Anticipatory logics of the global smart city imaginary

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Abstract
The smart city encompasses a broad range of technological innovations which might be applied to any city for a broad range of reasons. In this article, I make a distinction between local efforts to effect the urban landscape, and a global smart city imaginary which those efforts draw upon and help sustain. While attention has been given to the malleability of the smart city concept at this global scale, there remains little effort to interrogate the way that the future is used to sanction specific solutions. Through a critical engagement with smart city marketing materials, industry documents and consultancy reports, I explore how the future is recruited, rearranged and represented as a rationalisation for technological intervention in the present. This is done across three recurring crises: massive demographic shifts and subsequent resource pressure; global climate change; and the conflicting demands of fiscal austerity and the desire of many cities to attract foreign direct investment and highly-skilled workers. In revealing how crises are pre-empted, precautioned and prepared for, I argue that the smart city imaginary normalises a style and scale of response deemed appropriate under liberal capitalism.

Keywords: smart cities, the urban age, anticipation, risk

Introduction
Over the last decade the smart city has come to play a central if somewhat ambiguous role in imaginations and discussions of future urban development. Multinational information technology companies, such as IBM, Cisco and Siemens, have invested heavily in promoting their smart city visions to a global audience (Greenfield 2013, Townsend 2013), and their efforts apear to be having an effect—the term has been taken up in the planning rhetoric of cities as far apart as Melbourne and Rio de Janeiro. One recent report estimated that by 2020 the cumulative financial value of the smart city technologies market will be 1.565 trillion USD (Vidyasekar 2013). But the smart city encompasses a range of initiatives and can be used in a variety of ways. It has been connected to trends in computing (to ubiquitous, pervasive, mobile and wearable computing, ambient intelligence, the internet of things,

augmented reality and big data), practices of urban governance (including the entrepreneurial, creative and cultural city), and to previous attempts to promote information and communication technologies in the city (the wired, cyber, digital and intelligent cities, as well as community and urban informatics) (Hollands 2008, Kitchin 2014a, Stimson & Pettit 2014, Vanolo 2014, Wolfram 2012).

Hollands (2008) presents the smart city as the most recent manifestation of a long history of urban entrepreneurialism. He understands its agenda to take in four broad concerns: more efficient political and economic management through the use of networked infrastructure; business-led urban development; favourable conditions for investment in the technology and creative sectors; and social and ecological sustainability. An often cited definition of this *policy and economy smart city* (occasionally without attribution, usually without the final three words) originates in Caragliu *et al*. (2011, 70):

> We believe a city to be smart when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance.

Kitchin (2014a) acknowledges the desire for a smarter and more sustainable economy, but focuses instead on efforts to instrumentalise the management of urban environments by saturating them with technological devices. This version of the smart city collects massive amounts of real-time, granular data to help monitor urban systems in a more centralised, holistic and automated manner. The most concise definition of the *governance through technology smart city* can perhaps be found in Dohler *et al*. (2013, 70):

> It is through information and communications technologies that smart cities are truly turning 'smart'. This is facilitated by means of services that use, among others, networked sensors and actuators deployed in the city, allowing the monitoring of the urban environment in real-time, to react just-in-time if needed and to establish automated control processes with less or even without human intervention.

While these two approaches to the smart city overlap conceptually and are sometimes drawn upon interchangeably, there has in recent years been a shift in emphasis from the former to the latter (Hollands 2015).

A further distinction can be made along lines of practice rather than definition (in keeping with Collier & Ong 2005, Ong 2007). On the one hand, research has revealed grounded smart city ventures and legitimising discourses; what Shelton *et al*. (2015) have referred to as the *actually existing smart city*. These have specific sites of action and target particular local audiences. The work of Datta (2015) in exploring the provincialisation of the smart city imaginary in Dholera, India, as well as that of Wiig (2015) in exposing smart city

boosterism in Philadelphia, are instructive of the kinds of practice operating at this scale. On the other hand, there is a broader discursive apparatus which helps to support and sustain these local varieties. International engineering and business consultancy firms have helped popularise a *global smart city imaginary* which draws on general trends and addresses a broad audience. Greenfield (2013) and Townsend (2013) are the most well known critics of this placeless imaginary.

This paper presents an effort to tease out the future orientation of the global smart city imaginary by analysing how systemic crises are recruited, rearranged and represented by specific actors in the present. By way of preliminary illustration, consider the efforts of IBM. Over the last several years IBM is estimated to have spent over 100 million USD advertising their turn to city service provision (Townsend 2013, 31). Their slogans populate business magazines and airport terminals: 'Drivers can see traffic jams before they happen'; 'Police see emergencies before they occur'; and 'Buildings bring down their own energy costs'. Opportunities are evoked as a response to expected insecurity: traffic congestion dissolves through empowerment of the driver; rising crime rates are kept in check by identification of potential problem regions. Urban strife is simultaneously posed and resolved.

