WHAT ARE FUTURE CITIES?
ORIGINS, MEANINGS AND USES.

Compiled by The Business of Cities for the Foresight
Future of Cities Project and the Future Cities Catapult

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FOREWORD

Peter Madden,
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By 2030, the UN estimates, 70% of people will be in our global cities, the hubs of innovation and economy that today provide about 80% of global GDP (World Bank). How these cities look, feel and operate will critically affect the lives of communities around the world, will impact our environment, and will influence our local, national and international economies. It is crucial that we proactively understand what we want and need for our future cities, and put in place systems now that support those future needs in a sustainable and integrated way.

'Future cities' have been talked about for hundreds of years, as urban areas around the world have been imagined, planned, built, adapted and analysed. Some future city visions have flourished and some have failed. To support current urbanists and city-makers, we have partnered with the Government Office for Science Future of Cities Project. Together we recognise the importance of analysis into how 'future cities' have been considered through time, and how they are currently interpreted. This directly impacts how they are being designed and built, and understanding that helps us recognise how cities can best respond to the needs of their citizens and countries. We are particularly interested in the findings that detail different interpretations of 'future cities', 'smart cities', 'liveable cities' and more – bringing clarity to this field will help focus resources towards developing cities that individuals most want to live, work and travel in.

The UK Government's Technology Strategy Board has recognized the skills and expertise of UK innovators, businesses, cities and universities in developing future city solutions. In 2013 it set up the Future Cities Catapult, one of a network of elite technology and innovation centres across the UK. Our central London Innovation Centre, data-driven CitiesLab and multi-disciplinary teams provide cutting-edge facilities for urban innovation, and we aim to harness UK city-making expertise, build it and share these solutions with cities the world over. To find out more about our work, please visit *our website*, follow us on *twitter*, or email Caroline Twigg *ctwigg@futurecities.catapult.org.uk*.

Cities are complex systems and centres for innovation and growth. The 64 largest cities in the UK make up just 9% of the landmass, but account for 54% of the population, 58% of jobs and 60% of the UK's GVA, figures that are only predicted to increase in the future. The Foresight Future of Cities Project, based in the Government Office for Science, is examining the opportunities and challenges facing UK cities over the next 50 years, such as contributing to economic growth, increased need for housing, and the challenges of social inequality. The project's aim is to provide central government and local authorities with an evidence base to support good decisions in the near future which will lead to positive outcomes for cities in the long-term. The look, feel and function of our cities in 2065 and beyond will depend on decisions that policymakers and practitioners make today and in the near future. Perhaps paradoxically, an integral component of looking meaningfully at the future of cities is looking backwards: the cities we have today are the product of their own history and our everyday lives are still shaped by decisions that were taken hundreds of years ago. Thus, in investigating the present state of cities we are also examining how they have developed over time.

This joint report is the product of an ongoing partnership between the Foresight Future of Cities Project and the Future Cities Catapult. It covers new ground in understanding the multiplicity of ideas that are being explored by the many different groups now looking at the future of cities.
While this has a demonstrably long heritage, the science of cities is continuously emerging as a distinct field of study. We very much support the work of the Future Cities Catapult in bringing an international dimension to the UK Government's activities in this space and playing a prominent role in promoting UK expertise to a rapidly urbanising world.

**Professor Sir Alan Wilson
Chair, Lead Expert Group,
Foresight Future of Cities
Project**

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EXECUTIVE SUMMARY

This paper reviews the origins, definitions, trends and pathways of knowledge about future cities and the future of cities. In particular, it examines the different terms and phrases that are used by key stakeholders concerned with the future of cities. Its findings are based on an extensive English-language source and literature review of relevant publications, reports, projects and online press. It identifies key developments in future thinking and practice amongst governments, corporations, institutions and citizens at the local and global level.

- The future of cities discourse is over a century old and has encompassed at least four cycles of thinking about the nature, purpose and destiny of cities. Today's cycle of future city thinking is distinctive for its global, positive, strategic, integrated, and evidence-led character.

