. and Dowling, R. (2016b). Making a smart city for the smart grid? The urban material politics of actualising smart electricity networks. *Environment and Planning A: Economy and Space 48*: 1709–1726.

Burgoyne, S. and Maalsen, M. (2016). How smart are Australian cities? Local approaches to adopting smart city strategies. Future Cities Collaborative/The United States Studies Centre at the University of Sydney.

Citron, R. (2016). Better late than never for smart cities in Australia. Navigant Research, 29 December 2016. [Online]. Available: www.navigantresearch.com/blog/better-late-than-never-for-smart-cities-in-australia [Last accessed 27 October 2017].

City of Newcastle (2017a). City welcomes smart city funding. [Online]. Available: www.newcastle.nsw.gov.au/Council/News/Latest-News/City-welcomes-smart-city-funding [Last accessed 15 January 2017].

City of Newcastle (2017b). Newcastle City Council Smart City Strategy 2017–2021. [Online]. Available: www.newcastle.nsw.gov.au/Newcastle/media/Documents/Strategies,%20Plans%20and%20Policies/Strategies/Newcastle-City-Council-Smart-City-Strategy-2017-21.pdf [Last accessed 27 October 2017].

Cugurullo, F. (2016). Frankenstein cities: (de)composed urbanism and experimental eco-cities. In J. Evans, A. Karvonen and R. Raven (eds), *The Experimental City*. London: Routledge, 195–205.

Datta, A. (2015). New urban utopias of postcolonial India: entrepreneurial urbanization in Dholera smart city, Gujarat. *Dialogues in Human Geography 5*: 3–22.

Economist (2017). Global liveability has improved for the first time in a decade. *The Economist*, 16 August 2017. [Online]. Available: www.economist.com/blogs/graphic-detail/2017/08/daily-chart-10 [Last accessed 27 October 2017].

Gabrys, G. (2014). Programming environments: environmentality and citizen sensing in the smart city. *Environment and Planning D: Society and Space 32*: 30–48.

Gentle, N. and McGuirk, P. (2018). Rethinking culture-led urban regeneration: the creative (re)assembling of inner-city Newcastle. In K. Ruming (ed.), *Urban Regeneration and Australian Cities*. London: Routledge, 227–245.

Gordon, J. (2015). Don't hold your breath. *Newcastle Herald*, 31 August 2015. [Online]. Available: www.theherald.com.au/story/3317168/jason-gordon-dont-hold-your-breath. [Last accessed 27 October 2017].

Hambleton, R. (2014). From the smart city to the wise city: the role of universities in place-based leadership. Paper for Smart City: New Media, Social Participation and Urban Governance International Workshop. Shanghai University, China, 5–7 June 2014. [Online]. Available: http://eprints.uwe.ac.uk/24142 [Last accessed 27 October 2017].

Haarstad, H. (2017). Constructing the sustainable city: examining the role of sustainability in the 'smart city' discourse. *Journal of Environmental Policy & Planning 19*: 423–437.

HIP (Hunter Innovation Project). (2018). *Hunter Innovation Project website*. [Online]. Available: http://hunterinnovationproject.com.au [Last accessed 27 October 2017].

Hollands, R.G. (2008). Will the real smart city please stand up? *City 12*: 303–320.
Jones, R., Instone, L. and Mee, K.J. (2014). Making risk real: urban trees and the ontological politics of risk. *Geoforum 56*: 211–225.
Kitchin, R. (2015). Making sense of smart cities: addressing present shortcomings. *Cambridge Journal of Regions, Economy and Society 8*: 131–136.
Lombardi, P., Giordano, S., Farouh, H. and Wael, Y. (2012). Modelling the smart city performance. *Innovation: The European Journal of Social Science Research 25*: 137–49.
Luque-Ayala, A. and Marvin, S. (2016). The maintenance of urban circulation: an operational logic of infrastructural control. *Environment and Planning D: Society and Space 34*: 191–208.
Marvin, S., Luque-Ayala, A. and McFarlane, C. (eds) (2016). *Smart Urbanism: Utopian Vision of False Dawn*. New York: Routledge.
McNeill, D. (2015). Global firms and smart technologies: IBM and the reduction of cities. *Transactions of the Institute of British Geographers 40*: 562–574.
McNeill, D. (2016). Governing a city of unicorns: technology capital and the urban politics of San Francisco. *Urban Geography 37*: 494–513.
Ruming, K., Mee, K.J. and M^{c}Guirk, P.M. (2016). Planned derailment for new urban futures? An actant network analysis of the 'great [light] rail debate' in Newcastle, Australia. In Y. Rydin and L. Tate (eds), *Exploring the Potential of Actant Network Theory*. London: Routledge, 44–62.
Shelton, T., Zook, M. and Wiig, A. (2015). The 'actually existing smart city'. *Cambridge Journal of Regions, Economy and Society 8*: 13–25.
Söderström, O., Paasche, T. and Klauser, F. (2014). Smart cities as corporate storytelling. *City 18*: 307–320.
Townsend, A. (2013). *Smart Cities: Big Data, Civic Hackers and the Quest for a New Utopia*. New York: Norton.
Vanolo, A. (2014). Smartmentality: the smart city as disciplinary strategy. *Urban Studies 51*: 883–898.
Wiig, A. (2016). The empty rhetoric of the smart city: from digital inclusion to economic promotion in Philadelphia. *Urban Geography 37*: 535–553.
Wiig, A. and Wyly, E. (2016). Introduction: thinking through the politics of the smart city. *Urban Geography 37*: 485–493.
Westbury, M. (2015). *Creating Cities*. Melbourne: Niche Press.

3

DISSECTING THE FRANKENSTEIN CITY

An examination of smart urbanism in Hong Kong

Federico Cugurullo

Introduction: smart urbanism between dream and reality

The tension between ideas and materiality, between dreams and reality, has roots which go back to the beginning of civilisation. From an urban perspective, we can find evidence of this phenomenon in the very genesis of philosophy and science. In *The Republic*, for example, written by Plato around 380 BC, the Greek philosopher discussed the nature of ideals, placing them in a dimension separated from our world; meanwhile in *The Politics*, his disciple, Aristole, struggled to find a material representation of the ideal city in existing built environments (Aristotle 1981, Plato 2007). Across history, the same theme has been reprised and refined by a number of scholars who have, at different times and in relation to different spaces, explored the discrepancy between visions of ideal cities and their actual material incarnations (see Fishman 1982, Kruft 1989, Cugurullo forthcoming). Despite the heterogeneity of this body of work, the key lesson is surprisingly homogenous: when we attempt to translate an urban ideal into an urban space, things go wrong and the outcome is usually far from what our mind had initially conceived.

There are several reasons for this progression, which can be summarised in a single word: context. As notable examples such as Fra Carnevale's Ideal City, Ebenezer Howard's Garden City and Le Corbusier's Ville Radieuse show, the location where we attempt to materialise a vision matters. Ideals can be conceptualised as universal and homogeneous, while contexts tend to be specific and heterogeneous. This is a situation which can be observed from multiple perspectives. It is an objective fact that the physical geography of the planet, for example, is extremely diverse; and it is therefore hard, if not impossible, to envision a single plan for an ideal city, which can fit a plethora of morphologies. Similarly, when it comes to politics, we come across the same degree of diversity, among different

societies as well as within the same society. Different cities, for instance, are governed through different political systems, and a one-size-fits-all master plan would not be universally accepted. Moreover, a city is normally governed by a number of different actors with different interests which are difficult to unify via a single urban design. In essence, implementing the same ideal in different contexts is rarely possible; and when it is, the context reshapes the ideal to the point that the latter might no longer be recognisable.

More recently, this is a lesson which has been repeatedly posited by critical urbanists working in the field of sustainable urbanism. Building upon research conducted in both the Global North and South, many academics have lamented the stark discrepancy between the lofty socio-environmental targets of urban sustainability projects and their actual performances (Krueger and Gibbs 2007). Eco-city projects are emblematic of this phenomenon. Over the last decade, numerous studies have revealed 'gaps between ideas and realities in individual cases' of so-called ecological urbanism (Chang 2017: 1721). In practice, the word 'eco' often does not stand for *ecological* but rather for *economic*; and eco-city initiatives, instead of pursuing visions of sustainability, tend to cultivate the business of capitalist elites (Cugurullo 2013a, Caprotti 2015, Datta 2015, Rapoport and Hult 2017, Rosol *et al.* 2017). These studies show that the failures of these projects are not simply due to the physical limits discussed by Plato. Ideals are not perfectly translated into material artefacts: not because their perfection belongs to a different and impenetrable plane of existence, but because those in charge of the process do not want to realise them in the first place. The analysis of the Masdar City project in Abu Dhabi, for instance, has demonstrated that the plan of the developers was never to create a city by following the rules of ecology. Instead, the agenda was shaped by financial interests, and ultimately designed to support the political economy of Abu Dhabi, with little or no interest in social and environmental concerns (Cugurullo 2013b, 2016a, 2016b, Caprotti 2014, Cugurullo and Ponzini this volume).[1]

This chapter follows the above line of research to investigate the extent to which the ideal of smart urbanism differs from its material representations. To put it simply, what happens when the smart city, as an idea, touches down in a particular context? The geographical focus of the chapter is the city-region of Hong Kong, where the smart-city agenda is analysed on the basis of three months of fieldwork between 2013 and 2016 to reveal how the local understanding and practice of smart urbanism has been shaped by the politico-economic context.[2] The chapter is organised as follows. In the next section, the narrative explores the conceptual underpinnings of smart urbanism, focusing on its core ideas and promises, framing the following empirical analysis through the notion of *Frankenstein urbanism*.

The chapter then examines the politics of urban development in Hong Kong, presenting the city as an incarnation of the logic of neoliberal urbanism, largely implemented by a plethora of heterogeneous private forces with little or no control from the government. As this part of the study will show, this is

a politico-economic context in which the local government actively triggers urbanisation, and subsequently loses control over it once the power to urbanise is consciously given to private companies. In the fourth section, the chapter examines how Hong Kong's smart-city agenda is rolled out over a fragmented urban-political *milieu* which leads to the production of a number of heterogeneous smart interventions. Because of such fragmentation, what is nominally a cohesive smart city grows as a patchwork of disconnected built environments which undermine the sustainability of the region, particularly from a socio-environmental perspective. Ultimately, this study dissects the practice of smart urbanism in Hong Kong to reveal its components in the hope that the emerging lessons can contribute to the development of more sustainable smart cities.

Smart urbanism under the shadow of Frankenstein urbanism

Before beginning the inquiry, the first question to face is: what is the smart-city ideal? Although we know that there is no single understanding of the smart city, current smart-city initiatives tend to take inspiration from a fairly homogeneous imaginary (Cugurullo 2018). From a philosophical point of view, the smart-city movement sees information and communication technology (ICT) and engineering as infinite sources of data and energy through which cities can be managed and powered in an efficient and, ultimately, sustainable manner (Neirotti *et al.* 2014, Vanolo 2014, Calzada and Cobo 2015, McNeill 2015, Hashem *et al.* 2016, Kummitha and Crutzen 2017, Mosannenzadeh *et al.* 2017). Here, the expectation, and also the promise, is that through the development and enhancement of urban technologies – such as big data networks, autonomous transport systems and smart grids – it is possible to better understand how cities function to improve their metabolism (Viitanen and Kingston 2014, Luque-Ayala and Marvin 2015, Garau *et al.* 2016, Coletta *et al.* 2017). In terms of energy, for instance, smart interventions are promoted to synchronise demand and production, avoid waste when energy circulates and allow the transfer of energy from a building with a surplus of energy to one in need of energy. Conceptually, there is an explicit connection between technological development and urban development, based on an incessant creation of new technologies designed to integrate the built environment. In these terms, according to the narrative of smart urbanism, the progress of a given city is pursued (and measured) by means of the progress of its technology.

Moreover, one of the main claims made by advocates of the smart city is that such initiatives are different, alternative and, in a word, better, inasmuch as they are based on comprehensive master plans whose implementation is followed in a systematic manner. The argument is that smart urbanisation is grounded in rationality and order, while abhorring chaos and disorder. In this sense, smart urbanism is about detailed blueprints and methodologies designed to reshape and technologise the fabric of an entire city. According to Zygiaris (2013: 225), for example, 'Barcelona's smart planning follows a top-down design approach,

which ensures a comprehensive smart city plan', while for Washburn and colleagues (2009: 9), Masdar City and Songdo 'have the luxury of incorporating the Smart City vision in its entirety'. The same logic is echoed in the many discourses where smart-city agendas are celebrated. Vienna's smart urbanism, for instance, is intended to be 'systematically' implemented through 'comprehensive innovation' providing 'the best quality of life for all inhabitants' (Smart City Wien 2017). In a similar vein, Masdar City boasts 'innovative sustainable development and a single vision of sustainability engineered on a grand scale' (Masdar Initiative 2017). In essence, smart-city projects appear to aim not only high, but also big in terms of scale, as their official target is never a single building or a single infrastructure, but rather the entire city.

Given the capillary diffusion of the smart-city movement, and its impact on global socio-environmental and economic systems, we need to study and evaluate the urban futures that smart-city agendas are promising, starting with the foundations of their claims. Are existing smart-city projects actually realising their ideals? To what extent is it possible to translate abstract visions of smart urbanism into built environments through a master plan? The chapter will shed light on these questions by using the theory of *Frankenstein urbanism* as a lens to explore what spaces, infrastructures and technologies are produced by smart-city agendas, and how these material products are connected to each other and, above all, to the original vision of smart urbanism (see Cugurullo 2017a). This theoretical framework, originally developed to study urban experiments (including smart-city and eco-city projects), although far from being universal in terms of scope and ambition, emphasises two crucial aspects of the smart-city phenomenon.

First, on a micro-scale, the single buildings, infrastructures and technologies produced by smart-city agendas are the outcome of a process based upon a rigorous scientific method which disciplines the translation of an idea into an artefact. A roof-mounted photovoltaic panel, for instance, is developed, built and, eventually, integrated into a building by means of complex engineering studies and methodologies. However, on a macro-scale (the city and the region), the same scientific approach does not apply. Urbanisation is not framed by a detailed and coherent plan of action. Instead, it occurs in a chaotic and uncoordinated manner, resulting in outcomes which are often very different from the original vision. In these terms then, the notion of Frankenstein urbanism focuses the inquiry on the scale of smart urbanism, and where smart interventions are actually taking place.

Second, the absence of a holistic planning strategy means that the single components of smart-city projects are conceived and implemented on an individual basis and, as a result, they are not in sync with each other. Individually they perform well, but the lack of connection creates fragmentation and, ultimately, a condition of contrast in which different urban developments oppose one another. In addition, this lacuna affects not only the built environment but also the natural environment, and manifests itself in buildings, infrastructures and technologies which are insensitive to local ecosystems. Here, the Frankenstein

framework seeks to capture the degree of connection between a smart intervention and the rest of the built environment, and between smart interventions and the natural environment.

Ultimately, what the theory of Frankenstein urbanism puts emphasis on is that smart-city agendas might result in unsustainable urban monsters made of a patchwork of different incompatible elements due to the fragmentation of the politics of the city (Cugurullo 2016c). On the one hand, we have ideals which are homogeneous in their abstract perfection. On the other hand, we have cities whose physical evolution has been, through the ages, governed and shaped by heterogeneous political systems made of often contrasting forces (see Mumford 1961, Benevolo 1993). When these two dimensions collide, the heterogeneity of urban politics affects the homogeneity of urban ideals, thereby producing fragmented built environments. The final product is intrinsically connected to the place where ideas and reality clash; and, for the purpose of this study, it is therefore essential to analyse smart-city initiatives within their specific geographical context. Building upon this premise, the chapter now turns to Hong Kong, focusing on the context of its smart-city agenda.

Neoliberal Hong Kong

Now a Special Administrative Region (SAR) of the People's Republic of China (PRC), Hong Kong was previously a colony of the British Empire. Although geographically and (from 1997) politically connected to China, this is a region whose development has been deeply influenced by Western models since its inception as a city-state in 1841 (Shelton *et al.* 2013). Today, the development of Hong Kong is based on the principle of 'One Country, Two Systems' under which the pre-unification economic paradigm, capitalism, remains the dominant model. Often described by scholars as 'laissez-faire capitalism', Hong Kong's economic system has produced what for many years has been the world's freest economy (Index of Economic Freedom 2017). In essence, state intervention in the various economic activities taking place across the city-region is minimal, and great freedom is given to private companies, particularly in relation to the two core sectors of the local economy: real estate and finance (Haila 2000, Lai 2012). When it comes to urban development, the same logic applies. As Raco and Street (2012) point out, the planning system of Hong Kong is flexible, and akin to that of a Western neoliberal city such as London. The SAR owns the land, and developers bid for parcels of it in the absence of an overarching vision of urban development (see also Raco and Gilliam 2012). Once a lease is signed, the government has little or no authority over the design and function of what will be built on a parcel.

Over the years, the product of this uncoordinated model of city-making has been a heterogeneous and fragmented built environment. From a design and architectural perspective, Hong Kong is a melting pot of different aesthetics in which old Chinese temples can be found next to modernist skyscrapers, and run-down social housing estates stand in the shadow of colossal five-star hotels

(Mathews 2011). However, what is more problematic is that the laissez-faire attitude of the government has allowed private developers to prioritise their individual economic interests, to the detriment of the social and environmental needs of the region. As a result, the SAR is characterised by a rising GINI coefficient which is symptomatic of a deeply divided society, while suffering from severe issues of water and air pollution, and biodiversity loss (Tam *et al.* 2000, Chan *et al.* 2002, Chiang and Tang 2003, Hong Kong Government 2012).

The situation is particularly dire in terms of housing. Academics and journalists have repeatedly stressed that 'the construction industry in Hong Kong has long been associated with poor quality' (Tam *et al.* 2000: 437, also see The Guardian 2013, 2017). Because of the chronic lack of developable flat land, Hong Kong's developers tend to maximise the usable space by building compact high-rise housing units provided with very small flats.[3] In addition, to reduce construction costs, developers tend to save money by using low-quality building materials and infrastructures (Chan *et al.* 2002). The outcome is a hyper-dense city where only a minority of high-income workers can afford adequate housing. According to a recent official report, Hong Kong's housing market is the most expensive in the world. As a result of the sky-high cost of properties, over 200,000 people are living in subdivided flats, with 65 per cent of families in units ranging from 7 to 13 square metres (Hong Kong Government 2016). Yet, to date, the government has not stepped in to enforce a more socially just housing stock, instead favouring the economic interests of property development companies.

In light of this neoliberal politico-economic context, it is therefore not surprising that the recent urban agendas advanced by the government have failed to achieve their goals. Emblematic is the case of *Hong Kong 2030*, a programme of urban development officially launched in 2007 under the banner of sustainability (Cugurullo 2017b). As noted by scholars such as Francesch-Huidobro (2012), Higgins (2013) and Wong and Wan (2009), the SAR's first agenda of sustainable urban development ended up as a collection of discourses promoting economic growth in synergy with social justice and environmental preservation, but with no real political power and, therefore, concrete effect. Eventually, because of the non-compulsory nature of *Hong Kong 2030*, the game of private developers remained fundamentally unchanged, and the SAR's vision of urban sustainability remained just a vision.

It is in this context that, in September 2013, the government of Hong Kong launched a smart-city agenda. Officially named *Smarter Hong Kong, Smarter Living*, the SAR's programme reflects the broader imaginary of smart urbanism, as discussed above. From a philosophical point of view, the emphasis is on technological innovation (ICT in particular), in sync with urban development. According to a policy document, a smart city is:

> one with wide application of new technologies such as sensors, Internet of Things, cloud computing, mobile technology and big data analytics to

> develop intelligent systems in city planning, construction and management. A smart city uses innovation in various aspects of city development to integrate the city's systems and services, thereby producing synergy and increased efficiency in the use of resources.

From a practical point of view, the focus of the document is on master planning.

According to the Secretary for Commerce and Economic Development, *Smarter Hong Kong, Smarter Living* is a 'blueprint': a detailed plan of action intended to homogeneously reshape the urban fabric of the city-region (Commerce and Economic Development Bureau 2013: 1). The blueprint aspect of the agenda was recently re-emphasised by the government through a new initiative: *Hong Kong Smart City Blueprint* (Hong Kong Government 2018). However, there is an evident tension between the general laissez-faire attitude of the SAR towards planning, discussed above, and its policymakers' apparent will to master plan the transformation of the whole of Hong Kong into a smart city. The chapter now examines this issue by turning to the implementation of *Smarter Hong Kong, Smarter Living*, with a focus on what has actually been built, where and how.

The geography of smart urbanism

'We don't have an integrated policy. Our approach is project-based.' This is how a representative from the Planning Department of Hong Kong described the government's approach to smart urbanism. As the interviewee explained, the regional smart-city agenda is not coordinated by any administrative division. There are many smart-city projects taking place, at the same time and in different spaces, across the SAR. The Planning Department engages with them exclusively on an individual basis, without any overarching master plan. This course of action is radically different from what the official smart-city campaign promises. The only plan that is being implemented is economic in nature and consists of giving private developers carte blanche to fulfil their own interests. 'We are trying to change the environment to make it more conducive to business', said the representative, describing the smart city as 'the way forward' to 'make the environment attractive to companies'.

This attitude is effectively a planning void which, when it comes to smart urbanism, translates into a myriad of heterogeneous and disconnected smart interventions largely led by the private sector. These interventions can be divided into two categories: retrofits and new builds. In the first category, we find existing buildings and infrastructures which are regenerated and (from a technological point of view) modernised by means of smart devices. These are interventions which are initiated by private companies and implemented by private companies. Cathay Pacific, for instance – the flag carrier of Hong Kong and, in essence, one of the largest companies in the SAR – pays another private company, IBM, to make its services, buildings and infrastructures *smart*. IBM uses its software and hardware to streamline the storage and analysis of the data that the business of

Cathay Pacific generates, and integrates technologies such as smart sensors and CCTV into the company's offices, thereby making them safer and more energy efficient. Other examples include hotels and shops where owners invest in smart interventions to improve customer service and, ultimately, their revenue (see IBM 2017, 2018).

In the second category, we find buildings and infrastructures constructed from scratch, such as the Hong Kong Science Park (HKSP): one of the flagship smart-city initiatives developed under the banner of *Smarter Hong Kong, Smarter Living*. The Park is a 220,000-square metre urban space which accommodates over 600 companies working in cleantech. The mission of HKSP (2017) is to 'catalyse technological innovation' in areas ranging from robotics to renewable energy. This is a goal which is pursued via the built environment. The Park's infrastructure is permeated by a plethora of smart technologies such as integrated photovoltaic panels, insulated facades, experimental hybrid energy generators mixing solar with wind power, and smart grids. Moreover, part of the renewable energy produced by the Park's new technologies feeds into intelligent transport systems like pilot models of self-driving autonomous cars.

It is important to note that the geography of these smart installations is uneven and does not resemble the product of a blueprint. **Figure 3.1** shows the location of HKSP within the SAR. The areas in grey represent the urbanised

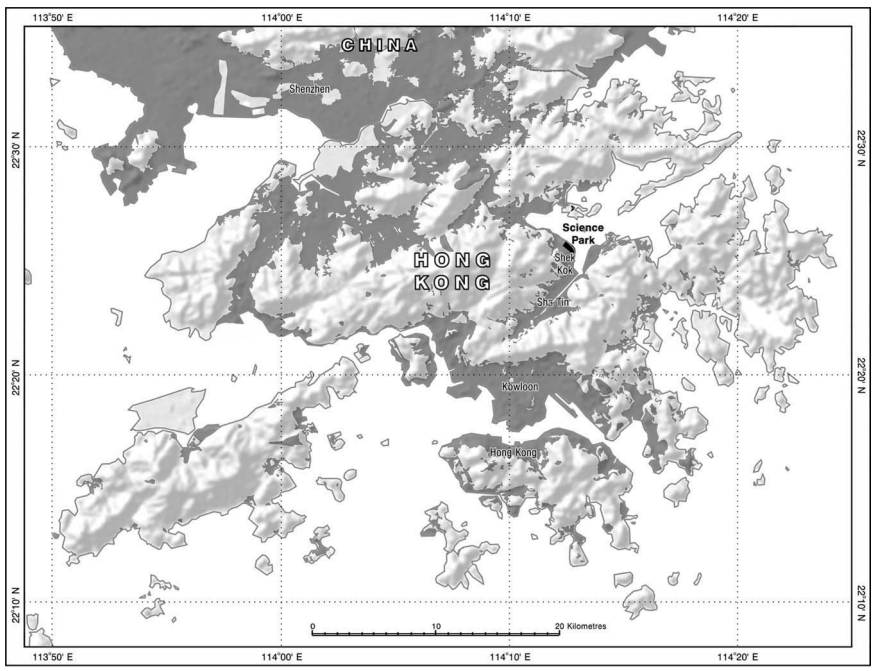

FIGURE 3.1 Map of the location of the Hong Kong Science Park.
Source: author and the University of Manchester's Cartographic Unit.

extent of Hong Kong, while those in white are part of the territory which has not been touched by urban development yet, and consist mostly of mountainous terrain (high peaks where it is hard to build). From a geographical perspective, HKSP (in black) is located in Pak Shek Kok, in the north-east of the region. It is detached from the main urban areas of Hong Kong, and its only close connection is with the campus of the Chinese University of Hong Kong, with whom HKSP has a research partnership.

Overall, the Park is an isolated urban environment populated almost exclusively by those who work there, with little or no social activities after office hours. Its position was strategically determined by a twofold economic rationale. First, the cost of land, which is considerably cheaper far from the hyper-dense centre of the SAR: Kowloon and the northern side of Hong Kong Island. In this sense, Pak Shek Kok, given its location, represents a major source of savings for the developers. Second is the proximity of the Park to mainland China. There is a direct connection between Shenzhen, an important financial node near the southern border of China, and HKSP via the regional metro system. In addition, the two locations are connected by a major road passing between two ridges, which allows for quick transit by car. As a manager from HKSP explained, this geographical configuration is convenient and, above all, profitable, inasmuch as Chinese investors and potential buyers of the many smart technologies developed in the Park can visit its showrooms and see with their own eyes how new devices function and perform.

From a sustainability point of view, this is a geography with several problems. The distribution of smart interventions is not based on a planning rationale which embraces a holistic approach to urban development, but rather on a neoliberal logic which narrows the focus down to the economic interests of an elite. The actual outcomes of *Smarter Hong Kong, Smarter Living* – whether in the shape of new or existing smart buildings and infrastructures – are located exclusively where it is economically more beneficial for the developers, and where the service of private companies such as IBM has been paid for. From a social justice perspective then, this means that: (a) smart interventions supersede less lucrative urban initiatives; and (b) their benefits are shared only among those who can afford them. As a result, instead of a homogeneous smart urbanisation, we find an isolated urban development which overlooks social issues and exacerbates the divide between the rich and the poor.

Such unequal urbanism is particularly deleterious in relation to the housing crisis discussed in the previous section, inasmuch as it not only ignores the SAR's lack of affordable houses but also ameliorates the condition of the few high-income workers who already have access to adequate housing. This unsustainable situation is the direct consequence of a specific decision of the Planning Department, whose publications do not mention a single intervention related to social issues of any kind. As confirmed in several interviews, the SAR's budget allocated to *Smarter Hong, Smarter Living* is devoted entirely to the development of premium business spaces.

The SAR's practice of smart urbanism does not only fragment the built environment; it also causes severe ecological fractures. Smart buildings, infrastructures and technologies are developed in isolation from the surrounding natural environment. In terms of urban planning and design, the implementation of HKSP, for example, followed what a representative from the Park defined as 'the standard approach in Hong Kong'. According to the interviewee, the process was not informed by an ecological rationale. The developers did not conduct an environmental impact assessment, but simply cleared the plot of the existing vegetation and then levelled and paved the land. The only local administrative division with expertise in environmental preservation and ecology, the Environment Bureau, was not consulted, and HKSP was built on ecological ignorance and indifference.

It is important to stress the fact that this is not an isolated case. The story of HKSP, and more generally of *Smarter Hong Kong, Smarter Living*, resonates with broader regional trends in urban development. There is a plethora of empirical evidence that the urbanisation of China since the 1990s has had deleterious impacts on natural habitats. Forests, rivers and lakes have been erased to make room for new cities and urban infrastructures, to bolster the national economy (He *et al.* 2014, Long *et al.* 2014, Peng *et al.* 2015, Qiu *et al.* 2015, Wan *et al.* 2015). In essence then, if there is a science behind this type of urbanisation, it is only that of economics: a science which, alone, falls short of nurturing a condition of urban sustainability.

Conclusion: united we stand, divided we fall

When we look at the case of Hong Kong, there is a clear discrepancy between the smart-city ideal and its practice. The image of smart urbanism portrayed by advocates of this model of city-making and the actual urban artefacts that are being constructed bear little resemblance. Particularly when studied from a geographical perspective, it is evident that, in Hong Kong, smart interventions are far less homogeneous than how they are promoted through official discourses. As this chapter has shown, the smart-city programme of Hong Kong, *Smarter Hong, Smarter Living*, while officially presented by the local government as a blueprint is, in reality, a patchwork of heterogeneous, disconnected initiatives taking place in different pockets of the region. There is no scientific approach to urbanisation in the SAR.

On a micro-scale, when we look at single smart buildings, infrastructures and technologies, such as inside the Hong Kong Science Park, we do find science. These are products developed on the basis of complex and precise studies, calculations and plans in the fields of engineering, architecture and computer science. Here, there is indeed a rigorous methodology at play. However, when we shift the focus to the macro-scale, the city and the region, what we observe is chaos: a plethora of stand-alone projects carried out by private developers in an individualistic manner, with no concern for the rest of the built and natural environments.

The final outcome is a Frankenstein city composed of heterogeneous elements which are forced together by an economic rationale. This, as we have seen, is an urban creature which does not care much about the socio-environmental needs of the SAR. It tramples the ecosystems of the region while serving the interests of its economic patrons and ignoring the rest of the population.

There are two main reasons behind the discrepancy between the ideal smart city and the real smart city. The first is connected to the politico-economic context of the region. In Hong Kong, the politics of urban development is influenced by the logic of neoliberalism. The government does not intentionally prescribe a homogenous vision of the city. Instead it gives private developers considerable freedom with regard to the spaces, infrastructures and technologies that they want to materialise on their parcels of land. The same neoliberal modus operandi applies to smart urbanism. As a result, while on the one hand we find grandiose abstract visions and agendas of smart urbanism, on the other hand the disorder – or, to put it differently, lack of regular arrangement characterising the urbanisation of the region – prevents any systematic and homogeneous implementation of smart interventions. The second interconnected reason is linked to a precise and conscious choice of the Planning Department which, as this chapter has shown, is implementing the SAR's smart-city agenda with a laissez-faire attitude. Therefore, smart urbanism in Hong Kong cannot be cohesive, not simply because it clashes with the desires of private developers. There is an explicit drive by the Planning Department to adopt a project-based approach to support the interests of the private sector.

In conclusion, it is evident that the merging of smart and neoliberalism urbanism poses significant sustainability challenges. While sustainable urban development seeks holism and equilibrium among different (but potentially mutually reinforcing) environmental, social and economic forces, neoliberalism favours elites and prioritises only those activities that can be monetised. If the condition of sustainability is one of homogeneity and cohesiveness, the neoliberal experience is characterised by fragmentation and unevenness. Yet, even within such a gloomy context, there is hope. According to Plato, it will never be possible to transfer a perfect ideal to our imperfect world; but, as the case of Hong Kong illustrates, the failures due to the imperfect incarnation of the smart-city ideal are not metaphysical in nature. They are caused by a human-induced, politico-economic architecture which can be destroyed or modified, just as it was created and shaped. This of course will require strong political change which, while challenging, does exist in our sphere of existence, and there can be found, by those wishing to stand together to achieve sustainability.

Notes

1 See also de Jong *et al.* (2013) in relation to Chinese eco-city initiatives.
2 Given the controversial nature of some of the information disclosed during the research, none of the interviewees have been named. The same rationale has been applied to the documents that were linked to them.

3 Official statistics indicate that the average living space per person in Hong Kong is 13.2 square metres. In the poorest areas of the city-region, it is possible to find 46-square metre apartments with up to 30 residents. These flats are called 'coffin homes' (Hong Kong Government 2017).

References

Aristotle. (1981). *The Politics*. London: Penguin.

Benevolo, L. (1993). *The European City*. Oxford: Blackwell.

Calzada, I. and Cobo, C. (2015). Unplugging: deconstructing the smart city. *Journal of Urban Technology 22*: 23–43.

Caprotti, F. (2014). Critical research on eco-cities? A walk through the Sino-Singapore Tianjin Eco-city, China. *Cities 36*: 10–17.

Caprotti, F. (2015). *Eco-Cities and the Transition to Low Carbon Economies*. London: Palgrave Macmillan.

Chan, E.H., Tang, B.S. and Wong, W.S. (2002). Density control and the quality of living space: a case study of private housing development in Hong Kong. *Habitat International 26*: 159–175.

Chang, I.C.C. (2017). Failure matters: reassembling eco-urbanism in a globalizing China. *Environment and Planning A: Economy and Space 49*: 1719–1742.

Chiang, Y.H. and Tang, B.S. (2003). 'Submarines don't leak, why do buildings?' Building quality, technological impediment and organization of the building industry in Hong Kong. *Habitat International 27*: 1–17.

Coletta, C., Heaphy, L. and Kitchin, R. (2017). From the accidental to articulated smart city: the creation and work of 'Smart Dublin'. [Online]. Available: https://osf.io/preprints/socarxiv/93ga5 [Last accessed 16 February 2018].

Commerce and Economic Development Bureau. (2013). *Smarter Hong Kong, Smarter Living.* [Online]. Available: www.digital21.gov.hk/eng/relatedDoc/download/2014D21S-booklet.pdf [Last accessed 16 February 2018].

Cugurullo, F. (2013a). How to build a sandcastle: an analysis of the genesis and development of Masdar City. *Journal of Urban Technology 20*: 23–37.

Cugurullo, F. (2013b). The business of Utopia: Estidama and the road to the sustainable city. *Utopian Studies 24*: 66–88.

Cugurullo, F. (2016a). Urban eco-modernisation and the policy context of new eco-city projects: where Masdar City fails and why. *Urban Studies 53*: 2417–2433.

Cugurullo, F. (2016b). Speed kills: fast urbanism and endangered sustainability in the Masdar City project. In A. Datta and A. Shaban (eds), *Mega-Urbanization in the Global South: Fast Cities and New Urban Utopias of the Postcolonial State*. London: Routledge, 78–92.

Cugurullo, F. (2016c). Frankenstein cities. In J. Evans, A. Karvonen and R. Raven (eds), *The Experimental City*. London: Routledge, 195–204.

Cugurullo, F. (2017a). Exposing smart cities and eco-cities: Frankenstein urbanism and the sustainability challenges of the experimental city. *Environment and Planning A: Economy and Space 50*: 73–92.

Cugurullo, F. (2017b). The story does not remain the same: multi-scalar perspectives on sustainable urban development in Asia and Hong Kong. In F. Caprotti and L. Yu (eds), *Sustainable Cities in Asia*. London: Routledge, 43–51.

Cugurullo, F. (2018). The smart city imaginary: from the dawn of modernity to the eclipse of reason. In C. Lindner and M. Meissner (eds), *The Routledge Companion to Urban Imaginaries*. London: Routledge.

Cugurullo, F. (forthcoming). *The Urban Equation: Formulas for Sustainable Smart and Eco-Cities*. London: Routledge.

Fishman, R. (1982). *Urban Utopias in the Twentieth Century*. Cambridge, MA: MIT Press.

De Jong, M., Wang., D. and Yu, C. (2013). Exploring the relevance of the eco-city concept in China: the case of Shenzhen Sino-Dutch low carbon city. *Journal of Urban Technology 20*: 95–113.

Datta, A. (2015). New urban utopias of postcolonial India: 'entrepreneurial urbanization' in Dholera smart city, Gujarat. *Dialogues in Human Geography 5*: 3–22.

Francesch-Huidobro, M. (2012). Institutional deficit and lack of legitimacy: the challenges of climate change governance in Hong Kong. *Environmental Politics 21*: 791–810.

Garau, C., Masala, F. and Pinna, F. (2016). Cagliari and smart urban mobility: analysis and comparison. *Cities 56*: 35–46.

Haila, A. (2000). Real estate in global cities: Singapore and Hong Kong as property states. *Urban Studies 37*: 2241–2256.

Hashem, I.A.T., Chang, V., Anuar, N.B., Adewole, K., Yaqoob, I., Gani, A., Ahmed, E. and Chiroma, H. (2016). The role of big data in smart city. *International Journal of Information Management 36*: 748–758.

He, C., Liu, Z., Tian, J. and Ma, Q. (2014). Urban expansion dynamics and natural habitat loss in China: a multiscale landscape perspective. *Global Change Biology 20*: 2886–2902.

Higgins, P. (2013). From sustainable development to carbon control: urban transformation in Hong Kong and London. *Journal of Cleaner Production 50*: 56–67.

Hong Kong Government. (2012). The Gini coefficient of Hong Kong: trends and interpretations. [Online]. Available: www.hkeconomy.gov.hk/en/pdf/box-12q2-5-2.pdf [Last accessed 16 February 2018].

Hong Kong Government. (2016). Thematic Household Survey Report No. 60. [Online]. Available: www.statistics.gov.hk/pub/B11302602016XXXXB0100.pdf [Last accessed 16 February 2018].

Hong Kong Government. (2017). Housing in figures 2017. [Online]. Available: www.thb.gov.hk/eng/psp/publications/housing/HIF2017.pdf [Last accessed 16 February 2018].

Hong Kong Government. (2018). Hong Kong Smart City Blueprint. [Online]. Available: www.smartcity.gov.hk/ [Last accessed 16 February 2018].

HKSP (Hong Kong Science Park). (2017). Mission, vision and core values. [Online]. Available: www.hkstp.org/en/about-hkstp/the-corporation/mission-vision-core-values/ [Last accessed 16 February 2018].

IBM. (2017). Creating a smarter hotel. [Online]. Available: www-07.ibm.com/hk/smb/smarter_hotel/ [Last accessed 16 February 2018].

IBM. (2018). Getting started to smarter retailing. [Online]. Available: www-07.ibm.com/hk/smartercommerce/retailing/customeracquisition.html [Last accessed 16 February 2018].

Index of Economic Freedom. (2017). Country rankings. [Online]. Available at: www.heritage.org/index/ranking [Last accessed 16 February 2018].

Krueger, R. and Gibbs, D. (eds) (2007). *The Sustainable Development Paradox: Urban Political Economy in the United States and Europe*. London: Guilford Press.

Kruft, H.W. (1989). *Städte in Utopia: die Idealstadt vom 15. bis zum 18. Jahrhundert zwischen Staatsutopie und Wirklichkeit*. Munich: Beck.

Kummitha, R.K.R. and Crutzen, N. (2017). How do we understand smart cities? An evolutionary perspective. *Cities 67*: 43–52.

Lai, K. (2012). Differentiated markets: Shanghai, Beijing and Hong Kong in China's financial centre network. *Urban Studies 49*: 1275–1296.

4

ORDINARY CHINESE SMART CITIES

The case of Wuhan

Robert Cowley, Federico Caprotti, Michele Ferretti and Chen Zhong

Introduction

Although there is no shortage of international commentary on China's more ambitious urban development projects and policies, researchers have paid relatively little attention to the growing importance of smart city ideas within these. The current chapter therefore aims to add to our collective understanding of 'smart urbanism' in the Chinese context. However, rather than taking its cues from global cities in the international limelight (for example, Shanghai) or from new digital technologies in exemplar development projects (for example, Tianjin Eco-City), the chapter responds to the call by Shelton and colleagues (2015) to investigate how the 'actually existing smart city' is rolling out in more 'ordinary' settings (Amin and Graham 1997, Robinson 2006). Specifically, the case of Wuhan is used to illustrate the ways that the smart city concept has 'landed' in typical Chinese urban space, since the city is neither a high-profile coastal metropolis nor a remote backwater. The case of Wuhan, and its national context, is potentially of empirical interest to readers more familiar with smart city development elsewhere; but it also has particular importance as one of several cities in which significant hope and resources are currently being invested as a model for future urban development in China. In this chapter, we address two research questions: What is distinctive about the Chinese smart city, as exemplified by Wuhan? And what does that tell us about smart city development elsewhere?

After providing brief contextual information about Wuhan and sketching out its current smart city activities, we consider three interrelated dimensions of their recent emergence. First, from a 'vertical' perspective, they are enabled by national policies which adapt and frame the loose global discourse of the smart city to reflect particular Chinese agendas. In this sense, smart city activities on the ground may be understood as the contingent outcomes of policy transfer

at the national level. Second, from a more 'horizontal', municipality-centric perspective, we explore the additional significance and more dispersed agency associated with a Chinese mode of 'urban entrepreneurialism'. Finally, we suggest that the more obvious significance of the smart for daily life is embedded within a much broader embrace of everyday digital technology, which extends beyond the 'smart' label itself. The chapter concludes by summarising some of the distinctive characteristics of Wuhan as a Chinese smart city, and reflecting on what this tells us about smart city development and research in different geographical contexts.

The discussion draws on evidence from publicly available Chinese- and English-language textual sources (with data triangulated where necessary across different policy documents, local and international news stories, academic publications and relevant reports and websites), as well as on observations of everyday life and informal discussions with local contacts during two site visits in February and April 2017.

Wuhan as an 'ordinary' Chinese city

Despite its relatively low international profile in urban scholarship and the popular media, Wuhan is central China's most populous city, with approximately 10 million residents in 2017. Historically known as the 'Center of the whole Empire' (Rowe 1984, cited in Han and Wu 2004: 349), the city is promoted by the Wuhan Bureau of Commerce (2010: 2) as the logistical 'heart of China', and the 'largest transportation hub for land, water and air travel. Its strategic location links the East with the West, and the South with the North.' The national State Council has formally recognized Wuhan as the most important shipping centre in the middle sections of the Yangtze river (van de Bovenkamp and Fei 2016: 2).

Chinese cities are grouped into four 'tiers' – a hierarchy originally established by the central government to manage urban development but now also used as an informal classification tool. Only a handful of cities (such as Beijing, Shanghai, Guangzhou, Tianjin and Shenzhen) are generally classified as Tier I: they have strong international profiles, and in many ways function as 'showcases' for China's economic development on the international stage. Wuhan falls in Tier II, which – depending on the calculation used – accounts for around 30 cities with a lower gross domestic product (GDP) and smaller populations (typically 3–15 million residents in the metro area), and which are mostly provincial and sub-provincial capitals. It was once comparable to Shanghai and Beijing in its manufacturing output and educational levels, and as recently as 1981 served as China's fourth largest centre of industry. However, the focus of earlier reforms on coastal regions and Tier I cities led to its relative (though not absolute) economic decline (Han and Wu 2004, French Consulate in Wuhan 2014: 4). Today, Wuhan's continued reliance on state-controlled heavy industry (Yu 2014: 26) leaves its per capita income not much higher than the national average, and

significantly lower than that of similar-sized Tier I cities (Euromonitor International 2017). Revenues from key steel and automotive industries, furthermore, are declining (Economist 2015).

Nevertheless, national development policies are increasingly being directed at Tier II cities because they are seen as key drivers for China's future economic growth. The Wuhan city region has benefited from the national 'Rise of Central China' programme, launched in 2004 (Economist 2015) and now in its second ten-year phase (van de Bovenkamp and Fei 2016: 7). Along with the 'Go West' policy initiative, the programme incentivises foreign companies to relocate from coastal regions (ibid: 16) while also attracting foreign banks to Wuhan (Wuhan Bureau of Commerce 2010). An often-cited indicator of investment in the city's development is its ongoing expansion of the metro network (at the rate of one line per year) and the planned expansion of its international airport (Economist 2015). Accordingly, Wuhan is one of two cities which the national State Council intends to upgrade to 'national central city' status (wh-china 2017) in recognition of its developmental prospects. This status was previously reserved for Beijing, Shanghai, Tianjin, Guangzhou, Chongqing and Chengdu. Meanwhile, the city ranked 11th in *Foreign Policy*'s list of 'Most Dynamic Cities of 2025', and its GDP is forecast to grow by more than 400 per cent between 2012 and 2025 (van de Bovenkamp and Fei 2016: 16).

Promotional campaigns for Wuhan often emphasise the city's educational credentials and its ambitious plans to diversify the local economy. Its smart city vision is at least discursively legitimised through the valorisation of well-educated and entrepreneurial 'smart people' (Kitchin 2015) in the post-industrial, creative and hi-tech sectors. Wuhan is home to 120 higher education institutions (van de Bovenkamp and Fei 2016), with students accounting for more than 1 in 10 of the city's population (Wuhan Bureau of Commerce 2010). It has been officially ranked as China's most important university cluster outside Beijing and Shanghai (French Consulate in Wuhan 2014: 4). Recent university rankings published by both *Times Higher Education* (2017) and QS (2017) place Wuhan University among China's top ten higher education institutions. Active efforts to move Wuhan's manufacturing base away from its dependence on heavy industry have focused on Wuhan East Lake Hi-Tech Development Zone, one of the city's three 'state-level development zones', where incentives are provided by central government to encourage investment by Chinese and foreign companies (**Figure 4.1**). Following its designation by the State Council as a strategic 'Independent Innovation Model Area' in 2009, the zone has attracted a wide range of hi-tech companies in opto-electronics, renewable energy, bio-engineering, pharmaceuticals and agriculture (Wuhan Bureau of Commerce 2010, WEHDZ 2012). The national Ministry of Science and Technology ranks East Lake as China's third most important hi-tech industrial zone (French Consulate in Wuhan 2014: 4).

Our intention here is not to reproduce the optimistic tone of official policy proclamations and promotional documents about Wuhan, but rather simply to highlight that it is earmarked as having significant unfulfilled economic

FIGURE 4.1 Ongoing construction at Optics Valley roundabout, the gateway to Wuhan's East Lake Hi-Tech Development Zone.

Source: authors.

potential. A 2015 photo essay in *The Guardian* newspaper suggested that Wuhan's appearance as a 'typical second-tier Chinese city' belies its significance in the country's history and contrasts with contemporary policy ambitions to transform it into 'a world-class cosmopolitan metropolis comparable to New York, Paris and Tokyo' (Bollen 2015). An only slightly less grandiose ambition is stated in the *Plan Wuhan 2049* document, published in 2013 by the China Academy of Urban Planning and Design, for the city to become a world-ranking metropolis comparable to Rome, Chicago or Munich (French Consulate in Wuhan 2014). Rhetoric aside, the future success of Wuhan is intended to be a blueprint for other second-tier cities (Euromonitor International 2017). Thus, Wuhan is an 'ordinary' Chinese city, but also serves as an indicator of planned future development at national level. It provides intriguing insights on how the actually existing smart city is emerging in China.

Overview of smart city activity in Wuhan

There is convincing evidence that Wuhan has actively embraced the use of smart technology across a wide range of areas of urban life, even though implementation is at a pilot stage in many cases. In this respect, the city is a relative pioneer. As long ago as 2010, its Municipal Science and Technology Bureau announced the intention to invest 10 million yuan (€1.3m) in smart city projects. The China Aerospace & Industry Corporation (CASIC) was chosen to draw up the plans, which were approved in 2012 (Fan *et al.* 2016). Implementation has been coordinated by the Wuhan Research Institute for Smarter Cities (WRISC), established

in 2012 by the Wuhan Information Industry Office (a government agency) and the city's Land Resources and Planning Bureau, with a remit to distribute funding, provide consultancy and assist in the development of industrial parks (WRISC n.d.). In 2016, 30 demonstrator projects had been implemented under this smart city pilot umbrella (Changjiang Daily News 2016).

Many of the pilot projects are described on WRISC's website. They include various industrial applications, including the distribution of pharmaceuticals, the management of agricultural production and a platform allowing producers to sell food boxes direct to households. A new barcode system provides information on the methods used to grow fresh food and on its provenance (Chien 2017), and radio-frequency identification (RFID) chips track meat production from slaughterhouse to point of sale.

The projects also address traditional and digital infrastructure. An integrated real-time data system for sewage management has been trialled. Meanwhile, electronic toll collection was introduced to some of the city's bridges and tunnels and will contribute to a wider roll-out of a smart parking scheme, with possible further uses of the collected mobility data being explored. Wi-Fi is being extended on the bus network to enable real-time service information. Investment in the city's cloud-based geographic information system (GIS) has facilitated administrative decision-making and supported the development of smartphone apps. Integrated online administrative public services were introduced alongside a platform for residents to report problems and register complaints. Meanwhile, video cameras across the city feed into a centralised traffic information system and a surveillance system connected to all the city's police stations to improve public safety. The local government has introduced a free public Wi-Fi network with over 1000 hotspots, and significantly expanded the city's fibre-optic broadband coverage. Plans are underway to digitally monitor the safety of construction sites and passenger lifts, and to roll out smart traffic management more widely (Changjiang Daily News 2016).

Other activities are more oriented towards social needs and public education. A 'smart campus' demonstrator project sends alerts to parents' phones to confirm children's arrival at school and facilitates communication with teachers (Chien 2017). The 'Smart Television Bookstore' project allows people to read books, magazines and newspapers through their televisions. Information about historical architecture is provided via Quick Response (QR) codes displayed on buildings. Online services, including telemedicine and home care, have been developed to support the elderly and to facilitate food delivery, domestic maintenance and emergency services. The local government has been particularly keen to develop its 'Smart Health' information programme. Medical records are available from a specially constructed cloud platform (Fan *et al.* 2016), and smart wristbands are being used in hospitals to collate individual medical files for patients from different departments (Chien 2017).

Taken as a whole, then, these officially sanctioned smart city activities display the potential to have tangible impacts on a broad variety of aspects of everyday

life. One important reason for their emergence, as discussed in the next section, is the role of policy-making 'from above'.

Vertical enabling factors

To understand how the smart city is being manifested on the ground in different locations, it is useful to draw on contemporary debates regarding international 'policy transfer'. While political scientists have long been interested in the factors enabling or hindering the implementation of ideas and initiatives imported from different contexts, the notion of 'fast policy transfer' (Peck and Theodore 2001, 2010, Peck 2011) describes the tendency for ideas across diverse fields of governance to circulate more rapidly and extensively than was previously the case, as a result of contemporary processes of globalisation. Relatedly, examples of 'best practice' in urban development are widely emulated in different cities around the world: the tendency for contemporary urban sustainability projects, for example, to draw on the expertise of international firms of consultants and masterplanners (Joss *et al.* 2013, Rapoport 2015, Rapoport and Hult 2017) means that the same ideas and designs are often replicated in a wide range of contexts.

Yet this process does not necessarily have homogenising effects on urban landscapes around the world. As Rapoport (2015) observes, ideas are frequently modified for local use, and what gets built may sometimes diverge radically from the masterplan or design. Accordingly, we follow Stone (2017) in conceptualising contemporary policy transfers as processes of hybridisation whereby ideas from elsewhere inevitably get 'translated' into local contexts, rather than straightforwardly imposed in linear fashion. The recent spread of 'smart city' ideas to *national* policy-making invites more detailed exploration of how these are variously transformed as they become enrolled in pre-existing policy agendas, and, in turn, of their roles in constraining and enabling what actually emerges at the local level. This approach departs from critiques of the smart city concept which variously highlight its technocratic characteristics as a potentially problematic one-size-fits-all imposition on urban space (see, for example, Halpern *et al.* 2013, Söderström *et al.* 2014, Vanolo 2014).

Our discussion of Wuhan's smart city activities begins by interpreting them through the lens of national policy, as a particular 'translation' of a global policy discourse. The case for considering the influential effects of national policy on urban development may seem self-evident – and yet its role is often underemphasised or overlooked in discussions of city-specific initiatives (Joss and Cowley 2017) that are not 'top-down' flagship projects, such as Masdar City in the United Arab Emirates (Cugurullo 2016). As discussed below, Chinese smart city development is not solely determined by the national government, but is nevertheless more clearly driven from the centre than is typically the case in, for example, European cities.

Wuhan's smart city funding announcement in 2010 (mentioned earlier) directly resulted from its selection by the Ministry of Science and Technology as

a pilot location in the China-wide '863 Smart Cities' programme (High-Tech Development and Industrialization Office 2012). More recently, a wider enabling national policy landscape has emerged. Significantly, the new National Urbanisation Plan (2014–2020), which aims primarily to 'convert the rural population into urban residents in an orderly manner' (China.org.cn 2014), also envisions a series of specific 'directions' to 'drive forward the building of smart cities' (CAICT/EU-China PDSF 2016: ix). These include proposed improvements to broadband networks, the digitalisation of urban planning and management, smart infrastructure and more convenient public services (Tan-Mullins *et al.* 2017). A report by the China Academy of Information and Communications (CAICT/EU-China PDSF 2016: 41–45) lists a raft of recent national policies directly relevant to smart city development. These include:

- Two strategic documents issued by the State Council in 2012 (primarily aimed at improving and integrating data use across different urban public services) and in 2013 (encouraging municipalities to develop demonstrator projects in collaboration with the private sector);
- Three five-year plans issued by the Ministry of Industry and Information Technology (MIIT) in 2011 relating to information security, e-commerce and the Internet of Things (IoT), the latter encouraging smart city demonstrator projects across fields including logistics, transport, security and medical care;
- A *Special Action Plan* issued by the MIIT to encourage wider use of digital information across different industrial sectors, covering the period 2013–2018;
- A call by the Ministry of Housing and Urban-Rural Development (MOHURD) in 2012 for cities to apply to a national pilot smart cities scheme relating to fields including security, construction, municipal administration and industry;
- A strategic agreement made between the Chinese Society for Urban Studies and China Development Bank (CDB) whereby the CDB will finance smart city development following the end of the 12th Five-Year Plan;
- Proposals made by the National Administration of Surveying, Mapping and Geoinformation in 2012 (to enhance digital mapping support for smart city development) and 2013 (to link local databases and geographical information to cloud platforms); and
- A cross-ministry strategic document, *Promoting the Healthy Development of Smart Cities*, released in 2014 (Tan-Mullins *et al.* 2017) aiming to provide clear guidelines for the smart city as a new model of sustainable urban development, and to introduce more convenient, efficient and environmentally friendly public services, with 100 pilot cities to be selected.

It is difficult to place a precise figure on the resulting number of smart city projects currently taking place in China. Some sources report small numbers, and suggest that Wuhan is one of ten cities chosen to participate in a national programme

of pilot smart schemes to promote low-carbon development (Min *et al.* 2015). Elsewhere, it is reported that several hundred smart city initiatives were launched across the country between 2013 and 2015 (Tan-Mullins *et al.* 2017, CAICT/EU-China PDSF 2016). This variation mirrors the challenges in quantifying 'eco-city' schemes in China (Joss 2015), for which estimates range from 'more than 100' (Wu 2012) to 'more than 1,000' (Ren 2013: 112), depending on the sources and the definition used. For both smart and eco-city projects, this variation and imprecision reflects a broader symptom of 'fragmented authoritarianism' (Lieberthal and Oksenberg 1988). As Tan-Mullins and colleagues (2017: 3) note:

> different central government Ministries may stipulate various related but different … policies, creating greater political space for sub-national local governments to apply or compete. This is one important reason why most Chinese cities have more than one type of smart and eco project.

Conversely, the last document in the above list suggests that a process of 'standardisation' is underway at the national level. Again, however, this is only part of the story: while a shift towards standardisation may be interpreted as an attempt to strengthen the role of central government, there is a parallel emphasis on the private sector to deliver smart cities. While local governments have played a dominant role in procuring smart technology in China, it is expected that their role in future will be increasingly restricted to regulatory oversight, with wider roll-out of public–private partnership arrangements (Li *et al.* 2015). A more complete picture of the smart city agenda in Wuhan is revealed by accounting for the distinct roles of local actors. In the next section, we consider Wuhan's smart city development through the lens of 'urban entrepreneurialism'.

Horizontal enabling factors

In their review of the early literature around the shift towards 'urban entrepreneurialism' in Western cities, Hall and Hubbard (1996) picked out a series of defining characteristics. These include: a shift from primary concern with providing local welfare and services to a more outward-looking focus on economic development; the use of 'place marketing' as part of wider conscious attempts to attract inward investment, underpinned by an understanding of the ongoing globalisation of production and, consequently, the more pressing need to compete with other cities internationally (Dowling *et al.*, Haarstad and Wathne, Wiig this volume); and the growing use of temporary multi-sectoral partnerships and coalitions in the service of 'piecemeal' urban development based on speculative projects. Wu (2003: 1675) distinguishes contemporary and more active 'attempts to pursue entrepreneurial advantages' from the 'conventional city which is merely a location where entrepreneurial activities occur'. Wu mobilises Jessop and Sum's (2000) model of the definitive characteristics of the entrepreneurial city that include the use of entrepreneurial *strategies* within a recognisable entrepreneurial *discourse* to promote particular entrepreneurial *images* of the city.

There are various problems with applying the idea of urban entrepreneurialism to Chinese cities. Perhaps most obviously, such tendencies in 'post-socialist' cities (Wu 2003) address neither a 'post-Fordist' crisis nor the perceived failure of the social-democratic Keynesian welfare state (Jessop 1994, 1999). But neither can direct parallels be made with Eastern European 'post-socialist' economies, which were already significantly more industrialised and urbanised than China before 1979 (Wu *et al.* 2016). In China, market reforms are not related to a 'roll-back' (Peck and Tickell 2002) of the state, but rather are intended to support the centrally planned economy and consolidate state power (de Rambures 2015). Although Chinese municipal entrepreneurialism is encouraged by the ongoing process of market reforms, it is also constrained by a prioritised requirement for 'social stability' (Yu and Zhu 2009: 217). China differs from the West, furthermore, in its national government's financial and political ability to impose 'megaprojects' with significant consequences for individual cities, its lack of strong horizontal networks of associations between local governments, and limited institutionalised coordination of large projects across city-regions (Ren 2013: 76).

Nevertheless, certain surface features of contemporary Chinese urban governance are at least analogous with those of Western urban entrepreneurialism (Yu and Zhu 2009: 202), if only because particular aspects of 'marketisation' have been borrowed from the Western experience (Wu 2003: 1674). Below the surface, furthermore, Yu and Zhu (2009) argue against the assumption that local 'entrepreneurialism' in China describes a straightforward implementation of policy directions imposed by central government. Rather, both local government and local enterprises have significant agency (and may be the key factors) in shaping its precise forms (ibid.). Certain cities, such as Shanghai (Wu 2003), clearly display entrepreneurial strategising and agency which, in line with Jessop and Sum's model, extend beyond the presence of activities 'simply resulting from market-oriented reform' (Wu 2003: 1675).

At least in the superficial sense, Wuhan displays clear evidence of urban entrepreneurialism. It has developed a 'brand logo' for its place-marketing agenda that is prominently displayed on billboards all over the city and in promotional materials (**Figure 4.2**). The inclusion of an English-language strapline suggests the outward orientation of the message; and its wording ('Wuhan, Different Every Day!') consciously taps into entrepreneurial discourses around flexibility and the ability to manage continual change (Yu and Zhu 2009) while also promoting the city as an interesting destination for visitors and businesses.

Wuhan's ongoing growth and increasing importance within national policy-making has attracted the interest of the outside world, and the active role played by foreign interests further disrupts a model of hierarchical national planning emanating from Beijing. Its most well-established ties are with France, which reopened its consulate in the city in 1998. Three other countries now have consulates in Wuhan: South Korea (established in 2010), the US (2008) and the UK (2015); Russia is also considering opening a consulate in the near future. While the Netherlands opened a trade office in Wuhan as early as 1996, several other countries have followed suit since 2010, including Singapore, Japan,

FIGURE 4.2 Place marketing on billboards in Wuhan.
Source: Haiyu Zhang.

Canada and Australia. The development of smart city activities in Wuhan, then, has paralleled a wider opening up of direct links with the outside world, and the growing number of foreign residents in the region is a source of pride for the city (see for example Hubei Government n.d.).

The connections with France have had the most tangible impact on Wuhan's spatial development, including a strong French industrial presence (French Consulate in Wuhan 2014, UbiFrance – SE de Wuhan 2014) and the planned 30-square kilometre 'Sino-French Ecological Demonstration City' in the Caidan district to the west of the city (Chien 2017). However, Wuhan's smart city agenda is directly influenced by a longstanding and active 'twin city' arrangement with Manchester in the UK (Jayne *et al.* 2013) – one of 22 twinning arrangements established since 1979 (CIFCA n.d.). The planned Qingshan Riverside business development explicitly aims to learn from Manchester's very own flagship smart city area – 'Corridor Manchester' – and one of the Memorandums of Understanding signed to coincide with the opening of the British Consulate in 2015 intended to:

> boost co-operation and exchange between the two cities to identify smart city solutions. The cities will work together to highlight the challenges each city faces in tackling smart city issues and find ways the cities and their companies can collaborate.
>
> *(UK Government 2015)*

Wuhan's 2010 smart city funding announcement and competition indicate how the actions of the local authorities are extending beyond procedures laid down by

Beijing. Fan and colleagues (2016: 2) observe that, while the design and planning processes were 'typical' for China, the 'open and global project bidding' process was ground-breaking in the Chinese context. Equally, it would be limiting to interpret the prominent Wuhan Smart Health initiative (mentioned above) as an example of a local government enacting strategic directions set from above. This enacts a long-standing national government interest in using new technologies to reduce health inequalities and improve services (Zheng and Rodríguez-Monroy 2015). However, its implementation has depended on the synergetic agency of 'hundreds' of local private companies (Fan *et al.* 2016: 62), suggesting a networked and dispersed mode of governance rather than a 'firm-handed' command-and-control approach.

Many of the local private companies are based in Wuhan's 'Optics Valley', mentioned above. This development zone, dubbed the city's 'Silicon Valley', is also home to IBM, which first established a branch in Wuhan in 1996 (IBM n.d.) and has collaborated closely with the Wuhan government at the 'platform' level to develop cloud computing to enable smart technology (Hao *et al.* 2012). The Wuhan East Lake High-tech Development Zone reaches out horizontally in its active appeals to foreign investors as the only approved 'future science and technology town' in the central and western regions (WEHDZ 2012).

It is possible, then, to narrate the emergence of smart city initiatives in Wuhan as the result of policies and incentives introduced by Beijing, in reflection of a body of global discourse but translated into and constrained by a particular set of national development agendas. To do so, however, misses the equally important influence of, and more dispersed agency implied by, dynamic entrepreneurial connections among Wuhan's local government, city governments abroad, local private enterprises and foreign firms.

Wuhan as 'everyday' smart city

The fact that our story so far might reasonably have been told based only on secondary sources raises various methodological questions in relation to the smart city. In particular, there is a risk that investigations based solely on published documents will produce distorted pictures. The researcher discovers a variety of official documents, nested at different scales of governance and designed to present achievements and plans in the best possible light. Glossy promotional websites and brochures illustrate activities ranging from city-wide infrastructural upgrades, radical improvements to services and newly built whole districts of a city, through to small-scale experiments in digitalisation and one-off educational schemes. And one might surmise that the smart city is not only a centrally important global policy phenomenon, but also has a significant impact on the daily lives of the city's residents. On arriving in the city, however, the expectation of finding – for better or worse – a glistening, digitalised, ultra-efficient metropolis of the future remains unfulfilled. Instead, it is difficult to find visible or tangible evidence of the 'smart'. The championed flagship initiatives are relatively

insignificant within the space of the city on the whole, and go largely unnoticed by local residents. Certain widely touted and innovative sounding urban improvements in fact predate their packaging as 'smart', and other schemes never go beyond their planning stages. In our collective experience of investigating related policies and practices internationally, even policy-makers themselves are sometimes only vaguely aware of their city's smart ambition when interviewed, while other key actors view it primarily as a passing fad mobilised instrumentally to attract funding.

Such disappointment need not mean that the smart city is only chimerical. Reflecting on a visit to Wuhan, a delegate from Manchester City Council concluded that 'Smart cities should be felt, not seen' (Oliviera 2015). By this, he meant that the smart city is not revealed by the visible presence of particular innovative technologies and processes on display. Rather, a 'Smart City is one where all the technology is for the most part hidden from view, working in the background, sensing, listening, reacting and predicting' (ibid.). This conclusion has similarities with Weiser's (1991) influential predictions around the project of ubiquitous computing. Here, the smart city feeds into long-standing ambitions to 'enhance the world already in existence by making computing an invisible force that runs through the background of everyday life' (Gabrys 2016: 6). An alternative search for the everyday smart city leads us to those digital technologies whose use has become normalised in, and which co-constitute, daily life, and are already 'embedded into the fabric of cities' (Kitchin 2016: 24). The big picture may elude us if definitional work focuses only on the content of smart city policy documents and visions, or on cataloguing particular 'smart' activities rendered visible through institutional ratification. This is not to deny the importance of the 'official' smart city but to position it as a reflection, or at best a catalyst, of the more invasive and invisible digitalisation of everyday life.

No attempt is made here to provide a detailed survey of the take-up of digital technologies in Wuhan, or to compare this systematically with cities elsewhere. Impressionistically, however, certain differences are immediately apparent when comparing Wuhan to Western cities. The visitor is struck by the widespread use of mobile payment systems, provided through services such as Alipay, WeChat Pay and Baidu. This is in stark contract with European or North American cities, where mobile payments are a nascent activity. Services such as Alipay allow for rapid transfer of funds via QR codes, which are commonplace in shops, restaurants and elsewhere. *The Economist* (2017) reports that mobile payments in China as a whole are now 'more than 50 times the size of the American market'. Similarly, one is struck by the prevalence and *variety* of bike-sharing schemes in operation (**Figure 4.3**). Innovative Chinese approaches to such technology, relying on QR codes and Global Positioning System (GPS) technology, have recently made international headlines – notably including the rise of 'Mobike', which has recently extended its operations to Manchester.

While the smart city is not coterminous with the internet, the infrastructure of the latter clearly has an important enabling role. Internet connection speeds

FIGURE 4.3 One of Wuhan's many bike-sharing schemes, enabled by QR codes, smartphones and GPS technology.
Source: Haiyu Zhang.

in Wuhan are slow by Western standards, but the city is a leader in overall internet usage relative to its urban peers. The city has the fourth highest level of internet use among all Chinese cities (Wei 2016) and the *2016 China Internet + Index* ranks Wuhan as one of the top ten cities in China (Chien 2017: 58). It is arguably through smartphone technology that the 'real' smart city is evolving most significantly in everyday China. Data from the China Internet Network Information Center (CNNIC) showed that 90 per cent of Chinese internet users (who account for just over half the population) access it via smartphones (Huang 2016). The *South China Morning Post* estimates smartphone usage in China at 62 per cent, compared with an average of 55 per cent in European countries (Perez 2015). More recent survey data (Poushter 2017) suggests that 68 per cent of Chinese adults now own a smartphone, rising as high as 94 per cent among 18–34-year-olds, and marginally higher in urban than rural areas. This compares to only 18 per cent for India, a 'developing' country of similar size. In Wuhan specifically, based on our own observations of everyday life, smartphone use is at least as visible as in most European cities, and is certainly not the exclusive domain of the young and affluent.

This suggests that there are different 'spheres of action' in Chinese (and broader) smart urbanism. The spheres of international and national policy discourse, and the municipal strategy sphere, are clearly not recognisable at the level of the urban resident. More accurately, the impact of today's policies and strategies is likely to be visible, and felt, only when concrete is poured, digital fibre is laid and ways of governing and organising the city change. Nonetheless, it is clear from our research in Wuhan that the smart city exists at the level of the street, and of the individual citizen. At this level, the smart city is accessed and rendered visible

through interfaces such as the smartphone, and is experientially felt and performed through technologies and practices such as shared bike schemes, mobile payment services and smart transport solutions. This underlines the point that studies of the smart city can usefully move from the more static world of policy documents and glossy reports (Kitchin 2015) to the messy and at times more playful performance of smart urbanism as lived practice.

Conclusions: the ordinary Chinese smart city

Whether we trace the implementation of smart city technology in Wuhan back to national policy drives, see it as more directly catalysed by local multi-sectoral actors or speculate on the way it dovetails comfortably with a broader embrace of digital technology, the smart agenda is revealed as less of a discrete phenomenon and more of a repackaging or rechannelling of the broader currents of urban development. With this in mind, we return to our original questions: What is distinctive about the Chinese smart city, as exemplified by Wuhan? And what does that tell us about smart city development elsewhere?

The search for distinctiveness is difficult at first, since none of the specific technologies and aspirations embodied within official local smart schemes are unique to Wuhan. In using digital technology, for example, to improve the efficiency of public services and infrastructure, update the administration of healthcare or rationalise the allocation of parking spaces, Wuhan's activities mirror those of any number of cities around the world. Importing technological solutions in this way need not imply a naivety about their social implications. Rather, Chinese authorities have traditionally professed adherence to the adage of 'Western technology, Chinese wisdom' (de Rambures 2015: 11). But what characterises these smart activities, taken as a whole, is that they conjure up a rather passive sense of the public. The focus on efficiency is not accompanied by parallel attempts to encourage digital participation in decision-making, co-create the smart city or address a public sphere beyond those dimensions of urban life which are institutionally sanctioned or associated with consumer activity. To adapt a model of smart city 'publicness' recently developed in relation to the UK (Cowley *et al.* 2017), smart city activities in Wuhan are oriented towards a public envisioned as a collectivity of service users, rather than designed to appeal to the more creative, political or civic dimensions of its residents' lives.

This outcome is not unique to China. It might be predicted, however, by the particular combination of broader agendas into which enabling smart city policies are subsumed – namely supporting economic development, improving the efficiency of public services, managing urban growth and supporting social stability. Since the national government does appear to have a significant role in the emergence of local smart city activities, it is likely to continue influencing future developments. This is unlikely to be in the direction of democratising cities, or guided by a broad 'neoliberalising' belief in the efficacy of markets at the expense of 'big government' – but rather by the desire to strengthen the state further.

Relatedly, we see significance in the fact that Chinese smart city development is advocated within national *planning* documents (CAICT/EU-China PDSF 2016). Even though this chapter has specifically argued that the Chinese smart city goes beyond national policy directives, its mobilisation as a national planning concept suggests a more centralised mode of development than in Europe. In the UK, for example, national policy-makers appear to view smart technology primarily in terms of its potential for exports; local authorities are not required to include smart ambitions in their strategic plans. In the Netherlands, similarly, the smart city is unfolding through highly networked governance at the local level but suffers from a lack of national coordination (Sengers 2016: 3).

The Chinese approach also diverges from the Indian programme of smart cities: it is being pushed forwards on multiple policy fronts, rather than through a single policy drive. The simultaneous mobilisation of various smart city concepts by different national government agencies appears to be a characteristic example of Chinese 'institutional bricolage' whereby ideas and practices from elsewhere in the world are borrowed selectively and 'reassembled onto existing institutional frameworks' (de Jong 2013: 89). This, in turn, may be an outcome of the fragmented approach to national policy-making (Chien 2017), which not only suggests agentive space for local authorities to 'pick and choose' to some extent but also reflects smart city development elsewhere. One methodological implication, especially in cross-comparative work, is that approaching the smart city as a body of practices resulting from policy discourse should not involve expectations of linearity between particular policies and outcomes. Rather, the flexibility of the concept allows it to derive legitimacy from multiple agendas – and, consequently, attempts to delineate and define its contents at different scales are likely to be frustrated. Instead, while it is fruitful to trace the various policy influences, the local smart city is best understood as a rather open-ended idea which channels these broader agendas in shifting place-specific ways.

The last point may appear to privilege the 'vertical' effects of smart city discourse on particular places. But we have proposed that this should go hand in hand with analysis of the horizontal agency exerted by local actors and institutions, as well as a more open-ended reading of its everyday lived experiences and materiality. This broad, three-way framework for analysing and comparing smart city activity internationally is currently being developed further within a wider research project looking at a variety of European and Chinese cities (for a preliminary discussion, see Sengers *et al.* 2017). This resonates with the call by Hodson and colleagues (2017) to approach socio-technical urban sustainability transitions as varied 'reconfigurations' of loose bodies of ideas and practices which are constituted simultaneously by discourse, particular forms of governance and technical innovations.

Such an approach, in the case of Wuhan, positions the ordinary, 'actually existing' smart city as neither an object of study which can be definitively pinned down to a particular set of innovations nor merely as an empty policy signifier.

More satisfactorily, it may be approached as a locally inflected symptom of a broader set of changes to urban space and governance; and it is these, rather than their superficial and more readily visible manifestations labelled as 'smart', which should be the focus for future investigations.

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References

Amin, A. and Graham, S. (1997). The ordinary city. *Transactions of the Institute of British Geographers 22*: 411–429.

Bollen, J. (2015). Welcome to Wuhan: a photographic tour of a historic Chinese city. *The Guardian*, 17 November 2015. [Online]. Available: www.theguardian.com/cities/gallery/2015/nov/17/wuhan-photographic-tour-historic-chinese-city [Last accessed 4 September 2017].

CAICT/EU-China PDSF. (2016). *Comparative Study of Smart Cities in Europe and China 2014*. Heidelberg: Springer/Commercial Press China.

Changjiang Daily News. (2016). 武汉已建成智慧城市涉及民生项目30多个 [Wuhan has built more than 30 smart city projects involving people's livelihood]. 21 June 2016. [Online]. Available: www.360fdc.com/news/16204.html [Last accessed 25 September 2016].

Chien, S.-S. (2017). *Wuhan*. In M. Tan-Mullins, A. Cheshmehzangi, S.-S. Chien and L. Xie, *Smart-Eco Cities in China: Trends and City Profiles 2016*. Exeter: University of Exeter (SMART-ECO Project), 58–64.

China.org.cn. (2014). Transcript: press conference on new urbanization plan. Government briefing, 19 March. [Online]. Available: http://china.org.cn/china/2014-03/19/content_31836248_2.htm [Last accessed 5 September 2017].

CIFCA. (n.d.). 湖北 [Hubei]. China International Friendship Cities Association database of friendship relations with Chinese cities. [Online]. Available: www.cifca.org.cn/Web/SearchByPro.aspx?proID=80&proName=%BA%FE%B1%B1 [Last accessed 15 August 2017].

Cowley, R., Joss, S. and Dayot, Y. (2017). The smart city and its publics: insights from across six UK cities. *Urban Research & Practice,* online ahead of print. DOI: 10.1080/17535069.2017.1293150.

Cugurullo, F. (2016). Urban eco-modernisation and the policy context of new eco-city projects: where Masdar City fails and why. *Urban Studies 53*: 2417–2433.

de Jong, M. (2013). China's art of institutional bricolage: selectiveness and gradualism in the policy transfer style of a nation. *Policy and Society 32*: 89–101.

de Rambures, D. (2015). *The China Development Model: Between the State and the Market*. London: Palgrave Macmillan.

Economist. (2015). China's Motor City confronts structural challenges. *The Economist*, 21 October 2015. [Online]. Available: www.eiu.com/industry/article/1023589886/chinas-motor-city-confronts-structural-challenges/2015-10-21 [Last accessed 17 August 2017].

Economist. (2017). The age of the appacus: In fintech, China shows the way. *The Economist*, 25 February 2017. [Online]. Available: www.economist.com/news/finance-and-economics/21717393-advanced-technology-backward-banks-and-soaring-wealth-make-china-leader [Last accessed 17 August 2017].