By drawing on a range of marketing materials and research consultancy reports I hope to show that the global smart city imaginary consists of a general but flexible narrative and a common set of logics for anticipating future crises. The paper proceeds in three sections. I begin by considering storytelling, mythology and anticipation as different analytical frames for interpreting technological narratives of the future. Settling on anticipation as my mode of entry, I outline Anderson's (2010b) language of pre-emption, precaution and preparedness as a way of dissecting the logics used to make uncertain futures present. In the second section, I explore three commonly called-upon crises: mass urbanisation, global climate change and fiscal austerity. By framing its proposed development in this way, the global smart city imaginary is shown to normalise a set of responses deemed significant in the protection of valued life. I conclude by fleshing out what this analysis reveals about the smart city's future orientation and make some suggestions about what it might mean for subsequent research.

Making futures present

The smart city pitch often begins with an evocation of the urban age already upon us. This bears repeating. Some time in the first decade of the 21st century, humankind is said to have entered a new epoch—the world became more urban than rural and whether due to higher relative birth rates, or continuing patterns of labour migration, this process of urbanisation shows no sign of letting up. By 2030, it has been calculated that 5 billion people will be living in cities; by 2050 that number will be nearly 6.5 billion (United Nations 2014). Despite the unsteady empirical and philosophical foundations of the urban age hypothesis (Brenner & Schmid 2013), it has been accepted and repeated by even the most vocal smart city critics. Publicly, it is a frequently cited rationalisation for smart city futures and the foundation upon

which much of its call to action rests. As the number of urban dwellers rises, it is imagined that the allocation and management of resources will become evermore difficult. These trends will be exacerbated by the effects of climate change, and complicated by ongoing financial and fiscal austerity. In the interest of protecting citizens and their way of life, it is up to city governments to take action today to avert the disastrous outcomes of these crises. Faced with an increasingly unpredictable and hazardous future (Amin 2013) the smartest cities will be those which best prepare for imminent insecurity.

There are many conceptual framings which might help in analysing this dominant narrative of the smart city future. I will outline three, moving from the concrete to the more abstract: storytelling, mythology and anticipation.

Urban geographers have consciously been using storytelling as a way to frame and understand planning practices for at least the last ten years (Sandercock 2003, van Hulst 2012). Stories, whether told through development plans, renewal strategies or municipal policy documents, act to prefigure the production of material space. This process is interwoven with relationships of power. Dominant narratives of urban progress and redevelopment recount a history of planning practice which casts the (typically white, male) planner-protagonist as a heroic figure (Sandercock 1998, 35). In opposition to these dominant stories, it is conceivable that counter-narratives might be used to encourage more multicultural or cosmopolitan ways of urban life. Throgmorton (2003) in particular has urged planners to use stories to promote locally grounded, sustainable futures. While such efforts begin from an ideal position, it is important, he argues, that space be allowed for a diversity of voices.

The tradition of storytelling in urban planning has been adapted to an analysis of IBM's smarter city campaign by Söderström *et al*. (2014). Complementing the company's promotional materials with a series of employee interviews, they identify two important components to the campaign's story. The first is an alignment with cybernetics and systems thinking. Drawing inspiration from Jay Forrester's (1969) work on urban dynamics in the late 1960s, the city is translated by nine institutional mechanisms into a form which is capable of being measured and managed by the company's suite of centralised command and control tools, the Intelligent Operations Center. This approach acts to legitimise IBM's technological platform by association with scientific naturalism and methodological rigour. The second component is a cautious utopianism. Söderström *et al*. (2014, 315) suggest that the smarter cities campaign adopts a similar strategy to that deployed by utopian urbanists: a diagnosis of social ailments used as basis for the prescription of universally applicable solutions. Where it differs from earlier utopian plans is in its abandonment of a radical normativity; this is "a utopian rhetoric tempered by market realism: it is easier to sell technologies and services than an *ad nihilo* urban structure, more convincing to tap on the faith in technology and progress than to promise a brave new city" (Söderström *et al*. 2014, 316). Stories are used by IBM to

position the company as a key market player—or obligatory passage point—in city management consultancy and services.

There are however a number of irregularities between the practice of storytelling and the smart city narrative which may serve to make them an unsuitable match. Principally, the smart city does not adhere to the structural properties of stories as outlined by Sandercock (2003). Rather than use a narrow and specific example as a way of expanding to the general, it does the reverse, using global forces as a way to articulate a strategy of the particular. This is not told with characters or plot, but through affective evocation of models and predictions. Further uneasiness can be identified in their dissimilar uses of time. As van Hulst (2012) has pointed out, the storyteller is not concerned explicitly with the future. Instead, stories are typically used as a way of making sense of the past and present, and are only then extended to cover coming possibilities. The smart city works in the opposite way, recruiting the future as a call for action in the present. Its connection to its past—to neoliberal buzzwords (Hollands 2008), post-war cybernetics (Townsend 2013) and 20th century World Fairs (Kitchin 2014b)—is obliterated by its fetishisation of dilemmas which have yet to fully unfold. While storytelling might be a useful way of framing specific corporate strategies, it is not so easily applicable to the wider discourse of global consultancy firms.

Broader in scope and less attached to an identifiable voice, mythology provides a more flexible approach to understanding the narrative strategies of technological futures. Mosco has outlined an approach to mythology within sociological studies of technology.