- Future city terminology can convey either environmental, social, economic or governance aims, or a hybrid of some or all of these elements. Although terms such as 'garden city', 'inclusive city', 'competitive city' and 'intelligent city' tend to refer to one specific domain, the more commonly used terms tend to have broad, hybrid or ambiguous meanings. This especially applies to current phrases such as 'smart cities', 'sustainable cities', 'future cities' and 'liveable cities'. The high degree of conceptual crossover and overlap means most terms are highly compatible with each other, but reflect different sources or alliances, often with a desire to suggest conceptual differentiation despite substantive overlap.

- Sustainability is no longer the main prism through which thinking about the future of cities takes place. The 'sustainable city' was the most cited English language term in the future cities discourse in the 1990s and early 2000s, as awareness and consensus of the human impact on the environment grew. Although the literature on sustainable cities has continued to mount up, its popularity as a news and search term has declined since 2006.

- 'Smart cities' has become the most popular formulation for the future city, and is becoming a globally recognised term, replacing or co-existing with terms in other languages. The 'smart city' has displaced the 'sustainable city' and 'digital city' as the word of choice to denote ICT-led urban innovation, and new modes of governance and urban citizenship. It is also the only English language term to have become widely used in continental Europe.

- 'Eco cities' emerged as an important term for projects in Asian cities in the mid-2000s, and is still widely used in Asia and the Middle East to describe a model of low-carbon urbanism for individual districts and sometimes whole cities. The term has become less common since 2009, and has been linked to a

number of unsuccessful or criticised projects in China and UAE. A similar trend is observed with 'digital cities', a term found to be used in most continents, but whose appeal has been displaced by the broader concern of 'smart cities'.

- A small cluster of thought leaders, knowledge centres, inter-governmental bodies and multi-national technology firms are the vanguard of future city thinking and practice. Ideas of city systems, systems of cities, integrated, connected, compact, flexible and resilient cities have all been successfully packaged and promoted by these influential 'generators' whose cutting edge R&D shapes the framework and market for government 'customers' and 'end-users'.

- National and local governments adopt future city ideals and 'demonstrator' projects as solutions to short-term challenges, to develop international profile and to build shared identity and purpose. Other future city 'adopters' include corporate sponsors of urban dialogue, one stop-shop technology solution providers, taught academic programmes, philanthropic organisations, media outlets and city benchmarking studies.

- Cities also adopt future city vocabulary in an attempt to become better equipped to plan and shape their futures, as they acquire and build new governance systems, finance tools, data streams, and city management techniques.

- Formal and informal citizenship engagement with future cities has become more inventive and collaborative. Citizens adapt future city language to their aspirations for quality of life, safety, design, culture and vibrancy, and pursue them through crowd-funding, crowdsourcing, DIY solutions and political campaigns, among other means.

- The science of cities is still emerging and has not yet generated global language norms. It is also an inter-disciplinary science, and this makes clarity of concepts harder to achieve. A more consistent and globally accepted set of principles for future cities may, paradoxically, take shape over the next decade, but it is likely that this will happen at the same time as local and corporate propositions and terminologies continue to multiply.

- The discourse of future cities is becoming more multi-disciplinary, more evidence-led and more conceptually watertight, but descriptions and imaginations of the future city will always reflect the changing way that cities are perceived to matter to society, the environment, and the economy, and will also reflect the competitive dynamics between cities and the firms and institutions that seek to serve them.

1.
INTRODUCTION

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1. INTRODUCTION

1.1 The future of cities – importance and relevance

The world is two-thirds of the way through a century-long cycle of rapid urbanisation, at the end of which more than 70% of people will live in cities (WHO, 2014). The urban transformation has become a major contributor to economic, demographic, social and environmental change (Pickett, 2013). Twentieth century models of urbanisation were typically applied without full consideration of future outcomes and path dependencies, as the use of the private motor car and urban sprawl became dominant trends. In the twenty-first century, global urbanisation must be shaped and managed so that cities fully achieve their potential to increase prosperity and social cohesion, bring about improved standards of environmental efficiency, citizen health and well-being, and strengthen international relations. If it is not managed, and if suitable local financing and investment tools are not achieved, rapid urbanisation could prove a major threat to both modern society, and to the world's environmental fabric.