Euromonitor International. (2017). Wuhan city review. [Online]. Available from: www.euromonitor.com/wuhan-city-review/report [Accessed 12 August 2017].

Fan, M., Sun, J., Zhou, B. and Chen, M. (2016). The Smart Health Initiative in China: the case of Wuhan, Hubei Province. *Journal of Medical Systems*, 40: 62.

French Consulate in Wuhan. (2014). Wuhan, ses rôle et place dans la Chine actuelle et ses perspectives pour l'année 2049. Briefing note. [Online]. Available: https://cn.ambafrance.org/IMG/pdf/2014_04_04_note_.pdf [Last accessed 17 August 2017].

Gabrys, J. (2016). *Program Earth: Environmental Sensing Technology and the Making of a Computational Planet*. Minneapolis: University of Minnesota Press.

Hall, T. and Hubbard, P. (1996). The entrepreneurial city: new urban politics, new urban geographies? *Progress in Human Geography 20*: 153–174.

Halpern, O., LeCavalier, J., Calvillo, N. and Pietsch, W. (2013). Test-bed urbanism. *Public Culture 25*: 272–306.

Han, S.S. and Wu, X. (2004). Wuhan. *Cities 21*: 349–362.

Hao, L., Lei, X., Yan, Z. and ChunLi, Y. (2012). The application and implementation research of smart city in China. In *2012 International Conference on System Science and Engineering (ICSSE)*, 288–292.

High-Tech Development and Industrialization Office. (2012). 武汉智慧城市总体规划与设计工作圆满完成 [Wuhan Smart City master plan and design is accomplished]. Wuhan Science and Technology Bureau (Wuhan Intellectual Property Bureau). News item, 14 September. [Online]. Available: http://whst.gov.cn/xwzx/show/13774.aspx [Last accessed 3 September 2017].

Hodson, M., Geels, F.W. and McMeekin, A. (2017). Reconfiguring urban sustainability transitions, analysing multiplicity. *Sustainability 9*: 299.

Huang, M. (2016). More than half of China's population is online – and most use smartphones. *Wall Street Journal,* 26 January 2106. [Online]. Available: https://blogs.wsj.com/chinarealtime/2016/01/26/more-than-half-of-chinas-population-is-online-and-most-use-smartphones/ [Last accessed 17 August 2017].

Hubei Government. (n.d.). Foreigners in Wuhan. [Online]. Available: http://en.hubei.gov.cn/photo_gallery/people/201706/t20170616_1007008.shtml [Last accessed 15 August 2017].

IBM. (n.d.). IBM 武汉分公司 [IBM Wuhan Branch]. [Online]. Available: www-31.ibm.com/ibm/cn/city/hubei/wuhan/ [Last accessed 18 August 2017].

Jayne, M., Hubbard, P. and Bell, D. (2013). Twin cities: territorial and relational geographies of 'worldly' Manchester. *Urban Studies 50*: 239–254.

Jessop, B. (1994). Post-Fordism and the state. In A. Amin (ed.), *Post-Fordism: A Reader.* Oxford: Blackwell, 251–279.

Jessop, B. (1999). The changing governance of welfare: recent trends in its primary functions, scale, and modes of coordination. *Social Policy & Administration 33*: 348–359.

Jessop, B. and Sum, N.-L. (2000). An entrepreneurial city in action: Hong Kong's emerging strategies in and for (inter)urban competition. *Urban Studies 37*: 2287–2313.

Joss, S. (2015). *Sustainable Cities: Governing for Urban Innovation*. London: Palgrave Macmillan.

5

THE FREE ZONE AND SMART-GLOBAL URBANISATION IN PHILADELPHIA

Alan Wiig

Introduction

Since the turn of the twenty-first century, Philadelphia, Pennsylvania aligned to the smart innovation economy through an economic development strategy bolstered by spatially bounded tax breaks, exclusive infrastructure provision and a wholesale transformation of deindustrialised nodes into work spaces for this globalised economy. This chapter examines the territorial politics underlying the city's emblematic zone for free enterprise, the Philadelphia Navy Yard. This is a 1200-acre complex housing 150 companies employing over 13,000 people (Navy Yard 2017) on a decommissioned United States Navy shipyard. Industry sectors represented in the zone include fashion and design, advanced manufacturing, research and development, pharmaceuticals, e-commerce and finance. While the zone succeeded in bringing multinational, innovation-focused corporations into the city, its long-term value was questionable given the high costs associated with the district, especially the provision of significant tax breaks to stimulate job creation, estimated at nearly $104,000 per worker (Butkovitz 2014, Director of Fiscal & Policy Analysis 2016), a point expanded on below. Here I argue that the urban-economic revitalisation strategy enacted in the Navy Yard was made possible through systematic territorial politics that jurisdictionally, infrastructurally and contextually maintained the separation of the zone from the existing city.

Philadelphia offers an ideal study of contemporary patterns of smart and global, networked urbanisation (Graham and Marvin 2001), where the unitary ideal of a modern, nineteenth- and twentieth-century city integrated by and through its water, energy, telecommunication and transportation infrastructures transformed over time into a matrix of socially and economically privileged 'premium networked spaces' linked through newer, global and municipal infrastructures: energy, transportation, mobile communications and the Internet, security

and surveillance. Today, Philadelphia is a city where the international airport connects quickly via rail to the central business district (CBD), and highways move traffic to and from suburban office parks and residential neighbourhoods to the CBD. However, proximate inner-city, industrial-era residential neighbourhoods as well as their adjacent manufacturing and warehousing districts remain fragmented and marginalised, often by the same infrastructures connecting these spaces of the global economy (Wiig 2013, 2016, Masucci *et al.* 2016).

Global 'second cities' like Philadelphia (Hodos 2011) offer productive sites for studying these twenty-first century urbanisation processes beyond the emblematic New York City-London-Tokyo model (Sassen 2001). Since the decline of its industrial strength, Philadelphia has embarked on an agenda to grow its global prominence in the new information and innovation economy through experimenting with spatial planning strategies to attract the knowledge economy (May and Perry 2016). The overarching context of Philadelphia's efforts at smart and global change was the necessity of reversing the city's post-industrial decline through, at base, attracting new firms to the city that would hire local workers. By the 2010s, local politicians would say this process had succeeded (e.g., Nutter 2015); and yet this success was unevenly distributed in the city, reinforcing or even exacerbating socio-economic and spatial divides.

In tracing the geography of smart-global urbanisation in Philadelphia, I argue that the smart city, of information technology-driven 'solutions' to urban problems, was subordinate to ambitions to attract global firms. For instance, smart city projects like a workforce education and digital inclusion app rolled out to much fanfare, but ultimately failed in achieving their stated goal of generating jobs for low-literacy, low-skill residents.[1] At the same time, the ongoing, neoliberal experiment (Peck *et al.* 2009) in global urbanisation progressed. Philadelphia's city government was more concerned with attracting global firms than achieving widespread rehabilitation of the city's poor, marginalised neighbourhoods. While little significant economic development returned to these deindustrialised areas – which, to be fair, is not a problem unique to Philadelphia (see Hackworth 2007) – the nodes of the global and smart city flourished, including the Philadelphia Navy Yard. Unlike previous eras of networked urbanism, where enclaves were maintained primarily through spatial and infrastructural segregation, the Navy Yard is notable for its strategies of free zone territorial politics that separates the district from the city through new means, as expanded upon below.

Conceptualising the Navy Yard as a free zone proceeds through an analysis of the evolution of the district from an industrial space to its current iteration in the knowledge and innovation economy. This chapter highlights how the free zone-styled urban-economic revitalisation strategy enacted in the Navy Yard was made possible through systematic territorial politics that jurisdictionally, infrastructurally and contextually maintained the separation of the zone from the existing city. The chapter argues that Philadelphia's smart and global urbanisation agenda actively, if unintentionally, perpetuated the splintered and inequitable

landscape of the existing city that smart technologies were ostensibly intended to overcome. The chapter concludes by arguing that the extra-jurisdictional shift, in particular the tax breaks offered to corporations in the zone, was the most important factor for firms to locate there.

Theorising the free zone

> The zone – a.k.a., the Free Trade Zone, Foreign Trade Zone, Special Economic Zone, Export Processing Zone, or any of the dozens of variants – is a dynamic crossroads of trade, finance, management and communication.
> *(Easterling 2012)*

The revitalisation of economically stagnant, deindustrialised areas of older cities across North America and Western Europe has progressed through multiple, layered, free market-driven governance strategies. Over the last 40-plus years, a city's ambitions for far-reaching territorial competitiveness in the globalised, post-Fordist economy has largely materialised in spatially targeted districts where this new enterprise would locate. In Philadelphia, as elsewhere, efforts at attaining territorial competitiveness sought to attract globally mobile corporations through attractive, 'place-specific locational advantages' funded through government subsidies (Brenner and Wachsmuth 2012: 181–188). To a large extent, this governance and planning agenda led to the large-scale urban developments that have been critiqued as experimental, extrospective and entrepreneurial, reliant on ideologies of widespread city improvement through fragmented and private benefit (Brenner and Wachsmuth 2012: 197, citing Cheshire and Gordon 1996; see also Harvey 1989, Graham and Marvin 2001, Hackworth 2007). By empowering 'nonelected government bureaucrats, technical experts, property developers, and corporate elites who are not accountable to the populations most directly affected by their activities' (Brenner and Wachsmuth 2012: 199, citing Swyngedouw *et al.* 2002), the politics facilitating these 'new urban spaces' (Olds 1995) sidestep established forms of governance and oversight. Critiquing the implications of attracting multinational corporations through the spatial planning and governance decisions underlying these new urban spaces offers a framing for grounding smart-global enterprise in space (While *et al.* 2004, Allen and Cochrane 2007, Jonas *et al.* 2010, Stead 2013). This chapter builds on the above-mentioned scholarship to situate the Navy Yard as a free zone masquerading as a smart-global district. Critiquing the territorial politics of this development builds on understandings of smart urbanisation as an extension of neoliberal urbanisation (Shelton *et al.* 2015) with commonalities among free zones worldwide.

To conceptualise the territorial politics of free zones, I employ Keller Easterling's theorisation of 'extrastatecraft' (2014), which critiques politics through recognised as well as traditionally unaccounted for sources. In this case study, the politics of smart-global city-building involved more than the policy-making and the

economic development outcomes. Theorising extrastatecraft specifically for this case is done by identifying the territorial politics that facilitated the urban transformation. The three foci of these territorial politics are outlined here, and then expanded on below.

Extra-jurisdictional shifts: Ceding of spatial planning, development, maintenance and control of the Navy Yard free zone to the Philadelphia Industrial Development Corporation (PIDC), the city's public–private economic development partner that has no management or oversight by elected officials, even as the city government provided police for security and partially funded infrastructural upgrades, and the state facilitated economic growth via tax abatements. This factor, I will argue, was the most crucial for attracting smart-global enterprise.

Exclusive and smart infrastructure provision: Smart infrastructure was an amenity for the free zone alongside premium provision of established municipal services. Premium services included: a well-paved road network and ample parking (a rarity in the established city); city police and private security patrols as well as a manned gate at the main entrance; close proximity and easy access to Philadelphia International Airport as well as adjacency to a major freeway interchange; and a private shuttle from the central business district to complement the limited city bus service. Digital services included the presence of high-speed telecommunications network and a data centre linking into transatlantic data networks. Specifically, 'smart' infrastructure was a self-contained micro-grid energy supply and testbed as well as green infrastructure solutions to manage storm water runoff.

Contextual transformation: The Navy Yard was located on deindustrialised waterfront 6 miles south of the central business district. The large-scale redevelopment transformed the dilapidated location into a free zone through a concentration of high-quality architecture, urban design and landscape design by internationally recognised firms that often build similarly-styled zones globally (Olds 1995). This central location, with the absence of existing residents, facilitated a *tabula rasa* for population-free urbanisation coordinated by a neoliberal planning partnership, much like similar waterfront redevelopment projects worldwide (Brownill 2013). The revitalisation of deindustrialised waterfronts into 'transformative spaces' of a creative class-revived economy (Florida 2002) were representative of a 'city's resurgence and aspirations of world class status' (Boland *et al*. 2017: 119). In the Navy Yard, this orientation attracted multinational firms to new-build office spaces, and renovated historic buildings providing creative-class amenities fostering industries new to the city, such as advanced manufacturing.

The 'success' of free zones was predicated on the transfer of governance beyond the state and to multinational enterprise; measuring 'success', as will be detailed below, was intentionally ambiguous and focused on retaining or growing corporate tenants rather than substantive local job creation. These spatial strategies operate 'jurisdictionally independent' of city and state, a manifestation

of neoliberal economic logic that prioritises economic independence from regulatory oversight as the primary condition of locating in any particular city. Easterling (2013) writes that these extraordinary 'conditions have become the expectation – the addiction – for most global companies that operate within them'. As free economic zones urbanised as in Shenzhen, China (Chen 1995), as new-build smart cities were designed as free zones from the ground up – like New Songdo City (Halpern *et al.* 2012) or Masdar City, United Arab Emirates (Cugurullo 2013) – and as established enterprise zones like London Docklands took significant urban, national and international prominence in the global economy (Fainstein 2010), the territorial politics of the free zone was adopted and adapted in site-specific ways.

While it may not be possible to trace the direct lineage of the Navy Yard back to, for instance, the abovementioned exemplars, the underlying experimental governance strategies and planning rationale shares significant commonalities, not least the territorial 'mutations' (Ong 2006) of different strands of neoliberal urban development agendas (Peck *et al.* 2009, 2013). The variegated geographies of free zones worldwide were underpinned by similar territorial, political strategies to attract and retain multinational enterprise: the zone was fit to the corporate tenant before its integration into the wider city was considered.

While free zone urbanisation strategies continue to be adopted worldwide, it must be noted that critiques beginning in the 1980s questioned the costs versus benefits of the first generation of free zones, specifically London's Docklands and Canary Wharf nodes of global finance. These early critiques found that the zones rarely lived up to their stated promise, namely of job creation and urban revitalisation through full embrace of free market logics (e.g., Massey 1982, Wilder and Rubin 1996). As Easterling (2014: 27) writes more recently, 'While extolled as an instrument of economic liberalism, [the zone] trades state bureaucracy for even more complex layers of extra-state governance, market manipulation, and regulation.' Free zones, as part of a broader discussion on special economic zones and free trade zones, have been well studied and critiqued in urban and geographic literature (e.g., Sklair 1986, McCalla 1990, Bach 2011, Farole and Akinci 2011), primarily in relation to their use as a policy tool that shifts state sovereignty to multinational corporations, to then effectively attract inward foreign investment and boost economic development through export-oriented markets. This historically occurred in cities of the majority world such as Shenzhen, China (Chen 1995, Sklair 1985, Yeung *et al.* 2009), but cities worldwide are now adopting these policy strategies regardless of national-scale market orientation (Easterling 2013, 2014).

This chapter adds to the above-mentioned literature by considering how economic policy efforts to attract multinational firms to emerging markets mutated into state- and city-driven – not national – strategies to ostensibly bring new corporations to a deindustrialised city-region of the US. Furthermore, the strategy largely amounted to a means for corporations in the region to relocate headquarters or manufacturing a few miles to take advantage of tax breaks (Director of

Fiscal and Policy Analysis 2016): much as Brenner and Wachsmuth (2012) argue, that territorial competitiveness in general is a race to the bottom since in an era of global corporate mobility companies can ostensibly pick up and move if they do not receive the tax holidays and other financial and infrastructural benefits that they have come to expect. The Philadelphia case is notable in that, as expanded upon below, even when the state government was presented with findings that indicated the stated return of jobs to economic disenfranchised, deindustrialised areas was inadequate at best, the representatives voted to extend the tax break legislation anyway.

In the following, this chapter weaves the three foci of territorial politics together, discussing the evolution of the Navy Yard over time. I argue that the extra-jurisdictional shift, in particular the tax holiday offered to corporations in the zone, was the most important factor for locating there. The infrastructure provision was an amenity for attracting global enterprise, and the contextual transformation was an outcome of the experiment in revitalisation.

Territorial politics of a smart, globally competitive Philadelphia

The Navy Yard sits at the southern edge of the city on low-lying marshland where the Delaware River joins the Schuylkill, the city's secondary river. The district is separated from the city's established neighbourhoods today by an elevated highway and below-grade rail corridor, existing industry, a large city park and the field, stadium and arena and parking lots of the city's three professional sports teams (**Figure 5.1**). Extending from its nineteenth-century origins and twentieth-century heyday as a US naval shipyard that connected the military enclave to US geopolitical actions and wars globally, the Navy Yard's new life as a free zone enhanced the city's neoliberal urban transformation, applying planning and governance tactics that perpetuated the lack of local government oversight present when the enclave was under naval control. This was achieved by turning oversight of the area to the city's private economic development partner (Director of Fiscal & Policy Analysis 2016).

In this Philadelphia case, I approach the 'smart and global' public as a 'normative democratic ideal', building upon Cowley and colleagues (2018: 55). While the city's costs to create the zone were justified through the ambiguous promise of job creation without a specific target given, the ultimate beneficiary of the tax holiday and premium infrastructure provision were the multinational corporations that operated in the Navy Yard, illuminating how the zone facilitated publicly financed private benefit. As Stephen McGovern states, writing on the revitalisation of Penn's Landing in central Philadelphia, 'the key question is not whether to develop urban waterfronts, but how they should be developed. For what purpose? For whose benefit?' (McGovern 2008: 285 [*sic*]; quoted in Boland *et al.* 2017: 119). In what follows, critiquing the territorial 'politics of public benefit' (Boland *et al.* 2017: 123) proceeds via detailing the evolution of the Navy Yard from naval shipyard to smart-global free zone.

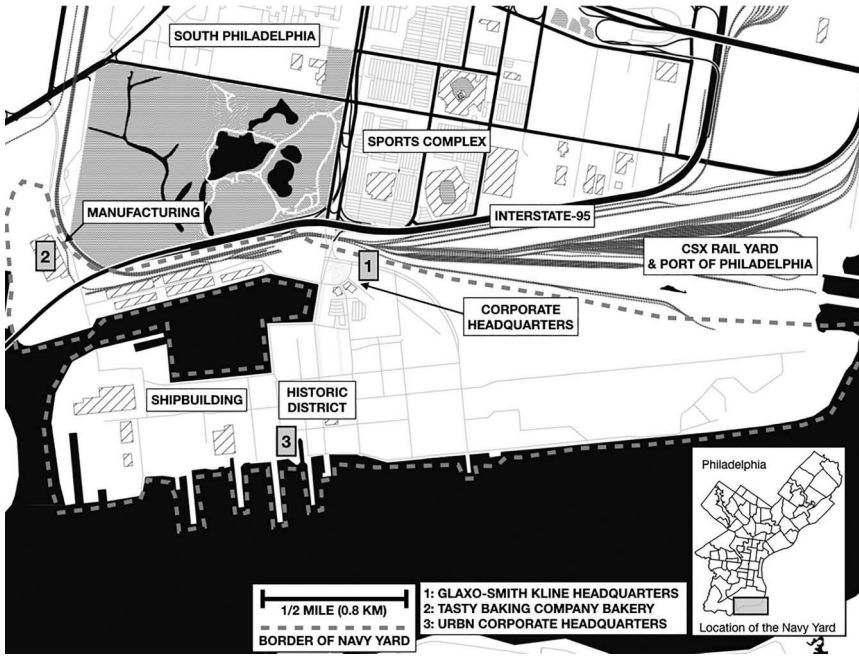

FIGURE 5.1 Map of the Navy Yard.

Source: Stamen Design (http://maps.stamen.com), data adapted from the Navy Yard Master Plan Update (RAMSA 2013).

Evolution of the Philadelphia Navy Yard

The Philadelphia Navy Yard originated in the early nineteenth century as the Philadelphia Naval Shipyard; at its peak during World War II, 47,000 workers were employed in shipbuilding. The Naval Shipyard closed in 1996 due to shrinking military budgets after the end of the Cold War (Hess *et al.* 2001: 5–11). Around the same time as the Naval Shipyard's closing, interest in reinvigorating formerly industrial areas was growing across Pennsylvania. The resulting policy discussion created Pennsylvania's 1998 Keystone Opportunity Zone (KOZ) legislation, allowing for 'tax exemptions, tax deductions, tax abatements and tax credits' to be used as incentives 'to facilitate economic development, stimulate industrial, commercial, and residential improvements and prevent physical and infrastructure deterioration' (Pennsylvania 1998: 1). Tax exemption was from retail sales tax, state tax on the business, as well as payroll tax (Pennsylvania 1998: 18–21). The Navy Yard was one of just over 200 KOZs established in Philadelphia alone as of 2015, with the attendant tax breaks and related incentives (Philadelphia Keystone Opportunity Zone n.d.); it was the largest by acreage by far. The logic of the Navy Yard was to maintain and grow the city's global potential: fix existing enterprise in place and attract new innovation-focused firms to the city.

Unlike the centrally located and globally oriented clusters of Philadelphia that are constrained by location within historic street grids, the Navy Yard was easily

integrated into the larger region through quick freeway access (and without the dense traffic of navigating in and out of the central city), close proximity to the airport, and telecommunication systems including a data centre directly linked into high-speed transatlantic data networks (TierPoint 2017). Reshaping the city for multinational enterprise required opening up spaces not constrained by outdated industrial modes of production, like much of the city's existing urban matrix; it also required, and more importantly according to officials involved in the Navy Yard, opening up spaces within city limits, close to the social opportunities and cultural amenities of a large city and not in the suburban fringe where much of the innovation economy located in the 1980s and 1990s (Gillen 2014). It is notable that, at 1200 acres, the Navy Yard was roughly the same geographic size as Philadelphia's central business district.

In 2000, the Philadelphia Industrial Development Corporation took over management of the Naval Shipyard site. This was Philadelphia's primary public–private economic development partner since 1958 that operated since its founding outside of democratic oversight (Adams 2015). The conversion of the Navy Yard into a free zone was codified in 2004 with the release of a master plan prepared by Robert A. M. Stern Architects (RAMSA), an urban design and planning firm working worldwide. This master plan presented a new urbanist, neighbourhood-centric vision of 'a dynamic, mixed-use waterfront community that includes everything one would expect from a great city: industrial development, offices, retail, waterfront amenities, executive conferencing, research and development, improved mass transit, great public spaces, and the potential for residential development' (RAMSA 2004: i). In addition to the zone's potential for business, the plan embraced connectivity to Philadelphia proper, as well as residential developments and a premier golf course (golf being a core component of business relationships for global firms [Easterling 2005]). Most projects not directly business related were put aside for reasons of cost or zoning concerns, and as of writing have yet to be built.

Residential construction or reuse of existing dwellings was not allowed, under stipulations of the US Navy's base closure rules, since the closure displaced workers and their families from existing housing (Vice President of Marketing & Business Development 2013). Consequently, no one lived in the zone: it became a space solely for business. This was likely to change however. In 2015, the PIDC began negotiating with the US Navy to allow the development of up to 1.5 million square feet of rental housing and small retail units for residents, with a mix of loft-style reuse of existing industrial structures as well as new-build apartments or town homes, marketed to 'young professionals' likely of the sort who would work in the zone (Arvedlund 2015).

As a naval shipyard, the separation from the civilian city was a matter of security and safety, but with the Navy Yard touted by the mayor and others as neighbourhood of Philadelphia itself, the physical separation remained, extending to private security guards as well as a visibly present Philadelphia police force at the gated main entrance. Geographically, the shipyard's enclaved design translated seamlessly into the free zone. The Navy Yard was open to the public with restrictions,

accessible primarily during business hours, Monday to Friday. Employees of, and visitors to, the complex could take a private shuttle from either central Philadelphia near one of the primary transport hubs or the subway stop nearest the zone, about half a mile (1 kilometre) north of the main entrance (Navy Yard n.d. a).

In terms of built form, the Navy Yard achieved a style that crossed between the quiet grounds of a sprawling university and a suburban research campus. Mature shade trees lined the streets, bike lanes were freshly painted on smooth asphalt roads, and ample parking was available. All these elements were attractive resources for employees, resources often absent in downtown Philadelphia. A 2008 study determined that it would be feasible to extend the north–south subway line into the Navy Yard, but because of the high cost this transportation infrastructure plan was not implemented (RAMSA 2013: 30).

Furthering the use of internationally prominent architects and planners, the Navy Yard brought in James Corner Field Operations – known for their design of New York's High Line park, built on an abandoned elevated railway – to design a showcase park in the centre of the Philadelphia zone, called Central Green (Popkin 2012). The use of these globally known designers was meant to signify the Navy Yard as a unique and important urban place for global investment, not merely a peripheral office park (Saffron 2015). Continuing this angle for civic and economic promotion through design, Bjarke Ingels Group (BIG), 'a global phenomenon in architecture and design', was contracted to design an office building in 'the city's booming business park' (Jennings 2015), pictured in **Figure 5.2**. The *Philadelphia Inquirer*'s architecture critic, Inga Saffron (2015), argued that the city's best new building designs were found in the Navy Yard. Ultimately, the

FIGURE 5.2 Bjarke Ingels Group's four-storey, curving and overhanging office building in the Navy Yard.

Source: author.

use of these architecture and design firms brought attention to the zone for its social and cultural importance beyond solely a globalised business location.

In addition to rehabilitating historic buildings and constructing new ones, the refurbishment of the shipyard into a free zone necessitated both renovating municipal infrastructure – such as the road grid and parking, and shifting security to city police and private patrols – and building a data centre and wiring high-speed telecommunications into the area. Additionally, 'green' storm water management systems were installed (City of Philadelphia 2012) as well as a smart grid/micro grid electricity network exclusive to the zone, built to both maintain power in the event of an outage and to allow for new, smart energy technologies to be tested (Burger 2017). The zone was population free, so installation and maintenance of this infrastructure test bed did not greatly interfere with residents' daily lives. Furthermore, smart systems are common features of free zones worldwide (e.g., Easterling 2014, Halpern *et al.* 2012), and installing premium and smart infrastructures complemented the city's ambition to compete for multinationals (WBCSD 2014).

By January 2014, ten years after the master plan was released, the president of the Philadelphia Industrial Development Corporation stated that the Navy Yard had evolved from 'an experiment and economic development initiative' into an 'established', 'mature, stable, and important option' for the city's economic growth (Kosteini 2014). The success of the Navy Yard from the perspective of the business community was undeniable. It contributed to Philadelphia's corporate revitalisation, facilitating the changing perceptions of the city from downtrodden to lively. The Navy Yard was presented by city officials and developers as a 'vibrant urban business park' (Gillen 2014), as a major component of the city and region's twenty-first century economic development agenda. In 2013, Philadelphia Industrial Development Corporation's Vice President of Marketing and Business Development stated that 'the Navy Yard has been an opportunity to provide … a suburban style layout with all the amenities of a big city' for companies that do not want or need to be in the city centre. However, the *Philadelphia Inquirer*'s architecture critic made the point that until the zone is actively linked, via public transportation between the airport and the city centre, the Navy Yard will remain at a remove from the rest of Philadelphia (Architecture Critic 2016): this friction between economic success and separation from the city's existing neighbourhoods is central to understanding the zone. If the Navy Yard represented Philadelphia's transformation, it did so in a fashion that was largely disconnected from the urban matrix, its population and its diversity. The rationale presented for the Navy Yard's economic success in bringing new enterprise and jobs to Philadelphia was its location in the city (Gillen 2014), even though the tax incentives as well as amenities provided to firms within the zone – including for example, not only easy parking and a cafe, but also yoga classes, food trucks and exercise/walking paths, common amenities in urban revitalisation strategies intent on attracting the 'creative class' (Florida 2002) – kept the Navy Yard apart from the rest of the city, similar to its status when it was a naval shipyard.

Experiments in smart-global urbanisation

Into the 2010s, the Navy Yard remained central to the city's innovative, smart and global economic transformation. Continued investment in the zone was seen by the then mayor as central to the continued competitiveness of the district (Nutter 2015). The Navy Yard was frequently promoted as a success in Philadelphia's efforts to attract or retain multinational enterprise, whether by the mayor (Nutter 2015) or the president of the public–private development partner (Kosteini 2014). To briefly illustrate the sort of firms locating in the Navy Yard, three examples follow:

1 GlaxoSmithKline (GSK) is a globally prominent pharmaceutical corporation based in the United Kingdom but with their US corporate headquarters in the Navy Yard. Their building was designed around ecologically sustainable construction practices by the same firm that produced the Navy Yard's master plan, and houses about 1000 employees (George 2015; Navy Yard n.d. b).
2 Founded in Philadelphia over 100 years ago and known regionally for its line of Tasty Kake baked goods, the Tasty Baking Company opened a 345,000-square foot, modernised manufacturing and distribution facility in 2010, in the process creating 'one of the world's largest LEED certified bakeries' (DVGBC 2014). The company relocated from an outdated facility in historically industrial North Philadelphia, moving into the zone to take advantage of tax breaks but also as a more convenient location for distribution throughout the region, due to the proximity to freeways. Several hundred employees work there (Schlegel 2010). The president of the company stated: 'The Navy Yard site is ideal … we are able to get our products out faster, fresher, and farther than ever' (Navy Yard n.d. b). The Tasty Baking Company also moved its corporate headquarters to the zone in 2009, adjacent to GSK and a large regional financial institution.
3 URBN is a Philadelphia-based youth-lifestyle retail brand including the Urban Outfitters, Anthropologie and Free People chains of stores, with 238 locations in the United States, Canada and Europe (Reuters 2017). Their corporate headquarters at the Navy Yard has over 2000 employees on site, working in preserved historic warehouses. The first major corporation to relocate from downtown Philadelphia into the zone, URBN moved in 2006 to consolidate multiple retail brands housed in different buildings in one location, pictured in **Figure 5.3** (Navy Yard n.d. b).

These proclamations of success continued even as the tax breaks the zone relied on were called into question across Pennsylvania in 2009 (Holoviak and Carabello 2009) and in Philadelphia itself, where in 2014 the City Controller criticised the costs of the zone to the city and its taxpaying residents (Butkovitz 2014). The imperative to compete globally led to extraordinary accommodations given to corporations in order to gain or retain their presence in Philadelphia.

FIGURE 5.3 URBN's global headquarters in a renovated shipbuilding complex on the Navy Yard's waterfront.

Source: author.

Ultimately, the Navy Yard's success, measured against the tax break legislation's primary objective of job creation, remains unknown. Because legislation did not mandate any mechanism for participating businesses to report job data, there is no way of accurately measuring the success of the programme beyond corporate attraction.

In 2014, the Philadelphia City Controller's Office released a report strongly critiquing the Keystone Opportunity Zones in the city for not actually bringing wage tax revenue to the city. In an extensive audit, complicated by the lack of oversight of the programme, the report found that the Keystone Opportunity Zone Act itself 'established very loose standards for qualifying a business and required very little in the way of verifiable reporting of incomes', with only self-reporting and no auditing of the businesses in the zones (Butkovitz 2014, Executive summary). This lack of regulation was built into the policy itself. The most striking finding from the audit was that 'It would take roughly 52 years for each new job to pay itself off", assuming average annual pay of $50,000 and current wage-tax rates' (Brubaker 2014). More specifically, the report found that between 1999 and 2012, $385 million in tax credits were given to the 617 businesses in Philadelphia's Keystone Opportunity Zones. The programme created 3,700 jobs, and tax revenue increased by $39.2 million. Each worker hired cost the city $103,971 in credits. At Philadelphia's wage tax rate of 3.924 per cent, recovering the tax credits would take 52 years (Butkovitz 2014, Executive summary).

The Controller granted that critics would argue that the benefit of these tax breaks was not in jobs created but in jobs that did not leave the city, a common argument from Philadelphia's business community that takes aim at the wage tax in general (Brubaker 2014). As a City Controller staff member described the situation, 'You shouldn't let facts get in the way of ideology, right? It wouldn't be Pennsylvania if you did' (Director of Fiscal & Policy Analysis 2016), recognising that with free zones like the Navy Yard, maintaining the ideology of territorial competitiveness mattered more than measuring outcomes or critiquing the costs underlying the experiment's 'success'.

While a subsidy accountability bill was passed by the city council in 2016, mandating that corporations receiving subsidies would have to report jobs created – including the hiring of independent contractors and temporary labour (Chief of Staff 2016) – in the same council session a different bill expanded the properties qualified for a tax break and extended the tax breaks on new properties through to 2026 (City of Philadelphia 2016: 6). With the Subsidy Accountability Bill, city government took back some control over the Navy Yard and associated smaller zones in the city. However, the city's interest in retaining its territorial competitiveness agenda did not diminish in the face of critique of the value of tax abatement policies.

Conclusion: prototyping urban change

Locating the smart-global city necessitates understanding this recent turn in urbanisation within the longer trends of splintering, networked urbanisation. Doing so leads to examining the spaces inhabited by the innovation and information economy, like the Navy Yard. As an experiment in attracting global enterprise, the zone functioned as desired. However, this success in drawing corporations to the city came at a high cost; and, as such, measuring this success should be tempered by recognition of the underlying factors, which I frame here as territorial politics. By prototyping a spatially selective redevelopment strategy in a city already fragmented by ongoing processes of post-industrial decline and highly uneven economic rebound, this chapter argued that Philadelphia's smart and global agenda actively, if unintentionally, perpetuated the fractured, inequitable landscape of the industrial city that smart technologies were ostensibly intended to overcome. In framing the Navy Yard as an experiment, the zone brings together the untested elements of transforming a derelict industrial space into a smart and global district.

Territorial politics problematise who globalised economic development is for and how those benefits spread (or not) through a city. Even as it remained separate, the costs of the Navy Yard, in terms of tax breaks and infrastructure provision, were distributed citywide. Even in transitioning the zone, and the city more generally, to an innovation and information economy, the territorial politics of the zone amplified the broader inequities latent in the city, where neoliberal governance has extended into the private control of an entire district

of the city. The Navy Yard case expands understandings of neoliberal territorial competitiveness to consider both the material spaces where these policies are enacted and the fiscal costs associated with these efforts. If, as I have argued, Philadelphia is emblematic of the splintering characteristics of post-industrial urbanisation (Graham and Marvin 2001), theorising the Navy Yard as a free zone advances these arguments in time and space to unpack the political implications of the city's ongoing integration into the globalised economy. These territorial politics 'mutated' into the free zone. Worldwide, the variegated nature of free zones speaks to their adaptability – through the transference of oversight and planning to those within the zone – to a multiplicity of local conditions. Premium infrastructure provision, high-quality real estate construction and rehabilitation, and the potential for socio-economic transformation from dockworkers to knowledge economy creatives all contributed to this metamorphosis; but underlying, and inseparable from the experiment, were the tax breaks for economic development, a strategy that was tested and critiqued in Pennsylvania as costly and difficult to measure, but still deemed a necessity for it to remain a globally relevant city.

The Navy Yard was produced through unevenly distributed infrastructures and public–private governance strategies based on the premise of stated positive, citywide economic benefit even though the zone remained oriented foremost to the corporations within, thereby crafting a space for global enterprise disconnected from the city itself. In order to maintain territorial competitiveness, Philadelphia operated the Navy Yard in an extra-jurisdictional fashion that furthered the city's corporate ambitions while ignoring the stated goal of actually achieving the job-creation aims of the economic development policy itself. The costs for the incentives underlying this competitiveness have been critiqued, but it remains to be seen what the job creation reporting that the Subsidy Accountability Bill mandates will lead to. Revitalising this former shipyard into its current incarnation succeeded for multinational corporate enterprise; but the success came at significant, literal public cost, not only regarding subsidising the tax breaks and premium infrastructure provision, but also in the absence of public input into the design and use of the space, and without the open access to the streets, sidewalks and parks inherent in a typical neighbourhood of Philadelphia. Even though the zone was championed by numerous elected officials over two decades, and even though the city has financed millions of dollars of infrastructural improvement, its success hinged on the absence of taxation and the proximity to quality urban, cultural and economic amenities found in a major city (Vice-President, Marketing & Business Development 2013). Many businesses need to be downtown, but many do not. The Navy Yard remains a jurisdictionally, infrastructural and contextually distinct space, giving globally mobile businesses a way to operate in the city but keep separate from it. If and when the tax breaks expire, it remains to be seen if the zone will stay successful or if the globalised enterprise will move location to the next, new district near or far from Philadelphia, offering extended, better tax breaks and other amenities.

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Note

1 See Wiig (2016) for a full discussion of this case.

References

Adams, C. (2015). Philadelphia Industrial Development Corporation. [Online]. Available: http://philadelphiaencyclopedia.org/archive/philadelphia-industrial-development-corporation-pidc/ [Last accessed 29 June 2015].

Allen, J. and Cochrane, A. (2007). Beyond the territorial fix: regional assemblages, politics and power. *Regional Studies 41*: 1161–1175.

Architecture Critic. (2016). Interview with author. Philadelphia, July 20.

Arvedlund, E. (2015). Living in ships' shadows may be reality. *Philly.com*. [Online]. Available: http://articles.philly.com/2015-04-20/real_estate/61308117_1_navy-yard-u-s-navy-rental-housing [Last accessed 12 May 2015].

Bach, J. (2011). Modernity and the Urban Imagination in Economic Zones. *Theory Culture Society* 28: 98–122.

Boland, P., Bronte, J. and Muir, J. (2017). On the waterfront: neoliberal urbanism and the politics of public benefit. *Cities 61*: 117–127.

Brenner, N. and Wachsmuth, D. (2012). Territorial competitiveness: lineages, practices, ideologies. In B. Sanyal, L. Vale and C. Rosan (eds), *Planning Ideas That Matter: Livability, Territoriality, Governance, and Reflective Practice*. Cambridge, MA: MIT Press, 179–206.

Brownill, S. (2013). Just add water: waterfront regeneration as a global phenomenon. In M. Leary and J. McCarthy (eds), *The Routledge Companion to Urban Regeneration*. New York: Routledge, 45–55.

Brubaker, H. (2014). City Controller sees small return on 'Opportunity Zone' program. *Philly.com*, 21 March 2014. [Online]. Available: http://articles.philly.com/2014-03-21/business/48406994_1_koz-butkovitz-wage [Last accessed 21 April 2014].

Burger, A. (2017). Project spotlight: the Philadelphia Navy Yard microgrid. *Microgrid Knowledge*. [Online]. Available: https://microgridknowledge.com/navy-yard-microgrid/ [Last accessed 21 August 2017].

Butkovitz, A. (2014). An analysis of the Keystone Opportunity Zone Program, 1999–2012: the costs and benefits to Philadelphia. City of Philadelphia. [Online]. Available: www.philadelphiacontroller.org/publications/KOZ-Report_March2014.pdf [Last accessed 30 April 2014].

Chen, X. (1995). The evolution of free economic zones and the recent development of cross-national growth zones. *International Journal of Urban and Regional Research 19*: 593–621.

Cheshire, P. and Gordon, I. (1996). Territorial competition and the predictability of collective (in)action. *International Journal of Urban and Regional Research 20*: 383–399.

Chief of Staff. (2016). Telephone interview by author with City Councilwoman Helen Gym's Chief of Staff. Philadelphia, 16 December.

City of Philadelphia. (2012). Lower South District Plan. [Online]. Available: www.phila2035.org/pdfs/FinalLowerSouth.pdf [Last accessed 23 July 2017].

City of Philadelphia. (2016). Bill No 160708-AAA: Amending Chapter 19–3200 of The Philadelphia Code, 'Keystone Opportunity Zone, Economic Development District, and Strategic Development Area'. [Online]. Available: https://phila.legistar.com/View.ashx?M=F&ID=4704514&GUID=EE87E608-B0C5-4D16-BBE6-F90ADFE6EFB9 [Last accessed 23 April 2017].

Cowley, R., Joss, S. and Dayot, Y. (2018). The smart city and its publics: insights from across six UK cities. *Urban Research & Practice 11*: 53–77.

Cugurullo, F. (2013). How to build a sandcastle: an analysis of the genesis and development of Masdar City. *Journal of Urban Technology 20*: 23–37.

Director of Fiscal & Policy Analysis. (2016). Office of the Philadelphia Controller. Interview with author. Philadelphia, 19 July.

DVGBC (Delaware Valley Green Building Council) (2014). Tasty Baking Company at the Navy Yard. [Online]. Available: www.dvgbc.org/green_resources/projects/tasty-baking-company-navy-yard [Last accessed 3 October 2015].

Easterling, K. (2005). *Enduring Innocence: Global Architecture and Its Political Masquerades*. Cambridge, MA: MIT Press.

Easterling, K. (2012). Zone: the spatial softwares of extrastatecraft. *Places Journal*. [Online]. Available: https://placesjournal.org/article/zone-the-spatial-softwares-of-extrastatecraft/ [Last accessed 28 August 2017].

Easterling, K. (2013). Are you in the zone? *Fulcrum 70*. [Online]. Available: http://fulcrum.aaschool.ac.uk/wp-content/uploads/2013/03/fulcrum70_180313_shadowstates.pdf [Last accessed: 3 November 2017].

Easterling, K. (2014). *Extrastatecraft: The Power of Infrastructure Space*. New York: Verso.

Fainstein, S. (2010). *The Just City*. Ithaca: Cornell University Press.

Farole, T. and Akinci, G. (2011). *Special Economic Zones: Progress, Emerging Challenges, and Future Directions*. Washington, DC: World Bank.

Florida, R. (2002). *The Rise of the Creative Class: And How It's Transforming Work, Leisure, Community and Everyday Life*. New York: Basic Books.

George, J. (2015). GlaxoSmithKline files notice of 150 layoffs in Pennsylvania. *Philadelphia Business Journal*. [Online]. Available: www.bizjournals.com/philadelphia/blog/health-care/2015/03/glaxosmithkline-planning-to-layoff-about-150-in.html [Last accessed 1 October 2015].

Gillen, T. (2014). Rebirth of the Navy Yard. TEDx Talks. [Online]. Available: www.youtube.com/watch?v=0H7_ke51x7o [Last accessed 12 May 2015].

Graham, S. and Marvin, S. (2001). *Splintering Urbanism: Networked Infrastructures, Technological Mobilities and the Urban Condition*. New York: Routledge.

Hackworth, J. (2007). *The Neoliberal City: Governance, Ideology, and Development in American Urbanism*. Ithaca: Cornell University Press.

Halpern, O., LeCavalier, J., Calvillo, N. and Pietsch, W. (2012). Test-bed urbanism. *Public Culture 25*: 272–306.

Harvey, D. (1989). From managerialism to entrepreneurialism: the transformation in urban governance in late capitalism. *Geografiska Annaler, Series B: Human Geography 71*: 3–17.

Hess, R., Marquis, J., Schank, J. and MacKinnon, M. (2001). *The Closing and Reuse of the Philadelphia Naval Shipyard*. Santa Monica: RAND Corporation.

Hodos, J. (2011). *Second Cities: Globalization and Local Politics in Manchester and Philadelphia*. Philadelphia: Temple University Press.

Holoviak, P.A. and Carabello, D. (2009). *An Evaluation of the Keystone Opportunity Zone (KOZ) Program*. Harrisburg: Center for Rural Pennsylvania.

PART 2

Integrating and aligning

6

ACTUALLY EXISTING SMART DUBLIN

Exploring smart city development in history and context

Rob Kitchin, Claudio Coletta and Liam Heaphy

Introduction

Initial empirical research concerning the development of smart urbanism focused largely on smart city rhetoric, the marketing materials of companies promoting smart city products and services, and the policy and visioning documents of lobbying bodies and city administrations (e.g., Söderström *et al.*, 2014, McNeill 2015). This was accompanied by academic critique concerning the underlying political economy of the smart city that countered its supposedly pragmatic, non-ideological, commonsensical vision for future city-making (e.g., Greenfield 2013, Kitchin 2014, Vanolo 2014, Datta 2015). However, as Kitchin (2015) and Shelton *et al.* (2015) detail, until recently few in-depth studies had been directed towards how the smart city was unfolding on the ground in actually existing initiatives, both in terms of locally grounded rhetoric and materially manifested technological deployments (cf. Cugurullo 2017, Wiig 2018, Trencher and Karvonen forthcoming). As this book attests, this situation has been rectified to some degree in the last couple of years, with researchers starting to unpack and analyse specific initiatives and the socio-economic contingencies and consequences of smart urbanism in particular locales.

Our contribution to understanding the 'actually existing smart city' (Shelton *et al.* 2015) has been to focus attention on the unfolding of the idea of the smart city and its supporting administration and initiatives in Dublin, Ireland and Boston, United States, conducted as part of the Programmable City project.[1] This large project has involved several hundred interviews and ethnographic fieldwork over a five-year period; producing smart city technologies (e.g., the Dublin Dashboard); and active involvement in smart city initiatives (for example, conducting a smart lighting scoping study, running 'challenge' workshops and being a member of the Smart Dublin steering group).

In this chapter, we examine how the smart city idea has been enacted through a set of smart city initiatives and brought into common discourse in the Dublin city region through the Smart Dublin programme. We chart how Dublin has moved from an 'accidental smart city' (Dourish 2016) to an articulated vision with its own projects. So successful has this re-articulation been that Dublin was one of six shortlisted finalists for smart city of the year at the Smart City Expo and World Congress 2017. In mapping Dublin as an actually existing smart city, we identify and detail three principal components of smart city-branded activity in the city: an open data platform and big data analytics; the rebranding of autonomous, technology-led systems and initiatives as smart city initiatives; and supporting innovation and inward investment through testbedding, the creation of a smart district and adopting new forms of procurement designed to meet city challenges. We start, however, by tracing the origins of smart urbanism in Dublin and the creation of Smart Dublin.

A brief history of entrepreneurial and smart urbanism in Dublin

Dublin's path to becoming a smart city extends back much further than the creation of Smart Dublin in 2014. We would argue that its origins were in fact seeded in the late 1980s, when there was a fundamental shift in economic, planning and development policy in Ireland towards neoliberal ideas and ideals. Throughout the 1980s, Ireland suffered economic and political instability and crisis. Indeed, the country was relatively poor, with a weak indigenous economy and foreign direct investment (FDI) characterised by low-skilled, branch-plant manufacturing. In 1987, Ireland's gross domestic product (GDP) was 63 per cent of the European Union (EU) average, making it the second poorest country in the Union, behind Portugal (Breathnach 1998). As a result of economic instability and social hardship, there was constant tension and conflict among the state, employers and unions, with successive governments struggling to address high unemployment, inflation and spiralling debt while balancing spending, reforming taxation and satisfying the electorate. This situation was transformed in the early 1990s by six factors:

1. the introduction of social partnerships to manage industrial relations;
2. changes to the planning regime;
3. the adoption of free-market principles, entrepreneurial freedoms and deregulation;
4. strong foreign direct investment;
5. subsidies and political support from the European Union; and
6. the instigation of the peace process in Northern Ireland (Kitchin and Bartley 2007).

These factors acted together to produce political and economic stability and encourage investment and economic growth.

A key factor in the revival of Dublin's fortunes was the adoption of entrepreneurial urbanism to stimulate property development and attract service-based foreign direct investment. This process started in 1986 with the initiation of new planning and regeneration policies designed to modernise and re-image key zones in the city and enhance international competitiveness (Bartley 2007). In that year, Ireland's first Urban Development Corporation (UDC), the Custom House Docks Development Authority (CHDDA), was established through new urban renewal legislation. Sidelining the local authority, central government sought to emulate an experiment similar to London Docklands by establishing an independent, single-task organisation to rejuvenate the north-east inner city of Dublin. The CHDDA had its own planning powers, was supported by development tax breaks and exemptions, and could enter into partnership with companies to achieve its objectives (Bartley 2007). Crucially, the area was designated as the site for a new International Financial Services Centre in 1987.

This entrepreneurial approach to planning and development paved the way for private companies to take an active role in shaping and delivering urban policies and projects (see MacLaren and Kelly 2014). Indeed, planning policy in general changed from a 'concern with integrated comprehensive planning for all areas within the planning authority's area of control to an approach based on planning for fewer, selected areas based on highest potential for success' (Bartley 2007: 36). In turn, local authorities were encouraged to become more entrepreneurial and business-friendly in their own operations, developing public–private partnerships with companies to deliver services, but also to drive and support entrepreneurial activity in the city.

During the 1990s, entrepreneurial urbanism in the city developed through a series of governance innovations. The Temple Bar UDC involved an independent agency (Temple Bar Properties) to manage the project, but the local authority was reintroduced to the process to control planning decisions. The Dublin Docklands Development Authority replaced the CHHDA in 1997 and implemented an Integrated Area Plan approach to regeneration that had to take more account of social needs and local participation (Bartley 2007). In all cases, development was designed to attract inward investment, support business and enhance competitiveness, with the state playing an active role in facilitating entrepreneurial activity.

This planning/property-led approach was complemented in the 2000s by the Dublin local authorities' embrace of ideas based on the creative city. In Florida's (2002) terms, a creative city is one that promotes an entrepreneurial approach to place-making and economic development centred on a tripartite set of policies relating to talent, tolerance and taxation. By producing cosmopolitan, attractive places for creative workers and businesses to locate, cities could compete on the international stage for inward investment. Allied with an entrepreneurial approach to urban governance, Dublin rolled out a series of initiatives aimed at supporting creative and service industries and fostering an innovation economy, including the Temple Bar regeneration and the creation of the Digital Hub

(Bontje and Lawton 2013). The Digital Hub was established in 2003 with the aim of producing a vibrant, digitally driven economy. It is managed by the Digital Hub Development Agency and housed in eight former buildings of the Guinness brewery to the west of the city centre. As well as supporting circa 90 companies at any one time (220 in total), it also houses NDRC, a state-backed early stage investor and accelerator for tech start-up companies. It is also a key agent in local regeneration, using a public–private partnership model to redevelop and invest in local property stock.

These endeavours were supported by the Creative Dublin Alliance, a collaboration between local authorities, universities and businesses to promote and market the creative sector through initiatives such as Innovation Dublin. Moreover, the ideas of the creative city formed a key element of the 2009 Economic Development Action Plan for the Dublin region (DRA 2009, Bontje and Lawton 2013). The Irish Development Agency (IDA) and Enterprise Ireland both used the notion of creative place-making to drive inward investment of creative industries, particularly in the software sector, with several high-profile companies locating their European headquarters in the city, including Google, Facebook, Twitter and LinkedIn. Dublin's dalliance with the creative city further deepened its commitment to entrepreneurial urbanism and a proactive role in involving and fostering the interests of business in urban development.

The shift to a smart city approach is the latest phase of entrepreneurial urbanism in the city, this time driven by technological solutions to urban development and encouraging a new wave of economic investment by attracting tech companies producing smart city technologies and fostering indigenous start-ups. While overlapping with the emphasis on innovation and the notion of Digital Dublin,[2] and leveraging on networked technologies that were being used to manage city services (such as the traffic control room and customer-relations management systems) that were subsequently folded into the notion of a smart city, this phase was perhaps initiated by the foundation in 2011 of Dublinked – the city's open data portal.

Unlike other open data initiatives that were often framed as making city governance more transparent and accountable, Dublinked was created to produce an open data economy. In essence, it was hoped that by making city data available, companies would be able to build apps and services and create jobs in the wake of the 2008 financial crisis and its devastating effect on the country's economy (Kitchin *et al.* 2012). The data store covered planning, transport, environment, arts, culture and heritage, and other aspects of city life, including some real-time datasets. Dublinked was also significant because it was the first formal, long-term collaboration between the four Dublin local authorities that comprise the Dublin city region (Dublin City Council, Fingal County Council, South Dublin County Council and Dún Laoghaire Rathdown County Council). Importantly, Dublinked staff and the post of smart city officer for Dublin City Council (created in 2013) were active players in the creative city initiatives. Members of the steering group, such as the heads of information and communication technology

(ICT), had been active in nascent smart city initiatives. As such, the ideas and ethos have been carried through by the same public sector actors from earlier rounds of neoliberal city-making. Similarly, many of the private sector company and university actors active in fostering the creative city are also actively promoting the smart city.

In 2014, the four local authorities decided to actively frame and coordinate the smart city initiatives through a single endeavour. Rather than create an entirely new entity, given the existing structure and smart city expertise, it was decided to repurpose Dublinked into a shared unit that encompassed the open data portal while also performing several other roles. Smart Dublin was formally launched in March 2016 but had been meeting and planning since the initial decision to found. Its mandate is to coordinate, manage and promote smart city initiatives in the Dublin region. There is a very strong economic development function to its work, including working with companies to facilitate testbedding, running a smart city challenge-led innovation funding scheme and supporting public/private-sponsored hackathons.

Given the trajectory of entrepreneurial urbanism in the city from strategic planning to creative city to smart city, it is perhaps no surprise that the new smart district is located in the Docklands Strategic Development Zone (SDZ) – colloquially known as 'Silicon Docks' and home to many global digital technology/software companies – and is actively supported and promoted by Smart Dublin working in conjunction with businesses in the area. Smart Dublin also acts as a key node in the advocacy coalition for smart city initiatives operating in the city, liaising and working with international partners (Kitchin *et al.* 2017).

The key point from this brief history is that Dublin's path towards becoming a smart city is part of a much longer trajectory of city-making, including forms of networked urbanism and the unfolding of a neoliberal urban political economy in Ireland (see Kitchin and Bartley 2007, Kitchin *et al.* 2012, MacLaren and Kelly 2014).[3] As such, rather than simply mapping out smart city initiatives in a city, or their most recent history, it is important to trace out how they are rooted in larger and longer political and economic processes and ideologies.

The actually existing smart city

Having outlined the evolution of the smart city concept in Dublin from its origins in entrepreneurial urbanism, creativity and local enterprise programmes like Digital Dublin and the concomitant technological modernisation of services, we now proceed to examine how it is being enacted as the actually existing smart city. By analysing how smart is performed, we wish to draw together the various technological cultures at play in the city and their interactions, thereby noting how technological change is driven by the city's position as the anchor point for foreign direct investment and local innovation networks.

Open data platform and data-driven applications

As already noted, Dublinked is the open data repository for the four local authorities in the Dublin city region. The origins of Dublinked are rooted in the confluence of a number of initiatives. The original proposal was first muted by the Creative Dublin Alliance as a suggestion for the Dublin Regional Authority's 2009 economic strategy. The idea was to produce an open data portal as a regional response to the unfolding economic crisis and the need to stimulate innovation and economic development. In part, this was building on the initial success of the Fingal Open Data site, the first open data repository by a local authority in Ireland. The spark to transform from an initial idea to a funded project was the process of attracting IBM's global smart city research team to Dublin. As well as the usual development grants and aid provided through the IDA, the city sought to provide data that IBM could use to develop new products. However, providing the data to a single company might have been construed as unofficial state aid, so the decision was made to make the data open to all. Relatively quickly, a partnership was formed between the four local authorities who would provide the data, IBM who would supply the technology platform and Maynooth University who would build the portal.

The initiative had a strong economic development focus, and the design for the portal divided the site into two separate domains: an open domain that anyone could access; and a closed domain that could only be accessed by those paying a subscription fee. The open domain provided access to general datasets produced by the local authorities and other government agencies. The closed domain contained higher-value datasets, such as Ordnance Survey Ireland map layers and Geodirectory address databases, that were usually licensed to users but agencies and companies were willing to share with vetted users to create new products. The Dublinked portal was launched in 2011 with 30 open datasets that increased in the next couple of years as new datasets were made open. To encourage their usage, Dublinked ran a number of workshops and hackathons designed to produce apps and new businesses.

One initiative that sought to leverage the data was the Dublin Dashboard.[4] Initiated in November 2013, the project started as a means to explore the politics and praxes of creating city dashboards by building one as part of the Programmable City project (Kitchin *et al.* 2016). Shortly afterwards, the project formed a partnership with Dublin City Council. The site sought to present the data provided by Dublinked and other sources using interactive maps and graphs. A series of modules were built that enabled users to answer questions such as: 'How well is Dublin performing?'; 'How does Dublin compare to other places?'; 'What's happening in the city right now?'; 'Where are the nearest facilities/services to me?'; 'What are the spatial patterns of different phenomena?'; 'What are the future development plans for the city?'; and 'How do I report issues about the city?' The site is one of the most comprehensive public city dashboards internationally and has recently received significant funding to undertake additional

fundamental and applied research, including building virtual reality and augmented reality models for the city.

In 2015, Dublinked was incorporated into Smart Dublin and the partnership with IBM was concluded. The website was transferred to a Comprehensive Knowledge Archive Network (CKAN) platform and the closed domain was discontinued. At the time of writing, Dublinked contained 251 datasets about various aspects of the city. While Dublinked had some success in initiating economic development, the limited scope, quality and timeliness of the data has hindered the creation of the envisaged open data economy. Nonetheless, the project is seen as a vital aspect of the Smart Dublin initiative and a full review and overhaul of Dublinked, aimed at addressing its shortcomings, was initiated in late 2017 and conducted by a private start-up called Derilinx. In addition to Dublinked and the Dublin Dashboard, Smart Dublin partners have implemented a number of data-driven applications (such as Fix-Your-Street, Public-Realm Mapping, Community Maps and Dublin Economic Monitor) and have started to work with private data-rich companies (such as Vodafone and MasterCard) to undertake data analytics aimed at better understanding the city. The aim is that, over time, the city will increase its data offerings and tools to make sense of such data, and that the four local authorities will become more data-driven in terms of managing operations and formulating policy.

Rebranding of largely autonomous systems and initiatives

Prior to the initiation of Smart Dublin in 2015, few considered Dublin to be a smart city. This view was commonly held across our interview respondents, who were selected because of their alignment to initiatives commonly associated with smart city programmes and research. Moreover, Dublin did not feature in initial global smart city rankings. Instead, it was felt that smart city thinking and initiatives were highly fragmented across the local authorities and different agencies, accompanied by a piecemeal approach rather than a coordinated strategy, and lacking leadership and direction. In addition, while there were some parts of individual local authorities that were open to engagement and collaboration, as a whole the four authorities were seen as inflexible, conservative, lacking in key capacities and vision, and behind the times in both governance and technology. Nevertheless, there was a sense among interviewees that the city had deployed 'smart city' urban technologies and had the potential to become a smart city given the confluence of technology-focused multinationals and the vibrant indigenous start-up community in the city.

We identified over 50 different projects and programmes in our 2015 survey of initiatives in Dublin that might be legitimately classified as fitting the profile of a smart city deployment. Many of these were institutional or support-orientated, such as accelerator programmes for tech start-ups working on smart city solutions, rather than technical systems, or were pilot or research initiatives. **Table 6.1** details 28 mainstreamed, operational smart city technologies used by the four Dublin local

authorities to manage city services, classified using Giffinger and Pichler-Milanović's (2007) typology of smart city initiatives (although it should be noted that there is some overlap between categories). As the descriptions make clear, the systems are broad in scope and seek to address a diverse range of issues. What is clear from the table is that the city had been procuring and developing digital technology-led solutions to urban management issues for quite some time, and in the case of the Traffic Control Room, since 1987 (coincidentally, the starting point for entrepreneurial urbanism in the city). Despite the rise of smart city rhetoric in recent years, many of systems detailed in **Table 6.1** are still understood by their staff as domain-focused initiatives (e.g., transport, waste, economy) rather than smart city endeavours.

In many cases, the technical systems are extensive and mature. Again, with respect to traffic control, the present system is a large, coordinated activity with data streaming into a control room from a fixed network of 380 CCTV cameras, 800 sensors (inductive loops), a small number of Traffic Cams (traffic-sensing cameras), a mobile network of approximately 1000 bus transponders, phone calls and messages by the public to radio stations and the operators, and social media posts which are then processed by control room software (Sydney Coordinated Adaptive Traffic System/SCATS) to control in real time the sequencing of traffic lights and the flow of traffic (see **Figure 6.1**) (Coletta and Kitchin 2017). This technical infrastructure has been used as a foundation onto which further 'smart' technologies can be integrated. Examples of this include the Horizon 2020 project Insight ICT and its successor, VaVel, which are local collaborations with IBM as part of a wider international European consortium that adds further algorithmic 'eyes' on city mobility. These projects have appended further data analysis functionality onto the existing SCATS implementation and conducted experiments with crowd-sourced data from a smartphone app and video analytics.

Smart Dublin has sought to corral these various projects and rebrand them as examples of smart urbanism in Dublin. In practice this has meant little more than incorporating them as examples in Smart Dublin's promotional material and using the Smart Dublin office as a mediator for further enquiry. There is relatively weak operational coordination of smart city initiatives across the city, as none of the initiatives have been pulled into the managerial control or day-to-day operations of Smart Dublin (aside from Dublinked). In contrast, there is now a quite well-developed narrative of Dublin as a smart city that is starting to take effect locally and internationally. In this sense, as we have noted previously (Coletta *et al.* 2017), Dublin has been transformed from an 'accidental' into an 'articulated' smart city. The articulated smart city, complete with its narrative, is directed towards a local advocacy coalition and an international network of cities competing in the knowledge economy while also, in rhetoric at least, responding to the sustainability challenges of the twenty-first century. The 'accidental city', in contrast, is comprised of: firstly, a broad range of largely independent and disconnected urban and national intelligence systems; and, secondly, an incipient innovation-based economy seeking further collaboration and support from local and national government.

TABLE 6.1 Selected smart city initiatives (28 in total) undertaken by or with local authorities in the Dublin city region

Typology	*Name*	*Year initiated*	*Scale*	*Description*
Smart economy (entrepreneurship, innovation)	Dublinked	2009	City	Provides access to city datasets, including some real-time data feeds
Smart environment (green energy, sustainability, resilience)	Sonitus sound sensing	2007	Local Authorities	Network of sound sensors monitoring noise levels
	EPA pollution monitoring	2008	Nationwide	EPA network of pollution sensors
	Big Belly Bins	2010	Local Authorities	Networked compactor bins that use sensors to monitor levels; waste collection route optimisation
	CODEMA + DCC energy monitoring	2012	City	Real-time monitoring of energy use in local authority buildings; publicly displayed on screens
	Docklands 21	2015	Local Authority	Locality-based consortium seeking sustainability gains
	Spatial Energy Demand Atlas (Codema)	2015	Local Authority	Energy use and district-heating feasibility mapping
Smart government (e-gov, open data, transparency, accountability, evidence-informed decision-making, better service delivery)	CRM workflow system	2004	Local Authority	Customer relations management system to interface with the public and undertake workflow planning
	Fleet Management	2010	Local Authority	GPS tracking of local authority fleets and route optimisation
	Public realm operations map	2010	Local Authority	Interactive map that reports scheduled public works
	fixyourstreet	2011	Nationwide	Website and app for reporting issues (e.g. vandalism, dumping, potholes) to local authorities
	Map Road PMS	2011	Nationwide	National management system for road maintenance
	Lexicon Library	2014	Building	New-build library with smart control systems and digital services

(*Continued*)

Typology	*Name*	*Year initiated*	*Scale*	*Description*
Smart living (quality of life, safety, security, risk management)	Map Alerter/Unfolding News	2010	Local Authorities	Real-time alerts for weather and flooding
	Dublin Dashboard	2013	City	Comprehensive interactive graphs and city maps (including real-time data) and location-based services
	Smart Stadium	2015	Building	Sensor network monitoring different facets of stadium use
Smart mobility (intelligent transport systems, multi-modal inter-op, efficiency)	Traffic Control Room	1987	Local Authority	Suite of technologies including SCATS (transduction loops at junctions), CCTV, automatic number plate recognition (ANPR) cameras, detection of breaking red lights at Luas (tram) lines, feeding into a centralised control room
	ANPR	2005	Local Authority	ANPR for data analytics on traffic volumes, both local and passing through area
	E-flow road tolling	2008	City	Automated roll tolling/billing using transponders
	Dublin Bikes	2009	Local Authority	Public hire bike scheme
	Leapcard	2011	Nationwide	Smart card access/payment for trains, buses and trams
	RTPI	2011	Nationwide	Digital displays at bus and tram stops and train stations providing information on arrival/departure times
	Insight ICT	2013	Local Authority	Data analytics system with crowdsourcing, integrated into traffic system
Smart people (creativity, inclusiveness, empowerment, participation)	TOG	2009	City	Civic hacking coding meetups
	Fingal Open Data	2010	Local Authority	Local authority open data sets
	CIVIQ/Citizenspace	2012	Local Authority	Web consultation for planning documents and other policy proposals
	Code for Ireland	2013	Nationwide	Civic hacking coding meetups
	Geohive	2015	Nationwide	Open spatial data website, facilitating customised maps

FIGURE 6.1 Part of the traffic control room in Dublin.
Source: authors.

Supporting innovation through testbedding, smart districts and pre-commercial procurement

One of the key new roles of Smart Dublin and Dublin City Council's smart city coordinator is to facilitate testbedding and establish living labs in conjunction with local actors. A living lab is typically a spatially delimited real-world experiment outside the confines of the traditional laboratory, where technologies can be tested against real-world conditions. Such testbeds aim to establish Dublin as a key site of experimental urbanism that will enable companies to test prototype technologies and prove market-readiness. For example, several start-ups have been provided with data and access to infrastructure in recent years to scale up sensor-based technologies for bicycle safety (See.Sense) and footfall analysis via Wi-Fi signals from smartphones (ThinkSmart Technologies). This enabled start-ups to build larger operations in other cities around the world while retaining their status as Irish companies (or Northern Irish in the case of See.Sense) or, less exultantly perhaps, being acquired by multinationals scouting for new products (ThinkSmart was acquired by Cisco in 2012). Smart Dublin works in conjunction with the IDA to market and promote the country as a prime site to locate companies developing the Internet of Things (IoT) and smart city technologies. It also acts as a first point of contact, aiding with the identification of physical locations and negotiating infrastructure access, advising on risk and litigation, and brokering introductions to appropriate departments within the local authorities.

Given its outreach work and presence at tech events, Smart Dublin's personnel and its work are now reasonably well known within the tech sector. However, given the limited agency of Smart Dublin as a unit (under the control of four local authorities and with no decision-making capacity outside its steering group), its capability to push independently and authoritatively for technological change and experimentation is restricted (Coletta *et al*. 2017). Therefore, Dublin City Council as the most powerful and wealthy of the four local authorities has progressed with 'coalitions of the willing' to advance specific testbeds where new technologies can be trialled. These are being created where opportunities arise, among which are Dublin Docklands, the new Dublin Institute of Technology campus at Grangegorman and Croke Park stadium.

The Dublin Docklands and Grangegorman sites are designated as Strategic Development Zones, exempt from individual planning control subject to being aligned to integrated and detailed strategic plans which incorporate physical and social infrastructure. As already noted, SDZs are a key feature of entrepreneurial urbanism and have proved an amenable entry point for testbedding smart technologies in urban environments. Dublin Docklands is home to many technology and data multinationals (such as Google, Accenture and Facebook) as well as several start-up incubators that are keen to use their local environment to test their products and demonstrate the utility and value of smart urbanism in general. The 'Smart Docklands' formal testbed is now being prepared in terms of social organisation and stakeholder networks, access to infrastructure and financing (Heaphy 2018). Croke Park is a more private venture between the stadium owners – the Gaelic Athletic Association (GAA) – Dublin City University and companies, and forms a more closed, controlled testbed.

In addition to testbedding, Dublin has been at the forefront of rolling out pre-commercial procurement to help produce new smart city solutions and foster innovation and new company formation or new products in existing companies. Pre-commercial procurement is a means, on the one hand, of identifying new potential solutions to urban problems; and, on the other, of encouraging economic development where a substantial amount of research and development is still needed to bring an idea to the market. The process is challenge-led in that the city authorities identify an issue that has long been a problem and where previous attempts to address it have largely failed. Rather than trying to prejudge what might be a possible solution, a competition is established that invites the market to suggest possible new solutions. The solutions are then evaluated as to which are most likely to address the problem. Generally, three to six possible solutions are selected for seed-funding to research and develop the concept further and to work on a prototype solution. After a few months, one or two of the projects are selected to receive further funds to develop their solution into a marketable product.

Smart Dublin, working with the four local authorities, has run several challenge workshops with city administration workers to identify issues that require redress. Based on the challenges identified, it has then successfully applied for Small Business Innovation Research (SBIR) funds from Enterprise Ireland (the state agency responsible for developing and supporting indigenous companies) to run pre-commercial procurement schemes. SBIR operates under the European Union's pre-commercial procurement rules and is a pan-government, structured process, enabling the public sector to engage with companies – especially start-ups operating in the high-tech sector. Smart Dublin is running four SBIR challenges focused on increasing the modal share of cycling, tackling illegal dumping of waste, improving flood management and providing assisted wayfinding. Several new start-up companies have been formed to participate in the challenges, while existing small and medium-sized enterprises (SMEs) have been given the opportunity to expand their operations. Pre-commercial procurement is inherently risky to both the procurer and the developer as it is possible that no solution may be achieved for a given problem. However, in Dublin's case it has been deemed a success as it has acted as an economic stimulus and enhanced Dublin's reputation as a place where smart city innovation and development occur.

Conclusion

Our aim in this chapter has been to map out the actually existing smart urbanism being enacted in Dublin and to place the city's ambition to become a smart city into a longer historical context. As with all cities, Dublin has deployed various forms of networked technologies in its governmental regime of urban management since the 1980s. Contemporaneously, Dublin started adopting the ideologies and practices of entrepreneurial urbanism, reconfiguring its governance, planning regime and urban development to prioritise market-led policies. Initially, entrepreneurial urbanism focused on creating a new fast-track, pro-economic growth planning system designed to stimulate property investment and attract service-based foreign direct investment. This enabled private companies to become more active agents in urban policy-making and urban development, and encouraged local government to become more entrepreneurial and business-friendly in their own operations, both of which are key ingredients for contemporary smart urbanism. During the 2000s, the city adopted the ideas of the creative city, taking an entrepreneurial approach to place-making and economic development that promoted the interests of the creative and service industries and sought to foster an innovation economy. This phased into the era of smart urbanism, initially through the creation of Dublinked and then by Smart Dublin, in which a tech-led form of entrepreneurial urbanism is being pursued. The entrepreneurial nature of smart urbanism is well illustrated through Smart Dublin's main programmes and initiatives – an open data platform, the creation

of a smart district testbed and new forms of pre-commercial procurement – that have a strong emphasis on supporting economic development, fostering innovation and start-ups and attracting foreign direct investment.

The emphasis on enacting a tech-led form of entrepreneurial urbanism favouring business interests and focusing mainly on realising economic development goals means that Dublin has largely ignored the views and desires of citizens, or has taken a stewardship (for citizens) and civic paternalism (deciding what is best for citizens) approach to smart city implementation (Cardullo and Kitchin 2018). The smart city challenges to date have been driven through consultation with staff from the local authorities and discussions with the tech community. Initiatives, then, are citizen-centric to the extent that they are delivered on behalf of citizens. Citizens are seldom, if ever, directly consulted on how initiatives are formulated or deployed. Indeed, in their analysis of smart citizenship in Dublin, Cardullo and Kitchin detail that across the various smart city initiatives deployed in **Table 6.1**, citizens largely play the roles of user, data-point, consumer, recipient, player and tester. More rarely are they participants or proposers, and very rarely co-creators, decision-makers or leaders.

The involvement of citizens then is to be steered, nudged and controlled: to consume, act and feed back; but not to provide ideas, vision or leadership, or create their own initiatives. Their participation is thus narrowly framed in a very instrumental way. Even events such as hackathons are owned and run by companies and local government, who frame the aims and desired outcomes (Perng *et al.* 2017). The primary aim of such events is to stimulate innovation and create viable prototypes for marketable products, and to promote the logic of smart city solutions to urban issues. Therefore, hackathons are a means to kindle and maintain business-led urban development and entrepreneurial urban governance (Perng *et al.* 2017), rather than producing citizen- or community-led smart city solutions (Cardullo and Kitchin 2018).

Adding to the neoliberal ethos of smart urbanism in Dublin is a lack of strong oversight and accountability measures to open smart city initiatives up to scrutiny and public debate. As we have argued elsewhere, the advocacy coalition promoting the idea and ideals of smart cities globally does not appreciate the need for democracy, openness and public consultation in city management and the technological solutions adopted to address urban issues (Kitchin *et al.* 2017). This is also our impression of how smart urbanism operates in Dublin. Executive decisions to create new programmes and to procure and deploy smart city technologies are made largely outside of the democratic process. City managers approve projects with little political, media or public oversight or feedback. Indeed, local politicians and the public have been ignored almost entirely in the formulation of Smart Dublin and the development and roll-out of smart city initiatives. This is largely due to the fact that there is no mayor or politician with responsibility for running the city. Instead, this is the remit of the CEOs of the four local authorities, who are career bureaucrats, and such endeavours are seen as operational matters rather than strategic ones (Kitchin *et al.* 2017). It is worth noting that part of the appeal of the smart district area is that there are very few

residents (less than 2000), many of whom are affluent and mobile, to oppose urban testbedding. For example, the redrawn SDZ boundary in 2015 excludes more well-established residential areas to reduce opposition to planning decisions. Similarly, Croke Park is a wholly private space and has no residents.

Given the pro-market orientation of the two main political parties in Ireland, and the absence of a unitary mayor or amalgamated city region authority, it seems unlikely that an alternative model of smart urbanism will emerge in Dublin in the near future. Instead, Smart Dublin is likely to pursue a strategy that prioritises economic goals of supporting local innovation and attracting foreign direct investment while justifying the approach through a framework of civic paternalism and stewardship. The logic and efficacy of this strategy is likely to be bolstered by the shift from an accidental to an articulated smart city that has seen the city become more recognised internationally as an active site for smart urbanism and innovation. This has been a process of gaining recognition for intelligent management technologies and civic participation apps that have been retrospectively branded as 'smart', thereby responding to increasing pressure from an assertive local technology community for the city to accommodate and support economic growth. At the same time, Dublin City Council, in collaboration with Smart Dublin, has moved independently to create partnerships and testbeds with little reciprocity from the other local authorities. While issues of governance will not change until there is sufficient pressure from central government, we expect that Dublin will continue to develop as a smart city in the years ahead through its maturing partnerships with the broader research and development ecosystem and its close adherence to the momentum that has driven economic policy over recent decades.

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Notes

1 See http://progcity.maynoothuniversity.ie.
2 See https://digitaldublin.wordpress.com/.
3 For example, see Breathnach (1998) and Dodge and Kitchin (2000) for details on how networked digital technologies reshaped the space economy of Dublin in the 1990s.
4 See www.dublindashboard.ie.

References

Bartley, B. (2007). Planning in Ireland. In B. Bartley and R. Kitchin (eds), *Understanding Contemporary Ireland*. London: Pluto Press, 31–43.

Bontje, M. and Lawton, P. (2013). Mobile policies and shifting contexts: city-regional competitiveness strategies in Amsterdam and Dublin. *Tijdschrift voor Economische en Sociale Geografie 104*: 397–409.

Breathnach, P. (1998). Exploring the 'Celtic Tiger' phenomenon: causes and consequences of Ireland's economic miracle. *European Urban and Regional Studies 5*: 305–316.

Cardullo, P. and Kitchin, R. (2018, online first) Being a 'citizen' in the smart city: Up and down the scaffold of smart citizen participation in Dublin, Ireland. GeoJournal doi: 10.1007/s10708-018-9845-8.

Coletta, C. and Kitchin, R. (2017). Algorhythmic governance: regulating the 'heartbeat' of a city using the Internet of Things, *Big Data and Society 4*: 1–16.

Coletta C., Heaphy, L. and Kitchin, R. (2017). From the accidental to articulated smart city: the creation and work of 'Smart Dublin'. [Online]. Available: https://osf.io/preprints/socarxiv/93ga5/download?format=pdf [Last accessed 19 June 2017].