> Useful as it is to recognize the lie in the myth, it is important to state at the outset that myths mean more than falsehoods or cons… Myths are stories that animate individuals and societies by providing paths to transcendence that lift people out of the banality of everyday life. They offer an entrance to another reality, a reality once characterized by the promise of the sublime. (2004, 3)

By asking why they exist, where their importance comes from and what they mean to people, the lens of mythology helps reveal common hopes, dreams and values. On the one hand, this might be used to explore motivations for action. Myths can point to issues on which the powerful might act, or they might be used to help inspire change amongst those usually see to be without power. On the other hand, following Lévi-Strauss (2001), mythology might be used to analyse inaction—to help locate fears and anxieties which have been socially rationalised and normalised. This could be useful in illuminating, for example, the unresolvable but manageable contradictions juggled in the technology industry (Mosco 2004, 28). Myths are ontologically ambiguous and flexible, but offer a powerful way of observing and analysing the forces of social and cultural change.

Dourish & Bell (2011) bring myth and mythology to their anthropology of ubiquitous computing (a technological forerunner of the smart city). Their particular focus is on the

continued relevance of the vision of Xerox PARC researcher Marc Weiser to this field (see for example Weiser 1991, Weiser & Brown 1997). They argue that an emphasis on the 'proximate future'—a distinctly possible hereafter that is, nevertheless, always just around the corner—acts to forever delay the recognition of technological achievement. This draws political responsibility away from the present, permitting developers and engineers to absolve themselves of self-reflexive critique. The seamlessly connected world hypothesised by Weiser brackets off actually existing social and political inequality. Counterposed to his mythology then is mess, by which Dourish & Bell (2011, 4) mean the contested and conflicted reality of technological deployment. Stability, they argue, is always local and fleeting. It is negotiated and compromised, but crucial to what is meant by technological infrastructure.

While instructive, the myth/mess binary says nothing of how technological futures are themselves always moving and changing; how they are produced iteratively through contingent and contextual citations of previous utterances. Maintaining Weiser's vision requires constant effort, at workplaces and industry gatherings, and through the publication of academic and popular accounts of ubiquitous computing. This is an inherently messy process. In the case of the smart city, where the signifier is so unsettled, a more flexible way is needed to address its multiple and sometimes conflicting framings of the future. Amongst the mess, the challenge of identifying common approaches to the future becomes evermore acute.

Conceptually, anticipation is more subtle than either storytelling or mythology. It does not confront representations of the future so much as offer a way of interrogating their ontogenetic emergence. Where Beck's (1992) theorisation of the 'risk society' emphasised the *incalculability* of existential threats brought about under the modern welfare state, anticipation attempts to understand and describe how threats to critical infrastructure are made the basis for action in the present (Anderson 2010b, 794).

In the first instance potential disruptions must be revealed and made intelligible. Collier (2008) contrasts two ways of knowing risk. Archival-statistical knowledge tracks past incidences of a specific disruption forward into the future. This is then used as the basis for distributing and securing against that risk, as in the case of classical approaches to insurance. At the limits of archival-statistical knowledge however exist certain catastrophic events, contingencies or crises which lack the appropriate historical precedent demanded by this risk calculus. Rather than suppose an epochal shift to a period of reflexive modernisation (Beck 1992), Collier outlines enactment-based techniques for mapping the terrain of uncertainty and insecurity. Through the use of games and simulations uncertain futures are acted out *as if* they had occurred, exposing vulnerabilities and helping to reveal how these threats might better be prepared for. It is by combining these two ways of knowing that interruptions to the normal functioning of economic and security infrastructure can be effectively governed (Amoore 2013, Collier & Lakoff 2014).

Anticipatory knowledges draw attention to the potentiality of future threats and form the basis for responsive action in the present. Drawing on the work of Massumi (2007), Ewald

(2002), and Collier & Lakoff (Lakoff 2007, Collier 2008, Collier & Lakoff 2008), Anderson (2010b) has developed a conceptual heuristic for unpacking how indeterminate futures are perceived and operationalised. Following the identification of a potentially threatening event, contingency or crisis, intervention is sanctioned through distinct logics of anticipation. He elaborates three. *Pre-emption* argues for action designed to prevent the emergence of an undesirable threat (regardless of whether or not that threat would actually emerge). *Precaution* justifies action after a threat has emerged which would prevent it from reaching a point of irreversibility. And lastly, logics of *preparedness* argue for changes which will ensure the perseverance of valued life under conditions of an actual or perceived threat, without attempting to explicitly address the conditions which produce the threat itself. While Anderson's empirical emphasis has been on events or emergencies brought about by war, terrorism, pandemic outbreak and global warming (Anderson 2010a, Anderson 2011, Adey & Anderson 2011), his language can be adapted to an analysis of more quotidian technological narratives of an uncertain future.

Kinsley (2011, 2012) has done this to explore the anticipatory practices of ubiquitous computing. As a discourse, he argues that "anticipation is performed according to a range of logics through which attempts to stabilise… particular futures play out" (2012, 1557). This performance occurs not in accordance with the anticipation of risks which happen *to* us, but rather, and in a more progressive sense, by way of an anticipation which acts *for* us. In applying anticipation to ubiquitous computing, Kinsley highlights the agency of future visions and their performative significance to the work of technological research and development in the here and now.