The future form, functionality, appearance and ambience of cities will have a direct impact on most people's lives, whether they live in a city or not. The future city will not only impact on society, but will also influence wider global environments and economies. In terms of economics, the largest city markets have already grown bigger than those of many nations. New York has an economy which is approximately the same size as Australia's, and is the 12th largest in the world. Even more modest cities eclipse some national economies – for example Anchorage has a larger economy than Latvia (Florida, 2014). In the future, cities will cement their roles as key drivers of national, and sometimes even regional economies.

1.2 Methodology and approach

This paper reflects on two inter-related ideas: the 'future of cities' and 'future cities'. The authors of this paper consider that:

- The future of cities is a means to describe a series of enquiries, reviews and investigations into the likely requirements of cities in the future, the roles they will play, the pressures and threats they will address, and the trends that will help cities adjust and succeed.
- Future cities is a term used to imagine what cities themselves will be like, how they will operate, what systems will orchestrate them and how they will relate to their stakeholders (citizens, governments, businesses, investors, and others).

The paper examines English language interpretations of these ideas and the use of future city language amongst a wide range of stakeholders and interest groups. It seeks to identify the main trends in usage and the origins, meanings and applications of future city terminology. The paper is focused solely on English language usage, but is not restricted to English-speaking countries – it includes commentary on Japanese, Indian, Scandinavian and German initiatives, debates and discussions, where these have been published in English. It is a 'global' review in the sense that it draws upon material produced by global organisations, global firms, universities and publications, but the paper has only investigated English language sources available in the public realm.

This review does not profess to be an academic study and does not seek to provide an exhaustive glossary of all existing or possible future city interpretations. Rather, it seeks to identify key trends amongst different communities of interest, and to begin to shine some light on the drivers and actors shaping discussion and progress in the future cities sphere. It is important to note that the explanations we provide for key terms reflect common usage rather than strict definitions. In many academic and applied fields, future cities terminologies have been used interchangeably, and their meanings evolve over time as new stakeholders enter the conversation. It should also be noted that the terms we have searched for and commented upon are those that refer primarily to the idea of cities becoming more fit for the future. An equally rich study could explore the extensive terminology of cities as economic units (competitive cities, world cities, innovative cities), and of cities as hubs for creativity, diversity and attractiveness (creative cities, cultural cities, etc).

1. 3 Future cities – challenges and opportunities

The challenges cities face are well documented. Future cities will need to adapt to, or in some cases work to mitigate against:

- Climate change
- Population growth
- Globalisation of economy, demographics, risks and ecologies dependencies
- Technological developments
- Geo-political changes
- Human mobility
- Ageing populations
- Inequality and social tensions
- Insecurity (e.g. energy, food, water)
- Changing institutional and governance frameworks

Cities in the developing world face the toughest challenges, as they will see the vast majority of urban growth over the next 30 years (WHO, 2014) and experience the greatest degree of change, often with the lowest levels of resources and institutional capabilities. As the forces of globalisation place cities into direct competition with one another, cities are required to deliver thriving economies, great quality of life, political stability, business friendliness and a reduced environmental impact in order to be competitive not only on a regional or national scale, but globally.

The dual trends of urbanisation and globalisation also present opportunities; both for cities themselves and the wider world, which could then benefit from the advantages which cities bring. In particular, their critical mass, in terms of population size and density, means that cities can have truly transformative impacts upon the environment, and present a major opportunity for countering climate change. As much as 80% of human generated carbon emissions come from cities and hence can be addressed in cities (Barber, 2013). Cities harbour the scale for low-emission transport, effective land-use planning, mass retro-fitting, building efficiency, viable water and electricity systems, and product recycling (UNEP, 2014). Cities can also access global markets and resources, and create and sustain international flows of varied goods and services. The innovations provided by technological developments present possibilities for markedly improving the quality of life, health and wealth of city residents, provided the mechanisms for investment and delivery are also in place. The agglomeration of urban populations will continue to breed conditions for innovation, knowledge creation and the communication of ideas and solutions.