Cugurullo, F. (2017). Exposing smart cities and eco-cities: Frankenstein urbanism and the sustainability challenges of the experimental city. *Environment and Planning A: Economy and Space 50*: 73–92.

Datta, A. (2015). New urban utopias of postcolonial India: 'entrepreneurial urbanization' in Dholera smart city, Gujarat. *Dialogues in Human Geography 5*: 3–22.

Dourish, P. (2016). The internet of urban things. In R. Kitchin and S.-Y. Perng (eds), *Code and the City*. London: Routledge, 27–46.

Dodge, M. and Kitchin, R. (2000). *Mapping Cyberspace*. London: Routledge.

DRA. (2009). *Economic Development Action Plan for the Dublin City Region*. Dublin: Dublin Regional Authority.

Florida, R. (2002). *The Rise of the Creative Class, and How It Is Transforming Work, Leisure, Community and Everyday Life*. New York: Basic Books.

Giffinger, R. and Pichler-Milanović, N. (2007). *Smart Cities: Ranking of European Medium-Sized Cities*. Vienna: Centre of Regional Science, Vienna University of Technology.

Greenfield, A. (2013). *Against the Smart City*. New York: Do Publications.

Heaphy, L. (2018). Interfaces and divisions in the Dublin Docklands 'Smart District'. Programmable City Working Paper 36. *SocArXiv*. [Online]. Available: https://osf.io/preprints/socarxiv/z2afc [Last accessed 30 May 2018].

Kitchin, R. (2014). The real-time city? Big data and smart urbanism. *GeoJournal 79*: 1–14.

Kitchin, R. (2015). Making sense of smart cities: addressing present shortcomings. *Cambridge Journal of Regions, Economy and Society 8*: 131–136.

Kitchin, R. and Bartley, B. (2007). Ireland in the twenty first century. In B. Bartley and R. Kitchin (eds), *Understanding Contemporary Ireland*. London: Pluto Press, 1–26.

Kitchin, R., O'Callaghan, C., Boyle, M., Gleeson J. and Keaveney, K. (2012). Placing neoliberalism: the rise and fall of Ireland's Celtic Tiger. *Environment and Planning A: Economy and Space 44*: 1302–1326.

Kitchin, R., Maalsen, S. and McArdle, G. (2016). The praxis and politics of building urban dashboards. *Geoforum 77*: 93–101.

Kitchin, R., Coletta, C., Evans, L., Heaphy, L. and Mac Donncha, D. (2017). Smart cities, urban technocrats, epistemic communities, advocacy coalitions and the 'last mile' problem. *it – Information Technology 59(6):* 275-284.

MacLaren, A. and Kelly, S. (eds). (2014). *Neoliberal Urban Policy and the Transformation of the City: Reshaping Dublin*. Basingstoke: Palgrave Macmillan.

McNeill, D. (2015). Global firms and smart technologies: IBM and the reduction of cities. *Transactions of the Institute of British Geographers 40*: 562–574.

Perng, S-Y., Kitchin, R. and MacDonncha, D. (2017). Hackathons, entrepreneurship and the passionate making of smart cities. Programmable City Working Paper 28. [Online]. Available: https://osf.io/nu3ec/ [Last accessed 19 June 2017].

7

SMART CITIES AS STRATEGIC ACTORS

Insights from EU Lighthouse projects in Stavanger, Stockholm and Nottingham

Håvard Haarstad and Marikken W. Wathne

Introduction

In this chapter, we take issue with the idea that smart city development is driven primarily through universalist and techno-optimistic ideas and policies. Instead, we conceptualise cities as strategic actors that utilise the resources from smart city discourses to mobilise initiatives, projects and networks to benefit their own priorities and interests – including sustainability ambitions. As we show through our discussion of European Union (EU) Lighthouse projects in three cities – Stavanger (Norway), Nottingham (United Kingdom) and Stockholm (Sweden) – local politicians and planners are enrolling and reframing pre-existing initiatives into the smart agenda, creatively using it to further their own goals.

The critical issue of current smart city development is not so much that cities are overrun by a universalist smart city agenda, but rather which actors define the smart agenda locally and what the ensuing outcomes are for sustainable urban development. This is not to deny that there is a hegemonic policy discourse that presents blueprint technological solutions as the way forward for cities across the world, and that this has resonance with many local decision-makers. With the growing challenges tied to urban areas, 'smart city' solutions are commonly presented as the antidote. By adding new technologies to old urban systems, and thus increasing urban efficiency, the smart city approach to urban planning is seen as both increasing economic competitiveness and reducing the stress cities put on the environment. Becoming 'smart' is trending among city administrators and the concept has become a fundamental approach to urban development (Thorne and Griffiths 2014).

Correspondingly, social scientists have critiqued the smart city discourse as overly focused on the technological aspects, driven by a techno-optimistic approach to urbanism, and failing to recognise local needs and contexts

(Townsend 2013, Luque-Ayala *et al.* 2014, Luque-Ayala and Marvin 2015, March and Ribera-Fumaz 2016). It is also argued that smart city strategies placate corporate marketing campaigns (Hollands 2008; Söderström *et al.* 2014, Viitanen and Kingston 2014). However, there is a danger that academic analyses downplay or disregard the way urban actors and city officials – many of whom are conscious about, and critical of, universalistic and techno-driven urban development – use these discourses as windows of opportunity to pursue their own agendas.

In line with the overall objective of this book, we argue that such local contexts have a substantially more important role in shaping local smart city strategies than what is often assumed, vis-à-vis supranational discourses and agendas. By examining the smart city projects in three of the EU's 'Lighthouse cities', we argue that even if driven by international funding and ideas, smart city strategies tend to facilitate the continuance and further development of pre-planned projects when integrated into pre-existing cityscapes. In turn, we need to understand 'actually existing' smart cities (Shelton *et al.* 2015) as *negotiated* in their processes and *hybrid* in their outcomes.

The chapter is based on empirical data from in-depth interviews, site visits and participation in smart city events. Interviewees included 19 project managers as well as company representatives and other stakeholders in the three cities. In addition, we participated at three Nordic Edge Expo conferences in Stavanger (2015–2017), the EV charging point infrastructure conference in Nottingham (2017) and a demonstration of one of the implementation sites in Stockholm (2017).

Smart cities as strategic actors

Recent urban theory seems to lend support to this chapter's perspective on smart cities as proactive and strategic actors. Certainly, there are a multitude of ways to look at the city and its particularities. Yet the relational view – which understands cities as created through their connections and relationships with other places, cities and scales (eg. Massey 2010) – has become foundational for much of the literature. As Robinson (2016) argues, urban studies is searching for a more global approach to understanding cities. While the contemporary urban world has long been associated with globalised 'flows' (i.e. Castells 1996), urban scholars in geography and beyond are now grappling with ways of connecting these flows with the contexts and materialities through which they are produced and contested (McFarlane 2011, McCann and Ward 2012, Healey 2013). In turn, cities are seen less as the surfaces at which globalisation processes play out, and more as arenas for proactive and selective engagement (Robinson 2013).

Bringing these ideas to our understanding of the making of smart cities means that we need to reframe the way the latter tend to be conceptualised. We argue that social scientists too often have analysed the smart city agenda as a profusion of a universalised agenda driven by ubiquitous powerful actors. For example, Söderström and colleagues (2014) analyse the smart city agenda as corporate

storytelling, emphasising how smart urbanism is an ideological construct given content by the likes of IBM. Viitanen and Kingston (2014) argue that the underlying principle of smart city strategies has been to expand the market for new technology products and services. Similarly, others have portrayed the prevailing smart city agenda as a new type of urban entrepreneurialism where technological optimism and business interests are key frames of reference (Hollands 2008, Greenfield 2013).

There is clearly something to this, but we would contend that this narrative is only part of the picture. And since many of the analyses seem to stop short of engaging with what Shelton and colleagues (2015) call the 'actually existing smart city', the narrative tends to downplay how urban decision-makers and planners engage with the smart city agenda in active and strategic ways, as seen in Burton and colleagues' analysis of Bristol and Manchester in this volume. Urban actors cannot be assumed to be dupes in the empire-building aspirations of the tech industry. As Kitchin (2015: 132) suggests in his review of the smart city literature, there is 'an absence of in-depth empirical case studies of specific smart city initiatives and comparative research that contrasts smart city developments in different locales', and 'weak collaborative engagement with various stakeholders'. Our work can serve to remedy this.

To understand the role of cities in relation to the smart city agenda, we argue that we need a vocabulary that can analyse them as active and strategic, rather than passive 'receivers' of smart city projects. Central to the process of making cities smart is a negotiation in which urban actors draw on resources available to them, and *assemble* these into projects that cohere with their interests and strategic priorities. This does not mean that smart city projects can become anything local actors want them to be – they must manoeuvre in relation to a limited and constrained set of resources and capacities. Yet emphasising the strategic element here means that we foreground the act of mobilising these resources and capacities around specific projects in concrete urban sites.

We find the vocabulary of assemblage thinking useful to open this conceptual space, not because we adopt the framework wholesale but because it provides some inroads to new ways of thinking about change and emergence (DeLanda 2006). It disrupts established ways of placing people and things in social science analyses, and can therefore enable us to identify new patterns and relationships (Haarstad and Wanvik 2017). The basic proposition is that a *unit* in society around us is not a stable thing, but rather composed and held together by a series of more or less temporary relationships. This may sound like philosophical nitpicking, but it may actually help us understand smart cities, and in particular to conceptualise them in more active and strategic ways. It provides an understanding of cities as continuously created through the fluctuating relations in which they take part. This has several consequences for how we understand smart cities.

First, 'actually existing' smart city projects are negotiated (assembled) using resources and materials that already exist locally. The smart city agenda is not simply imposed from above, but makes use of pre-existing relationships,

institutions, infrastructures, agendas and so on. Even if 'smart city' is a powerful and ubiquitous discourse, it is only by making use of these materials that it can gain any sort of concrete existence in a city. The endurance and tenacity of these materials shapes or determines what the smart city can become. Below, we will see this in the case of Stavanger, where the dominant presence of the oil industry is influencing the trajectory of the smart city agenda.

Second, the activity of organising a particular smart city project is to a large extent done by and through negotiations between local actors. While the 'smart city' discourse may seem powerful, there are many other discourses and pressures that shape current policy in cities. A smart city project of any significance needs to connect divergent actors and interests under a common framing and construct some sense of common purpose. A smart city is not an end-state; it is a frame under which a whole range of interests, agendas and projects are continuously negotiated. So, while an actor like IBM may enter a city with a powerful discourse and enticing technological solutions, the company is dependent on aligning with certain actors and interests. We should expect these processes to be messy, the alliances created to be temporary and the overall purpose to be imprecise.

Third, within these messy and temporary processes and alliances, smart city projects may serve as catalysts for broader change by uniting stakeholders around a relatively coherent agenda – reassembling the urban in new ways (Haarstad and Wanvik 2017). A smart city project, such as those funded through the EU's Horizon 2020 programme, may trigger emergent capacities and disrupt the existing alliances within a city. It may create a new arena for cooperation, new incentives to work together, new goals that unite divergent actors (in addition to creating new battlegrounds and potential conflicts, of course). In this sense, our primary question is not what a smart city project *is*, because it does not have an existence separate from the city. Rather, the question is what the smart city project *does* to the existing landscape of interests and alliances in a city. In understanding smart cities, then, we should look for catalysts, or assemblage converters, that are able to forge smart city projects out of temporary alliances and divergent interests.

The EU's Horizon 2020 programme for smart cities

The smart city agenda in Europe is composed of a complex set of policies, ideas, technologies and projects promoted by a diverse range of actors and networks. Major technology providers such as IBM, Siemens and Microsoft are important players, but many other actors (both public and private) are also driving this agenda. The EU is one of these key actors, and it uses a combination of 'hard' and 'soft' mechanisms to achieve its aims. Through the Horizon 2020 programme, the EU's European Innovation Partnership (EIP) seeks to improve quality of life as well as the economic performance and competitive position of cities.

One way the EU is doing this is through the Smart Cities and Communities (SCC) programme. The SCC programme seeks to demonstrate 'sustainable,

cost-effective and replicable district-scale solutions at the intersection of energy and transport enabled by ICT' (EC 2016: 17).[1] Funding from the programme is awarded to cities that cross institutional borders and devise innovative solutions to large societal challenges, which, according to the Horizon 2020 work programme, should integrate 'smart homes and buildings, energy efficiency measures, very high shares of renewables, smart energy grids, energy storage, electric vehicles and smart charging infrastructures' (EC 2016: 105). Even though sustainability is often put forward as a chief priority, as we have argued earlier, the main objectives of the SCC programme are largely focused on economic innovation and competitiveness (Haarstad 2016).

In the SCC programme, the cities where smart city projects are funded are labelled 'Lighthouse' cities – where solutions are developed, tested and implemented. The explicit goal is to develop many Lighthouse cities across Europe by 2020, varying in size, climate and economic system (EC 2016). Relevant solutions address energy, mobility, and information and communication technologies (ICT); and common initiatives involve the retrofitting of old buildings, developing shared big data platforms and electrifying vehicle fleets. Lighthouse cities are provided with funding to develop for three years, and are then required to assist 'Follower' cities through up-scaling and replicating smart initiatives.

As of October 2017, 12 Smart Cities and Communities projects were in operation. The first-generation projects – REMOURBAN, Triangulum and Grow Smarter – have been running since 2014; and the newest additions to the project family – IRIS, Match-up and Stardust – were recently announced. Thus, there are a total of 36 Lighthouse cities and 42 Follower cities. The first-generation Lighthouse cities have implemented their smart interventions and are starting to measure the effects of these implementations while assisting in up-scaling and replicating them in the Follower cities (EC 2016). This chapter focuses on experiences in the first-generation Lighthouse cities of Stavanger, Stockholm and Nottingham. Here, we take a comparative perspective on smart implementations in these three cities to explore how 'becoming smart' is negotiated, organised and catalysed in different contexts.

Stavanger is a Lighthouse city under the Triangulum project, together with Eindhoven (Netherlands) and Manchester (UK). The Stavanger region has a long history with petroleum-related industrial activity, and today there is a strategy to build an identity decoupled from, and beyond, the age of petroleum (Stavanger Municipality 2017). As we shall see, smart city strategies play an important role here. The Stavanger consortium consists of five partners: the Stavanger municipality; the electricity company Lyse; Rogaland Regional Authority; the University of Stavanger; and Greater Stavanger (a partnership of 16 Norwegian municipalities and Rogaland County Council working to promote business in the region). The smart interventions in Stavanger are situated in two demonstration areas: Hillevåg/Paradis, and Stavanger city centre. Triangulum has sparked the large-scale conference initiative Nordic Edge Expo, and Stavanger municipality has

also framed key parts of its governance agenda around smartness by establishing a smart city office and developing a smart city road map, among other things.

Nottingham is a Lighthouse city in the REMOURBAN project, alongside Valladolid (Spain) and Tepebaşı (Turkey). Nottingham has great pride in its award-winning transportation systems as well as in hosting the oldest district heating network in the UK, and is renowned for progressive energy solutions. These focus areas are enhanced through REMOURBAN with smart mobility and smart energy as key focus areas for the city (REMOURBAN n.d.). In Nottingham, the smart solution demonstration area is the Sneinton district, which is located in the central city and characterised by high energy poverty. The district is also the location of several Nottingham City Council housing estates that are poorly constructed and have deficient energy performance (REMOURBAN n.d.). An important part of smart city activities in Nottingham is to renovate these houses and address environmental and social issues simultaneously.

Stockholm is one of the three Lighthouse cities in the GrowSmarter project, alongside Barcelona (Spain) and Cologne (Germany). Sweden's capital city is aspiring to be an environmentally friendly city as well as a good city for living and working. These aspirations have informed its smart city activities. The two Stockholm demonstration areas are located in the old industrial Slakthus area, as well as Årsta, a rapidly growing district in the southern area of the capital (GrowSmarter n.d.).

A striking commonality of these smart city projects is that what is actually being done to make the cities 'smarter' is quite similar. In fact, all the Lighthouse projects seem relatively alike. Stavanger, Stockholm and Nottingham are all focused on improving energy efficiency of their housing stocks, especially in those older houses where energy losses are high. Secondly, all three cities focus on developing smart mobility solutions, where the key aim is to introduce both private and public electric transportation. Thirdly, all cities are developing big data platforms to create databases of large-scale, real-time data that will be accessible to the public. Such platforms are intended to spur innovation by making data accessible to developers (preferably local ones). However, while the projects are relatively similar in their framing and types of interventions, there are clear differences in how the interventions are negotiated, organised and catalysed in their specific urban contexts.

Negotiating, organising and catalysing smartness in Stavanger, Nottingham and Stockholm

In what follows, we reflect on the experiences in Stavanger, Nottingham and Stockholm in assembling their respective Lighthouse city activities. We specifically examine: (1) how the smart city projects are negotiated using existing local resources and elements; (2) how local actors organise smart city projects around

their existing interests; and (3) the extent to which the smart city activities and actors catalyse broader change in their respective cities, with a particular emphasis on sustainable urban transitions.

Negotiating the smart Lighthouse city

Looking across the three Lighthouse cities, it is clear that their character is to a significant extent mediated through a myriad of overlapping projects, interests, beliefs and actors in the context where they 'arrive'. In all three cases, the smart city interventions were, to a significant extent, already planned prior to being awarded EU funding. A key task for the responsible actors was to negotiate the Horizon 2020 funding requirements to align with the existing local goals and projects. This was achieved in a variety of ways depending on the specific contextual conditions.

Having existed as the epicentre of the Norwegian oil and gas sector, Stavanger is highly influenced by its industrial past. Several large oil companies and supply companies are located in the region, and a large percentage of the region's population is employed in services directly or indirectly supported by the petroleum industry. However, given the shifting global oil market, Stavanger has been looking for 'more legs to stand on' (interview, Triangulum project representative). The smart city approach to urban and regional development creates opportunities to broaden the market for local technology industries while rebranding the city in a more future-oriented direction. The smart city approach 'is especially valid in a situation where the municipality is facing challenges for which there are no standard solutions' (Stavanger Municipality 2016: 3). The smart city strategy provides an opportunity for the business and knowledge sectors to collaborate on new solutions that open up new markets and lay the foundation for post-petroleum industrial growth. Here, the petroleum industries that played a highly influential role in Stavanger's historic development continue to play a large role. 'The region houses a number of companies with high technology expertise, which are developing smart city technology or which have the potential to transfer methods and solutions from the oil and gas industry to new fields' (Stavanger Municipality 2016: 4). Thus, in Stavanger, the smart city strategy is intended to fill the gap left by the decline of the oil and gas sector.

In turn, the Triangulum initiatives in Stavanger have been dwarfed in size by a conference that grew out of it, the Nordic Edge Expo. In this expo, the city is using its 'smart' status to rebrand itself as the Nordic capital of technology and innovation. Here, in negotiating the Triangulum project in Stavanger, resources previously used in the oil and gas sector are repurposed and reused. Thus, the smart city framework facilitates Stavanger's continuous attachment to several elements from the oil and gas age: cutting-edge technology, skills, knowledge and its status as an internationally oriented city. In other words, the smart city project is *put to work* to serve the city's larger strategic interests.

As the above example shows, history and identity play an important part when smart city projects are negotiated locally. This can also be seen in Nottingham. Nottingham takes pride in being at the forefront of transportation system innovation in the UK, but it simultaneously struggles with issues of air pollution. Thus, the electrification of Nottingham's private and public transportation fleet is an important objective for which the smart city discourse is actively negotiated. Smart city funds were partly used to strengthen the electric bus service and to electrify one of 13 vehicles in a local-owned car club. Likewise, the energy strand of REMOURBAN is highlighted as perhaps its most important element – which can be seen as a continuation of Nottingham's strong reputation as a city being progressive in its approaches to energy solutions.

However, just as existing elements in the city can be negotiated to spur smart city development, smart city projects and resources can in turn be negotiated to spur the desired urban development. In Nottingham, REMOURBAN funds were applied in various projects, but they were commonly coupled with funding from other sources. For example, investment in transportation was funded partly through REMOURBAN funds and partly from other sources, such as Go Ultra Low. Here, the Transportation Department of Nottingham City Council had been granted £14 million to improve transport solutions in the city. This facilitated the expansion of the electric vehicle (EV) bus fleet, as well as the construction of a much larger EV charging point infrastructure than would have been possible had the City Council only had REMOURBAN funds available. It also provided opportunities for Nottingham to develop a citizen engagement programme around EVs. REMOURBAN funds could thus be seen as constituting one of the pieces comprising the Nottingham sustainable mobility puzzle. The City Council had the overall responsibility of ensuring that the image created by the various pieces was aligned with the desired smart city strategy.

This was somewhat confusing when examining the interventions on the ground, as one informant admitted. While hosting a tour of Nottingham's new electrified buses, charging stations and water-absorbent concrete, the City Council representative pointed to a fenced area with other electric buses, and ironically stated: 'The REMOURBAN funds have paid for that parking area.' Thus, the impact of the Horizon 2020 funds was not easily distinguishable from other funds supporting 'smart' initiatives. However, the combining of funding radically improved overall service. This was perhaps most visible in the electrification of one of the car club vehicles. With REMOURBAN funds alone, the electric vehicle in the car club would run solo: there was no further infrastructure planned for charging EVs in the city, and thus, as a City Council representative argued: 'this would be a single facility in a city that had very little on the EV front'. With the additional funding, an extensive network of EV charging points could be set up throughout the city, which made the infrastructure more comprehensive. At the same time, the piecing together of various funding sources made planning and reporting requirements more complicated.

The coupled funding for smart projects in Nottingham can arguably be seen as shaping how the projects were communicated. While in Stavanger, smart city projects were largely framed and communicated under the Triangulum brand, Nottingham largely communicated its smart initiatives as discrete interventions, without linking them to the wider smart city commitment. Thus, rather than communicating REMOURBAN as one project, the City Council preferred to communicate interventions such as the improved bus fleet and the car club EV with improved charging infrastructure as separate initiatives. This reveals how the smart city funds were negotiated to support the existing smart urban development strategy.

Similarly, the GrowSmarter project in Stockholm is a collection of pre-existing initiatives brought together in a common framework. At the Valla Torg demonstration site, four older buildings were retrofitted with more energy efficient appliances and smart technologies. The site served as an arena for suppliers and subcontractors to test new solutions and to install their products in a new setting. The project coordinator noted that work on the project has, to a large extent, involved negotiations within the municipality of Stockholm for the proper permits and regulatory changes, and with EU project officers, residents and sub-contractors to achieve the GrowSmarter goals.

Organising the smart city

When studying the local negotiations within smart cities, it is also important to examine which actors are involved, who shaped the projects and how this defines the content of the projects. These networks are largely coherent and tactical, to varying degrees. In Nottingham, the smart city strategy was initiated by actors at Nottingham Trent University, who contacted the City Council and other local partners to secure a local consortium. The City Council, describing itself as open to new initiatives such as REMOURBAN, was receptive to participation, but the initiative stemming from outside the City Council might have impacted the project strategy as such. Where in Stavanger and Stockholm the project was initiated by actors working within the local authorities, the project seemed to have a more coherent expression throughout its implementation. In Nottingham, responsibility for various strands of the project was continuously shifting. For example, with the EV enrolment, a significant amount of planning was devoted to simply siting the charging point.

During the process, many of those in charge of the project left for employment elsewhere or to work in other Nottingham City Council departments, resulting in repeated assessments and an incoherent planning process. As a City Council representative stated, 'you have got a bit of fracturing of the development of the project'. Due to the frequent shifting of lead actors, several key processes of the project were duplicated. As a consequence, the interventions lacked a clear and coherent direction during their planning and implementation phases. The transfer of responsibility from one person to another influenced the smart city strategy in Nottingham more broadly. When asked about the reasons

for choosing a particular intervention, a City Council representative struggled to identify the relevant contact person because individuals had been relocated to other jobs or departments. 'To be perfectly honest, we might never find the answer to that question,' he said. This points to the importance of having individual ownership and responsibility to ensure that specific interventions succeed. Local administrators feeling a sense of responsibility for the project might create a perception of coherency.

In contrast to Nottingham, Stockholm's network of project actors was more coherent and strategic from the start. One project coordinator championed the project from the beginning and ensured that the stated objectives in the GrowSmarter application were implemented on the ground. Using his background in environmental protection, this key actor had a significant influence on the project objectives, and was able to enrol others successfully. Yet he also relied on key individuals in other parts of the municipality to act strategically and align the city's interests with the smart city agenda. For example, the hiring of the new Director of ICT signalled a shift in how the municipality facilitated cross-sectoral cooperation. As the smart city project coordinator said:

> It used to be called the IT department … they only worked on internal network systems for municipal employees, and were not interested in broader connectivity at all. Then they got a new department head, who changed the name of the department to Digital Development, and started thinking completely differently.

In his words, the department started thinking of Stockholm 'not just as a municipality' but 'more as a place', which led to the contributions of many other actors to the city's digital development.

Similar to Stockholm, the process of becoming a smart city under Horizon 2020 has a coherent and well-planned appearance in Stavanger. Prior to the call, Stavanger municipality was involved in similar projects. Triangulum was perceived as a natural continuation of such engagements. The rationale for Triangulum was tightly connected to the decline of the oil industry as well as the perceived solution to lead Stavanger out of the crisis. As a Triangulum representative argued, the decline of the oil price led the industry in Stavanger to reconsider its strategies: 'Many people started to consider new options that previously hadn't been considered due to our deep engagement with the oil industry. Now, people saw that they needed to think differently.' The smart city framing, and the new business opportunities it promised, clearly resonated with this new reality.

Catalysing smart cities

Finally, a key question is how smart city projects and interventions may serve as catalysts to affect broader change. It is important to note that the smart city

planning objectives in Stavanger, Nottingham and Stockholm did not change radically when they were designated as Lighthouse cities. Instead, the Horizon 2020 funds were used to enhance existing plans. At the same time, the smart city discourse and Horizon 2020 funding had a significant impact on the specific interventions in each city. First of all, the funding facilitated deeper collaboration across sectors. The three Lighthouse cities include partners from the private, public and higher education sectors, and this resulted in the creation of new links between these partners. For example, the Nottingham Energy Partnership (NEP) explained that, as a direct consequence of REMOURBAN, they could work more closely with Nottingham Trent University. 'The project is giving us tasks to do together,' an NEP representative explained, adding that this led to additional collaboration with the university beyond the REMOURBAN activities.

The creation of cross-silo collaboration and new network connections is a relatively well-known aspect of smart city initiatives. However, another key influence of the Horizon 2020 projects in Stavanger, Nottingham and Stockholm was how it boosted the ambitions of pre-existing plans. When asked whether the smart city initiatives would have been implemented regardless of the Horizon 2020 funding, most respondents answered that they would, but perhaps not to the same extent. This was seen in all three Lighthouse cities. In Nottingham, the retrofitting of houses was upgraded to a higher energy efficiency standard as a result of the REMOURBAN project (**Figure 7.1**). Similarly, in Stockholm, energy reduction targets for housing in Valla Torg were increased from 50 per cent to 70 per cent as a result of the GrowSmarter commitments. A municipal representative explained that the increased energy efficiency targets were not cost efficient; but because these targets were

FIGURE 7.1 The '2050 homes' in Sneinton, Nottingham, before (left) and after (right) retrofitting. The houses were renovated to reduce energy loss. REMOURBAN funding allowed Nottingham City Council to secure a higher energy efficiency standard than originally planned.

Source: REMOURBAN.

required by the Horizon 2020 funding, it made the intervention more ambitious. A representative for the Stavanger-based energy company Lyse AS also explained how a project to deliver health information through televisions in the homes of elderly residents was expanded because of the Triangulum funding. In addition, the intervention was expanded to include direct communication with health service professionals. The Lyse representative added that being a Lighthouse city reduced risks for the companies that are developing smart solutions, and this encouraged investment in new technologies. 'Smart city projects under Triangulum are refunded 70 per cent of their expenses. That makes it possible to take risks,' he argued.

In sum, the findings suggest that Lighthouse projects *by themselves* do not result in significant change or transformation. Instead, the Horizon 2020 funding enhances existing initiatives and plans to mobilise higher levels of ambition. The support from the EU is also a trigger to push initiatives through, and to achieve the agreed timeframes. It facilitates new forms of connections and collaborations, and has the potential to generate ripple effects across the pre-existing landscape of interests and alliances in the Lighthouse cities.

Conclusions: assembling the smart city

'Actually existing' smart city projects do not resemble the tech-driven, entrepreneurial ventures as often portrayed in the literature. Instead, we see pragmatic and strategic manoeuvring within the relatively wide opportunity space that the 'smart city' label affords. The actors involved utilise resources from Horizon 2020 Smart Cities and Communities projects, and networks attached to them, as well as resources in related projects and initiatives in their cities. They do so in strategic ways, even though there are of course elements of coincidence and messiness involved. This suggests that smart city projects need to be theorised as assemblages of local and trans-local resources, rather than simply being imposed 'from above'. This means that, even though there are powerful trans-urban discourses surrounding the smart city agenda, concrete interventions are mobilised by situated actors. This mobilisation and strategic application of resources and capacities may trigger wider change across the urban landscape through which smart city strategies may have a wider set of intended or unintended effects.

Across our three cases, we see a significant contrast in how the Lighthouse projects are mobilised and put to work. In Stavanger, the Lighthouse funding sparked a significant rebranding of the city as a whole, and it now strives to be the leading smart city in the Nordic countries. The city has strategically reconfigured a range of its governance tasks under the 'smart' framing. In Nottingham, the Lighthouse city status was treated more casually, as it was incorporated into a range of interrelated activities and initiatives. In Stockholm,

the Lighthouse project has been used to leverage more ambition in existing interventions.

What is common in the cases, however, is that the concrete initiatives that comprised the Lighthouse project were based on pre-existing or already planned projects that were subsequently rebranded and made more ambitious. These initiatives are relatively modest in terms of technological innovation – at least in comparison to what is often advertised in the hype surrounding smart cities. However, they have provided city planners and other urban actors with a powerful framing to tie together ongoing activities, to connect actors and to push initiatives through (in addition to providing funding, of course). Urban actors are not seduced by the universalist, tech-oriented discourse; in fact, a mantra at many smart city events calls for smart city strategies and interventions to be centred on humans rather than technology. This is probably in part rhetorical; but it is also a reflection of how local actors themselves are critical towards the tech-oriented smart city discourse.

Of course, the seductive qualities of technological visions shape smart city projects on many different levels. We do not deny that tech giants play a significant role in shaping the hegemonic imaginaries of urban futures, as many social scientists suggest. Nevertheless, this should not lead us to disregard how specific urban strategies around smartness are created and put in motion by strategic and pragmatic planners and other urban actors that use smart city framings to serve their own agendas and purposes. This can be quite positive in many respects. The smart city agenda can be a powerful tool for ambitious local actors concerned with sustainability.

This re-conceptualisation of cities – from passive receivers of smart strategies and projects to active agents assembling smartness – opens up many new challenges and concerns. Many of these pose novel normative and practical questions for smart city development and the research on this form of urban development. How can practitioners take advantage of the resources and possibilities the smart city discourse affords? And, as the local scale becomes more influential than previously recognised, how do we ensure that local smart agendas actually drive cities to become more sustainable? If local politics, with its strong and weak actors, networks and vested interests, is decisive on the translation processes, how can it ensure that the progressive potential is not subsumed by entrenched and regressive local interests? The critical approach to smartness is not only one of examining the smart city as a discourse, but also one of examining the processes through which cities are enacting and rolling out their smart city agendas.

Note

1 The European Commission (EC) is the executive arm of the European Union. See Organisational structure. [Online]. Available: https://ec.europa.eu/info/about-european-commission/organisational-structure_en [Last accessed 15 January 2018].

References

Castells, M. (1996). *The Rise of the Network Society: The Information Age – Economy, Society and Culture*. Hoboken, NJ: Wiley.

DeLanda, M. (2006). *A New Philosophy of Society: Assemblage Theory and Social Complexity*, London: Continuum.

EC (European Commission). (2016). Horizon 2020: Work Programme 2016–2017. [Online]. Available: http://ec.europa.eu/research/participants/data/ref/h2020/wp/2016_2017/main/h2020-wp1617-focus_en.pdf [Last accessed 8 September 2017].

Greenfield, A. (2013). *Against the Smart City*. New York: Do Projects.

GrowSmarter. (n.d.). Lighthouse city: Stockholm. [Online]. Available: www.grow-smarter.eu/lighthouse-cities/stockholm/ [Last accessed 12 March 2018].

Haarstad, H. (2016). Who is driving the 'smart city' agenda? Assessing smartness as a governance strategy for cities in Europe. In A. Jones, P. Ström, B. Hermelin and G. Rusten (eds), *Services and the Green Economy*. London: Palgrave Macmillan, 199–218.

Haarstad, H. and Wanvik, T. (2017). Carbonscapes and beyond: conceptualizing the instabilities of oil landscapes. *Progress in Human Geography 41*: 432–450.

Healey, P. (2013). Circuits of knowledge and techniques: the transnational flow of planning ideas and practices. *International Journal of Urban and Regional Research* 37: 1510–1526.

Hollands, R.G. (2008). Will the real smart city please stand up? Intelligent, progressive or entrepreneurial? *City 12*: 303–320.

Kitchin R. (2015). Making sense of smart cities: addressing present shortcomings. *Cambridge Journal of Regions, Economy and Society 8*: 131–136.

Luque-Ayala, A. and Marvin, S. (2015). Developing a critical understanding of smart urbanism? *Urban Studies 52*: 2105–2116.

Luque-Ayala, A, McFarlane, C. and Marvin, S. (2014). Smart urbanism: cities, grids and alternatives? In M. Hodson and S. Marvin (eds), *After Sustainable Cities?* London: Routledge, 74–89.

McCann, E. and Ward, K. (2012). Assembling urbanisms: following policies and 'studying through' the sites and situation of policy making. *Environment and Planning A: Economy and Space 44*: 42–51.

McFarlane, C. (2011). The city as assemblage: dwelling and urban space. *Environment and Planning D: Society and Space 29*: 649–671.

March, H. and Ribera-Fumaz, R. (2016). Smart contradictions: the politics of making Barcelona a self-sufficient city. *European Urban and Regional Studies 23*: 816–830.

Massey, D. (2010) *A Global Sense of Place*. N.p.: Aughty.org.

REMOURBAN. (n.d.). Demo: Sneinton District. [Online]. Available: www.remourban.eu/cities/lighthouse-cities/nottingham/nottingham---sneinton-district.kl/ [Last accessed 12 March 2018].

Robinson, J. (2013). 'Arriving at' urban policies/the urban: traces of elsewhere in making city futures. In O. Söderström, G. D'Amato and F. Panese (eds), *Critical Mobilities*. Lausanne: EPFL, 1–28.

Robinson, J. (2016). Thinking cities through elsewhere: comparative tactics for a more global urban studies. *Progress in Human Geography 40*: 3–29.

Shelton, T., Zook, M. and Wiig, A. (2015). The 'actually existing smart city'. *Cambridge Journal of Regions, Economy and Society 8*: 13–25.

Söderström, O., Paasche, T. and Klauser, F. (2014). Smart cities as corporate storytelling. *City 18*: 307–320.

8

SMART GOES GREEN

Digitalising environmental agendas in Bristol and Manchester

Kerry Burton, Andrew Karvonen and Federico Caprotti

Green goes smart

The smart city is increasingly described as an emergent and soon to be dominant urban development paradigm. Premised on notions of increased efficiency through digitalisation and on visions of transitions towards more high-tech, added value economic futures, smart urban visions have become attractive to urban stakeholders in a wide range of geographical contexts. From New York City to Shanghai and from Adelaide to Santiago, smart urban futures are presented as utopian urban prospects for the near future, frictionless and technology-enabled urban environments that are supposedly just around the corner. The urban imaginations associated with smart urbanism are often clear, if superficial. They exist in consultants' presentations, glossy reports, websites, and policy and corporate documents and brochures (Söderström *et al.* 2014). Indeed, there exists a global, or at least international, set of discourses on the smart city, and the actors involved in producing, discussing and shaping these discourses are familiar, from technology corporations to high-flying governments to multinational consultancies and place branding executives (McNeill 2017).

At the same time, smart urbanism is often described as the next step in the evolution of sustainable urbanism (de Jong *et al.* 2015, Haarstad 2017, Martin *et al.* 2018). Flagship developments such as Masdar City in the United Arab Emirates (Cugurullo 2016) and Songdo in South Korea (Shwayri 2013, Yigitcanlar and Lee 2014) have inspired a multitude of less prominent projects around the world that use technological innovation to realise more sustainable urban futures. And smart technologies feed into sustainable urban development in multiple ways: by making cities more efficient to operate; by identifying and reducing environmental pollution; and by making them more democratic and equitable. The environmental agenda of sustainable urban development is particularly attractive to

smart city promoters because environmental performance can be readily measured and assessed using sensors. Moreover, environmental protection provides a purpose for smart technologies beyond economic development. Smart-green can be understood as the latest incarnation of ecological modernisation, with technology being used to simultaneously boost economic performance while protecting the environment.

In this chapter, we examine the translation of smart urban development to two British cities with noted environmental agendas: Bristol and Manchester. Both cities exemplify the 'actually existing smart city' (Shelton *et al.* 2015), with a particular emphasis on the green or environmental aspects of smart technologies. This provides a more nuanced and particular understanding of how digitalisation agendas are changing the development patterns of cities in the twenty-first century. The findings reveal how the respective smart city strategies evolved from (but are not necessarily wholly coherent with) previous green development priorities and strategies. We also focus on the different urban landscapes produced as a result of these varying strategies. Our key interest in this chapter, then, is the production of a complex, place- and path-dependent urban geography of smart urbanism in two cities that have heavily invested in 'smart' both as a brand and as a guiding concept to catalyse green urban development.

The chapter begins with a comparative perspective highlighting the emergence of smart city strategies in both cities, focusing on the link between smart urbanism and previous green urban agendas in Bristol and Manchester. The narratives of both cities aim to highlight how smart urban agendas developed in ways that were closely intertwined with local geographies. Moreover, this shows how a focus on information and communication technology (ICT) innovation provides these cities with the next step in their pursuit of international recognition by positioning their local governments as visionary and proactive in shaping their respective urban futures. As such, smart urbanisation extends the existing green narratives in Bristol and Manchester while strengthening the ties to other cities around the world.

Bristol: digitalising the inclusive green narrative

With a population of just over 460,000, Bristol is relatively small in comparison to many other UK cities adopting smart city programmes. However, the city has gained a reputation as one of the United Kingdom's leading smart cities, building upon a recent history as a city committed to green ideals (Caprotti *et al.* 2016). In 2015, Bristol became the first British city to hold the title of European Green Capital, and has explicit ambitions to become a leading European city by 2020. In accepting the award of European Green Capital, George Ferguson, then the city's mayor, described the city's 'vision to justify our position as the UK's greenest, most innovative and most vibrant city' (cited in Bristol 2015). However, Bristol's political geography presents barriers to its city-scale ambitions. Key areas of the city are located within the administrative boundaries of

several counties, including South Gloucestershire and North Somerset. Thus, Bristol must align its green agenda with the visions of its neighbours. Conversely, this geography benefits many of the city's green narratives, as many of its carbon-intensive industries, such as the Avonmouth Docks, remain hidden from view. This enables the promotion of an iconic city imaginary of colourful houses and waterside living.

In 2012 the city elected its first mayor, and from May 2017 this position was redefined as a regional metro mayor to represent the new city-region of West of England (an area that includes parts of South Gloucestershire, Bath and North Somerset). The new city-region has a budget and responsibility for key infrastructure and transport development. More importantly, this new administrative geography benefits the comprehensive visions of smart-green while also raising potential challenges as additional stakeholders are involved in the collective city-region agenda.

Green identities and pathways

Bristol's ambition to transition to a low-carbon, smart-green city is underpinned by the city's governance structures, an existing digital infrastructure, economic pulling power and established international networks. The centrality of sustainability discourses within Bristol's smart city agenda is the result of a strong and active local environmental movement. However, there have been multiple criticisms of how the Bristol European Green Capital bid and process was managed, what its local legacy will be and who the beneficiaries (socially, economically and geographically) of the green city will be. Bristol has cultivated a strong ethos of independent green thinking, much of which has been underpinned by an engaged green-oriented civil society. Nonetheless, recent years have seen an increasing imbrication of the notion of smartness with the idea of the city as a green urban centre. In effect, the smart agenda serves as the next stage in the city's long-term commitment to becoming a 'green city'.

However, while active networks of green initiatives are evident in Bristol, and there is evidence of a commitment to digital infrastructure and innovation, there is little evidence of where and how these two agendas are converging. The increasingly dominant top-down smart-green discourse is entrenched within neoliberal rationalities of urban competitiveness and economic growth aimed at attracting high-tech creative businesses and visitors. In contrast, its bottom-up smart-green discourse embraces a circular economy of self-sufficiency and localism and an underlying ethos of reduction, reuse and recycling. The material implementations of this convergence and/or divergence on the ground reflect many of the wider tensions within any 'smart-green' narrative (Martin *et al.* 2018).

The strong commitment to green innovation and urban sustainable development in Bristol can be traced to the 1970s, when a small but active section of the community established Resource Futures. The organisation initiated a kerbside

recycling scheme, feasibility research into a Severn River Barrage energy generation project, health inequalities research on air pollution and campaigns for comprehensive cycle provision in the city. In 1977, a small group of cycle campaigners (including future mayor George Ferguson) formed the national organisation Sustrans, which eventually shaped much of the UK's cycle path network (Brownlee 2011). In 1979, an eco-house called the Urban Centre for Appropriate Technology was created as a home for the Bristol Energy Centre, an organisation committed to linking the built environment with ecological and social concerns. By the mid-1980s, several national 'green' organisations, including the Federation of City Farms and the Soil Association, moved their headquarters to Bristol and created a focal point for national environmental leadership.

This emerging network of civil society organisations has been central to promoting urban sustainability within Bristol. As a vehicle to deliver the city's Local Agenda 21 strategy, the Bristol Partnership was established in 2001. The partnership is a coalition of public, private and civil society stakeholders that describes itself as 'a powerful voice for Bristol, helping us to work and negotiate with the Government, regional and national organisations, and our European partners' (BCC 2003: 1). The strategy introduced the city's digital sector as a foundation for economic sustainability, citing Future Lab – a partnership between Bristol University and the National Endowment for Science Technology and the Arts (NESTA), established in 2001 and funded by the Department of Education to develop ICT learning solutions – as a starting point for green-digital leadership: 'We want to build on this strength by attracting more high-tech industries into Bristol. It also presents a clear vision of Bristol's direction as a green capital in Europe – creating sustainable communities and improving the quality of life' (BCC 2003: 20). Thus, the digital and green agendas were quickly conflated, with implications that continue to resonate today.

This cross-sector partnership of digital and green pledged to make Bristol a 'low carbon city with a high quality of life', supported by a 'Green Capital Co-ordinator' funded by Bristol City Council (BCC) within its sustainability team (Brownlee 2011). When the EU launched the European Green Capital Award in August 2007, the partnership submitted a bid that was unsuccessful. However, they used the momentum from the bid-writing process to develop two initiatives that served as the foundation for subsequent 'smart city' initiatives. Within the National Digital Inclusion Network that includes nine UK cities (Birmingham, Bristol, Hull, London, Manchester, Milton Keynes, Nottingham, Norwich and Shrewsbury), Bristol took the lead on green digital innovation. Bristol also took the lead on green digital initiatives within the Low Carbon City programme, a project supported by the UK's Carbon Trust to develop urban action strategies to achieve low-carbon but thriving economies (Dixon 2012). These early initiatives were focused on making digital consumption 'greener' instead of developing digital innovations to create a low-carbon city. Initiatives that emerged from the programmes included an ICT footprint calculator and a 'Green Addict' website to help businesses cut

their emissions (EUROCITIES 2015). In 2013, Bristol was successful in its second bid for the European Green Capital designation. Then city mayor, George Ferguson (Independent candidate and well-known sustainability campaigner and architect), described Bristol as a 'test-bed' for environmental innovation (UK Government 2013). This further strengthened the explicit link between the greening of the city and technological innovation.

Green to smart, and back

Today, the Bristol smart city programme is underpinned by existing assets, including a digital infrastructure installed in the 1970s. The 76-kilometre network of fibre-optic cable was laid under the city by telecoms company Rediffusion in anticipation of the mass roll-out of cable television. The network was acquired by BCC in 1999 to supply local telecommunications needs (primarily traffic control and CCTV). This infrastructure has enabled the local government to cultivate a distinct smart city programme by offering high-speed, high-capacity data storage and transmission. Alongside a new network of 1500 Wi-Fi-enabled lampposts (enabled through partnerships with Toshiba and Nokia) and the partial rebranding of the existing 3D Planetarium (formerly Imax 3D cinema) into the Bristol Data Dome, digital infrastructure has enabled Bristol to gain a reputation as a 'city-wide test bed' that has the capacity to store large quantities of data, host city-scale simulations and conduct closed network application testing (University of Bristol 2017). The most recent incarnation of the Bristol digital infrastructure is managed by Bristol is Open, a partnership between BCC and Bristol University. Bristol is Open aims to work towards what is termed the 'open programmable city' (Snell 2017) to apply notions of open software and open digital networks to the urban context.

Geographically, this digital network operates along a city-centre corridor reaching from a newly created Enterprise Zone (EZ), close to Temple Meads rail station, through the primary commercial centre (Redcliffe and Broadmead) and to the regenerated areas of the Harbourside and Park Street, home to BCC and Bristol University. With government funding through BCC and the South West Regional Development Fund, as well as private investment, the EZ targets the redevelopment of land previously occupied by warehouses. In 2016, it was announced that a large site adjacent to the EZ that once housed a Royal Mail sorting office would become a new campus for Bristol University and house a new School of Business and Innovation (Cork 2017). A new rapid transport system, Metrobus, connects the EZ to the city centre and Filton, a major aerospace-focused industrial hub that is home to BAE Systems, Airbus and Rolls-Royce. The emphasis on this narrow corridor of high-capacity digital infrastructure serves business and university interests rather than citizen-centred smart initiatives that are located outside the EZ boundaries. This reflects a more conventional interpretation of smart urbanisation that is focused on corporate innovation and economic development (Hollands 2008, Söderström *et al.* 2014).

At the same time, using technology to address issues of environmental protection and social equality has been foregrounded within the outward-facing narrative of smart in Bristol. Like many UK cities, Bristol has long-standing and increasing levels of wealth inequality, high levels of traffic congestion and air pollution, and a stated aim to address environmental and social issues while transitioning toward a low-carbon economy. Bristol has some of the poorest urban areas in the UK, and has secured funding from the UK government and European funding agencies to supplement existing projects with digital innovation to tackle socio-environmental problems. For example, in 2016 the city was awarded one of five Urban Living Partnerships projects, jointly funded by Innovate UK (the government's innovation agency) and the country's seven research councils. The Bristol project is targeted at urban diagnostics, and aims to leverage digital innovation to enable increased wellbeing, health and carbon neutrality, among other desired outcomes (University of Bristol 2016).

Geographically, the key areas of deprivation in the city lie outside the new digital corridor, on the periphery of the city. Third-sector organisations with a history of delivering projects within deprived communities lead these programmes. Smart-green funding has come to these organisations largely through non-governmental bodies (such as the Joseph Rowntree Foundation) and partnerships with BCC, local universities and a variety of private companies with wider digital interests in Bristol (including Siemens and Toshiba). Some EU funding has come via involvements within wider international consortia. Other funding has been directly allocated to smart-green projects by the city council, such as the £5m allocated by Bristol's mayor to the first stage of a projected city-wide district heating system (Cuff 2016).

A key nodal point for citizen-focused smart-green projects has been the Knowle West Media Centre (KWMC 2018). KWMC has a history of delivering social projects using digital technology spanning more than a decade, and is based in an area with high levels of economic deprivation and a substandard housing stock. The centre secured funding as part of the IES Cities Network (where IES stands for 'Internet Enabled Services'), which is part of the EU Competitiveness and Innovation Framework Programme and a member of the European Network of Living Labs (ENOLL 2018). One of the key activities at KWMC has been to disseminate information on participation and community-scale social projects through its 'Bristol Approach Toolkit' and through sharing ideas for bottom-up social change. The financing and networking activities have also enabled KWMC to facilitate small bottom-up projects related to digital inclusion, domestic energy consumption and citizen-led research. However, tasking third-sector organisations with delivering smart-green programmes in a time of austerity has geographical and capacity limitations. While many of the projects have been successful at a limited scale, financial barriers and lack of capacity has stymied their ambitions to move beyond these niche-level interventions.

The story of Bristol's development as a green city and, more recently, as a smart city highlights the path-dependent character of green urban development. Bristol's

current smart-green 'brand image' draws heavily on the city's involvement with environmental and then sustainable urbanism beginning in the 1970s. More recently, smart urbanism has rapidly emerged as a key driver shaping urban development strategies and priorities. Today's smart-green projects are seen primarily as ways in which the city's economy can change to take advantage of new opportunities in the digital economy. What is less clear is how these two directions – towards the green city and towards smart urban futures – dovetail in practice. Two distinct geographies of innovation, the EZ and KWMC, embody top-down and bottom-up approaches to smart-green futures. This is far from the comprehensive smart-green city as envisioned by the local and regional leaders, and suggests an increasing fragmentation of the city-region landscape (Karvonen 2018).

Manchester: enhancing green growth with ICT

Manchester is rapidly emerging as a leader in smart urban development in the UK and around the world. The city's smart agenda builds upon its long-standing global reputation as a place of innovation. In 1844, the noted British politician Benjamin Disraeli famously pronounced, 'What Manchester does today, the rest of the world does tomorrow' (cited in Haughton *et al.* 2016: 366). Today, its reputation as a first mover or pioneer continues to drive the city's development ambitions to shed the last vestiges of post-industrial decline experienced in the second half of the late twentieth century and once again become an exemplar global city (Peck and Ward 2002, Harding *et al.* 2010). The city, with a current population of 530,000, is using smart to feed into this long-standing narrative of innovation while also bolstering its existing economic development strategy of 'urban entrepreneurialism' (Quilley 2000, Deas 2014, Robson 2016). Alongside this, Manchester has a commitment to greening its urban landscape. The fabric of the city continues to reflect its industrial past (Karvonen 2015), and there are multiple efforts to green the city to be more economically competitive and liveable.

Realising the knowledge economy

Central to the rebirth of Manchester's economy has been the collective focus on creating a knowledge economy to replace the once thriving industrial economy of the nineteenth and twentieth centuries (May and Perry 2006, Perry 2008). Manchester is often compared to other former industrial cities in Europe, such as Barcelona, Lyon and Munich, that are reinventing themselves in the wake of industrial decline. An important contributor to the knowledge economy was the development of regional science policies to spur economic growth. In 2004 and 2005, Manchester was designated as one of six Science Cities (alongside Birmingham, Bristol, Newcastle, Nottingham and York). The purpose of Science Cities was to 'use their strong research base to drive city-regional growth by strengthening linkages between business, the public sector and the science community' (Charles *et al.* 2014: 331). This 'triple helix' strategy continues today in

the N8 Research Partnership (2018), comprised of eight universities in Northern England that collaborate with one another as well as the industrial and public sectors on key research areas. Manchester Knowledge Capital was launched in 2003 as a coalition of city-region actors including universities, local authorities and interagency umbrella bodies to realise a broad-based regional economy. An important aim of this coalition was to forward the city-region as an international player, with the city framed as a centre of learning and innovation. This would recast Manchester's global reputation from 'cottonopolis' to 'ideopolis' (Jones *et al.* 2006).

The environmental agenda in Manchester is less pronounced than its economic innovation agenda. Like many cities, there is a wide range of civil society groups in the city that advocate for action on climate change, local food production, water and air quality, and so on (While *et al.* 2004, Karvonen 2015). One of the most visible environmental agendas involves climate change and was launched in 2009, when Manchester City Council (MCC) and engaged citizens introduced the city's first climate change strategy, *Manchester: A Certain Future*. The strategy committed to reducing the city's carbon emissions by 41 per cent by 2020 when compared with 2005 levels. After the Paris Agreement of 2015, the strategy was updated to transform Manchester into a 'zero carbon' city' by 2050 (MCCA 2018). Not surprisingly, technological innovation plays a prominent role in the decarbonisation agenda. One of the most visible commitments to the green agenda is the recently completed Co-operative Group headquarters in central Manchester, a building that uses cutting-edge technologies to optimise building performance.

The emphasis on knowledge capital and triple helix collaborations has produced a new mode of local governance driven by public–private partnerships. Despite the long-standing dominance of the Labour Party in Manchester, city leaders have embraced a non-bureaucratic approach to governance that operates more like a quango or specialist government agency rather than a publicly elected authority (Deas 2014). There is a shared focus on 'getting things done' (Allmendinger and Haughton 2009: 619) at the expense of citizen participation and democratic accountability. Surprisingly, this elite approach to governance has not faced sustained challenges from the electorate. The Labour Party has continued to win local elections for decades while enacting policies that focus first and foremost on economic growth over other public priorities.

One of the prominent partnerships at the head of the knowledge economy agenda is Corridor Manchester. Formed in 2007, this public–private partnership consists of Manchester City Council, the University of Manchester (UoM), Manchester Metropolitan University (MMU), Royal Northern College of Music, Central Manchester University Hospitals NHS Foundation Trust, Bruntwood and Arup (Corridor Manchester 2018). The partners have designated an 'innovation district' in the city centre that comprises 243 hectares that circumscribe these knowledge-intensive organisations. The partnership personifies a 'networked style of governance' (Cowley *et al.* 2017: 10) that is increasingly commonplace in

Greater Manchester, with the partners encouraged to align their investments and activities strategically to realise a whole that is greater than the sum of its parts.

Meanwhile, the city-region continues to grow as a governing body with authoritative power. Regional partnerships include the Association of Greater Manchester Authorities (formed in 1986), the Greater Manchester Combined Authority (formed in 2011) and the Local Economic Partnership (formed in 2012) (Charles *et al.* 2014). While MCC continues to play a dominant role in shaping the trajectory of development, there are signs that the city-region will be more influential in the future. Manchester is part of a city-region with a population of 2.5 million that is characterised as having 'the largest and most diverse creative and digital sector in the UK outside of London' (Carter 2017: 4).

Greater Manchester is of particular importance to the national economic agenda known as the Northern Powerhouse (Haughton *et al.* 2016). The city-region is designated as the key to unlocking new economic opportunities in the north of England that will rebalance the national economy. This involves the devolution of statutory powers from the central government to regional governments, providing Greater Manchester with more power to govern its collective services such as transportation, health and police. The first city-region mayor, Andy Burnham, was elected in May 2017 following an agreement between the UK government and the Greater Manchester local authorities. The ten local authorities are committed to working together to create a city-region that can achieve global status. And smart-green is a prominent driver. As Mayor Burnham notes, 'By building a low-carbon economy in Greater Manchester, we will put ourselves in a strong position to attract more jobs and investment' (quoted in GMLCA 2017).

Smart-green as urban economic development

The smart-green agenda in Manchester dovetails neatly with the emphasis on innovation, the knowledge economy and public–private partnerships while also drawing upon previous digitalisation efforts. From 2003 to 2015, MCC funded the Manchester Digital Development Agency (MDDA) to support business development initiatives as well as programmes for community development and the creative sector. MCC also published digital strategies in 2008 and 2012 (Cowley *et al.* 2017), demonstrating a long-term commitment to technological innovation as the primary driver of economic growth. With austerity measures implemented in the early 2010s, MCC experienced major funding shortfalls and the MDDA was shuttered. MCC shifted from leading on digitalisation programmes to serving as a coordinator for collaborative funding bids to the UK government and the European Union. Today, Manchester is one of a small number of UK cities – including Bristol, London, Birmingham and Glasgow – where the local authority is leading on smart city innovation (Taylor Buck and While 2017). However, it practises a particular mode of leadership that involves a collective form of governance, with MCC as the main steering partner.

The aforementioned knowledge economy agenda features prominently in smart-green projects and the idea that one of Manchester's main assets is its research capacity. Two universities in central Manchester (UoM and MMU) are key partners in building the smart agenda (Evans and Karvonen 2014, Paskaleva *et al.* 2017, Karvonen *et al.* forthcoming). As Deas (2014: 2304) notes, Manchester's universities are recognised 'not as insular ivory towers of scholarly learning, but as an intrinsic part of the developing urban knowledge economy'. Both universities are partners in the aforementioned Corridor Manchester partnership, creating a durable link to the knowledge economy agenda. The smart agenda enhances the universities' international research reputations while demonstrating a commitment to local urban development (Karvonen *et al.* forthcoming). Moreover, their campuses provide a physical space to trial smart technologies because they are single owner and managed in-house. As Evans and colleagues (2015: 1) note, 'campuses offer amenable real world locations in which to conduct applied research'. Smart innovation is being demonstrated in the real world rather than on a computer screen or in a controlled laboratory setting.

Several smaller research projects on smart technologies were trialled at UoM and MMU in the early 2010s on energy grids, green infrastructure, high-speed wireless communication and real-time environmental sensing (Evans and Karvonen 2014, Cowley *et al.* 2017). These projects were typical of many research-intensive universities around the world. However, these activities were bolstered in 2014 when an international consortium of actors in Manchester, Eindhoven (Netherlands) and Stavanger (Norway) were awarded a €25m Horizon 2020 grant from the European Commission's Smart Cities and Communities Programme (EC SCC 2018). The Triangulum project is designing, constructing and evaluating low-carbon smart districts over a five-year period (2015–2020) by integrating energy, transport and ICT on the two university campuses. The three Lighthouse cities are coordinating a shared data hub and evaluation framework that will inform smart urban development agendas in three follower cities – Sabadell (Spain), Leipzig (Germany) and Prague (Czech Republic) – as well as other cities around the world through a process of demonstration, measurement and replication (Triangulum 2018). The merging of smart and green is an explicit aim of the project, and reinforces the existing connections between these two agendas in Manchester.

The UoM and MMU campuses were chosen for the Triangulum low-carbon smart district due to the existence of Corridor Manchester as an innovation district and governance partnership and the opportunities to install and test new technologies in a sheltered space (Evans and Karvonen 2011, 2014). MCC is the lead partner and is joined by UoM, MMU, Siemens, and Clicks and Links (a local immersive technology consultancy). Technologies to be installed and monitored involve renewable energy, historic building refurbishment, electric vehicle (EV) charging stations, electric cargo bicycles for logistics, a 'virtual' power plant and more (Triangulum 2018). The work enhances the existing campus sustainability programmes (UoM 2018, MMU 2018) as well as the broader low-carbon agendas of the city and city-region (MCCA 2018). In effect, Triangulum is using

smart technologies to make collective urban services more efficient and, in the process, realise a low-carbon city-region.

The Triangulum project has been followed by additional externally funded projects. Of particular note is CityVerve, an 'Internet of Things' (IoT) project that was awarded £10m from the UK Government's Department of Culture, Media and Sport (CityVerve 2018). The three-year project (2017–2020) is a logical extension of the Triangulum work and focus on transport and travel, culture and the public realm, health and social care, and energy and the environment. The project includes 21 partners (several of whom are also partners in Triangulum) and extends beyond the university campuses to include other parts of the city.

The high profile of these externally funded projects reveals Manchester's smart-green urban development strategy to be based on projects rather than a comprehensive and strategic city-wide agenda (Luque-Ayala *et al.* 2014, Taylor Buck and While 2017). This is clearly seen in MCC's Smarter Manchester Programme (2018), which is simply a collection of existing projects and programmes rebundled as a comprehensive agenda. The smart-green agenda in Manchester is opportunistic rather than strategic, a vision of urban futures that is driven by funding rather than clearly defined objectives. The longevity of this agenda is dependent on attracting additional national and European funding to ideally create a self-sustaining regional economy based on the high-tech sector.

Meanwhile, third-sector organisations continue to forward bottom-up initiatives aimed at social inclusion and equity with little publicity or fanfare. For example, the Manchester Digital Laboratory (MadLab) conducts programmes on grassroots innovation, play, craftsmanship and skills training (Carter 2015, Cowley *et al.* 2017, MadLab 2018). This is a continuation of the social digitalisation programmes initiated and funded by the MDDA in the 1990s, and suggests an alternative pathway for smart to influence the city's future. However, there is little interaction between these two approaches to smart and suggests the emergence of a two-speed city (Harding *et al.* 2010), with one focusing on elite partnerships while the other focuses on grassroots and community development.

Contextualising the smart-green city

The experiences with smart-green in Bristol and Manchester highlight different development pathways of smart-green urbanism in two of the UK's most dynamic centres of urban innovation. Bristol's smart city strategies overlay and reframe its long-standing identity as a green city that is based on citizen engagement as exemplified through the programmes organised through community-based organisations such as KWMC. There is a strong emphasis on openness and inclusion, which connects to notions of social equity and good governance. Meanwhile, Manchester has visions of a smart city that can develop its green economy and its ambitions to be a low-carbon, high-tech city-region. This suggests two diverging pathways of smart-green that aim for social inclusion or economic development to realise the smart-green city of the twenty-first century.

However, the differences in smart-green narratives in Bristol and Manchester are overshadowed by many key similarities. Firstly, both cities have ambitions in terms of being situated within their wider 'city-regions'. In the case of Manchester, the city's ambition is supported by national policymakers, with the UK government's discussion of the potential for a Manchester-focused 'Northern Powerhouse'. Bristol is also using its newly established city-region government to develop a larger economic development strategy. Smart-green ambitions are being used to enable and enhance these expanded views of city-region economic development. The newly elected city-region mayors are using their respective smart-green agendas as centrepieces of their emerging city-region development plans. This, in turn, highlights a further similarity: while both cities' mayors have exhibited a clear and publicly stated interest in smart-green strategies and transformations, there has been a corresponding municipal government drive to enable these transformations, or at least to stimulate them. Furthermore, public–private partnerships between public, private and third-sector organisations (including international bodies such as the EU) are being leveraged to realise these ambitions.

Beyond their prominent city-region agendas, the smart-green strategies in Bristol and Manchester exhibit commonalities in terms of their existence and participation within wider national and international networks of sustainable urbanism. At the national scale, both cities contribute to the national discourse that posits the smart city as *the* future urban development direction for UK cities (Cowley *et al.* 2017). Internationally, both cities (and especially Manchester) participate in international networks that range from those focusing on research and innovation funding (such as European consortia) to international city networks and initiatives (such as the European Green Capital competition). This supports the broader landscape of multi-city partnerships focused on future urban development: more than 200 city networks currently exist, in addition to thousands of para-diplomatic city-to-city links (Acuto and Rayner 2016). Thus, smart is a way for both cities to enhance their global reputation through frequent interactions with other global cities.

A further commonality between the two cities is the decision to situate the most high-profile innovation activities in discretely defined districts. The districts in both cities are defined by their public–private partnerships as well as their central and visible position. In effect, they serve as 'truth spots' (Gieryn 2006) where smart-green technologies can be trialled and demonstrated in real-world settings (Evans *et al.* 2015, Caprotti and Cowley 2017). This points to the increasingly common strategy of reconciling wider spatial ambitions and international networks with grounded experimentation in urban laboratories and testbeds. These districts are simultaneously local and global, experimental and proven, exemplary and commonplace. Paradoxically, their special status tends to set these districts apart from their immediate surroundings.

Finally, both cities raise key questions around digital exclusion, the 'digital divide' and enduring socio-economic inequalities. Bristol in particular has advertised its ambition to be inclusive and open. It remains to be seen if the

smart-green agendas in Bristol and Manchester can find ways to be inclusive and democratic, or if they are reinforcing the divide between the 'haves' and the 'have-nots', with the privileged benefiting from the digitalisation agenda while the precariat are left behind (Karvonen *et al.* 2014, Karvonen 2018).

In conclusion, this chapter presented the emerging smart-green agendas in Bristol and Manchester. The findings demonstrate how contextually specific strategies and projects are combining smart and green in unique ways. The respective geographies of smart-green in Bristol and Manchester underline the need to be sensitive to the fine-grained ways in which cities encapsulate experiments with smart-green urban futures while at the same time speaking to national and global audiences by linking local urban strategies to globalised policies, technologies, funding sources and collaborations. This highlights the need for urban research that can connect up the global ambitions with local interventions of urban innovation. Moreover, the interaction between these discursive material elements constitutes a city-specific performance of the future. It is at this point that smart-green projects become open to critical analysis and where a space for urban politics emerges.

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References

Acuto, M. and Rayner, S. (2016). City networks; breaking gridlocks or forging (new) lock-ins? *International Affairs 92*: 1147–1166.

Allmendinger, P. and Haughton, G. (2009). Soft spaces, fuzzy boundaries, and metagovernance: the new spatial planning in the Thames Gateway. *Environment and Planning A: Economy and Space 41*: 617–633.

Bristol 2015. (2015). What's European Green Capital. *Bristol 2015 website*. [Online]. Available: www.bristol2015.co.uk/about/whats-european-green-capital/ [Last accessed 3 January 2018].

BCC (Bristol City Council). (2003). Bristol's community strategy. [Online]. Available: www.bristol.ac.uk/media-library/sites/academic-quality/migrated/documents/comm_strategy.pdf [Last accessed 3 January 2018].

Brownlee, E. (2011). *Bristol's Green Roots*. Totnes: Schumacher Institute.

Caprotti, F. and Cowley, R. (2017) Interrogating urban experiments. *Urban Geography 38:* 1441–1450.

Caprotti, F., Cowley, R., Flynn, A., Joss, S. and Yu, L. (2016). *Smart-Eco Cities in the UK: Trends and City Profiles 2016*. [Online]. Available: www.smart-eco-cities.org/wp-content/uploads/2016/08/Smart-Eco-Cities-in-the-UK-2016.pdf [Last accessed 3 January 2018].

Carter, D. (2015). Manchester – from a creative digital city to a smart future city: the Manchester Digital Development Agency (MDDA) – our role in the upturn – an 'original, modern' case study – 2002–2015 (and beyond?). Unpublished manuscript.

Carter, D. (2017). Smart cities: terrain for 'epic struggle' or new urban utopias? *Town Planning Review 88*: 1–7.

Charles, D., Kitagawa, F. and Uyarra, E. (2014). Universities in crisis? New challenges and strategies in two English city-regions. *Cambridge Journal of Regions, Economy and Society* 7: 327–348.

CityVerve. (2018). *CityVerve website*. [Online]. Available: www.cityverve.org.uk [Last accessed 3 January 2018].

Cork, T. (2017). Council agrees sale of Temple Meads sorting office for Bristol University campus. [Online]. Available: www.bristolpost.co.uk/news/business/council-agrees-sale-temple-meads-7135 [Last accessed 3 January 2018].

Corridor Manchester. (2018). *Corridor Manchester website*. [Online]. Available: www.corridormanchester.com [Last accessed 3 January 2018].

Cowley, R., Joss, S. and Dayot, Y. (2017). The smart city and its publics: insights from across six UK cities. *Urban Research & Practice* (early view). [Online]. Available: https://doi.org/10.1080/17535069.2017.1293150 [Last accessed 31 May 2018].

Cuff, M. (2016). Bristol mayor approves £5m low-carbon heating scheme. [Online]. Available: www.theguardian.com/environment/2016/jun/09/bristol-mayor-marvin-rees-approves-5m-low-carbon-heating-scheme [Last accessed 3 January 2018].

Cugurullo, F. (2016). Urban eco-modernisation and the policy context of new eco-city projects: where Masdar City fails and why. *Urban Studies 53*: 2417–2433.

Deas, I. (2014). The search for territorial fixes in subnational governance: city-regions and the disputed emergence of post-political consensus in Manchester, England. *Urban Studies 51*: 2285–2314.

de Jong, M., Joss, S., Schraven, D., Zhan, C. and Weijnen, M. (2015). Sustainable–smart–resilient–low carbon–eco–knowledge cities: making sense of a multitude of concepts promoting sustainable urbanization. *Journal of Cleaner Production 109*: 25–38.

Dixon, T. (2012). Low carbon cities: an overview of scenario-based studies. [Online]. Available: www.retrofit2050.org.uk/sites/default/files/resources/WP20122.pdf [Last accessed 3 January 2018].

EC SCC. (2018). *European Commission Smart Cities and Communities website*. [Online]. Available: https://ec.europa.eu/inea/en/horizon-2020/smart-cities-communities [Last accessed 3 January 2018].

ENOLL. (2018). *European Network of Living Labs website*. [Online]. Available: www.enoll.org [Last accessed 3 January 2018].

EUROCITIES. (2015). EUROCITIES on COP 21: Green AddICT, Bristol, 22 June. [Online]. Available: www.eurocities.eu/eurocities/allcontent/EUROCITIES-on-COP-21-Green-AddICT-Bristol-WSPO-9XQB68 [Last accessed 3 January 2018].

Evans, J., Jones, R., Karvonen, A., Millard, L. and Wendler, J. (2015). Living labs and co-production: university campuses as platforms for sustainability science. *Current Opinion in Environmental Sustainability 16*: 1–6.

Evans, J. and Karvonen, A. (2011). Living laboratories for sustainability: exploring the politics and epistemology of urban transition. In H. Bulkeley, V. Castán Broto, M. Hodson and S. Marvin (eds), *Cities and Low Carbon Transitions*. London: Routledge, 126–141.

Evans, J. and Karvonen, A. (2014). 'Give me a laboratory and I will lower your carbon footprint!' Urban laboratories and the governance of low-carbon futures. *International Journal of Urban and Regional Research 38*: 413–430.

Gieryn, T.F. (2006). City as truth-spot: laboratories and field-sites in urban studies. *Social Studies of Science 36*: 5–38.

GMLCA (Greater Manchester Low Carbon Hub). (2017). The Mayor of Greater Manchester, Andy Burnham, announced his ambitions for making Greater Manchester one of the leading green cities in Europe, 18 September 2017. [Online]. Available: http://gmlch.ontheplatform.org.uk/article/mayor-greater-manchester-andy-burnham-announced-his-ambitions-making-greater-manchester-one [Last accessed 3 January 2018].

Haarstad, H. (2017). Constructing the sustainable city: examining the role of sustainability in the 'smart city' discourse. *Journal of Environmental Policy and Planning 19*: 423–437.

Harding, A., Harloe, M. and Rees, J. (2010). Manchester's bust regime? *International Journal of Urban and Regional Research 34*: 981–991.

Haughton, G., Deas, I. Hincks, S. and Ward, K. (2016). Mythic Manchester: Devo Manc, the Northern Powerhouse and rebalancing the English economy. *Cambridge Journal of Regions, Economy and Society 9*: 355–370.

Hollands, R.G. (2008). Will the real smart city please stand up? Intelligent, progressive or entrepreneurial? *City 12*: 303–320.

Jones, A., Williams, L., Lee, N., Coats, D. and Cowling, M. (2006). *Ideopolis: Knowledge City-Regions*. London: Work Foundation.

Karvonen, A. (2015). Pathways of urban nature: diversity in the greening of the twenty-first-century city. In J. Hou, B. Spencer, T. Way and K. Yocom (eds), *Now Urbanism: The Future City Is Here*. London: Routledge, 274–285.

Karvonen, A., Evans, J. and van Heur, B. (2014). The politics of urban experiments: realising radical change or reinforcing business as usual? In M. Hodson and S. Marvin (eds), *After Sustainable Cities?* London: Routledge, 104–115.

Karvonen, A. (2018). The city of permanent experiments? In B. Turnheim, P. Kivimaa and F. Berkhout (eds), *Innovating Climate Governance: Moving Beyond Experiments*. Cambridge: Cambridge University Press, 201–215.

Karvonen, A., Martin, C. and Evans, J. (forthcoming). University campuses as bounded sites of smart-city co-production. In C. Coletta, L. Heaphy, L. Evans and R. Kitchin (eds), *Creating Smart Cities*. London: Routledge.

KWMC. (2018). *Knowle West Media Centre website*. [Online]. Available: http://kwmc.org.uk [Last accessed 3 January 2018].

Luque-Ayala, A., McFarlane, C. and Marvin, S. (2014). Smart urbanism: cities, grids and alternatives? In M. Hodson and S. Marvin (eds), *After Sustainable Cities?* London: Routledge, 74–90.

McNeill, D. (2017). *Global Cities and Urban Theory*. London: Sage.

MadLab. (2018). *Manchester Digital Laboratory website*. [Online]. Available: https://madlab.org.uk [Last accessed 3 January 2018].

Martin, C., Evans, J. and Karvonen, A. (2018). Smart and sustainable? Five tensions in the visions and practices of the smart-sustainable city in Europe and North America, *Technological Forecasting & Social Change 133:* 269–278.

May, T. and Perry, B. (2006). Cities, knowledge and universities: transformations in the image of the intangible. *Social Epistemology 20*: 259–282.

MCCA. (2018). *Manchester Climate Change Agency website*. [Online]. Available: www.manchesterclimate.com [Last accessed 3 January 2018].

MMU (Manchester Metropolitan University). (2018). Let's make a sustainable planet. [Online]. Available: www.mmu.ac.uk/environment [Last accessed 3 January 2018].

N8 Research Partnership. (2018). *N8 Research Partnership website*. [Online]. Available: www.n8research.org.uk [Last accessed 3 January 2018].

Paskaleva, K., Evans, J., Martin, C. Linjordet, T., Yang, D. and Karvonen, A. (2017). Data governance in the sustainable smart city. *Informatics 4*: 41.

Peck, J. and Ward, K. (2002). Placing Manchester. In J. Peck and K. Ward (eds), *City of Revolution: Restructuring Manchester*. Manchester: Manchester University Press, 1–17.

Perry, B. (2008). Academic knowledge and urban development: theory, policy and practice. In T. Yigitcanlar, K. Velibeyoglu and S. Baum (eds), *Knowledge-Based Urban Development: Planning and Applications in the Information Era*. London: Information Science Reference, 21–41.

Quilley, S. (2000). Manchester first: from municipal socialism to the entrepreneurial city. *International Journal of Urban and Regional Research 24*: 601–615.

Robson, B. (2016). The resurgent entrepreneurial city. In A. Kidd and T. Wyke (eds), *Manchester: Making the Modern City*. Liverpool: Liverpool University Press, 347–396.

Shelton, T., Zook, M. and Wiig, A. (2015). The 'actually existing smart city'. *Cambridge Journal of Regions, Economy and Society 8*: 13–25.

Shwayri, S.T. (2013). A model Korean ubiquitous eco-city? The politics of making Songdo. *Journal of Urban Technology 20:* 39–55.

Smarter Manchester. (2018). *Smarter Manchester website*. [Online]. Available: www.manchester.gov.uk/smartercity [Last accessed 3 January 2018].

Snell, J. (2017). Developing an open programmable city. [Online]. Available: www.insidegovernment.co.uk/uploads/2017/12/julie-snell.pdf [Last accessed 3 January 2018].

Söderström, O., Paasche, T. and Klauser, F. (2014). Smart cities as corporate storytelling. *City 18*: 307–320.

Taylor Buck, N. and While, A. (2017). Competitive urbanism and the limits to smart city innovation: the UK Future Cities initiative. *Urban Studies 54*: 501–519.

Triangulum. (2018). *Triangulum website*. [Online]. Available: www.triangulum-project.eu [Last accessed 3 January 2018].

UK Government. (2013). Press release: new initiative to support $40 billion smart cities in the UK, 9 October. [Online]. Available: www.gov.uk/government/news/new-initiative-to-support-40-billion-smart-cities-in-the-uk [Last accessed 3 January 2018].