Crises of the smart city

The smart city narrative recounted at the beginning of the previous section is a generalisation of a complex and contested imaginary. Any single telling of *what* the smart city is, or *why* it is that it is needed, is always partial and contextually specific. Considered cohesively the smart city is continually brought into being through events—such as workshops, international conferences and industry trade-shows—and through the publication of media materials—blog posts, pamphlets, promotional videos and research papers. The work of convincing city mayors and managers to buy into the smart city, literally and figuratively, is an important driver of the smart city future narrative. Consider the following from the former lead of Arup's Foresight + Innovation team, Dan Hill, as he reflects on work undertaken with Melbourne City Council in 2011.

> It's impossible to underestimate how difficult it is to get smart city strategies through… Genuinely Powerful Companies like IBM, Cisco, Siemens, General Electric, Accenture *et al*. are in the ear of city governments virtually every day, yet few have landed any major

> commissions, despite the vast amounts they've spent… And so you find yourself in the slightly awkward situation of persuading people that this is important, whilst not having the answers to difficult questions like 'How much will this all cost, exactly?' and 'What do I get in return, exactly?' (Hill 2011, n.p.)

Much has changed since Hill made this frank confession in 2011. Melbourne City Council now recognise the need to integrate information technologies into their urban management strategies. Cities in Spain and the UK are attempting to grow their local smart city sector as a potential export industry. Shortly after coming into office in early 2014, India's Prime Minister Narendra Modi announced a bold plan for 100 smart cities. Tropes and tactics have emerged for casting smart city initiatives in a favourable light. These have been repeated on websites and in business documents. Over time and with considerable use they have accreted into dominant narratives which are repeated at the global scale.

Three broad social crises are consistently recruited when attempting to justify the need for smart cities. First, resource pressure brought on by rapid urbanisation and an ageing population. Second, the effects of anthropogenic global climate change. And third, the twinned pressure of fiscal austerity and inter-urban competition. Other perceived threats can be evoked—such as the digital divide, ageing technological infrastructures, shrinking tax reserves, the need to meet rising citizen expectations and the silo-like nature of inherited city bureaucracies—but I will not address them directly here, either because they are felt to be a subset of one or another of the three crises under analysis, or for reasons of brevity. In identifying these crises my purpose is not to refute their specific claim to the truth so much as to draw attention to the politics of the logic on which they rest.

The following analysis draws on informal conversations with industry experts at the Smart City Expo 2014 in Barcelona, as well as an analysis of the smart city publications (websites, promotion and marketing material, reports) of six global engineering and business consultancy firms: Arup, IBM, KPMG, PricewaterhouseCoopers (PwC), Forrester and Ovum. These were selected to be a broad but representative sample following an initial survey of twenty multinational companies. As has been argued by Amoore (2013), private consultancy companies act as a proxy form of sovereignty, dispersing and mobilising governance while simultaneously normalising a particular way of thinking and acting in the world. Taking these companies as my empirical starting point allows me to acknowledge that political and economic power are contingent, plural and multifaceted, but brought about by the everyday decisions of specific actors and institutions.

Crisis 1: Mass Urbanisation

The smart city is often introduced alongside global demographic data. Century spanning calculations of urban births and migration are recruited and repackaged into evocative

statistical sound bites applied to the world as a whole: "in 1900 only 13 percent of people lived in urban areas; today that number is 51 percent" (Chism 2011, 6); "the global urban population will increase globally by 80% between 2010 and 2050" (Bélissent 2010, 27); "180,000 new people [move] into cities each day" (Spelman 2011, 5). This "mad dash for the city" (Chism 2011, 6) is authoritatively presented as a *fait accompli*. No mention is made of the practices of national data consolidation and collation on which it rests (Brenner & Schmid 2013). While some reports draw attention to the differences in urbanisation rates between the global North and South, or between mature and developing markets (Bélissent 2010, Green 2011, Hodgkinson 2011), in many others, these figures are left unqualified.

In terms of Anderson's (2010b) heuristic, an anticipatory logic of preparedness underpins the rhetorical deployment of this crisis. The broad issues driving global trends of urbanisation—which might include political economies of labour fluidity, the massification and industrialisation of agriculture, political asylum, and climate or war-related migration—are not raised. Rather, the phenomenon is hewn of any geopolitical cause and used as the basis for a set of imagined threats to be played out at regional and local scales.

> In most cases, new urban migrants will find themselves entering cities that are already struggling with high levels of unemployment, decaying infrastructure and a lack of affordable housing. If things continue on their current trajectory, the vast majority can expect to end up in slums, toiling as unskilled labor or in the informal economy.
>
> City governments should be concerned. Massive urban migration will put incredible pressure on city services, economies and infrastructure. Even assuming jobs and affordable housing can be found for all of the new urbanites (and that is highly improbable), city planners will need to fundamentally rethink their approach to urban infrastructure. (KPMG 2011, 9)

Disruptive change is accepted and internalised. Response is recommended in preparation for diverse consequences, real or imagined. It is worth unpacking how the argument continues.