1. 4   Future cities – conceptions of success

Planners, scholars, authors and architects have been studying, planning, and speculating about the future of cities since ancient times (Fainstein, 2014). In the past century, ever since Englishman Ebenezer Howard's landmark 1898 book Garden Cities of Tomorrow, urbanism itself, as a distinct term and discourse, has grown out of this concern for future city development (Howard, 2007; Pike, 2005). The Frenchman Eugène Hénard was possibly the first to write strategically about future cities in Europe at his Royal Institute of British Architects address in London in 1910:

"My purpose is to inquire into the influence which the progress of modern science and industry may exercise upon the planning, and particularly upon the aspect, of the Cities of the Future... The Cities of Tomorrow will be more readily susceptible to transformation and adornment than the Cities of Yesterday." (Hénard, 1910)

The parameters of what is intended by the use of future cities language have evolved over time. During the interwar period modernist planners and architects developed

influential ideas of highly planned greener cities that would alleviate the mistakes of industrialisation. These included Le Corbusier's The City of Tomorrow and Its Planning (1929) and Helsinki-planner Eliel Saarinen's The City: Its Growth, Its Decay, Its Future (1943), both of which had a lasting impact on the design of European and North American cities.

Box 1: The future of cities – what the scholars said

"[W]hat then is to be the future of cities, three hundred years hence, a hundred years hence, or even thirty years hence? I do not know. But I venture a guess: - that those who are reasonably fortunate in this foresight will make their fortunes, and that others will be ruined by mistakes in calculation"
Alfred North Whitehead, mathematician and philosopher, UK, 1933

"In the future of cities – at least for the next half-century or more – the factor most to be reckoned with is growth, a growth proceeding at such a pace that it forces decisions before the constituted authorities are ready to decide...all our anticipations for cities of the future, then, must confirm to and may also profit by the requirements for growth"
Richard Meier, architect, USA, 1959

"[I]t is useless to speculate about the future of cities until we have reckoned with the forces of annihilation and extermination that now, almost automatically. and at an ever-accelerating rate, are working to bring about a more general breakdown"
Lewis Mumford, urbanist, USA, 1961

"There is an absence of an image for our future cities...too many of us are rooted in rural traditions, searching for security and conformity, unwilling to commit ourselves to the solution of the problems of the city in which we live and even more unwilling to pay for their solution"
Elizabeth Geen, professor, USA 1966

"The ability to build better cities lies in the technological base from which we work. When cities are seen as continuous urban systems unrestricted by political or geographical boundaries, we can create high-technology, systems-oriented companies with the capability to design and build better cities"
Professor JP Eperhard, Carnegie Mellon University, Pennsylvania, USA 1966

> *"The future of cities is not necessarily as bleak as the common fatalism might suggest – there is a future as well as a past to large cities...the future of cities should be high on the political agenda"*
> Brian Robson, Professor of Geography, University of Manchester, UK 1987
>
> Sources: Whitehead (1933); Meier (1959); Mumford (1961); Geen (1966); Eperhard (1966); Robson (1987)

Later, in the aftermath of the Second World War, the future cities discourse was geared towards remedying cities destroyed by aerial bombing (a new phenomenon) and ground warfare. These cities were often described in biological language, as sick patients in need of revival. In the United States, a three year study of The Future of Cities and Urban Development under the direction of influential Professor Coleman Woodbury, aimed to devise "policies, measures, and activities that would banish the major forms of physical blight in cities." Shortly afterwards in France, urbanist Raymond Lopez published L'Avenir des Villes, viewing urbanisation as an "indispensable instrument for life and the vitality of men", while in Spain Miguel Fisac's La Molecula Urbana proposed a future of 'convivial cities' to replace the existing model (Woodbury, 1953; Tbh, 2007; Ragon, 1970).

The trend towards centralised politics and desire to 'balance' national economies in the 1970s and 1980s saw a relative dearth of strategic thinking about the future of cities beyond the need to rehabilitate distressed areas experiencing de-industrialisation. But the transition towards a new cycle of global trade and liberalisation in the mid-1980s saw more proactive approaches to future city development begin to appear.