University of Bristol. (2016). Bristol citizens in driving seat for urban regeneration project. [Online]. Available: www.bristol.ac.uk/news/2016/may/bristol-urban-area-diagnostics-project.html [Last accessed 3 January 2018].

University of Bristol. (2017). Bristol showcases city-wide test beds in the European capital. [Online]. Available: www.bristol.ac.uk/news/2017/march/city-wide-test-beds.html [Last accessed 3 January 2018].

UoM (University of Manchester). (2018). *Environmental sustainability website*. [Online]. Available: www.sustainability.manchester.ac.uk [Last accessed 3 January 2018].

While, A., Jonas, A.E. and Gibbs, D. (2004). The environment and the entrepreneurial city: searching for the urban 'sustainability fix' in Manchester and Leeds. *International Journal of Urban and Regional Research 28*: 549–569.

Yigitcanlar, T. and Lee, S.H. (2014). Korean ubiquitous-eco-city: a smart-sustainable urban form or a branding hoax? *Technological Forecasting and Social Change 89:* 100–114.

9

SMART URBANISM AND THE VISIBILITY AND RECONFIGURATION OF INFRASTRUCTURE AND PUBLIC ACTION IN THE FRENCH CITIES OF ISSY-LES-MOULINEAUX AND NICE

Marie Veltz, Jonathan Rutherford and Antoine Picon

Introduction

In the 2014 Paris mayoral election, both main candidates faced off against each other over a variety of issues; but one prominent concern was smart technology and how this could be used to improve the everyday functioning of life in the French capital. The current mayor then proceeded to pepper her general city strategy with promises of material deployments and upgrades to enact a smart Paris that would be an international leader in digital technology (Hidalgo 2014). Smart has emerged then on the French scene,[1] with a number of organisations proposing documents and strategies, as well as a host of seminars, forums and trade fairs, aimed at urban practitioners and politicians to seize the possibilities of the inherent 'intelligence' lying within the city if entities, objects and processes are better arranged, interconnected and managed (see Danielou and Ménard 2013). The Caisse des Dépôts (2016) state bank captures the current zeitgeist in the blunt title of its report 'Smart city versus stupid village?', implying that organisation of intelligence is now a marker of modern urbanity and will not just separate frontrunners from laggards, but those places contributing to renewing civilisation in France for a digital era versus those places where a perceived backwardness will continue to blight development.

Yet, for all the recent ubiquity of smart urban projects, practitioner and policy discourse in France and more widely and a furore of work in and around urban studies concerned with interpreting meanings, modalities and outcomes of this, there is a sense in which we are still struggling to grasp what might be distinctive about smart urbanism. In terms of content, many versions of smart urbanism appear to revolve around or emerge out of a conflation or synthesis of three elements: interconnection of networks and rebundling of infrastructure systems; mass deployment of sensors, screens and surfaces and associated processes

for monitoring, recording, circulating and feeding back of/from these in real time; and promotion of an adaptive, flexible, on-demand, individualised urban experience. By combining more and deeper technology deployment throughout the urban fabric, the interconnection of heterogeneous systems and an 'enhanced self-sufficiency' or 'individualized, autonomized spatiality' (Michael 2009: 95–96), 'smart' becomes a prime field of experimentation and testing of new socio-technical configurations in the city (Karvonen and van Heur 2014, McLean *et al.* 2016), and the inevitable solution to a host of big problems ranging from climate change to the provision of public services under austerity. Halpern and colleagues (2013: 278) call this marriage of sustainability and bandwidth 'a fantasized transformation in the management of life – human and machine – in terms of increased access to information and [thus] decreased consumption of resources'. Cugurullo (2018) argues that these discourses of integration and cohesion of smart-eco elements hide a fundamental incompatibility and lead to fragmented, grotesque cities in practice.

Critical analysis of how, why and for whom these developments are being put to work in the city is essential (Hollands 2008, Kitchin 2014, Luque-Ayala and Marvin 2015). The generic corporate-led version of the smart city, driven by market logics and technology fixes that are deployable anywhere, claims to improve urban functioning in myriad smooth and unproblematic ways. Yet this clearly runs the risk of erasing the very distinctiveness of the urban – its heterogeneous, place-based, material and political vitality – in favour of standardised, controlled spaces for the clear-cut application of given solutions (Viitanen and Kingston 2014, Söderström *et al.* 2014, McNeill 2015). Smart urbanism can be placed in a long lineage of the reshaping of social relations by the 'contingency with bias' (Graham and Marvin 1996) of information and communications technologies (ICT). As Mattelart (1999: 169) has argued, communications technologies 'have been, are and will remain the object of contradictory claims: they lie at the heart of confrontations for global control' (see also Murdock 1993). In this way, it is essential to study how integrated infrastructures, data gathering and on-demand individual services are configured in highly political ways in terms of access, use, experience and analysis of results.

While tracking and analysing the material implementation of smart urban projects is seen as one way to go beyond broad-brush critique of corporate discourse and exceptional cases which always promise more than they deliver (Shelton *et al.* 2015, Kitchin 2015), studying smart in practice is still plagued by the issue of whether practitioners are doing anything substantively different in the name or through the frame of smart. Initiatives may be linked to a variety of local stakes and requirements, and implemented *in situ* in quite distinctive ways. In the core of this chapter, we explore therefore the question of the difference that smart makes *in situ* or in context to try to understand the still fuzzy question of what smart actually is and what its added analytic and/or practical value might be. The key questions here are: 1) what does smart produce or allow to be done (differently); and 2) how does it reconfigure the urban?

We address these by focusing on two forms of smart urban practice in two French cities: reconfiguration of energy system flows in a district-level smart grid project in Issy-les-Moulineaux; and data capture and use for urban management in smart city initiatives in Nice. The Issy case shows local work at the interface of energy systems, digital networks and the urban environment which produces infrastructure change, while the Nice case is a more systemic urban attempt to rework public action and public–private relations and promote institutional and organisational change. The aim is not to represent the full array of smart work being conducted in France, but to explore issues and concerns emerging in technology-mediated interventions in the French urban context.

The contribution of the chapter lies in its exploration of smart urban governance on a local level in France, and how public authorities are seeking to shape socio-technical interventions around local strategic concerns. While technology firms and utility companies are involved, and there is thus some reworking of relations between public and private actors which is not without struggle and tension, our argument is that local authorities still play a significant role in organising and maintaining smart urban implementations, and are indeed using the visibility of flows and actions produced by smart to make organisational adjustments and to maintain the capacity to decide and act in a wider strategic interest. It follows that there is decidedly no single one-size-fits-all smart city practice, but a heterogeneous process of urban reconfiguration around smart which is contingent on existing relations, ways of working and contours of the urban fabric. We explore the smart grid and smart city initiatives in turn, before discussing what they cumulatively reveal about the nature, modalities and implications of smart urbanism.

Smart grid: reconfiguring infrastructure and making energy flows visible

The Paris region requires ever more 'intelligent' work to link up production and consumption of electricity. Île-de-France imports more than 90 per cent of its electricity, and demand for energy is projected to increase. Meanwhile, the peak load charge is already increasing much more rapidly than actual consumption. This means that during particular short periods in winter there is a sudden, temporary boost in demand which places stress on the electricity system to deliver the required amount of energy. Renewable energy generation is often small-scale and intermittent in its supply. Furthermore, at peak times, the French electricity system relies on carbon-intensive production, which goes against climate goals and does little to reduce regional energy dependency. The system must therefore have the capacity to produce, transport and distribute sufficient supply to meet these occasional peaks, as well as the knowledge and expertise to be able to monitor and anticipate as closely as possible when and where these are likely to take place. This has become a crucial issue for energy in the Paris region, illustrating a wider shift in infrastructure from a traditional concern for flow management to a form of event- and scenario-based technological management (Picon 2015).

A number of overlapping measures and actions have been initiated to respond to this issue, with the overarching aim to flatten the load charge and to realise 'better consumption of electricity' (ERDF official, quoted in ERDF 2011: 52). Smart meters are being rolled out to provide more data and information to electricity providers about consumption patterns and quantities. Smart grid projects are being introduced to experiment with mutualisation of demand – 'agglomerating several consumption models' (ERDF official, quoted in ERDF 2011: 52) – and with local production. Here, the aim is to interconnect buildings and neighbourhoods to share local renewable energy supplies or to bundle loads to create more coherent, and less differentiated, temporal electricity demand.

The IssyGrid project in southwest Paris is the first operational smart grid project in France. It markets itself as a 'laboratory' or 'window of know-how in the domain of energy, digital and the city' (IssyGrid 2016). It is located in a municipality with a long-term interest and expertise in deploying ICT in its projects (local official, Ville d'Issy-les-Moulineaux): it was one of the leading French 'cybercities' in the 1990s, with an innovative ICT strategy. As a research and development (R&D) public–private partnership between large companies,[2] local start-ups and the Issy municipality, initiated in 2012 for a period of five years, the project represents a 'mixed economy' mode of contracting and doing urban projects in France whereby local authorities involve private partners in the financing and operation of projects rather than doing everything themselves and only 'using public money' (city official in Lelong 2016). Through 'collegial governance' (IssyGrid 2016), various distinct logics coalesce around Issygrid, creating a coalition of political economic interests brought together by 'smart'. It is at once a playground to test new technologies, devices, techniques and business models (corporate interests) as well as electricity load management (EDF, ERDF), and to reduce energy bills (Issy municipality) and improve city branding and publicity with internal (political) and external (growth) objectives (Issy).

As of April 2016, the project vaunted that 'all the elements of an urban smart grid' were in place (IssyGrid 2016). In terms of material infrastructure, this meant that more than 1,000 homes (with 2,200 inhabitants) as well as five office buildings and part of the local street lighting system had been connected in two city districts. Two energy storage systems, three photovoltaic (PV) production facilities and a state-of-the-art smart electricity distribution substation were deployed. Control is achieved through 14 interconnected information systems, a data platform for 'energy supervision' which provides real-time readings and a system which forecasts anticipated local PV production. In the longer term, the project is supposed to cover 2,000 homes, 5,000 inhabitants, 10,000 workers and 160,000 square metres of offices in the city (IssyGrid 2016, Petrucci 2017).

The project is a prime example of an 'experimental' approach to 'optimising energy consumption' to 'consume better, less and at the right time' (Ville d'Issy-les-Moulineaux n.d.) through making real-time adjustments between energy production and increasingly variable energy demand. But it is not without difficulties and tensions, with three sets of challenges present from the outset

(project coordinator in Lelong 2016; local official, Ville d'Issy-les-Moulineaux). First, it requires intervening in the existing urban fabric with buildings which were not designed to exchange data and energy flows. Second, there are complex regulatory issues concerning both what a local municipality can do autonomously within a national electricity system and the extent to which it is possible to produce and analyse data collected from the domestic sphere. Third, there are ongoing difficulties in getting buy-in from residents to participate in the project. These issues reflect the problematic top-down nature of the exercise, with a substantive disconnect between the coalition initiating and coordinating the project and the households whose energy consumption is the focus of the objectives and is supposed to be made visible, and thus manageable and more 'efficient'.

Real-time energy consumption monitoring and tracking aims to optimise the district systems by creating a local and temporally differentiated 'energy profile' to flatten peak load electricity demand, thus reducing CO_2 emissions by creating less need for supplementary fossil fuel energy at certain times, and improve both the balance of the network now and in its future dimensioning (IssyGrid 2016).

Homes are equipped with both smart meters and domotic systems allowing inhabitants to view their energy consumption hour by hour. Visualisation of energy flows thus signals to users how changes can be made to improve their consumption (project coordinator in Lelong 2016). A software management platform developed by a local start-up enables this data to be transmitted to IssyGrid; but to comply with data protection regulations it is collected hourly as a package of ten comparable homes to safeguard anonymity. Issy officials spent 12 months working with CNIL, the French data privacy agency, to develop procedures for anonymity while collecting and circulating data.

The project has thus been the forerunner in establishing new rules on a national level for regulating the use of energy consumption data (local official, Ville d'Issy-les-Moulineaux). The aggregation process is done by servers and the data is then sent to the IssyGrid platform with an electronic signature. Any breach would modify the signature and automatically shut down the collection of data (IssyGrid 2016). As well as their own data, inhabitants can see the aggregated figures for their building and neighbouring buildings – the idea being that they can compare their consumption against these 'averages', which is held to stimulate virtuous behaviour. Visibility here aims to promote a new civic engagement or even a new form of citizenship, with individuals contributing to the collective good. As Halpern and colleagues (2013: 287) argue, 'Through this promise of omniscience and omnipresence viewers/users/consumers can exceed their human limitations thanks to the automated collection and analysis of data that are suddenly easy to access.'

IssyGrid has also started producing data which links electricity consumption throughout the day in particular buildings with available and forecasted local PV production. This is meant to allow residents to anticipate whether some of their electricity consumption can be delayed to when local production is at its highest level, although it is unclear what proportion of residents would actually

do this. The project also provides a dashboard display for real-time data to visualise performance and to engage residents. Many residential and office buildings in the district have already been built to green standards with low energy consumption levels, so the data flows add an extra layer on top of absolute building performance to allow temporal shifts to further improve network functioning. A new electricity distribution substation in the area allows monitoring of local PV production and storage of electricity in recycled electric vehicle (EV) batteries. Excess PV production during the day can thus be stored until peak local demand in the evening.

Reflecting a motto where 'to govern is to foresee', the Issy municipality and its collaborators are attempting to increase the controllability and predictability of local energy flows by deploying integrated systems for the production of information. Issy thus deploys an anticipatory governance agenda to seek assurance within a wider vision of smart urbanism promoted at the national level 'where the exchange between governor and governed will be accelerated' (CGDD 2012: 3). This is a configuration 'that allies ecology and digital' (IssyGrid 2016, Ville d'Issy-les-Moulineaux 2015), and speaks to an 'autonomous city' discourse (Ville d'Issy-les-Moulineaux n.d.) which relocates production, distribution, storage and consumption of energy to the local scale to reduce dependence on long-distance energy flows.

In sum, this appears to be a new socio-technical complex to rework technology, temporality and space in energy systems, ostensibly for user-oriented goals. But there remain important questions about the extent to which the municipality's search for increased local autonomy and capacity for control can be implemented through partnership with large global companies with their own logics and vested interests. IssyGrid may be seen as a configuration to sustain the growth and expansion of an existing top-down system 'based on existing assets' (IssyGrid 2016). As an IssyGrid project document states, 'This realistic approach allows us to deploy a territorial energy optimization policy at least cost without questioning previous or future infrastructure choices' (IssyGrid project n.d.).

Smart city: augmenting public intervention in the city

The Nice City Region on the south coast of France has been developing 'smart city' policies since 2010 as politicians look to build a more productive and modern economy oriented around 'digital innovation'.[3] After small-scale experiments with near-field communication (NFC) technology, contact was made between the city and IBM, which had local offices in the Nice area, and the city became one of the laureates of IBM's global 'Smarter Cities Challenge' in 2011.[4] A senior IBM employee recounts the extremely intensive exchange and mutual learning between the two that developed:

> Seminars, meetings, brainstorming sessions, 'discovery workshops' – we gave out our knowledge and learned a lot in return about city operations.

> It was exciting because we all brought something to the table – we complemented each other really well. Sometimes I didn't know if I was working for IBM or for Nice City Region.

The city's broad objectives around smart[5] accorded with IBM's vision from this point on, leading to the creation of a three-year joint research and development programme from 2013 to 2015. The objective of the jointly funded programme was to create a data platform or warehouse to promote interoperability and accessibility of data from across the city which could then be used transversally in all collaborative smart projects (Métropole Nice Côte d'Azur 2013). This built on IBM's Intelligent Operations Center (IOC) solution to gather critical datasets (traffic, waste collection, air quality, noise) and offer a panoptic platform view of city functioning and events ('hypervision') to help city departments take decisions about their operations.[6] While a demonstrator was put in place for an exhibition in 2014, further elaboration of the data warehouse ran into problems that varied from lack of data capture and updates to difficulty in constructing meaningful indicators from the raw data to allow analysis and real-life testing of standard operating procedures. Several respondents noted that the tool has not been taken up by the city departments it was intended to help because agents struggled to understand IBM's system and the departments decided it did not meet their immediate needs. Nevertheless, several interviewees argued that the IBM partnership had been worthwhile in terms of creating an image and envisaging city management as a process of creating systemic interoperability and transversal ways of working.

Nice's subsequent smart urban strategy has had a particular focus on the use of new forms of data to improve urban functions. This was implemented through two types of initiative: one enrols data capture and analysis as a new instrument for the conduct of existing public policies and actions (digitalisation of city work/tasks); the other uses sensors and data production to extend the field of urban intervention into new services (perhaps producing a new area of urban public policy).

Some of Nice's sectoral operations departments have been equipped with data collection and analysis tools including sensors, chips and cameras. The deployment of these new technologies has usually been decided by the departments themselves. For the authority as a whole, the aim is to implement their tasks in a more efficient manner, with these new tools seen as shedding fresh light (knowledge) on the object of public action (they inform about various parameters of a task), allowing measurements to be made, which in turn enables corrections or adjustments in intervention. The Nice waste management department has, for example, adopted a special on-board digital route management tool (consisting of a GPS system and interface) in its waste collection trucks to optimise collection routes and to provide real-time information on collection circuits and various problems and defects in equipment. The tool also allows for data aggregation to evaluate activities and performance, for example by truck, by area or over a certain length of time (representative, waste management department).

In this case (and similar ones), the main objective of smart is greater efficiency in public service provision. It is about saving time, reducing costs or obtaining more visibility over operations, with smart layered over existing ways of doing things: 'It works better, it's more fluid, faster. For example, drivers don't miss collections, no, they let themselves be guided. Before we had paper listings that we printed every night … well, they did as they could' (representative, waste management department). Operations and tasks are thus optimised but are not otherwise drastically changed, partly because there is still a lack of expertise in processing all the data: 'We now have the data in real time. But today, we are not really structured to analyse it' (representative, waste management department). There is, however, the possibility of analysing the data following a dysfunction to understand what happened.

Another set of initiatives in Nice's smart city portfolio of activities has more potential for systemic rather than internal piecemeal change, working towards smart as a new domain of public policy rather than just re-tooling existing policy areas as above. These are the efforts to explore data production and analysis as a new field of urban experimentation in the city. A significant example is the Urban Monitoring project jointly carried out by the City Region authority and a consortium including Veolia, Orange, M2O City and IBM. The project deploys 3,000 sensors across the city to measure various parameters such as noise, air quality (for both pollution and pollen), road traffic, water network leaks, water quality, green space water consumption, energy consumption of pilot housing and public lighting. The aim behind this collection and processing of data is threefold: 1) to develop new services to improve the quality of life of citizens; 2) to generate savings for the community; and 3) to generate economic development potential around data provision (Métropole Nice Côte d'Azur 2016).

Rather than just inserting smart/digital into existing actions, the stated objective here is to explore new areas of intervention, which may be multi-sectoral and sometimes at the limits of or beyond the scope of the public sector per se. Local officials invoke rhetoric such as 'the territory as a laboratory of experimentation' to justify initiatives (Nice official). These new interventions necessitate the development of transversal organisation across departments in the Nice authority, involving coordination between teams that have not been used to working together and mutualising skills and competencies. For example, air pollution action involves teams from departments for the environment, health, and roads and traffic.

Smart here enables new ways of working together internally and institutional change to develop capacity for public control of the strategic agenda. This becomes crucial when authorities are learning to work alongside influential private companies that are configuring projects for their own goals. Access to new data about service operations enables city officials to reassert authority over services run by private companies. As one Nice official states, 'We now have alarms for major discrepancies and if the company doesn't react, we can inform them that there's a problem on a particular system. That changes our position because we're

no longer blind like before – we have the data.' Smart thereby gives public actors more visibility, knowledge and (thus) control over city operations, and allows some rebalancing of relations between the authority and private subcontractors that are perceived to be asymmetric.

Nevertheless, private partners are mobilised for their digital expertise and extra resources, and can play a central role in steering and implementing projects through research and development partnership contracts with the local authority. Experiments involve 'testing' applications and solutions that can be developed and put on the market by partners, with Nice City Region benefiting from job creation and the emergence of local start-up companies within this dynamic urban smart ecosystem. One such application, Métropollen, takes the data provided by an optical analyser measuring the real-time granulometric distribution of pollen across the city, and sends out a regular and accurate bulletin that pollen sufferers can receive on their smartphone or tablet. Another application provides personalised advice to beachgoers about sun protection based on their skin type and real-time measurement of sunlight intensity. Nice's role is to create and sustain local conditions conducive to the development of innovative solutions which can attract businesses and boost economic development. It provides the territory on which trials can take place; but it also brings actors together, finances initial work and contributes to 'derisking', albeit in the service of private sector implementations.

The two types of smart initiative deployed in Nice raise a key question as to whether smart only offers an upgrade to existing areas of operation or actually constitutes an entirely new domain of public action and policy. In turn, this question plays out in tensions around both the signification, process and outcomes of experimentation and the nature, use, responsibility and ownership of data produced in and circulated around the city.

The whole idea of an experimental approach to urban development appears to conflict with the usual way of doing things in the different departments of the City Region. The partnership with IBM and the Urban Monitoring project are attempts to explore new possibilities with uncertain outcomes. Interviewees suggested that they are more accustomed to following a clear roadmap to obtain a specific objective – it is difficult for them to accept that an experiment with uneven processes and inconclusive results may also be rich in lessons and knowledge. Within individual departments, and even personal schedules and workloads, doing smart often plays out as 'interference' in the valued, quantifiable work that people should be doing.

Experimentation with smart technology can therefore be uncomfortable for those who implement it on the ground. A lot of work needs to be done to bridge the gap between ambition on a city level and concrete operational tasks and goals for those implementing smart. Testing ideas for a limited time without certainty of wider application or upscaling leads to interrogations about what comes 'after', and whether and how partnerships and ways of working can be maintained. This is all situated within a context of resource constraint within local authorities and

the need to demonstrate and justify longer-term sustainability of public action which, according to respondents, is a real concern for project leaders. This leads to debates about the role, position and scope of the missions of public action and authorities at the current juncture. Can investing work time and public money in noise, pollen and sun sensors be justified if this is essentially a 'derisking' activity for private sector implementation, with few certain returns on investment for local authorities?

This tension overlaps with the issue of ownership of and responsibility for the data captured and analysed through new technologies. As one city project manager summarises:

> OK, we bought sensors, so we own the data from the sensor. But as they are illegible as such, they have to be processed on the platform provided by [a partner]. And to get there, they transit through a network that is not really ours. So in the end, who owns the data that we're exploiting?

Data circulate between technological artefacts managed by different entities, *and* in doing so data are transformed – both to make them intelligible and often to anonymise personal information. They also require different interpretative expertise that local authorities do not necessarily possess, in contrast to their private partners. The respondents noted that they are concerned about 'staying in control and not becoming trapped' by the adoption of technical solutions that might constrain future choices. There is wariness of being 'captive' to a single set of solutions of an exclusive service provider, especially as smart tools and solutions imply constant monitoring, maintenance, upgrades and learning/training. Smart thus enables an emergence of concern for reflexivity and reversibility in policy options and choices (data as a future public heritage), offering a new perspective on path dependencies in urban infrastructure.

Technology, local authorities and the difference that smart makes

A lot more can be said about these two quite different projects than has been discussed above, but they reveal a number of pertinent issues. In both projects, we find: an activation of intrinsic urban intelligence through some form of transversal articulation or rebundling of previously distinct systems; a form of real-time monitoring; loops of information and recursive feedback; and a certain degree (or at least the promise) of individualisation of system use. More broadly, the projects in Issy and Nice reveal an emerging mandate and capacity for local authorities to facilitate experimentation on their territories, whether to test local responses to 'big' issues such as energy and climate or 'internal' urban management improvements. They demonstrate a lot of technology (new and old) and interconnection/integration with objectives of local autonomy (e.g. buildings and neighbourhoods in Issy) or efficient transversal urban functioning (Nice).

Even if the ICT and digital flows and layers are usually implicit or behind the scenes, they are nevertheless an increasingly important component of the systemic process. In both cities, sensors and measures contribute to the functioning, maintenance and improvement of systems, constituting a digital platform above or across traditional infrastructures which allows near real-time knowledge and feedback for constant adjustment, evaluation and learning through processes of reflexive governance (Plantin *et al.* 2018). This technology connects and constitutes authorities, providers and residents in new ways, although residents are not actively present in projects and are mobilised as rather homogeneous and rational 'contributors' who are enrolled in configurations in self-evident ways.

In organisational terms, both projects work through a coalition of political and private utility actors and investments with apparently different interests and competences. They manage to loosely coalesce and fuse around these sites, and push forward a collective agenda and objectives (perhaps around a need to reflexively manage and react to residential demand patterns). However, as we briefly saw, this is not without tensions, contradictions and conflicts that constrain how things are done.

Beyond this analysis about the 'smartness' of the Issy and Nice projects, we can identify other aspects that highlight what 'smart' produces or allows that might not otherwise be possible. In the smart grid project, smart promotes infrastructure transformation and socio-technical change by enabling the emergence of a local grid supported by local energy production and demand-side management to test or 'demonstrate' a degree of autonomy from 'distant' national infrastructure. Production and consumption are contiguously organised; and the possibilities of energy storage, home domotics and forecasting techniques allow for the partial recomposition of energy temporalities by anticipating when and how generation and demand can be best aligned. The production of visibility of flows is intended to engage residents in the creation of a more efficient system. Smart civic engagement here means reacting to signals to reduce or displace energy use temporally to benefit the whole community.

In the smart city initiatives, smart promotes institutional and organisational change as well as shifting urban materiality. It recasts relations between public and private actors, enabling mutual learning and alignment on overarching goals in some ways and at some times, but also (and crucially) maintaining and perhaps reinforcing the boundaries and distinctions between these actors, as when public authorities use smart to safeguard control over their domains of intervention. In this way, smart brings together but also reinforces boundaries in highly contingent ways. While there are pushes for systemic actions and panoptic views of urban functioning to facilitate efficiencies and optimisations, smart also raises reflective questions among some actors as to the significance and limits of collective public action in the city. It poses a fundamental ontological question about what a local authority should be and what it should provide for its citizens. For example, should data production, circulation and management support the

extension of intervention into new areas, or support the improvement of existing initiatives and policies, or be used to reduce the sphere of public action? While there are clear concerns over the extent to which knowledge, expertise and control is being given over to private interests, there is also an awareness of the possibilities of smart technology to reinforce the provision of 'public services' and to support the 'general interest', which is partly about creating the future digital heritage of a city.

Looking across both cities then and the difference that smart makes in their distinctive projects, we argue that for all the technological possibilities deployed, local authorities remain the crucial organisational cog in smart urban governance around which everything else turns. While their role is challenged and changed to some degree, their mandate for experimentation and for placing limits on this in keeping with strategic concern for capacity and control over infrastructure and public services means that smart urbanism here remains primarily a domain of public action and implementation.

Without wishing to engage in structured comparison between the very different 'smart grid' and 'smart city' initiatives, we can identify at least three areas of convergence. First, context and contingency matter to the shaping, evolution and implications of projects. Smart arrives or emerges in Issy and Nice for particular reasons, including previous experience and the presence of ICT actors. Near real-time technologically mediated flows and circulations are adjusted by local specificities in infrastructure and urban governance, and notably come up against the slower rhythms and different temporalities of urban planning and regulatory changes.

Second, the role of public authorities is changed but not necessarily diminished. Cultures of administration and of managing city operations are shifting, and public actors are engaging in learning processes as initiatives bring up issues of transversality, integration, transparency and responsibility. However, this might just reaffirm traditional values rather than promote innovation. Third, smart clearly transforms (and is transformed by) urban materiality, both as new artefacts and technologies (sensors, meters, grids) are inserted into the urban fabric and as buildings, networks and relations are made commensurate through the work of data production and circulation. Data interconnects and allows correspondence across time and space of things which are otherwise distinct and separated.

Thus, because it both works through and reworks these local contexts, cultures of administration and urban materiality, an overarching difference that smart makes is not to 'reduce' the city to a generic passive representation or a neutral site for external intervention (see also McNeill 2015). Any view of a one-size-fits-all smart city appears to be totally at odds with smart urban practice on the ground. There is arguably a process of increased urban differentiation where the interconnection of systems, data flows and digital platforms allows further distinctions to be made in monitoring relations, events and processes in the city (Picon 2015). Furthermore, in the two cases we have discussed, the perspective

of local residents – the diverse lived experience of these smart configurations – remains an unknown factor. It is either largely absent or else instrumental in character, with people rationally contributing to optimal system functioning. Who is involved in creating what kind of subjects of smart urbanism, and who is subjected to this process and in what ways remain crucial questions for further study (see Cowley *et al.* 2018).

Concluding reflections

In this chapter, we have studied how smart reconfigures urban processes and practices by looking at distinct initiatives in two French cities. We identified some of the differences that smart projects contribute to the ongoing constitution of infrastructural and organisational change. In doing so, we have made two main points. First, there is no one-size-fits-all smart city because the importance of urban context, public authority roles and ways of doing, and the materiality of the urban fabric all contribute to smart urban interventions. Second, there remains a crucial role for local authorities in smart urban governance as they promote experimentation and learning while drawing on visibilities engendered through smart to safeguard their own remits of action within shifting and uncertain public–private relations. We conclude here by reflecting briefly on the implications of smart urbanism with regard to long-term action in the context of continuing uncertainty and disorder.

A strangely underexplored question in smart urban analysis and practice is how smart configurations can be sustained, made durable and aged or future-proofed (Picon 2015). In some ways, as we have seen, these emerging, ongoing configurations may simply be a modest means to deal with infrastructure and organisation inertia, i.e. the strongly embedded materiality of the city and the entrenched ways of doing and managing processes. At the same time, we encountered configurations in Issy and Nice which appear to be assembling elements and components of both reversibility and irreversibility with regard to future pathway possibilities. Testing or experimenting with materials and relations involves significant resources, effort and investment, and leaves traces. They also seek to avoid becoming tied to single choices or possibilities that would create dependence on specific obligatory points of passage, whether a particular technology, company or contract (see Söderström *et al.* 2014). There is a need to develop a more reflexive mode of governance with constant feedback processes to safeguard at least to some degree future possibilities of action in an uncertain world (Callon *et al.* 2001).

This flexibility may well be both a strength and limitation of smart configurations more generally (see also Halpern *et al.* 2013). It enables a useful context of experimentation and learning; but what is produced beyond this remains unclear as the conditions for creating and sustaining more meaningful, widespread, upscaled or long-term actions continue to be elusive. This is neatly illustrated by the recurrent difficulties in Nice as to how to contractualise uncertainty, i.e. how

to involve private actors in local innovation without guarantees as to results and implications. Projects only get so far before reaching critical junctures that prove to be impassable. In some ways, the idea of 'the city of permanent experiments' (Karvonen 2018) is sustained in the French administrative/governance context through a continuing basic need to demonstrate concrete action and productive results to justify work and to use public sector resources to demonstrate the lasting quality and sustainability of government action.

This can be read as an enduring (and perhaps understandable) inability of practitioners to be able to deal with contingency in and of the city. The smooth, rational and uncomplicated urban future of many smart city visions always ends up colliding with the disorder, clutter and muddling through of the actually existing urban (Robins 1999, Cugurullo 2018). One tendency has been to try obstinately to simplify the context of intervention, to erase any distinctiveness in the urban environment and to create a flat, generic plane to optimise project roll-out. This is fundamentally at odds with the nature of smart and what it allows, and antithetical to any basic view of what the city is and how it functions and is experienced. Smart offers new and multiple perspectives or viewpoints on city operations and events which were usually not possible or visible previously (Greenfield 2017). What is needed therefore is urban policy for, or aggregating the potentials of, these multiple happenings. Smart urbanism demands to be incarnated and enacted through fleshy embodiment, incorporation and interaction between the jumbled mix of peoples, communities, ideas and things which are the very social and political basis of urban life and which form the material conditions of possibility of urban change. Far from 'clearing up' the mess of the urban through technology, smart interventions could amplify the inherent disorder, difference and discordance of the city through reconfigurations that are visible and traceable, but also allow debate and contestation over the many modalities and implications of 'improving' urban functioning and experience.

Notes

1 See also Le Monde's smart cities pages and annual prize for urban innovation (www.lemonde.fr/smart-cities/).
2 These are Alstom, Bouygues Immobilier (lead partner), Bouygues Energies & Services, Bouygues Telecom, EDF, ERDF, Microsoft, Schneider Electric, Steria and Total.
3 Nice Côte d'Azur Metropolis is an intermunicipal group of 49 local authorities in the Nice region with broad powers in the fields of urban planning, economic development and the environment.
4 On the origins of IBM's Smarter Cities initiative, see McNeill (2015).
5 The stated objectives include better resource allocation, improved quality of services and economic development. These have not been fully translated into more concrete operational goals.
6 This fits with Söderström and colleagues' (2014) view of how IBM has usually worked with municipalities, by constructing urban problems that their technologies and platforms can help resolve or render more manageable.

References

Caisse des Dépôts. (2016). *Guide: 'Smart City versus Stupid Village'*. Paris: Caisse des Dépôts.

Callon, M., Lascoumes, P. and Barthe, Y. (2001). *Agir dans un Monde Incertain: Essai sur la Democratie Technique*. Paris: Seuil.

CGDD. (2012). *La ville intelligente: état des lieux et perspectives en France*. Paris: CGDD.

Cowley, R., Joss, S. and Dayot, Y. (2018). The smart city and its publics: insights from across six UK cities. *Urban Research & Practice 11*: 53–77.

Cugurullo, F. (2018). Exposing smart cities and eco-cities: Frankenstein urbanism and the sustainability challenges of the experimental city. *Environment and Planning A: Economy and Space 50*: 73–92.

Danielou, J. and Ménard, F. (2013). *L'art d'augmenter les villes: (pour) une enquête sur la ville intelligente*. La Défense: PUCA (MEDDE).

ERDF. (2011). *Repères et enjeux de la distribution d'électricité: dialogue avec ERDF (séminaire du 8 juin 2011)*. Paris: ERDF.

Graham, S. and Marvin, S. (1996). *Telecommunications and the City: Electronic Spaces, Urban Places*. London: Routledge.

Greenfield, A. (2017). *Radical Technologies: The Design of Everyday Life*. London: Verso.

Halpern, O., LeCavalier, J., Calvillo, N. and Pietsch, W. (2013). Test-bed urbanism. *Public Culture 25*: 272–306.

Hidalgo, A. (2014). *Paris qui ose: mon projet pour Paris 2014–2020*. Paris: Mairie de Paris.

Hollands, R. (2008). Will the real smart city please stand up? *City 12*: 303–320.

IssyGrid (2016). *IssyGrid premier smart grid de quartier opérationnel en France (dossier de presse)*. Issy-les-Moulineaux: IssyGrid Project.

IssyGrid project (n.d.). *IssyGrid website*. [Online]. Available: http://issygrid.com [Last accessed 18 September 2017].

Karvonen, A. (2018). The city of permanent experiments? In B. Turnheim, P. Kivimaa and F. Berkhout (eds), *Innovating Climate Governance: Moving Beyond Experiments,* Cambridge: Cambridge University Press, 201–215.

Karvonen, A. and van Heur, B. (2014). Urban laboratories: experiments in reworking cities. *International Journal of Urban and Regional Research 38*: 379–392.

Kitchin, R. (2014). The real-time city? big data and smart urbanism. *GeoJournal 79*: 1–14.

Kitchin, R. (2015). Making sense of smart cities: addressing present shortcomings. *Cambridge Journal of Regions, Economy and Society 8*: 131–136.

Lelong, J. (2016). IssyGrid: une expérimentation à l'échelle d'un quartier. *La Gazette des Communes* (21 March): 52–53.

Luque, A. and Marvin, S. (2015). Developing a critical understanding of smart urbanism?. *Urban Studies 52*: 2105–2116.

McLean, A., Bulkeley, H. and Crang, M. (2016). Negotiating the urban smart grid: socio-technical experimentation in the city of Austin. *Urban Studies 53*: 3246–3263.

McNeill, D. (2015). Global firms and smart technologies: IBM and the reduction of cities. *Transactions of the Institute of British Geographers 40*: 562–574.

Mattelart, A. (1999). Mapping modernity: utopia and communications networks. In D. Cosgrove (ed.), *Mappings*. London: Reaktion, 169–192.

Métropole Nice Côte d'Azur (2013). *Smart and Sustainable Metropolis, 2013–2015*. Nice: Métropole Nice Côte d'Azur.

Métropole Nice Côte d'Azur (2016). *Environmental Urban Monitoring*. June 2016 report. Nice: Métropole Nice Côte d'Azur.

Michael, M. (2009). The cell-phone-in-the-countryside: on some ironic spatialities of technonature. In D. White and C. Wilbert (eds), *Technonatures*. Waterloo, Ont.: Wilfrid Laurier University Press, 87–107.

Murdock, G. (1993). Communications and the constitution of modernity. *Media, Culture and Society 15*: 521–539.

Petrucci, M. (2017). IssyGrid, le premier smart grid français, atteint la maturité. [Online]. Available: http://les-smartgrids.fr/issygrid-premier-smart-francais/ [Last accessed 18 September 2017].

Picon, A. (2015). *Smart Cities: A Spatialised Intelligence*. Chichester: Wiley.

Plantin, J.-C., Lagoze, C., Edwards, P. and Sandvig, C. (2018). Infrastructure studies meet platform studies in the age of Google and Facebook. *New Media and Society 20:* 293–310.

Robins, K. (1999). Foreclosing on the city? The bad idea of virtual urbanism. In J. Downey and J. McGuigan (eds), *Technocities*. London: Sage, 34–59.

Shelton, T., Zook, M. and Wiig, A. (2015). The 'actually existing smart city'. *Cambridge Journal of Regions, Economy and Society 8*: 13–25.

Söderström, O., Paasche, T. and Klauser, F. (2014). Smart cities as corporate storytelling. *City 18*: 307–320.

Viitanen, J. and Kingston, R. (2014). Smart cities and green growth: outsourcing democratic and environmental resilience to the global technology sector. *Environment and Planning A: Economy and Space 46*: 803–819.

Ville d'Issy-les-Moulineaux (2015). *Digital Fort's Eco-District: From a 19th Century Military Building to a District Showcasing the Metropolis of the Future*. Issy-les-Moulineaux: Ville d'Issy-les-Moulineaux.

Ville d'Issy-les-Moulineaux (n.d.). *IssyGrid: 1er réseau de quartier intelligent en France*. [Online]. Available: http://www.issy.com/issygrid [Last accessed 18 September 2017].

10

THE TRANSNATIONAL SMART CITY AS URBAN ECO-MODERNISATION

The case of Masdar City in Abu Dhabi

Federico Cugurullo and Davide Ponzini

Introduction

This chapter explores the incarnation of the smart city ideal in the context of Abu Dhabi, the capital of the United Arab Emirates (UAE), focusing in particular on a new high-tech urban project: Masdar City. The aim of the chapter, based on field research over a three-year period (2010–2012), is to explain the rationale behind the development of Masdar City in relation to the politico-economic development of Abu Dhabi. In this sense, the protagonist of the chapter is not Masdar City, but Abu Dhabi; and this is where the narrative underpinning the following sections starts. However, before proceeding further, there are two important preliminary considerations to take into account regarding where Masdar City stands from an ideological and spatial perspective.

Masdar City between labels and reality

This chapter seeks to illuminate one of the most controversial aspects of smart city developments: the difference between the label and the materiality of the project; or, in other words, between what the project has been called and what has actually been implemented. Masdar City is a new settlement which has been under development in Abu Dhabi since 2007, under the aegis of the Masdar Initiative, a public company controlled by the government of Abu Dhabi. In ten years, the Emirati project has been promoted, described and characterised in a variety of ways. Originally, the project was labelled by its developers as an 'eco-city', and later it was rebranded as a 'zero-carbon city.' When, in 2010, the developers realised that the complete decarbonisation of the settlement was impossible, the official label of Masdar City became 'low-carbon city'. Then, between 2013 and 2015, when the Emirati project was heavily criticised for its

scarce environmental performance and its unecological inclination, the Masdar Initiative stopped referring to its creation as an eco-city and began to use the expression 'smart city' – which, at that time, was growing in popularity and carried less emphasis on sustainability. More recently, following the hyper-popularisation of the concept of smart city, the Masdar Initiative seems to have readopted the original 2007 moniker and is now promoting Masdar City as the first and best eco-city in the world (Masdar Initiative 2017).

What this carousel of labels reveals is not the shifting nature of the project, but rather the shifting nature of the discourses surrounding it, and how the public narrative has been morphing accordingly. As shown in a number of studies, the implementation and evolution of Masdar City has been, in practice, fairly linear (see Caprotti and Romanowicz 2013, Crot 2013, Cugurullo 2013a, 2016a, 2016b, 2017a, Caprotti 2016, Evans *et al.* 2016). Of course, in ten years, the physical shape of the city has changed along with the masterplan, in order to address a number of contextual challenges such as the 2008 credit crunch and the Arab Spring in 2010 (see Cugurullo 2016a). When the financial crisis hit the global economy, for example, the scale of the Masdarian autonomous transport system was considerably reduced. However, the Masdar City project has not undergone any fundamental changes to justify a completely new label.

Discourses have changed, largely for financial reasons, in order to better promote what, as we will see, is essentially an urban space employed as an engine of economic growth (see Burton *et al.* this volume). These are discourses which, in pure Foucauldian fashion, construct *truths* to support specific sets of power relationships instead of capturing the essence of things. On these terms, as we will observe in the remainder of the chapter, the power gravitating towards Masdar City is, first, political and economic, and, second, transnational in nature. It is the political power of the local elite, which is maintained in Emirati society by means of the economic power of its rulers, as well as the economic power of the multinationals running the Masdarian businesses. The preservation of these powers is what defines the structure, design and mechanics of Masdar City, whose many labels have never reflected its actual ecological performance (as an alleged eco-city) or the intelligence of its infrastructure and governance (as an alleged smart city). These labels have been formulated to be appealing to a diverse pool of potential investors (mostly cleantech companies) and clients (see Masdar Initiative 2018). For these reasons, the process of (re)labelling, which has characterised Masdar City since its inception, leads us to our first consideration: there is not always a direct correlation between the label 'smart city' and the actually existing urban space to which that label is attached. The very term 'smart' appears to be fuzzy and, as such, loosely connected to politico-economic agendas which exist a priori.

Masdar City is in and out of Abu Dhabi

From a spatial point of view, Masdar City is located in Abu Dhabi's territory and is therefore influenced by its politics, economy, culture, climate and morphology.

However, if we analyse the project from different geographical perspectives, its origin, metabolism and impact go far beyond the boundaries of the emirate. From an ideological point of view, for instance, the key ideas behind the architecture, the technology and the design of Masdar City have been shaped by international experts and companies – such as Foster + Partners (2007), Arup and Mitsubishi – responsible for the formation of what appears to be 'a fairly uniform and consistent set of ideas for enhancing the sustainability of urban development' (Rapoport 2015: 113). These ideas and sets of knowledge originate from different spaces and experience a multitude of incarnations whose specifics differ in relation to the spaces where they eventually land (Rapoport and Hult 2017). This is particularly evident in the case of Abu Dhabi, whose context, as discussed in the following section, is inherently transnational and, as such, heavily exposed to the influence of external forces (Kolo 2016). This does not mean, of course, that Abu Dhabi is just a blank canvas that only absorbs overseas inputs. In terms of expertise in urban development, urban design and architecture, for example, Abu Dhabi (like many other cities in the Gulf) is not just the destination of urban ideals, policies, projects and technologies, but also their origin (Molotch and Ponzini forthcoming).

If we approach the study of Masdar City with a focus on supply chains, then Abu Dhabi can be seen as a node within a much broader international network. The majority of the physical resources that are used to build the new city, such as metals, plastics and minerals, do not originate in Abu Dhabi. An example of this condition is coltan (short for columbite-tantalite), an ore used to construct a plethora of smart technologies, which, as noted by Kaika (2017: 90), comes largely 'from the Democratic Republic of Congo, and is mined by hand under what the UN repeatedly reports to be a highly organized and systematic exploitation of both local nature and local people' (see also Moran *et al.* 2015). Similarly, the labour working on the implementation of the project consists mostly of foreign workers originally from Bangladesh, Pakistan, India and the Philippines. In this sense, we must consider the fact that the socio-environmental impact of Masdar City has a transnational scale which cannot be ignored if one wants to evaluate the project, particularly from an urban sustainability point of view.

Abu Dhabi as a transnational context

From an urban perspective, Abu Dhabi, the capital city of the UAE and the context of the Masdar City project, has a strong transnational character. Until the discovery of immense oil and gas reserves, Abu Dhabi was a small village whose economy was based on fishing and pearl diving. Soon after the creation of the UAE (a federation of seven emirates) in 1971, a series of projects targeting modernisation started, leading to the demolition of most of the original settlement and the implementation of infrastructural plans and land-use schemes based on Western urban models. The population doubled between 1986 and 2005 due to a massive influx of foreign workers. The current population of Abu Dhabi is

about 3 million, and what was a fishing village is now a metropolis. Such fast-paced development has been fuelled largely by waves of migration of temporary workers, who now comprise the majority of the population (almost 90 per cent of which are international migrants). Speed is also relevant in terms of how long people tend to stay in Abu Dhabi, as immigrants typically leave the country after only a few years of work, having received salaries which are typically higher than those in their country of origin.

Until 2004, the founding father of the UAE, Sheikh Zayed bin Sultan Al Nahyan, led the country and its infrastructural modernisation, opening his country to globalisation. The openness towards Western economies and business models dramatically accelerated after his son, Sheikh Khalifa bin Zayed Al Nahyan, became the new ruler. Beginning in 2005, a wave of reforms in real-estate regulation introduced new rights for non-Emirati individuals and companies. A partial liberalisation welcomed an influx of foreign investments that favoured a large urban expansion. In less than two decades, urbanisation changed the landscape and regional organisation of the emirate, in conjunction with the even faster growth of Dubai's urban infrastructure – e.g. the gigantic Jebel Ali port, which is positioned near Abu Dhabi's border and has become an economic magnet for the region (Ramos 2016, Akhavan 2017).

The focus of the government of Abu Dhabi has often been on flashy mega-projects such as museums, resorts and financial districts, with little or no attention to the basic housing needs of the low-income share of the population or the lower middle class (Ponzini and Nastasi 2016). An example of this line of planning is the Louvre Abu Dhabi, a 24,000-square metre museum built in 2017 to showcase art from around the world and costing more than €600 million (Louvre Abu Dhabi 2018). Such an approach to urban development has been facilitated by the local policy context. Political power and economic resources are in the hands of a close-knit network of decision-makers and developers, facilitating fast-track governance which, in turn, speeds up the approval of large development projects (Ponzini 2011).

However, despite this apparent positive trend, the economic and urban growth of Abu Dhabi is now hindered by a series of obstacles. First, Abu Dhabi's economy is largely based on oil which, as a finite resource, poses pressing questions about the sustainability of the regional economic system. In addition, the emirate is characterised by a strong consumerist culture and an energy-intensive lifestyle that put pressure on its limited amount of natural resources, such as fresh water, which is scarce in the entire region (Luomi 2009, Molotch forthcoming). This situation, together with the rapid urbanisation discussed above, has led local policy-makers to revise not simply the economy of Abu Dhabi but also how development (and urban development in particular) is understood and practised. These are concerns which, of course, go well beyond economic and environmental rationales. Similar to most sultanistic regimes, the political stability of the country and the power of the royal family are based on strong welfare systems providing constant rewards to the local population (Linz and Stepan 1996).

However, such gilded cages are expensive to maintain and require a solid economy, which is what Abu Dhabi will lack when its oil reserves begin to show their limits (Cugurullo 2016a). It is in this politico-economic context that, in 2008, Abu Dhabi released a new large-scale agenda called Economic Vision 2030, meant to coordinate a set of plans and policies for the economic redevelopment of the region. Although it includes a series of principles regarding institutional transparency, private sector empowerment, sustainability, welfare and public infrastructure development, the explicit target is economic diversification. This objective has been pursued mainly by cultivating alternative sectors of the economy, such as cleantech: an industry based in part on the research, development and commercialisation of smart technologies.

This new economic vision has interacted with local urban expansion strategies. In 2008, an international team launched the Urban Structure Framework Plan in order to sustainably develop the city until 2030 (Samarrai 2016). Some of the policies included in the vision were derived from the experiences of other cities, but their implementation was carried out mostly by local organisations (Ponzini 2011, 2013). From an urban sustainability perspective, ideas and policies were derived, in part from the experience of Vancouver (Canada), which local policy-makers identified as a model of best practice (Khirfan and Jaffer 2014). Emblematic is the case of Vancouver's former Director of Planning, Larry Beasley, who became special advisor to the Crown Prince on matters of urban policy and sustainability.

The chapter now switches the scale of enquiry, moving the discussion to a single urban project, Masdar City, to examine how Abu Dhabi's new strategies of economic diversification (which, as we have seen, find in cleantech one of the main foci) have been rolled out via urbanisation.

Masdar City as urban eco-modernisation

Masdar City is a new master-planned settlement which the government of Abu Dhabi is building from scratch in a previously undeveloped area of the emirate. Once the project is fully implemented, Masdar City will cover an area of 6 square kilometres and is expected to host a population of 50,000 residents and 60,000 daily commuters. Although promoted as a city, as **Figure 10.1** shows, this alleged smart eco-city is technically a district. While detached from the main population centres of Abu Dhabi, it remains a segment of its urban fabric and, as such, part of a broader city rather than an independent urban cell.

At the time of writing, the Emirati vision is far from being realised. Although despite the delays caused by the recent global financial crisis, the construction of the district has never stopped (**Figure 10.2** and **Figure 10.3**), from a social point of view the project has been a failure. Fewer than 500 people actually live in Masdar City: a clear sign that, as we will see in the remainder of the chapter, smart technologies alone cannot sustain urban living. On these terms, the social plague that is affecting the new Emirati settlement is part of a broader disease

FIGURE 10.1 Map of Masdar City.
Source: Transnational Architecture and Urbanism research unit, Politecnico di Milano.

FIGURE 10.2 Masdar City in April 2018 – southwest side. As the picture shows, the new district is growing in an area which is detached from the other districts of Abu Dhabi, and is not ecologically sterile as many might think.
Source: Gianfranco Serra Photography.

FIGURE 10.3 Masdar City in April 2018 – north side.
Source: Gianfranco Serra Photography.

which, especially in recent years, has been contaminating a number of master-planned cities developed under the 'eco' and 'smart' banners: new cities built from scratch as quickly as possible and then filled with clean technologies, with scarce social concerns (Cugurullo 2016c). As noted by Caprotti (2014a: 15), these are built environments which not only lack social resilience, and are therefore prone to be shocked by social, environmental and economic crises. They are also 'empty infrastructural containers waiting for an influx of residents', where a community is hard to form in the first place (see also Günel forthcoming).

The reasons why the new city has experienced such poor social performance are directly connected to its geographical context: Abu Dhabi. As discussed in the previous section, through Economic Vision 2030, the emirate is undergoing a phase of transition from an oil-based economy to an economic architecture made of sectors that are less dependent upon petroleum. In this sense, the political economy of Abu Dhabi has been steered towards what is commonly called a 'green economy', and the cleantech industry is one of its main foci. Urbanisation has become a medium to achieve this transition, and Masdar City is but a gear in this broader politico-economic machine.

The new city is being used as a testbed for the development of new smart-clean technologies – such as concentrated solar power stations, smart grids and autonomous transport systems – which are integrated in Masdar City, thereby becoming part of its structure. This is why large international companies like Siemens, Mitsubishi and Schneider Electric have forged a partnership with the Masdar Initiative, opening new laboratories and offices in the new city. The city itself can be seen as a large-scale outdoor laboratory where companies working in cleantech can experiment with new products before commercialising them.

Eventually, once the new technology becomes a commodity and is sold, the Masdar Initiative and, therefore, Abu Dhabi receive a share of the revenue, ranging from 30 to 60 per cent (see also Cugurullo 2013a, 2013b, 2017a).

The rhetoric through which this type of economic-urban development has been pushed forward resonates with the ideology of ecological modernisation. As explained by Whitehead (2007: 34), ecological modernisation – often referred to as 'eco-modernisation' – is a Western typology of development, based on the idea of 'making business sense out of sustainability.' Modernisation has always been at the core of capitalist strategies of economic growth. In order to keep selling their products, private companies need to constantly reinvent them and keep them attractive, with new designs and features that promise better performance. A classic example of this phenomenon is the escalation of iPhone models that Apple has been pushing forward for over a decade. The American multinational technology company would not survive if the sales of its products, such as smartphones, stopped. Therefore, it has to regularly modernise them, keeping their features state of the art so as to make them appealing to new customers and, above all, to existing customers who, by seeing their iPhone as an obsolete device, are stimulated to buy the newest model. Eco-modernisation takes the same rationale and makes it ecologically friendly, claiming that economic growth (particularly via production and consumption) and environmental preservation can go hand in hand and support one another (Harvey 1996, Andersen and Massa 2000, Rapoport 2014, Cugurullo 2017b).

In the case of Masdar City, this rationale is put into practice by means of the development and sale of smart technologies designed to decrease the environmental impact of cities. Via Masdar City, Abu Dhabi is embracing a typical Western business model: an attitude which, as we saw earlier in the chapter, is common practice in the emirate. The peculiarity here lies in the fact that the process of modernisation through which new smart-clean technologies are researched, developed, tested and then sold is rolled out by building a city and, on these terms, we refer to it as *urban eco-modernisation* (see Cugurullo 2016a). This urban phenomenon can indeed lead to a type of economic growth linked to positive environmental externalities, such as the reduction of the carbon emissions produced by cities. Nonetheless, there are some critical issues to consider.

The first problem concerns the nature of the economic and environmental benefits that Masdar City's urban eco-modernisation is generating. The smart technologies produced and sold in Masdar City focus on the reduction of urban carbon emissions. This focus is the outcome of precise market analyses indicating that this typology of products is now in demand. As also noted by Swyngedouw (2010), because of the popularisation of climate change discourses, CO_2 has been identified as the culprit responsible for the disorder of our weather systems and, as such, the international enemy to defeat. The Masdarian technology targets precisely the annihilation of this 'enemy'. However, in so doing, it promotes an urbanism which completely ignores the remainder of the spectrum of ecological problems that cities experience today. It is scientifically established that

urban carbon emissions contribute, to some extent, to climate change; but it is also equally established that there is a plethora of other urgent environmental issues caused by urbanisation, such as loss of natural habitats, water scarcity and, in essence, the disruption (and often destruction) of ecosystems and ecosystem services (Bulkeley and Castán Broto 2013, Castán Broto and Bulkeley 2013). In this sense, the case of China exemplifies the ecological havoc that an urbanism implemented without drawing upon the insights of ecology can cause. The urban population of China reached 51.3 per cent in 2011, an unprecedented urban growth whose price was the loss of approximately a quarter of all the country's forest and water coverage (He *et al.* 2014, Li *et al.* 2015).

Seen from this perspective, the environmental contribution of Masdar City towards issues of sustainability is relatively scarce, and so is its distribution. In terms of housing, the clean, low-carbon built environment of the new district is designed to accommodate an elite composed of high-income workers, and little or no space is reserved for those at the low end of the socio-economic spectrum (see also Caprotti 2014b, Cugurullo 2017a). An average one-bedroom apartment (65 square metres) in Masdar City, for example, costs over €185,000; meanwhile the majority of the population, consisting of low-income foreign workers, today earns an average salary of €220 per month and, despite working 12 hours a day, seven days a week, is forced to share hyper-crowed flats. Common in Abu Dhabi are stories of large groups of people (over 40 men) sharing a three-bedroom flat due to the country's lack of affordable housing (Ahmad 2016). The same unevenness applies to the economic benefits that the Masdarian business generates. All the money that the sale of smart technologies brings to the new district immediately leaves the settlement to feed into the local and, ultimately, elitist economic system discussed in the previous section, and into the portfolio of the business partners of the Masdar Initiative. In so doing, it reinforces the economic power of a small minority, and reproduces and sharpens the typical issues of inequality that we find in capitalist systems: in Masdar City, *smart* is not for everybody.

The second problem is connected to the supply chains underpinning the implementation of the Masdar City project. As noted earlier, Abu Dhabi is a node within complex economic and socio-environmental systems, and so is Masdar City. Given that the practice of urban eco-modernisation requires the constant production of new technologies, Masdar City needs to extract a wide range of resources (such as metals and minerals) to build its smart devices, and to use large quantities of oil and gas to generate the energy necessary to power the processes of production and distribution. As emphasised by several critics of the practice of ecological modernisation, the environmental costs of these processes are enormous (Foster 2002, Pepper 1998). The process of extraction, for instance, not only destabilises ecosystems and reduces the stock of resources of the planet. It is also carbon intensive, and adds to the carbon emissions that are produced when materials become ingredients to create products and products become commodities which are distributed around the world. Third, the focus of urban eco-modernisation strategies is on the *economic* and (partly) on the *environmental* and,

as a result, little or no attention is paid to the *social*. This is one of the most important dimensions of cities, and its disregard inevitably prevents the formation of an urban community. Instead, the outcome is a soulless city or, in the words of Augé (2008), a 'non-place': a space bereft of identity and social relations, and plagued by an extremely weak or inexistent society (see also Palermo and Ponzini 2015)

Conclusions: Masdar City is not a (smart) city

This chapter has explored the genesis and development of Masdar City in relation to Abu Dhabi's politico-economic context. The origin of the new settlement lies in a specific regional programme of economic diversification, targeting the development of a post-oil economy. More specifically, the aim of the political economy of Abu Dhabi is the cultivation of a cleantech sector based on the development and sale of smart technologies such as smart grids, autonomous transport systems and concentrated solar power stations. In this context, Masdar City is an instrument in the hands of the local government, employed to realise the new economic vision of Abu Dhabi. What is actually a new district, rather than a new city, is being used as a living laboratory. Here, several multinationals working in cleantech develop, test and commercialise state-of-the-art technology, eventually sharing part of the profit with the Masdar Initiative and the government of Abu Dhabi.

In this sense, the origins of Masdar City are deeply rooted in the geographical location where its construction has taken place. However, this chapter has also shown that the project has several translational sides. Many of the ideas behind the design and architecture of the new city, for example, originate in international networks of experts. In a similar vein, a large portion of the labour and materials that have been used to build Masdar City comes from transnational supply chains which have a transnational socio-environmental impact. More specifically, the chapter has emphasised how the dual local/transnational character of the project resonates, in theory and practice, with the logic of *urban eco-modernisation*. The development of Masdar City is carried out in sync with the development and commercialisation of smart technologies designed to reduce the environmental impact of urban settlements. However, the environmental performance of the new district is tailored to fit the business interests of a small elite while ignoring those ecological issues that cannot be easily monetised. In addition, to paraphrase Whitehead (2007), the developers' stress on making business sense out of sustainability by selling smart technology has led them to ignore basic social aspects of urban living. As a result, Masdar City has grown without a community, thereby becoming what Augé would call a 'non-place'.

In conclusion, the analysis of the case of Masdar City in Abu Dhabi raises a series of critical questions regarding the *scale* of so-called smart cities. First, when we look at the city and the region where Masdar City is located, the scale of the project covers only a small portion of territory. The new district is a relatively small settlement and, as such, the benefits that its smart technologies generate have a limited range. As we have seen, Abu Dhabi is undergoing rapid

and large-scale urbanisation, and the implementation of the Masdar City project counts only for a fraction of it. Therefore, there is a clear discrepancy between the scale of urbanisation and the scale of *smart* urbanisation. This means that, overall, the advantages of smart urban technologies influence only a minority of the built environment and a minority of the population. Moreover, in qualitative terms, the case of Masdar City shows that this new high-tech development does not target some of the basic and most crucial urban issues experienced by Abu Dhabi, such as a shortage of affordable housing for low-income workers and the lower middle class. In this sense then, there is also a discrepancy between the targets of smart urbanisation and what the broader urban region is lacking.

Second, there is the issue of *scaling up*. Even if the government of Abu Dhabi wanted to use Masdar City to test a new model of city-making, with the idea of exporting it in the future to the rest of the UAE and beyond, we argue that this is not an urbanism which can be easily scaled up. Having been formulated for a new settlement, the Masdarian model requires a *tabula rasa* in order to be put into practice, and this is not a condition which existing urban spaces can easily offer. In addition, the new district's sky-high costs per square metre, largely due to the very expensive technology that permeates the built environment, makes the scaling up of the Masdar City project unfeasible even for a rich state such as Abu Dhabi.

Finally, from a sustainability point of view, it is important to compare the scale of global socio-environmental issues with the scale of the solutions that smart urbanisation offers (Cugurullo forthcoming). On the one hand, we have what in the literature are increasingly being referred to as 'super wicked problems' (Levin *et al*. 2012): issues such as global climate change, whose scale of complexity and impact is such that most smart city solutions would turn out to be simplistic and, ultimately, ineffective. On the other hand, we have urban projects like Masdar City, which have a very narrow environmental focus and tackle only carbon emissions via clean technology. The lacuna is evident. Moreover, with their simple and positive narrative of technological salvation, smart city projects risk distracting public attention from the complexity of large-scale socio-environmental problems such as climate change, resource scarcity, social injustice and the deterioration of natural habitats, thereby preventing the formation of any collective action against them. We should not forget that, at the very core of smart urbanisation, lies a transnational capitalist machine of production and consumption (of technology); and, by fuelling it, alleged smart cities will only exacerbate the same problems that they claim to be solving.

References

Ahmad, A. (2016). Crackdowns on room-sharing in Abu Dhabi not deterring labourers. [Online]. Available: www.thenational.ae/uae/crackdowns-on-room-sharing-in-abu-dhabi-not-deterring-labourers-1.158785 [Last accessed 12 February 2018].

Akhavan, M. (2017). Development dynamics of port-cities interface in the Arab Middle Eastern world: the case of Dubai global hub port-city. *Cities 60*: 343–352.

Andersen, M.S. and Massa, I. (2000). Ecological modernization: origins, dilemmas and future directions. *Journal of Environmental Policy & Planning 2*: 337–345.

Augé, M. (2008). *Non-Places: An Introduction to Supermodernity*. London: Verso.

Bulkeley, H. and Castán Broto, V. (2013). Government by experiment? Global cities and the governing of climate change. *Transactions of the Institute of British Geographers 38*: 361–375.

Caprotti, F. (2014a). Critical research on eco-cities? A walk through the Sino-Singapore Tianjin Eco-City, China. *Cities 36*: 10–17.

Caprotti, F. (2014b). Eco-urbanism and the eco-city, or, denying the right to the city? *Antipode 46*: 1285–1303.

Caprotti, F. (2016). *Eco-Cities and the Transition to Low Carbon Economies*. London: Palgrave Macmillan.

Caprotti, F. and Romanowicz, J. (2013). Thermal eco-cities: green building and urban thermal metabolism. *International Journal of Urban and Regional Research 37*: 1949–1967.

Castán Broto, V. and Bulkeley, H. (2013). A survey of urban climate change experiments in 100 cities. *Global Environmental Change 23*: 92–102.

Crot, L. (2013). Planning for sustainability in non-democratic polities: the case of Masdar City. *Urban Studies 50*: 2809–2825.

Cugurullo, F. (2013a). How to build a sandcastle: an analysis of the genesis and development of Masdar City. *Journal of Urban Technology 20*: 23–37.

Cugurullo, F. (2013b). The business of Utopia: Estidama and the road to the sustainable city. *Utopian Studies 24*: 66–88.

Cugurullo, F. (2016a). Urban eco-modernisation and the policy context of new eco-city projects: where Masdar City fails and why. *Urban Studies 53*: 2417–2433.

Cugurullo, F. (2016b). Speed kills: fast urbanism and endangered sustainability in the Masdar City project. In A. Datta and A. Shaban (eds), *Mega-Urbanization in the Global South: Fast Cities and New Urban Utopias of the Postcolonial State*. London: Routledge, 78–92.

Cugurullo, F. (2016c). Frankenstein cities. In J. Evans, A. Karvonen and R. Raven (eds), *The Experimental City*. London: Routledge, 195–204.

Cugurullo, F. (2017a). Exposing smart cities and eco-cities: Frankenstein urbanism and the sustainability challenges of the experimental city. *Environmental and Planning A: Economy and Space 50*: 73–92.

Cugurullo, F. (2017b). The story does not remain the same: multi-scalar perspectives on sustainable urban development in Asia and Hong Kong. In F. Caprotti and L. Yu (eds), *Sustainable Cities in Asia*. London: Routledge, 43–51.

Cugurullo, F. (forthcoming). *The Urban Equation: Formulas for Sustainable Smart and Eco-Cities*. London: Routledge.

Evans, J., Schliwa, G. and Luke, K. (2016). The glorious failure of the experimental city: cautionary tales from Arcosanti and Masdar City. In J. Evans, A. Karvonen and R. Raven (eds), *The Experimental City*. London: Routledge, 218–235.

Foster, J.B. (2002). *Ecology Against Capitalism*. New York: Monthly Review Press.

Foster + Partners. (2007). Masdar development [Online]. Available: www.fosterandpartners.com/projects/masdar-development/ [Last accessed 12 February 2018].

Günel, G. (forthcoming). *Spaceship in the Desert: Energy, Climate Change and Urban Design in Abu Dhabi*. Durham, NC: Duke University Press.

Harvey, D. (1996). *Justice, Nature, and the Geography of Difference*. Malden: Blackwell.

He, C., Liu, Z., Tian, J. and Ma, Q. (2014). Urban expansion dynamics and natural habitat loss in China: a multiscale landscape perspective. *Global Change Biology 20*: 2886–2902.

Kaika, M. (2017). 'Don't call me resilient again!' The new urban agenda as immunology … or what happens when communities refuse to be vaccinated with 'smart cities' and indicators. *Environment and Urbanization 29*: 89–102.

Khirfan, L. and Jaffer, Z. (2014). Sustainable urbanism in Abu Dhabi: transferring the Vancouver model. *Journal of Urban Affairs 36*: 482–502.

Kolo, J. (2016). Accidental or envisioned cities: a comparative analysis of Abu Dhabi and Dubai. In G. Katodrytis and S. Sharmeen (eds), *Gulf Cities as Interfaces*. Cambridge: Gulf Research Centre, 161–180.

Levin, K., Cashore, B., Bernstein, S. and Auld, G. (2012). Overcoming the tragedy of super wicked problems: constraining our future selves to ameliorate global climate change. *Policy Sciences 45*: 123–152.

Li, H., Wei, Y.D., Liao, F.H. and Huang, Z. (2015). Administrative hierarchy and urban land expansion in transitional China. *Applied Geography 56*: 177–186.

Linz, J.J. and Stepan, A. (1996). *Problems of Democratic Transition and Consolidation: Southern Europe, South America, and Post-Communist Europe*. Baltimore: Johns Hopkins University Press.

Louvre Abu Dhabi. (2018). Our story. [Online]. Available: www.louvreabudhabi.ae/en/about-us/our-story [Last accessed 12 February 2018].

Luomi, M. (2009). Abu Dhabi's alternative-energy initiatives: seizing climate-change opportunities. *Middle East Policy 16*: 102–117.

Masdar Initiative. (2017). About Masdar City [Online]. Available: www.masdar.ae/en/masdar-city/detail/About-Masdar-City [Last accessed 12 February 2018].

Masdar Initiative. (2018). Want to become a Masdar City client? [Online]. Available: www.masdarcityfreezone.com/why-masdar/want-to-become-a-masdar-city-client [Last accessed 12 February 2018].

Molotch, H. (forthcoming). Consuming Abu Dhabi. In H. Molotch and D. Ponzini (eds), *Learning from Gulf Cities: Urbanization in and from the Arabian Peninsula*, New York: New York University Press.

Molotch, H. and Ponzini, D. (eds) (forthcoming). *Learning from Gulf Cities: Urbanization in and from the Arabian Peninsula*. New York: New York University Press.

Moran, D., McBain, D., Kanemoto, K., Lenzen, M. and Geschke, A. (2015). Global supply chains of coltan. *Journal of Industrial Ecology 19*: 357–365.

Palermo, P.C. and Ponzini, D. (2015). *Place-Making and Urban Development: New Challenges for Contemporary Planning and Design*. London: Routledge.

Pepper, D. (1998). Sustainable development and ecological modernization: a radical homocentric perspective. *Sustainable Development 6*: 1–7.

Ponzini, D. (2011). Large scale development projects and star architecture in the absence of democratic politics: the case of Abu Dhabi, UAE. *Cities 28*: 251–259.

Ponzini, D. (2013). Branded megaprojects and fading urban structures in contemporary cities. In G. Del Cerro Santamaria (ed.), *Urban Megaprojects: A Worldwide View*. New York: Emerald, 107–130.

Ponzini, D. and Nastasi, M. (2016). *Starchitecture: Scenes, Actors and Spectacles in Contemporary Cities*. New York: Monacelli Press.

Ramos, S.J. (2016). *Dubai Amplified: The Engineering of a Port Geography*. London: Routledge.

Rapoport, E. (2014). Utopian visions and real estate dreams: the eco-city past, present and future. *Geography Compass 8*: 137–149.

Rapoport, E. (2015). Globalising sustainable urbanism: the role of international masterplanners. *Area 47*: 110–115.

PART 3

Contradicting and challenging

11

ACKNOWLEDGING THE IDIOT IN THE SMART CITY

Experimentation and citizenship in the making of a low-carbon district in Santiago de Chile

Martín Tironi and Matías Valderrama

Introduction: 'Live the experiment of a new city'

Figure 11.1 illustrates the citizen intervention 'Shared Streets for a Low-Carbon District', which was implemented by the non-governmental organisation (NGO) Ciudad Emergente (Emergent City, or CE) for three days in September 2016 in the Lastarria neighbourhood of Santiago de Chile. In response to claims that the main sources of urban pollution come from motorised transportation, the purpose of the intervention was to 'measure and promote residents' willingness to change their habits regarding urban mobility in response to climate change through the use of Shared Streets' (CE 2016).[1] Using the slogan 'Live the experiment of a new city', the project sought to encourage citizen participation through face-to-face encounters and more sustainable modes of mobility such as walking and cycling. When reporting the results of the experiment, CE stated that the Shared Streets 'proved to be an effective strategy for generating low-carbon districts[...]. Thanks to the installation of four CO_2 concentration measurement sensors, it is possible to conclude that the Shared Streets experiment reduced CO_2 levels in the neighbourhood by a factor of three' (CE 2016: 118).

The goal of this chapter is to examine the political capacities of this experiment in the promotion of smart and sustainable cities. By describing the contingencies and controversies that emerged as a result of the efforts to 'laboratorise' the urban space towards low-carbon habits, this chapter contributes to the discussion of how 'smart citizen' projects are translated and operationalised in specific contexts such as Santiago de Chile. We analyse how the use of ideas of citizen participation and urban laboratories – which are being increasingly included in smart city strategies around the world (Halpern *et al.* 2014, Evans *et al.* 2016) – constitute true socio-material devices for justifying and legitimating institutional interests while limiting other modes of experimentation and smartness.

FIGURE 11.1 José Miguel de la Barra Street on 4 September 2016.
Source: Rodrigo Fortuny.

Specifically, we show that despite the efforts deployed by those responsible for the project to turn the corporate concept of the smart city to a more citizen-driven perspective through urban tactics and participatory sensing, in practice a type of public with an ecological awareness (Marres 2012, Dantec and DiSalvo 2013, Yaneva 2017) was favoured while other publics were made invisible. Drawing on recent works on the conceptual character of the idiot (Stengers 2005, Horst and Michael 2011, Michael 2012a, 2012b, Gabrys 2016), we argue that the urban intervention did not appreciate what might be called 'idiotic manifestations', those moments of misbehaving, recalcitrance and indifference that emerged during the experiment. This purification of the urban intervention denied the realisation of a truly experimental exercise in which the idiotic manifestations could be considered as sites of (re)composition. The idiot, developed by Stengers (2005), does not pretend to achieve evidence. Instead, it seeks to slow down and provoke thought about what we are taking for granted. In this sense, as we will see with the case, the experimental processes should not just serve to demonstrate or validate previously defined objectives; they should also provide moments of opening and exploring the unknown (what is not yet completely defined), making visible and tangible what is emergent in urban life.

The ethnographic study of the case included observations in the preparation phase of the urban intervention, visiting the homes of residents where environmental sensors were installed, and witnessing the implementation phase over the course of the three days of experimentation. Observations were also conducted in a subsequent public seminar in which CE presented the main impacts of the experiment. Furthermore, eight in-depth interviews were conducted before and after the experiment with relevant actors from CE as well as organisations that collaborated with the project, including the Municipality of Santiago and Fab Lab Santiago.

Grammars of experimentation and citizen participation in the smart city

Different notions of 'smartness' are unfolding in various urban ecologies around the world (Marvin *et al.* 2016) and have recently permeated Latin American cities, including Santiago de Chile (Tironi and Valderrama 2018). The 'smart' paradigm has become a requirement in recent years as various actors (NGOs, companies, the government and so on) pursue strategies to operationalise smart city projects.[2] To complement the narrative, political and technological aspects behind smart cities (Kitchin 2014, Söderström *et al.* 2014, Vanolo 2014, March and Ribera-Fumaz 2016, Marvin *et al.* 2016), in this chapter we highlight two closely linked concepts: namely the 'experimental' and 'citizen' grammars that are increasingly infused into smart city programmes and their implications in cities of the Global South (see also Odendaal this volume).

The city as a laboratory

As several authors have shown (Halpern *et al.* 2014, Luque-Ayala and Marvin 2015, Tironi and Sánchez Criado 2015), the discourses of smart urbanism address both present needs and expectations of a more efficient, less polluted and more participatory urban future, using experimentation and testing as a protocol for the construction of that future. It is no coincidence that the majority of stakeholders who are involved in the emerging context of smart cities use grammar associated with experimental logic and phrases such as 'urban laboratory', 'living lab', 'pilot projects', 'open innovation' and so on. As Marres (forthcoming: 7) argues, 'the role of technology testing in society has radically expanded over the last years, assuming a prominent role in the public communication of innovation, and as part of strategies for promoting "societal acceptance" of technology.'

The strategy of producing knowledge based on controlled conditions such as those found in a scientific laboratory is a matter that Science and Technology Studies has addressed broadly, analysing different modes of exteriorisation of the 'laboratory' (Pinch 1993, Muniesa and Callon 2007, Callon *et al.* 2009, Marres 2012, Laurent and Tironi 2015, Laurent, 2017). This literature has shown that experimentation allows for both the testing and enactment of realities. For example, Bruno Latour (1983) describes how the experiments that Pasteur developed in laboratories equipped with different instruments allowed certain facts to become solid and scalable to the rest of society. Certain entities or issues can only come into existence through experimental practices, which means that particular settings and instruments play an ontological role in how these entities are defined or represented.

Increasingly, smart city initiatives have developed particular modes of laboratorisation to test new technological solutions and social innovations (Marres 2012, forthcoming, Evans and Karvonen 2014, Halpern *et al.* 2014, Evans *et al.* 2016). Through this grammar of experimentation, new modes of knowledge production and urban governance are orchestrated by hybrid alliances through

testing 'in the real world' (Evans and Karvonen 2014). But even though urban laboratories seem to be an attractive model, authors such as Evans and Karvonen warn that this can result in the strengthening of some traditional actors and the solidifying of their agendas in shaping the city.

