

## The little book of smart cities

Cavada, Marianna; Hunt, Dexter; Rogers, Christopher

*License:*

None: All rights reserved

*Document Version*

Publisher's PDF, also known as Version of record

*Citation for published version (Harvard):*

Cavada, M, Hunt, D & Rogers, C 2017, *The little book of smart cities*. ImaginationLancaster.  
<[http://liveablecities.org.uk/sites/default/files/outcome\\_downloads/littlebookofsmartcities.pdf](http://liveablecities.org.uk/sites/default/files/outcome_downloads/littlebookofsmartcities.pdf)>

[Link to publication on Research at Birmingham portal](#)

**Publisher Rights Statement:**

Checked for eligibility: 04/07/2019

**General rights**

Unless a licence is specified above, all rights (including copyright and moral rights) in this document are retained by the authors and/or the copyright holders. The express permission of the copyright holder must be obtained for any use of this material other than for purposes permitted by law.

- Users may freely distribute the URL that is used to identify this publication.
- Users may download and/or print one copy of the publication from the University of Birmingham research portal for the purpose of private study or non-commercial research.
- User may use extracts from the document in line with the concept of 'fair dealing' under the Copyright, Designs and Patents Act 1988 (?)
- Users may not further distribute the material nor use it for the purposes of commercial gain.

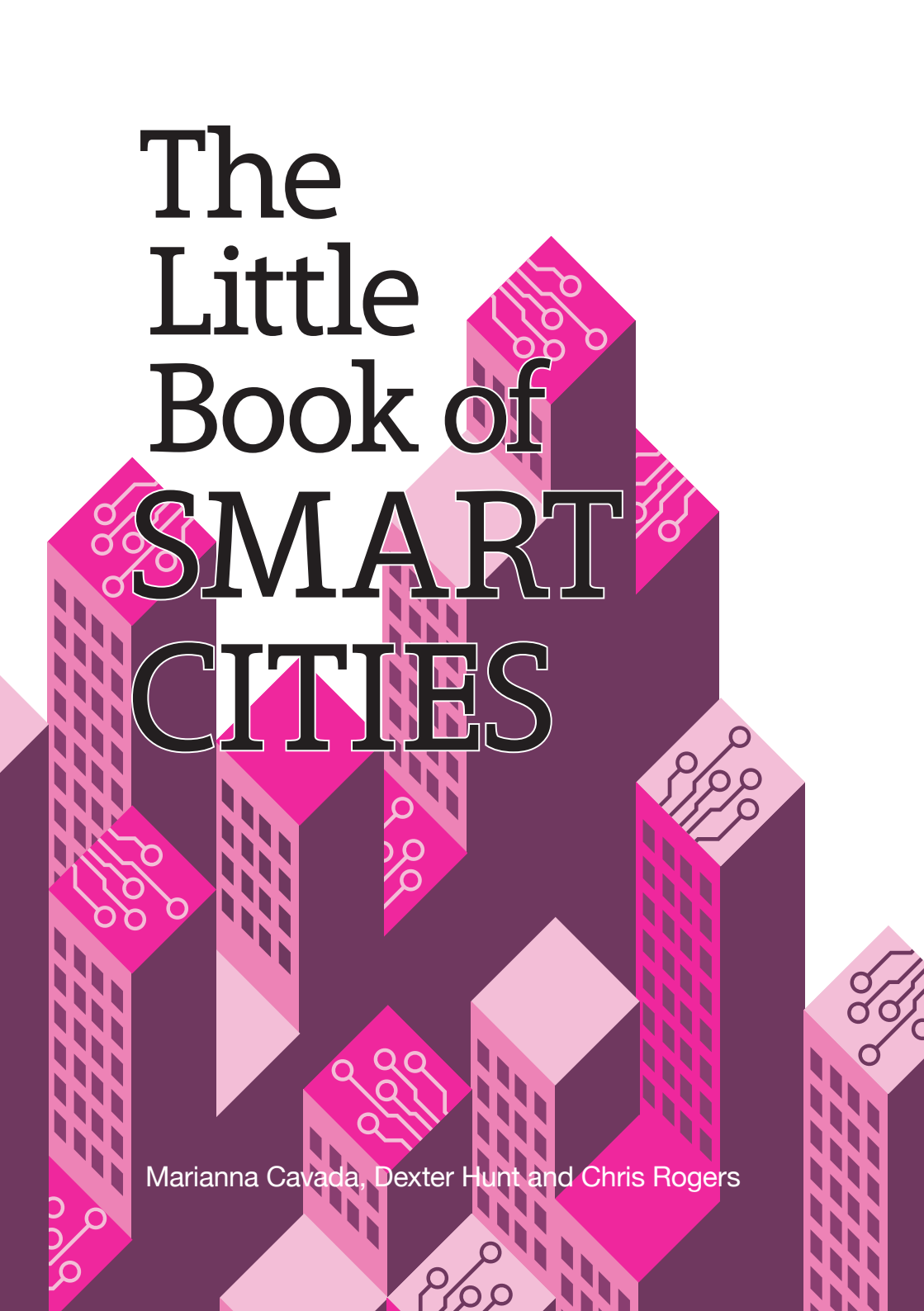
Where a licence is displayed above, please note the terms and conditions of the licence govern your use of this document.

When citing, please reference the published version.

**Take down policy**

While the University of Birmingham exercises care and attention in making items available there are rare occasions when an item has been uploaded in error or has been deemed to be commercially or otherwise sensitive.

If you believe that this is the case for this document, please contact [UBIRA@lists.bham.ac.uk](mailto:UBIRA@lists.bham.ac.uk) providing details and we will remove access to the work immediately and investigate.

The background features a stylized cityscape composed of various 3D rectangular blocks in shades of pink and purple. Some blocks have a grid pattern, while others have white circuit board traces with circular nodes. The blocks are arranged in a way that creates a sense of depth and perspective.

# The Little Book of SMART CITIES

Marianna Cavada, Dexter Hunt and Chris Rogers

Editors of the Little Books series:

Dr Christopher T. Boyko and Dr Claire Coulton,  
ImaginationLancaster, Lancaster University

With design by Roger Whitham, Rachael Hill and Michael Stead,  
ImaginationLancaster, Lancaster University



ISBN 978-0-70442-949-9

© ImaginationLancaster 2017  
All rights reserved.



The  
Little  
Book of  
**SMART  
CITIES**

Marianna Cavada, Dexter Hunt and Chris Rogers

# Acknowledgements

This book is part of the Liveable Cities project, which is funded by the UK Engineering and Physical Sciences Research Council under grant EP/J017698. Led by Professor Chris Rogers, Liveable Cities was a collaborative effort undertaken by researchers at the University of Birmingham, Lancaster University, University of Southampton and University College London. The contributions of all the members of the research consortium in helping to shape this Little Book are gratefully acknowledged.