Nevertheless, anticipation of the telecommunications and IT revolutions saw many analysts incorrectly surmise, as Sir Peter Hall has explained, " that cities have no future at all," (Hall, 1999) due to the alleged 'death of distance' and lack of need for face-to-face contact. In opposition to this idea, academics and international organisations were grasping the metropolitan and agglomeration character of urbanisation, as well as the new challenges of social integration and environmental inter-dependency. In France, Francois Ascher's book Metapolis: The Future of Cities was an influential guide to the way metropolitanisation - the process of cities merging with surrounding areas to form larger agglomerations - was changing social and economic relationships.

A plethora of terms and ideas now make up the 'future city' lexicon. They reflect different stakeholder and interest group conceptions of the ideal city of the future. The popularity of individual terms, and indeed the meanings ascribed to them, have waxed and waned over time amongst academic, business, policy and civic communities.

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Figure 1.1 illustrates just a few of the terminology and conceptions of success which are most widely used by those working in specific city-related fields, or concerned with particular future city outcomes.

Figure 1.1: Future cities – conceptions of success

Environmental	Social	Economic	Governance
Garden cities	Participative cities	Entrepreneurial cities	Managed cities
Sustainable cities	Walkable cities	Competitive cities	Intelligent cities
Eco cities	Integrated cities	Productive cities	Productive cities
Green cities	Inclusive cities	Innovative cities	Efficient cities
Compact cities	Just cities	Business friendly cities	Well-run, well-led cities
Smart cities	Open cities	Global cities	Smart cities
Resilient cities	Liveable cities	Resilient cities	Future cities

Figure 1.2 illustrates that some terms, including Smart, Resilient and Intelligent, have been espoused in a number of different agenda areas. Sometimes phrases take on both narrow and wide meanings when used by different audiences. For example 'smart cities', when used in a narrow sense, refers to the way Information and Communication Technologies (ICT) can improve city functionality, proposing that use of the right hardware, software and technology platforms can solve many or most urban development challenges. However, a broader conceptualisation of smart cities – more commonly considered by academic and policy user groups, rather than corporates - places emphasis on good city governance, empowered city leaders, smart or 'intelligent citizens' and investors *in tandem with* the right technology platform. Other words can take on different meanings when used by different interest groups. Interpretations of economic resilience, for example, have competitiveness imperatives that are distinct from, and sometimes in conflict with, environmental or social understandings of resilience.

Figure 1.2 – Future cities – hybrid conceptions of success

FUTURE CITIES - HYBRID CONCEPTIONS OF SUCCESS

Economic + Governance
NETWORKED

Economic + Governance
INTELLIGENT

Environmental + Governance
DIGITAL

CITIES

Economic + Environmental
RESILIENT

Environmental + Governance
SMART

Social + Economic
ATTRACTIVE

Source: Future Cities Catapult (2014) (adapted from Clark and Moonen)

Figure 1.3 shows a 'trending' timeline of future city terms based on the number of books, journals and presentations in which they appear. It demonstrates how the entire future cities discourse has surged in the past two decades, beginning in the early 1990s, and picking up pace since 2007.