Within this growing laboratorisation of cities, it is relevant to underscore the role of materiality in experiments. Issues such as climate change or the need for more sustainable habits or topics related to the concept of a 'shared city' do not exist in an exclusively discursive realm. On the contrary, many authors have emphasised the relevant capacity of material devices, settings and environments that allow certain issues and publics to come together (Lezaun and Soneryd 2007, Marres and Lezaun 2011, Marres 2012; Dantec and DiSalvo 2013, Laurent and Tironi 2015, Gabrys 2016). For example, Marres (2012) analyses how everyday carbon accounting devices in sustainable living experiments not only update a relationship between ecological crisis and domestic practices but also constitute a rearticulation of public participation and the role of experts in environmental issues. From this perspective, participation is always a fragile and contingent achievement of socio-technical entanglements which are made to exist among multiple devices (websites, sensors, social network sites, road markings, etc.).[3] This invites us to examine the powers of engagement of material devices and urban settings in the creation or materialisation of certain publics rather than others (Marres and Lezaun 2011, Marres 2012).

From the corporate smart city to the smart citizen

Along with this grammar of experimentation, over the past few years a 'participatory', 'citizen' or 'bottom-up' component has been added to smart city interventions. However, it is still unclear how this 'citizen' dimension can be incorporated into smart city projects, and which versions of citizenship or smartness are enacted when invoking the figure of the 'smart citizen' (Tironi and Valderrama 2018).

In this debate, various authors have noted that a corporate vision has predominated in smart city initiatives, using apps, sensors and algorithms to provide more automated forms of management and to assist multiple stakeholders (municipalities, companies, citizens and so on) in making decisions driven by data (Harrison and Abbott 2011, Kitchin 2014). This corporate vision of the smart city is criticised because it reduces urban smartness to 'meaning nearly any innovation based on technology for the planning, development and operation of cities' (Harrison and Abbott 2011: 2–3). Thus, a criticism emerges around the excessively normative and technologically oriented drive of smart city initiatives to promote a technocratic model of urban government with a pronounced dependency on private tech companies (Hollands 2008, Kitchin 2014, Morozov 2014, Vanolo 2014, March and Ribera-Fumaz 2016).

Parallel to these critiques, various rankings of smart cities have emerged based on calculations of urban components and indicators that go beyond the limited

definition of smartness as digital technologies in urban space (Giffinger *et al.* 2007, Giffinger and Gudrun 2010, Caragliu *et al.* 2011, Cohen 2014). While smart city projects used to focus on the 'triple helix' of governments, academy and industry, through this quantification of the smartness of cities, the role of citizen participation has now become highly valued as an indicator of the intelligence of a city.

Using this participatory grammar, some authors speak of a new Smart Cities 3.0 generation (Cohen 2015) that is no longer guided by the technology sector or urban governments, but by the citizens themselves through experimental interventions of co-creation and prototyping inspired by tactical urbanism, prototype urbanism, peer-to-peer and do-it-yourself culture (de Lange and de Waal 2013, Corsín Jiménez 2014, Finn 2014, Forlano and Mathew 2014, Ratto and Boler 2014, Tironi 2016). The objective of all of these actions is to empower the citizen and place him or her at the centre of the design and making of cities, substituting the prominence of technology corporations, and even bypassing traditional institutions (de Lange and de Waal 2013, Forlano and Mathew 2014).

Laboratorising the streets of Santiago

To empirically describe the use of experimental and citizen grammars in the unfolding of smart cities projects in Chile and to examine the extent to which these initiatives truly challenge the corporate logics and interests of local governments, we review the case of 'Shared Streets for a Low-Carbon District' that was conducted by the NGO Ciudad Emergente (CE). The organisation is described as a 'laboratory for citizen urbanism tactics and tools' that conducts multiple experimental interventions or 'tactical actions' that seek to promote changes in habits, enhance citizen participation, and build capacity and relationships between public officials and civil society. The co-founder and Executive Director of CE stated that these actions are based on tactical urbanism and are 'light, quick, cheap and involve people in the construction or improvement of a public space'. One of the suppositions of CE is that the urban fabric includes 'emergent' forms of community building that are commonly invisible to the bureaucratic planning gaze. The organisation's objective is thus to activate and strengthen these emerging communities through 'citizen activation tactics' and 'social intercommunication 2.0' tools. These principles have inspired the development of the 'Shared Streets' intervention.

The organisation of the experiment was hybrid, drawing on financial support from the UK Foreign and Commonwealth Office through its 'Smart Cities/ Infrastructure' and 'Climate Change and Low-Carbon Transition' programmes, and the transfer of knowledge from three UK agencies: the consulting firm ARUP; the Eden Project (experts on the development of 'community' lunches); and the London School of Economics (LSE) Cities Programme. This strong connection between the project and UK agencies provided early legitimation in Chile. At the local level, the intervention received the support of the Smart Cities

Unit of the Ministry of Transportation, the Ministry of the Environment, Fab Lab Santiago and the Municipality of Santiago. The latter played a key role in the decision regarding the location of the intervention because it had already committed to creating a bike lane in the neighbourhood. In this sense, the Shared Streets project would be a good experiment for *demonstrating* the demand for cycling infrastructure and evaluating the willingness of citizens to adopt more ecological habits. The Director of the Smart Cities Unit of the Ministry of Transportation also found the experiment important to illustrate that 'a smart city is not only the implementation of technology within the city, but also involves how this technology is accepted by the community, the people, those who inhabit it.'

The main objective of the intervention was to promote the idea of a city where the streets are shared between cars and non-motorised transport (cycling and walking), thus reducing carbon emissions as well as combating climate change through new attitudes and sustainable habits. To achieve that goal, it was necessary to evoke an emerging 'ecological' awareness through practices, interventions and prototypes to co-create low-carbon neighbourhoods. The challenge was to generate a material, emotional and cognitive setting that would produce this awareness.

Citizen tactics: assembling audiences to transform habits

The first urban tactic was initiated on the evening of Thursday, 1 September 2016, when a group of 30 volunteers painted a set of blue calypso circles on José Miguel de la Barra Street for nearly seven hours. The circles were meant to combine the six car lanes and pavement as a large shared public space rather than fragmented terrains dedicated to each type of mobility, leaving just two lanes for cars and reducing the speed limit to 10 kilometres per hour.

Experimental bike lanes and car stubbornness

Along with this redistribution of space, a temporary bike lane was established in the area to connect existing bike lanes. The new lane was open from 7 a.m. to 7 p.m. during the three days of the intervention and was created using municipal signage that legitimised the temporary change. In addition, CE installed orange vinyl cones, while volunteers acted as 'human traffic lights' to delineate the bike lane. This tactic was one of the important symbols of the experiment because it embodied infrastructure associated with an 'ecological' practice (cycling) and the increased visibility revealed a demand that was not being addressed by the authorities.

However, starting on the first day, the efforts to transform this section of the city into a laboratory encountered a range of stubborn and 'idiotic' manifestations. The intervention created traffic congestion and produced unpleasant conditions for some residents. Many drivers were unhappy with or indifferent to the goals of

the intervention, and constantly honked their horns to show their disapproval of the experiment. Heated discussions occasionally took place between pedestrians and drivers. The edges of the experiment were progressively challenged by elements that had not originally been taken into account, such as the obstinate practices of certain drivers. As such, during the rush hour (6–7 p.m.), the experimental bike lane was removed by order of the municipality. While the bike lane was reopened in a more amenable way over the next two days – particularly during the mornings – there was always a feeling of tension and chaos. As such, the infiltration of 'external' elements (in this case, the drivers' displeasure) exceeded the control and demarcation imposed by the organisers, and revealed sensitivities that were less than 'compatible' with the idea of shared streets.

Changing the city in 5 minutes

Another tactic developed by CE involved calling on different publics to take part in a *malón urbano* ('urban potluck'). Based on earlier experiences in the UK and older traditions in Chile,[4] the purpose of this activity was to activate the participation of neighbourhood residents by inviting them to a shared meal where they could discuss urban problems. The organisations affiliated with the intervention (artists, cycling organisations, neighbourhood groups and so on) held the *malón urbano* on Sunday evening, the last day of the experiment. A special area was designated in the street for long tables and chairs where residents and passers-by could sit and participate in open conversations, accompanied by live band performances and a line of temporary stores selling t-shirts, caps, accessories and bicycle repair services.

It is important to note that the topics discussed at the tables, and their dynamics, were not always the result of participant spontaneity and effervescence. Like a focus group, each table had CE coordinators who encouraged discussion and commitments to issues related to climate change and sustainable habits. While specific or preset roles were not assigned to the participants, during our observation we noted the presence of certain implicit understandings of how things should be, as well as a particular interpretation of 'community' that embodied preferable values and habits. Far from providing an opportunity to identify disagreements or differences regarding the type of city that one wanted, the encounters in the *malón* took place in a context of consensus that was devoid of dissent and controversy.

This public atmosphere of deliberation and commitment to environmental issues coexisted with the incessant honking of angry motorists, as well as the perception that the experiment was an 'invasion' by elites and hipsters who were disconnected from the lived experience of the neighbourhood. Furthermore, given the neighbourhood's proximity to the city's tourist attractions, the development of the *malón* seemed to be more attractive to tourists and passers-by than to residents. In the discussions generated during the intervention and on the event's Facebook page, several people stated that they were uncomfortable with

the aims of the experiment and did not understand the purpose of 'paralysing a neighbourhood'. Some criticised the utopian and unrealistic character of the experience and the idea that CE would want to 'change the city in 5 minutes', showing that they were sceptical of these 'ludic' and 'rapid' modes of promoting new urban habits. Others even criticised the colour of the circles painted on the street because they thought it made the neighbourhood less attractive. One Facebook user stated that the idea of sharing the street seemed 'downright stupid', which led to the following response from CE:

> Just as people thought that women's suffrage was seen as stupid 100 years ago and is now common sense, we want to promote a city with a common sense that involves streets that allow for slow vehicular passage and pedestrian flow. I hope you don't take 100 years to realise this.

Citizen data: encouraging involvement through measurement activities

Parallel to the urban tactics, CE deployed a series of participatory sensing tools to evaluate the 'impacts' of the experiment. The measurements would serve to show the positive aspects of sharing the street and adopting more sustainable forms of mobility, as well as deriving lessons for future public policies. The objective was to gather two types of data: social and environmental. The measurement of social data focused on the willingness of the public to adopt more sustainable habits, and was collected using various instruments. First, 'idea trees' were installed in four locations to visually collect (by hanging slips of paper on a structure) thoughts and concerns about what Santiago should be like and perceptions about the event. Second, CE conducted a resident survey prior to the intervention to gather information about climate change issues, transportation habits and social cohesion. The same survey was conducted after the intervention to assess whether the experiment generated any changes in the district. Third, a group of 16 social science students conducted participant observation at the *malón* and documented the conversations at the tables.

In regard to the environmental data, a series of sensors were installed to gather data to *demonstrate* the impacts of the experiment on bicycle use and reduction of air pollution in the district. These sensors would be the smart city component of experimentation, as one CE representative told us. Equipment was placed in two sections of the bike lane to measure the flow of cyclists during the intervention. And, in the spirit of open-source technologies and social innovations that emerged from other urban laboratories, the Smart Citizen Kit (SCK) environmental sensor was distributed to some residents in the experimentation area to measure variables such as temperature, humidity, light intensity, noise levels, and nitrogen dioxide (NO_2) and carbon monoxide (CO).[5]

The SCK is a low-cost hardware device created by Fab Lab Barcelona to democratise environmental monitoring and empower people to produce their

own smart cities (Diez and Posada 2013). One of the qualities of the device highlighted by its creators is that it does not operate as a 'black box' but as an 'open box' that is compatible with non-experts and free experimentation. Both the technology and principles that formed the basis of the SCK were imported by Fab Lab Santiago in Chile, a digital manufacturing and open innovation laboratory that experiments with these sensor technologies. Fab Lab Santiago was then invited by CE to contribute to the Shared Streets experiment by installing and maintaining the SCK. The idea was to invite residents, non-experts and individuals affected by air pollution to measure a series of parameters and evaluate the impacts on their quality of life, transforming them into a network of intelligent sensors with their own neighbourhood. One of the founders of Fab Lab Santiago told us: 'This sensor [SCK] has been very successful because it was the first technological object linked to the smart city that placed people at the centre.' As such, the spirit and capacities of this digital device seemed to strongly align with the purposes of the CE intervention. The SCK offered the possibility of engaging citizens in environmental issues by being involved in the specific work of gathering data on urban pollution. As such, SCK devices were distributed to volunteer residents who lived at strategic points, allowing them to participate in environmental measurements prior to and after the intervention. An engineer (sent by Fab Lab Santiago) later installed and activated the SCK (**Figure 11.2**).

Soon after the devices were installed in the homes, the idea of a non-expert public committed to ecological issues was quickly challenged by unexpected situations. A CE representative told us: 'It wasn't difficult to find people who

FIGURE 11.2 The Smart Citizen Kit (centre) installed in a resident's window box.
Source: authors.

wanted to install the kit. What has been difficult was finding people who have the technical conditions to manage the kit.' Some houses exhibited 'deficiencies' with respect to the SCK's requirements, reducing its capacities due to issues of height and proximity to the street. There were also problems with the ways in which residents maintained the SCK. The residents were willing to accept the installation of the sensor, but this did not prevent them from disconnecting it if they needed to plug in something else or if the sensor got in the way of another household activity such as cleaning. The Fab Lab engineer responsible for installing the devices in the houses told us about a series of difficulties in 'enrolling' people in the environmental monitoring operations. The sensors often failed because of poor Wi-Fi connections, disconnection, resident absence and even power outages in some houses. In addition, the SCK required a Wi-Fi connection with a password with a maximum of 19 characters. Some residents were unhappy when they were asked for the password and found it invasive or burdensome if they were asked to change it.

Another misalignment occurred approximately one month prior to the project's implementation. During a meeting with the Ministry of the Environment, CE stated that while the measurement of CO levels is an important topic for climate change, the air pollution that affects people daily is actually related to particulate matter (PM 2.5) in the air, which meant that the Shared Streets project should include measurement of PM 2.5. This requirement was not expected, and the SCK did not have sensors to measure PM 2.5. Moreover, it showed the importance of having 'hard data' that would allow the institution to justify future decisions pertaining to the city. This required CE to install an additional sensor to measure PM 2.5 to meet the institutional objectives. This also presented problems because they had not measured PM 2.5 for the two days before the intervention, and thus there was no baseline for comparison.

This type of practice reveals the emergence of idiotic manifestations of overflow and breakdown regarding the rules proposed by the experiment, calling into question the type of involvement expected of citizens with digital sensors. Furthermore, the various idiotic manifestations in the installation and maintenance of the sensors created noise and errors in the data, and even the failure to obtain data for several hours and days, which later made it difficult to read and compare the data. For the director of the NGO, the SCK was 'more rigid than expected' and was an object that was difficult to maintain and integrate within the household ecosystem.[6]

The smart citizen in the idiotic city

As we have described throughout this chapter, growing experimental and citizen grammars have permeated the narratives of smart city initiatives, and this has reconfigured the notion of smartness 'required' for contemporary cities. The case of the Shared Streets project in Santiago de Chile clearly shows how smart urbanism, which was originally centred on a technological component, is now

adopting new forms of social legitimation with more participative and experimental interventions through urban laboratories. However, we have shown how tactics and measurements to activate a more ecological citizenship and demonstrate positive impacts on the environment come up against a series of unexpected situations and moments of overflow, evoking publics and ways of participation that are not necessarily aligned with the ecological agenda.

The prototypes developed by CE certainly had the power to involve and attach specific groups (Marres 2012, Dantec and DiSalvo 2013), facilitating the discussion of issues associated with sustainability and climate change. This allowed them to make visible a certain ecological awareness and to amplify the citizen potential of smart urbanism. At the same time, the proposed setting involved other publics and practices that were not originally considered in the experiment under heterogeneous modalities. The lack of interest in the project, the direct problematisation of agile and light logics of tactical urbanism, the effort to turn the city into a laboratory in five minutes, the honking of automobile horns and the resulting chaos of the experiment, and the residents' neglect of the SCK compel one to slow down and question the citizen and experimental grammar of the intervention.

It is these undocile and recalcitrant situations of the urban laboratory that we propose to understand as 'idiotic manifestations'. The idiot has commonly been understood pejoratively as someone with little understanding, or an egoist who is only interested in their own situation rather than the common good. If we reflect on the Greek origin of the word, the idiot was the person who spoke a semi-private idiom removed from the shared language of the polis, which made his or her murmur incoherent and unintelligible, continually marginalising him or her from the community (Stengers 2005, Farías and Blok 2016). But in light of the work of authors like Gilles Deleuze and Isabelle Stengers, the idiot has been rediscovered as a useful concept to interrogate what we take for granted and to transform what seems absurd into a more creative or inventive thought (Deleuze and Guattari 1994). The idiot is positioned as someone who does not seek out evidence or productive knowledge. Without having a well-founded reason, the idiot resists truth and consensus simply because he or she feels that 'there is something more important' that goes beyond the way a specific situation is presented or defined (Stengers 2005: 994). This compels one to slow down and recognise the uncertainty, partiality and inevitable incommensurability of any definition of things. As such, the idiot always stops us and protects us from considering 'ourselves authorized to believe we possess the meaning of what we know' (Stengers 2005: 995).

The idiot offers an opportunity to speculate on how things could be presented differently and how we could experiment with new ways of making cities. The idiot alerts us to the fact that we might be prematurely limiting our vision of things, suggesting that there is always something more (interests, affects, issues, publics) that escapes us and must be rethought.

Recent works have been incorporating the 'murmur of the idiot' (Stengers 2005: 1003) in social research (Horst and Michael 2011, Michael 2012a, 2012b)

and more specifically to understand citizen participation in smart cities (Gabrys 2016, Tironi and Valderrama 2018). Instead of closed resolutions, there is an effort to raise questions and generate situations that can build new relationships with our surroundings (Michael 2012a). In other words, the idea is not to reduce urban problems to a problem-solving logic – which is strongly rooted in today's smart culture – and open oneself up to the dynamics of problem-making. The idiot suggests unanticipated directions, rejecting forms of linear thinking that preconfigure solutions prior to understanding the problems that are presented.

Instead, CE decided to disregard or close off the idiotic manifestations in the dissemination of the experimental results. When those responsible for the intervention were asked about the presence of unhappy drivers and passers-by, they said that they represented a small number compared to those who were in favour of the experience, and no mention was made of the idiotic manifestations presented in the data collection in the public presentation of the experiment's impacts. The interesting frictions, interstices and collisions between worlds that the experiment evoked were not considered as a component worthy of consideration, but as a noise that had to be eliminated through the idea of consensus.

This limited willingness of the project to engage with what might be called the 'idiotic city', with their urban practices of recalcitrance and indifference that challenge established protocols and normativity (Savransky 2014), can be explained by the aim of validation that the project implicitly sustained from its inception. One of the objectives of CE was to be able to produce quantitative social and environmental data that would justify the construction of a bike lane in the neighbourhood and the replicability of the experiment in other places. In other words, there was a need to show the activation of a public that was receptive to the intervention. As a stakeholder from the Municipality of Santiago stated, the data offered by the intervention constitute 'a source of support' for the bike lane construction. The Director of CE also understood the project in this manner:

> They [Municipality of Santiago] are going to invest 150 million pesos in order to install more permanent cycling infrastructure. They said that they are going to do that in advance. So rather than determining whether or not a bike route is good or bad, our prototypes were used to address the generation of the change in habits, and how to raise awareness about an important topic.

As such, rather than acknowledging the 'idiotic' manifestations, the focus was demonstrating the emergence of an 'eco-friendly' audience and an improvement in air quality thanks to the practice of sharing the streets.

The demonstrative will of the intervention does not only lead to a privileging of a certain type of publics, but also contributes to the devaluing of others. The disagreements, confrontations and failures of the intervention were not conceived of as opportunities to innovate and rethink the suppositions, but as ills of a

pragmatic citizenry that has yet to become ecological. Drivers and their honking and criticisms, for example, were stigmatised and excluded from the ecological spirit, considered as an obstinate, stupid or idiotic (in the pejorative sense) force with archaic mentalities who only think about their individual wellbeing and do not understand the need to aspire to a new shared city. The series of socio-technical failures that SCK presented in their coexistence with households was interpreted as technical deficits or as a lack of preparation on the part of citizens. It was not considered as an opportunity to rethink the role of digital data and modes of involving citizens.

Conclusions: unfolding the capacity of urban experiments

The purpose of this chapter has been to idiotically complicate the cosmos convened by urban tactics and participatory sensing that have recently permeated smart city initiatives. Rather than building on a smart city notion driven by multinational technology companies (Vanolo 2014), the case study shows a notion of smart city informed by 'experimental' and 'citizen' interventions, while lacking the ability to incorporate the differences and frictions that emerge through urban experimentation.

This case opens up important questions about the actual capacities of citizen experiments to influence government decision-making in an innovative way. As has been documented in regard to similar cases (Evans and Karvonen 2014), the Shared Streets intervention seems more interested in using the 'experimental' and 'citizen' grammars to test and legitimate pre-set institutional projects than to inform planning processes in the municipality through the generation of knowledge and public debate. While urban experiments have the potential to unfold new situations, entities and political relationships, and to create a space of exploration that is open to the unanticipated, the case study shows a more rhetorical use of the notion of experimentation than an empirical one.

Second, the case leads apparently to a disjunctive regarding the experimental and participatory components of smart citizen projects. An ambivalent relationship was created for CE and Fab Lab Santiago between seeking to obtain 'hard', 'representative' or 'reliable' social and environmental data to validate the interventions and the proliferation of breakdowns produced by the engaged citizens during the measurement processes. As the Fab Lab engineer in charge of installing the sensors told us:

> On the one hand, you have this entire trend of the smart city which seeks to empower people by linking with the use of sensors … But on the other hand, I have realised through this experience in particular that a much more reliable system is one in which there are no users involved.

Rather than adopting a precautionary approach in which the *idiotic-ness* of the city is considered a barrier or force of distortion of data that reduces the participatory

nature of these interventions, Marres (2015) calls for the affirmation and experimenting with those troubles in inventive ways. The multiple disconnections, indifferences and failures involved in the enactment of this urban intervention can be taken up as sites of true experimentation to generate new ways of engaging drivers and residents beyond the logic of validation.

These two points force us to return to the pragmatist thinking of John Dewey (2012) and the background of the idea of the political as experimentation. Dewey suggests that politics should open itself up to experimentation because the problems and publics concerned with them emerge together through processes of co-formation and problematisation. It is precisely this strong sense of experimentation as a site permeated by the unexpected and those agencies or 'other questions' left aside (Stengers 2005) that proved to be affected by the bureaucratic-institutional use of experimental grammar. If experimentation implies openness to problematisation (Dewey 2012) in which the identity of the participants and problems are not defined a priori but are instead the result of the testing process itself (Latour 1983), the logic that dominated in the Shared Streets initiative was consensus, excluding the possibility of an urban policy based on disagreements and idiotic manifestations. In this regard, Gabrys (2016) argues that many 'smart citizen' strategies do not manage to become true spaces of participation, and instead result in the validation of conventional experts and institutions. Thus, the question continues to be how these forms of experimental participation can increase the vigour of public participation around the city without becoming merely aesthetic actions to celebrate particular citizen types or even actions that only serve to reinforce the interests of current institutional governments.

The 'Shared Streets' project, similar to many other smart trials in urban spaces, leveraged enfolding capacity of experimentation (Domínguez Rubio and Fogué 2017): that is, the capacity to prescribe programmes and norms into spaces and people. However, this kind of urban experiment could serve not only to test and legitimate more sustainable and smart infrastructures and habits, but also to unfold a rearticulation of social, political and ethical issues (Marres fortcoming). In other words, rather that conceiving of smart experiments as a 'façade' or a 'fraud', they can be reconsidered as spaces to prototype new forms of political deliberation, where the notions of idiotic-ness and smartness converge in a process of mutual correspondence (Tironi and Valderrama 2018). The idiotic manifestations that characterise the urban liveliness have to be recognised as part of the socio-material frictions and recalcitrance of the city, from which the assumptions of what we take for granted about smart urbanisation and public participation can be rethought. For example, we can explore how to think about a shared city in the presence of publics that are apparently not willing to share it. How can we allow the frictions of the city to *(in)form* new possibilities on the composition of the urban? Finally, which modalities of experimentation allow for the consideration of those imperceptible murmurs of the idiot that tend to be marginalised from the prevailing canons of smart culture?

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Notes

1 This and all other quotations from Spanish-language sources have been translated by the authors.
2 One example of this is that Santiago currently has a Smart City Regional programme financed by the Economic Development Corporation (CORFO) for the development of pilot projects and technological solutions in the priority areas of urban mobility, the environment and security. See http://sesantiago.cl [Last accessed 1 July 2017].
3 The project of rethinking the formation of publics from an object-oriented democracy (Latour 2005) involves overcoming a concept in which materiality (among other entities) is considered as mere support for or an accessory of the political.
4 CE even proposed a ten-step guide to holding a raid in keeping with the DIY spirit.
5 The SCK contains various sensors, a data processing board, a battery and a cover. The data are automatically uploaded when it connects to a Wi-Fi signal.
6 Fab Lab reached a different conclusion: many of the problems resulted from the low level of participation in the project objectives. According to the Director, the problem of measurement was not related to the SCK, but to the lack of time to promote more prolonged learning and appropriation of the technology.

References

Callon, M., Lascoumes, P. and Barthe, Y. (2009). *Acting in an Uncertain World: An Essay on Technical Democracy*. Cambridge, MA: MIT Press.

Caragliu, A., Del Bo, C. and Nijkamp, P. (2011). Smart cities in Europe. *Journal of Urban Technology 18*: 65–82.

CE (Ciudad Emergente). (2016). Calles Compartidas para un distrito bajo en carbono. Reporte Final. Santiago de Chile. [Online]. Available: https://issuu.com/ciudademergente_cem/docs/reporte_calles_compartidas [Last accessed 1 July 2017].

Cohen, B. (2014). The smartest cities in the world. *Fast Company*. [Online]. Available: www.fastcoexist.com/3038765/fast-cities/the-smartest-cities-in-the-world [Last accessed 7 July 2017].

Cohen, B. (2015). The 3 generations of smart cities. *Fast Company*. [Online]. Available: www.fastcompany.com/3047795/the-3-generations-of-smart-cities [Last accessed 7 July 2017].

Corsín Jiménez, A. (2014). The right to infrastructure: a prototype for open source urbanism. *Environment and Planning D: Society and Space 32*: 342–362.

Dantec, C.A.L. and DiSalvo, C. (2013). Infrastructuring and the formation of publics in participatory design. *Social Studies of Science 43*: 241–264.

de Lange, M. and de Waal, M. (2013). Owning the city: new media and citizen engagement in urban design. *First Monday 18*.

Deleuze, G. and Guattari, F. (1994). *What is Philosophy?* New York: Columbia University Press.

Dewey, J. (2012). *The Public and Its Problems: An Essay in Political Inquiry*. University Park: Pennsylvania State University Press.

Diez, T. and Posada, A. (2013). The fab and the smart city: the use of machines and technology for the city production by its citizens. In *Proceedings of the 7th International Conference Tangible, Embedded and Embodied Interaction, ACM,* 447–454.

Domínguez Rubio, F. and Fogué, U. (2017). Unfolding the political capacities of design. In A. Yaneva and A. Zaera-Polo (eds), *What Is Cosmopolitical Design? Design, Nature and the Built Environment*. London: Routledge, 143–160.

Evans, J. and Karvonen, A. (2014). 'Give me a laboratory and I will lower your carbon footprint!' Urban laboratories and the governance of low-carbon futures. *International Journal of Urban and Regional Research 38*: 413–430.

Evans, J., Karvonen, A. and Raven, R. (2016). The experimental city: new modes and prospects of urban transformation. In J. Evans, A. Karvonen and R. Raven (eds), *The Experimental City*. London: Routledge, 1–12.

Farías, I. and Blok, A. (2016). Introducing urban cosmopolitics: multiplicity and the search for a common world. In A. Blok and I. Farías (eds), *Urban Cosmopolitics: Agencements, Assemblies, Atmospheres*. London: Routledge, 1–22.

Finn, D. (2014). DIY urbanism: implications for cities. *Journal of Urbanism: International Research on Placemaking and Urban Sustainability 7*: 381–398.

Forlano, L. and Mathew, A. (2014). From design fiction to design friction: speculative and participatory design of values-embedded urban technology. *Journal of Urban Technology 21*: 7–24.

Gabrys, J. (2016) *Program Earth: Environmental Sensing Technology and the Making of a Computational Planet*. Minneapolis: University of Minnesota Press.

Giffinger, R. and Gudrun, H. (2010). Smart cities ranking: an effective instrument for the positioning of the cities? *ACE: Architecture, City and Environment 4*: 7–26.

Giffinger, R., Fertner, C., Kramar, H., Kalasek, R., Pichler-Milanovic, N. and Meijers, E. (2007). Smart cities: ranking of European medium-sized cities. [Online]. Available: http://smartcity-ranking.org/download/smart_cities_final_report.pdf [Last accessed 20 July 2017].

Halpern, O., LeCavalier, J., Calvillo, N. and Pietsch, W. (2014). Test-bed urbanism. *Public Culture 25*: 273–306.

Harrison, C. and Abbott, I. (2011). A theory of smart cities. Proceedings of the 55th Annual Meeting of the ISSS, held at University of Hull Business School, UK, 17–22 July.

Hollands, R.G. (2008). Will the real smart city please stand up? *City 12*: 303–320.

Horst, M. and Michael, M. (2011). On the shoulders of idiots: re-thinking science communication as 'event'. *Science as Culture 20*: 283–306.

Kitchin, R. (2014). The real-time city: big data and smart urbanism. *GeoJournal 79*: 1–14.

Latour, B. (1983). Give me a laboratory and I will raise the world. In K. Knorr-Cetina and M. Mulkay (eds), *Science Observed: Perspectives on the Social Study of Science*. London: Sage, 141–170.

Latour, B. (2005). From Realpolitik to Dingpolitik or how to make things public. In B. Latour and P. Weibel (eds), *Making Things Public: Atmospheres of Democracy*. Cambridge, MA: MIT Press, 2–32.

Laurent, B. (2017). *Democratic Experiments: Problematizing Nanotechnology and Democracy in Europe and the United States*. Cambridge, MA: MIT Press.

Laurent, B. and Tironi, M. (2015). A field test and its displacements: accounting for an experimental mode of industrial innovation. *CoDesign 11*: 208–221.

Lezaun, J. and Soneryd, L. (2007). Consulting citizens: technologies of elicitation and the mobility of publics. *Public Understanding of Science 16*: 279–297.

Luque-Ayala, A. and Marvin, S. (2015). Developing a critical understanding of smart urbanism? *Urban Studies 52*: 2105–2116.

March, H. and Ribera-Fumaz, R. (2016). Smart contradictions: the politics of making Barcelona a self-sufficient city. *European Urban and Regional Studies 23*: 816–830.

Marres, N. (2012). *Material Participation: Technology, the Environment and Everyday Publics*. London: Palgrave Macmillan.

Marres, N. (2015). Why map issues? On controversy analysis as a digital method. *Science, Technology & Human Values 40*: 655–686.

Marres, N. (forthcoming). What if nothing happens? Street trials of intelligent cars as experiments in participation. In S. Maassen, Dickel, S. and C.H. Schneider (eds), *TechnoScience in Society, Sociology of Knowledge Yearbook*. Nijmegen: Springer/Kluwer.

Marres, N. and Lezaun, J. (2011). Materials and devices of the public: an introduction. *Economy & Society 40*: 489–509.

Marvin, S., Luque-Ayala, A. and McFarlane, C. (eds) (2016). *Smart Urbanism: Utopian vision or False Dawn?* New York: Routledge.

Michael, M. (2012a). 'What are we busy doing?' Engaging the idiot. *Science, Technology & Human Values 37*: 528–554.

Michael, M. (2012b). De-signing the object of sociology: toward an 'idiotic' methodology. *Sociological Review 60*: 166–183.

Morozov, E. (2014). *To Save Everything, Click Here: The Folly of Technological Solutionism*. New York: Public Affairs.

Muniesa, F. and Callon. M. (2007). Economic experiments and the construction of markets. In D. MacKenzie, F. Muniesa and L. Siu (eds), *Do Economists Make Markets? On the Performativity of Economics*. Princeton: Princeton University Press, 163–189.

Pinch, T. (1993). 'Testing-one, two, three … testing!' Toward a sociology of testing. *Science, Technology & Human Values 18*: 25–41.

Ratto, M. and Boler, M. (eds) (2014). *DIY Citizenship: Critical Making and Social Media*. Cambridge, MA: MIT Press.

Savransky, M. (2014). Of recalcitrant subjects. *Culture, Theory and Critique 55*: 96–113.

Söderström, O., Paasche, T. and Klauser, F. (2014). Smart cities as corporate storytelling. *City 18*: 307–320.

Stengers, I. (2005). The cosmopolitical proposal. In B. Latour and P. Weibel (eds), *Making Things Public: Atmospheres of Democracy*. Cambridge, MA: MIT Press, 994–1003.

Tironi, M. (2016). Ecologías urbanas temporales: del diseño inteligente al diseño especulativo. *INMATERIAL. Diseño, Arte y Sociedad 1*.

Tironi, M. and Sánchez Criado, T. (2015). Of sensors and sensitivities: towards a cosmopolitics of 'smart cities'? *TECNOSCIENZA: Italian Journal of Science & Technology Studies 6*: 89–108.

Tironi, M. and Valderrama, M. (2018). Unpacking a citizen self-tracking device: smartness and idiocy in the accumulation of cycling mobility data. *Environment and Planning D: Society and Space 36*: 294–312.

Vanolo, A. (2014). Smartmentality: the smart city as disciplinary strategy. *Urban Studies 51*: 883–898.

Yaneva, A. (2017). Guerreros en busca de un público: modalidades disposicionales y políticas de presentar la arquitectura. *Revista Diseña 11*: 62–79.

12

A SMART EQUIVOCATION

Co-laboration and subsidiarity in a smart city consortium

Ignacio Farías and Claudia Mendes

Introduction

In February 2016, the smart city project *Smarter Together* was officially launched in the cities of Munich, Vienna and Lyon. Funded under the European Commission's Horizon 2020 Smart Cities and Communities (SCC) programme, the so-called innovation action is intended to 'identify, develop and deploy replicable solutions in energy, transport, and ICT … through lighthouse (large scale demonstration – first of the kind) projects'. Within the H2020 framework, the SCC programme is issued under the 'societal challenges' label, and therefore supposed to be driven by 'demand-side actors' instead of industries or research institutions. Further, the 'proposed activities … should also lead to the development of integrated urban plans' (European Commission 2015: 83, 84). Hence, the programme quite clearly mobilises municipalities as key players to lead large public–private consortia and to make sure that a 'holistic' and 'integrated' approach is being adopted.

In the case of *Smarter Together*, the city-led consortium assembles over 30 partners from public administration, research institutions, non-governmental organisations (NGOs), small enterprises and multinational companies around the declared overarching aim of reducing CO_2 emissions and improving citizens' quality of life in urban districts. Concrete measures to be implemented through the project include: the large-scale refurbishment of existing housing estates and the installation of smart meters; the introduction of e-mobility infrastructure and sharing systems; the implementation of intelligent lamp posts equipped with sensors and adaptive lighting; and the deployment of municipal data management platforms. All of these so-called solutions need to be implemented by 2019, and achievements will be monitored until 2021. We are thus writing about an ongoing project, a 'work in progress'.

Recent scholarly discussions on smart urban governance identify the extensive and experimental cross-sector collaborations envisaged and carried out through smart city projects as one of its key features (Marvin and Silver 2016, Meijer and Bolívar 2016, Trencher and Karvonen forthcoming). This aspect, expressed in the *Smarter Together* proposal's compelling narrative of 'co-creation' across sectors and cities, has been deemed a decisive feature for the project's positive evaluation by the SCC committee. What we set out to explore in this chapter is how this smart urban governance agenda actually plays out in the complicated institutional ecology shaping *Smarter Together.* By limiting the scope to the city of Munich, we provide an in-depth analysis of the modes of collaboration between the city administration and two key consortium partners: the multinational tech company Siemens and the city-owned private company Munich Society for Urban Renewal (Münchner Gesellschaft für Stadterneuerung, or MGS).

Reconstructing the stories of the collaboration among these actors allows us to challenge common smart city narratives and critiques. On the one hand, many critical studies have pointed out that corporate actors tend to be the driving force behind smart city initiatives, persuading municipalities that their smart technologies are key to making cities more efficient, sustainable and liveable in the long term. Municipalities that succumb to that narrative risk being locked into dependency with these companies, which in return can reap large profits. A growing influence of private business actors on urban planning and development and an increasingly opaque way of data-driven, algorithmic decision-making is feared to be the result (Luque-Ayala *et al.* 2014, Söderström *et al.* 2014, Hollands 2015, McNeill 2016). On the other hand, smart city projects are often read as technocratic, standardised approaches to urban development, with little concern for local specificities and culture. Thus, they focus on entrepreneurial and business-friendly urban growth, producing fragmented spaces for technological test-bedding as well as for wealthy, tech-savvy 'smart citizens', at the expense of more socially inclusive projects and a holistic planning approach (Hollands 2008, Datta 2015, Kitchin *et al.* 2015, Luque-Ayala and Marvin 2015, Zandbergen and Blom 2015, Cugurullo 2017).

While recent empirical studies have broadened the picture by highlighting more participatory and less technology-centred smart city rationales (Stollmann *et al.* 2016, Cowley *et al.* 2018, Farías and Widmer 2018, Trencher and Karvonen forthcoming), the stories we tell in this chapter require us to question the implicit model of urban innovation that underlies the critical perspectives presented above – one that resembles the so-called sociology of translation (and treason) developed by Callon and Latour in the 1980s. Indeed, most critical analyses of smart city initiatives rely on a Machiavellian understanding of the tactics and strategies by which one actor becomes capable of interesting and enrolling other actors in its problematisation to the point of becoming capable of speaking in the name of a complex network of actors (Callon 1986, Akrich *et al.* 2002). By examining the complicated stories of collaboration among city administrations, technology corporations and subsidiary private companies, we present a less univocal

situation. Instead of an asymmetrical capacity of actors to translate the interests of others, the forms of collective action in *Smarter Together* are based on what anthropologist Viveiros de Castro calls 'equivocations', that is 'the referential alterity between homonymic concepts' (2004: 5).

Equivocations are not simply based on a confusion of the different meanings of a homonym, but on the structural analogies in incommensurable material-semiotic systems. The following Amerindian myth grasps the kind of equivocations Viveiros de Castro is discussing:

> The human protagonist becomes lost deep in the forest and arrives at a strange village. There the inhabitants invite him to drink a refreshing gourd of 'manioc beer,' which he accepts enthusiastically and, to his horrified surprise, his hosts place in front of him a gourd brimming with human blood.
>
> *Viveiros de Castro (2004: 9)*

Taking seriously the Amerindian ontology in which 'individuals of the same species see each other (and each other only) as humans see themselves' makes clear that the equivocation Viveiros de Castro is talking about is not just related to the superposition of multiple meanings of words, but the superposition of multiple worlds around meanings: 'What changes when passing from one species of subject to another is the "objective correlative," the referent of these concepts: what jaguars see as "manioc beer" (the proper drink of people, jaguar-type or otherwise), humans see as "blood"' (Viveiros de Castro 2004: 6). Hence, jaguars and humans share a sense and a taste for manioc beer, but this opens up incommensurable worlds.

In this chapter, we use the notion of equivocation to describe complex ecologies of cooperation shaping urban governance in and around the smart city, as articulating incommensurable worlds. Equivocations are a central clue to rethink our understanding of collaborative innovation processes from one being based on univocal translations to one based on ontological multiplicity. In the next section, we demonstrate how equivocations around the notion of 'smart city' and the so-called *city intelligence platform* (CIP) shape the partnership between Siemens and the city administration, leading to a relationship of 'co-laboration' (Niewöhner 2015), that is, joint but separate work. We then argue that equivocations surrounding the goals of two urban renewal programmes are crucial to inverting the relationship of the city and the city-owned company running these programmes, from one of top-down delegation to one of subsidiarity. Next, we come back to a conceptual issue that is central to the chapter – the need to move from a sociology of translation to a sociology of equivocation when studying urban innovation processes. Finally, we characterise the specific type of equivocations that hold *Smarter Together* together.

A corporate-driven project? From enrolment to co-laboration

In the face of the prominent smart city critique as a corporate-driven strategy, one partnership in the *Smarter Together* project seems to be especially relevant to

examine in more depth: the involvement of one of the big players in the smart city market, having its headquarters in the Bavarian capital – the multinational tech company Siemens. The role played by Siemens in the history of Munich's participation in the *Smarter Together* consortium cannot be overstated. But did it really establish itself as an obligatory passage point? Did it enrol the city administration in a project aimed at testing new market products? And, if not, what then were the parameters that collaboration proceeded along? These are the questions we explore by tracing the collaboration from the early phases of agenda setting through drafting of the proposal and to the running of the project.

To begin with, Siemens was actively involved in formulating the recommendations to the European Commission (EC) on which all Smart Cities and Communities (SCC) calls are based. The company's CEO of the Infrastructure & Cities sector has been one of the 25 CEOs and city mayors of the high-level group of the European Innovation Partnership SCC. More concretely, when the company first created its Infrastructures & Cities sector in 2011, it also appointed account managers in about 60 cities around the globe, including one in Munich. Having identified a €300 billion market to be addressed, the city account manager would 'enter in direct contact with decision makers in cities' in order to 'offer the complete Siemens portfolio to their respective city', while at the same time internally contributing 'with their experiences to the further development of the Siemens portfolio for cities' (Siemens 2011: 1–2).

Two years later, in 2013, a process called *Themenradar* (topic-radar) was set in motion as a joint effort between the municipality's planning department and Siemens. The whole endeavour was meant to loosely and noncommittally map innovations and possible smart city solutions with respect to their readiness for implementation. Officially, Siemens was only acting as facilitator, and the city of Munich was the driving force in inviting contributors, steering discussions and documenting outcomes. However, by providing meeting rooms, slide templates and knowledge of the EU call's thematic clusters, as well as the very 'topic-radar method', Siemens exerted a major influence on the entire process. While the topic-radar was meant to provide a platform for both cross-departmental exchange within the municipality and networking with various research and industry partners (other than Siemens), the fact that it was hosted at Siemens left some of the participants suspicious, and resulted in somewhat restrained discussions; or, as one of our interlocutors at the city planning department put it, 'people were constantly holding the brake pedal', especially tech companies who were afraid of disclosing innovative ideas. Given such difficulties in identifying new solutions and the increasing pressure on planning officers to develop a concrete proposal for upcoming European Union (EU) deadlines, the city decided to drop the topic-radar in 2014.

However, the topic-radar did not simply fail, but gave rise to a more concrete and committed process of developing a proposal to the EU SCC call led by the city administration. Although the deadline for the first call in December 2014 could not be met, the city identified two partner cities, Lyon and Vienna, through the process to build a project consortium. It also identified partners within the

different departments motivated enough to push through the proposal-writing phase. Further, a consultancy was hired to identify and shortlist industry partners for Munich's solutions, and regular meetings were held to focus on the action clusters defined in the EU call, one of them being integrated information and communication technology (ICT) infrastructures and processes.

With these activities, the influence of Siemens in the smart city project did not disappear. The cooperation between the city of Munich and Siemens turned from one in which Siemens introduced the smart city to the city administration into a more focused partnership within a larger project consortium. The municipality's ICT department and Siemens agreed to work on the CIP that by the time of the proposal writing was still being tested before becoming one of Siemens' leading smart city products.

Up to this point, the story we have told could be read as a conventional story of corporate-driven smart city urbanism in line with the translation-model sequence of 1) problematisation, 2) interessement, 3) enrolment and 4) mobilisation (Callon 1986). Before Munich even started to consider smart city projects, Siemens was operating at different levels, demonstrating that digital automation of urban infrastructures was the solution for sustainable cities. Once a problem has been linked to new smart city products (1), Siemens begins to interest other actors (city administrations) in their problem definition (2), to the point of enrolling the city of Munich as a test site for one of its important market products (3) and becoming the spokesperson of the smart city (4).

But things are more complicated than this. Effectively, a different story of enrolment and translation can be told by focusing on some key players in the city administration and how they were by no means committed to Siemens. Indeed, up until March 2015 another smart data platform, developed by the consultancy hired to prepare the proposal, had been the preferred choice. However, the consultancy was eventually kicked out of the project after criticising the municipality's approach as not being sufficiently innovative and for trying to push the city administration down a technology-driven path they were not willing to go. So, actually, by choosing Siemens the city administration was enrolling the company in a project that aimed at developing forms of public ownership and management of data, thus decentring the role of tech corporations. This other story is important because it points to the co-existence of 'multiple translators' of the smart city operating at the same time.

While promising, this description of the process as simultaneous translations of more than one entrepreneur does not fully explain how the collaboration between Siemens and the city administration took concrete shape in the *Smarter Together* project. This is due to a significant feature of their interaction: both actors entered into the partnership with a common set of goals, all the while knowing very well that these goals implied disparate, even irreconcilable things for each of them. This becomes particularly apparent when looking at the specific technology solution to be developed and implemented through the collaboration: the city intelligence platform (CIP) that aggregates and analyses data from several municipal sources. Notably, there is a common language regarding the

data platform: both Siemens and Munich's ICT department are interested in optimising urban resources and processes, integrating different data sources, moving from big to smart data, establishing a platform for private companies to try out creative solutions and so on. But, astonishingly, while formulating common goals with a common language, these actors were speaking about fundamentally different things (or rather *not* speaking about them).

As noted above, the understandings of the CIP were shared. What varied were the objects that were being intervened in and experimented with through the platform. Siemens was testing the extent to which the CIP was capable of running a city as a 'natural ecosystem' 'equipped with enough sensors and feedback loops to manage most of their services automatically while making the best possible use of resources' (Zistl 2015). Accordingly, making the test in a real city was crucial to develop the CIP into a 'marketable solution' or to experiment with potential apps and services to be developed on top of it.

The Munich ICT department on its part was testing a completely different reality: namely, the extent to which the CIP is capable of assisting urban planners when making decisions and helping them integrate knowledge and work processes across administrative silos. Working with Siemens in real conditions is an opportunity to gain experience, insights and expertise about digital infrastructures, and to experiment with it for administrative purposes, public services and the stimulation of start-up businesses. The data and services developed with the help of the CIP during the project shall not affect 'business as usual' in Munich's city administration, but merely be complementary. Thus, whereas Siemens's experiment concerned the capacity of the CIP to automatise urban infrastructures and flows, the city administration's experiment concerned the capacity of the CIP to steer urban planning and management processes.

The real is bifurcated, but kept together by a set of shared equivocal notions. Just like in Viveiros de Castro's example (2004: 9), these actors share concepts (smart city/suitable drink for people) but do not operate on the same object (the city/manioc beer vs. the administration/blood). Notably, this goes on to the extent that collaboration becomes euphemistic. In its stead what one could observe is rather a form of *co-laboration* in the sense of 'transient, non-teleological joint epistemic work without the commitment to a shared outcome' (Niewöhner 2015: 236). According to Niewöhner, co-laboration is an ecological relation that results from the sharing of a common space where actors work side by side on similar, but ultimately incommensurable objects. The effect of co-laboration is a mutual, positive irritation which, we argue, thrives on equivocations.

But the story continues. Well aware of some of the critical smart city literature, one important concern among city officials in Munich was to avoid dependence on the technological solutions of one corporation. Accordingly, they repeatedly insisted that the experiment needed to be designed in such a way that it would be possible to simply unplug the CIP if it did not prove to be useful or financially viable. Unexpectedly though, not even a year into the project, it was Siemens that decided to resign from its partnership with the city, even though the consortium agreement allocated 44 person-months to Siemens Germany for

its contribution to the city of Munich's project. This was an impressively high commitment, especially when compared to the effort of the city of Munich and its various subsidiary publicly owned companies, which in total only tripled Siemens's allocated person-months. The consortium agreement thus reveals the commitment that Siemens had made to the project, while their resignation indicates how quickly they realised that the two experiments were incompatible.

Resigning from *Smarter Together* as a reality check for the CIP, Siemens decided to hand over the task of supporting the city administration to their subsidiary VMZ, a company specialising in mobility management and information systems. While this presented some serious challenges due to the highly complex and formal requirements imposed by the EU grant agreement, Siemens argued that VMZ was the better fit to deal with the very hands-on task of developing and tailoring the platform's architecture to the city's specific needs. Suddenly the frame of the collaboration had radically changed. Instead of having a unique opportunity to continue working on the CIP in a complex urban context, the collaboration was redefined as an opportunity for their subsidiary to 'enlarge their operative fields of activities towards a broader smart city management focus' (Smarter Together 2017).

Interpreting this collaboration as based on the logics of enrolment and translation would only allow us to read it as a failure. On the one hand, the city of Munich might have failed to enrol Siemens in a smart city project, where their primary role would be to support the city administration in experimenting with data-inspired urban planning and management tools. On the other hand, one could stress the ultimate incapacity of Siemens to enrol the city in their strategy of developing smart city products, unable to cope with complex and slow urban planning and authorisation procedures and citizen participation requirements, as well as the many legal, political and moral constraints that limit the pace and scope of innovation and experimentation. We would argue that this reading of the last episode as one or the other's defeat is rather insufficient and fairly vain. Returning to the notions of equivocation and co-laboration again offers a more meaningful interpretation.

In the previous analysis, we emphasised that a critical element sustaining the relationship between these two actors was the fundamental equivocations resulting from a shared vocabulary around the smart city, by which they actually refer to two fully incommensurable objects: a system moving towards automated efficiency based on sensors, real-time data and algorithms versus a unit administered more efficiently by public experts with the help of digital technologies to enhance the common good (Reiss-Schmidt 2017). Taking this into account, we characterise their cooperation as a form of co-laboration, a case of joint but separate work where they operate in two incommensurable realities. Accordingly, it begs the question whether these two actors were ever capable of enrolling each other. Assuming that this was not really the case, this last episode can actually be understood as something completely different. By renouncing co-laboration and delegating the task to a subsidiary, Siemens created the conditions for mutual enrolment to occur – that is, for the two actors involved (the city administration and VMZ) to become the ally they need to achieve their goals.

A technocratic urban development approach? From delegation to subsidiarity

In the context of Siemens transferring tasks and funds to a subsidiary, another relationship in the *Smarter Together* project emerges as worthy of analysis: the collaboration between the city administration and the city-owned company Munich Society for Urban Renewal (MGS), which became a partner of *Smarter Together* while also running another urban renewal programme in the same project area. In this case, we explore a different set of equivocations concerning the goals of both programmes; equivocations that proliferate in the interstice between the city's delegation of tasks and MGS's performance of its subsidiary function. This is the crux of the story we tell here, which more generally concerns how smart city projects relate to co-occurring urban development projects.

MGS is a company that is wholly owned by the city. It was founded in 1979 to regenerate deprived neighbourhoods as a trustee of the city of Munich. Its main advantages are the ability to operate more flexibly, i.e. on real estate issues, and to be eligible to receive funding from federal urban development programmes (this is restricted to limited companies). MGS typically chooses and prepares new urban regeneration projects via assignment from the planning department. However, once the municipal council assigns a project to MGS, they operate with a high degree of independence. As for the *Smarter Together* project area, Neuaubing-Westkreuz, MGS was commissioned in 2012/13 to prepare a so-called integrated district development concept defining the targets of the holistic urban renewal programme supported by federal funding *Soziale Stadt*. This was approved in April 2014 and its implementation was assigned to MGS.

MGS's procedure to develop the underlying concept of the *Soziale Stadt* programme involves a range of studies and participatory processes to define district-specific priorities of action in the fields of local economy and supply, education, social and cultural issues, and energy refurbishment. When it comes to implementation, they follow what they call a 'bottom-up' and 'district-based' approach with contingent funds for small local projects, counselling and financial support for energy refurbishment of residential buildings and the regeneration of central places such as commercial centres. Indeed, most measures in *Soziale Stadt* rely on the integration of (and often private investment by) diverse local actors such as shopkeepers, land and housing owners and educational institutions. Thus, two permanent offices for community management (*Stadtteilläden*) as well as a special task force (*Projektgruppe*) were established. The *Projektgruppe* – consisting of members from all involved city departments, municipal and district politicians of all parties, representatives of all local institutions and associations as well as a few interested residents – is given particular importance. MGS values the opinions of all members regarding overall goals as well as singular concrete measures, and seeks to achieve consensus.

With the EU SCC requirement to enhance ongoing efforts by the municipalities in the envisaged Lighthouse districts and guaranteed additional funds

for implementation, the *Soziale Stadt* programme became one (if not the main) reason for choosing Neuaubing-Westkreuz as the project area. However, during the preparation phase of the *Smarter Together* project, city administration and invited experts from industry and academia were only concerned with identifying abstract solutions that could turn any ordinary district into a smart one. Accordingly, despite their expert and local knowledge, MGS members were not involved in this explorative phase, when the *Smarter Together* project was being defined to test and roll out specific technological solutions. General ideas of how these solutions would benefit local residents in the long run were not underpinned by local knowledge of potential impacts. Indeed, many of the public officials eventually involved in *Smarter Together* did not even have much knowledge of what the *Soziale Stadt* urban renewal programme entailed.

As it turned out, MGS was only involved towards the end of the proposal's preparation phase, when the final decision on Neuaubing-Westkreuz as the future project site had already been made. So when MGS joined the workshops, the smart city action clusters were already defined and only a small range of solutions were still under discussion, mainly with respect to innovativeness, feasibility and eligibility as defined in the call as well as the commitment and trustworthiness of relevant partners. MGS was invited as a partner to lead the tasks of energy refurbishment and citizen engagement. But notably, MGS representatives expressed concerns about foreseen measures beyond these two areas, as they deemed the *Smarter Together* project to be pursuing goals that were not just diverging from but also undermining those of the *Soziale Stadt* programme.

A first area of concern involved the planned mobility solutions. These included the instalment of a network of so-called mobility stations (physical hubs for e-bike and e-car sharing) aimed not only at residents but also at taxi and delivery service fleets. The type and location of these mobility solutions contradicted the aim of revitalising the district sub-centres that were mainly designed for pedestrian access. Mobility stations would also create conflicts with residents' parking habits and destroy scarce public space while not taking into account actual resident mobility needs and the district's historic infrastructure. Secondly, the planned smart delivery boxes would primarily serve big online traders and supermarket chains, undermining the *Soziale Stadt* goal of regenerating and preserving small businesses in the district's centres. Beyond this, the smart infrastructure would minimise personal contact and eventually cause an increase in traffic in residential streets. Finally, MGS representatives were especially concerned that the strong emphasis on co-creation and participatory design in *Smarter Together* would end up duplicating existing participation efforts, exhausting and confusing people.

Taking these concerns into account, the collaboration between the city administration, its *Smarter Together* partners and MGS during the proposal-writing phase was thus primarily oriented towards establishing coherent wording for the description of goals and tweaking the proposed solutions to meet the minimal requirements of *Soziale Stadt* so that synergies could be realised. In the case

of the mobility stations, MGS representatives stated that the Munich Transport Authority (MVG) has done its best to integrate the goals established by the *Soziale Stadt* programme on top of all the mandatory legal and infrastructural parameters, although it made their task even more complex and time-consuming. The willingness to do so, according to an MGS representative, is heavily linked to the fact that the Transport Authority is also a municipality-owned company: 'Siemens would probably have said long ago: "if you want to do it this way, go ahead, but without us".' To the extent that this statement is about municipality-owned companies, it is also a statement about the MGS itself – a company that long ago could have said 'build your smart city without us', but made a major effort to integrate both programmes, as reflected in the project proposal submitted by the Munich consortium.

At first sight, one could interpret the involvement of MGS in the smart city project as an act of delegation. Instead of having members of the planning department themselves dealing with local residents' concerns, convincing home-owner communities to agree upon extensive retrofitting or reporting to the district council on a regular basis, they assigned MGS to take care of these tasks on their behalf. However, this form of delegation would presuppose a rather complete alignment where 'someone, something, reliably acts as lieu-tenant, holding the enunciator's place' (Latour 1994: 39). Yet, what we encounter here is a more equivocal process aimed at aligning project goals so that an acceptable degree of communication and integration between the projects could be pursued, while sensing that 'understandings persist in being not the same' (Viveiros de Castro 2004: 12). This equivocation is based on a radically bifurcated enactment of the urban district. Both would fully agree on the need to enhance sustainability and quality of life in the project area; yet public officials running the *Smarter Together* project would approach the city district as a lighthouse area to test and establish standards for a city-wide roll-out, while employees of the MGS *Soziale Stadt* programme would act upon it as a deprived neighbourhood in need of their support to keep pace with the rest of the city.

The equivocations resulting from this require us to unpack the relationship of subsidiarity between the city and MGS, for it entails more than simply following the mandate of the city to participate in the smart city project and implementing top-down solutions as a delegate. Indeed, as a governance principle, 'subsidiarity requires political decisions to be made at the lowest feasible level of governance so as not to override deep-seated communal sensibilities' (Jasanoff 2013: 135). Taking the subsidiary character of MGS seriously thus demands attention to the fundamentally different objects of intervention enacted by the city planning department and MGS, the homonymous but incommensurable urban realities that they construct and act upon in practice. Unpacking subsidiarity allows us to identify two strategies for handling in practice such a bifurcated reality. Firstly, subsidiarity implies efforts at *not* integrating the *Soziale Stadt* and *Smarter Together*, but keeping them separate and allowing them to co-exist. Secondly, the subsidiary role of MGS turns the idea of delegation upside down, so that instead of

acting in the name of *Smarter Together* the smart city project is subsumed into the *Soziale Stadt* agenda to the point of making *Smarter Together* disappear. These two strategies, co-existence and subsummation, we argue, are not forms of clarifying, but rather working with the equivocation that both programmes would have the same goals and thereby enable cooperation among the involved actors.

We experienced how these subsidiary strategies of co-existence and subsummation unfolded in practice while contributing to the work package on citizen involvement led by MGS. When first invited by the city's planning department to become a consortium partner in charge of the co-creation activities, we submitted a concept that entailed the need for a dedicated communal space for communication and co-creation activities. The proposal was fully embraced by the city despite some initial scepticism from MGS. Hence, only a few months into the project, a place we called *Stadtteillabor* opened its doors on the second floor of the largest building complex in the project area. It was designed as a highly modular workshop space for co-design processes and was also used as a promotional stand for *Smarter Together*, with supposedly cool words written in big letters on the wall.

This combination of aesthetics and uses stood in stark contrast to the aesthetics and uses of MGS *Stadtteilläden*, two rather ordinary offices for community management and essential components of the *Soziale Stadt* programme with information material on display and regular consultation hours. On the inauguration day of *Stadtteillabor*, the city mayor, the district mayor and various representatives from the *Smarter Together* project (including one of us) gave euphoric speeches about all the new things that were going to happen in that space and in the district in general. Notably, even though they could have easily done so, none of the MGS representatives gave any public speeches to celebrate the new synergies between the two projects. Interestingly, while the *Stadtteillabor* was triple the size of the MGS *Stadtteilläden*, it was located on the second floor, so it was much more difficult to be noticed and accessed by passers-by. And, in terms of personnel, the MGS local agents never spoke publicly in the context of *Smarter Together* activities, and *Smarter Together* events were not displayed on the MGS public online calendar for Neuaubing-Westkreuz. Thus, the physical and aesthetic demarcation between the two projects was an important way of achieving co-existence by keeping things separate despite efforts towards project integration.

Beyond this, and perhaps more importantly, when speaking to local actors, members of MGS carefully avoid infusing the *Soziale Stadt* project and activities with the smart city discourse of *Smarter Together*. Indeed, when residents visit the *Stadtteilläden*, they are informed about a wide variety of measures currently implemented in the different action fields defined by the integrated district development concept underlying *Soziale Stadt* that was issued by MGS in 2013. *Smarter Together* projects might be mentioned, but not with the keyword 'smart city' or in terms of an EU-funded Lighthouse project. Local residents, they explain, are not primarily concerned with the funding source or the overall programme behind it, but with the actual measures implemented and the immediate effects on their life worlds. Perhaps the best example of the subsummation of *Smarter Together*

as a subsidiary's agenda concerns the closing of the *Stadtteillabor* in December 2017. In the final event, a public report on the current state of implementation of the *Smarter Together* project was only a minor activity in a diverse evening programme. Instead, the event displayed participatory activities organised by MGS in the fields of arts and education before the building will be demolished and rebuilt as part of the *Soziale Stadt* urban renewal activities. A new *Stadtteillabor* is supposed to be established for the *Smarter Together* project in the district, only this time in the basement of one of the *Soziale Stadt Stadtteilläden*. The contrast with the pompous opening of this space could not be more telling of how the majestic arrival of the smart city is subtly but effectively subsumed into long-term local development agendas.

A smart equivocation?

The presented smart city initiative then offers an excellent case to uncover the constructive value of equivocations. The suitability of the case is not only related to the so-called 'smart' character of the planned urban transformations, even though the notion of 'smart city' has indeed become a floating signifier apt to be filled with almost any possible meaning. Equally important is the *urban* nature of the project at stake, which entails the co-existence of multiple, often contradicting ways of enacting the city. In the stories we have told, we encounter at least three different ways of enacting, that is, representing, practising and intervening in one urban district: as a generalisable test site for global smart city markets; as the foundation for a city-wide implementation of digital infrastructures of urban management; and as a decayed neighbourhood in need of revitalisation. Urban sites are not just experienced or represented in different ways by different actors and institutions; they are also multiple in the sense of participating in various and often incommensurable worlds. Hence, both the need for and the impossibility of achieving coherence among disparate worlds become particularly apparent in urban sites.

In the previous sections, we identified two ways in which equivocations – understood as productive 'communicative disjuncture where the interlocutors are not talking about the same thing, and know this' (Viveiros de Castro 2004: 9) – allowed the different urban actors participating in the smart city consortium to proceed with their project. The first operation, involving the city administration and the multinational tech company Siemens, occurred through engagement in what Niewöhner calls 'co-laboration', that is, *joint but separate* epistemic work. The second operation, involving the cooperation of the city administration with the city-owned urban renewal company MGS, is related to what Jasanoff calls 'epistemic subsidiarity' to account not just for *joint-but-separate* co-existence of distinct urban development projects, but also for the *top-down-but-bottom-up* subsummation of transnational discourses, goals and standards. These paradoxical *joint-but-separate*, *top-down-but-bottom-up* modes of constituting technoscientific worlds reflect several equivocal relationships at the core of many smart city projects. We have shown that paying attention to equivocations requires us to

challenge the translation model of innovation; and, turning again to Viveiros de Castro, we can further specify the kind of equivocal operations at stake.

In his article, Viveiros de Castro describes anthropology as a discipline whose main task has always been the 'translation of the "native's" practical and discursive concepts into the terms of anthropology's conceptual apparatus' (2004: 4–5). Assuming that every translation is always a form of treason, the perennial question of anthropology has been about whose language is being betrayed: either the original languages by anthropologising native concepts or anthropology's language by pushing it to go native and think as others think. It is here where Viveiros de Castro sees the potential of Amerindian relationships of equivocation, as it allows us to rethink anthropology's translation/treason dilemma. Instead of cultural translations that are based on 'implicit or automatic (and hence uncontrolled)' comparisons, Viveiros de Castro pleads for an anthropology of 'controlled equivocations' – that is, an effort to 'avoid losing sight of the difference concealed within equivocal "homonyms"' (2004: 5, 7). The art of controlling equivocations, in the sense of flagging and grounding them in ontological difference, emerges then as a necessary condition for good anthropology.

In a similar gesture, we have proposed to use the notion of equivocation to rethink the so-called 'sociology of translation'. Elaborated by Callon and Latour in the 1980s to describe the progressive constitution of socio-technical worlds, translation has been conceptualised here as a process resulting from 'the capacity of certain actors to get other actors – whether they be human beings, institutions or natural entities – to comply with them' (Callon 1986: 201), while establishing themselves as spokespersons of the actors enrolled. Interestingly, the conventional critique of the sociology of translation also revolves around the question of betrayal: its lack of attention to those betrayed or left behind in such techno-scientific projects of world-making is Star's (1991) critique of the alleged managerialism of actor-network theory (ANT) and the basis for Galis and Lee's (2014) 'sociology of treason'. The latter is meant to balance ANT's one-sided emphasis on the construction of worlds by paying attention to the progressive constitution of social exclusion and powerlessness. As with anthropology, it appears that the translation/treason framework for the study of techno-scientific innovation is grounded in a zero-sum logic. Accordingly, equivocation offers a promising analytical perspective to overcome that logic by paying closer attention to the handling of ontological multiplicities and incommensurabilities in the constitution of techno-scientific worlds.

In the case of the smart city, however, equivocations and the attempts to operate with and around them play out in somewhat different ways from the ones described by Viveiros de Castro for anthropology. For the latter, equivocations are the basic condition encountered in the field; and controlling them in the sense of making them explicit by carefully keeping in sight 'the difference concealed in equivocal homonyms' (2004: 7) is the method anthropologists have to adopt for the sake of cultural translation. For the observed participants in the smart city consortium, what is at stake is not translation but joint action despite incommensurability. Accordingly, instead of a careful and highly reflective

method of controlling equivocations, a less reflexive and, in a sense, 'smart' approach to dealing with equivocations seems to be required, if by smart we stick to the very first word that appears in some English dictionaries' entry for smart – namely, astute. The astute equivocations described in the preceding sections are far from being 'uncontrolled': that is, based on the negation or ignorance of the fundamental differences persisting behind homonymous terms – an approach that would testify to the *naivité* of the involved actors. Rather, the partners of the consortium (on occasion, even ourselves) would make an effort to indeed lose sight of the equivocation for the sake of engaging in the joint venture. By way of this astute, tacit yet productive approach, smart equivocations become the means to enable and coordinate *joint-but-separate*, *top-down-but-bottom-up* collaborations.

References

Akrich, M., Callon, M. and Latour, B. (2002). The key to success of innovation: the art of interessement (Part 1); the art of choosing a good spoken person (Part 2). *International Journal of Information Management 6*: 187–225.

Callon, M. (1986). Some elements of a sociology of translation: domestication of the scallops and the fishermen of St Brieuc Bay. In J. Law (ed.), *Power, Action and Belief: A New Sociology of Knowledge?* London: Routledge, 196–223.

Cowley, R., Joss, S. and Dayot, Y. (2018). The smart city and its publics: insights from across six UK cities. *Urban Research & Practice 11*: 53–77.

Cugurullo, F. (2017). Exposing smart cities and eco-cities: Frankenstein urbanism and the sustainability challenges of the experimental city. *Environment and Planning A: Economy and Space 50*: 73–92.

Datta, A. (2015). New urban utopias of postcolonial India: 'entrepreneurial urbanization' in Dholera smart city, Gujarat. *Dialogues in Human Geography 5*: 3–22.

European Commission (2015). Horizon 2020 work programme 2014–2015: 10. Secure, clean and efficient energy, Revised. [Online]. Available: http://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/main/h2020-wp1415-energy_en.pdf [Last accessed 16 November 2017].

Farías, I. and Widmer, S. (2018). Ordinary smart cities: how calculated users, professional citizens, technology companies and city administrations engage in a more-than-digital politics. *Tecnoscienza 8*: 43–60.

Galis, V. and Lee, F. (2014). A sociology of treason: the construction of weakness. *Science, Technology & Human Values 39*: 154–179.

Hollands, R.G. (2008). Will the real smart city please stand up? Intelligent, progressive or entrepreneurial? *City 12*: 303–320.

Hollands, R.G. (2015). Critical interventions into the corporate smart city. *Cambridge Journal of Regions, Economy and Society 8*: 61–77.

Jasanoff, S. (2013). Epistemic subsidiarity: coexistence, cosmopolitanism, constitutionalism. *European Journal of Risk Regulation 4*: 133–141.

Kitchin, R., Lauriault, T.P. and McArdle, G. (2015). Smart cities and the politics of urban data. In S. Marvin, A. Luque-Ayala and C. McFarlane (eds), *Smart Urbanism: Utopian Vision or False Dawn?* London: Routledge, 16–33.

Latour, B. (1994). On technical mediation. *Common Knowledge 3*: 29–64.

Luque-Ayala, A. and Marvin, S. (2015). Developing a critical understanding of smart urbanism? *Urban Studies 52*: 2105–2116.

Luque-Ayala, A., McFarlane, C. and Marvin, S. (2014). Smart urbanism: cities, grids and alternatives. In: M. Hodson and S. Marvin (eds), *After Sustainable Cities?* London: Routledge, 74–89.

Marvin, S. and Silver, J. (2016). The urban laboratory and emerging sites of urban experimentation. In J. Evans, A. Karvonen and R. Raven (eds), *The Experimental City*. London: Routledge, 47–60.

McNeill, D. (2016). IBM and the visual formation of smart cities. In S. Marvin, A. Luque-Ayala and C. McFarlane (eds), *Smart Urbanism: Utopian Vision or False Dawn?* London: Routledge, 34–52.

Meijer, A. and Bolívar, M. (2015). Governing the smart city: a review of the literature on smart urban governance. *International Review of Administrative Sciences 82*: 392–408.

Niewöhner, J. (2015). Epigenetics: localizing biology through co-laboration. *New Genetics & Society 34*: 219–242.

Reiss-Schmidt, S. (2017). Digital transformation: cities between reaction and integrated strategies – case study Munich, Germany. Joint OAPA-ISOCARP Conference/53rd ISOCARP Congress 2017. [Online]. Available: www.eventure-online.com/parthen-uploads/95/17POR/add_1_364864_GjD4UGxLae.pdf [Last accessed 16 November 2017].

Siemens. (2011). Siemens begins fiscal 2012 with new structure. Press release, 27 September 2011. [Online]. Available: www.siemens.com/press/pool/de/pressemitteilungen/2011/corporate_communication/AXX20110985e.pdf [Last accessed 16 November 2017].

Söderström, O., Paasche, T. and Klauser, F. (2014). Smart cities as corporate storytelling. *City 18*: 307–320.

Smarter Together. (2017). P1. *Periodic Technical Report Part B – Version 1*, 29 September 2017. [Online]. Available: https://cordis.europa.eu/result/rcn/215111_en.html [Last accessed 16 November 2017].

Star, S.L. (1991). Power, technology and the phenomenology of conventions: on being allergic to onions. In J. Law (ed.), *A Sociology of Monsters? Essays on Power, Technology and Domination*. London: Routledge, 26–56.

Stollmann, J., Wolf, K., Brück, A., Frank, S., Million, A., Misselwitz, P., Schlaack, J. and Schröder, C. (eds) (2016). *Beware of Smart People! Redefining the Smart City Paradigm towards Inclusive Urbanism: Proceedings of the 2015 'Beware of Smart People!' Symposium*. Berlin: Universitätsverlag der TU Berlin.

Trencher, G. and Karvonen, A. (forthcoming). Stretching 'smart': advancing health and well-being through the smart city agenda. *Local Environment*.

Viveiros de Castro, E. (2004). Perspectival anthropology and the method of controlled equivocation. *Tipití: Journal of the Society for the Anthropology of Lowland South America 2*: 3–22.

Zandbergen, D. and Blom, S. (2015). Smart city: in search of the smart citizen. *GR1P website* [Online]. Available: https://gr1p.org/en/documentary-smart-city-in-search-of-the-smart-citizen/ [Last accessed 16 November 2017].

Zistl, S. (2015). Synergy city. *Pictures of the Future Magazine*, 7 June 2015. [Online]. Available: www.siemens.com/innovation/en/home/pictures-of-the-future/infrastructure-and-finance/smart-cities-city-intelligence-platform.html [Last accessed 16 November 2017].

13

PARRAMATTA SMART CITY AND THE QUEST TO BUILD AUSTRALIA'S NEXT GREAT CITY

Sarah Barns and Andrea Pollio

Introduction

The world is today awash with smart city strategies and toolkits. Many focus on the need to leverage data analytics to promote greater insights into urban behaviours. Others focus on collaboration platforms: 'When it comes to building a smart city, teamwork is key', pronounces a report from the Smart Cities Summit in Boston in 2016 (Shea 2016). It is not uncommon for a smart city expert or strategy to pit 'top-down' solutions against 'bottom-up' ones, sometimes described as 'Smart Cities 1.0' versus 'Smart Cities 2.0' (or 3.0, or even 4.0) (Cohen 2015). To establish a space of critical distance from large-scale data surveillance tactics and vendor-oriented technology solutions, many smart city strategists will extol the virtues of more citizen-centric approaches that promote collaborative technologies to foster better engagement between citizens and their governments. A UK National Endowment for Science Technology and the Arts (NESTA) report from 2015, for example, offered to 'Rethink Smart Cities From the Ground Up' through four key areas for investment (collaborative economy, crowdsourcing data, collective intelligence and crowdfunding) to shift from revenue-centric to community-centric strategies (Saunders and Baeck 2015).

These two dimensions – the smart city as a form of entrepreneurial urbanism designed to advance the needs of (technology) capital on one hand, and the smart city as a technology-based form of collaborative urbanism on the other – are also reflected in the critical scholarship on the topic. Some important contributions highlight the role of tech corporations in establishing the smart city as a powerful discourse of urban development (Townsend 2013, Söderström *et al.* 2014, McNeill 2015) and the way in which such discourse rearticulates entrepreneurial urban policies (Hollands 2008, Wiig 2015, Barns 2016). Technology-driven urban entrepreneurialism is, in fact, a largely speculative endeavour whereby a

city's brand or place identity is aligned to the spirit and success of technology entrepreneurship, as well as to the capacity to foster investments in more traditional sectors, such as real estate (Goldman 2011, Datta 2015).

However, other contributors have focused on the potential of technology-based initiatives in creating forms of citizen participation and engagement (Cowley *et al.* 2018), in fostering digital publics (Kitchin 2014) and democratic ecologies (Araya 2015), and in augmenting the transparency and accountability of policymaking in establishing data-rich infrastructures to support planning (Barns *et al.* 2017, Leszczynski 2016). These concerns were already shared by one of the first smart city strategies, the 2011 *Road Map for the Digital City,* developed in New York under the Bloomberg administration, which presented itself as 'a comprehensive, strategic plan' for the city to become the world's 'top ranked Digital City, based on indices of Internet access, Open Government, citizen engagement, and digital industry growth' (Barns 2016: 560).

What the literature suggests, in general terms, is that the ambition of smart city plans and policies seems to oscillate between urban entrepreneurialism and creating innovative modes of civic engagement. Yet few accounts have actually addressed how local policy frameworks that steer the implementation of smart city ambitions are articulated across these two dimensions. Moreover, smart city solutions appear as inherently good, 'commonsensical and pragmatic' (Kitchin 2015: 131); or, as one of Sydney's most prominent urbanists has put it, 'it's clearly good to be a "smart city", largely because the alternative seems a tad unappealing' (Williams 2016). And yet, it is by no means clear, despite the high volume of speculative pronouncements, what would actually constitute the successful implementation of a smart city strategy.