# Contents

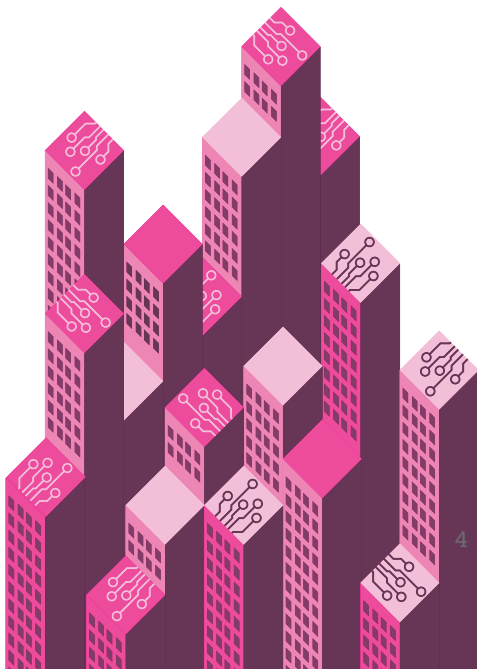
<b>What this little book tells you</b> .....	4
<b>1. Introduction</b> .....	5
<b>2. City typologies</b> .....	7
2.1 Sustainable cities .....	7
2.2 Liveable cities .....	9
2.3 Intelligent cities .....	10
2.4 Conclusion .....	10
<b>3. Smart cities meaning</b> .....	12
3.1 Academic .....	12
3.2 Commercial .....	13
3.3 National and international .....	14
3.4 Conclusion .....	15
<b>4. International smart cities exemplars</b> .....	16
4.1 European: Copenhagen .....	16
4.2 Asian: Singapore .....	18
4.3 Conclusion .....	20
<b>5. UK smart cities initiatives</b> .....	21
5.1 Initiatives .....	21
5.2 Birmingham initiatives .....	22
5.3 London initiatives .....	24
5.4 Smart Birmingham vs. smart London .....	24
<b>6. Conclusion</b> .....	26
References .....	27
Bibliography of initiatives .....	30

# What this little book tells you

'Smart Cities' forms part of the 'Liveable Cities' research project, a five year programme grant (2012 – 2017) whose vision is to transform the engineering of cities to deliver global and societal wellbeing within the context of low-carbon living and resource security. This little book explores what is actually meant by smart (cities). More importantly, it is about how, given a range of contexts and local conditions, we can make cities smart for everyone. This book, explores the following ideas:

- To identify and elucidate different city typologies (Section 2)
- To explore Smart Cities meaning(s) according to stakeholder groups (Section 3)
- To identify world leading Smart City examples (Section 4)
- To highlight contrast and compare Smart Initiatives in two UK cities (Section 5)
- To identify, contrast and compare Smart Initiatives for Birmingham and London (Section 5.4)

This 'Little Book of Smart Cities' offers a general picture to how we might better understand smartness and provides an overview of how smart cities are defined and implemented today.



# 1. Introduction



‘Smart’ has been a buzzword used by cities and citizens for more than a decade now. Often, smart is used to refer to a product or products that are seamlessly connected to the Internet and make our everyday life easier, more efficient and enjoyable. However, not all smart cities relate to this technically-oriented ideology, because a city is more like a liveable organism, where people have different approaches to how they (choose to) live. This book, aims to understand the concept of smartness and frames smart cities within a liveable environment context.

A smart city is a subject that contains many uncertainties and before we embark on the exploration of what makes cities smart, we must take stock of what historically we mean when we refer to a city (Cavada et al., 2014). For example, we could think of the ancient cities of Athens or Rome where smart city organisation evolved much earlier than many other similarly-sized cities of the time. Moreover, they are shining examples of where democracy (and a smart participatory system to the decision-making within the city) was readily adopted and thrived. Likewise, medieval cities were a cluster of vibrant urban spaces of commercial activity where continuous smart innovations helped their expansion. Over time, people have been attracted to the promise, lure and opportunity of a better way of life within the city, one in which vibrant spaces and (increasingly smarter) infrastructure responds to the changing needs of the population.

Today, cities are a mixture of opportunity and they often, but not always, work seamlessly as independent urban spaces; the phenomenon of the metropolis has empowered cities to become economically independent, environmentally aware and more socially inclusive. Interestingly, a metropolis is a place that has been through rapid development over recent decades, where previously unimagined infrastructure (not least communications) and ever-more complex buildings appear almost overnight. In addition, they attract ever-increasing numbers of people from other countries and very rapidly become international epicentres of talent. This brings with it the opportunity to create a booming economy and rich billionaires, yet also creates difficult living conditions and inequality. Hopefully, new types of cities are starting to evolve that focus on better living standards (offered in their own contexts) for all. Evidently, city rankings now recognise this and include ratings for ‘*best life*



*quality*; it is, however, unclear how this translates to everyday life. Consequently, many cities promote different visions for living and as such this had led to a wide and diverse typology of cities.

A smart city according to our research is an overarching concept of these various different typologies. We see smartness not entirely as a city where digital technologies cover all operations since this would mean that those who cannot afford to buy, or update, their technologies, or even be trained to use them in the first place, are instantly excluded from the smart concept. At the same time, it is undoubtedly difficult to determine exactly what smart is and what it is not – this is framed in many ways by a city's local context and local conditions. For this reason, this little book gives a general introduction to our research on the subject of smart cities. We firstly focus on providing an understanding of a range of city typologies and, through some carefully selected examples, set the context for what smart cities are.



# 2. City typologies

In this chapter, we look into a range of city typologies in order to understand how the context of a city might be framed. Of the typologies that exist, the most frequently used over recent decades has been related to sustainability, but increasingly liveability and intelligence have come to the fore (Moir et al., 2014 ), as shown in Figure 1.

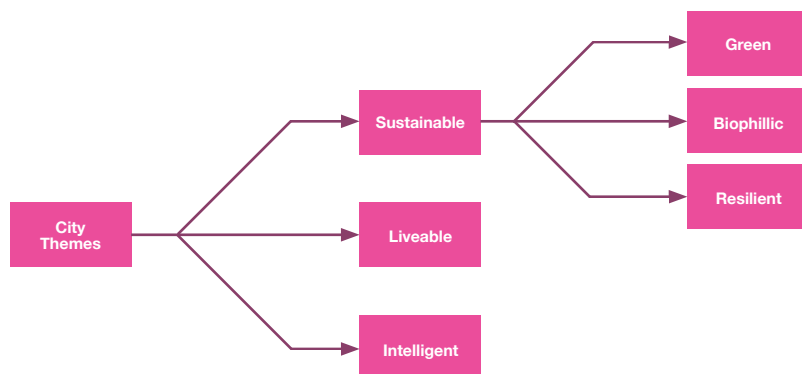


Figure 1. City typologies, with emphasis on sustainable cities.

## 2.1 Sustainable Cities

Sustainability is in principle a three-pillar concept; however many, if not all, cities struggle to balance economic, social and environmental aspects equally (Neuman and Churchill, 2015). Sustainable cities have all too often focused on (or simplified the perspective to) one pillar – for example, the environmental aspects, due in part to the threat of climate change and the need to mitigate against its long-term impact(s). Therefore it should not be surprising that there are many allied typologies within this theme, three of which are shown in Figure 1 and discussed in detail below.