Figure 1.3: Trending of future city terminologies in English language academic and policy discourse over the past three decades
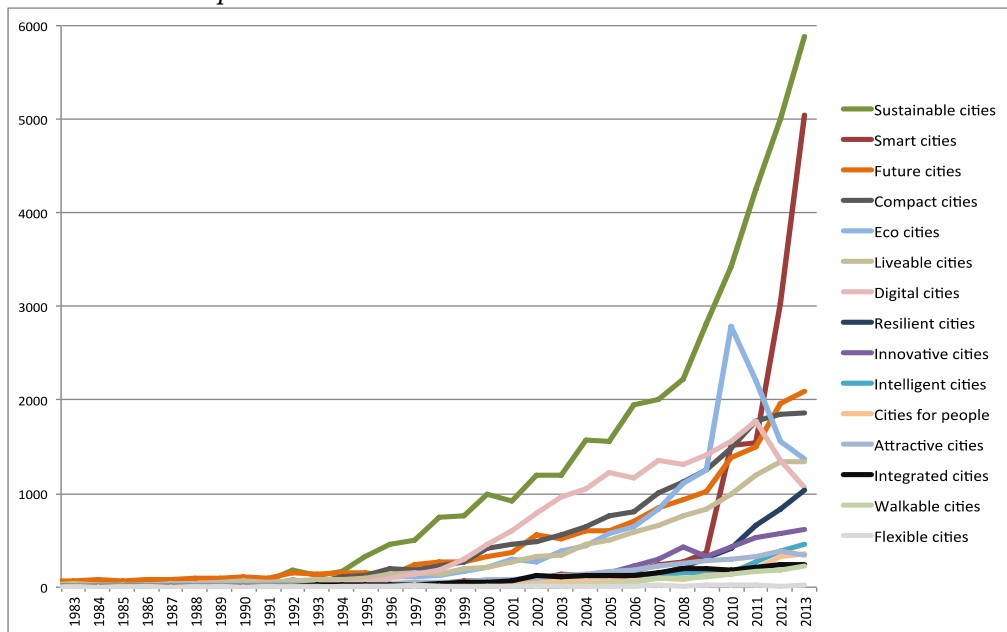
*y-axis figure is based on number of exact phrase hits on Google Scholar in each year. Terms are aggregates of singular and plural, in all spellings.
Source: Google Scholar

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The 'sustainable city' discourse became the most popular term for thinking about future urban development in the mid-1990s, off the back of the influential 1987 United Nations Brundtland Commission's publication on sustainable development. It remains the most commonly-referred-to term today in English, probably given the increasing urgency of the environmental challenge in both developing and developed economies. However, despite recent popularity of the term, it is often unclear exactly what is meant by it when used in different contexts.

In the late 1990s, up until the global financial crisis, 'digital cities' became the second most popular term in the discourse, coinciding with the optimistic narratives surrounding the global technology and dot.com boom. Boosted by the European Commission programme called European Digital Cities that began in 1996, a number of books were published that used the digital idea to describe the goal of representing the complex environments of cities and of building platforms and networks to support local communities and empower citizens (Aurigi, 2005).

Since 2009, however, the momentum behind digital cities has slowed, much of it replaced by the rocketing interest in 'smart cities'. The 'smart cities' expression has taken on some of the digital dimensions of connected systems and flexible computing infrastructures. It also incorporates elements of sustainability and inclusivity, as well as responding to the rise of new internet technology interfaces (Deakin, 2012). Some observers point out that smartness as a term is more politically neutral than sustainability. Thus, iterations of the term smart ('smart city', 'smart growth', 'smart development') are more palatable in countries where a large body of public opinion associate sustainability and greenness with highly liberal or progressive politics (RPA World Cities Planning Committee, 2014).

'Smart cities' looks imminently set to overtake 'sustainable cities' as the most commonly used future-oriented term. In addition to its overall rise in use, we have identified the anglicised term 'smart city' as already in use in a number of international contexts. It is used:

- in Germany, to describe projects in Berlin and Cologne (Loy, 2014; SmartCity Cologne, 2014);
- in France, as the name for a long-term urban strategy in Lyon, an urban research programme in Paris, and as part of a government programme to create 'smart communities' (Grand Lyon, 2014; SmartCity, 2014a; Cassely, 2014);
- in Morocco, interchangeably with 'ville intelligente' (Ater, 2014);
- in Switzerland, as a federal energy department project (SmartCity,2014b);
- in Spain, as the name of a new urban innovation centre in Zaragoza (Europa Press, 2014);

- in Indonesia, as the name of a programme of development in Jakarta and regional cities, in partnership with the Netherlands (Badan Informas Geospasial, 2014);
- in Colombia, as the title of a virtual education course on city planning for city leaders at Javeriana University in Bogota (Badan Informas Geospasial, 2014).