In this chapter, we address the latter question, using the Parramatta Smart City Masterplan (PSCM) as an example of how success and failure are contested terrains of evaluation, and can only be understood in relation to the wider policy frameworks and concerns through which smart city initiatives are framed locally. Parramatta, one of Australia's fastest-growing local councils, was the first city in Australia to launch a wide-ranging smart city plan, as part of wider urban renewal efforts which have been collectively advanced under a rebranding effort to build 'Australia's Next Great City'. The Masterplan included the appointment of Australia's first smart cities officer. The officer's purported role was to drive smart city implementation; to champion Parramatta's technology investments at industry and policy forums; and to ensure that Parramatta would remain 'up to date' compared to smart city initiatives in places like Amsterdam, Barcelona and Chicago.

These ambitious plans soon fell short of their promises. There is little evidence that the Masterplan translated into the implementation of data-driven strategies, smart services, ground-up technology solutions, or even in the attraction and relocation of technology firms. The role of the smart city officer, and many of the initiatives she championed, was ultimately abolished just one year after her appointment in 2016. While the city continues to promote its Smart City Masterplan, and will no doubt pursue smart city-oriented opportunities

associated with recently released federal government funding for smart city investments, it is clearly the case that its investment and engagement activities have been limited and inconsistent. Although there are new staff employed to develop some aspects of the strategy, it is fair to say that, to date, there has been a mismatch between the boldness of the claims made within the strategy and the reality of its implementation.

Nevertheless, if the Masterplan's ambitions are considered in relation to Parramatta's strategic planning visions, a different sense of their effectiveness emerges. While unsuccessful at fostering technology-based entrepreneurialism or civic engagement, the Masterplan can be seen as the culmination of a complex, long-standing regional strategy to redistribute economic, employment, cultural and education opportunities across Sydney's unequal metropolitan area. As we will show, the interplay between globalised narratives of smart city development and localised renewal agendas give rise to distinct visions and models of smart cities promulgated by city governments, consultancies and think tanks across the globe.

The chapter is structured as follows. In the first section, we trace a short profile of Parramatta within the regional and metropolitan strategies of the Greater Sydney area. In particular, we highlight how Parramatta evolved from being a suburban centre in Western Sydney – an area traditionally associated with economic marginality, low employment opportunities and lack of public services such as transport and education facilities – to becoming one of the fastest-growing metropolitan centres in the country.

In the second section, we analyse the Smart City Masterplan and other technology-driven initiatives that Parramatta undertook between 2010 and 2016. The story of how many of the council's smart city ambitions have not, over the past six years, been realised, obscures how the powerful narrative of urban renewal shapes much of the council's strategic positioning. Becoming a smart city is ultimately, we argue, a rebranding exercise aimed at generating new employment opportunities and attracting commercial development within the Parramatta central business district (CBD). This fundamental – though often unstated – premise behind the city's smart city strategy is evidenced by the lack of long-term commitment to the successful roll-out of key technology platforms and initiatives associated with the strategy itself.

In this respect, what the Parramatta case study suggests is that smart city agendas may in fact be predicated on technology-driven entrepreneurial urbanism or civic participation, but the latter are not necessarily measurements of their success. As our case study shows, when viewed as a rebranding exercise for a city seeking to attract new investments, the successes and failures of the Masterplan can also be evaluated against the efforts of city leaders to grow localised entrepreneurial networks and corporate investments beyond, or even without, any technology focus.

The research underpinning this text is based on a long-term engagement of the authors with smart city policies in Australia (see also Dowling *et al*. this volume),

involving archival research of policy and planning documents conducted at the State Library of New South Wales, as well as interviews with Parramatta's smart city representative. It is worth noting that following new Federal Government funding in late 2017 investment in smart city initiatives and platforms is continuing to accelerate. This case study does not take in these more recent investments, but it does make sense of the city's negotiations around smart city planning during the preceding five years.

Placing Parramatta

One of the Sydney metropolitan area's biggest urban centres, and Australia's oldest inland European settlement, Parramatta is positioned in the New South Wales (NSW) Government's metropolitan strategy, *A Plan for Growing Sydney* (DPE 2014), as Sydney's 'second CBD'. With Greater Sydney's population projected to expand by 1.74 million over the next 20 years (DPE 2017), the strategic importance of Parramatta has grown in recent years as government planners seek to unlock housing supply across the metropolitan region to accommodate an anticipated 725,000 additional houses. While Sydney's CBD is constrained by its position on the eastern coast of the city, the Western Sydney region is expected to accommodate the majority of Sydney's new population.

Population growth in the Western Sydney region has been faster over the past decade than elsewhere in the city, and these trends are predicted to continue over the coming decades. In 2014, the Western Sydney population (2.12 million) made up almost half of the total Sydney population (4.51 million), having grown by 315,000 over the past decade (Montoya 2015: 11). While the region has accommodated a high proportion of new migrants, structural industry shifts have seen a decline in traditional manufacturing jobs. As a consequence, the region remains reliant on employment opportunities in the CBD, which in turn causes major congestion issues for Sydney as a metropolitan region. According to a recent report by Western Sydney University, between 2001 and 2014 not only did the gap between population and jobs growth increasingly widen in Western Sydney (Fagan and O'Neill 2015), but also its public infrastructure deficit worsened in relation to wealthier and more central areas of Sydney (O'Neill 2016).

The need to improve employment opportunities in Western Sydney has been a long-standing planning challenge in NSW throughout the twentieth century, a 'defining feature of Sydney's post-war suburban development' (McGuirk and O'Neill 2002: 307). Recent metropolitan plans have more actively pushed for Parramatta to become the city's 'second CBD' as population growth continues, driven by high levels of migration (Searle 2013). The 2014 *Plan for Growing Sydney* explicitly developed a strategy to grow Parramatta as a second CBD and established a 'priority growth area' for the local council, which meant, operatively, that the city could forecast large urban redevelopments and densification in compliance with the overall strategy for the region. A newly created Greater Sydney Commission saw Parramatta as a potential cultural capital for Western Sydney. Therefore, it has recommended the relocation of cultural facilities, like

the Powerhouse Museum, and the construction of an entertainment district. The necessity of a commercially vibrant Parramatta that can offer job and cultural opportunities to larger proportions of Western Sydney's growing population has since helped spark a significant wave of infrastructure investment in the city over recent years.

Parramatta has also benefited from significant injections of state-based infrastructure investment. The introduction of an 'asset recycling programme' by the NSW Liberal Government has seen the government privatise or sell off its assets in electricity, ports and government-owned land to reinvest in infrastructure, thereby leading to a projected $26 billion in transport investments designed to improve connectivity in Western Sydney. This prompted the Premier of New South Wales, Mike Baird, to describe Parramatta in 2015 as the 'infrastructure capital of the world' (Kembrey 2015). Significant upgrades to the Parramatta CBD are currently underway, including a $2 billion upgrade to the central Parramatta Square and a $310 million investment in North Parramatta, as well as an additional $31 billion redevelopment of Parramatta Road. NSW Government investment in Parramatta's urban renewal has also been accompanied by the progressive relocation of many of its key departments, which will occupy much of the new office space currently being constructed in Parramatta Square. Private real estate investment has also grown significantly, with many commercial and residential property developments underway, including the 73-storey Aspire Tower and a new high-rise residential precinct, South Quarter.

This wave of urban renewal investment provides important context for the development of Parramatta's smart city initiatives. While Parramatta has been gaining much attention for the pace and scale of transformation currently underway, the NSW Government continues to provide much of the investment, with the intention of improving its attractiveness to private developers and large employers. To succeed, these efforts must counter an entrenched image of Parramatta as an unfashionable suburban enclave (Dowling and Mee 2000, Mee 2002, Powell 1993) and negative perceptions associated with the presence of ethnic communities, including alleged radical Islamists.[1]

Parramatta's investment in smart city initiatives during 2015 was part of this wider suite of public investments designed to promote a better image of Parramatta as a good place to 'live, work and play' (CoP 2015a: 17). When Parramatta launched its Smart City Masterplan in August 2015, it became the first Australian municipality to do so. The Masterplan incorporated several pre-existing initiatives developed by the city council over the previous five years, and in this sense it could be seen primarily as a speculative exercise designed to support city rebranding. The following section explores the development and roll-out of this Masterplan in more detail. What we suggest, however, is that its policies should be read in relation to a longer history of strategic planning in Western Sydney. By connecting these long-standing strategies for redistributing access to economic and cultural resources throughout the metropolitan area to the Smart City Masterplan, its critical role in rebranding Parramatta as a node of expansion contrasts with the apparent failures in delivering its promises.

Parramatta's Smart City Masterplan: promoting 'Australia's next great city'

Parramatta's formal adoption of a smart city strategy in 2015 was preceded by efforts over a number of years to advance many citizen-focused technology opportunities. As we show in this section, there has been a strong shift away from these earlier efforts in focusing on collaborative technology innovation and opportunity towards more conventional entrepreneurial goals. In 2010, Parramatta launched an 'e-Parra roadmap' that aimed 'to make Parramatta a smart city for the future' (CoP 2010). The roadmap's strategic envisioning was initially concerned with promoting the use of a new, federally funded national broadband network (NBN). Beyond this initial focus, however, e-Parra was subsequently divided into a set of 'e-government' initiatives accompanied by a public-facing 'ParraConnect' programme.

Under e-Parra, ParraConnect was described as a city-wide 'community venture' that aimed to 'foster new digital initiatives in the local public sphere'.[2] The initiative included a series of ambitious digital projects such as free public Wi-Fi, the digitalisation of the public library and a smart payment card called the ConnectCard, subsequently relabelled 'Parrasync'. The smart payment card, launched in 2012, was developed with the intention of 'revolutionising the way we work, shop and play in Parramatta' through a consortium including the French-Italian semiconductor manufacturer STS Electronics and the US software developer SGS Technologies (CoP 2012). It would be awarded 'Best Near Field Communication Collaboration Initiative' at the first Smart Card Awards Asia event in Singapore, winning against competitors Google and Australia's Commonwealth Bank (Vagus 2012). Also included in the ParraConnect initiatives was the roll-out of wireless CCTV cameras across the city and the creation of an augmented-reality history of Parramatta's colonial era called 'DigiMacq'. Community-led ventures were encouraged to submit ideas for digital projects to the local council, including the opportunity for citizens to submit a business case for the deployment of new technologies in the urban environment.

A new strategic plan adopted by the city in 2013 called *Parramatta 2038* (CoP 2013) would see Parramatta's ambitions shift away from the inclusive rhetoric of its previous 2006 plan – to be 'a city for everyone' (CoP 2006) – to that of 'a world-class city' and 'effective capital of Western Sydney' (CoP 2013: 5), echoing the wider metropolitan plan. *Parramatta 2038* also positioned the city brand as one of the key focus areas for strategic investment. In this sense, *Parramatta 2038* set up an explicit area of intervention in the field of what McCann (2013) calls 'policy boosterism', involving the marketing of a city's successfulness through the promotion of its best practices, policies and programmes. The strategic plan identified the use of the city's 'distinct identity' to help secure state and federal funding, and to 'improve the perception and reputation' (CoP 2013: 24) against its long-standing stigmatisation as a not very interesting suburban centre.

Following the new strategic plan, in 2015 the City of Parramatta would adopt a new corporate plan with the goal of positioning Parramatta as 'Australia's next

great city', the new tagline for the identity and marketing strategy of the city (CoP 2015a: 8).[3] In the strategic plan, one of the 12 priority actions was to 'Position Parramatta as a Smart City, capable of creating well-connected businesses, residents, government and community organisations and clusters of knowledge capital and high skill jobs through creative partnerships and advocacy that produce investment in leading-edge technology' (CoP 2015a: 14). The plan allocated responsibility for the delivery of the smart city initiatives to the Director of Marketing and City Identity, thereby demonstrating the importance of the smart city strategy to the promotion and marketing activities of the city.

Among the smart city actions identified in the plan was the formulation of a memorandum of understanding with the Future Cities Institute, an international non-governmental organisation (NGO) that offers digital strategy consulting. Also identified in the corporate plan was the need for a smart city strategy that would be 'underpinned by Economic Development and City Positioning drivers' (CoP 2015a: 51), and it set out a dedicated business plan and implementation plan. The Parramatta Smart City Masterplan was subsequently launched in August 2015, articulating 'a vision and the various elements, technologies and approaches that are required to create a Smart City' (CoP 2015b: 14). The strategy was developed by external consultant Meld – a practice that specialises in building technology strategies for investors and developers in the property sector – which co-authored the strategy document in partnership with its client, the City of Parramatta. The PSCM (CoP 2015b: 1) outlined a vision for the smart city in Parramatta as follows:

> Parramatta will be a Smart City that leverages the foundations of good urban planning, transparent governance, open data and enabling technologies that will underpin our position as a vibrant, people-centric, connected and economically prosperous city.

The launch of the PSCM was accompanied by the appointment of a smart city officer tasked with promoting the Masterplan at key industry forums and leading its implementation. As the officer explained: 'Many councils have tried but have not gone this far. We're the only local government in NSW that has done a strategy of what a smart city is and does' (Cheesman 2016). Following the August launch, a Smart Cities Summit was held in November 2015 in partnership with the Future Cities Collaborative, designed to help Parramatta 'learn from the lessons of Chicago and Amsterdam', with keynote speakers from these cities invited to share their lessons in driving and implementing leading-edge technologies in city planning and governance systems (Stevens 2015). As Parramatta's then Lord Mayor, Paul Garrard, described it:

> The Summit is designed to spark discussion about how Parramatta can transform into a globally recognised Smart City where clever design and innovation become part of the fabric of our community. It's about fostering

> an environment of collaboration where we can work together to uncover solutions to improve the City's liveability and to encourage investment into the region.
>
> *(cited in Stevens 2015)*

While the Masterplan may have been a first in Australia, it was developed against a backdrop of global interest in smart city opportunities that looked to technology investments, data-driven analytics and citizen-oriented digital platforms as significant reform drivers in urban governance and transformation. The PSCM was, however, somewhat distinct from many existing smart city initiatives in that it broadened the focus of smart city investment away from technology platforms, and instead prioritised the need for a more expansive vision of good governance and collaboration within the city, enabled by technology. A smart city is described in the document (CoP 2015b: 11) as one that fosters:

> A collaborative approach between a wide range of stakeholders within various communities. The approach undertaken has to recognise people's various needs and to respect their value in helping to identify and contribute to solutions.

It extended the remit of smart city activities well beyond technology investments, to include everything from arts and education, waste services, to recreation and health. Crucially, it also provided limited funding pathways for existing digital initiatives such as ParraConnect and the ParraSynch smart card.

Having adopted Australia's first smart city masterplan, in 2016 Parramatta subsequently announced a 'smart city survey' with residents to identify what digital initiatives they would like to see implemented (GovNews 2016). The smart city officer also toured key sites across Australia to learn from existing technology trials. In an interview with the officer in 2016, key inspirational smart city initiatives included examples like a new library in the City of Geelong and a 'Smart Street' initiative being trialled in the City of Adelaide:

> Ultimately, the smartest thing that you can do as a city is understand your own city identity, the role you play in the local economy, the role you play in the national economy and the role you play in the global economy' in terms of cities in the future, and whilst we all in the future might have LED lighting, or Smart poles, or Smart bins, in terms of our city identity, 'me too', is not a strategy for success. So you really have to work out your own identity in terms of who [you] are, how [you] create value both local and national in terms of participating in global markets when Parramatta, touch wood, really sort of is able to participate at that level.
>
> *(Cheesman 2016)*

As this passage makes clear, for Parramatta's policymakers, the smart city was primarily a question of city identity and its contribution to market positioning in a highly competitive landscape. Specific technology trials and pilots were of much less importance than this wider entrepreneurial ambition. Another example mentioned in the interview was the City of Chicago:

> What is smart about what they've done isn't the fact that you walk into the city and everything is digital right now, right here, but they've really understood the reputation that they're wanting to build as why you should go to Chicago, what you would experience when you're in Chicago, the type of people that live in Chicago and whether or not you want to be part of that community. They've specifically chosen projects and services which enhance that reputation, which I think is really clever.

In the months following our interview, the smart city officer would leave the City of Parramatta, and the position was not renewed. Over the following months, the city's primary digital platform, ParraConnect, would also be removed from the city's website. Key investment areas proposed under the Masterplan, including an open data portal, have not yet been implemented. However, some activities have progressed. For example, smart bins (solar-powered, sensor-endowed, waste-compacting urban furniture) have been trialled in the city centre, and the city has since commissioned Meld to prepare a new smart city Masterplan as part of its $2 billion Parramatta Square redevelopment. This new masterplan is focused at the precinct scale, and outlines opportunities for investment in the domains of Wi-Fi, high-tech security cameras, recycled water and other sensor technologies.

The chairman of Parramatta's smart city committee, and driver of the ParraConnect initiative, described the range of smart poles, utility nodes and technology layers that will be delivered in Parramatta Square as 'the first of its kind in this country'. The technology, he claimed:

> Will help to attract more jobs and big businesses to Parramatta. We'll get smarter businesses, smarter jobs and companies who want to be seen as part of a smart precinct. So if they are making a decision whether they want to be part of us and somewhere else, then they would choose us. We have all these smart initiatives. It's a no brainer to come to Parramatta once it is implemented.
>
> *(Adoranti 2016b)*

Once again, the promotional virtues of the smart city technologies seem to overshadow their actual technical functions and services offered. Moreover, the schematic design of this digitally enhanced urban precinct sits at odds with the expansive smart city vision presented in the 2015 PSCM, which emphasised the values of collaboration and transparent governance. Instead, the new focus

is more squarely on the need for premium technology infrastructure to attract high-yield tenants to Parramatta Square, which was again branded under the tagline 'Australia's next great city'.

It can be expected that Parramatta will continue to invest in programmes, technology strategies and initiatives aligned to the visions of its Smart City Masterplan. However, the outcomes to date point to the real possibility that ongoing investments will continue to prioritise external positioning opportunities over significant governance reform as well as opportunities to prioritise citizen-centric approaches to collaborative technologies. As we discuss in the next section, this is in line with the entrepreneurial objectives of the city – attracting investors and tenants to Sydney's new CBD – as much as it articulates a longer-standing policy rationale to rebalance economic opportunities across the metropolitan region.

Conclusions: success and failure in Parramatta's smart city initiatives

With its smart city initiatives, Parramatta has been at the forefront of policy-making in this field in Australia. In this chapter, we charted how these policies – including the first smart city masterplan of its kind and the appointment of a dedicated officer – have thus far failed to deliver substantial technology-led innovations and ambitions. While many of the innovations championed in the field of citizen engagement have lacked consistent support, other benefits have been realised. When situated in the context of strategic planning for Western Sydney, Parramatta's smart city initiatives align with a much more powerful agenda to redistribute values and benefits in a polarised city. In this sense, we have argued that these policies were in fact crucial in the city's 'extrospective' efforts (McCann 2013) in the field of self-promotion and city marketing, and contributed to the successful development of large-scale public and private investments that have recently taken place in the municipality.

Smart city approaches are usually classified according to whether they are driven by technological corporations and city governments or emerge from citizen-led platforms (Cohen 2015). This taxonomy, which is echoed in NESTA's white paper (Saunders and Baeck 2015), captures a discursive shift away from top-down, technology-led initiatives towards more citizen-centric, bottom-up solutions. Yet, as our case shows, this distinction does not capture the possibility that policies move backwards, or that smart city plans – even when predicated on collaborative and transparent governance – are relatively indifferent to technological innovations, but rather articulate other urban rationalities and strategies.

In the case of Parramatta, the masterplan – and its spokespersons – discursively rejected the corporate-driven, solution-based smart city, and proposed a more holistic policy that included initiatives designed to improve citizen participation and other public services. Thus far, however, Parramatta's efforts have merely resulted in the design of a high-tech showcase in a large redevelopment precinct

(Parramatta Square). This suggests that cities will continue to prioritise the goals of urban entrepreneurialism – in particular real estate investment and employment generation – over those of transparent urban governance and citizen participation. Critical scholars also rightly suggest that, in some instances, smart city solutions serve as a distraction from actually addressing the long-standing urban inequalities that these policies are intended to fix (Kitchin 2015, Luque-Ayala and Marvin 2015, Wiig 2015).

Clearly, smart urban policies can be contradictory and articulate multiple, even opposed, rationalities (Baccarne *et al*. 2014). Smart city planning in Parramatta, for example, seemed less concerned with the implementation of actual technological innovations and more with promoting the city's real estate and more general attractiveness. This, we suggest, should be read not only in relation to Parramatta's entrepreneurial ambitions but also to a longer history of strategic planning for the metropolitan region. In this sense, the smart city initiatives in the city served primarily as a marketing strategy to redefine Parramatta's reputation. Such a strategy, we argue, aligned with a long-term planning effort to redistribute values and rebalance employment opportunities across the Greater Sydney area. Although contradictory, the results of this process are evident, as Parramatta is growing and attracting more investment, both private and public.

This speaks to the question of success and failure, which is often held against smart urbanisation by its critics. Parramatta is not the first city to have embarked on an ambitious undertaking to rebrand itself as 'smart' and then achieved limited results. Some within Sydney's wider smart city ecosystem wonder when Parramatta will finally progress the range of initiatives identified in its masterplan and when Parramatta's rhetorical ambition to lead Australia's smart city efforts will be supported by sustained investments. That time may be yet to come; but despite the withdrawal of its early digital city investments, the smart city strategy is already the culmination of a longer, broader effort of repositioning Parramatta to address unequal shares of economic possibilities in the city region of Sydney.

As more building sites keep opening in the city, one of Australia's largest banks, the National Australia Bank, announced in December 2016 that 4,000 of its employees will relocate to Parramatta Square by 2020. Meanwhile, plans for a public-funded light rail are underway, and the state's first high-rise public school is under construction in the heart of the city (Adoranti 2016a). Investment continues to pour into the city from public and private sources. Thus far, the strategy appears to be working, oscillating between Parramatta's urban entrepreneurialism and the need to rebalance Sydney's polarised geographies.

Notes

1 A policeman was killed in downtown Parramatta in 2015 by a radicalised 15-year-old boy of Middle Eastern background who attended the Parramatta mosque. Other events to cause negative perceptions included violent clashes between the Lebanese community of Parramatta and the large Indian community.
2 The URL for ParraConnect was www.parraconnect.net.au.

3 The corporate plan, within the framework of the State legislation on urban planning, is the mid-term operational document that brings together the delivery programme (four years) and the operational plan (one year), translating the strategic objectives of *Parramatta 2038* into actual projects with performance or milestone indicators, linking them to the long-term financial blueprint.

References

Adoranti, K. (2016a). Designs for the state's first high-rise public high school in Parramatta unveiled. *Daily Telegraph* (Australia), 21 January. [Online]. Available: www.dailytelegraph.com.au/newslocal/parramatta/designs-for-the-states-first-highrise-public-high-school-in-parramatta-unveiled/news-story/526cd42ac12a511959cc7e7fdf9c5c3e [Last accessed 20 December 2017].

Adoranti, K. (2016b). Parramatta Square to house smart city technology and attract big business to the area. *Daily Telegraph* (Australia), 19 May. [Online]. Available: www.dailytelegraph.com.au/newslocal/parramatta/parramatta-square-to-house-smart-city-technology-and-attract-big-business-to-the-area/news-story/34a53d3bb0262179f2dae80e0b2fbbc5 [Last accessed 20 December 2017].

Araya, D. (2015). *Smart Cities as Democratic Ecologies*. New York: Palgrave Macmillan.

Baccarne, B., Mechant, P., Schuurman, D., Colpaert, P. and De Marez, L. (2014). Urban socio-technical innovations with and by citizens. *Interdisciplinary Studies Journal 3*: 143–156.

Barns, S. (2016). Mine your data: open data, digital strategies and entrepreneurial governance by code. *Urban Geography 37*: 554–571.

Barns, S., Cosgrave, E., Acuto, M. and McNeill, D. (2017). Digital infrastructures and urban governance. *Urban Policy and Research 35*: 20–31.

Cheesman, T. (2016). Interview by Sarah Barns and Andrea Pollio with Smart City Officer Tara Cheesman. Parramatta Smart City, July 2016.

Cohen, B. (2015). Three generations of smart cities. *Fast Company*, 10 August [Online]. Available: www.fastcompany.com/3047795/the-3-generations-of-smart-cities [Last accessed 20 December 2017].

CoP (City of Parramatta). (2006). *Parramatta Twenty25: A City for Everyone. Great Places and Spaces*. Parramatta: Parramatta City Council.

CoP. (2010). Lord Mayor calls for community group to drive e-Parra strategy. Press release, April. [Online]. Available: www.parracity.nsw.gov.au/your_council/news/media/media_releases2/2010/april_2010/lord_mayor_calls_for_community_group_to_drive_e-parra_strategy [Last accessed 20 December 2017].

CoP. (2012). ParraSynch from City of Parramatta. [Online]. Available: http://parraconnect.net.au/2012/05/parrasync/ [Last accessed 20 December 2017].

CoP. (2013). Parramatta 2038: Community Strategic Plan. [Online]. Available: www.cityofparramatta.nsw.gov.au/sites/council/files/inline-files/Community%20Strategic%20Plan%202038.pdf [Last accessed 20 December 2017].

CoP. (2015a). Parramatta Corporate Plan 2013/2014–2016/2017, July 2015 update. [Online]. Available: www.cityofparramatta.nsw.gov.au/council/key-council-documents [Last accessed 20 December 2017].

CoP. (2015b). Parramatta Smart City Masterplan. [Online]. Available: http://old.parracity.nsw.gov.au/__data/assets/pdf_file/0005/163904/PCC_Smart_City_Masterplan-12.08.15S.pdf [Last accessed 20 December 2017].

Cowley, R., Joss, S. and Dayot, Y. (2018). The smart city and its publics: insights from across six UK cities. *Urban Research & Practice 11*: 1–25.

Datta, A. (2015). New urban utopias of postcolonial India 'entrepreneurial urbanization' in Dholera smart city, Gujarat. *Dialogues in Human Geography 5*: 3–22.

Dowling, R. and Mee, K. (2000). Tales of the city: Western Sydney at the end of the millennium. In J. Connell (ed.), *Sydney: The Emergence of a World City*. Melbourne: Oxford University Press, 273–291.

DPE. (2014). *A Plan for Growing Sydney: A Strong Global City, a Great Place to Live*. Sydney: NSW Government Planning and Environment.

DPE. (2017). Sydney housing supply forecast. NSW Government Planning and Environment. [Online]. Available: www.planning.nsw.gov.au/Research-and-Demography/Sydney-housing-supply-forecast [Last accessed 20 December 2017].

Fagan R. and O'Neill, P. (2015). Work, places and people in Western Sydney: changing suburban labour markets 2001–2014. Report. Centre for Western Sydney, Western Sydney University. [Online]. Available: http://uws.edu.au/__data/assets/pdf_file/0008/880235/CWS_WorkPlacesandPeopleinWS_platformpaper.pdf [Last accessed 15 March 2017].

Goldman, M. (2011). Speculative urbanism and the making of the next world city. *International Journal of Urban and Regional Research 35*:555−581.

GovNews. (2016). Parramatta, smart city in the making seeks community input. [Online]. Available: www.govnews.com.au/parramatta-smart-city-making-seeks-community-input/ [Last accessed 20 December 2017].

Hollands, R.G. (2008). Will the real smart city please stand up? *City 12*: 303–320.

Kembrey, M. (2015). Premier Mike Baird says Parramatta is looked to as the 'infrastructure capital of the world'. *Sydney Morning Herald*, 13 March. [Online]. Available: www.smh.com.au/national/nsw/premier-mike-baird-says-parramatta-is-looked-to-as-the-infrastructure-capital-of-the-world-20150313-1437md.html [Last accessed 15 March 2017].

Kitchin, R. (2014). The real-time city? Big data and smart urbanism. *GeoJournal 79*: 1–14.

Kitchin, R. (2015). Making sense of smart cities: addressing present shortcomings. *Cambridge Journal of Regions, Economy and Society 8*: 131–136.

Kitchin, R., Lauriault, T.P. and McArdle, G. (2015). Urban indicators and dashboards: epistemology, contradictions and power/knowledge. *Regional Studies, Regional Science 2*: 43–45.

Leszczynski, A. (2016). Speculative futures: cities, data, and governance beyond smart urbanism. *Environment and Planning A: Economy and Space 48*: 1961–1708.

Luque-Ayala, A. and Marvin, S. (2015). Developing a critical understanding of smart urbanism? *Urban Studies 52*: 2105–2116.

McCann, E. (2013). Policy boosterism, policy mobilities, and the extrospective city. *Urban Geography 34*: 5–29.

M^{c}Guirk, P. and O'Neill, P. (2002). Planning a prosperous Sydney: the challenges of planning urban development in the new urban context. *Australian Geographer 33*: 301–316.

McNeill, D. (2015). Global firms and smart technologies: IBM and the reduction of cities. *Transactions of the Institute of British Geographers 40*: 562–574.

Mee, K. (2002). Prosperity and the suburban dream: quality of life and affordability in Western Sydney. *Australian Geographer 33*: 337–351.

Montoya, D. (2015). Western Sydney: an economic profile. Sydney NSW Parliament. [Online]. Available: www.parliament.nsw.gov.au/researchpapers/Documents/western-sydney-an-economic-profile_1/Western Sydney - an economic profile.pdf [Last accessed 20 December 2017].

O'Neill, P. (2016). Addressing Western Sydney's jobs slide. [Online]. Available: www.westernsydney.edu.au/__data/assets/pdf_file/0019/1064701/JTW_report_complete_7April.pdf [Last accessed 20 December 2017].

Powell, D. (1993). *Out West: Perceptions of Sydney's Western Suburbs*. Sydney: Allen & Unwin.

Saunders, T. and Baeck, P. (2015). *Rethinking Smart Cities from the Ground Up: National Endowment for Science Technology and the Arts (NESTA) Report*. [Online]. Available: www.nesta.org.uk/publications/rethinking-smart-cities-ground [Last accessed 20 December 2017].

Searle, G.H. (2013). 'Relational' planning and recent Sydney metropolitan and city strategies. *Urban Policy and Research 31*: 367–378.

Shea, S. (2016). Building a smart city: it takes a village. [Online]. Available: http://internetofthingsagenda.techtarget.com/news/450404467/Building-a-smart-city-It-takes-a-village [Last accessed 20 December 2017].

Söderström, O., Paasche, T. and Klauser, F. (2014). Smart cities as corporate storytelling. *City 18*: 307–320.

Stevens, K. (2015). Parramatta hosts Smart City summit. *Parramatta Sun*, 25 November. [Online]. Available: www.parramattasun.com.au/story/3517484/parramatta-council-chatter-smart-city-lessons/ [Last accessed 20 December 2017].

Townsend, A.M. (2013). *Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia*. New York: Norton.

Vagus, S. (2012). ParraSync application beats out competitors to take home award. *QR Code Press,* 5 February 2012. [Online]. Available: www.qrcodepress.com/parrasync-application-beats-out-competitors-to-take-home-award/858666/ [Last accessed 20 December 2017].

Wiig, A. (2015). IBM's smart city as techno-utopian policy mobility. *City 19*: 258–273.

Williams, T. (2016). Smart cities need smart governance: discuss! *The Fifth Estate,* 17 May. [Online]. Available: www.thefifthestate.com.au/columns/spinifex/smart-cities-need-smart-governance-discuss [Last accessed 20 December 2017].

14

FROM PARTICIPATION TO START-UP URBANISATION? RE-SITUATING OPEN DATA IN LISBON

Luís Carvalho and Mário Vale

Introduction

Over the last decade, Portugal has received considerable attention within the 'smart city' realm due to the PlanIT Valley project – an ambitious attempt to build a new city from scratch to test all sorts of proprietary technologies (Carvalho and Campos 2013, Carvalho *et al.* 2017b). The new city was never built (van den Bosch 2018), but its vision largely epitomises the growing critique of so-called 'top-down' smart city development (e.g. Jaffe 2013, Poole 2014). Drawing on PlanIT Valley and many other greenfield projects (Carvalho 2015) and 'actually existing' smart city experiments (Shelton *et al.* 2015), several authors have highlighted fundamental pitfalls such as technological inflexibility, power imbalances, vendor dependence, data control, the risks of algorithmic governance and fragmented urbanism, among others (for reviews, see Townsend 2013 and Kitchin 2016).

Yet, in Portugal as in many other parts of the world, 'smart city' discourses and strategies have become more nuanced in the last few years, increasingly moving from top-down visions to embrace notions of transparency, citizen involvement, flexibility and co-creation (e.g. Baron 2013, Nesta 2015, Ramsden 2016, ZOOM Smart Cities 2017). The open data movement in cities informs this turn, with many local governments worldwide launching initiatives to release and re-use several types of city data (Goldstein and Dyson 2013, Ojo *et al.* 2015). Often under the umbrella of wider 'smart-digital' urban strategies (Carvalho and van Tuijl 2017), open data initiatives promise to broaden the scope and type of innovation actors involved, moving from large technology powerhouses towards more distributed communities including entrepreneurs, academics, civic activists and journalists, among others (e.g. Townsend 2013). Moreover, and in opposition to command-and-control types of governance, open data promises more

democratic access to city data and a more equal distribution of power among governments, companies and citizens (e.g. Hunsinger and Schrock 2016).

To illustrate and critically reflect on this contemporary shift, this chapter explores Lisbon´s open data initiative to understand how the open data agenda has unfolded in Portugal´s capital city. The first open data initiatives in Lisbon began in 2011 and were driven by the municipality´s transparency and participation agenda. Yet, open data only gained significant momentum in 2016 when it was linked to the development of a next-generation urban operations platform, as well as to the city´s economic agenda on entrepreneurship and start-up promotion. This re-situating of open data within the city came with heightened levels of financial and political support as well as new network formations and constituencies. An example is the creation of a specific start-up incubation programme called 'Smart Open Lisboa' (2016) that is prototyping solutions to the city's problems using open data. Yet, as we will show, the pressure to deliver and showcase solutions also meant prioritising established start-ups and data-driven innovation broadly speaking, which paradoxically risks driving civic participation and data openness to the background of the initiative.

This chapter draws on the analysis of secondary material including press releases, reports and government documents, as well as 12 semi-structured, in-depth interviews conducted by the authors with policymakers, government agencies, municipal staff, start-ups, event organisers, academic researchers and data activists involved with open data development in Lisbon between July 2016 and May 2017. Additionally, the authors participated in the launch event for Lisbon´s open data initiative in February 2016 and a meet-up event organised by the municipality to discuss future challenges for open data in Lisbon in October 2016.

The chapter is organised as follows. The next section briefly reviews the early developments of open data in cities and how their rationales have evolved in recent years and become situated in different urban agendas. Next, it proceeds to explore how these ongoing changes have played out in the case of Lisbon. The final section summarises the findings and highlights some issues in relation to open data development in cities, and smart urbanisation more generally.

Open data in cities: an uneasy combination of multiple (changing) objectives

Early developments

The open data movement can be traced back to two related social movements that have been unfolding for several decades. The 'freedom of information' (FoI) movement is concerned with transparency and the right to access government-related, decision-making information (which is now a constitutional right in many countries of the world). Meanwhile, the 'knowledge commons' movement advocates for open publishing with respect to licensing, copyrights and

intellectual property (IP), notably in scientific publishing and software code (e.g. Kitchin 2014). At the convergence of these movements, open data gained momentum during the late 2000s as national governments (e.g. the Obama Administration in the US), Internet advocates, inter-governmental organisations (e.g. the Organisation for Economic Co-operation and Development/OECD) and civil officers in large municipalities in Europe and North America began to advocate for the open release of government data (e.g. Goldstein and Dyson 2013, Townsend 2013).

While freedom of information laws made governmental bodies *passively obliged* to share information about decision-making processes and operations, the open data movement envisioned a more radical transformation in which data about public services, government decisions and provisions are *proactively* opened, easily accessed online through 'machine-readable' formats and under licences that allow for re-use and re-distribution (e.g. Open Knowledge Foundation 2016). Defined as such, the ultimate goal is to allow for interoperability or the ability for different users and organisations to collaborate and combine different datasets together – to visualise urban phenomena, to develop apps and software and so on.

Naturally, open data requires a complex socio-technical transition. It can hardly be implemented by decree, and there is a large gap between 'viewing' and 'doing' (e.g. Truffer *et al.* 2002). Apart from technology, open data challenges many of the cultural, social, economic and legal foundations behind the production and use of data by government bodies (Janssen *et al.* 2012), requiring experimentation and the development of new knowledge, constituencies and legitimation before it can be embedded in society. Because of these challenges, and similar to other socio-technical transitions (e.g. Frantzeskaki *et al.* 2017), the presence of dense networks of actors, community movements, political power and other resources (knowledge, finance) meant that cities and local governments are among the most relevant arenas or 'labs' (Karvonen and van Heur 2014) to nurture new governance models involving open data (Carvalho *et al.* 2017a).

Unsurprisingly, far from being framed as refined 'experimentation' projects, most open data initiatives have been social and politically defensible under more prosaic rationales. At first, many open data pilots in cities were justified under participation, transparency and enhanced democratic objectives. For example, by opening up government data, citizens and other organisations would be more aware of the government's operations and decisions, engage more in public affairs and contribute to advanced forms of participative democracy. Yet, the motivation for committing resources to open data experimentation soon moved beyond transparency to include government efficiency and local economic development as well. (Goldstein and Dyson 2013). For example, combining government data would break down administrative silos, reduce inefficiencies, optimise operations and result in improved public service delivery. Moreover, just as a number of organisations and consultancies heralded the monetisation potential of government data (e.g. McKinsey Global Institute 2013), local governments perceived open data as a way of fostering new digital industries, jobs and local economic

development. Providing large companies and local start-ups with raw material to create and test new smart solutions would benefit the city and generate profits when transferred to other places, resulting in both social and private gain.

The ways in which these benefits and ambitions – transparency, efficiency and economic development – have been mobilised to justify open data initiatives varies across jurisdictions and urban contexts (Kitchin 2014), depending on a city's specific social, cultural and economic context, as well as on the agendas, interests and priorities of local planners and policymakers. For example, recent studies on pioneering open data initiatives in Europe revealed a stark contrast in cities such as Helsinki and Dublin with respect to the ways that broad open data ambitions are negotiated and situated in the city. While Helsinki linked its open data pilot ('Helsinki Infoshare') to rationales of openness and transparency steered by planners' ambitions to enhance the use of design and data to improve citizen–government interaction (Otgaar and Carvalho 2017), the early release of open data in Dublin ('Dublinked') explicitly sought to fuel 'smart city' innovation and revamp the local economy in the midst of a financial crisis by championing a coalition between the municipal government, local universities and IBM (Carvalho and Otgaar 2017; also Kitchin *et al.* this volume).

Re-situating open data in cities?

The ways in which general open data visions are negotiated and situated in urban development ambitions and strategies varies from place to place, but also changes over time. Sollazzo (2015) makes an illustrative distinction between two general open data 'waves': the early 'open' wave and a more recent 'data' wave. He argues that the second wave is overtaking the first as local governments search for new data-driven applications to improve both internal municipal processes and external services to citizens. In the process, local governments increasingly position themselves as data 'platforms' (O´Reilly 2010) in which multiple organisations, companies and software developers can access and recombine data. As described by Barns (2016: 559), and notwithstanding city-specific nuances, this trend is epitomised by the appointment of new city bureaucracies such as Chief Data Officers, with an eye to pursue data integration and coordination across city departments and between the city and external organisations. As smart city technologies and urban sensor networks promise to optimise urban management while simultaneously threatening massive data deluges (Economist 2010), municipalities are actively seeking data integration systems and platforms to combine all sorts of closed, shared and, whenever possible (but not as a priority) open data (van der Lans 2015).

The re-situating of open data within broader platform strategies and the focus on data-driven 'solutions' to urban problems has highlighted new types of actors. Examples include start-ups, entrepreneurs, data evangelists and app competition event organisers (Almirall *et al.* 2014, Barns 2016), sometimes at the expense of, e.g., civil society groups and data journalists (Hunsinger and Schrock 2016).

Some authors argue that the role of start-ups and software developers has dominated open data strategies, hampering the ability of local governments to articulate their open government priorities (Robinson and Yu 2012, Barns 2016). This is particularly evident as experimentation focuses on the rapid development of solutions and business models that can hopefully be transferred to other geographies (van Winden and van den Buuse 2017). In the process, innovation 'sites' become temporary and fluid – e.g. during 'hack days' and software programming competitions – while specific districts in cities are cherry-picked for piloting and demonstrating data-driven solutions (Evans *et al.* 2016). In this sense, open data 'solutionism' is increasingly connected to contemporary forms of so-called start-up urbanism (Rossi and Di Bella 2017) in which aspiring and established entrepreneurs strive to benefit from new data 'commons' related to the urban environment while trying to embed themselves in global networks of ideas and finance, actively encouraged and supported by government ambitions to position start-ups as a remedy for overall economic contraction (see Rossi 2017).

All in all, this re-situating of open data within shifting urban agendas creates new uncertainties and hesitations about the future of open data, both *per se* and as part of broader smart city strategies. Beyond ongoing populist movements that defy data openness principles in some parts of the world (e.g. Knorr 2017), an important issue is whether the heightened focus on the economic-entrepreneurial and service efficiency dividends of open data – paired with new experimentation resources (e.g. finance, political support) and quick wins – may actually hamper the development of broader open data transitions in the medium and long term. Early open data evangelists in Northern Europe speak of open data 'boom and bust' phenomena when social and political support vanishes as heralded economic gains fail to materialise. Meanwhile, civic participation and data openness paradoxically move to the background of the initiatives.[1] Despite the acknowledged benefits of open data and government-as-a-platform strategies to enhance the functioning of governments (e.g. Barns 2016), this dynamic conflict of objectives raises new issues for open data initiatives as they struggle to find their place in revamped smart city strategies (Carvalho 2017).

Open data in Lisbon

In this section, the aforementioned issues are illustrated by looking at the ways in which open data initiatives emerged and became (re-)situated within Lisbon´s recent smart city strategies. Lisbon is Portugal´s capital city (500,000 inhabitants) and the core of a metropolitan area of about 2.8 million inhabitants (INE 2011). As mentioned, Portugal received considerable policy and scholarly attention during the early critique of smart city utopias due to the vendor-driven PlanIT Valley project that was planned for a greenfield location in the north of the country. Curiously, the failure of PlanIT Valley is seldom mentioned – if at all – in contemporary smart city strategies and policy documents, notwithstanding the recent growth of 'smart' experimentation in the country (ZOOM Smart

Cities 2017). Over the last few years, and in line with other European counterparts, Portuguese cities (mainly Porto and Lisbon) became involved in a growing number of piloting, knowledge exchange and 'smart' demonstration schemes, often supported by European funding programmes. At the national level, 'smart' agendas have been championed by the Ministry of the Environment, focusing on urban-ecological improvements but also with an eye to developing new technologies to be exported and scaled up elsewhere (INTELI 2014). Data-related issues are a growing concern and, although efficiency goals tend to dominate local 'smart' agendas, a new rhetoric of participation, transparency, innovation and co-creation around data has also emerged (ZOOM Smart Cities 2017).

The development of open data initiatives in Lisbon illustrates such a turn. At the time of this writing (October 2017), the city´s open data platform – Lisboa Aberta ('Open Lisbon') – hosted 387 open datasets from 13 different organisations.[2] Portugal has been considered an open data 'follower' due to the maturity of the country´s open data portals and regulatory frameworks (Open Data Barometer 2017). In April 2016, the City of Lisbon took bold steps to implement its new 'open data policy', establishing clear responsibilities and nominating an open data coordinator (the city´s recently appointed Chief Data Officer). Lisbon´s open data policy was established under the umbrella of the Information Systems (IT) alderman to foster: 1) active civic participation; 2) transparency and citizen access to information; 3) economic development and new technology solutions; and 4) internal municipal efficiency gains (City of Lisbon 2016). Beyond this rhetoric, how did open data actually emerge and become situated within the local 'smart' strategies over time?

Linking open data to participation

Lisbon´s first open data experiments date from 2011, nurtured under the city´s participation agenda. The initiative, Open Data LX, grew from a partnership between the City of Lisbon, the national agency for government modernisation and the city´s environmental agency. It focused on openness and fostering citizen–government dialogue at a time when the first national open data portal (Dados.Gov) was under development. A number of municipal departments were asked to collect and release datasets (mostly Excel files), which were hosted in the so-called 'Participation Portal' together with other initiatives such as community dialogue platforms, idea forums and participatory budgeting tools.

Despite the initial focus on participation and transparency, Open Data LX was soon connected to a number of early app competitions in Lisbon (Vodafone Lisbon BIG Apps) in which the use of data from the platform was mandatory. Moreover, between 2011 and 2013, new open data releases and experimentation benefited from the participation of the municipality – together with other local partners and eight European cities – in a major European research and innovation project called CitySDK ('Service Development Kit'), with the aim of developing scalable user interfaces for the city´s (open) data. Despite

the municipality´s commitment to the project, as explained by an academic researcher involved in it:

> [The initiative] died when people championing it in the city changed [job] positions, and when the funding was over. […] It was not easy to get data as people were afraid of everything, the usual hurdles. […] [The project] opened mindsets about open data, but people [in the city] just kept doing things the same old way when the project was over.

During 2014, as early enthusiasm and resources waned, the municipal officers who were closely involved with Open Data LX realised that the initiative was exhausted and stopped maintaining the platform. Yet, during that year, the same municipal officers decided to test the visualisation of a few datasets within a newly released software platform made available by the city´s geographic information system (GIS) software vendor. A recently appointed alderman for IT liked the idea, and these experiments gave rise to a new city portal called Geodados ('Geo-data'), with a few geo-referenced datasets. This portal would be ultimately integrated into a broader municipal programme called 'Lisboa Aberta' (also under the IT department) that was intended to restore open data efforts in tandem with digital inclusion and civic participation objectives. Yet, at this time, open data was still largely disconnected from the smart city agendas, which were only starting to emerge in the city.

Re-situating open data: between integrated data platforms and new forms of start-up urbanism

Integrated City Operations Centre (COI)

During 2015, two major smart city initiatives were devised in the municipality which, according to a municipal staff member in the economic department, 'helped formulate the city´s positioning in the field, create new [constituency] networks and get people to speak the same language' – namely involving the city´s IT, economic and innovation departments. One such initiative was the development, with other European cities, of a large research and innovation consortium named Sharing Cities that was funded as a European 'Lighthouse' project to develop and upscale smart city solutions (e.g. electric bikes and mobility solutions, smart grids, buildings and data-management solutions). The other initiative involved a plan to develop a City Operations Centre (COI), a platform to integrate multiple IT and data systems from the municipality and beyond (e.g. data from telecom companies, energy utilities, transportation companies and so on).

Lisbon's COI was intended to be more than a conventional 'control room' – like the one developed by IBM in Rio de Janeiro (e.g. Townsend 2013) – and focused on overall data integration, including open data. As explained by one of its proponents:

> In the past, [a COI] was a closed control room with monitors and the like, which does not make too much sense any more. Now we want it to be

> everywhere, in people's desktops and smartphones as well as in city departments. […] In order to have all the relevant information real time, we need data from several sources, internal and external [to the municipality]. […] Parts of it will be private, but a lot of it can also be made available as open data.

At this stage, the plans to develop the COI became intertwined with the city´s still embryonic open data agenda, with the former acting as a catalyst for the latter, namely by providing resources and additional buy-in from data providers.[3] The task force appointed to develop the COI – staffed with experienced municipal officers and led by a newly appointed Chief Data Officer – was also responsible for implementing the open data strategy in the city. This made it possible to explore synergies by liaising with external COI data providers, but also to have enough leeway to explore alternative viewpoints and pathways for open data, not only with City departments but also with data activists, universities, companies, start-ups and other actors. As described by a task force member:

> This afternoon I will meet with two start-ups that used open data from the municipality to know what they felt, if the data is well documented, what else would be needed, etc. […] The idea is to avoid having just a bunch of data that nobody uses, but select a few and then invest in it. […] Next week we'll host a workshop with journalists, researchers, start-ups, etc. to discuss how to re-use data. Because there are always multiple understandings, aren't there? If we talk with person A [data activist] he will tell me that some [open data] models are already exhausted, and maybe there are better and more useful ways. We don´t really know, and everything is still open.

On the top of that, by linking the somehow 'low-profile' open data strategy with the 'high-level' COI project for Lisbon – which was of significant interest to many external stakeholders – a broader constituency network was mobilised to make some non-municipal datasets also openly available. To this effect, the previous contacts between the municipality and 18 external COI partners (e.g. transport, energy, waste and telecom companies, national tourism and civil protection agencies, etc.) were extended to include their participation in open data initiatives. As explained by a senior officer jointly involved with the COI and open data strategies in the city:

> These [utility] companies want to take part in the game, and without them, Lisboa Aberta [open data strategy] could turn into a failure. Just as we benefit from linking up to their real-time data, they also want to link to ours and know [e.g.] where the municipality is opening new streets and running construction works, or to jointly coordinate actions during emergency situations. And if one [utility company] is present, the others also want to take part in it, and so on.

Nevertheless, beyond the rhetoric and the signing of memoranda, the involvement of external stakeholders and utility companies in open data initiatives may be far from straightforward, and not necessarily very appealing to these parties. As suggested by a municipal officer involved with open data in Lisbon:

> Parts of the data [in COI] will always be private or just shared among the municipality and other organizations, but now we can also knock on their door and say, 'Hey, we are here, could you please *also* give us something for open data?' We were actually making our own bets internally on which data they [COI team] would get [from external organizations]. We have very little right now but hopefully more will come.

Smart Open Lisboa and Lisbon´s start-up agenda

During 2016, Lisbon's open data strategy became intertwined with the city´s innovation and entrepreneurship agenda (named 'Made of Lisboa'), championed by the economic and innovation department. This agenda had been gathering considerable momentum and political support over the previous years, namely as Lisbon was chosen as the host city for Web Summit – a leading global technology conference – beginning in 2016 (**Figure 14.1**). At this time, open data efforts in the city (and the 'openness' narrative around it) were mobilised by the economic department to foster a link between start-up promotion and smart city ambitions, which became embodied through a new start-up acceleration programme named 'Smart Open Lisboa' (SOL).

FIGURE 14.1 Banners from 'Made of Lisboa' in the city.
Source: authors.

SOL was designed to encourage start-ups to work with city data to prototype (and pilot) urban technology solutions in the city in a three-month time frame.[4] As in other start-up acceleration programmes, the focus was on business growth and upscaling. Specifically, there was an emphasis on the ability of start-up solutions to attract investment and contracts for replication in other cities, or in other organisations/domains within a city. To develop the programme, the municipality teamed up with a number of semi-public and private sponsors, such as Cisco Systems, Portugal Telecom, the National Tourism Agency and a start-up acceleration company in Lisbon. As explained by a representative of the latter:

> People in the municipality started to speak about open data and now the objective was to move one step further and reach 'smart cities'. […] This has to do with the start-up and entrepreneurship 'world', in which we have a huge network and can thus attract start-ups to the [SOL] programme. Many of the start-ups envision also following up their activities through the Sharing Cities project.

Inspired by other fast-paced start-up acceleration programmes, SOL included an initial 'hackathon' as well as 'bootcamps', 'pitches', 'demo days' and multiple mentoring sessions. Then, a handful of start-ups were selected to test their prototypes in a real-world context in the city (e.g. in a specific building or square) while being mentored by the municipality or the project sponsors. Ultimately, the start-up finalists were awarded with access to the 2016 Web Summit conference. SOL's participants (at least in the 2016 event) were mostly established start-ups rather than 'civic hackers' or hobbyists. Moreover, the finalist start-ups needed to have 'minimum viable products', as explained, 'in order to be able to walk fast down the road and have an immediate impact'. With respect to data 'openness', the participation criteria were loose – e.g. illustrating the aforementioned turn from 'open' to 'data'. For example, a condition to participate was to use open data from the municipality, *or* from any other source, *or* to open up the data generated during the experimentation. Yet, as explained by one of the start-ups involved in the 2016 event, 'it was not that there was a contract for it, it was an informal agreement'. **Table 14.1** illustrates the types of issues addressed by the finalist start-ups in SOL's 2016 event.

Overall, SOL brought new resources to the city's (open) data agenda. For example, the programme enhanced the visibility of open data within the local start-up community and beyond, and catalysed new conversations between data users and data providers (as illustrated in the previous section). Also, the focus on more experienced start-ups increased the chance that some solutions will actually be developed instead of abandoned after the hackathon. Moreover, some of the piloting start-ups ultimately brought new knowledge, novelty and ideas to address urban issues, contributing to new discussions about the role of data in cities while broadening the types of business models pursued by conventional technology vendors. In this respect, urban technology experimentation under the

TABLE 14.1 The finalist start-ups for SOL's 2016 event

Finalist start-up	*Aims*	*Technology*
A	Assist non-governmental organisations working with homeless people	Geo-referenced social aid manager
B	Make waste collection in cities more efficient	Sensors connected to an online platform with dashboards and algorithms
C	Reduce water and energy consumption by citizens	Cyber-physical system and gamification techniques
D	Enhance urban mobility and identify less congested routes	Digital products and technologies based on Cisco's Connected Mobile Experience (CMX)
E	Making energy consumption in buildings more efficient	Cloud-based software that monitors and controls buildings' energy consumption in real time
F	Understanding and monitoring the impact of sound in the urban environment	Network of sensors and multi-channel microphones distributed throughout the city
G	Automate customer support services (e.g. in municipalities)	Automatic call response software based on previous interactions with customers
H	Solutions for active ageing and assistance in finding missing persons in a city	Software platform using existing public and personal infrastructure

Source: elaboration by authors based on information from Smart Open Lisboa (2016).

auspices of SOL, perhaps more than championing open data *per se*, have played a role in connecting the start-up world with the Lisbon's smart city agenda.

Yet, the benefits from the aforementioned links between the open data and smart start-up agendas also raises a number of questions and uncertainties about the broader embedding of open data ambitions in the city. Although it is too early to fully understand the scope and to assess the outcomes of these connections in Lisbon, some issues can be raised from the first iteration of the SOL model. Overall, prioritisation of established start-ups and data-driven innovation broadly speaking risks leading civic participation and data openness purposes to the background of the initiative. SOL has been inspired by other types of acceleration programmes, and a substantial part of the discussion focused on how to accelerate innovation, increase usability, acquire funding and grow a business. As explained by an event organiser:

> We kept the name 'hackathon', but [SOL] is actually a start-up challenge. Hackathons are essentially techy, very experimental, which is something we prefer to avoid. […] During the coming weeks, [start-ups] will do a proof of concept in which they test their concepts to understand what can

> make them most successful. In the end, we will choose a few start-ups and, together with the partners, provide them a 'seal of approval' to help them acquire more funding and partners.

In this vein, start-ups and event organisers often perceive the city as a source of inspiration 'commons', demonstration and, for some, as a transitional point to upscale business and acquire new contracts elsewhere. One interviewee explained that:

> The first thing a client will say [to a start-up] is 'show me a use case, what happened and with whom did you work'. [Hence], this experimentation stage gives them just that, a 'use case' they can show in other countries. The same with Sharing Cities, which is an international programme and start-ups working in Lisbon can also test their technologies in other places.

In this context, the discussion and learning about data openness is overshadowed or, at best, left as a secondary issue. While some start-ups do intend to release (aggregated) parts of newly collected data and have more social aims, others have more proprietary approaches, and intend to sell the data, or simply leave the open data discussion to a later point in time. As described by one start-up, '[SOL] is a great opportunity to access [closed] city data, and we can build on it. In the future, we will generate our own data and decide whether to open parts or just sell them.'

Finally, it is unclear if the culture of speed and delivery of results promoted by start-ups is at odds with the sustainability of those results and, overall, with the civic participation objectives (initially) associated with the open data agenda in Lisbon. As stated by an open data expert and activist:

> By definition, start-ups are created for fast growth; to acquire funding and create a business model that allows for profit. This is a good thing, I have nothing against it, but it may be at odds with open data innovation. […] Not every open dataset can be monetised; if the focus goes too fast towards monetising, notions of democracy and participation are lost. […] Start-ups and new business models would be the logical extension of a more open and participative society, rather than the start of the pipeline.

All in all, this suggests that the promotion of start-ups and the focus on acceleration and upscaling, while sensible in the world of entrepreneurship, may be increasingly misaligned with the slow development of open governance. In this vein, and like early smart city pilots and visions, open data development risks becoming instrumental to short-term economic gain while jeopardising broader socio-technical transition aims.

Conclusions and reflections

The PlanIT Valley utopia placed Portugal on the global map during the first wave of external, vendor-driven, top-down smart urbanism. The case of open

data development in Lisbon illustrates a turn in smart city initiatives that increasingly mobilises a discourse of transparency and participation, as well as of innovation and service improvement. As described, the first experiments with open data in Lisbon starting in 2011 focused on participation and transparency. Yet, they gained momentum in 2016 only after they became linked to higher-level and more resourceful smart city initiatives. The development of the municipality's Integrated City Operations Centre symbolised a new city-as-a-platform approach. This was followed by Lisbon's innovation and start-up promotion agenda in which a tailor-made start-up acceleration programme was designed to foster experimentation with (open) data-driven technology in the city ('Smart Open Lisboa').

This re-situating of open data in the city and the connections with other agendas came with heightened levels of financial and political support, new network formations and constituencies. Yet, and namely in relation to the start-up agenda, the ambition to deliver results by accelerating companies and showcasing solutions also involved the prioritisation of established start-ups and data-driven innovation, relegating initial civic participation and data openness purposes to the background. This illustration from Lisbon resonates with concerns in many cities that the heightened focus on short-term economic dividends and on the 'data' side of open data may actually hamper the development of a broader open data transition in the medium and long term.

The case of open data development in Lisbon raises a number of additional considerations and open questions. First, it suggests that the embeddedness of the open data movement in cities may rely on fragile and temporary networks that are assembled and reassembled over time as stakeholder interests and strategies evolve. Moreover, the urban contexts that define and influence the configuration of open data strategies in place are themselves shaped by emerging external-to-the-city networks and policy agendas (e.g. European research funds for smart experimentation and/or large technology events such as Web Summit). Because of this, open data and other related smart agendas in cities are likely to go through different rounds of negotiation in nuanced and sometimes volatile governance and policy contexts. Today, it is still unclear how this potential volatility might influence the quality and ability of smart agendas to gain (or lose) traction, namely because there are still very few – yet much needed – longitudinal studies on smart city development in their urban contexts.

Second, the emergence of new types of data-driven urban strategies, like in Lisbon, raises new questions about whether notions such as 'smart open' have the potential to become a new narrative for a city's future, and the implications of 'smart' urban development driven by start-ups. This marks a rather significant shift in the smart city discourse from global corporate players to the innovation abilities of local start-ups. This case study suggests that this shift might come with advantages (e.g. heightened resources for experimentation, innovation potential) and disadvantages (e.g. diverting the focus of experimentation from open governance and societal learning towards the upscaling of start-ups). Hence, there is an open question about the extent to which this shift can ameliorate the

frequently pointed problems of smart city development (e.g. Kitchin 2016) or simply represent old wine in new bottles.

Finally, the development of open data in Lisbon calls attention to the uneasy relationship between open data ambitions and the overall 'smart-digital-data' strategies in which they are often nurtured, as well as access to resources (e.g. finance, staff, advocacy) in contemporary smart urbanism. How the tensions between different types of objectives (participation, service efficiency and economic development) are solved, and how they interact with one another across different urban contexts, is a key issue for policymakers and further research. A deeper appreciation of the positive and negative dynamic interplay between these objectives is pivotal to realise the potential of data openness within a smart urbanism framework.

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Notes

1 For example T. Demeyer, personal communication, 8 December 2015.
2 The City of Lisbon and affiliated organisations released roughly 80 per cent of the datasets, and 13 per cent were released by the National Institute of Statistics. See *Lisboa Aberta website*. Available: http://dados.cm-lisboa.pt [Last accessed 23 October 2017].
3 One interviewee suggests that linking to the open data agenda was a relevant resource for both the Sharing Cities project and the COI strategy in order to strengthen their image as open and inclusive initiatives vis-à-vis early top-down, closed and control-centred smart city solutions.
4 For the second iteration of the programme in 2017, the timeframe was extended to six months and new partners joined the initiative (e.g. the city's water company).

References

Almirall, E., Lee, M. and Majchrzak, A. (2014). Open innovation requires integrated competition-community ecosystems: lessons learned from civic open innovation. *Business Horizons 57*: 391–400.

Baron, G. (2013). Smartness from the bottom-up: a few insights into the Amsterdam smart city programme. *Metering International 3*: 98–101.

Barns, S. (2016). Mine your data: open data, digital strategies and entrepreneurial governance by code. *Urban Geography 37*: 554–571.

Carvalho, L. (2015). Smart cities from scratch? A socio-technical perspective. *Cambridge Journal of Regions, Economy and Society 8*: 43–60.

Carvalho, L. (2017). Open Steden, open data? *Agora Magazine 33*: 19–22.

Carvalho, L., Berg, L. van den, Galal, H. and Teunisse, P. (eds) (2017a). *Delivering Sustainable Competitiveness: Revisiting the Organising Capacity of Cities*. Abingdon: Routledge.

Carvalho, L. and Campos, J.B. (2013). Developing the PlanIT Valley: a view on the governance and societal embedding of u-eco city pilots. *International Journal of Knowledge-Based Development 4*: 109–125.

Carvalho, L. and Otgaar, A. (2017). Dublinked (Dublin). In L. Carvalho, L. van den Berg, H. Galal and P. Teunisse (eds), *Delivering Sustainable Competitiveness: Revisiting the Organising Capacity of Cities*. Abingdon: Routledge, 41–60.

Carvalho, L., Plácido Santos, I. and Vale, M. (2017b). Living PlanIT and the development of the Urban Operating System: the geographies of an innovation. In L. Kebir, O. Crevoisier, P. Costa and V. Peyrach (eds), *Sustainable Innovation and Regional Development: Rethinking Innovative Milieus*. Cheltenham: Edward Elgar Publishing, 86–102.

Carvalho, L. and van Tuijl, E. (2017). Digital strategy (Manchester). In L. Carvalho, L. van den Berg, H. Galal and P. Teunisse (eds), *Delivering Sustainable Competitiveness: Revisiting the Organising Capacity of Cities*. Abingdon: Routledge, 19–40.

City of Lisbon (2016). Resolution from the mayor´s office on open data policy. Official Resolution 58/P/2016. [Online]. Available: www.am-lisboa.pt/documentos/1498144054T1aAU3gg8Wx11EV1.pdf [Last accessed 8 June 2018].

Economist. (2010). The data deluge. *The Economist*, 25 February. [Online]. Available: www.economist.com/node/15579717 [Last accessed 23 October 2017].

Evans, J., Karvonen, A. and Raven, R. (eds). (2016). *The Experimental City*. London: Routledge.

Frantzeskaki, N., Castán Broto, V., Coenen, L. and Loorbach, D. (eds) (2017). *Urban Sustainability Transitions*. Abingdon: Routledge.

Goldstein, B. and Dyson, L. (eds). (2013). *Beyond Transparency: Open Data and the Future of Civic Innovation*. San Francisco: Code for America Press.

Hunsinger, J. and Schrock, A. (2016). The democratization of hacking and making. *New Media & Society 18:* 539–557.

INE (Instituto Nacional de Estatística [Portugal]). (2011). *Population Census 2011*. Lisbon, INE. [Online]. Available: www.ine.pt [Last accessed 8 June 2018].

INTELI (Inteligência em Inovação). (2014). Smart Cities Portugal Roadmap. INTELI report, May. [Online]. Available: www.inteli.pt/uploads/documentos/documento_1400235009_2055.pdf [Last accessed 11 January 2018].

Jaffe, E. (2013). How are those cities of the future coming along? *City Lab*, 11 September. [Online]. Available: www.citylab.com/life/2013/09/how-are-those-cities-future-coming-along/6855/ [Last accessed 23 October 2017].

Janssen, M., Charalabidis, Y. and Zuiderwijk, A. (2012). Benefits, adoption barriers and myths of open data and open government. *Information Systems Management 29*: 258–268.

Karvonen, A. and van Heur, B. (2014). Urban laboratories: experiments in reworking cities. *International Journal of Urban and Regional Research 38*: 379–392.

Kitchin, R. (2014). *The Data Revolution: Big Data, Open Data, Data Infrastructures and Their Consequences*. Thousand Oaks, CA: Sage.

Kitchin, R. (2016). Reframing, reimagining and remaking smart cities. Programmable City Working Paper 20, Maynooth University, Dublin.

Knorr, E. (2017). Will open data survive Trump? *Infoworld*, 16 January. [Online]. Available: www.infoworld.com/article/3157870/open-source-tools/fears-of-trump-prompt-open-datas-underground-railroad.html [Last accessed 23 October 2017].

McKinsey Global Institute. (2013). Open data: unlocking innovation and performance with liquid information. October. [Online]. Available: www.mckinsey.com/business-functions/digital-mckinsey/our-insights/open-data-unlocking-innovation-and-performance-with-liquid-information [Last accessed 23 October 2017].

Nesta. (2015). *Rethinking Smart Cities from the Ground Up*. London: Nesta.

O'Reilly, T. (2010). Government as a platform. In D. Lathrop and L. Ruma (eds), *Open Government: Collaboration, Transparency, and Participation in Practice*. Sebastopol, CA: O'Reilly Media, 11–40.

Ojo, A., Curry, E. and Zeleti, F. (2015). A tale of open data innovations in five smart cities. *48th Hawaii International Conference on System Sciences (HICSS)*. IEEE. 2326–2335.

Open Data Barometer. (2017). Open Data Barometer website. [Online]. Available: http://opendatabarometer.org/4thedition/detailcountry/?_year=2016&indicator=ODB&detail [Last accessed 23 October 2017].

Open Knowledge Foundation. (2016). Open Knowledge Foundation website. [Online]. Available: http://opendatahandbook.org/guide/en/what-is-open-data/ [Last accessed 23 October 2017].

Otgaar, A. and Carvalho, L. (2017). World Design Capital (Helsinki). In L. Carvalho, L. van den Berg, H. Galal and P. Teunisse (eds), *Delivering Sustainable Competitiveness: Revisiting the Organising Capacity of Cities*. Abingdon: Routledge, 200–218.

Poole, S. (2014). The truth about smart cities: 'in the end, they will destroy democracy'. *The Guardian*, 17 December. [Online]. Available: www.theguardian.com/cities/2014/dec/17/truth-smart-city-destroy-democracy-urban-thinkers-buzzphrase [Last accessed 20 October 2017].

Robinson, D. and Yu, H. (2012). The new ambiguity of 'open government'. *UCLA Law Review Discourse 59*: 178–208.

Rossi, U. and Di Bella, A. (2017). Start-up urbanism: New York, Rio de Janeiro and the global urbanization of technology-based economies. *Environment and Planning A: Economy and Space 49*: 999–1018.

Rossi, U. (2017). *Cities in Global Capitalism*. Cambridge: Polity Press.

Shelton, T., Zook, M. and Wiig, A. (2015). The 'actually existing smart city'. *Cambridge Journal of Regions, Economy and Society 8*: 13–25.

Smart Open Lisboa. (2016). Smart Open Lisboa 2016 event. [Online]. Available: www.smartopenlisboa.com/sol2016/ [Last accessed 20 October 2017].

Sollazzo, G. (2015). Open data: where the movement started and where it's headed. *Computerworld UK*, 1 October. [Online]. Available: www.computerworlduk.com/data/open-data-where-it-started-where-its-headed-3626537/ [Last accessed 23 October 2017].

Townsend, A. (2013). *Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia*. New York: Norton.

Truffer, B., Metzner, A. and Hoogma, R. (2002). The coupling of viewing and doing: strategic niche management and the electrification of individual transport, *Greener Management International 37:* 111–124.

Ramsden, P. (2016). There is no sense in sensors: making a smart city for citizens. URBACT, 27 July. [Online]. Available: http://urbact.eu/there-no-sense-sensors-making-smart-city-citizens [Last accessed 23 October 2017].

Van den Bosch, H. (2018). PlanIT Valley: the smartest city never been built. *Smart City Hub*, 10 January. [Online]. Available: http://smartcityhub.com/governance-economy/planit-valley-the-smartest-city-never-been-built/ [Last accessed 15 January 2018].

Van der Lans, R. (2015). *Open and Big Data*. Amsterdam. Amsterdam Smart City.

Van Winden, W. and van Buuse, D. (2017). Smart city pilot projects: exploring the dimensions and conditions of scaling up. *Journal of Urban Technology 24*: 51–72.

ZOOM Smart Cities. (2017). Zoom Smart Cities website. [Online]. Available: www.zoomsmartcities.com/blogue/ [Last accessed 23 October 2017].

PART 4

Experiencing and encountering

15

BARCELONA

From corporate smart city to technological sovereignty

Hug March and Ramon Ribera-Fumaz

From first- to second-generation smart cities

In the last decade, critical urban scholars have raised several concerns around the deployment of smart city strategies both in the Global North and the Global South (see March 2016, Odendaal this volume). Smart city initiatives frequently overestimate the transformative power of technology while underestimating the non-technological aspects of urban problems, especially those that are most urgent, such as poverty, inequality and so on. Proponents of smart cities forward an epistemological perspective that frames urban problems as engineering and technical challenges. In other words, as Morozov (2013) argues, technological solutionism is privileged as the way to tackle any existing problem.

In the context of austerity urbanism, the smart city becomes a lucrative framework for technology-driven urban governance, accelerating the involvement of corporate actors in the prefiguration of urban futures. Along those lines, Vanolo, when describing the different imaginaries behind smart cities, argues that there is an imaginary of 'smart cities without (or with invisible) citizens' and another one of 'dystopian, pervasive and totalitarian smartness' that he also calls 'the subjugated citizen' (2016: 30, 32). On the other hand, the digitalisation of urban services may have splintering effects as some social groups may have limited access to digital resources. As Gabrys (2014) argues, smart city imaginaries may delimit what is constitutive of urban citizenship in the twenty-first century.

However, the actually existing smart city does not exclusively respond to these premises. Cardullo and Kitchin (2017) note that, countering this vision, there is an emergent set of second-generation smart city strategies that are shifting the focus towards community-led projects with concern for inclusivity, participation and citizen engagement. Elsewhere, Vanolo (2016:33) summarises this smart city imaginary as 'active citizens and inhabitants-as-sensors'. This shift responds to

the failure or limited impact of many top-down smart initiatives in the recent past as well as to critiques of their implementation. Two important factors have enabled this shift: the development of new technology architectures and infrastructures that put the citizen at the centre of urban governance; and the rise of new models of urban governance (e.g. sharing economy platforms).

In addition, the shift towards citizen-led, bottom-up initiatives has been supported by international bodies (e.g. UN-Habitat, the World Bank and the EU), nation-states (India and Korea) and leading smart cities (Amsterdam, Barcelona, Vienna and Helsinki). Consequently, the smart city industry is progressively embracing this shift. This new logic is summarised by Carlo Ratti, director of the SENSEable City Lab at the Massachusetts Institute of Technology (MIT):

> I think municipalities are starting to understand the importance of this approach. Most urban transformations are the result of a joint effort between different actors (government, industry, etc.). We think that citizens in particular should have a key role through 'bottom-up' dynamics. So, rather than focusing too much on the installation and control of hardware – fixed, static 'sensing systems' – it is important for governments to get people excited about reading apps and using data themselves. If we can develop the right platforms, people can be the ones to address urban issues.
>
> *(cited in Almirall et al. 2016: 142–143)*

In this regard, new smart city flagship projects have moved from expensive projects involving the deployment of monitoring networks and centralised software towards small-scale, bottom-up projects. These approaches embrace a vision of the city as a laboratory for social innovations, where citizens are not only part of these experiments but are also generators of innovation. As March (2016) notes, ICT-based urban interventions contribute to the reorganisation not only of urban governance and management but also of design, production and consumption (see also Burton *et al.* this volume). For example, a thoughtful alternative application of ICT is to support the so-called sharing economy, facilitating collaboration beyond the market that results in fundamental changes in value creation, sustainability and social inclusion. However, for other commentators, these shifts do not necessarily point towards a brighter future. Instead, they might end up reinforcing the logic of first-generation smart cities and corporate benefits (McLaren and Agyeman 2015, Charnock and Ribera-Fumaz 2017).

This chapter explores the tensions within these second-generation smart city experiments in Barcelona. First, we briefly explain the shift of focus from first- to second-generation smart city policies in Barcelona developed by the liberal local government (2011 to 2015). Then we document how the concept of technological sovereignty and new visions around the smart city emerged. The anti-eviction activist Ada Colau was elected mayor in 2015 with a new political party, Barcelona en Comú. We explore the central tenets behind the *Barcelona Digital Plan*, a key document that illustrates a significant shift in digital policies

to go beyond the first-generation smart city. Finally, the chapter ends with some reflections on the potentialities and limits of this new urban digital paradigm in Barcelona.

From first- to second-generation smart urbanism in Barcelona (2011 to 2015)

The deployment of a smart city strategy started in Barcelona (rhetorically more than effectively) at the end of the 2000s. At the time, the local government was led by the left coalition of the Catalan Socialist Party (PSC) and the red-green party Inicitativa per Catalunya-Els Verds (ICV). However, it was with the liberal government of Mayor Xavier Trias (2011 to 2015) that Barcelona fully embraced the smart city gospel.[1] The vision was for Barcelona to become a smart city based on principles of self-sufficiency, efficiency, quality of life and social equity (March and Ribera-Fumaz 2016).

The first step by Barcelona City Council (BCC) was to merge the planning and infrastructure, housing, environment and ICT departments into a single department called Hàbitat Urbà (Urban Habitat). This department was created to manage the:

> new challenges of a city that moves forward toward sustainability at the local and global scale […] to become a city of neighbourhoods at the human scale, interconnected and eco-efficient, in the context of a high speed, hyper-connected, energetically self-sufficient, renaturalised and regenerated metropolitan area.
>
> *(March and Ribera-Fumaz 2016: 818)*

Integrating the ICT department with the other municipal departments framed ICT and Internet topologies as the key ordering principles of the city that would empower citizens while boosting efficiency and promoting new urban economies. Thus, Barcelona presented itself as the leader of the smart city transformation:

> All of the cities in the world want to be the protagonist of [the smart transformation], and Barcelona, the city where Cerdà invented and implemented modern urbanism, has the chance to convert this need for change into the economic engine for the creation of wealth and welfare for its citizens […] the new smart cities across the world offer a unique opportunity to apply solutions in which Barcelona can be the laboratory and leader at the same time.
>
> *(Ajuntament de Barcelona 2012: 2–3)*[2]

This leadership was implemented through public–private partnerships with major corporations developing several local projects and pilots that largely focused on infrastructure, sensing and operation systems/software to recast Barcelona as a

laboratory for the city of the future. These pilots and initiatives were intended to set the standards elsewhere through international initiatives such as City Protocol (aimed at creating global standards of the smart city) and through events such as the World Mobile Congress and the Smart City World Congress (**Table 15.1**).

This involved conventional smart city contracts with technology providers such as Cisco, Schneider Electric, Suez and Endesa. Central to the liberal government's smart city strategy was the creation of the City Operating System (City OS), a technological platform that allows for the management of scattered urban information (Ajuntament de Barcelona 2014). In April 2015, City OS was introduced as a joint venture between Accenture, Tradia Telecom, Sinovia (Suez) and Cofely España (Suez) (El Periódico 2015). Nonetheless, Mayor Trias's smart city strategy was not only about infrastructure and the top-down rearrangement of urban governance. Integral to the strategy were flagship projects aimed at engaging citizens and local communities that were responding to a new form of smart city. Examples of this include the Ateneus de Fabricació Digital (AFDs – Digital Fabrication Athenaeums) (Ateneus de Fabricació 2017), the Fab City project (Fab City 2017) or Vincles BCN (Ajuntament de Barcelona 2017a). These projects are described in the following paragraphs.