## **i. Green cities**

A green city, usually stems from, or is driven by, a visionary – someone with a clear plan for the city and a desire to implement radical changes to the spatial planning process. Past examples of the garden city, for example, are used to describe the idea of how a green city might look. Moreover, green examples are, and continue to be, visible efforts to provide access to, and interaction with, nature throughout the city; these include, but are not limited to, parks (e.g. Green Park, Hyde Park, Regents Park in the UK, Phoenix Park in Dublin, Central Park in New York), gardens (e.g. botanical gardens or as part of our homes), and managed and unmanaged areas of green space. However, they are increasingly being supplemented with green roofs, green walls and similar interventions, which can have a green aesthetic and biodiversity value (which we increasingly need to score through metrics) but also provide functional engineering to city problems (e.g. sustainable urban drainage systems, or SuDs). These can certainly add a whole new green ‘view’ of the city and offer citizens a sense of pride and pleasure, providing they are maintained sufficiently well. Furthermore, a green city is more likely to adapt better to different weather conditions. It is, therefore, for this reason that green cities are considered to be an essential asset, not only for how a city looks and performs, but also with respect to the wider health benefits it brings (Harrison et al., 2010). For these reasons, being green must be a facet of being smart (see Section 2.0).

## **ii. Biophilic cities**

This typology, as with the previous one, refers to those cities that favour the natural environment within the city context. However, a biophilic city is one that considers people within the heart of the natural environment and how they benefit from it (Neuman, 2015) – in contrast with green cities, biophilia is the connection of people to nature and cities. A biophilic city therefore develops green infrastructures that embrace the natural habitat in a way that people can enjoy and feel protected within it. To integrate this through the city requires smartness to be embraced on many fronts.

## **iii. Resilient cities**

The resilient city is a popular concept amongst many city leaders and respective organisations that have a vested interest in the resilience agenda (e.g. Rockefeller Foundation – which defines the top 100 most resilient cities). Resilience in this case

usually refers to the ‘bounce-back-ability’ of a city when (un)foreseen circumstances abound (e.g. a 1-in-1000-year flood, such as seen in Texas in 2017). Resilience takes a long-term view of the city and so is often, but not always, seen as an integral part of the sustainability agenda. Resilience ensures cities are considering and developing ways in which to withstand any danger that can damage or otherwise adversely influence the city and the people that live and work there. In this way, it is not only about how safe cities are, but also how well prepared they are to respond to a range of future challenges. These challenges often relate to natural disasters, some, but obviously not all, of which are caused by climate change. For this reason, resilience is considered to originate from, and be integral to, the sustainable cities agenda (Blackburn et al., 2012).

That said, what is green, biophilic, resilient and sustainable to one city may be far from it for another. Local context, local conditions and priorities must ensue for smartness to be achieved.

## *2.2 Liveable Cities*

‘Liveable Cities’ is a relatively new concept and, as such, liveability can be a loaded phrase with numerous definitions and expectations. Moreover, there will always be the push back of ‘liveable to whom...?’ and ‘what is liveable to one city dweller may not be to another’. Hence, there is much ongoing research and debate into this important subject and how it should be approached. The Liveable Cities research project, for example, of which this book forms an output, has an ambitious vision: *“To transform the engineering of cities to deliver global and societal wellbeing ... (through) radical engineering that demonstrates the concept of an alternative (liveable) future”*. This project is underpinned by multi-disciplinary research into a City Assessment Methodology that prioritises individual, societal and planetary wellbeing, one aspect of which relates to lower carbon emissions (Liveable Cities, 2013). A consortium of academics from different disciplines drawn from four UK Universities (Birmingham, Lancaster, Southampton and UCL) have collaborated to create a shared vision of liveability, and therefore to inform the measurement of the performance of cities across the full range of perspectives, as a bespoke means by which to achieve improved wellbeing and resource security. The outcomes of the project aim to create, and guide the means to deliver, future ‘liveability’ visions to help achieve better life within cities.

## *2.3 Intelligent Cities*

Intelligent cities offer highly-advanced technology in terms of services, governance or city management ; hence, smartness is interwoven within this. However, intelligent cities are distinct from smart cities. Intelligence within cities considers the use of (fully- or semi-) automated systems that are able to calculate and respond to human operations and needs in order to efficiently (or even optimally) manage outcomes and expectations. As such, an intelligent city is the outcome of digital system(s) that organise and support the city with the use of sensors, data and innovation technology (Taewoo and Pardo, 2011). Within these systems, technology companies themselves play a big role and service provision becomes a central part of how intelligent cities operate. Although this typology could allow citizens to become familiar with digitalisation, or even create employment opportunities, digital technology companies tend to focus on short-term service provision and profit, rather than the long-term positive and negative effect(s) that digitalisation has on cities and people.

In this way, city leaders need to make sure that digitalisation does not inadvertently create yet more social inequalities or social ills. A society that is driven through its intelligence and technology may not be a place in which we want to (or even should) live.

Intelligent cities, we would suggest, are very much a part of Smart Cities, but they are not in themselves smart (see Section 1.4).

## *2.4 Conclusion*

‘Sustainable’, ‘Liveable’, and ‘Intelligent’ cities are some of the key typologies that appear in the literature on cities. Cities benefit from such typologies, not least as an exploration of their own opportunity. As such, cities may use a particular typology to develop their city vision, and certainly many cities have been offered funding (through European or international funds) to achieve such goals.

Our brief description of these key city typologies helps us to create a basic understanding and start the process of being able to frame them within a smart cities context. However, we understand that ‘smart cities’ is a more complex matter, in part because our current understanding of ‘smart’ is very much framed around intelligent cities – in other words, if you asked a person on the street, they would say smartness in a city is about the smart phone and other associated products of innovative technology that directly influence their lives. Whilst this is important,

it is also necessary to understand how a more holistic smart city concept can be developed that makes city life better for people today and in the future - using multiple smart pathways. In the next part of this book, taking into consideration the uncertainties that are embedded within the smart concept, we look into how smart cities have been described through various smart cities definitions.



# 3. Smart city meaning

Here, we explore the meaning of smartness, as defined by three stakeholder groups: commercial, academic, and national/international (Figure 2). By taking cognisance of each of these stakeholder perspectives, a general consensus can be sought on how smart is perceived and how it might be holistically defined through a single (or multiple) definition(s).

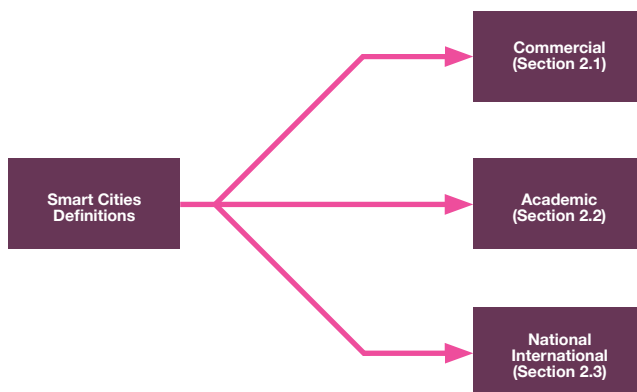


Figure 2. Stakeholders for smart cities definitions

## 3.1 Commercial

Private companies, mostly larger organisations, were probably the first to invent, and strongly promote, the concept of smart cities. Organisations such as IBM, CISCO and ARUP all toyed with, and became pioneers of, the idea of a ‘smart’ city. Let us not forget, it is only a decade ago when Steve Jobs presented the smart phone, saying that this is the dawn of a new age in the way we communicate – the revolutionary ‘i-phone’ technology was designed to make our lives easier. Similarly, in terms of

smartness in cities, big organisations focussed on the idea of making cities run in ever more efficient ways. The systems that were developed offered advances on how we could assess and improve the performance of a city – but only in part: in certain, narrowly-focussed ways. Smart products emerged from this concept (e.g. systems that measure air quality, provide parking and traffic information). Additionally, these new technologies have been used in a few urban developments during the design phase to build the smart city from the core (e.g. Masdar).