Physical infrastructure and the provision of public services are portrayed as being always already strained or ageing and therefore insufficient to deal with the stresses of mass urbanisation. A Forrester research report (Bélissent 2010, 5–6) identifies seven areas of concern: transportation, utility provision, public safety, healthcare, education, building construction and maintenance, and waste management. In each instance, technological solutions are proposed as a way of pre-empting the ramifications of that urban system's overuse.

Urban transportation systems offer a number of sites where information technology has been shown to help improve efficiency and reduce costs. Traffic congestion might be averted by opening or redirecting lanes in response to expected demand, or by using tollways to

disincentivise vehicles from taking heavily travelled routes. Sensors embedded into streets and parking spaces could be used to expose data to drivers, allowing them to respond to conditions by adjusting their departure and arrival times. Alternatively, freer roads can be assured by encouraging people to use buses, trains or trams. Integrated scheduling and ticketing systems might make public transport services more attractive to commuters, as well as more responsive to unexpected fluctuations in use. Buses could be re-routed ahead of time to account for incidents of high footfall, such as for sporting events or public holidays. By installing a combination of these solutions, cities are assured that they will be able to keep congestion to a minimum. The Swedish National Road Administration, for example, was able to achieve 18% reductions in city centre traffic in 2005 by employing a system of road charges in collaboration with IBM: "congestion was reduced so much that bus timetables had to be changed to reflect faster transit times" (IBM 2010, 7).

The next key area identified by Forrester (Bélissent 2010) concerns utility provision. As demand for resources rise, companies are proposing to help cities manage their energy and water in a more adaptive and less wasteful manner. This might occur by allowing a city's inhabitants to oversee their own consumption patterns with the assistance of locally installed smart meters. Or it could be achieved with systemic regulatory techniques: by real-time pricing mechanisms to moderate the times of usage or, when necessary, by controlled blackouts which ensure that disruptions to critical sites and services are kept to a minimum (Townsend 2013). New technological configurations, such as solar-powered data centres, or (the holy grail of the energy sector) mass power storage, will allow grids to manage diverse sites and forms of energy input, as well as offer different solution packages to customers (Bélissent 2010, 5). While smart grids promise to save energy and dramatically reduce the amount of money that energy companies spend insuring against overload, so far they have only been deployed fitfully. Xcel Energy's SmartCityGrid project in Boulder, Colorado, for example, delivered on few of its projected targets, despite ballooning to over three times its estimated cost and leaving its customers to pick up the bill (Jaffe 2012).

Public safety and emergency response is understood to be an area where small increases in efficiency or perceived effectiveness will have significant public relations benefits to the politicians or public officials who bring them about (Bélissent 2010, 6). Integrating closed-circuit security systems will allow greater areas of the city to be surveilled and protected. The same logic applies to the management of emergencies. Consolidation of response services into a centralised control room has been used to allow inevitable disruptions to normal functioning urban systems to be quickly identified and neutralised. Police, ambulance and fire teams might work with greater cooperation, cover wider geographical regions and react with more precision when called upon. Further, through the use of computer models and threat identification algorithms, smart city suggests that oversight will be rid of the biases and errors of human operators. Control rooms might even be able to transition from responding to emergencies after they have occurred, to predicting likely locations of future events and

allocating resources accordingly in pre-emption. Predictive policing mechanisms deployed in Los Angeles, California, have been reported by the Federal Bureau of Investigation's Law Enforcement Bulletin (Friend 2013) to have twice the accuracy of previous crime identification practices. These methods are already being rolled out across the United States and in some cities in the United Kingdom.

Other public services may likewise be instrumented and rendered more efficient through the use of information technology. Digital patient records will allow the healthcare system to integrate and centralise data, which might facilitate collaboration between pharmacies, health clinics and hospitals, across public and private medical providers. Innovations in tele-medicine are being used to extend the spatial reach of these services, allowing peak demands in one location to be met by locations experiencing a lull. Education, similarly, might be made more effective through the use of distance learning and massive open online courses. These will allow more people to access education services, both in terms of geographical reach as well as financial cost, and might, over time, help standardise and improve academic content. Furthermore, schools and university campuses could be made more safe, accessible and maintained more efficiently through the use of local control rooms.

The physical landscape of the city, including construction, maintenance and waste disposal services, offers additional systems where information technology companies are looking to scale-up their smart city solutions. Building methods have been optimised to consume fewer resources in the construction of, and less energy over the lifetime of, buildings. Lighting, air conditioning and heating, elevators and computer server rooms could all be made more efficient, saving money and reducing carbon emissions. Capacity sensors can be installed in rubbish bins to notify when waste is ready to be collected. Electric noses might be used to indicate the presence of toxic chemicals in waste fill sites.

As these examples highlight, the global smart city imaginary does not offer a way to halt or slow processes of urbanisation. This is assumed to be either unsolvable or beyond the ability of city governments and civil servants to affect in a meaningful way. Instead, the smart city breaks the crisis into a broad set of smaller anticipated challenges which can then be addressed by pre-emptive action. This use of multiple logics is not unique to the smart city. As Anderson (2010b, 788) puts it: "each logic can be found across terrorism, climate change and trans-species epidemics, and can co-exist within responses to any one event, contingency or crisis". What is significant in the case of urbanisation as a justification for the smart city, is the way in which these logics interact in an almost nested structure. While ostensibly a form of preparation, it is by use of the anticipatory logic of pre-emption that the smart city is contextualised as a way for dissolving the risks which are anticipated to be brought about by expected global migration patterns.