In 2013, Ateneus de Fabricació Digital (AFDs) were launched. AFDs are public makerspaces aimed at empowering citizens through digital fabrication. The goal is to have a public makerspace in each of the ten districts of the city, based on three activities: social innovation (where citizens and local communities go to AFDs to 'make things' and experiment on improving the neighbourhood);

TABLE 15.1 Barcelona's smart city strategy under the Trias government

Local projects*	Self-sufficient square blocks, smart lighting, district heating	Governance arrangements
	22@, Smart City Campus, BarcelonaLab, Fablabs	
	Barcelona Institute of Technology for the Habitat (BCC and Cisco)	
	Hàbitat Urbà (merger of various BCC departments)	
International collaboration	Strategic agreements with Cisco, Schneider-Telvent	
	Abertis, Telefónica, GDF-Suez, IBM and Endesa	
	Green Digital Charter	
	City Protocol	International Projects
	World Mobile Congress	
	Smart City World Congress	

* Public and Public–Private Partnerships

Source: March and Ribera-Fumaz (2016).

pedagogy (training sessions on digital fabrication for primary and secondary schools); and family activities on Saturdays. Each AFD was planned to have a thematic specialization. The programme started with three AFDs, each focusing on a specific city challenge: one in the middle/high-income neighbourhood of Les Corts (inclusiveness), and in the working-class neighbourhoods of Barceloneta (sustainability) and Ciutat Meridiana (urbanism). Paradoxically, the ADF of Ciutat Meridiana was occupied by neighbours and was used as a community food bank at the beginning of the initiative. This unexpected event prompted a rethinking of its rationale and a shift from the highly abstract topic of urbanism to capacity building and digital fabrication training.

Digital fabrication and citizen involvement were also at the centre of the smart city strategy through the Fab City project. In July 2014, Mayor Trias announced at the 10th International Fab Lab Conference in Barcelona that BCC would aim to be 100 per cent energy self-sufficient by 2054 by joining the Fab City project led by the Institute for Advanced Architecture of Catalonia, MIT's Center for Bits and Atoms and the Fab Foundation. This project aims to develop locally produced and globally connected self-sufficient cities via a circular economy model and citizen empowerment in 12 cities, 1 region and 2 countries around the world.

In contrast, Vincles BCN is a 'social innovation project designed to strengthen the social ties of elderly people who feel lonely and to improve their well-being with the aid of new technologies' (Ajuntament de Barcelona 2017a). This citywide platform uses an app for tablets to strengthen the social ties of people who are over 65 and living alone. The app was part of a broader initiative to promote face-to-face gatherings and meetings. It won the Grand Prize of the 2014 Bloomberg Mayors Challenge in Europe, a competition among more than 150 European cities to develop new approaches to pressing urban issues (Mayors Challenge 2017). While the idea was born under the Trias government, it was not effectively implemented until 2017.

These three projects demonstrate how, at least discursively, Barcelona started to put a different emphasis on the deployment of the smart city during the liberal government, gradually embracing the idea of bringing citizens to the smart city. However, by the local elections of 2015, this vision had not been entirely deployed, most likely due to a lack of time to implement them: Fabcity had not yet started to engage citizens; Vincles did not start its implementation until 2017; and AFDs were only able to gain traction after an initiation period marked by conflict and opposition. The outcomes of the local elections of 2015 challenged the smooth implementation of Trias's smart city vision.

From second-generation smart city to technological sovereignty?

After the most significant economic crisis in Spain since the late 1970s and the rise of popular protests against austerity politics, in May 2015 a new left-wing political party, Barcelona en Comú, led by social activist Ada Colau (former

leader of the anti-evictions social movement PAH), won the local elections. Barcelona en Comú's programme and campaign were based on bringing about a 'democratic rebellion in Barcelona' that would 'be the trigger for a citizen revolution in Catalonia, Spain, Southern Europe and beyond' (Barcelona en Comú 2016: 4). Indeed, as their foundational political manifesto clearly stated:

> Taking advantage of the economic crisis, the economic powers have launched an offensive against the rights and social achievements of the majority of the population … We can't afford another institutional blockade from above that leaves us without a future. We need to strengthen, more than ever, the social fabric and spaces for citizens to self-organise. But the time has also come to take back the institutions and put them at the service of the majority and of the common good.

Thus, the new (minority) government was committed to radically rethinking the 'Barcelona urban model'.[3] This process implied deciding what to do with the smart city strategy inherited from the previous liberal government. During the first year of governing, there was ambiguity and a lack of action on the smart city strategy because most attention was directed towards other issues of the city model, such as the negative impacts of mass tourism on some neighbourhoods and the housing crisis in the city. Little was done beyond raising doubts about the previous administration's smart city strategy. The strategy was neither promoted nor rejected; instead, it was largely frozen until, eventually, some initiatives were revived because of their potential social impact or for legal reasons (contracts were already signed), while others were abandoned. One of the most important early changes involved the dismantling of the former smart city structure centred on Hàbitat Urbà (Urban Habitat) into separate functions in different areas. It was not until June 2016 that BCC appointed Francesca Bria – an independent expert from innovation foundation Nesta (UK) – as Chief Technology Officer (CTO) with a new vision that emphasised the importance of data.

This new vision acknowledged that, within what Schiller (2014) calls digital capitalism, the lifeblood of the information economy – dominated by a small group of corporations – is data: data that is extracted, often without user knowledge, and monetised to generate huge profits. However, at the same time, this transformation also allows the collective reappropriation of information and knowledge (Vercellone 2011). Therefore, as Bria states (in Almirall *et al.* 2016: 151):

> Cities should explore how to build a commons-based sharing economy that is data centric but where the data that is generated and gathered by citizens, IoT, sensor networks, and open city level data, is available for broader communal use with appropriate privacy protections. As a result, a mass of innovators, start-ups, SMEs, NGOs, cooperatives, and local communities can take advantage of that data to build apps and services that are most relevant to them and the wider community.

This vision led to the elaboration of a new strategy launched in October 2016, *Barcelona Digital Plan: A Road Map Towards Technological Sovereignty* (Ajuntament de Barcelona 2016). While the concept of technological sovereignty has not been clearly defined in any public document, Deputy Mayor Gerard Pisarello (2016: 22) states that:

> In a democratic city, technology should serve to digitally empower citizens, to protect their privacy from abuses by the public and private powers, to fight against corruption and to advance towards a more equitable and sustainable economy. That has a name: conquering technological, digital sovereignty, for the common good.[4]

In this new urban digital paradigm, the control over urban data by citizens is central but insufficient. It is also necessary to involve citizens in decision-making and to change the actual political economies of digital capitalism in the city. In other words, while the focus on citizens and the need for continuous (social) innovations is inherited from the smart citizens/city ethos (**Table 15.2**), this is framed and developed with the aim 'to go beyond the smart city'. In effect, it aims to minimise the relevance of the smart city concept as the guiding principle of urban policy making in Barcelona. In this regard, both in the *Barcelona Digital Plan* document and the public interventions of BCC technology policy, the notion of the smart city is frequently substituted with the 'Open', 'Circular', 'Democratic', or 'Commons' city.

According to the plan, Barcelona will continue to position itself as a global 'benchmark in the promotion of technological and digital innovation'. However, this leadership should be 'in the service of social and environmental transformation, as a tool for the development of a plural economy, and to favour the empowerment of citizens and their participation in the governance of information' (Ajuntament de Barcelona 2016: 14). Thus, the new *Barcelona Digital Plan* notes that the previous smart city model followed a 'technology push' strategy that produced several dependencies on infrastructure and service providers that could result in undesirable lock-ins. In particular, it had the potential to complicate the

TABLE 15.2 Vision and mission of Barcelona Ciutat Digital

Vision	Beyond the smart city: Barcelona will become an open, fair, circular and democratic city and a referent in technological policy for a transparent public and citizen's leadership.
Mission	To solve city and citizen challenges through the more democratic use of technology, fostering technological and digital innovation for a more open government; as a tool for the development of a plural economy that promotes the social and environmental transformation, and that favours the empowerment of citizens.

Source: Ajuntament de Barcelona (2016).

control not only of infrastructure but also the capacity to generate public open data, knowledge and management innovations.

Central to the new vision was the aim to tackle social problems. According to BCC, urban challenges such as climate change, resource consumption, employment, wage inequality, housing and data rights were not adequately addressed in the previous smart city strategy. For instance, the *Barcelona Digital Plan* highlights the existing digital divide in Barcelona whereby, in middle-class and high-income neighbourhoods such as Les Corts, almost all of households are connected to the Internet, compared to poorer neighbourhoods such as Torre Baró (in Ciutat Meridiana), where one in three households lacks access to the Internet. This digital divide between rich and poor neighbourhoods is even more pronounced with elderly residents (Mobile World Capital 2016).

The new vision also suggested that deploying digital technologies in the urban environment is not only about equipping the urban fabric with sensors and other state-of-the-art ICT; it is also about bridging technological gaps and engaging the population through participatory processes. Accordingly, BCC will deploy 'data-based innovation to improve cities and the lives of citizens' (Mobile World Capital 2016: 9). In a nutshell, under the new strategic plan, BCC aimed to re-appropriate the public–private programme of urban management instigated under the former liberal government (**Table 15.3**). In general terms, the plan involved three lines of action: government and the city, business and social entities, and citizens. These lines of action were operatively renamed digital transformation, digital innovation and digital empowerment, respectively.

In this context, the local government led by Barcelona en Comú has, on the one hand, retained some of the programmes of the previous administrations such as Vincles BCN, AFDs and Fab City (although the latter was relabelled Makers District). On the other hand, it has promoted initiatives that respond to their new vision. Among these projects, we focus on three: Decidim Barcelona; La Comunificadora and the digital social innovation initiative DSI4BCN; and the new public digital technologies procurement process. These are described briefly in the following paragraphs.

Decidim Barcelona (2017) is the city's digital participation platform. The platform is based on open source software (uploaded to GitHub) and can be improved or re-used by anyone. Other Spanish municipalities already use the platform, and some social movements are considering using it for campaigns and struggles.[5] The platform was an outcome of the EU-funded project Decentralised Citizens ENgagement Technologies (D-CENT) (2013 to 2016) that explored open source tools for direct democracy in four cities (Barcelona, Madrid, Helsinki and Reykjavik). The prototype of the platform was developed in Barcelona and is based on the techno-political communities that emerged from the Indignados movement of 2011 (also known in Spain as '15M'). It was established on principles of open source and privacy by design, the latter aiming at always keeping data produced by users in their own hands with transparency and accountability while preventing the appropriation of data for commercial use. It was first used

TABLE 15.3 Barcelona's Technological Sovereignty projects

Area	*Field*	*Main projects*
Digital transformation	Technologies for a better government	Open budget
		Ethics mailbox (anonymous corruption complaints)
		Open apps and software
	Urban technologies	Internet4all (digital bridge programmes)
		Bicing (bike rental)[a]
		T-mobility (integrated transport card)[a]
		Superblocks[a]
		Sentilo[a]
	City data commons	City Dash Board
		Open Data Portal
		DECODE[c]
		City OS[a]
Digital innovation	Digital economy	DSI4BCN[c]
		La Comunificadora
	'Made in Barcelona'	Digital Fabrication Athenaeums[b]
		Poblenou Makers District (formerly Fab City)[b]
	Urban i-lab	e-procurement
		Mobile Congress and Smart City World Congress[a]
Digital empowerment	Education and digital capacitation	Digital Fabrication Athenaeums[a]
		Educational programmes
	Digital inclusion	Educational programmes
	Democracy and digital rights	Decidim Barcelona

Notes

a External programmes from the previous administration with pre-established contractual commitments.

b Programmes from the previous administration that have been adapted and modified.

c European Commission Horizon 2020 project aimed at putting individuals in control of whether they keep their personal information private or share it (for the public good).

for the participatory development of the municipal action plan for neighbourhood initiatives. Almost 40,000 people proposed, deliberated and voted on what BCC should do in each neighbourhood. Currently, the Decidim platform is being used in various participatory processes of the city (e.g. Pla Clima, the climate action plan of Barcelona), and there is continuous upgrading of the platform and open public discussions on how the platform can help enhance direct democracy.

La Comunificadora is a business incubator for cooperatives and small projects related to the commons-based, collaborative and sharing economy (Barcelona Activa 2016). It hosts start-ups that work in the fields of open design and software, digital fabrication, open data and the circular economy. It also provides foundational courses on how to create a collaborative economy company and

a mentoring programme. It is located in Barcelona Activa (BCC's economic development agency) but is operated by Goteo (the first social economy crowdsourcing platform in Spain), Platoniq (a collaborative economy lab) and the Free Knowledge Institute. In addition to La Comunificadora, but also with the aim of enhancing social innovation and the local collaborative economy, BCC has launched Digital Social Innovation for Barcelona (DSI4BCN), based on the European Commission's Horizon 2020 project DSI4EU. DSI4BCN aims to promote social innovation programmes and digital fabrication spaces to improve the local digital manufacturing economy while adhering to participatory and ecologically sustainable principles in Poblenou, the city's technology district.

Finally, in 2017 BCC launched a new process called 'Public Procurement for Innovation'. The objective of the process is to use public procurement as a tool of urban socio-economic transformation. In other words, it aims to use procurement processes to find innovative solutions to local urban challenges while promoting the local economy (SMEs, cooperatives, social economy, etc.) (Ajuntament de Barcelona 2016, 2017b). The new guidelines for public procurement for innovation are influencing BCC's acquisition of digital technology and digital services (Ajuntament de Barcelona 2017c). The *Barcelona Digital Plan* allocates a budget of €10 million for innovative procurement processes in ICT provision, mainly targeting SMEs and cooperatives that work with open source, open data, privacy by design and agile methodologies. This initiative may reduce the power of big technology corporations in municipal procurement processes.

Potentialities, tensions and challenges of technological sovereignty

In the last decade, Barcelona has become an experimental laboratory for testing new approaches to technology and urbanism. Initially, the city fully embraced the smart city gospel and situated Barcelona on the global map of smart cities. Later, under Mayor Colau's *Barcelona Digital Plan*, the focus shifted towards technological sovereignty and a data-centric, commons-based sharing economy.

It is interesting to note that, notwithstanding the initial rejection by the new local government of the existing smart city model, the narrative and actions of the new *Barcelona Digital Plan* are partially derived from the same concepts promoted by orthodox and corporate smart city proponents. This includes digital (disruptive) social innovation, a fourth industrial revolution and citizen empowerment, among other concepts. Furthermore, the European Commission's Horizon 2020 programmes have funded many of the initiatives.[6] For example, the D-CENT project, which gave birth to the Decidim platform, was developed under the second-generation smart city strategy of the liberal administration that focused on smart citizens. However, the new BCC has reinforced the role of citizens in this process. They are not conceived merely as providers of data, but are active participants in urban governance through digital platforms such as

Decidim. In addition, the new CTO of Barcelona has underscored the importance that citizens can control their data through privacy-by-design approaches.

On the other hand, the *Barcelona Digital Plan* and broader technological sovereignty frame do not use technology to depoliticise governance, but instead to engage with social movements and communities and re-politicise urban issues. Technological sovereignty, however, should avoid fetishising the local scale and technology. Instead, it should be aware that technology-led solutions are not independent of broader relations of production (Arboleda 2017). To some extent, the *Barcelona Digital Plan* recognises that to overcome problems experienced at the local scale, BCC must conduct a larger systemic diagnosis of how technology providers are impacting specific geographies. In July 2017, it was announced that BCC is creating local platform competitors to Airbnb and Uber (Cuesta and Solanas 2017).

Moreover, it is important to reflect on the limits of local technological strategies. First, technological sovereignty, both the concept and its goals, remain vaguely defined and many different visions and alternatives are simultaneously being deployed. Second, technological sovereignty frequently revolves around an overly optimistic perspective on digital technology, and there are challenges in connecting to social movements and struggles beyond the technology sphere. For instance, in the recent polemic deployment of the superblock project (traffic calming measures that remove cars and increase public space), digital participatory resources did not prevent contestation, the necessity for face-to-face negotiation and the imposition of a top-down solution.

Conclusions

In summary, the new direction taken by Barcelona en Comú in BCC seems to incorporate the academic critique of both the corporate smart city and the more restrictive visions of the smart citizen. However, some problems still plague this shift, which should be urgently and seriously tackled if the effort is to succeed. First, the political economy of the smart city in Barcelona needs to be critically scrutinised and potentially reorganised. What will happen to all the signed contracts with large ICT companies and utilities? It is not clear that Barcelona en Comú will be able to carry out radical actions as it only holds 11 of 41 seats in the city council and the outcome of the local elections in May 2019 remain to be seen.

Second, and probably less dependent on entrenched power relationships, it is vital to avoid overly optimistic readings of the capacity of the technological innovation to spearhead urban change. As Hollands (2015: 72) argues, most smart city initiatives only encompass the 'right to use technology' instead of 'the right to shape the city using human initiative and technology for social purposes to make our cities better and more sustainable'. The democratisation of technology should not be an end goal but a potent tool to pursue progressive and emancipatory urban transformation. In this sense, it is fundamental to avoid falling

into an apolitical mode of technological innovation determinism (Medina 2015). Instead, policy makers, social movements, scholars and practitioners alike should collectively rethink how technology might be democratically harnessed to contribute to a progressive social change. Emancipatory digital visions should be connected to broader social movements to build up alternatives beyond technology (Smith *et al*. 2017) and to create new urban alternative economies.

Progressive local governments should reflect on the role of smart city/citizen technologies in the enactment of alternative and emancipatory urban transformations. It is not just a matter of what technologies and what data but, more importantly, the specific objectives that they address, the organisations that produce, manage and control them, and the organisations that extract value from them.

Notes

1 For a full description of the smart city in Barcelona under the liberal administration, see March and Ribera-Fumaz (2016).
2 All non-English quotations are the authors' translations.
3 Barcelona en Comú, Ada Colau's platform that included the ICV, won 11 city council seats out of 41. Since 2016, it has governed through a coalition with the PSC.
4 Cited and translated in Galdon (2017).
5 Personal communication with Barcelona Decidim developers' team.
6 H2020 funds continue to be an important financial resource to develop actions around technological sovereignty in the *Barcelona Digital Plan*.

References

Almirall, E., Wareham, J., Ratti, C., Conesa, P., Bria, F., Gaviria, A. and Edmondson, A. (2016). Smart cities at the crossroads: new tensions in city transformation. *California Management Review 59*: 141–152.

Ajuntament de Barcelona. (2012). *Mesura de Govern MES: l'estratègia TIC de l'Ajuntament de Barcelona al servei de la ciutat i dels ciutadans*. Barcelona: Ajuntament de Barcelona.

Ajuntament de Barcelona. (2014). *Institut Municipal d'Informàtica. Memòria 2014*. Barcelona: Ajuntament de Barcelona.

Ajuntament de Barcelona. (2016). Mesura de govern: transició cap a la Sobirania Tecnológica. *Pla Barcelona Ciutat Digital. Octubre 2016*. Available: https://bcnroc.ajuntament.barcelona.cat/jspui/bitstream/11703/98713/3/Pla_Ciutat_Digital_MdGovern.pdf [Last accessed 20 October 2017].

Ajuntament de Barcelona. (2017a). *Vincles Bcn website*. [Online]. Available: http://ajuntament.barcelona.cat/vinclesbcn/en/vincles-bcn [Last accessed 20 October 2017].

Ajuntament de Barcelona. (2017b). Guía de contractación pública innovadora. Available: http://ajuntament.barcelona.cat/digital/sites/default/files/guia_adt_guia_de_contractacio_esp_2017_af_9en.pdf [Last accessed 16 February 2018].

Ajuntament de Barcelona. (2017c). Guía de compra pública de TIC del Ayuntamiento de Barcelona. Available: http://ajuntament.barcelona.cat/digital/sites/default/files/guia_adt_6_guia_de_compra_publica_tic_esp_2017_af_9en.pdf [Last accessed 16 February 2018].

Arboleda, M. (2017). Revitalizing science and technology studies: a Marxian critique of more-than-human geographies. *Environment and Planning D: Society and Space 35*: 360–378.

Ateneus de Fabricació Digital. (2017). *Ateneus de Fabricació Digital website*. [Online]. Available: http://ateneusdefabricacio.barcelona.cat/ [Last accessed 20 October 2017].

Barcelona Activa. (2016). *Transitant cap al procomú: La Comunificadora*. Barcelona: Ajuntament de Barcelona.

Barcelona en Comú. (2016). *How to Win Back the City en Comú: Guide to Building a Citizen Municipal Platform*. Barcelona: Barcelona en Comú.

Cardullo, P. and Kitchin, R. (2017). Being a 'citizen' in the smart city: up and down the scaffold of smart citizen participation. *Programmable City Working Paper 30*, 5 May 2017.

Charnock, G. and Ribera-Fumaz. R. (2017). Barcelona en Comú: urban democracy and 'the common good'. In L. Pantich and G. Albo (eds), *Rethinking Democracy: Socialist Register 2018*. London: Merlin Press, 188–201.

Cuesta, A. and Solanas, P. (2017). L'Ajuntament promou una Airbnb i una Uber nascudes a Barcelona. *Diari Ara*, 10 July 2017. Available: www.ara.cat/economia/LAjuntament-Airbnb-Uber-nascudes-Barcelona_0_1829817019.html [Last accessed 20 October 2017].

Decidim Barcelona. (2017). *Decidim Barcelona website*. [Online]. Available: www.decidim.barcelona/ [Last accessed 20 October 2017].

El Periódico. (2015). Barcelona adjudica City OS el sistema operativo de la ciudad. *El Periódico*, 26 April. Available: www.elperiodico.com/es/tecnologia/20150426/barcelona-adjudica-city-os-el-sistema-operativo-de-ciudad-5691473 [Last accessed 20 October 2017].

Fab City. (2017). Fab City website. [Online]. Available: http://fab.city/#fabcity [Last accessed 20 October 2017].

Gabrys, J. (2014). Programming environments: environmentality and citizen sensing in the smart city. *Environment and Planning D: Society and Space 32*: 30–48.

Galdon, G. (2017). Technological sovereignty? Democracy, data and governance in the digital era. *CCBBLab, Citizenship, Internet and Democracy*. [Online]. Available: http://lab.cccb.org/en/technological-sovereignty-democracy-data-and-governance-in-the-digital-era/ [Last accessed 20 October 2017].

Hollands, R.G. (2015). Critical interventions into the corporate smart city. *Cambridge Journal of Regions, Economy and Society*, 8:61–77.

McLaren, D. and Agyeman, J. (2015). *Sharing Cities: A Case for Truly Smart and Sustainable Cities*. Cambridge, MA: MIT Press.

March, H. (2016). The smart city and other ICT-led techno imaginaries: any room for dialogue with degrowth? *Journal of Cleaner Production*, https://doi.org/10.1016/j.jclepro.2016.09.154.

March, H. and Ribera-Fumaz, R. (2016). Smart contradictions: the politics of making Barcelona a self-sufficient city. *European Urban and Regional Studies 23*: 816–830.

Mayors Challenge. (2017). Vincles BCN: collaborative care networks for better aging. [Online]. Available: http://mayorschallenge.bloomberg.org/ideas/collaborative-care-networks-for-better-aging/ [Last accessed 15 December 2017].

Medina, E. (2015). The Cybersyn revolution. *Jacobin*, 17. [Online]. Available: www.jacobinmag.com/2015/04/allende-chile-beer-medina-cybersyn [Last accessed 16 February 2018].

Mobile World Capital. (2016). L'escletxa digital a la ciutat de Barcelona. [Online] Available: http://mobileworldcapital.com/wp-content/uploads/2016/05/escletxa-digital_cat.pdf [Last accessed 20 October 2017].

Morozov, E. (2013). *To Save Everything, Click Here: The Folly of Technological Solutionism*. New York: Public Affairs.

16

SMART INNOVATION AT THE MARGINS

Learning from Cape Town and Kibera

Nancy Odendaal

Introduction

The words 'you have the presence of someone' stay with me when I consider the interface between livelihoods and technology. A young woman I interviewed in 2008 in Durban, South Africa, on how she uses her mobile phone to survive as a foreigner from the then war-torn Democratic Republic of Congo, described how important text messaging was when staying in touch with family. Her friend next to her claimed that losing her phone was like losing a limb, especially when it enabled information on what urban sites to avoid during the violence against foreigners in the city at the time. Mobile telephony enabled safety.

Walk through any African city and you will see phone services for sale on makeshift tables and trolleys that are mobile enough to be shifted to convenient market spaces and bus terminals. Passers-by can do their weekly fruit and vegetable shopping, purchase airtime, have a chat and make a quick call. More recently, with East African innovations like M-Pesa, electronic banking and money transfer using mobile phones have become common in Kenya for example. African urbanism has an uncanny tendency to be mobile, fleeting and opportunistic. That observation extends to most marginalised spaces in cities worldwide: the need to connect and communicate on the move is an integral part of survival in insecure spaces.

The emerging picture of digital urbanity on the move is not unfamiliar but quite far removed from the mainstream smart city image. As a discourse, the smart city promises a package of solutions to seemingly intractable problems resulting from climate change and increasing urban insecurity in a deterministic way (White 2016), but places space at the intersection of policy-driven urban techno-visions and bottom-up solutions (Picon 2015). Hollands (2015) sees these two scales of interpretation as part of a disjuncture between the corporate

language of technical 'quick fixes' and endogenous responses to local issues. Advertisements for mobile phone services sell the idea of ubiquity – whether in Rwanda's highlands or on Lagos's busy streets; but embedded appropriations of technology are informed by livelihoods and context (Odendaal 2014). Essentially the smart city at the margins is dominated by mobile phone access. Private individuals use flexible payment options provided through private service providers to access mobile telephony and the Internet, without onerous contractual obligations (difficult if you do not have formal employment). Community services are enabled through less formal to highly informal provision in phone shops and kiosks. New spaces have evolved as phone shops become meeting places and pavement fixtures. Other services and goods accompany these services, such as Internet access, call time and data sales. In many cases, they have become nodal meeting points.

The flexibility afforded by mobile telephony enables technology appropriation that translates into new spatialities. It starts with the body. The line between the corporeal and public is blurred; a private conversation links the individual to another space while he/she sits on a small stool in the middle of a physical place designated in front of a shopping centre. It extends to community – albeit transient community – as pedestrians go about their business, stopping to make a phone call at a table with an umbrella located on a paved space, and then extending the chat to an interchange with the vendor and fellow callers. The space can become private again as booths in shops allow for separation from the bustle of city life.

Bottom-up innovation, necessitated by marginal livelihoods, is not immediately obvious but can be profound. More recently, innovations with spatial implications have surfaced in the broader digital realm also. So too a reframing of the notion of data and its employ; or, as Townsend (2013: 191) argues, 'to truly understand what prevents poor people from making use of technology we will need to develop multidimensional assessments of technology and information literacy'. This chapter considers some of these dimensions, arguing that focusing on mainstream smart city interpretations is limited in terms of what it teaches us about contemporary urbanity. We forego an opportunity to learn from local appropriations and innovations, and this learning is valuable. Engagement with the everyday uses of technology enables deeper interrogation of context and the dynamics of place. Here the practices of organisations that seek to empower informal settlement residents with data practices are used as a means to interrogate what is a common phenomenon in cities of the global South: the urban informal.

A number of trends in contemporary discussions on smart cities in the media and the literature are discernible. The first is a broadening that seeks an engagement with the social and cultural coordinates of urbanity. In many cases, this is marketing language used to augment corporate agendas, a visual language that emphasises global connection. Whether digital technologies enable inclusion and empowerment would be an important question in this regard. The second is an engagement with ecological sustainability and, specifically, climate change,

reinforcing the relationship between livelihoods, disaster management and digital monitoring. Threats to livelihoods have in many cases necessitated social mobilisation, often using communication technologies.

There is growing emphasis on the capacity of online data, in particular 'big data', to enable real-time decision-making and evidence-based policy. The growth in use of dashboards and models to represent urban conditions at particular points in time is a common feature of contemporary urban governance. The era of big data has enabled a more articulate technological foundation for evidence-based planning and policymaking. The use of benchmarking to monitor progress and enable informed decision-making is a logical extension of neoliberal governance. Dashboards, indicators and benchmarking are employed by cities to report on performance and give a health check snapshot (Kitchin *et al.* 2015), and fit well with notions of accountability, transparency and efficiency.

When considering place-based innovation and ICT, a relevant feature of the smart city visual narrative is an eerie decontextualisation that leads to a placeless representation. There is a worrying tendency towards formulation of an ideal smart city (glass towers and superhighways are part of the visual language) that seemingly applies everywhere. The depiction of twenty-first century utopias is not new, but the stark contrasts between the physical qualities of cities in the global South and this visual language is staggering. If the smart city is indicative of a new form of urbanism, one that is data-driven and essentially accessible to a broad populace, it begs the question how, in the urban areas of the global South, can this translate into transformative practice that is cognisant of local place?

This may appear to be in stark contrast to the experimentation narrative that informs many urban projects under the smart banner. The notion of experimentation implies embedded local innovation. However, when urban experiments are uncoordinated or lacking an overall urban vision, the 'focus is on the single rather than on the whole' (Cugurullo 2018: 86). The result is fragmentation rather than sustainability as many of these initiatives promise. Frequently aligned with revitalisation efforts of neoliberal city regimes, smart initiatives often utilise security and surveillance technologies in such designated zones, contributing to a segregated landscape (Wiig 2018).

Two of the cases in this chapter focus on Cape Town, in South Africa, a coastal city of almost 4 million residents, and containing some of the most expensive real estate in the world alongside urban poverty. Both Nairobi, in Kenya, and Cape Town reflect geographies of stubborn inequality and growing spatial fragmentation. The aim here is to explore ways through which these structural deficiencies are countered by bottom-up action. My position is one that rejects the objectification of technology as an outside force that, by itself, liberates or constrains. The city is taken as representing the outcome of continuous socio-technical processes that manifest spatially as the relationships between the material (technology, infrastructure, natural systems) and human agency (social action, planning and so on) evolve. This represents a 'dance' between technological innovation and appropriation through social action and livelihood imperatives within the highly

unequal urban spaces of the global South. This is an opportunity for urban interventions to be relevant and effective.

I explore three themes with associated examples that provide clues as to what this relationship could be. The first refers to grassroots efforts to render the margins more visible through online mapping and geo-referenced data capture. The second dimension explores how this information can empower and enable local communities to engage powerful stakeholders, with the third exploring the extent to which social activism that employs social media can shift public debate and policy. The spectrum of innovations is intended to show variation in terms of spatial context and the causes for change. The chapter commences with an overview of debates on technology in developing settings.

Understanding the relationship between technology appropriation and livelihoods

In development discourses, the Information and Communication Technology for Development (ICT4D) paradigm has systematically explored the relationship between governance (and by extension planning), social action and social development. Popular as a paradigm that informed technology development initiatives by international development agencies, the premise is that ICT enables information transfer and communication critical to economic production and distribution. A more critical examination of the ICT4D idea reveals its modernisation roots: the notion that technology enables a progression away from more traditional forms of communication and media towards more sophisticated and complex structures. The linear path assumed for development, the global agenda driven from the North and the hegemonic image of the technologically advanced city as the most desirable, typifies the modernisation paradigm (Schech 2002). It also speaks to a temporal linearity that is inevitable, where developing countries cannot afford to be 'left behind' (Graham 2008). ICT4D is informed by the ideological and policy objectives of development agencies and governments. There is a more recent tacit recognition of the need for a more contextually appropriate approach. Moving from a supply-driven model to more demand-centred approaches frames the poor as potential innovators and producers, not just passive consumers (Heeks 2008).

Factors that influence the digital divide include language, poverty indicators and perceptions of technology (Keniston and Kumar 2004). Demographic and socio-economic factors influence the choice and use of ICTs as well as how they are used in conjunction with other resources (Crang and Graham 2007, Selwyn and Facer 2007). Availability of technology does not guarantee use. Several African studies quoted in Obijiofor (2009) show a predominance of Internet use for email while web surfing remains low due to cost restrictions. Social attitudes to computers are associated with social hierarchy and status. These perceptions are closely tied to other socio-economic indicators such as education, income and age (Crang and Graham 2007).

Contextual factors, cultural features and structural parameters clearly impact on digital access, but they are also measures of appropriation. Social acquaintance with technology is ongoing and imbued with values and norms. We still need to understand how different technologies take on different social meanings in particular cultural contexts, argued Thrift (1996). The choice of the mobile phone as an extension of personal style is a contemporary example. Among the youth of marginalised communities in Cape Town, for example, it is a personalised and symbolic connection to the world, a means of reinforcing identity through technology appropriation while remaining connected to selected global cultural icons (Hammett 2009). Work on mobile phones shows that appropriation is linked to social networks, cultural beliefs and socio-economic contexts. New spatial modalities of ICT use in developing countries mitigate cost restrictions: container telecentres and informal phone shops on pavements ('umbrella ladies') are examples (Donner 2007). The ways in which innovations are mediated by culture and social norms are illustrated by the notion of 'beeping' (making missed calls), as documented in Donner's (2005, 2008) ongoing work on mobile phone use in developing countries. Not only are missed calls intentional, they also represent an implicit communication code. They are indicative of particular social network arrangements. Beeping 'joins a repertoire of voiceless conversations, text messages, image-exchanging, emailing, and even purely visual "display"' (Donner 2008: 17).

Ubiquitous computing means that the fixtures and utilities of contemporary life are 'augmented with computational capacities' (Dourish and Bell 2007: 414). The boundaries between private and public have become less certain. As technologies become increasingly mobile and pervasive, opportunities for surveillance increase. As we purchase goods at supermarkets (using credit cards), stop at traffic intersections (through traffic webcams), acquire books and music online and enter buildings (through electronic entry points) and bank with our mobile phones, we leave 'bits' of ourselves: 'These technologies allow spaces to both remember and anticipate our lives' (Crang and Graham 2007: 789).

This has implications for the experience of space and movement between places. Ambient computing anticipates a spatial dimension where the 'cyber' and 'real' co-produce an experiential dimension typified by seamless flows of information and interaction. A hybrid space is possible at the interface between infrastructure and human experience (Dourish and Bell 2007). While traditional networked infrastructures are tangible and fixed, ubiquitous computing is pervasive, mobile and increasingly footloose due to wireless capacity. Not only is technology appropriation highly contextual therefore; it is also able to be personal and viscerally embedded.

Big data and the politics of 'dissensus'

As information technology and telecommunications have evolved to enable data storage and online processing and representation, dashboards, indicators and

benchmarking are employed by cities to report on performance and to provide health check snapshots (Kitchin *et al.* 2015). The era of big data has enabled a more articulate technological foundation for evidence-based planning and policymaking. How does this interface with livelihoods at the margins relate to the 'masking' work that numbers do in the name of transparent governance? Indicators and associated benchmarks signal consensus on what counts and what does not, and on what could be considered indicative of progress. Signals of 'dissensus' are perhaps more adept at capturing what is *not* working through insight into conflict and disagreement (Kaika 2017). By focusing on what is lacking, the spotlight can shine on the dysfunction of urban systems and governance, allowing the cracks to emerge.

This could hardly be a political ambition for state decision makers, and hence oppositional data-driven initiatives tend to evolve in response to crises, dramatic policy interventions or events. The Arab Spring illustrates the performative dimensions of ICT for example. In Egypt and Tunisia, social media played an important role in influencing key debates *before* both uprisings, and assisted in spreading democratic messages beyond the countries' borders during and after demonstrations (Howard *et al.* 2011). ICT was part of broader heterogeneous networks that included television and radio and built upon existing social and kinship capital (Allagui and Kuebler 2011). The power of the media no longer vests in the state alone, enabling distributed voices and visual content that potentially challenge official discourses. These multilayered, technology-mediated exchanges are subject to context, differentiated access and existing social networks.

Moments of crisis that gel oppositional forces can also activate what South African anthropologist Steve Robins (2014a) calls 'slow activism'. In examining the work of social movements that have challenged the City of Cape Town's claims to pro-poor service delivery, he explores the combinational use of new media together with social network connections that date back to the Apartheid struggle. The work with these organisations enacts an ongoing oppositional voice, keeping critical social justice issues in the public imagination. Voicing dissent through repackaging of data and documenting the 'everyday' is an important strategy in challenging the state consensus. Enabling such work to become part of the public discourse speaks to an epistemological shift that values the experiential dimensions of the urban: contingency, emergence and embodied testimonies that counter aggregated official narratives.

The objectification of urban life through enumeration and quantification plays an important role in targeting policy and focusing planning efforts. Increasingly, civil society organisations are using data to challenge policy discourses (Mitchell and Odendaal 2015), to make the 'invisible' (the informal, the marginalised) 'visible' through documentation practices (Hagen 2010) by using census practices for self-identification and visible empowerment (Baptist and Bolnick 2012) and motivating social action across geographies (Kellogg 2016). Social media enables connection and dissemination, often underpinning these dissension practices that are 'living indicators' (Kaika 2017) of urban life at the margins: the

real smart solutions and real social innovation embedded in dissension practices. They are performative indicators that reflect what is missing, rather than what is present. Turning numbers on their heads is one strategy of enabling debate on the essentials of urban life. There is an important emancipatory quality to the work cited above; the power of numbers can aid the status quo or represent constructive alternatives.

However, the question remains as to whether this counts as knowledge production. To make the shift from data to knowledge generation is more than who 'makes the numbers dance' but a shifting in discourse and public imagination. The networking and connective power of media avails opportunities for trans-local activism and knowledge exchange: what might be termed a knowledge-intensive urbanism as opposed to technology-driven, corporate smart city initiatives (McFarlane and Söderström 2017). Here the *act* of data sampling and collection, processing and representation is as significant as the means towards which it is used: it is an act of appropriation.

Creating an alternative discourse to data-mediated policy perspectives and official narratives requires ongoing social action, however, in order to shift narratives and focus attention on systemic issues. Dissensus provides one such window onto systemic inequality (Kaika 2017). Understanding the scaffoldings of such dissensus, the means through which it is communicated and represented, provides insight into strategies of knowledge production that takes us to a more accurate representation of urban life. It necessitates technology appropriation, but it also implies an aspirational shifting of policy discourses. Furthermore, I would argue, it entails conveying an experiential dimension to sharing that seeks to evoke an emotional response. Unlike 'cold, hard facts', using strategies such as spectacle or dramatic portrayals of 'everyday' suffering taps into the public imagination. Robins (2014b) documents what has become known as the 'poo protests' in Cape Town, where (among other public actions), in June 2013, activists emptied human waste onto the concourse of Cape Town International Airport to draw attention to the adverse sanitation conditions in informal settlements on the city's fringes. Here information was transmitted through visual media, hashtagging in order to link events in real time and attract the attention of the mainstream media. The power of the spectacle lies in elevating issues to policy discourses. 'Prior to the Toilet Wars, the shocking sanitation conditions in informal settlements seldom made it into the mainstream media or national political discourse' (Robins 2014b: 480).

There is also the 'slow burn' that is necessary: the 'bricolage' that connects people and technology to exert pressure on the state for change. Importantly, the work that enables knowledge networks sustains an ongoing discourse alternative to that which the state represents. That work, the 'slow activism' Robins refers to, builds on alliances stretched over time and across geographic boundaries, as well as political economies. In South Africa, relationships forged during anti-Apartheid activism now manifest in new forms. Much of this is enabled through a free press and a context that allows for civil society activism. Where

such organising is not possible without repercussions, the ability of digital media to enable network relations across geographies is meaningful. Samuel Kellogg's work on the Cuban blog *Voces Cubanas* reflects on the use of narrative technologies in 'enabling nodes around which relationships form and alliances are built' while 'within networks, narrative technologies allow new relationships with other actors' (Kellogg 2016: 44).

The work that technology does, in concert with human agency, forms part of alliance building and network making. Not only, in the Cuban example explored by Kellogg as well as in work by Robins on South Africa (2014c), does it challenge the state's control of knowledge, but it is also productive of 'alternative discursive spaces and subversive narratives' (Kellogg 2016: 23). It is performative and experiential. The power of the spectacle is that it evokes an emotional response that lingers in the public imagination and carries political currency. The 'slow burn' of ongoing networking and mobilisation is that it perpetually builds alternative narratives. Using a socio-technical lens on his work in Cuba, Kellogg (2016: 33) writes of the heterogeneous range of actors that contributes to networks becoming 'cyborg entities, homeostatic assemblages of heterogeneous techno-social elements with porous borders and radical political motivations'.

The 'cyborg' motif, as an entity that integrates and transcends the visceral boundaries of the body shaped by biology, provides a useful frame for understanding data-mediated activism. The intimate exchange among algorithm, human and urban space entails a reassembling of the individual as containing elements of human and machine, nature and technology (Asenbaum 2017). In thinking through the elements of a technology-mediated activism, the usual 'binaries' of nature versus technology, identity versus anonymity and public/private are reconfigured to allow for the reason–emotion divide to blur (ibid.). 'As the private pervades public spaces, the modern separation of *rationality*, objectivity and cool-headed politics, on one hand, and *emotion*, passion and affect, on the other, is reconfigured' (ibid.: 5, emphasis in original). The use of spectacle is therefore not only a media strategy to shine a dramatic light on injustice, but also 'choreographies of assembly' that become trending places, which together with devices such as hash tags become magnetic, heterogeneous assemblages (Gerbaudo 2012: 12). The emotional tension created through social media acts as a different kind of aggregator from the numeral ilk. It constructs common symbols and momentary unified identities from diverse participants, or what the activist Zackie Achmat, in a portrayal of the Social Justice Coalition in Cape Town, refers to as a 'moral consensus' (2014a). Thus, the experiential dimension is key to not only mobilising consensus and assembly, but also to creating a data of dissension that combines the 'slow burn' of monitoring, reporting and information processing with emotionally charged representations of suffering. In appropriating technology, emergent qualities of technology are enrolled as time and situation demands.

The following section examines examples of technology appropriation in African urban spaces. The intention is to explore three themes on the interface between livelihoods, data and technology appropriation.

Exploring technology appropriation at the margins: three themes

Making the invisible visible

At the 2014 World Urban Forum in Medellín, Colombia, Shack/Slum Dwellers International (SDI) convened a session entitled 'Smart cities from the bottom up'. Together with the Sante Fé Institute, the organisation is working on uncovering the 'science of slums' (Brelsford *et al.* 2015) by systematically mapping the spatial logics that underpin informal neighbourhoods. The project is technically interesting and will no doubt make an important contribution to insights that can assist in appropriate planning intervention. The Institute uses geographic information systems (GIS) and other technical tools to analyse the logics of grassroots spatial practices, and how various spatial interventions can assist in improved access. This is part of the smart story – using technology to analyse and test various intervention scenarios – and can no doubt add enormous value to planning processes. The second part of this initiative relates to what it uncovers, which is of interest to understanding smart practices at a grassroots level. Re-blocking practices (where slum dwellers reorganise their own settlements spatially to enable utility provision) and self-enumeration enable control and generation of spatial and other data by slum dwellers themselves, empowering them with the information necessary to engage the state and other service providers.

The acts of documentation and systematic mapping are processes of making visible the invisible (slums are seldom mapped on typical topo-cadastral maps, and are generally seen as 'temporary' by authorities). This is the strapline used by the Map Kibera Trust in describing their work in this famous Kenyan settlement in Nairobi. In addition to the invisibility of slums on conventional maps and in planning documents, mapping is often outdated because land uses, for example, change on an ongoing basis and circulation routes adjust to suit local conditions. Technically it therefore makes sense to enable local residents to map and update local conditions; but the actual process of mapping is an act of power. Claiming information through technical means builds capacity and intellectual property. In a way, it could be interpreted as a means through which members of marginalised groups construct their own critical cartographies.

The Map Kibera project, led by Erica Hagen and Mikel Maron, initially trained carefully selected and representative residents in using a range of technologies to map and collect stories about local places in Kibera, resulting in dense maps capturing points of interest categorised and selected by participants (Hagen 2010). Java editing software was used to map and share this data through OpenStreetMap (2015), a community-driven 'Wikipedia of maps' that captures local knowledge about places. The project has evolved into three spinoffs that illustrate the generative potential of such work. With support from funding partners, more detailed mapping on prioritised thematic areas has been done. This includes ongoing media development using tools from Ushahidi (an East African

non-profit company that develops open source software) that enable mapping through use of mobile phones, online video news reporting and SMS monitoring of local issues (Hagen 2010). This learning is now used in two other slums in Nairobi, and the website has evolved into a training platform where information and techniques are shared (Map Kibera 2015).

Smart-enabled co-production

The term 'e-governance' is often used in relation to smart city discourse, with the promotion of transparency and more integrated decision-making seen as important outcomes (Tironi and Valderrama this volume). The reciprocal relationship between content provided and consumer is assumed. It is worth considering whether this can be truly empowering in relations between the state and communities. The predominance of social media signifies a shift to a more decentralised form of e-governance where citizens could contribute content. But it also reveals a new form of oppositional politics, as illustrated by a contemporary case in Cape Town.

The Social Justice Coalition Cape Town (SJC-CT) is a civil society organisation based in the Khayelitsha, engaged in monitoring communal sanitation in the area. The lack of sufficient maintenance, the limited numbers of facilities and the high number of attacks on women at night in communal sanitation areas, together with the fact that many of the toilets provided do not have doors, have caused great and justified embarrassment to the city administration. The SJC uses digital tools to monitor and report on such issues. It does this not only through its onsite presence in Khayelitsha and other locations, but also through social media.

The Social Justice Coalition website (SJC 2018) provides a range of entry points for public support and involvement. Its campaigns engage local government and issues of safety and security. The local government campaign in particular provides a dashboard and access to social audits, reports, on sanitation. The overall aim is to increase monitoring of public spending and accountability. Each page contains the usual Twitter, Facebook and other social media sharing facilities.

The online dissemination of surveys and reports, as well as links to media from activist organisations, as a counter to municipal evaluations, has proven to be one of the central tasks of the organisation. Using this information to motivate calls for more rigorous upkeep of communal toilets has resulted in revising service level agreements between the City of Cape Town (CoCT) and contractors (Mitchell and Odendaal 2015). The fact that these audits on sanitation services are updated monthly is important for ongoing operations.

Essentially, the SJC's social media and online campaigns do represent a 'smart city from the bottom up', but mainly as a challenge to city discourses and, more importantly, as a monitoring strategy. These are important functions that have practical impacts, albeit with limited mobilisation effects due to seemingly mundane but important constraints that speak to larger digital divide issues. As part

of the organisation's slow activism, it is part of broader governance that may lack the drama of the 'poo protests' but nevertheless represents an alternative to the corporate smart city discourse.

The performative work of smart activism

'Cape Town is the most segregated city in the world' is a refrain often heard when considering the city's status as an international tourist destination in the midst of extreme urban poverty. This is a tagline well employed by 'Reclaim the City' (RtC), a campaign launched in February 2016 with the explicit purpose of confronting the City of Cape Town administration on policies that entrench spatial apartheid (RtC 2017). The campaign emerged from a proposed sale in late 2015 of publicly owned land: the site of a former school called Tafelberg in the Atlantic seaboard suburb of Sea Point – a high-density, middle/high-income, mixed-use neighbourhood approximately 3 km from the central business district (CBD).

The public advertisement sparked the mobilisation of domestic workers and low-income earners in Sea Point to protest against this, arguing that the city should follow through on its stated policy intentions to deliver social housing on well-located, publicly owned land in the city. Local civil rights non-governmental organisation (NGO) Ndifuna Ukwazi (2017) supports the campaign logistically and organisationally. The RtC campaign has subsequently evolved to include two campaigns. The first is continued pressure on the municipality to deliver affordable housing on inner-city state land, beyond the Sea Point site. The second follows the eviction of tenant families in a gentrifying neighbourhood called Woodstock, also near the CBD, demanding from the CoCT that temporary accommodation be provided in the area (RtC 2017).

The campaign has oscillated between a steady process of documentation and legal work and digitally augmented public events and interventions. The employment of the 'spectacle' in enabling emotional connection through personal sharing is a significant element of the campaign's public profile, and essentially defines its origins. The campaign's tagline, 'Land for People not Profit', soon became a familiar feature in public spaces in Sea Point following the first protest on 1 March 2016. Ongoing protests at the Tafelberg site were augmented with social media. A significant feature of this is the personalisation of key actors implicated in the sale. As is the case with social media, the discourse becomes uncomfortably personal at times, yet succeeds in creating the storylines necessary to convey household struggles against gentrification and the follies of property capital.

The importance of *place* is central to the activities of RtC, due to the spatial focus of the campaign itself as well as the stories that relate so specifically to home and identity. Media and social online platforms use photo essays and personal stories to shine a light on household struggles, while the networking capacity of social media is used to thematically connect disparate accounts into an overall narrative that challenges the market logics of property speculation. The networking capacity of new media is also employed in the creation of a hashtag

portal – an online 'place' where diverse voices can be collated around particular moments or events in the campaign.

The sale of the Tafelberg site was suspended as a result of the public pressure facilitated by RtC. A call for architectural proposals has subsequently deepened the technical viability of social housing for the site, with the ultimate proposal currently being negotiated. The systemic issues that led to the creation of the campaign in the first place still needed to be addressed, however; and what was initially a protest against the sale of the one site became an ongoing campaign for the reallocation of centrally located public land for social housing. Here, RtC activists took the experiential dimension of the campaign further with the subsequent 'symbolic occupation' of two vacant public buildings in prominent locations within the city (Stop the Sale 2017). The choice of sites is strategic, but also indicative of the value of focusing light on the spatial paradoxes that have come to define Cape Town. This is evident in the choice of infographics and mapping shared on social media, the visual depiction of glamour of the city in contradiction to the hardships of those on the edges, and the personal stories.

In addition to the spikes in activity that identified the milestones as well as entry points of connection to the campaign, the various actors engaged an ongoing mobilisation process that formed a 'slow burn' of diverse activities. The most significant, politically, was the legal campaign to stop the sale of the Tafelberg site. Later, there was an online and offline campaign to object to zoning proposals for the Somerset Precinct near the Waterfront (and containing the property that was occupied by activists) to allow for more social housing. The latter is indicative of the contest of numbers that played itself out as occupancy ratios and floor space allocations are debated. Selective representation of data is evident in both camps. However, RtC is as astute as the CoCT in ensuring that the numbers 'dance' in ways that support their arguments.

There have been substantive results. Perhaps the most momentous event in public policy discourse has been the CoCT announcing its plans for inner-city housing in July 2017. The plan designates a number of well-located sites within the city core for social housing. This is not the first time such intentions have been vocalised, but the latest plan contains sufficient delivery detail to convey commitment from the CoCT (Maragele 2017). An indirectly related initiative is a commitment from the mayor that the city's transportation plan will include free bus trips for the jobless – a meaningful initiative given the proportion of household income spent on travel by those living in informal settlements on the city's edges (Pather 2017).

Conclusion

Whilst the RtC campaign cannot be portrayed as a model for smart city appropriation (I would argue no such thing exists) and a deeper interrogation will no doubt reveal some inconsistencies and inaccuracies, it nevertheless represents an impressive intervention that has achieved a significant shift in public awareness

in its short time span. The scaffolding of its organisational structure and its activism reveals an array of online and offline strategies that range from populist representation of information to a technically astute interrogation of commonplace 'truths' regarding property markets and the space economy of the city. A significant part of the campaign is the foregrounding of the 'everyday' experiences of city dwellers in the face of gentrification and, as some would argue, state inaction. The enrolment of emotional, technical and political 'stories' in the campaign's narrative, together with the ongoing labour of legal, media and policy engagement, represents a fascinating entry point into what cyborg activism may look like and what its potential is for affecting change.

The stories of the everyday are easy to overlook in the shadow of the glossy smart city. These examples speak to a particular circumstance that requires oppositional practice. The efforts of organisations such as Shack/Slum Dwellers International and Map Kibera include strategies that put the informal and the urban poor on the map. That in itself is meaningful; but the work that data does, and that the act of collecting and processing information enables, speaks to empowering practice in this context. It could speak to less oppositional practice elsewhere as a means through which communities engage their local environments and engage local context and place. In the case of the SJC it opens up opportunities for co-productive governance and substantive shifts in how urban poverty is represented and packaged. These are not just acts of rebellion and advocacy; they are moments of material appropriation. In many cases, this is often the work that enables changed practices and political awareness that could lead to structural change.

References

Allagui, I. and Kuebler, J. (2011). The Arab Spring and the role of ICTs: editorial introduction. *International Journal of Communication 5*: 1435–1442.

Asenbaum, H. (2017). Cyborg activism: exploring the reconfigurations of democratic subjectivity in Anonymous. *New Media & Society* 1–21.

Baptist, C. and Bolnick, J. (2012). Participatory enumerations, in situ upgrading and mega events: the 2009 survey in Joe Slovo, Cape Town. *Environment and Urbanization 24*: 59–66.

Brelsford, C., Martin, T. and Bettencourt, L.M. (2015). Optimal reblocking as a practical tool for neighborhood development. *Environment and Planning B: Urban Analytics and City Science*. https://doi.org/10.1177%2F2399808317712715.

Cugurullo, F. (2018). Exposing smart cities and eco-cities: Frankenstein urbanism and the sustainability challenges of the experimental city. *Environment and Planning A: Economy and Space 50*: 73–92.

Crang, M. and Graham, S. (2007). Sentient cities: ambient intelligence and the politics of urban space. *Information, Communication & Society 10*: 789–817.

Donner, J. (2005). User-led innovations in mobile use in sub-Saharan Africa. *Vodafone Receiver 14*. [Online]. Available: www.kiwanja.net/database/document/report_innovations_africa.pdf. [Last accessed 1 June 2018].

Donner, J. (2008). Research approaches to mobile use in the developing world: a review of the literature. *Information Society 24*: 140–159.

Donner, J. (2007). The rules of beeping: exchanging messages via intentional 'missed calls' on mobile phones. *Journal of Computer-Mediated Communication 13*: 1–22.

Dourish, P. and Bell, G. (2007). The infrastructure of experience and the experience of infrastructure: meaning and structure in everyday encounters with space. *Environment and Planning B: Planning and Design 34*: 414–430.

Gerbaudo, P. (2012). *Tweets and the Streets: Social Media and Contemporary Activism*. London: Pluto Press.

Graham, M. (2008). Warped geographies of development: the Internet and theories of economic development. *Geography Compass 2/3*: 771–789.

Hagen, N. (2010). Putting Nairobi slums on the map. *Development Outreach* July 2010: 41–43.

Hammett, D. (2009). Local beats to global rhythms: coloured student identity and negotiations of global cultural imports in Cape Town, South Africa. *Social & Cultural Geography 10*: 403–419.

Heeks, R. (2008). ICT4D 2.0: The next phase of applying ICT for international development. *Computer 41*: 6.

Hollands, R.G. (2015). Critical interventions into the corporate smart city. *Cambridge Journal of Regions, Economy and Society 8*: 61–77.

Howard, P.N., Duffy, A., Freelon, D., Hussain, M. and Mari, W. (2011). What was the role of social media during the Arab Spring? Project on Information Technology and Political Islam, 1 September. [Online]. Available: www.pitpi.org [Last accessed 1 February 2015].

Kaika, M. (2017). 'Don't call me resilient again!' The New Urban Agenda as immunology … or … what happens when communities refuse to be vaccinated with 'smart cities' and indicators. *Environment and Urbanization 29:* 89–102.

Kellogg, S. (2016). Digitizing dissent: cyborg politics and fluid networks in contemporary Cuban activism. *Teknokultura 13*: 19–53.

Keniston, K. and Kumar, D. (eds) (2004). *IT Experience in India: Bridging the Digital Divide*. New Delhi: Sage.

Kitchin, R., Lauriault, T.P. and McArdle, G. (2015). Knowing and governing cities through urban indicators, city benchmarking and real-time dashboards. *Regional Studies, Regional Science 2*: 6–28.

Map Kibera. (2015). *Map Kibera website*. [Online]. Available: http://mapkibera.org/about/ [Last accessed 3 November 2015].

Maragele, B. (2017). City announces u-turn on social housing. *Biz Community*, 5 August 2017. [Online]. Available: www.bizommunity.com [Last accessed 8 August 2017].

McFarlane, C. and Söderström, O. (2017). On alternative smart cities: from a technology-intensive to a knowledge-intensive smart urbanism. *City 21*: 312–328.

Mitchell, H., and Odendaal, N. (2015). From the fringes: South Africa's smart township citizens. In M. Foth., M. Brynskov and T. Ojala (eds), *Citizen's Right to the Digital City*. Singapore: Springer, 137–159.

Ndifuna Ukwazi. (2017). Ndifuna Ukwazi website. [Online]. Available: http://nu.org.za/law-centre [Last accessed 7 June 2018].

Obijiofor, L. (2009). Mapping theoretical and practical issues in the relationship between ICTs and Africa's socioeconomic development. *Telematics and Informatics 26*: 32–43.

Odendaal, N. (2014). Space matters: the relational power of mobile technologies. *urbe: Revista Brasileira de Gestão Urbana 6*: 31–45.

OpenStreetMap. (2015). *OpenStreetMap website*. [Online]. Available: www.openstreetmap.org [Last accessed 1 June 2018].

Pather, R. (2017). Jobless Capetonians to get free MyCiti bus trips, says De Lille. *Mail and Guardian*, 30 May. [Online]. Available: www.mg.co.za [Last accessed 8 August 2017].

Picon, A. (2015). *Smart Cities: A Spatialised Intelligence*. Indianapolis: Wiley.

Robins, S. (2014a). Slow activism in fast times: reflections on the politics of media spectacles after Apartheid. *Journal of Southern African Studies 40*: 91–110.

Robins, S. (2014b). The 2011 toilet wars in South Africa: justice and transition between the exceptional and the everyday after apartheid. *Development and Change 45*: 479–501.

Robins, S. (2014c). Data driven activism empowering. *Cape Times*, 15 December 2014. [Online]. Available: www.iol.co.za/capetimes [Last accessed 10 January 2015].

RtC (Reclaim the City). (2017). *Reclaim the City campaign website*. [Online]. Available: http://reclaimthecity.org.za [Last accessed 9 August 2017].

Schech, S. (2002). Wired for change: the links between ICTs and development discourses. *Journal of International Development 14*: 13–23.

Selwyn, N. and Facer, K. (2007). Beyond the digital divide: rethinking digital inclusion for the 21st century. *FutureLab Innovation in Education website*. [Online]. Available: www.futurelab.org.uk/resources/publications_reports_articles/opening_education_reports. [Last accessed 22 August 2016].

SJC. (2018). *Social Justice Coalition website*. [Online]. Available: www.sjc.org.za [Last accessed 7 June 2018].

#Stop the Sale (2017). Why #Stopthesale of Tafelberg? [Online]. Available: https://stopthesale.net [Last accessed 9 August 2017].

Thrift, N. (1996). New urban eras and old technological fears: reconfiguring the goodwill of electronic things. *Urban Studies 33*: 1463–1493.

Townsend, A.M. (2013). *Smart cities: Big Data, Civic Hackers, and the Quest for a New Utopia*. New York: Norton.

White, J.M. (2016). Anticipatory logics of the smart city's global imaginary. *Urban Geography 37*: 572–589.

Wiig, A. (2018). Secure the city, revitalize the zone: smart urbanization in Camden, New Jersey. *Environment and Planning C: Politics and Space 36*: 403–422.

17

INNOVATING FOR AN AGEING SOCIETY

Insights from two Japanese smart cities

Gregory Trencher and Andrew Karvonen

Introduction

Smart cities are enthusiastically promoted around the world by industry and governments alike as a desirable means to achieve urban sustainability. However, increasing numbers of scholars have critiqued the smart city paradigm for forwarding private sector interests while failing to tackle issues related to resident lifestyles and wellbeing (Viitanen and Kingston 2014, Glasmeier and Christopherson 2015, Hollands 2015, Paskaleva *et al.* 2017, Martin *et al.* 2018). Other scholars have identified a diverse range of social issues that could be targeted for smart city innovation – including health, population ageing, crime, education, social cohesion, poverty reduction and so on (Goodspeed 2015, Stollmann *et al.* 2016, Colding and Barthel 2017). Calls for a 'Smart City 2.0' (Baccarne *et al.* 2014, Saunders and Baeck 2015, Trencher forthcoming) are an attempt to address these issues through citizen participation and empowerment (Joss *et al.* 2017).

The Smart City 2.0 model places the needs of residents first, promotes participation and citizen empowerment and 'stresses technology as a tool to use predominantly in service of citizens' (Crowley *et al.* 2016: 7). This suggests a significant reframing of the purpose of smartness as cities are designed and implemented to advance public welfare *directly* rather than indirectly as a by-product of economic development (Glasmeier and Nebiolo 2016, Trencher and Karvonen forthcoming). This repurposing also requires a shift from the city scale to a finer-grained focus on the community and human scale (Gardner and Hespanhol 2018), and the explicit objective of enhancing the wellbeing of city dwellers (Colding and Barthel 2017).

This chapter contributes empirical evidence on how projects reflecting qualities of a Smart City 2.0 model can play out on the ground. It examines two Japanese smart cities addressing the interconnected challenges of an ageing society and preventative health care for the elderly: Kashiwanoha Smart City near

Tokyo and Aizuwakamatsu Smart City in Fukushima Prefecture. The majority of smart city developments in Japan are fixated on environmental and economic objectives (Yarime and Karlsson forthcoming), and provide few opportunities for citizen engagement (Granier and Kudo 2016) or addressing social problems (Kono *et al*. 2016). Yet Kashiwanoha and Aizuwakamatsu stand out as two examples of 'articulated smart cities' (Coletta *et al*. 2017) whereby the goals of tackling social issues and improving resident wellbeing are explicitly stated and shared by diverse actors. The cases embody distinct socioeconomic contexts and approaches, but both exhibit bottom-up and resident-centred modes of local innovation. The chapter draws on fieldwork conducted between August 2014 and October 2017 involving seven site visits and 20 semi-structured interviews with 21 stakeholders. To ensure a diversity of perspectives, respondents included planners and project actors from local government, private enterprises, universities, non-profits and resident groups.

The chapter begins with an overview of Japan's ageing society and the recent roll-out of smart city projects. This is followed by two sections with empirical findings from Kashiwanoha and Aizuwakamatsu that examine flagship projects developed to address health and welfare challenges posed by an ageing population. The two cases demonstrate how smart agendas can be steered towards societal ends and drive new modes of resident empowerment and collaborative governance in highly unique contexts. The chapter concludes with some reflections on the governance of the Smart City 2.0 model and the potential for smart innovation to be directed towards tackling societal problems and improving resident wellbeing.

Japan's ageing society as a social problem

Greying trends in Japan far surpass the rest of the world. While other industrialised nations such as Germany, Italy and Finland are wrestling with the consequences of a rapidly ageing population, Japan has attained the dubious distinction of a 'super-ageing society'. At present, about 27 per cent of adults are over 65, and projections indicate that this subpopulation will increase to 33 per cent or more by 2035 (Statistics Japan 2016). Longer life expectancy due to high living standards and advances in health care are driving this population ageing, alongside a significant decrease in new births (Muramatsu and Akiyama 2011). In 2014, the national fertility rate reached a record low of 1.42, and popular media reported that nappy sales for seniors overtook those for infants (Hernandez 2016). This has created an eerie rural landscape peppered with shuttered elementary schools and kindergartens due to insufficient enrolment. The Japanese population peaked at 128 million in 2008 and is forecast to drop to around 100 million by 2050 (Statistics Japan 2016). If these greying trends continue unabated, Japan will lose 10 million people (roughly the equivalent of Sweden's population) each decade.

The ageing of the Japanese population is predominantly framed in the national discourse as an economic problem (Fujimura 2016). Besides creating worker shortages for corporations, a reduced working population generates less tax

revenue and economic output, thus challenging the public policy paradigm of pursuing economic growth. Furthermore, since all Japanese residents have the right to public health care, population ageing has contributed to sharp increases in expenditure on medical treatment and elderly care. This places an increasing burden on limited supplies of health professionals and care facilities while reducing public funding for other services such as education, transportation and housing.

Beyond the economic consequences of an ageing population, there are significant social issues to address, particularly with respect to social isolation and wellbeing (Drennan *et al.* 2008). As communities age and shrink, the social networks of the elderly decrease as family and friends move elsewhere or pass away. These community impacts are unevenly distributed, with the majority of adverse consequences affecting rural areas because younger generations readily gravitate to larger, more economically prosperous cities (Kudo *et al.* 2015). The remaining elderly populations in rural communities are at risk of social isolation and loneliness because public transport services to facilitate shopping, outings and socialisation are limited, while stores and services decline or move away in response to population decline. Reduced outings and socialisation can accelerate the deterioration of physical and mental health, which further burdens local and national health care services. With Japan's escalating national ageing crisis showing no signs of abatement, new approaches are needed to combine social and technological innovation and collaboration across public, private and academic spheres to serve the needs of an increasingly senior population. (Muramatsu and Akiyama 2011).

Smart cities in Japan

Similar to other countries, information and communication technologies (ICT) and big data are touted by the Japanese government and the private sector as silver bullets to address economic woes and rapidly changing societal needs. This is readily apparent in the vision of a so-called 'Society 5.0', presented in the national government's '5th Science and Basic Technology Plan' (Government of Japan 2016). This calls for a next phase of society building – beyond historical developments of hunting, agriculture, industry and information – to realise a 'super smart society' where all citizens benefit from a digitalised, data-driven national economy. While ambitions of attaining ubiquitous digitalisation centre on stimulating economic growth, social challenges are framed as innovation drivers, with a particular emphasis on public health and population ageing. Demonstrating this awareness, numerous initiatives utilising ICT to address the needs of the elderly are emerging. Robots are now actively used in nursing homes as socialisation tools for the elderly and to alleviate caregiver shortages (Emont 2017). In parallel, universities and municipalities are actively collaborating to address hospital bed shortages through digital at-home care for the elderly and to improve medical services by sharing patient health data across ICT networks and devices.

The digitalisation of society is not confined to the health care sector. As future-orientated models of urban development enjoying generous government funding, smart cities in Japan are increasingly expected to demonstrate how technology and data analytics can serve the needs of a greying population. The explicit framing in Society 5.0 of a socially focused agenda for digital innovation thus provides a novel guiding principle for the numerous smart cities that have propagated across Japan. Yarime and Karlsson (forthcoming) note that the roll-out of smart cities to date has overwhelmingly focused on energy-related issues such as smart grids, renewable energy, storage and electric vehicles (EVs). This preoccupation with energy is largely driven by the Fukushima Daichi Nuclear Power Plant disaster in 2011, and has prompted a focus on developing resilience to disaster-induced power outages rather than pursuing social objectives such as citizen engagement (DeWit 2013). While smart city projects focused on serving the needs of residents and an ageing society are rare, industry think-tanks have recently pointed to this need (Kijou and Rure 2014) and are pushing for a national agenda that aligns smart city developments with Japan's Society 5.0 ambitions (Nomura 2017). This broadening of smart city ambitions – from diffusing green technologies towards innovation agendas combining technical and social approaches to tackle population ageing, health and resident wellbeing – is particularly evident in Kashiwanoha and Aizuwakamatsu, as described in the following sections.

Kashiwanoha's preventative health centre

Kashiwanoha Smart City was initiated in 2008 in response to a large-scale ambition to create a newly built compact city for 30,000 residents by 2030. Located roughly 40 kilometres north-east of Tokyo, the opportunity to develop a showcase model of urban development was prompted by a new train line connecting Tokyo with the northern city of Tsukuba in 2005. While building and infrastructure development is spearheaded by a private developer (Mitsuifudosan) and several large ICT vendors (such as Hitachi), city planning involves extensive collaboration with local municipalities, universities (University of Tokyo and Chiba University) and a non-governmental organisation (NGO) specialising in local urban planning (Kurata *et al.* 2013). The city's overarching vision involves an ecological modernisation approach to spur the development of a high-tech sector by showcasing environmental technologies (Cugurullo 2013).

The pursuit of smartness is occurring in prosperous, privileged circumstances. Property prices are above those of neighbouring communities, while the city boasts advanced environmental features such as smart meters, energy-efficient architecture and a smart grid-controlled distributed renewable energy network. Residents consist of an upper-middle class of retired couples and young families who live mostly in luxurious apartment towers located in front of the train station and adjacent shopping and commercial centre. Video marketing materials promise prospective residents that environmentally oriented urban design

guarantees an effortless and ecologically responsible lifestyle 'just by residing here'. Coupled with the allure of an international city driven by scientific knowledge from world-class universities, Kashiwanoha Smart City offers its fortunate residents a highly desirable form of urban living in the twenty-first century.

Meanwhile, Kashiwanoha Smart City also has a distinctive third objective – to advance the health, wellbeing and longevity of its residents. This social agenda provides the developer with an attractive narrative to differentiate Kashiwanoha from other smart cities in a highly competitive national market while demonstrating the social relevance of smart urban development to the local population (Trencher and Karvonen forthcoming). Kashiwanoha's smart health agenda – defined and led by the abovementioned industry/municipality/university/civic collaboration – champions preventative health rather than medical treatment. The partners influence residential living patterns by encouraging healthy habits related to diet, sleep and exercise. Pre-illness lifestyle choices rather than post-illness medical services are promoted as the most effective way to maintain public health. Such objectives require residents to adopt a daily maintenance mind-set and actively assume responsibility for their individual health. When promoting this smart health objective, Kashiwanoha's smart advocates explicitly point to potential savings on public health expenditures that are rising annually in accord with societal greying trends. Residents are thus reminded of a responsibility to pursue health for the greater social good.

Although health is relevant to all ages, Kashiwanoha's smart health agenda affords special consideration to elderly residents through the explicit goal of advancing longevity. Given that the population of Kashiwanoha Smart City is somewhat younger than the surrounding City of Kashiwa, due to its popularity with newly relocated young families, a smart city planner explained that addressing health and longevity is 'an investment in social capital today for tomorrow', when ageing trends and associated burdens on public welfare will be further pronounced. In this respect, the smart health agenda seeks to futureproof Kashiwanoha from rising health costs in the long term.

Kashiwanoha's vision for preventative elderly health places great importance on socialisation. Smart city planners drew on medical research findings that identified socially active lifestyles among seniors as central to maintaining their physical and mental capacities. Connected to this, a respondent emphasised how the pursuit of health and longevity for residents strives to be simultaneously 'holistic' – by encompassing both physical and mental wellbeing – as well as 'fun'. Efforts to advance preventative health in the early years of the smart city involved experiments with wearable ICT devices (e.g. pedometers and wristband health monitors) and visual feedback of health indicator data to users. While some of these initiatives continue, most consisted of one-off pilot projects that were abandoned after exhaustion of government funding and failure to realise commercial potential (Trencher and Karvonen forthcoming). Informed by these initial experiences, recent smart city activities in the health arena have shifted to education and information provision instead of banking on the commercially risky roll-out of personal ICT devices.

Ashita, a walk-in preventative health centre, personifies this new focus in the smart city to health and ageing (**Figure 17.1**). It serves as a novel example of a human-oriented, bottom-up approach to advancing the health of residents that also incorporates advanced medical technologies to pursue its goals. Ashita was opened in late 2014 by the University of Tokyo with assistance from the developer and sponsoring corporations. The free-of-charge centre allows residents to visit without an appointment and engage with a team of volunteers. It displays commercially available health products, and invites visitors to use an array of digital health-monitoring equipment. The facility targets all ages, but Ashita's efforts to promote preventative health and longevity have mostly appealed to the elderly. About two-thirds of the roughly 2,000 members are aged over 60, while the majority of the centre's volunteers are seniors. Additionally, by extending membership to residents outside the smart city, the centre serves a larger community of elderly citizens. This provides an important avenue to share the benefits of the smart city beyond Kashiwanoha.

Education efforts concerning preventative health focus on three activities – walking, eating and socialisation – reflected in the name 'Ashita', which combines sounds from the Japanese words 'walk', 'eat' and 'talk'. Regarding the latter goal of socialisation, this emphasises the abovementioned awareness that socially active lifestyles lead to greater mental and physical health. Ashita promotes this objective through informal coffee hours, musical performances and creative activities such as origami and card making. A subtler strategy involves

FIGURE 17.1 The Ashita preventative health centre in Kashiwanoha (left) and a resident receiving a diagnosis of vital health indicators (right).

Source: Ashita.

a booth containing beauty products and tips for makeup. Volunteers explained that elderly women are more likely to socialise if they have confidence in their appearance. Complementing this socialisation approach, more direct strategies to foster healthier lifestyles involve education and awareness raising. The centre hosts a diverse range of events – such as lectures on diet, alleviating joint pain and improving sleep quality – as well as exercise and cooking workshops. Visitors also have the opportunity to attend individual consultations with staff to discuss machine-free exercises to increase flexibility and strength and, in particular, Nordic walking (due to the positive effects on posture and back muscle strength when walking with a pair of supporting sticks). Staff also provide dietary and oral care advice to visitors by showcasing an array of products (e.g. low-sodium and low-fat foods, toothpaste and specialised oral care items) that private companies utilise to raise brand recognition.

The above focus on information provision involves little reliance on technology and equates smartness with well-informed residents. Yet Ashita also embraces the smart city's high-tech focus by using data collection and monitoring to complement its educational efforts. It boasts an array of sophisticated digital medical equipment that enables members to monitor weight and body mass index (BMI), basic metabolism, muscle mass and distribution, visceral fat, bone weight and artery health (see **Figure 17.1**). One machine even allows visitors to monitor brain and nerve health by measuring reaction times to a video game-like display. Data generated by these machines are stored on membership cards, thus allowing visitors to monitor their results over time. Not only do numerical results provide users with a holistic and instantaneous snapshot of physical health, but longitudinal datasets also create an incentive for members to make lifestyle changes to improve their results and return to the centre for further monitoring. Datasets from some machines are provided to the equipment manufacturers for product development purposes. Ashita once held lofty ambitions to create 'big data' with commercial value; but, to date, this has not been realised because membership numbers and repeat visits are lower than anticipated.

Interestingly, none of Ashita's staff members are health professionals. A handful are paid as permanent employees, while the majority comprises roughly 30 volunteer residents from Kashiwanoha or nearby. The centre provides the volunteers with basic training and information. A proud volunteer stated that Ashita is 'run by citizens on behalf of citizens', drawing attention to the centre's bottom-up and community-empowering character. Community ownership of the centre's preventative health agenda increased after the expiration of the University of Tokyo's initial research funds. Ashita drives community empowerment by encouraging collaborative learning among non-expert volunteers and residents who share a common concern with preventative health. Rather than opting for a digital or online community, it pursues these goals through a physical space and person-to-person contact. In parallel, it boosts its scientific authority by outsourcing diagnosis to a cutting-edge fleet of medical technologies. While these machines characterise the centre and provide tangible evidence of 'smartness', their utilisation remains secondary to Ashita's people-focused engagement ambitions.