More recently, private companies are establishing collaborations on smart cities projects in collaboration with universities and cities. One of these examples occurred in Rio de Janeiro, where an infrastructure project collected city data to tackle issues of crime and pollution, and even helped manage the 2016 Olympic projects (IBM, 2009). These examples also involve smaller-sized companies, and often can generate further projects and attract funding from other organisations or from central government itself. In practical terms, commercial entities tend to think about smartness as a service provision for cities. Big thinkers within these commercial circles (e.g. Bill Gates) believe smartness can also help people to eliminate poverty, or provide exclusivity whilst being a general remedy for the problems of city living. However, those of us on the outside looking in are optimistic, yet at the same time realistic, about this ambitious outcome. Whilst it can be argued that smart cities might offer multiple overall benefits, there are likely to be many, as yet unknown, dis-benefits.

### *3.2 Academic*

‘Smart cities’ is a subject that has become very popular within academic research over the past decade. Researchers view smart cities from many perspectives of management, including economy, life-quality or sometimes a combination of these subjects, and there has been a large, and growing, volume of published research on the technology involved in smart city development (Dohler et al., 2011). This takes into consideration the fact that digital technology can make city operations more efficient and more open (not least because of it being online wherever we are), but also in terms of data generation and access for all. We have all seen the way in which up-to-the second transport information is relayed for buses and trains, and even taxis. Moreover people now have access to a wealth of information and buying power (e.g. online voting, ticket booking, viewing and submitting planning applications, making medical appointments and online shopping) without even needing to



leave their homes or whilst on the move. All of this is at the forefront of the smart technologically-driven / administered economy ethos. Additional benefits come from the fact that people communicate and can form interest groups more easily whilst being able to more effectively influence (or be influenced by) local governance issues and citizens alike.

However, the technology involved in smart cities creation and upkeep can also create social problems. For example, excessive use of digital technology can create inequality, as not everyone in cities can afford to purchase (or keep up-to-date with) the latest smart phone, tablet or computer. In parallel, it should not be forgotten that not everyone has been (or wants to be) trained to be tech savvy and thus many people are simply left behind. Notwithstanding these issues, the question arises of whether this change in the way we communicate with each other is itself beneficial – is it less personal, for example, and does it lead to a more insular society, or is it in fact the opposite? Only time will tell, although there are tell-tale signs of the latter rather than the former emerging. There is also the concern of what will happen if we can no longer supply smart cities with ever increasing amounts of bandwidth or electricity: will we be able to still talk about smart cities? Technology, therefore, can be a useful tool, yet it must never be the main (or only) reason for why a city is seen to be smart. Consequently, discussions in academia conclude that smart cities are a combination of things that aim to improve, but not dictate, life quality.

### *3.3 National and international*

Smartness is an urban concept that influences cities at both a national and international level. Competition to become the smartest city, drives cities to become more efficient and develop faster, and this leads to more challenges. Many different cities follow their own agenda and every city exists in its own unique context – a city is what it is because of its history and how it fits into its regional and national context (and, increasingly, its role internationally) – which makes the meaning of ‘smart’ interesting because it becomes difficult to regulate smartness in the broader endeavour to help cities move towards smartness via a process that is transparent and understandable. Nevertheless, there have been some attempts at regulating smart cities. For example, the British Standards Institution has published a series of documents that would help companies and organisations overcome the challenges of the smart city, focusing mainly on sustainability, efficiency and open data systems. Similarly, the European Union (EU) has been creating networks of communities

to create smart projects (EU-Commission, 2012). Often, cities produce smart cities proposals in order to compete with each other to get this type of EU funding. Past examples showed that cities engaging in these competitions looked at three broad categories of smart options in isolation: smart government; smart economy; and smart education. Of course, this can lead to further issues, as the categories create a single approach to smartness, rather than improved collaboration across all aspects of the city. It has, however, been a positive step towards establishing international collaborations (e.g. EU-China), where there is a lot of discussion on the resources that a smart city requires (Kang et al., 2014).

### *3.4 Conclusion*

The subject of smart cities has attracted huge interest and popularity of the concept is on the rise; in fact smartness has grown very fast in the last 5-10 years. Yet we don't exactly know what smart means. Academic ideas are critical, suggesting that we might consider technology to be part, but only part, of the smart agenda; yet smart has a different meaning for different stakeholders. This is perhaps inevitable, as the private sector has provided, and strongly 'sold', the latest technologies in smart cities in an attempt to dominate the smart landscape, while academia takes a broader perspective. The EU and international city examples show that there is not a shared vision of what we mean by, or how we assess, smartness; and, moreover, there is no shared concept of what forms of governance should be adopted.

Whilst there may not be a unified understanding of, or assessment system for, smart cities, this does not prevent cities announcing themselves as smart, through their own initiatives, agendas or competitions. For example, Vienna, New York, Amsterdam and Singapore are some of the more well-known smart cities award winners in the past five years, and yet, at least superficially, we would struggle to see them as alike in the way they operate and have an influence within or beyond their city boundaries. Perhaps they are right to make the claim and allow others to judge, or prove them wrong. Nevertheless, these cities have not been assessed according to an internationally accepted metric, which raises the question: 'What really makes cities truly smart?'



# 4. Smart city exemplars

## 4.1 Europe: Copenhagen

In this chapter, we look at two cities, Copenhagen and Singapore, that have very different geographical contexts and approaches to becoming smart, yet both have been named the world's smartest cities (albeit by different sources). We examine these cities in terms of their vision, initiatives and funding, to highlight similarities and differences in their approaches.

Copenhagen is the capital of Denmark and its most populated city (< 1million inhabitants). Famous for its canals, bikes (40% by modal split) and generally liberal attitudes, it is also often cited as the city with one of the lowest carbon footprints per capita and the most liveable, walkable and smartest city in Europe, if not in the world. As such it has received many awards and accolades, some examples of which are:

- In 2012 Copenhagen came 8<sup>th</sup> in the 'World's Smartest Cities' ranking (Cohen, 2012); Riello, 2014; CrossInnovation, 2012).
- In 2013 it was voted most liveable and walkable city by Monocle magazine and Walk 21 (CCB, 2014).
- In 2013 and 2014 it was voted Europe's Smartest City by Fast Company (CCB, 2014).
- In 2014 it came top of the EU 28 rankings for smart cities and was awarded the prestigious international 'World Smart Cities Award' in Barcelona for its 'Copenhagen Connecting' plan (StateOfGreen, 2014). This was based on six factors: Governance, Economy, Mobility, Environment, People and Living (CopenhagenCapacity, 2015). In the same year it was awarded the 'Green Cities' award (EuropeanGreenCapital, 2014).