Crisis 2: Global climate change

While not as emphatically or as frequently cited as demographic pressure, anthropogenic climate change is used by some companies as an equally important crisis with which to motivate the smart city. For Arup, the two crises are intertwined: "Half of the world's population lives in cities, yet they are responsible for 75% of the world's carbon emissions. Both of these figures are increasing." (Hill *et al*. 2011, 6). As such, solutions which address the outcomes of the first crisis, may also have a positive impact upon the causes of the second. For other consultancies, climate change serves as less of an ontological position, as a discursive strategy. PwC (in collaboration with The European Institute for Comparative Urban Research) position it is as the first in their list of 'megatrends' afflicting city-regions: "climate change, heightened globalisation, technological advances, shifting economic power, demographic change, state rescaling, enhanced concepts of democracy-transparency and the consequences of the 2008 financial crisis" (van den Berg *et al*. 2014, 11). Here, crises are used as a prompt for, but not necessarily a target of, the proposed solutions. In neither case is the empirical evidence for global warming called into question. Rather, the phenomenon is accepted as true and redeployed as a motivator for structural intervention. There are two distinct anticipatory logics at work in the use of this crisis. I will address them in turn.

Sustainability as a set of practices, beliefs and discourses constitutes what Anderson (2010b) would refer to as an anticipatory knowledge. This way of knowing the future typically presents cities as either a driver of harmful emissions, or as a site of unsustainable lifestyles. But this is not always the case. The argument that urban life—or more specifically the high population densities which urban life engenders—can act in accordance with the desires of sustainability has found purchase in recent years, particularly in the popular work of Owen (2009) and Glaeser (2011). This inversion of the common belief is reinforced by some proponents of the smart city:

> While cities are a major part of the problem of sustainability, they also have the potential to be a part of the solution. Urban citizens, particularly in developed economies, have lower carbon footprints than rural and suburban citizens as it is easier to deliver services in cities than to people living in lower density population areas. (Green 2011, 10)

This approach not only sets aside the causes of urbanisation but welcomes the trend as a potential way of mitigating against climate change. The challenge becomes one of finding ways to modify urban life so as to consume fewer resources and produce less waste. The planning, engineering and business consulting group Arup have presented a vision of the smart city which attempts to achieve this. Crucial to their vision is an instrumentation of city services which will allow them, over time, to run more efficiently and decrease their impact on the environment.

> Information has a strategic role to play in reducing the carbon footprint of cities. Amalgamating information on city systems means it can be deployed,

> real-time, to city leaders, allowing them to make decisions about the most effective use of city resources swiftly—and, ultimately, feed those decisions back to the components of the city: transport providers, energy companies, building owners. (Hill *et al*. 2011, 7)

This will also allow 'civic footprints' to be presented to city inhabitants—in a similar but more detailed way than that already done by smart meters—encouraging them to adapt their behaviour accordingly. Whether through infrastructure, or through the behavioural patterns of its citizens, urban life might become more sustainable by collecting data and rendering it knowable and actionable. But data can be put work to other, less obvious ways as well. The act of measuring and standardising city consumption has the further benefit of rendering the city as a site for financial instrumentation: "common metrics for cities [will allow] them to access new financing options and build new partnerships and business models that involve the private sector" (Webb *et al*. 2011, 8). Arup's smart city is not only sustainable for the environment, but also realisable as a sustainable business model.

Sustainability operates according to a logic of precaution. Climate change is recognised as a real and tangible threat to life and an appropriate response is reasoned to be one which acts to curtail factors contributing to that threat. Within this anticipatory knowledge however, there remains considerable space for disagreement (see for example Davis 2010). This is observable most clearly in debates over whether capitalism is itself capable of adopting strategies of mitigation, or whether it is only through radically different economies and ways of life that true sustainability might be achieved. By operating well within the acceptable boundaries of liberal debate—and in its preparatory stance to urbanisation—the smart city rehashes a conservative sustainability inherently palatable to the interests of capital.

Less zealous in its desire, resilience does not attempt to mitigate climate change so much as adapt to the conditions it will produce (for a more progressive framing of resilience see Gleeson 2013). Through its internalisation of climate change, resilience follows an anticipatory logic of preparedness. This plays out in a couple of ways. First, it occurs through the exogenous administration afforded by the centralised control room (as with the example of IBM's deployment of the Intelligent Operations Center in Rio de Janeiro). In this way, response to extreme and exceptional events—such as are imagined to be brought on by weather shifts and domestic insecurity—might be efficiently managed, and the city quickly returned to a state of normalcy. Kanter, writing with IBM researcher Litow, elaborates: "A smarter city infuses information into its physical infrastructure to improve conveniences, facilitate mobility, add efficiencies, conserve energy, improve the quality of air and water, identify problems and fix them quickly, [and] recover rapidly from disasters" (Kanter & Litow 2009, 2). Second, through its instrumentation, the city becomes knowable in a new way, opening up new avenues for insuring against risk. While predominantly deploying a precautionary logic of sustainability, Arup has also, in collaboration with Accenture and

others, evoked the principles of resiliency in preparation for the consequences to urban life brought on by of a rise in global temperature. "Climate change risks can also be managed more efficiently using smart technologies… In addition to mitigating physical risks, the measuring and reporting capabilities of smart technologies can offer assurances to bond issuers, insurance companies and corporate investors, which would, in turn, reduce premiums and increase investor confidence" (Webb *et al*. 2011, 26).