Ashita thus aims to be a vibrant community centre for the twenty-first century, where the boundaries between individual well-being, concerns for public health and private sector interests are blurred. Despite success in this regard, Ashita is grappling with several challenges. Membership and usage rates are significantly below initial expectations, and the staff are continually trying to find new ways of engaging a larger number of residents. Moreover, Ashita is experiencing ongoing obstacles in efforts to demonstrate the efficacy of the centre's activities with respect to health impacts. To date, the centre has failed to secure public health records of its members due to privacy concerns. Although optimistic about health impacts on Kashiwanoha's residents, the developer and staff both share desires to verify this empirically by linking members' public health records (including hospital visitations, medications prescribed, medical bills and so on) with data accumulated from visits to Ashita. A staff member argues that: 'If the municipality would provide us with medical expenditures data, there is so much we could examine. For instance, have the medical expenditures of members really dropped? We would love to analyse this.' Consequently, the centre's scientific legitimacy in terms of actual long-term health impacts remains unconfirmed. In parallel, these data provision roadblocks also hinder the potential formulation of a long-term business case that could position the centre as a public service that reduces health care expenditures for local and national governments.

Aizuwakamatsu's digitally driven rural living support

The pursuit of smart urban development in the socially distressed city of Aizuwakamatsu is markedly different from Kashiwanoha. Aizuwakamatsu is an historic city about 250 kilometres north of Tokyo in Fukushima Prefecture, with a population of about 120,000. Similar to Kashiwanoha, the decision to pursue a smart city agenda was initiated by the private sector (the consulting firm Accenture). Subsequent visioning, planning and implementation involved the municipality, the local university and several private companies and citizen groups that designed and executed a dynamic eco-system of top-down, bottom-up and hybrid projects. Aizuwakamatsu's smart city agenda is more ambitious and comprehensive when compared to Kashiwanoha. Objectives around the integration of ICT and (big) data address multiple sectors, including energy, agriculture, health, tourism and education. One town planner noted that the 'scope is extremely broad. It's as though we have incorporated smartness into community development itself.' While such agendas appear in varying degrees in other smart cities across Japan, Aizuwakamatsu's narrative is unique. Smart city protagonists explicitly frame smartness as a new tool for tackling a depressing list of chronic social woes, including economic stagnation, depopulation, deterioration of public services, escalating health care costs and population ageing.

Population ageing in Aizuwakamatsu is more pronounced than in Kashiwanoha. The municipality reports that 30 per cent of residents are over 65, which exceeds the national average of 27 per cent. Declining birth rates and population shrinkage are driving this trend, since most university graduates leave for employment

opportunities in the Tokyo metropolitan region. This situation has prompted a multitude of ICT and data analysis initiatives to serve the specific needs of the greying population. Similar to Kashiwanoha, many involve trials of individual health sensors and personal health data visualisations. Beyond technical innovations, however, smart urbanism provides a wide-reaching ethos and guiding paradigm. It spills over the confines of official smart city projects to impact diverse areas of public policy and municipal services that are attempting to respond more effectively to the needs of the greying population. For example, the municipality has redesigned public bus routes to better serve communities with high numbers of elderly residents by analysing spatial and population data. They have also instituted a digital reception where iPad-equipped staff greet visitors in need of official documents. This initiative supports the elderly by offering an alternative to long queues and completing complicated paper applications that pose problems to individuals with poor eyesight and other disabilities.

The municipality typically leads such initiatives with varying degrees of support from private companies and community organisations. In the future, however, reduced public income due to population decline and ageing will render it more difficult for the municipality to deliver public services on its own. Thus, Aizuwakamatsu's vision for a smart city calls for a decentralised, networked society capable of 'solving its own problems,' as described in project documents. This reframes public services and social problem solving as a collaborative endeavour where the municipality is but one actor in a societal network that equally affords residents and companies with an empowered and privileged role as co-creators.

An example of this collaborative approach to public service provision is the 'Rural Living Support System' that was formally launched in October 2017. The programme includes an array of new digital services to improve quality of life and to strengthen community bonds in an underserved rural population living at the edge of Aizuwakamatsu, in the isolated, mountainous area of Minato-machi (**Figure 17.2**). Supported by national funding, the initiative involves the free installation of an Internet modem (and ADSL cabling if necessary) to transform the televisions of existing residents into smart devices. This simple retrofitting exercise enables residents to access a customised on-screen menu called 'Minato Channel' providing three services: on-demand bus transport, local community information and health monitoring for the elderly. While the programme complements other official smart city initiatives and brands itself as such, the Rural Living Support System is a new digital approach to an existing set of social problems. These were previously identified by a grassroots governance body that unites residents with municipal officials around the broader goal of spurring community revitalisation in Minato-machi.

Although the Rural Living Support System targets all age groups, it is particularly aimed at the specific needs of the elderly. The municipality reports that 40 per cent of Minato-machi is aged over 65, and depopulation is occurring three times faster than the city average. These social conditions influenced the selection of smart technologies. The decision to deliver Internet services

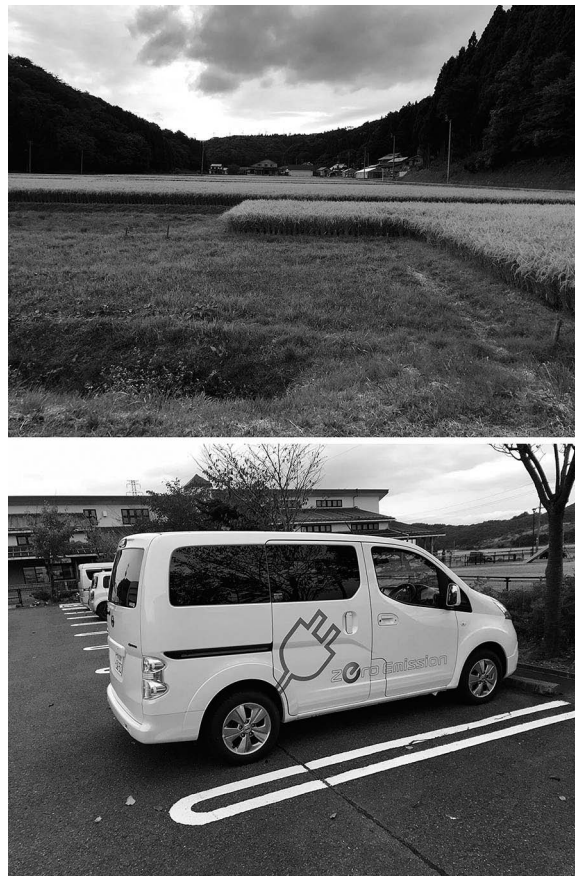

FIGURE 17.2 The rural landscape targeted by the Rural Living Support System, with wind turbines faintly visible in the background centre (top) and an electric van running on wind power that serves the personalised transport initiative (bottom).

Source: authors.

through televisions was driven by awareness that many elderly residents do not use smartphones, tablets or computers. Thus, the organisers exploited an existing technology (i.e. television) that was familiar to these residents. The Rural Living Support System has therefore provided many residents with their first opportunity to benefit from the Internet.

Yet ambitions behind the Rural Living Support System involve much more than simply diffusing the Internet to a rural population. The broader objective is to mitigate the inconveniences of rural living by using digital technologies to spur community revitalisation and invigorate community social networks. As the organisers emphasise, the on-screen services simply serve as a means or 'tool' to this end. The smart city's ethos of digital experimentation has thereby

provided residents and the municipality with a new perspective and instrument for tackling long-standing social problems. And, similar to Kashiwanoha, the use of smart technologies is focused on socialisation and community building.

The Rural Living Support System also provides on-demand transportation services through two electric vans that can be booked through the Minato Channel's on-screen menu. The vans shuttle residents to the nearest city bus stop, supermarket, convenience store, hospital and community centre. In addition to a digitally optimised passenger pick-up schedule, buses are installed with an extra level of smartness via an on-board GPS tracking system. This enables residents to check the real-time position of the vans to minimise waiting outside during the cold and snowy winter months. The vans operate on free electricity provided by local wind turbines (see **Figure 17.2**). This reduces operating costs and creates a tangible link to the energy and environmental objectives of the smart city agenda. On-demand transport addresses a chronic problem in Minato-machi. Around half of residents live 3–4 kilometres from the main bus route to downtown Aizuwakamatsu. The organisers explained that having to walk long distances to the nearest bus stop discouraged many elderly residents from running daily errands and socialising. Thus, the Rural Living Support System provides transport to further social welfare by increasing community-level socialisation opportunities for the elderly.

Linked to this socialisation objective, another aim of the Rural Living Support System is to supply community-level information to residents as part of a broader attempt to strengthen inter-community bonds and participation in social events by increasing the visibility of community traditions and events. This has roots in the area's low diffusion rate of Internet and digital communication infrastructure. Only some 20 per cent of households currently have access to the Internet, while a lack of fibre-optic networks means that net users must wrestle with ADSL connections. As residents explained, these are 'choppy and prone to dropping out every ten minutes or so'. As such, local communication is chiefly analogue and limited to infrequently distributed traditional paper media such as town bulletins. Villages lack information about nearby social activities such as festivals and community events; and, as one resident notes, 'residents in one village often have no idea what is happening in another'.

To address this situation, the Minato Channel diffuses multiple types of information. In addition to commonplace data on local weather and natural disaster information (e.g. heavy rainfall, snowfall and earthquakes), the on-screen menu automatically broadcasts summaries, photographs and voice recordings of social activities such as festivals and community events. It also displays relevant RSS feeds from the municipality, and allows users to access the existing local Minato-machi website containing more detailed community information. Finally, users can access live images of local road conditions to assess the suitability of weather conditions for road travel. This myriad of features and information stems from the involvement of residents during the system's design stages that resulted in the tailoring of the generic on-screen menu from vendor Fujitsu to meet the

needs of the community. While also providing opportunities for residents to shape, operate and assume ownership of the system, a municipal staff member explained that, pragmatically speaking, the collaborative approach ensures greater information accuracy and pertinence to community needs. Interviewed residents were proud to report that the majority of the information on the channel is generated 'by residents for residents'.

Finally, the system allows for the monitoring of daily health conditions in the elderly. Upon launching the system, elderly residents can opt for a daily prompt asking: 'How are you feeling today?' Several options are provided to indicate one's level of health: for example, if a user chooses 'I am not feeling well today', a notification is sent to an existing local volunteer network who can then phone or make a personal visit to the resident. This feature addresses the increasing prevalence of elderly residents living alone and without social ties, and provides an explicit example of how ICT can enhance existing elderly welfare efforts.

The smart city paradigm in Aizuwakamatsu has inspired a novel approach in Minato-machi for responding to the chronic problem of social isolation and community deterioration in a rural and ageing context. Although only recently launched, residents report that not only has this initiative been successful in the co-design process with the municipality and technical experts, but it has also been embraced as a community asset with residents who operate the system (via both paid and volunteer roles). This success is largely due to the collaborative process of diagnosing the area's social issues and designing the technological solution through the existing community governance framework that unites the municipality and residents. Yet, as in Kashiwanoha, the initiative also faces several obstacles – most notably around the long-term business feasibility of the system. One resident notes:

> At present we are receiving government funding. Yet after that expires next year how is this system going to sustain itself? There is a possibility that the Minato Channel and demand buses will shut down. So naturally we are preoccupied, or should I say worried, about how we can design this entire system to ensure its continuation.

This suggests that the long-term viability of the Rural Living Support System will require a financially sustainable business model that recognises the public benefit of this initiative. Residents in Aizuwakamatsu are considering a variety of options, including pick-up fees for transport and paid advertising on the Minato Channel. It remains to be seen, however, if these entrepreneurial efforts will generate the required funds to maintain and further develop the system in the future.

Towards the socially relevant smart city

Examples of how the smart city can directly address endogenous social problems are few and far between (Goodspeed 2015, Glasmeier and Nebiolo 2016, Stollmann *et al.* 2016). Likewise, concrete measures to meaningfully engage residents

in the design and implementation of smart city initiatives tend to be rare (Joss *et al.* 2017, Gardner and Hespanhol 2018), as are explicit considerations of how specific digital technologies can serve the needs of society. Using the unique context of Japan, this chapter has provided empirical evidence describing how two smart city projects have overcome these shortfalls. Both cases focus on an ageing society and its associated health and welfare concerns. The Ashita walk-in centre and the Rural Living Support System provide the smart city with a crucial opportunity to connect technological innovation with pressing social problems. The findings illustrate how smart city projects have inspired digitally enabled yet people-centric initiatives that leverage collaborative governance arrangements to empower residents.

Alongside social objectives, the examined projects from Kashiwanoha Smart City and Aizuwakamatsu Smart City feed into wider agendas that balance ambitions of spurring economic development and diffusing environmental technologies. This suggests that Smart City 2.0 initiatives can co-exist alongside conventional Smart City 1.0 projects with economically oriented ambitions (Trencher forthcoming). Furthermore, while the projects described in both cities are non-profit and principally designed to serve the interests of residents and advance public welfare, both benefit from significant support and expertise from the private sector. The Rural Living Support System in Aizuwakamatsu integrates ICT expertise from Fujitsu, while the Ashita centre is funded by the developer as an attempt to differentiate Kashiwanoha from other smart cities. This blurs the boundaries between public and private as well as profit and social welfare. It suggests that future smart cities might take a hybrid approach that simultaneously addresses public and private ends.

The cases also provide useful insights into how socially oriented smart city agendas can be relevant in dramatically different contexts. The new-build smart city in Kashiwanoha is unfolding in an affluent and privileged urban community adjacent to metropolitan Tokyo. Meanwhile, Aizuwakamatsu's retrofit model is being applied in a region struggling with chronic population decline and a loss of socioeconomic vitality, notably in its rural areas. These geographic contexts have informed the smart approaches taken in each case study. Ashita focuses on preventative health and longevity to foster health-conscious citizens, or 'health evangelists' as one volunteer described. The centre's diverse approaches include social events, face-to-face consultations and monitoring of vital indicators via sophisticated medical diagnostic technologies. Meanwhile, Aizuwakamatsu's Rural Living Support System adopts a markedly different approach. While the programme also monitors the daily health condition of elderly residents, the focus is on transportation services and information provision to promote socialisation and participation in community activities in a rural setting.

Both cases demonstrate how smart cities can selectively draw on technologies to advance public-serving objectives. Here, technologies are not framed as ends in themselves but as tools to address a societal need and purpose. This involves starting with a vision of improved health or quality of life for the elderly

and then selecting a suite of technologies to realise the vision. Particularly in Aizuwakamatsu, this process of selecting an existing suite of technologies (i.e. existing household TVs and readily available Internet modems) involved careful consideration of the unique features and needs of the targeted population. This depicts a novel pathway for stimulating innovation if considering the supply-side and technology-push approaches that tend to drive most conventional smart cities (Glasmeier and Nebiolo 2016, Crowley *et al.* 2016). In parallel, these initiatives suggest that 'smartness' need not be framed as a universal concept, but rather as something that can be interpreted differently depending upon problem definitions and the unique local contexts in which it is pursued (Goodspeed 2015, Bulkeley *et al.* 2016, Glasmeier and Nebiolo 2016).

The cases also depict how smart cities can benefit individuals beyond the privileged subset of residents living in a designated innovation zone. Ashita is open to residents from outside Kashiwanoha Smart City, while the Rural Living Support System targets an underserved rural area adjacent to the city limits. In this way, delivering smart services to a broader population segment makes innovation relevant to those who need it most. An Aizuwakamatsu resident confessed:

> Until now, to tell the truth I did not see any relevance of the smart city to life here in Minato-machi. But now that this initiative has materialised I have realised that to the contrary it is here in isolated rural areas where there is the largest need for ICT.

By injecting smart city innovation into a needy rural area, the Rural Living Support System in particular points to a broadened understanding of the geographical and social conditions where smart city projects might produce the greatest social value. Sharing smart city benefits to enhance livelihoods across a broad and inclusive population suggests a novel pathway for smart cities to enhance social equity (March forthcoming).

Initiatives in both cities also emphasise modes of collaborative governance. While most smart city projects around the world tend to involve a triple-helix of public, private and academic actors, the smart ageing programmes in Kashiwanoha and Aizuwakamatsu are defined and driven by local residents. On one hand, this can be understood as an empowerment strategy initiated by the public or private sector for residents to assume ownership over the collective conditions of their community (de Lange and de Waal 2013). On the other hand, this could be read as a hollowing out of the state (Hollands 2008, Karvonen *et al.* 2014, Kitchin *et al.* 2015, Karvonen 2018) and outsourcing government responsibilities to volunteers and community champions. So, while there are valid reasons to champion these activities as empowering and progressive, it is important to question the long-term implications of engaging residents in local governance.

Ultimately, it remains to be seen if the initiatives in Kashiwanoha and Aizuwakamatsu will blossom and become a new Smart City 2.0 model that can influence other smart city projects around the world. It is possible that these

efforts might thrive for a few years and then fade away due to lack of funding or interest by residents. Alternatively, they could prosper and serve as pioneering examples of how smart innovation and collective governance can be steered to address social agendas such as population ageing, health and public welfare. Regardless, these initiatives provide valuable hints about the context-specific characteristics of smart urban development and their relevance to civil society. While the ability of stakeholders in both cities to sustain each project is unclear, both cases provide important examples of alternative routes towards a more socially relevant interpretation of the smart city.

References

Baccarne, B., Mechant, P., Schuurman, D., Colpaert, P. and De Marez, L. (2014). Urban socio-technical innovations with and by citizens. *Interdisciplinary Studies Journal 3*: 143–156.

Bulkeley, H., McGuirk, P.M. and Dowling, R. (2016). Making a smart city for the smart grid? The urban material politics of actualising smart electricity networks. *Environment and Planning A: Economy and Space 48:* 1709–1726.

Colding, J. and Barthel, S. (2017). An urban ecology critique on the 'smart city' model. *Journal of Cleaner Production 164C*: 95–101.

Coletta, C., Heaphy, L. and Kitchin, R. (2017). From the accidental to articulated smart city: the creation and work of 'Smart Dublin'. Working paper. National University of Ireland Maynooth.

Crowley, M., Nutter, M., Wheeler, C., Schuetz, N., Lamberg, R. and Bent, E. (2016). *Smart Cities for Sustainability: A Sector-By-Sector Tech Review.* Washington, DC: US Urban Solutions.

Cugurullo, F. (2013). How to build a sandcastle: an analysis of the genesis and development of Masdar City. *Journal of Urban Technology 20*: 23–37.

de Lange, M. and de Waal, M. (2013). Owning the city: new media and citizen engagement in urban design. *First Monday 18*.

DeWit, A. (2013). Japan's rollout of smart cities: what role for the citizens? *Asia-Pacific Journal 11*: 1–12.

Drennan, J., Treacy, M., Butler, M., Byrne, A., Fealy, G., Frazer, K. and Irving, K. (2008). The experience of social and emotional loneliness among older people in Ireland. *Ageing and Society 28*: 1113–1132.

Emont, J. (2017). Japan prefers robot bears to foreign nurses. *Foreign Policy*, 1 March 2017 [Online]. Available: http://foreignpolicy.com/2017/03/01/japan-prefers-robot-bears-to-foreign-nurses/ [Last accessed 13 October 2017].

Fujimura, H. (2016). The challenge of keeping Japanese older people economically active. *Australian Journal of Social Issues 51:* 167–185.

Gardner, N. and Hespanhol, L. (2018). SMLXL: scaling the smart city, from metropolis to individual. *City, Culture and Society 12*: 54–61.

Glasmeier, A. and Christopherson, S. (2015). Thinking about smart cities. *Cambridge Journal of Regions, Economy and Society 8*: 3–12.

Glasmeier, A. and Nebiolo, M. (2016). Thinking about smart cities: the travels of a policy idea that promises a great deal, but so far has delivered modest results. *Sustainability 8*: 1122.

Goodspeed, R. (2015). Smart cities: moving beyond urban cybernetics to tackle wicked problems. *Cambridge Journal of Regions, Economy and Society 8*: 79–92.

Government of Japan. (2016). *The 5th Science and Technology Basic Plan*. Tokyo: Cabinet Office. [Online]. Available: www8.cao.go.jp/cstp/english/index.html [Last accessed 8 January 2018].

Granier, B. and Kudo, H. (2016). How are citizens involved in smart cities? Analysing citizen participation in Japanese 'smart communities'. *Information Polity 21*: 61–76.

Hernandez, V. (2016). Adult nappies outsell baby Pampers in Japan, indicating country's worsening lack of sex. *International Business Times*, 22 January 2016. [Online]. Available: www.ibtimes.com.au/adult-nappies-outsell-baby-pampers-japan-indicating-countrys-worsening-lack-sex-1501770 [Last accessed 8 January 2018].

Hollands, R.G. (2008). Will the real smart city please stand up? *City 12*: 303–320.

Hollands, R.G. (2015). Critical interventions into the corporate smart city. *Cambridge Journal of Regions, Economy and Society 8:* 61–77.

Joss, S., Cook, M. and Dayot, Y. (2017). Smart cities: towards a new citizenship regime? A discourse analysis of the British Smart City Standard. *Journal of Urban Technology 24*: 29–49.

Karvonen, A., Evans, J. and van Heur, B. (2014). The politics of urban experiments: radical change or business as usual? In M. Hodson and S. Marvin (eds), *After Sustainable Cities?* London: Routledge, 104–115.

Karvonen, A. (2018). The city of permanent experiments? In B. Turnheim, P. Kivimaa and F. Berkhout (eds), *Innovating Climate Governance: Moving Beyond Experiments*. Cambridge: Cambridge University Press, 201–215.

Kijou, N. and Rure, K. (2014). *Smart Cities: Observations on Issues Regarding Commercialisation of Demonstration Projects* (in Japanese). Tokyo, Japan: EY Institute.

Kitchin, R., Lauriault, T. and McArdle, G. (2015). Smart cities and the politics of urban data. In S. Marvin, A. Luque-Ayala and C. McFarlane (eds), *Smart Urbanism: Utopian Vision or False Dawn?* London: Routledge, 16–33.

Kono, N., Suwa, A. and Ahmad, S. (2016). Smart cities in Japan and their application in developing countries. In J. Jupesta and T. Wakiyama (eds), *Low Carbon Urban Infrastructure Investment in Asian Cities*. London: Palgrave Macmillan, 95–122.

Kudo, S., Mutisya, E. and Nagao, M. (2015). Population aging: an emerging research agenda for sustainable development. *Social Sciences 4*: 940–966.

Kurata, N., Ozasa, T., Ueno, T., and Komatsu, H. (2013). Campus planning for promoting quality of life in the community. In A. Konig (ed.), *Regenerative Sustainable Development of Universities and Cities: The Role of Living Laboratories*. Northampton, MA: Edward Elgar Publishing, 236–253.

March, H. (forthcoming). The smart city and other ICT-led techno-imaginaries: any room for dialogue with degrowth? *Journal of Cleaner Production*.

Martin, C., Evans, J. and Karvonen, A. (2018). Smart and sustainable? Five tensions in the visions and practices of the smart-sustainable city in Europe and North America, *Technological Forecasting & Social Change 133*: 269–278.

Muramatsu, N. and Akiyama, H. (2011). Japan: super-aging society preparing for the future. *Gerontologist 51*: 425–432.

Nomura, A. (2017). Towards smart town planning through user driven innovation: examples of smart city 2.0 initiatives overseas (in Japanese). *JRI Review 8*: 101–139.

Paskaleva, K., Evans, J., Martin, C., Linjordet, T., Yang, D., and Karvonen, A. (2017). Data governance in the sustainable smart city. *Informatics 4*: 41.

Saunders, T. and Baeck, P. (2015). *Rethinking Cities from the Ground Up*. London: NESTA.

Statistics Japan. (2016). Population changes and future projections (in Japanese). [Online]. Available: www.stat.go.jp/data/nihon/02.htm [Last accessed 8 January 2018].

18

LIFE IN SMART SEOUL

The female factor

Sofia T. Shwayri

Introduction

There is growing conviction that cities embedded and reconfigured with information and communication technology (ICT) are in a state of reinvention (Gabrys 2014) for which some kind of ever-evolving labelling is required, the most recent being the smart city. Despite such a city increasingly becoming the new urban form of choice by governments across the world, much criticism abounds. Central to these criticisms is the importance accorded to ICT in its making that has seen some policymakers employ ICT as an urban strategy as they seek advanced technological solutions to the pressing issues being faced (Viitanen and Kingston 2014). The intoxicating powers of ICT are compounded by the belief in its almost instantaneous transformative powers (Hollands 2008). This has led to calls for a shift from a top-down corporate smart city mode to one centred on citizens (Hill 2013, Hemment and Townsend 2013) who can participate in decision making.

In essence, this constitutes a call for the reimagining of government (Noveck 2015). Although the smart city – through networked infrastructure, big data and data analytics – is enabling new modes of governance, local governments have for several decades been engaged in some form of institutional change to encourage more citizen participation in policy making. Planners play an instrumental role in renegotiating the relationship of the state to the public by opening up urban development processes to collaboration (Healey 2005, Innes and Booher 2010). This approach received much focus in the 1990s, especially in its inability to minimise the inequalities of power and knowledge, and by further questioning the ability of participation to foster 'transformative social change' (Huxley 2000: 376). These disparities remain unresolved and continue to create pressure on governments as they seek to address the various economic, social

and environmental challenges. Both open data and ICT infrastructure promise new avenues for participation. With the proliferation of new modes of communication enabled by advanced communication infrastructure, it is becoming increasingly critical for governments to engage local residents with their institutions as they seek to improve the efficiency of decision-making processes, and consequently to foster a smarter mode of governance (Noveck 2016).

The continuing disagreement on a definition of the smart city has been countered by consensus on its constitutive outcomes, one of which is smart governance (Kitchin 2017). Embedding ICT into the fabric of the city is swiftly becoming routine, unlike reforming a governance structure, which is a much slower process that often requires several decades. Existing institutional structures and inherited organisational barriers are circumvented by a forward-looking, strong leadership, such as the various mayors of Seoul who have been determined to make the South Korean capital globally competitive (Lee *et al.* 2014). They further decentralise formerly highly centralised local government, and continuously employ cutting-edge technology to implement a sustainable living vision at the district and neighbourhood level, pushing through smart initiatives by addressing specific challenges that engage citizens (Snyder *et al.* 2012).

ICT, the major enabler of citizen-centric e-governance programmes, has in the last two decades become another utility in South Korea, and has emerged as the key to the planning and management of its cities (home to 82.7 per cent of the population). A series of e-government roadmaps involving more than 30 policies has shifted the focus from streamlining administrative systems to encouraging citizen participation in both government services and their individual development. ICT plays a prominent role in newly introduced services as well as in the reimagining of ancient systems, although less so in the planning processes of transport projects that feature multiple stakeholders.

With large-scale city-wide urban developments such as transportation projects, citizen participation becomes merely a non-expert presence with limited access to highly technical data, thus demonstrating the persistent inequalities of power and knowledge (Shin and Lee 2017). This lack of interest in representation and inclusivity can likely be explained by the sheer scale of the project, its complex, long-term impacts on economic growth and its management at the metropolitan government level as opposed to the district and neighbourhood levels. It is in these latter communities, however, that smart initiatives are more often realised as they are generally incremental, more immediate and achievable in a much shorter timescale, making inclusivity a prerequisite for the promotion of successful sustainable living.

The focus of this chapter is the 'Making Seoul Safer for Women' project, which is run under the Zero Violence to Women policy, one of the many innovative and progressive policies adopted by the Seoul Metropolitan Government (SMG) from its ever-evolving, citizen-centric e-governance programmes. Women's safety is part of a broader approach that addresses citizen security issues in Seoul as the city seeks to enhance liveability, improve the quality of the

environment and develop the economy. These are all key components on the path to smart growth. The increase in reports of crimes against women, particularly after 2010, made females more fearful in both in their own neighbourhoods and in navigating the city at night. Addressing solutions to these problems has involved the development of a range of tools (including ICT and open data) to engage women in policymaking processes from genesis through implementation and into the ongoing processes of improvement reviews.

The chapter sets the stage with a brief overview of how the SMG's e-government infrastructure has developed from both traditional practices and an information society fuelled by Korea's ICT development policies. External factors such as corruption and financial crises have also influenced the direction and progress of e-government infrastructure. Then the chapter discusses the Making Seoul Safer Project, and focuses on how ICT has been used to enable inclusivity in e-government and to impact the everyday lives of Seoul's residents. SMG has only very recently promoted Seoul as a smart city; but this chapter will show that its urban environment has been smart for many years due to its innovative and inclusive approaches to e-government that have enabled the various stakeholders through the continuous adoption of the latest state-of-the-art ICT.

From e-governance to smart governance

Since 2003, Seoul has been ranked first in the world for its provision of e-government services. This ranking is based on usability, privacy, content, and service and citizen engagement (Holzer and Monoharan 2016). This has been achieved through many far-sighted policies enacted since the 1970s by both central and local governments in the fields of governance, education, support for industry and technological development. The city's reputation has also been accelerated by responses to major economic events such as the decline in manufacturing in the early 1990s, the Asian financial crisis of 1996 and the global financial crisis starting in 2008. Also significant is the Korean tradition (since the 1700s) of citizens being able to directly petition their leaders with civil complaints. Last but not least, a strong policy-driven leadership of Seoul, as personified by its mayors since the first democratic elections in 1995, was made possible by the granting of administrative autonomy to local governments in 1993.

Until the mid-1990s, civil petitions and civil complaints were handled by a Civil Petitions Desk under the auspices of the national Public Administrative Services. However, many aspects of these services were corrupt and run by career civil servants with no interest in change. Corruption was identified as the main cause of the series of deadly infrastructure collapses that occurred in Seoul and elsewhere in the 1990s (Kidd and Richer 2005, Marshall 2015). The issue of corruption in Seoul was tackled head-on by Goh Kun, the third mayor in the new democratic age, elected on an environmental and anti-corruption ticket. He served as mayor of Seoul from 1998 to 2002. As well as the expansion of the Seoul subway, greening policies and hosting the 2002 World Cup, his notable

achievements included policies for a transparent government free of corruption. This would result in Seoul's first e-government service in April 1999, the Online Procedures Enhancement for Civil Applications system (OPEN). OPEN was publicly accessible through its entire process, from acceptance of the initial proposal to its final approval. The public had the opportunity to monitor its progress online. It had broad implications because the services it offered affected the lives of most citizens in multiple ways on a regular basis. Progress updates were done during office hours, but applications could be made around the clock and hence, participation was relatively high (Bloomberg 2001).

The lessons learned from the establishment of OPEN by the SMG contributed greatly to subsequent enhancements and to the implementation of later e-government systems. The main lesson learned and taken on board by every mayor to the present is the importance of leadership in strong policy, together with the rapid implementation of transparent solutions utilising the latest technology. OPEN took less than a year from Goh's election to becoming a fully functioning Internet-based implementation. It was the first of many Citizen Participation Forums that featured strong elements of information and communication technology (ICT) from the late 1990s. In 2003, these were renamed Cyber Policy Forums (CPFs) and were converted from offline, face-to-face meetings that took place during office hours to forums accessible to citizens around the clock (Seoul e-Government 2003). Traditional complaint-based services were also placed online. This resulted in the creation of innovative and open offerings that addressed policy issues and extended their reach, and thus citizen participation in democratic government (Kim 2010).

Although the CPFs lightened the load for policy planners while educating citizens about urban issues, policy making processes were still an opaque closed shop (Cho and Chun 2011). Future systems had to be transparent and reach out to all city stakeholders, including those less familiar with ICT – such as the elderly, immigrants, visitors and commuters. The SMG attempted to address these shortcomings in 2006 with the introduction of the 'Oasis of 10 Million Imagination'. It aimed to expand the CPF services extensively, both in scope and uptake, by focusing on policies that would achieve a happy, safe and healthy citizenry, using tools that were based on the latest developments in ICT. The aim of these services was to extend beyond a reactionary, problem- and complaint-driven toolkit into one where the SMG could provide proactive and citizen-inclusive, change-driven offerings.

Over the next few years, Seoul's public services changed in orientation from government to governance, towards more democracy while building on earlier efficiency gains. Internet-based service delivery that was rapidly expanding in reach, capacity, availability and quality enabled more interaction when compared with the earlier one-way, in-person approach. With the explosive growth in mobile devices and wireless Internet use, a smart and socially interconnected society was emerging. They were using ICT in innovative ways and were looking to address long-standing social problems with access to data that they also helped to create (Suh 2005).

Innovation through ICT-enabled transparent government

The first policies addressing the specific needs of women in the capital were realised in 2007. Then-mayor Oh Se-hoon was elected on a design-centric ticket and launched the 'Women-Friendly Seoul' programme that included the 'Happy Women City' project under the slogan 'Happy Women, Happy Seoul'. This project concentrated on changes to the physical environment, and was later expanded to provide services to better suit women's needs. It was designed so that women would 'worry less about harassment or violence' in their day-to-day lives in the city, and spawned spaces such as rooms that provided free books and inexpensive coffee for women and time slots in local theatres for women-centric performances. Services such as women-only night-time taxis were also created. Physical changes included: the renovation of walkways in the many underground malls and passageways to make them more accommodating to women in high heels; repairs and upgrades to women's public restrooms; the creation of more female-friendly apartment complexes; and, to protect the modesty of women in short skirts, the installation of opaque glass on staircases in at least one subway station. Women-only parking zones, outlined in pink and marked by the international symbol for a woman, appeared around the city (**Figure 18.1**).

This programme was both lauded by the United Nations Public Administration (UNPAN) and heavily criticised domestically and internationally (Zaragovia 2009). Much of the criticism centred on the top-down, politically inspired nature of the underlying policy, one that did not address the real concerns of equality for women in society. Furthermore, the programme was severely impacted by a lack of ongoing funding, due in large part to the fallout from the 2008 global financial crisis. Its allocation in the city budget in 2010 fell to $41.76 million, in contrast to the $104 million designated at its launch in 2007 (Women News 2009). A more inclusive, cost-effective and far-ranging set of policies – constrained by a reduced budget – was now required. Oh Se-hoon was re-elected in 2010 with pledges that included policies to better address women's needs, specifically in the areas of child- and retiree-care, time-consuming areas that women were traditionally responsible for and kept them from being competitive in the wider job market. The planned expansion of the 2007 programmes included the provision of kindergartens, daycare centres and facilities for senior citizens.

However, a policy defeat forced Mayor Oh from office in 2011 before any changes could be fully enacted. Responsibility for addressing these requirements was assumed by the new mayor, Park Won-soon, a long-time social justice and human rights activist. In 2013, his first full budget year, South Korea was still 'an entrenched patriarchal society' where 86 per cent of all victims of violent crime were women (Koo 2016). In Seoul alone, 6,064 cases were reported annually (an average of 17 per day). Despite central government policies against sex crimes, they were seen as reactive, focusing on the punishment of offenders rather than attacking the root causes of the problem.

FIGURE 18.1 'Women-Friendly Seoul' walkway (top) and parking signage for women drivers (bottom).

Source: author.

Inclusive and transparent government for a safer Seoul for women

One of the key campaign pledges of Mayor Park Won-soon was to turn Seoul into a city of innovation, and a central element of his vision involved transparent government. This was to be achieved in three ways: improving municipal services with the use of big data; providing citizen access to city government data by making it more open; and conducting regular and rapid interaction with citizens through accessible channels such as smart phone apps (Thorpe and Gamman 2013). This was made possible by the 2013 Act on Promotion of the Provision and Use of Public Data that mandated public institutions to open up their data. This meant that data in any format that was owned, acquired or managed by a

public institution became public data (with the exception of data related to national security or classified as a citizen's personal information). These public datasets are registered on the Open Data Portal (www.data.go.kr). To make sense of the data released and to turn it into meaningful information for citizen use, SMG hosted hackathons to explore the data, create data dictionaries and develop smart apps. This resulted in a service-oriented government based on the latest ICT that would deliver customised services to both the public and businesses. One of those registered public datasets is the Seoul Transport Operation and Information Dataset. It contains bus and subway information and, by the end of 2015, over 2,500 smart apps had been developed, several with women's safety in mind.

As the main catalysts and sources of innovation, citizens were encouraged to present their ideas, opinions and insights to develop urban policies. The Seoul Innovation Bureau was established as the platform to enable such an interaction among the various stakeholders to identify problems, clarify issues and generate solutions. Policy making now adopted a more scientific approach. The bureau worked through theory, observation, hypothesis, testing and refinement to understand what worked, and then developed the appropriate applications. There is evidence that many such policy proposals have emerged, been debated and discussed, filtered and eventually adopted as policy (Puttick *et al.* 2014). Six policy areas in particular – gender equity, job availability, health, zero violence, birth and childcare, and living well together – were formulated to improve the lives of women in Seoul. These policies, produced with a high degree of citizen participation from conception to enactment, have generated ten major projects, each underpinned by the appropriate use of elements of smart technologies.

One of the projects under the zero-violence policy, 'Making Seoul a Safer City for Women', is designed to tackle the problems of serious sexual assault and the lack of empathy towards women in wider society. The project provides a preventative, gender-based approach that began with a 'policy workshop on tour' to collect input from citizens who elaborated on the very real problems faced by South Korean women in their daily lives, such as being molested on public transport, being sexually harassed by males in the workplace and being attacked in the streets late at night. SMG took this initiative from the relatively closed bailiwick of women's organisations and pushed it into the wider public by using the power of social media and social policy to gain broader input from the public and experts in the field. This approach took the problem from being one focused on outcomes to one focused on prevention. It encompassed education, neighbourhood organisation, networking, local data, feedback and the provision of suitable tools such as mobile apps. It became the 'first participatory policy against sexual violence in Korea' (Seoul Solution 2015).

SMG was now determined to make the reduction of sexual violence in public spaces part of citizen-inclusive policymaking. To better gauge the scale of the problem in Seoul, SMG conducted field interviews with sex-crime victims, held town hall meetings to gather opinions and used interviews with police and statistical analysis of their data to confirm the severity of the problem and where

it was happening and when, and to uncover the lack of empathy for its victims from the authorities and wider society (Strother 2013). All these activities took place between December 2012 and February 2013, leading to the announcement by Mayor Park Won-soon on 6 March 2013 of the Comprehensive Plan for the Prevention of Sexual Violence (CPPSV).

Nationally, statistics suggest a huge rise in rape cases after 2010. In that year, there were 671 reported cases of sexual assault on the Seoul subway. That number rose to 1,192 in the first six months of 2011 (Kulik 2011). The steep rise in reported assaults can be attributed, in part, to legislation introduced that year, notably the Act on the Prevention of Sexual Assault and Protection of Victims Thereof. The law encouraged the reporting of these crimes by compelling the authorities to pursue cases irrespective of the wishes of the victims – or, more accurately, the wishes of those who put pressure on the victims to drop their cases. Other developments would further encourage reporting, such as measures taken to revise school violence prevention programmes (Lee 2013). Social media, too, was prominent in uncovering abuse by providing a forum for the exchange of information. Despite the increase in reporting, many more incidents went unreported. The United Nations Department of Economic and Social Affairs (DESA) reported in 2015 that almost 1 in 5 women in South Korea said they had experienced sexual violence (United Nations 2015: 145).

A three-pronged approach to safety

The 'Making Seoul a Safer City for Women' project is managed by the Seoul Women's Association in partnership with SMG's Health and Welfare Committee. Emphasising a 'prevention is better than cure' philosophy, SMG approached the problem of safety on three fronts:

1. public awareness through a long-term programme to elevate the issue of violence against women and tackle it with quality solutions;
2. development of a city-wide, community-based security network using the latest Crime Prevention through Environmental Design (CPTED) techniques and tools; and
3. the development of an effective reporting system in collaboration with citizens and NGOs for faster police response to reported incidents.

The public awareness approach is largely strategic, long term and proactive, and is designed to modify entrenched misogynistic attitudes by emphasising that crimes against women are a human rights violation, and to 'dispose of the stereotype that women must be protected and that men must do the protecting' (Women's Network Forum 2016). The problem is being tackled, first, through public education programmes, and then through changes to public policy and legislation with the support of the increasingly better-informed citizenry. Long-term

education includes classes for the young and public service workers, children and teenagers to foster healthy attitudes towards sex and to emphasise the rights violations inherent in sexual violence; and for groups including transit workers and the police, who are undergoing gender-sensitivity training.

One of the project's early deliverables included collaboration in 2014 with the UNNI Network (a South Korean feminist NGO) to produce a guidebook called *PLAN B*. It is aimed at unmarried women, a rapidly rising demographic where single-occupancy households accounted for 16 per cent of total households in Seoul in 2015, while nationally, 40 per cent of adults were single. Furthermore, the average age at which women got married rose to 30 in 2015, from 25 in 1995. And all of this occurred in a country that is near the bottom of Organisation for Economic Co-operation and Development (OECD) countries with respect to birth rates. The guide includes advice on subjects ranging from dealing with patriarchy to lifestyle choices and personal safety (Economist 2015).

The environmental and community-building approach, while still emphasising the strategic, includes more tactical elements to deliver results over a shorter period when compared with the public-awareness programmes. Its aim is to give women rights to public spaces while being balanced with a community viewpoint about what is cost effective and technologically feasible. One of its earliest achievements was the Safe Parcel Delivery Service for Women, which was initiated due to the high number of sexual assaults by fake delivery personnel on single-women households. Introduced in June 2013, 50 locations were set up where women could have their parcels delivered safely. The service was expanded by a further 50 locations in 2014, due in part to requests received through the citizen complaint system.

The general focus of this segment of the project is on areas where street crime is highest, typically long-established neighbourhoods with older housing, ageing or obsolete infrastructure, poorly lit thoroughfares and other environmental features that encourage crime. SMG's long-term plan includes the redevelopment of these areas, and to include crime prevention in their redesign. In the meantime, to make the existing environment safer, a combination of technology, social engineering methods and CPTED is being deployed to counter the relatively low investments in public infrastructure in those areas. Some actions were quickly initiated city-wide by SMG, such as emergency buttons, IP (digital video) cameras linked to local police stations, and the ongoing installation of or upgrade to existing street lights with LED technology to better illuminate dark and intimidating thoroughfares.

The first CPTED project in Seoul was launched in 2012 and was judged a success the following year by the Korean Institute of Criminology (Park 2013). The participants in the original project shared their expertise on how community and neighbourhood residents can jointly design solutions specific to the concerns of their own communities; on how to create interventions that are cost effective and sustainable due to their collaborative nature; and on the positive impact this has on the development of relationships between neighbours. Mayor Park refers

to this as the concept of harmony. The former top-down approach of experts as consultants and communities as users was gone. The 'designing out crime and designing in residents and their desires' requires a consultative approach that includes as many residents as possible to produce 'outcomes more holistic than solely focusing on the reduction of crime' (Thorpe and Gamman 2013: 213). A safety network for women has now been created using this approach, with local education and awareness programmes, that involves volunteers recruited city-wide to escort women home late at night and to patrol neighbourhoods under the 'Safer Neighbourhoods for Women' programme.

Local businesses also play an active and growing role in their communities. For example, an increasing number of 24-hour convenience stores (whose main customer base is the single-person household) are providing safe spaces for women following a February 2014 agreement between SMG and the convenience store trade association that represents over 600 stores. Designated as interim shelters, each is staffed by personnel trained in dealing with certain emergency situations, and is equipped with CCTV and hotlines that activate local police callout via emergency buttons or off-hook phones in the stores. Local neighbourhood patrols and the police are updated regularly with information pertaining to the stores. This programme features close cooperation between SMG, local organisations and citizens, with locals encouraged to report abuses in their neighbourhoods. The city plays a major role in providing the financing for this programme as well as material and personnel support for the implementation of each neighbourhood's local community-tailored safety measures. With this programme:

> Seoul City has lowered rates of violence against women to an extent it could not have just using surveillance cameras alone … this program represents a radical turn to grassroots civic participation in municipal policy-making … [it] is a citizen demand met through government action.
>
> *(Seoul Solution 2015)*

The two approaches described above – awareness and socially driven neighbourhood design – aim at sustained reduction in crimes against women. By mid-2017, the project had implemented the safe delivery service for single women, the women-only taxi service, women's safety networks in neighbourhoods and on public transit, improved street lighting citywide, and integrated control centres in each of the city's 25 districts. SMG runs a Social Media Centre, holds weekly discussion forums and organises mayoral on-site visits (Kim *et al.* 2015) that are intended to shape the city's policies with the active participation of women. Opinions are gathered both offline, in traditional face-to-face forums, and online using the ever-improving CPF services and social media tools and techniques deployed by Mayor Park in his election campaign. With other developments such as the provision of open big databases that facilitate ever-increasing micro-level analysis, a strong foundation is in place on which to build robust and effective predictive and reporting systems.

However, incidents still occur, and dealing with these is the focus of the third leg of the project. In a 2016 study by the Thomson Reuters Foundation and YouGov, Seoul's public transportation system was ranked the 12th most dangerous big city system for women, less safe than those in London and New York (Bruce-Lockhart 2016). Harassment is particularly evident on public transport, notably the subway. It is a particularly hard nut to crack and, ironically, is getting worse because of increased use of smartphones in these crimes. Of those incidents reported (and many are not), 148 men were convicted of sexually harassing women in 2016, an increase of 17 per cent since 2015 (Shin 2017). A number of apps have been developed, each addressing different aspects of women's safety in the city. They include tools to help reduce anxiety for public transit users, to provide services for safe home escort services and to report incidents that occur.

One simple but effective tool that this policy spawned is 'The Beacon'. This is a wireless personal area network running on a smart device's Bluetooth Low Energy protocol that communicates with beacons installed across Seoul's transportation network. It is the same underlying technology that helps blind people navigate the Underground stations in London and helps New Yorkers estimate the arrival times of their subway trains. It determines the user's exact location, and then automatically generates and sends a text message to a nominated recipient, such as a family member, when the carrier gets on or off a bus. The message includes the time, location and registration number of the vehicle used. The app is freely available for download, and by June 2017 it had over 2,000 users.

SMG is also providing a free walk-safe app service based on a Social Network Service (SNS) platform called 'The Subway Safekeeper'. The service was started in 2013 on a limited number of routes and was then expanded network-wide in 2015. Women who use the subway or bus between 10pm and 1am can make a call before arriving at their destination station. This guarantees that when the caller gets to the station, at least two staff members will be waiting to escort her home. The service is supported by over 500 people recruited in each district of Seoul. Upgraded at the start of 2015, in addition to the walk-home service, the app features a complaints segment that allows users to report incidents of sexual harassment, emergencies and other types of trouble such as assaults and fights. General complaints are also catered for, ranging from environmental conditions (heating, lighting, noise) to illegal trading and begging. The app also integrates with other subway-related services, including bicycle storage and bus and mainline train connections.

User interaction has been minimised so that any problem can be reported rapidly, either by shaking the smart device or by pressing a 'big button'. For example, Bluetooth or Wi-Fi on the user's smartphone can be automatically enabled to identify their exact location or the location of reported complaints when boarding the train. Details about the complainant are deduced from their mobile carrier data. Response times to incidents have been reduced significantly since the app's introduction. Previously, an incident call took between 20 and 30 minutes to process as every complaint was handled by a centralised call centre.

Now, the average response time is under 9 minutes as the app automatically determines the user's current location down to carriage level from the train's Wi-Fi information and calls the nearest station listed in the police location database. This app is a mobile version of the automated call-out service embedded in the CPTED areas where emergency buttons, IP cameras and LED technologies are deployed, effectively covering the city's blind spots. In its first three months of availability, the app was downloaded almost 13,000 times. In that period, there were 197 cases of disorderly behaviour, 176 reports about temperature, 61 other environmental complaints, 50 cases related to announcements and 4 cases concerning sex crimes and related emergencies. By June 2017, the app had been downloaded over 50,000 times from Google's Play Store.

Until recently, the sheer number of reporting tools with their different emphases on various aspects of the technology – both in the users' hands and in their use of underlying function and infrastructure – has led, in part, to patchy service quality. Some of these tools were so badly designed that any temporary failure in, say, network connectivity resulted in the loss of all accumulated user data and the location of the incident (KOJECTS 2016). This would inevitably lead to poor or non-existent response times from law enforcement. More fundamentally, a lot of the tools have come to market before suitable support infrastructure has been developed, or they did not account for ongoing infrastructure improvements. For example, a number of these apps utilised the older and slower centralised call centre network while ignoring the latest localised networks. Other problems arose, notably in the staffing of walk-safe services and in managing the ongoing social aspects of the various programmes. In short, the project required some tweaking.

To this end, SMG implemented 'Safe City for Women 2.0' in 2016 (SMG 2016). This upgrade has: extended the number of safe mail boxes citywide; tightened the women's safety scout service; increased the number of safety shelters for women; strengthened the social aspects of the CPTED programme and added more neighbourhoods for redesign; replaced older lighting with LEDs while reducing light pollution; and, in the transit system, added security staff in the subways and extended area coverage of the safety services. They have also extended the scope of the original project to include dealing with impacts of natural disasters, introducing programmes that will increase the engagement of women in policy; and, significantly, they have introduced a centrally coordinated smartphone app, Ansimi, for use in emergency situations.

Conclusions

Smart governance has in the last few years been recognised as a key feature of the smart city whereby advanced ICT infrastructure is credited with enabling increased participation and collaboration between governments and residents, resulting in more efficient decision-making (Noveck 2015, Kitchin 2017). At a fundamental level, participation is about reforming public institutions through

reforming citizen–government relations (Noveck 2016) that in turn can initiate citizen-centric policies aimed at addressing pressing everyday challenges. This is something that ICT infrastructure alone cannot achieve.

As this chapter has demonstrated, Seoul Metropolitan Government's e-government policy development, built on decades of national ICT-related policies, has focused on transforming the relationship between citizens and government by improving traditional practices and introducing new services to realise visions that make the city globally competitive. The implementation of forward-looking policies and fast adoption of the latest technology has deepened the trust in the mayoral leadership, especially as he demonstrated both his willingness to listen to the people and address their concerns through immediate action. Crucially, this has also translated to the continuous improvement of the quality of policymaking by engaging more with stakeholders, including groups previously excluded, such as women and expatriates – something made possible through the multi-level mode of governance embracing districts and neighbourhoods, and the continuous commitment to broad participation.

The 'Making Seoul Safer for Women' project illustrates the appropriate use of ICT by strong and committed leadership, by mayors since 1995 with visions to create a liveable city with happy residents. Early on, SMG recognised that this could only be achieved by investing both in their citizens and in their governing system. Today, this system elevates women – previously subordinate in a largely conservative and patriarchal society – to where they can now be instrumental in the formulation, funding, implementation and ongoing improvement of policies. This moves them from earlier simplistic, participatory processes to a current commitment to realise crime-free environments as they forge new partnerships through participatory budgeting.

E-governance in Seoul is credited with improving the lives of women. They certainly feel safer in the areas where the projects have been running, according to various qualitative surveys and police data on emergency callouts (Seoul Solution 2015). Surveys that use quantitative methods, though, show little variation in serious crime in both the neighbourhoods targeted by the projects and in surrounding areas. However, the sense of wellbeing can be attributed to a combination of: the more socially aware neighbourhoods; the opening up of big databases; the tactical, localised, placement of smart sensors – both Internet of Things (IoT) based and mobile – and emergency response centres; and the ever-growing roles that women play in decision-making in their neighbourhoods and districts.

Since 2013, Seoul's citizens have had a say in how an increasing portion of the city's budget is to be spent. Given the demographics relating to the number of women in Seoul and their ever-growing engagement in its policymaking, it is expected that more of the budget will be allocated to their programmes. An all-female Gender Equality Committee regularly reviews and monitors the project for SMG, which in turn holds gender governance meetings with citizens, NGOs, experts in violence against women, and other women's and children's

groups. These measures were taken long before SMG officially adopted its smart city strategy in 2015.

Smart governance continues to play a fundamental role in the creation of a liveable city for the citizenry, at least at the district level, as locals can decide on immediate small-scale development. Participatory budgeting remains localised, exposing challenges that the current horizontal mode of governance amplifies; as do the inequities of power and knowledge between the different districts and the role they play in Seoul's economic growth and global competitiveness. It will be necessary to envisage new modes of innovation and collaborations that will make the city spatially as well as socially inclusive.

References

Bloomberg. 2001. Goh Kun, Mayor, Seoul. *Bloomberg Business Week*, 1 July 2001. [Online]. Available: www.bloomberg.com/news/articles/2001-07-01/goh-kun [Last accessed 22 October 2017].

Bruce-Lockhart, A. (2016). Which cities have the most dangerous transport systems for women? *World Economic Forum*, 17 March 2016. [Online]. Available: www.weforum.org/agenda/2016/03/which-cities-have-the-most-dangerous-transport-systems-for-women/ [Last accessed 16 May 2017].

Cho, J-S. and Chun, S.A. (2011). Towards transparent policy decision making process: a case study for Seoul Metropolitan Government. In S.A. Chun, L. Luna-Reyes and V. Atluri (eds), *The Proceedings of the 12th Annual International Conference on Digital Government Research*. College Park: University of Maryland, 219–224.

Economist. (2015). I don't: South Korea's singletons. *The Economist*, 23 July 2015. [Online]. Available: www.economist.com/news/asia/21659768-more-women-ditch-or-delay-marriage-men-tie-themselves-knots-i-dont [Last accessed 15 July 2017].

Gabrys, J. (2014). Programming environments: environmentality and citizen sensing in the smart city. *Environment and Planning D: Society and Space 32*: 30–48.

Healey, P. (2005). *Collaborative Planning: Shaping Places in Fragmented Societies*. Basingstoke: Palgrave Macmillan.

Hemment, D. and Townsend, A. (eds) (2013). *Smart Citizens*. FutureEverything. [Online]. Available: http://futureeverything.org/ideas/smart-citizens-publication/ [Last accessed 10 April 2017].

Hill, D. (2013). On the smart city: or, a 'manifesto' for smart citizens instead. [Online]. Available: www.cityofsound.com/blog/2013/02/on-the-smart-city-a-call-for-smart-citizens-instead.html [Last accessed 20 July 2017].

Hollands, R.G. (2008). Will the real smart city please stand up? *City 12*: 303–320.

Holzer, M. and Manoharan, A. (2016). *Digital Governance in Municipalities Worldwide (2005–2016)*. Newark, NJ: E-Governance Institute, National Center for Public Performance, Rutgers University. [Online]. Available: https://spaa.newark.rutgers.edu/sites/default/files/files/EGov/Publications/Digital%20Governance%20in%20Municipalities%20Worldwide%20(2015-16).pdf [Last accessed 16 July 2017].

Huxley, M. (2000). The limits to communicative planning. *Journal of Planning Education and Research 19*: 369–377.

Innes, J. and Booher, D. (2010). *Planning with Complexity: An Introduction to Collaborative Rationality for Public Policy*. London: Routledge.

Kidd, J. and Richer, F.-J. (2005). *Infrastructure and Productivity in Asia*. London: Palgrave Macmillan.

Kim, J., Rim, S., Han, S. and Park, A. (2015). Seoul City's social innovation strategy: new models of communication to strengthen citizen engagement. In A. Nicholls, J. Simon and M. Gabriel (eds), *New Frontiers in Social Innovation Research*. New York: Palgrave Macmillan, 170–191.

Kim, S. (2010). Collaborative governance in South Korea: citizen participation in policy making and welfare service provision. *Asian Perspective 34*: 165–190.

Kitchin, R. (2017). Data-driven urbanism. In R. Kitchin, T. Lauriault and G. McArdle (eds), *Data and the City*. London: Routledge, 44–56.

KOJECTS. 2016. Safe walking app increases personal safety. Blog entry, 20 October 2016. [Online]. Available: http://kojects.com/2016/10/17/safe-walking-app-for-personal-safety/ [Last accessed 1 October 2017].

Koo, S-W. (2016). South Korea's misogyny. *New York Times*, 13 June 2016. [Online] www.nytimes.com/2016/06/13/opinion/south-koreas-misogyny.html [Last accessed 10 May 2017].

Kulik, M. (2011). Sexual assault in Seoul on rapid rise. *Three Wise Monkeys*, 20 June 2011. [Online]. http://thethreewisemonkeys.com/2011/06/20/sexual-assault-on-the-rise-in-seoul/ [Last accessed 25 July 2017].

Lee, J.H., Hancock, M.G. and Hu, M-C. (2014). Towards an effective framework for building smart cities: lessons from Seoul and San Francisco. *Technological Forecasting & Social Change 89*: 80–99.

Lee, H.-J. (2013). Seoul's teenage sex crime rates soars. *Korea Herald*, 26 November 2013. [Online]. Available: www.koreaherald.com/view.php?ud=20131126000798 [Last accessed 20 August 2017].

Marshall, C. (2015). Learning from Seoul's Sampoong department store disaster. *The Guardian*, 27 May 2015. [Online]. Available: www.theguardian.com/cities/2015/may/27/seoul-sampoong-department-store-disaster-history-cities-50-buildings [Last accessed 10 July 2017].

Noveck, B.S. (2015). *Smart Citizens, Smarter State: The Technologies of Expertise and the Future of Governing*. Cambridge, MA: Harvard University Press.

Noveck, B.S. (2016). Re-imagining government through civic media: three pathways to institutional innovation. In E. Gordon and P. Mihailidis (eds), *Civic Media: Technology, Design, Practice*. Cambridge, MA: MIT Press, 149–164.

Park, K.-R. (2013). *Preliminary Analysis on the Effectiveness of Seoul City CPTED Project*. Korean Institute of Criminology. [Online]. Available: https://eng.kic.re.kr/brdartcl/boardarticleList.do?brd_id=BDIDX_736t9S87ryDqxzPmkp5987&srch_menu_nix=w5mg0hj7&srch_mu_site=CDIDX00002&srch_mu_lang=CDIDX00023&add_info_02=CDIDX00085 [Last accessed 20 July 2017].

Puttick, R., Baeck, P. and Colligan, P. (2014). *I-Teams: The Teams and Funds Making Innovation Happen in Governments around the World*. Nesta. [Online]. Available: www.nesta.org.uk/publications/i-teams-teams-and-funds-making-innovation-happen-governments-around-world [Last accessed 10 July 2017].

Seoul e-Government. (2003). *Cyber Policy Forum: Cyber Acropolis for All Citizens*. UNPAN 2003. [Online]. Available: http://unpan1.un.org/intradoc/groups/public/documents/other/unpan022095.pdf [Last accessed 10 July 2017].

Seoul Metropolitan Government (SMG). (2016). *Women's Safety Metropolitan City 2.0*, 21 February 2016. [Online] Available: http://english.seoul.go.kr/policy-information/policy-focus-for-2016/womens-safety-metropolitan-city-2-0/

smarter-comprehensive-womens-safety-metropolitan-city-2-0/ [Last accessed 20 May 2017].

Seoul Solution. (2015). Fighting violence against women: Making Seoul Safer City for Women Project. [Online]. Available: www.seoulsolution.kr/en/content/fighting-violence-against-women-making-seoul-safer-city-women-project [Last accessed 6 July 2017].

Shin, H. and Lee, K. (2017). Participatory governance and trans-sectoral mobilities: the new dynamics of adaptive preferences in the case of transport planning in Seoul, South Korea. *Cities 65*: 87–93.

Shin, P. (2017). Police warn about sexual crimes on subway. *Korea Herald*, 23 July 2017. [Online] Available: www.koreaherald.com/view.php?ud=20170723000225 [Last accessed 23 July 2017].

Snyder, N., Hernandez, E., Maxwell, L., Hester, S. and Kapucu, N. (2012). Metropolitan governance reforms: the case of Seoul Metropolitan Government. *European Journal of Economic and Political Science 5*: 107–129.

Strother, J. (2013). South Korea struggles to confront stigma of sexual assaults. *Wall Street Journal*, 25 October 2013. [Online]. Available: www.wsj.com/articles/south-korea-struggles-to-confront-stigma-of-sexual-assaults-1382601988 [Last accessed 20 July 2017].

Suh, S.Y. 2005. Promoting citizen participation in e-government, 30 March 2005. [Online]. Available: http://unpan1.un.org/intradoc/groups/public/documents/un/unpan020076.pdf [Last accessed 10 July 2017].

Thorpe, A. and Gamman, L. (2013). The Seoul Innovation Bureau and its 'Sharing City' initiative: case study. *Centre for Public Impact*, 6 April 2016. [Online]. Available: www.centreforpublicimpact.org/case-study/seoul-innovation-bureau [Last accessed 23 September 2017].

United Nations. (2015). *The World's Women 2015: Trends and Statistics*. New York: United Nations, Department of Economic and Social Affairs. [Online]. Available: https://unstats.un.org/unsd/gender/downloads/worldswomen2015_report.pdf [Last accessed 10 March 2018].

Viitanen, J. and Kingston, R. (2014). Smart cities and green growth: outsourcing democratic and environmental resilience to the global technology sector. *Environment and Planning A: Economy and Space 46*: 803–819.

Women News. (2009). 2010 Seoul women's budget only 0.31% of city's total, *Women News*, 11 December 2009. [Online]. Available: www.womennews.co.kr/news/view.asp?num=42465 (in Korean) [Last accessed 8 August 2017].

Women's Network Forum. (2016). Building inclusive and safer cities for women: final report. *The 2nd Asian Women's Network Forum*. [Online]. Available: www.metropolis.org/sites/default/files/media_root/publications/final_report_building_inclusive_and_safer_cities_for_women.pdf [Last accessed 25 May 2017].

Zaragovia, Veronica. (2009). Will high-heel-friendly streets keep Seoul's women happy? *Time*, 5 August 2009. [Online]. Available: http://content.time.com/time/world/article/0,8599,1914471,00.html [Last accessed 8 August 2017].

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CONCLUSIONS

The long and unsettled future of smart cities

Andrew Karvonen, Federico Cugurullo and Federico Caprotti

The future (and past) of smart cities

The contributions to this volume situate the processes of smart urbanisation in particular material, social and political contexts. The experiences from Seoul, Dublin, Philadelphia, Cape Town and elsewhere reveal how the smart agenda is unavoidably bound up in the governance of cities, existing material and social conditions, and messy processes of translating ambitious visions into real-world applications. Smart urbanisation is neither universal, apolitical nor straightforward. So what is next for smart cities? Where do we go from here?

Many advocates of smart urbanisation suggest that the fully connected and digitalised future is just around the corner. The digital technology exists; technology providers are willing and eager to install it; and we are on the cusp of a fully integrated, networked and efficiently managed city. Smart is fuelling a global competition to see which city can be the first to optimise its various collective functions and claim the title of 'the world's smartest city'. The contributions to this volume tell a different story, and suggest that the embedding of ideas and practices of smart in particular contexts will be a long-term endeavour (Cowley *et al.* 2018). As Carvalho (2015: 56) notes, 'transitions are not races but marathons'. The technical, financial and practical barriers to digitalising cities pale in comparison to the larger reality that cities change slowly. The infrastructures and institutions that comprise the built environment tend to resist rapid disruption and change (Hommels 2005, 2008). Thus, the digitalisation of the built environment, while intriguing, will not occur as quickly as the digitalisation of our workplaces and domestic lives. We are closer to the beginning of the smart city journey than to its endpoint.

While smart cities promise different futures, we should also be looking to the past from a broad historical perspective (Gandy 2018). A handful of authors have

traced the origins of smart back to the 1960s, using notions of 'wired', 'cyber', 'digital' and 'intelligent' cities (e.g., Graham and Marvin 1996, 2001, Söderström *et al.* 2014, Vanolo 2014, Kitchin 2015, Picon 2015). This builds upon a longer history of developing scientific approaches to analyse and manage cities (e.g., Fairfield 1994, Light 2003) and demonstrates how the notion of rationalising and optimising has been a long-standing goal for various urban actors. For example, this was a prominent discourse during the urban infrastructure-building era in North American and Northern European cities of the mid- to late-nineteenth century (Hall 1988). At that time, debates about the future of the city were embodied in the design and construction of networked infrastructure services for water, wastewater, transport and energy (e.g., Schultz and McShane 1978, Dupuy and Tarr 1988, Melosi 2000). Negotiations over technological choices, financial models, the role of technical experts and related issues resonate with today's smart cities debates. At the same time, smart has revived technologically deterministic thinking, municipal boosterism, urban competitiveness and the potential for private actors to provide collective urban services. From this perspective, smart is the latest in a long line of sociotechnical dramas that have fuelled urban development debates for centuries.

Scaling up, scaling down

In addition to the historical parallels with smart urbanisation, scale is a ubiquitous presence in the rollout of smart technologies. The contributions to this volume demonstrate how smart is manifested at different scales – buildings, districts, neighbourhoods, infrastructure networks, cities and regions – while also having connections to multiple national and international consortia. The networked character of smart city knowledge and practice is fundamental to notions of scaling up, replicating, transforming, seeding, rolling out, breaking through, transferring and so on (Evans *et al.* 2016). Contemporary smart city interventions continue to be patchy, and it remains to be seen how and when they will be implemented across an entire city or region. The ubiquitous and universal digital world promoted by smart city advocates continues to be far from reality.

It is also possible that the universal and ubiquitous smart city may never arrive. Even if it were technically and financially feasible to create a fully networked city or city-region, it is not clear if the various urban stakeholders actually want this (Sennett 2012, Hollands 2015). There are emerging indications that smart urbanisation is being used to reinforce the variegated landscapes of cities (McFarlane and Söderström 2017, Cugurullo 2018, Karvonen 2018). As Luque-Ayala and Marvin (2015: 2108) argue, smart urbanism 'may serve to further deepen the splintering of urban networks that dominated the last part of the twentieth century for many cities, creating deep divides between those with access to "smart" and those without'. Thus, smart has the potential to produce a two-speed city that may further exacerbate existing socio-spatial patterns of inequality and deprivation (Graham 2002, Hollands 2008, Allwinkle and Cruickshank 2011, Martin

et al. 2018). Thus, we need to debunk the idea that smart cities are apolitical and inherently equitable. The benefits of smart will not automatically be distributed to all residents equally (Glasmeier and Christopherson 2015, Hollands 2015). We need to ask fundamental questions about how different groups of urban residents benefit from smart urbanisation; how we can include technologically illiterate and marginalised groups; and how we can devise smart interventions that benefit them first and foremost (Vanolo 2014, McFarlane and Söderström 2017).

Moreover, there are important lessons to learn about how smart initiatives travel, and how they are adapted and applied, in other places. This is related to the policy mobilities literature, and involves knowledge transfer through networks and exchange (e.g., Peck and Theodore 2010, McCann 2011, McCann and Ward 2012, Baker and Temenos 2015, Crivello 2015). As March and Ribera-Fumaz argue (this volume), there is a need to be mindful of international networks and how they connect the local with the global. Smart is often couched in terms that 'speak to' global agendas and global logics (such as international policymaking and corporate imperatives), while on-the-ground projects and materialisations of smartness are decidedly local.

In addition, Haarstad (2016: 3) argues that smart 'promises to open up new modes of cross-sectorial collaboration, new forms of problem-solving, and new governance models'. There are frequent references to the notion of the triple helix (and, more recently, the quadruple helix) that embodies a relational approach to design and manage cities. Participatory and collaborative planning models that have been developed over decades can provide inspiration and guidance for how the different partners can come together. Goodspeed (2015: 88) advocates for collaborative planning approaches, noting that 'grounded in theories of negotiation and consensus, collaborative planning seeks to integrate technical analysis into a discussion among stakeholders about what should be done.' Here, there is a need to be attentive to the power dynamics of partnerships, but also the potential for using smart to bring together various urban stakeholders to work towards shared goals.

The collaborative character of smart urbanisation provides multiple opportunities to learn about urban lifestyles and the broader metabolism of cities (McFarlane 2011, McFarlane and Söderström 2017). This type of learning, however, is not only about compiling big datasets and providing real-time monitoring of urban conditions; it is about the exchange of ideas. Learning occurs through devising new systems, altering existing urban functions and circulations, and collaborating to integrate the social and the technical in beneficial ways (Campbell 2012, McFarlane and Söderström 2017). This suggests that the integrative potential of smart cities is not only technical but also social.

Smart scales up from testbeds, districts and neighbourhoods to cities and regions; but it also scales down as it is tailored to individual lifestyles (Gabrys 2014, 2016, Gardner and Hesphanol 2018). With the rollout of smart services, there is a need to develop empirical accounts for how people appropriate digital tools and techniques to fit their multiple routines. Here, we are likely to see

significant variation as individuals modify smart programmes to fit their daily activities (Rose 2017). This could again have the most significant impacts on the poorest communities. Digital technologies have already enabled 'leapfrogging' with mobile telephones, social networking, e-banking and the like; but it is unclear if smart can be applied to make tangible improvements to the lives of the disadvantaged.

Devising and implementing alternative visions of the smart city

The insights from the contributors to this volume show a diverse range of ways that smart is being enacted on the ground. Collectively, they illustrate the inevitable messy reality of digitalising cities through recursive, two-way processes of sociotechnical change (Kong and Woods 2018). Here, it is important to remember that smart technologies are agnostic or ambivalent. They can be used for a wide range of political and social purposes, both regressive and progressive (Feenberg 2002, Nye 2007, Hollands 2008). As Goodspeed (2015: 86) notes, smart urbanisation 'can evolve in quite different directions'. It is this interpretive flexibility that provides opportunities to devise alternative pathways for smart cities. This requires us to shift our gaze from the technologies themselves to how they are being selectively tailored and applied in particular contexts, and the resulting political, social and cultural implications. In all cases, there is a need to start with urban problems rather than with technological solutions (de Lange and de Waal 2013, Hollands 2015). Smart technologies need to be put to the service of society rather than vice versa. Otherwise, smart cities simply become a tool for elites to support economic growth (Cugurullo 2013, 2016, Caprotti 2016). Defining the problem at hand is a critical but often overlooked step in imagining alternative and inclusive smart futures.

One promising turn of events for many is that the smart city, as a discourse and a practice, has gone beyond neoliberal, corporate agendas that were prominent a decade ago. Hollands (2015: 70) notes that:

> [The] lack of concern with democratic decision-making and real citizen involvement, participation and control of most smart city projects have led urban critics to search for different ways to think about smartness and to explore smaller scale, community-based and more socially progressive uses of new technologies.

This places a greater emphasis on non-corporate actors – including local governments, civil society organisations and local businesses – to steer smart towards more progressive change in cities (Glasmeier and Christopherson 2015, March and Ribera-Fumaz this volume). The recent turn towards the people-centric or citizen-led smart city raises intriguing questions about how residents can be involved in the steering of smart urbanisation agendas (Glasmeier and Nebiolo 2016, Trencher forthcoming).

While it is clear that urban residents are not simply consumers of smart services, ensuring that they have a say in how smart is rolled out continues to be a work in progress (Cowley *et al.* 2018, Kitchen *et al.* this volume). The work on technological democracy can be helpful here to suggest ways in which the smart city can be defined and governed by citizens rather than elites (Callon *et al.* 2009, Farías and Blok 2016). There are also parallels with constructive technology assessment from the 1980s and 1990s, as well as with the current agenda of Responsible Research and Innovation (Burget *et al.* 2017). This involves the conscious steering of technology to maximise benefits while minimising risks. This approach is nascent in smart initiatives and has promise to create digitalised cities that are underpinned by progressive political and social goals.

Local governments, civil society groups and local businesses are increasingly active in shaping smart city agendas, suggesting a more pluralistic development of digital urban futures. At the same time, alternatives to the corporate smart city continue to be under-articulated. As Hollands (2015: 74) provocatively asks, 'Can we afford not to consider different ideas of smartness beyond the corporate form?' Here, we might draw on the diversity of initiatives that have flourished under the banner of sustainable urban development to counter the dominant ideas about efficiency, pollution prevention and green growth. Sharing economies, maker spaces, Transition Towns and grassroots innovation can all serve as inspirations for new ways to interpret smart technologies. There is a need for sceptics and critics to take an active role in not simply revealing the dangers and risks and downsides of digitalising the built environment, but also in constructing alternatives (Glasmeier and Christopherson 2015, March and Ribera-Fumaz 2016, Tironi and Sánchez Criado 2016, McFarlane and Söderström 2017).

Conclusions

The dawn of the smart city raises fundamental questions about the relationship between the civic and the urban (Mitchell 1995). How do we want to conduct our lives in the twenty-first century city and how can information and communication technologies (ICT) facilitate this? Smart urbanisation will undoubtedly produce fundamental changes in the ways that cities function and how they are experienced in the coming decades. The futures promoted by dominant smart city advocates are not the only ones that are possible. Reflecting on smart cities, Shelton and colleagues (2015: 22) argue that: 'The problem is less with data, per se, and more with the uncritical, ahistorical and aspatial understandings of data often promoted within smart city imaginaries, themselves recycled from earlier attempts to make urban studies and planning "more scientific".' Thus, the pursuit of the 'actually existing smart city' is an attempt to situate smart urbanisation spatially and temporally while taking a critical stance towards these changes.

This collection is a first attempt to reflect on how smart city initiatives are being realised in different locales. There is much more to do here in developing a comparative research agenda while also trying to steer it in directions that are

socially equitable, environmentally friendly and economically robust. Glasmeier and Christopherson (2015: 11) call on smart stakeholders to take a proactive role in the digitalisation of cities, arguing that:

> We have to be willing and able to get in, roll up our sleeves and discover how new applications and technologies can be used to genuinely improve the quality of urban life. Otherwise, we can't complain we were locked out of this moment.

Thus, the future of smart cities needs to be informed not only by feats of technical wonder but also by the reinvention of social and political dynamics that define cities. By looking inside the smart city, we can begin to question how we want to live as urban residents and cities, and devise ways to direct urban development towards more progressive ends.

References

Allwinkle, S. and Cruickshank, P. (2011). Creating smart-er cities: an overview. *Journal of Urban Technology 18*: 1–16.

Baker, T. and Temenos, C. (2015). Urban policy mobilities research: introduction to a debate. *International Journal of Urban and Regional Research 39*: 824–827.

Burget, M., Bardone, E. and Pedaste, M. (2017). Definitions and conceptual dimensions of responsible research and innovation: a literature review. *Science and Engineering Ethics 23*: 1–19.

Callon, M., Lascoumes, P. and Barthe, Y. (2009). *Acting in An Uncertain World: An Essay on Technical Democracy*. Cambridge, MA: MIT Press.

Campbell, T. (2012). *Beyond Smart Cities: How Cities Network, Learn and Innovate*. London: Earthscan.

Caprotti, F. (2016). *Eco-Cities and the Transition to Low Carbon Economies*. London: Palgrave Macmillan.

Carvalho, L. (2015). Smart cities from scratch? A socio-technical perspective. *Cambridge Journal of Regions, Economy and Society 8*: 43–60.

Cowley, R., Joss, S. and Dayot, Y. (2018). The smart city and its publics: insights from across six UK cities. *Urban Research & Practice 11*: 53–77.

Crivello, S. (2015). Urban policy mobilities: the case of Turin as a smart city. *European Planning Studies 23*: 909–921.

Cugurullo, F. (2013). How to build a sandcastle: an analysis of the genesis and development of Masdar City. *Journal of Urban Technology 20*: 23–37.

Cugurullo, F. (2016). Urban eco-modernisation and the policy context of new eco-city projects: where Masdar City fails and why. *Urban Studies 53*: 2417–2433.

Cugurullo F. (2018). The smart city imaginary: from the dawn of modernity to the eclipse of reason. In C. Lindner and M. Meissner (eds), *The Routledge Companion to Urban Imaginaries*. London: Routledge.

de Lange, M. and de Waal, M. (2013). Owning the city: new media and citizen engagement in urban design, *First Monday 18*. [Online]. Available: http://firstmonday.org/ojs/index.php/fm/article/ view/4954/3786 [Last accessed 7 February 2018].