- In 2016 it was listed as 11th in the 'World's Smartest Cities' ranking (IESE, 2016) and 1st in the world due to its green strategy (Kwang, 2016).

Copenhagen's vision as a smart city was very much inspired by becoming first a 'green city'. The Copenhagen Climate Plan 2025 (Bjerregaard et al., 2009) was a city strategy that aimed to create the first carbon neutral capital by 2025.

In terms of smart initiatives (i.e. an action taken in order to achieve a goal – in this case becoming smarter) most of the projects included in the plan were related to energy, transportation and buildings, and all aimed to achieve a 20% reduction in carbon emissions over a ten year period (2005-2015). Copenhagen's smartest initiative, in most people's eyes, has for a long time been its propensity for encouraging and adopting cycling – this has to be one of the smartest method available (in absence of any smart technology) to lower carbon emissions whilst improving people's health and wellbeing. Moreover, it makes the city a much more pleasant environment in which to live due to its improved air quality and much reduced noise. An allied smart approach has been to bring together many stakeholders, including local governance bodies, local businesses, and universities (e.g. DTU), in order to rise to the 2025 challenge. This idea of smartness by collaboration, based on broad stakeholder engagement, has underpinned the development of smart city infrastructure (e.g. smart energy creation, smart communications and increasingly smart homes, to name but a few) within Copenhagen. Copenhagen won its 2014 award for initiatives to use 'Big Data' to make the city greener and improve the quality of life. This included initiatives with MIT (the Massachusetts Institute of Technology (MIT) that helped develop real-time traffic information and collection of air quality data through a range of city and bike sensors. As such innovative, green ideas have flourished, this has led to further research and greater employment opportunities.

In terms of funding, Copenhagen benefits through investment from many overseas companies (e.g. Cisco and Hitachi). Moreover, combined with home-grown capital creation through a significant body of newly funded 'smart' research, this has generated new experiences for the city and its people. Copenhagen's financial and consumer benefits extend the value generated by the movement towards smartness further, not least through bringing the green aim to fruition through a plethora of new 'green' products and 'green' industries that lead to lower carbon (and related noxious) emissions and health benefits in addition to employment and wealth creation – all of these systems, and benefits from changes to them, are interdependent

to some degree.

For these reasons, we can readily agree with the claim that Copenhagen has been very smart: promoting a green ideology, innovating and collaborating to develop new green markets, while also by creating a desirable city in which to live, leads to a mutually-reinforcing synthesis of multiple benefits.

## *4.2 Asia: Singapore*

Singapore is a small island, and uniquely both a city and a state, in the continent of Asia and is known to be a highly technological place. Since the 1980s it has been developing considerable digital hardware and creating numerous digital opportunities. While there have been parallel initiatives, it is perhaps primarily for this reason that it is often considered as the smartest city in the Asian region (Watson, 2017), and many ranking systems suggest it could even be the smartest city in the world. While recognising it as a leading smart city, others would contest this view; perhaps allowing that it is one of the world's top five (Buntz, 2016) – an observation that reinforces the arguments that smartness is a contested concept and context-dependent. Rankings and awards include:

- In 2016, Juniper Research suggested it as the first smart city in the world (Smith, 2016).
- In 2016, Singapore came 9<sup>th</sup> in 'World's Smartest Cities' rankings (IESE, 2016)
- In 2016, it was the big winner (along with New Zealand) in the 'IDC Smart city development index' (Rago, 2016).

In 2016, the Central Government of Singapore published a ten year plan called 'Smart Nation Singapore'. This plan proposed to make life quality better by connecting and using digital technology. To bring about this new vision for smartness, Singapore has adopted a top-down approach to the initiatives that it has sought to use – one which empowers the Central Government to take decisions on a range of smart issues. Within this plan, the Singapore Government has proposed four areas where a range of initiatives would be used to improve citizens' life: Health, Living, Mobility and Services.

In terms of mobility, Singapore has considerably fewer cyclists than Copenhagen, yet it is well recognised for its smart transport systems and related infrastructures, and its ability to manage them in an exemplary manner – a different form of smart with multiple beneficial outcomes, many the same, emphasising again the need for smartness to be responsive to context. For example, Singapore’s smartness include the ability to: flood transport tunnels in times of exceptionally heavy rain; capture real time traffic data, re-route buses and traffic in times of severe congestion; and automatically charge citizens according to the routes they choose – less for those that are less congested.

Moreover, the Singapore Government supports organisations and new businesses that support this agenda by providing funding and offering them collaboration opportunities, such as e.g. the National Youth Council’s offer of financial and development support to younger generations (NationalYouthCouncil, 2016). In collaboration with the National Research Foundation (NRF) and MIT, which supports the Alliance for Research and Technology (ART), they have researched, developed and helped commercialise innovative ‘smart’ technologies. An overall budget of \$60 million has been put aside in order for Singapore to materialise its vision in this respect. Furthermore, Singapore’s collaboration with industry partners, such as CISCO, will generate further collaborations and it is estimated that the profit from the digitalisation of services will exceed \$4.6 trillion in the next decade.

### *4.3 Conclusion*

We can see that Copenhagen and Singapore are both smart, yet for different reasons. Copenhagen has focused on greening and low carbon benefits for the city and its citizens, whereas Singapore has developed on a strongly digital basis. Both have responded to their local contexts. This begs the question: if we were to consider two UK cities, how are they smart, or how might they make themselves smarter?



# 5. UK smart city initiatives

So far, the different typologies described in this book refer to city aspirations wherein a city can identify its strengths and provide support for a new vision and identity that benefits to itself and its people. As seen from the Copenhagen and Singapore exemplars, the meaning of smart is not entirely clear and is difficult to visualise, not least in terms of the desired benefits that will be achieved in the city. Moreover, in smart cities terms, the aspirations for smartness that a city could aim for have not been clarified fully. In many cases, it appears that a single theme approach is used and we argue this should not be the case.

The *Little Book of Smart Cities* proposes that we need to see smart in its entirety. By this, we mean that if we try to explain smart in separate themes, then we might fail altogether to realise the multiple, complementary and mutually-supportive benefits arising from the opportunities that the city future holds for the next generations, noting that these ‘opportunities’ might relate to the need to address some of the impending, serious challenges that the future holds for the city and people. For this reason, this book proposes that the smart cities concept underpins the vision for the future, with the proviso that it embodies a holistic view of what this might be – where the possibilities can be rationalised fully. Smart, here, is a mechanism to help cities formulate their own vision, help them understand their contexts, and then help make the city resilient to adverse changes and liveable for the generations to come.

## 5.1 Initiatives

This book supports the argument that the interpretation of smart should be based on liveability principles and a participatory approach, and therefore that a smart initiative refers to an action taken in the name of achieving this goal. In this section we explore smartness in Birmingham and London in terms of their respective

initiatives. These cities have been chosen because they constitute the two largest cities in the UK and they include the research institutions of The University of Birmingham and UCL, both of which form part of the Liveable Cities research team and are studying the smart cities agenda.