Figure 1.3 also hints at the brief rise and fall of 'eco-cities' as a dominant way of thinking about the future of cities. Although the term has been popularised since the mid-1990s, in 2010 and 2011 the term really gained impetus as more places began to compete on sustainability innovation, not least the high-profile eco-city projects in China and Abu Dhabi (Joss, 2009). The term remains important, but it has since dropped from its peak, whilst 'compact cities' appears to be a more enduring theme, rising more steadily throughout the past decade. As 'digital cities' fell from common parlance, 'smart cities' rapidly took its place, encompassing a focus on technology as well as citizen and human-centred considerations.

'Future cities' and 'future of cities' are themselves popular terms in general academic, practitioner and policy use. When combined, they are the third most commonly used term after 'sustainable cities' and 'smart cities'. It is significant that 'future cities', which tends to have a more limited umbrella focus on technological dimensions, has overtaken 'future of cities' since 2009 (Figure 1.4). The rise in 'future cities' thinking is linked to the increasing spillover of urban topics into new disciplines – engineering, construction, energy, IT and ecology. By contrast the 'future of cities' is more confined to traditional, planning, policy and strategy thinking.

Figure 1.4: Occurrence of 'future cities' and 'future of cities' terms over the past three decades
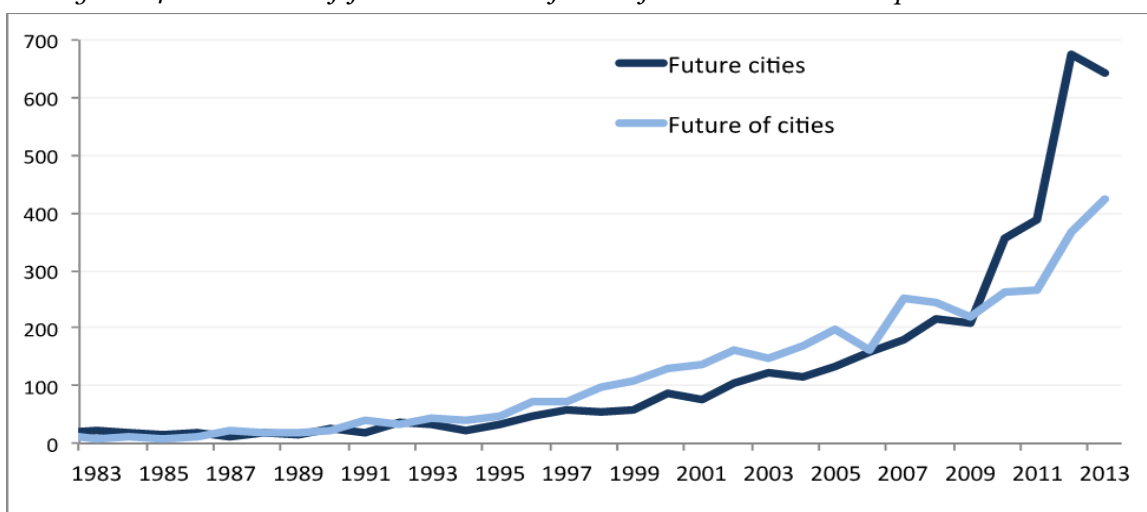

Source: Google Scholar

A global analysis of Google search trends (rather than literature citations) over the past decade reveals slightly different results, but a similar overall pattern (Figure 1.5). 'Future cities' has been stable, with occasional spikes in interest linked to specific projects including the term 'future cities' or 'future city' in them. Smart cities has become more actively searched for over the past 3 years in particular, having yielded barely any interest prior to 2006. Sustainable cities has declined from its brief position in 2006 as the most popular search term, and is now less than half as popular as smart cities. Eco cities and intelligent cities have much lower overall global appeal, but have been fairly stable since 2010.