The two anticipatory knowledges outlined in this section are not perfectly exclusive. Rather, as corporate strategies are assembled an alignment is sometimes made with both discourses of mitigation and adaptation. In the case of Arup, the 'the newly-resilient sustainable city' (Arup 2010, 4) employs diverse tactics in its effort to ensure safety and prosperity. Accordingly, a rational approach to sustainability is seen to be one which accepts that some change is likely, whatever intervention is realised, and so will also seek to modify and secure life under conditions which are different from those experienced in the here and now. In this sense the anticipatory logics of precaution and preparedness bleed over into one another.

Crisis 3: Fiscal austerity

The final crisis regularly evoked in the global smart city imaginary is that of financial pressures within municipal governance brought on, or exacerbated by, the global financial crisis. Without identifying reasons for budget deficits or bank bailouts, this threat is presented of as one half of a crippling pressure which smart city technologies are able to relieve. PwC put it thus: "the playing field for cities is changing dramatically with budgetary restrictions and the need to do 'more with less' increasing the importance of executing and implementing strategy effectively and making things happen on the ground" (van den Berg *et al*. 2014, 10). The other factor contributing to this pressure is the compulsion for cities to compete nationally and internationally against other cities. This inter-urban competition is predicated on a conviction in the fluidity of finance capital and highly skilled labour (Harvey 1989, Hall & Hubbard 1996). When coupled with fiscal austerity, it becomes increasingly difficult for cities to offer attractive financial incentives to industry while also providing all of their citizens with the social services they have come to expect.

Given this tension, the smart city presents itself not only as a boon to public service provision and the maintenance of urban infrastructure, but also as a sound business opportunity. This occurs in at least three ways. First, it offers to use data analysis to increase the efficiency of urban systems and reduce their ongoing maintenance costs. Here, information technologies and automation are presented not as a force for disruption, but as a 'force multiplier' (Dixon 2012) which allow each dollar spent to stretch a little bit further than it might otherwise have done. Where these technological solutions differ from those presented elsewhere in this paper, is in their emphasis on the benefits which might be accrued through data monetisation (Bélissent 2010, 23)—selling data to third-party developers and data

brokers—and data financialisation (Webb *et al*. 2011, 26)—opening up data to financial instrumentation.

Another second less direct method of achieving long-term economic return, might be found by capturing valuable flows of capital and labour. Marketing, in particular, is an important strategy deployed by municipal governments to achieve this. For Arup, branding allows cities to "reinforce their positions as the primary drivers of economic activity" (Arup 2010, 15). In light of this, sustainability and 'smart city thinking' are presented as a significant way in which cities might be able to represent themselves to international audiences. As was seen in the case of sustainable approaches to urbanisation, a response to one crisis is redeployed in answer to another.

IBM champion a third approach which is more in line with descriptions of the policy and economy smart city. They understand "people and their skills, creativity and knowledge, as well as the capacity of the economy to create and absorb innovation" (Dirks *et al*. 2010, 1) to be the main marker of a city's differentiation on the world stage. They arrange their strategy accordingly:

> We believe cities should focus on four areas to succeed in attracting, creating, enabling and retaining talented workers and innovative businesses: reduce congestion in the transport system; improve emergency response and reduce crime; improve education delivery and streamline government services; improve access to patient-centric healthcare. (Dirks *et al*. 2010, 7)

Augmenting urban infrastructure becomes a mechanism by which talented individuals might be attracted to and convinced to live within a specific area. Such emphasis on high-skilled labour echoes the sentiments of Florida (2005) and his 3Ts of effective city governance: technology, talent and tolerance. To be sure, the 'creative city' has been well established as an antecedent to the smart city (Hollands 2008), and thoroughly critiqued for its confusion of economic cause and migratory effect (Peck 2005, O'Callaghan 2010).

Because the smart city imaginary operates within the current financial and economic milieux, it is forced to attempt to resolve the tension between fiscal austerity and urban entrepreneurialism. As IBM researchers Harrison and Donnelly (2011, 4) observe, "the core motivation" for city governments seeking to invest, must be grounded in the realities of economic development. This presents a difficulty. Industry finds itself in the awkward position of needing to argue for money at a time when municipal governments around the world have less of it to spend. To resolve this, the imaginary positions the smart city as a way of increasing efficiencies and cutting costs in the long term, or as a way of branding cities as an attractive place for financial investment and active lifestyles. In this way, the anticipatory logic with respect to financial insecurity is undergirded by the precautionary principle: accept the conditions of the economic threat and do what can be done to ensure that things do not get any worse. Were the smart city to be seen as a poor financial investment—were it to deepen

the financial crisis even at a benefit to other areas of life—its widespread adoption would be unthinkable.