## 5.2 Birmingham initiatives

Birmingham is the second biggest city in the UK after London. For more than a decade, Birmingham has been progressing talks about how it can become a smart city and developing and implementing initiatives to move it towards smartness. In 2013, Birmingham City Council issued the Smart City Vision Statement (DigitalBirmingham, 2017) aiming to develop areas that would realise their smart aspirations. The 35 objectives advocated in the Birmingham roadmap were set by a group comprising public, private and academic communities, and aimed to respond to city challenges and improve city living by considering three main areas where actions would take place (Trickett, 2014): Technology & Places, People and Economy.

The underpinning strategy behind achieving Smart Birmingham is described as an ‘ecosystem’ that brings together and improves collaboration between stakeholders with shared aims and objectives. This integrated approach is essential and is supported by Birmingham’s Smart City Commission, Digital Birmingham and Birmingham’s Green Commission. Part of this ecosystem is a digital webpage portal where anyone (with access to the web) can get information and share their ideas on Smart Birmingham. All efforts fall under the umbrella of the Birmingham City Council, which has a strong focus on digitalisation as the enabler to boost employability, digital inclusion, connectivity, mobility and general wellbeing, but also to attract investment from outside sources.

The research that underpins the *Little Book of Smart Cities* explored the initiatives of this Birmingham ecosystem and created a database of initiatives for the city – this is accessible online and links can be found on page 19. In total, 125 initiatives were identified in Birmingham and categorised according to eight themes (see Figure 3). Interestingly, the largest category related to ‘business’ (29%) followed by ‘quality of life’ (23%), while resilience only specifically accounted for three initiatives. Even allowing for some duplication of benefits beyond the loose category definitions (some environmental sustainability initiatives would be likely to have benefits also in terms of resilience, for example), it is inconceivable that resilience – continuing to function



effectively in the face of change (be it climate-related or due to any other cause) – would not feature highly in the city’s list of priorities, and therefore constitute a core objective in the move towards smartness.

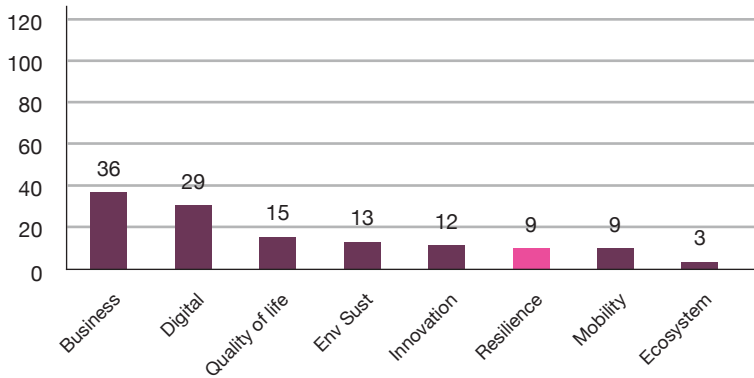


Figure 3. Birmingham initiatives in ranked order according to 8 thematic categories.

In order to have a balanced approach to smartness we suggest that a smart city should have (or aim to reach) broadly similar numbers of initiatives in each theme; this appears not to be the case for Birmingham.

### 5.3 London Initiatives

London, by far the largest city in the UK, faces many long-term challenges, not least its now rapidly increasing population (estimated to reach 9.8 million by 2030) and its associated demands. Taking this into consideration, and whilst recognising London as a ‘global city’, a number of plans have been created (e.g. Smart London 2020, Infrastructure 2050, Digital Connectivity and Technology, and Smart London). The Smart London Plan, part of the Mayor’s Vision 2020, is critical to overcoming the city’s challenges and creating smart solutions for making London more liveable. The focus is on seven key areas (SLB, 2013): Londoners; Open Data access; Talent (research, technology, creative); Networks; Growth; City Hall (as a service); and Experience for All.

Using the same approach as for Birmingham, a total of 275 initiatives were identified and categorised according to the eight strongest themes (Figure 4). Most of London’s

smart initiatives have been focused on ‘business’ (27%) and ‘digital’ (23%), with ‘ecosystem’ (5%) receiving least attention. Once again, there is a lack of balance across the categories and if anything, a greater emphasis on the economic pillar of sustainability at the expense of the social and environmental pillars.

### 5.4 Smart Birmingham versus smart London

When comparing the smart initiatives being taken by Birmingham and London, several key messages come to the fore:

- Smartness relates heavily to smart initiatives from ‘Business’ (ranking as 1<sup>st</sup> in both cities).
- ‘Digital technology’ is highly important (ranking as 2<sup>nd</sup> and 3<sup>rd</sup>, respectively, in Birmingham and London).
- Local context and local conditions lead to smart initiatives that are particular to that city (i.e. those related to ‘Communities’ in Birmingham and ‘Innovation’ in London are evidently highly place-specific).
- ‘Resilience’, ‘Ecosystem’ and ‘Mobility’ had the lowest number of initiatives associated with them, compared with ‘Business’, ‘Digital’, ‘Quality of Life’ and ‘Environmental Sustainability’.

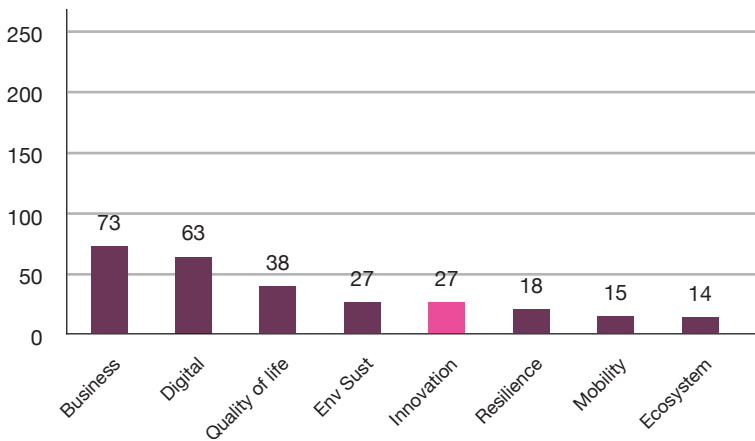
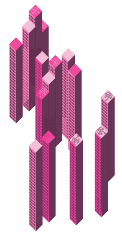


Figure 4. London initiatives in ranked order according to eight thematic categories (Pink highlights initiatives highly evident to this city alone).

# 6. Conclusion



The *Little Book of Smart Cities* shows how the concept of smartness unfolds and is interpreted in different ways and in different places. ‘Smart’ is considered a city typology, allied to other city typologies (i.e. sustainable, liveable and intelligent cities) in the sense of the desire to make cities better places to live. This book looked at the ways smart cities are being defined by key stakeholder groups (i.e. commerce, academics, national and international institutions) and shows that a different understanding of smart emerges, depending who defines the term. Similarly, when looking at two world-leading examples of smart cities, Copenhagen and Singapore, they have both achieved smartness, but in different ways. Even where common focuses were adopted (i.e. mobility), the approaches taken were distinctly different, largely as a result of their different contexts; this is as it should be. By looking at the smart initiatives in the UK’s two largest cities, Birmingham and London, it is apparent that those initiatives driven by and for business lead the rankings in both cities. Whilst Digital Technology features highly in both cities, it is one of many contributors to achieving a smart city. And while many common, smart initiative themes occurred in both cities and scored highly (seven were identified as being recognisably translatable to other cities), some did not (i.e. Community for Birmingham and Innovation for London were shaped specifically for the city in question); this highlights the importance of local context and local conditions when it comes to adopting smart initiative themes. We would argue that all smart initiatives should be shaped to, and be responsive to, the local context and local conditions. They should also be designed to be complementary so that the multiple benefits that any one initiative might deliver are reinforced by the other initiatives being implemented in the city.

# References

BJERREGAARD, R., BONDAM, K., KJELDGAARD, A., LØNBORG, M., ALLERSLEV, P., WARMIN, M. & HOUGAARD, J. 2009. Copenhagen Climate Plan *In: COPENHAGEN, C. C. (ed.). Copenhagen City of Copenhagen The Technical and Environmental Administration.*

BLACKBURN, S., JOHNSON, C., DODMAN, D., SATTERTHWAITE, D., DAVIS, T. H. & VALDÉS, H. M. 2012. Making cities resilient Report 2012. *In: EDUCATION, T. U. N. O. F. D. R. (ed.). EU: UNISDR.*

BUNTZ, B. 2016. *The World's 5 Smartest Cities* [Online]. The Internet of Things Institute Available: <http://www.ioti.com/smart-cities/world-s-5-smartest-cities>.

CAVADA, M., ROGERS, C. D. F. & HUNT, D. V. L. 2014. Smart Cities: Contradicting Definitions and Unclear Measures. The 4th World Sustainability Forum, 01/30/2014 2014 Basel, Switzerland. Basel, Switzerland: Sciforum.

COHEN, B. 2012. *The Top 10 Smart Cities on the Planet* [Online]. FastCoDesign. Available: <https://www.fastcodesign.com/1679127/the-top-10-smart-cities-on-the-planet> [Accessed 03.05.2014 2014].

COPENHAGENCAPACITY. 2015. *Denmark tops EU-28 Smart City ranking* [Online]. Greater Copenhagen. Available: <http://www.copcap.com/newslist/2015/denmark-tops-eu-28-smart-city-ranking> [Accessed 24.07.2016 2015].

CROSSINNOVATION. 2012. *The Top Smartest Cities of Europe* [Online]. Available: <http://www.cross-innovation.eu/the-top-10-smartest-cities-of-europe/news/> [Accessed 02.03.2015 2015] DIGITALBIRMINGHAM. 2017. *Smart cities Commission Members* [Online]. Birmingham. Available: <http://digitalbirmingham.co.uk/project/the-roadmap-to-a-smarter-birmingham/smart-city-commission-membership/> [Accessed 09/05/2017].

DOHLER, M., VILAJOSANA, I., VILAJOSANA, X. & LLOSA, J. 2011. Smart Cities: An Action Plan. *Smart Cities Congress*. Barcelona.

EU-COMMISSION 2012. COMMUNICATION FROM THE COMMISSION SMART CITIES AND COMMUNITIES - EUROPEAN INNOVATION PARTNERSHIP. final ed. Brussels.

EUROPEANGREENCAPITAL. 2014. *Copenhagen Green Capital* [Online]. Available: <http://ec.europa.eu/environment/europeangreencapital/winning->

cities/2014-copenhagen/ [Accessed 10.06.2014 2015].

HARRISON, C., ECKMAN, B., HAMILTON, R., HARTSWICK, P., KALAGNANAM, J., PARASZCZAK, J. & WILLIAMS, P. 2010. Foundations for Smarter Cities. *IBM*.

IBM. 2009. *IBM Builds a smarter planet* [Online]. Available: <http://www.ibm.com/smarterplanet/us/en/> [Accessed 20/03/2016 2016].

IESE. 2016. *Ranking The World's 'Smartest' Cities* [Online]. Available: <https://www.forbes.com/sites/iese/2016/07/06/the-worlds-smartest-cities/#2aef8cb84ab9> [Accessed 16/09/2016 2016].

KANG, Y., ZANG, L., CHEN, C., GE, Y., LI, H., CUI, Y. & WHYTE, H. 2014. Comparative Study of Smart Cities in Europe and China. *In: MINISTRY OF INDUSTRY AND INFORMATION TECHNOLOGY (MIIT), D. C., EU COMMISSION (ed.)*.

KWANG, T. W. 2016. *Top Smart Cities in the world today* [Online]. Hong Kong: eGov Innovation Available: <http://www.enterpriseinnovation.net/article/top-smart-cities-world-today-676169304> [Accessed 10.09.2016 2016].

LIVEABLE CITIES. 2013. *The Liveable cities project* [Online]. Birmingham [Accessed 10/5/2015].

MOIR, E., MOONEN, T. & CLARK, G. 2014 What are future future cities? Meanings and uses *In: SCIENCE, G. O. F. (ed.)*. London Foresight

NATIONALYOUTHOUNCIL. 2016. *National Youth Council Initiatives* [Online]. Singapore Singapore Government Available: <https://www.nyc.gov.sg/initiatives> [Accessed 18.01.2017].

NEUMAN, M. & CHURCHILL, S. 2015. Measuring sustainability. *Town Planning Review*, 86, 457-482.

NEUMAN, C. 2015. Measuring Sustainability *Town Planning Review*, 86.

RAGO, A., WANG. 2016. *IDC Announces 2016 Top Smart City Projects in Asia/ Pacific – Singapore and New Zealand as Big Winners* [Online]. Available: <https://www.idc.com/getdoc.jsp?containerId=prAP41679316> [Accessed 09.10.2016 2016].

RIELLO. 2014. *The 10 Smartest Cities In Europe* [Online]. Riello Elettronica. Available: <http://www.riello-ups.co.uk/blog/683-the-10-smartest-cities-in-europe>

[Accessed 01.25.2015 2015].

ROGERS, M. 2016. Smart Cities Interview. *In*: CAVADA, M. (ed.).

SLB 2013. Smart London Plan *In*: 2020, S. L. B. M. S. V. (ed.). London London Assembly

SMITH, S. 2016. *Singapore named 'Global Smart City 2016'* [Online]. Hampshire, UK: Juniper Research Available: <https://www.juniperresearch.com/press/press-releases/singapore-named-global-smart-city-2016>.

STATEOFGREEN. 2014. Copenhagen: State of Green. Available: <https://stateofgreen.com/en/profiles/city-of-copenhagen/news/connecting-copenhagen-is-the-world-s-best-smart-city-project> [Accessed 02.05.2015 2015].

TAEWOO, N. & PARDO, T. Conceptualizing Smart City with Dimensions of Technology, People, and Institutions. The Proceedings of the 12th Annual International Conference on Digital Government Research, 2011.

TRICKETT, L. 2014. The Roadmap to a Smarter Birmingham *In*: BIRMINGHAM CITY COUNCIL, B. S. C. C. (ed.). Birmingham Digital Birmingham

WATSON, J. 2017. *Where are the 10 smartest cities in the world?* [Online]. Available: <https://www.hottopics.ht/stories/tech-hubs/where-are-the-10-smartest-cities-in-the-world/> [Accessed 10.03.2017 2017].