Conclusion

Anticipation offers a useful way to take seriously the future orientation of the global smart city imaginary. It reveals that visions of technology-driven urban change are interwoven with the perceived challenges of a crisis-ridden world. The logics used to justify anticipatory action—pre-emption, precaution and preparation—expose the ways in which particular discursive strategies orient themselves to these challenges. In the case of processes of urbanisation, cities are encouraged to prepare for inevitable surges in population by pre-empting the stress this will place on urban infrastructure. In regards to the changing climate, two broad approaches are adopted. On the one hand, sustainable urbanism is embraced by some as a precaution against rising carbon emissions. On the other, cities are also warned to prepare for this threat by adopting programs to increase their resiliency. Finally, the fiscal pressure faced by city administration might be relieved by smart city ventures which make public services more efficient and attract additional capital investment—what Anderson (2010b) would refer to as precautionary actions. Global consultancy firms recruit, rearrange and represent these anticipated threats as a way of rationalising action in the present. This is considerably different from the future orientation common to urban planning in the first half of the 20th century (Hall 1988). Rather than rely on affirmative action towards some normative ideal, the global smart city imaginary resorts to the threat of inaction spiralling into panic and insecurity. This post-modernist turn in planning relies not so much on a politics of optimism, as on one of realistic-seeming fear, tempered by the possibility of hope—but only if action is taken now.

Consultancy companies which argue for smart city interventions do so on the following suppositions: (1) an understanding that while the future is open and malleable, liberal life as we know it is under threat by global crises; (2) a conviction that technology is able to provide the means to ameliorate the worst consequences of these crises; and (3) a belief that the city is an effective site at which to enact these technological solutions. This common foundation allows for diverse permutations of the smart city narrative and attendant legitimising logics, without recourse to a concrete, all-encompassing plan.

To conclude I want to draw out a few lines of critique based on these three suppositions, and suggest what my analysis of smart city anticipation might mean for future research. First, even within its own contextual frame the smart city tends not to address any present cause of the crises it evokes. This is clearly the case for mass urbanisation where this threat is framed according to the set of problems that it is expected to induce. For global climate change, this is also the case, although a little more complicated. Sustainability is used to motivate precautionary action to reduce emissions, however this is interwoven with a normalisation of the very urbanising processes held to be driving the threat in the first place. Resilience, as I

have used the term, describes those efforts which by definition do not address the driving forces of global warming. The causes of fiscal austerity, again, are not addressed structurally.

Second, attempts to find effective solutions to crisis are undermined by a fetishisation of technology and a concomitant technological determinism. The argument that information technologies are not on their own able to fix demographic, ecological and financial crises has elsewhere been made convincingly (Kitchin 2014a, Morozov 2013). A fixation upon efficiencies renderable through technology acts to obscure both the relations which prefigure and maintain those technological assemblages, as well as the social and political configurations which might, conceivably, be pursued in the service of more effective and long-lasting solutions. Systematic crisis is not something that will be so readily resolved by consultancy companies selling technocratic solutions to municipal governments. The scope of the challenges which will face cities in the coming years necessitate more fundamental and wide-reaching responses than have thus far been articulated within smart city discourses.

Finally, there is a disconnect between the scale of perceived threats and the site at which they ought to be addressed. This reveals a reification of the city and city governance, and a normalisation of their political agency. While the urban is framed as a substrate on which systemic crises will potentially unfold, it is rare that the consultancy companies under analysis refer to specific cities. Rather, global trends and statistics are called upon as a justification for action in particular instances. This serves a pragmatic role in regions of the world where national governments are deemed unable or unwilling to undertake the desired response. To apply this generalisation globally however overlooks differences in national politics as well as those threats which are not addressable at the city-scale.

Despite calls for research grounded in empirical studies of actually existing smart city technologies (Kitchin 2015, Shelton *et al*. 2015), this paper has sought to make a contribution to what I see as a valuable set of studies critiquing corporate marketing materials and research consultancy reports (Wolfram 2012, Greenfield 2013, Söderström *et al*. 2014). By focusing on how the smart city is rationalised at the global scale, rather than seeking to further delineate what the smart city is, or explore how it is explicitly being implemented, I have highlighted some of the assumptions on which its framing discourse rests and have suggested a few lines of critique for subsequent discussion. More than this however, I want to insist that the distinction between a global imaginary and situated instances is a productive one to work with. Not only does it reveal the importance of global consultancy firms in clearing a path for local infrastructure investment, it also has implications for future research on the smart city phenomenon. It is worth considering, as Datta (2015) has done, how the anticipatory logics of the global imaginary are provincialised at particular sites, as well as how the experiences of these sites are then worlded back into the imaginary (Ong 2011, Roy 2014). Arguments used to justify development in India will be different from strategies adopted in Ireland or the United States. It is likely however that they will inform one another. Calling attention to these practices of translation and mutation may be a politically useful way of slowing the speed at

which these projects progress. Similarly, further attention needs to be paid to how specific policies and practices move between cities (as in Peck & Theodore 2001, Peck 2002, McCann 2011, Ward 2006), how varying sites and scales are made equivalent, and how actual technologies come together in standardised and interoperable ways. Enquiry into the translation and transference of anticipatory knowledges will require a nuanced appreciation of the many scales at which smart city futures are made actionable.

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