# Bibliography of initiatives

## *(A) Birmingham*

Birmingham cycle revolution <http://bhamcyclerevolution.org.uk/>

Birmingham Data Factory <https://data.birmingham.gov.uk/>

Birmingham Tram <https://www.networkwestmidlands.com/ways-to-travel/tram/>

Birmingham Vision of the future [http://www.bebirmingham.org.uk/documents/Final\\_Sustainable\\_Community\\_Strategy-Birmingham\\_2026.pdf](http://www.bebirmingham.org.uk/documents/Final_Sustainable_Community_Strategy-Birmingham_2026.pdf)

Climate KIC <http://www.climate-kic.org/regional-centres/west-midlands-uk>

Digital Birmingham <http://digitalbirmingham.co.uk/projects/>

Greater Birmingham & Solihull <https://www.gbslepgrowthhub.co.uk/>

Innovation Birmingham <https://www.innovationbham.com/>

Innovation Birmingham Entrepreneurs <https://www.innovationbham.com/entrepreneurs-for-the-future>

Marketing Birmingham <http://www.marketingbirmingham.com/>

Profile of Birmingham's Business and Professional Services Sector [https://www.birmingham.gov.uk/download/downloads/id/2536/sector\\_profile\\_business\\_and\\_professional.pdf](https://www.birmingham.gov.uk/download/downloads/id/2536/sector_profile_business_and_professional.pdf)

Smart City Roadmap [http://s3-eu-west-1.amazonaws.com/digitalbirmingham/resources/Birmingham\\_Smart\\_City\\_Roadmap\\_revised-Nov-2014.pdf](http://s3-eu-west-1.amazonaws.com/digitalbirmingham/resources/Birmingham_Smart_City_Roadmap_revised-Nov-2014.pdf)

The Great Birmingham Project <http://centreofenterprise.com/the-greater-birmingham-project/>

The way forward: an independent review of the governance and organisational capabilities of Birmingham City Council [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/384732/The\\_way\\_forward\\_-\\_an\\_independent\\_review\\_of\\_the\\_governance\\_and\\_organisational\\_capabilities\\_of\\_Birmingham\\_City\\_Council.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/384732/The_way_forward_-_an_independent_review_of_the_governance_and_organisational_capabilities_of_Birmingham_City_Council.pdf)

Transition cities <http://www.transition-cities.net/wp-content/uploads/2014/07/Birmingham-Carbon-Roadmap.pdf>

Wayra <https://wayra.co.uk/>

## *(B) London*

London Infrastructure Plan 2050 <https://www.london.gov.uk/what-we-do/business-and-economy/better-infrastructure/london-infrastructure-plan-2050>

London's Technology Plan <https://www.london.gov.uk/what-we-do/business-and-economy/science-and-technology/smart-london/londons-technology-plan>

Smart London <https://www.london.gov.uk/what-we-do/business-and-economy/science-and-technology/smart-london>

Smart London Board <https://www.london.gov.uk/what-we-do/business-and-economy/science-and-technology/smart-london/smart-london-board>

Smart London Case Studies <https://www.london.gov.uk/what-we-do/business-and-economy/science-and-technology/smart-london/smart-london-case-studies>

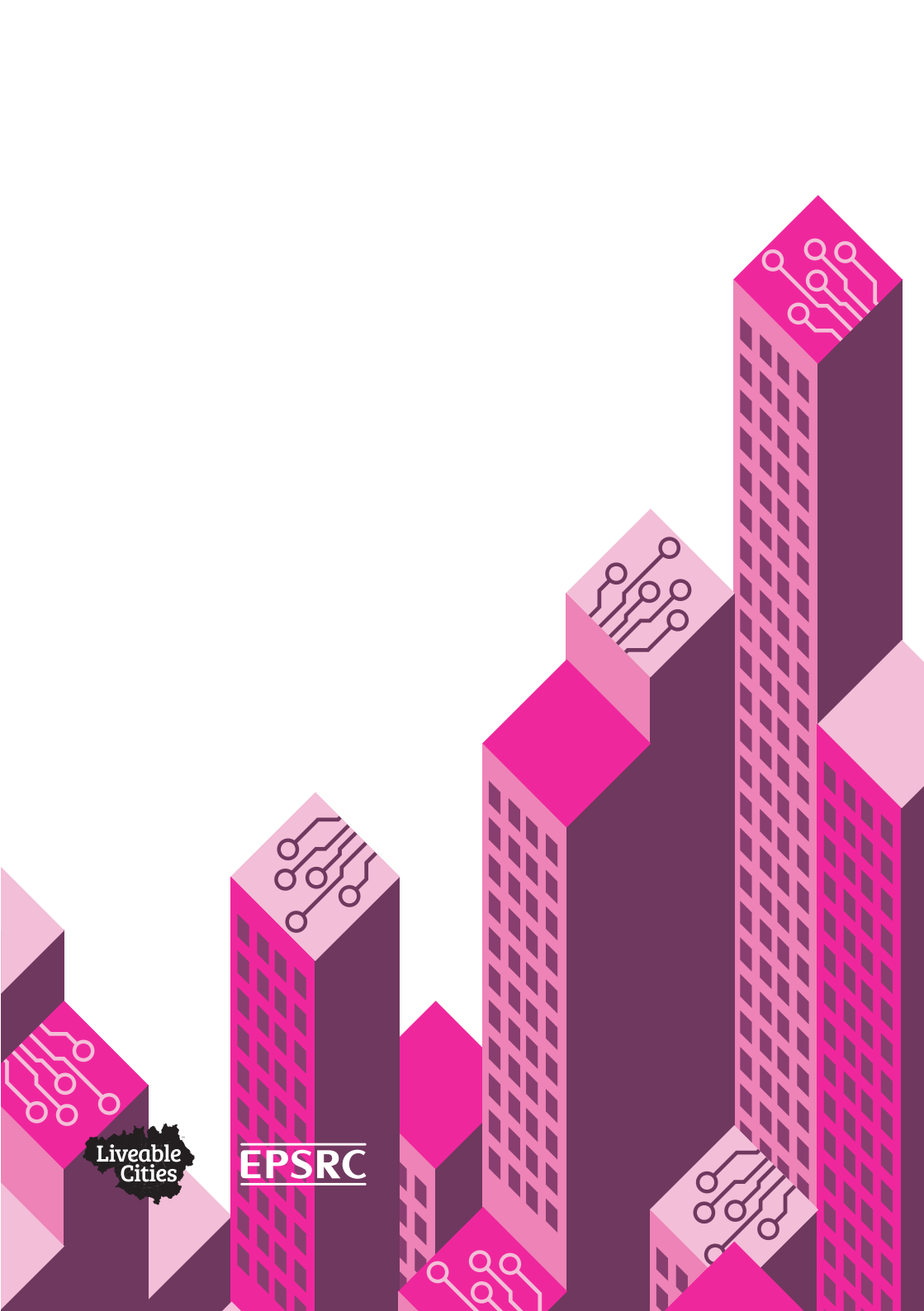
Smart London Plan [https://www.london.gov.uk/sites/default/files/smart\\_london\\_plan.pdf](https://www.london.gov.uk/sites/default/files/smart_london_plan.pdf)

Tech London <https://www.london.gov.uk/node/33880>

The Future of Smart <https://www.london.gov.uk/what-we-do/business-and-economy/science-and-technology/smart-london/future-smart>







Liveable  
Cities

EPSRC