Figure 1.5: Google search trends for five of the most common future city search terms
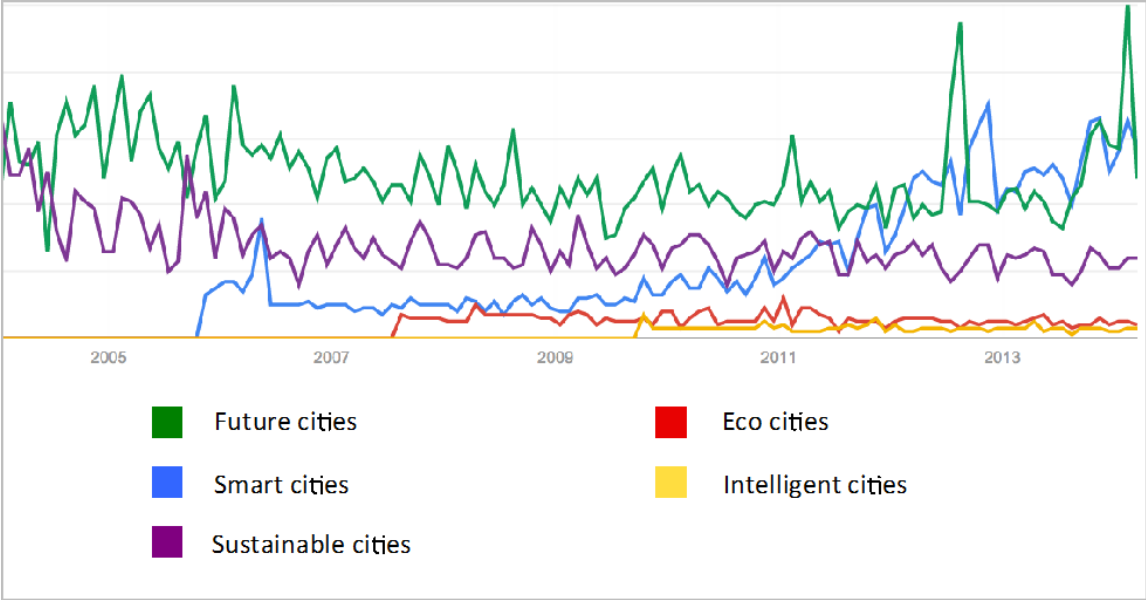
Source: Google Trends

Google Trends also offers an initial insight into the geographic distribution of future city interest (Figure 1.6). English-speaking regions are inevitably prominent for most English-language terminologies, but there are significant differences.

Figure 1.6. Geographic trends in future city term usage

	Trend	Regional popularity	Country popularity	City popularity
Future cities	Stable	Global	India, USA, Canada, Australia, UK, Mexico, Brazil	Minneapolis, Singapore, Mumbai, New Delhi, Phoenix, London, San Francisco, Pune
Eco City	Stable	Asia	Philippines, Singapore, Malaysia, India	Chandigarh, Tianjin
Smart cities	Rising usage	Europe, North America	Italy, Spain, Belgium, UK	Barcelona, Bologna, Turin, Rome
Intelligent cities	Stable	North America	USA, UK	London
Sustainable cities	Declining usage	Commonwealth	Australia, UK, Canada, USA, India	Vancouver, Singapore, Washington, Auckland, Portland, Dubai, London, Austin
Compact cities	Stable	Mixed	Australia, UK, USA	Salt Lake City, New York City
Liveable cities	Sporadic (ranking-led)	Commonwealth	Australia, UK, Canada, Singapore	New York City, Singapore, Melbourne, Pittsburgh, Vancouver
Digital cities	On the decline	Mixed	Ireland, Philippines, USA, UK	Kansas City, Oklahoma City, Dublin, Minneapolis
Innovative cities	Stable	Mixed	USA, UK, India	Bangalore
Green cities	Stable	North America	USA, Australia, Canada	New York City

Source: Google Trends

'Future cities' has strong appeal throughout the world, and is a common search term in India, Mexico and Brazil as well as in North American and the UK. At the city level, it is notable that 'future cities' is of interest in the larger global cities in the West and the East – including Singapore, Mumbai, London and San Francisco. On this evidence, no other term has quite the same multi-lateral appeal. Most other terms are popular in much more localised areas.

Eco cities' has clearly gained the most ground in Asia, especially South and East Asia. This is primarily due to a series of well-publicised Eco City projects that national governments have begun in tandem with international architects and technology specialists. The term has not caught on as much in other English-speaking regions, where its designation as a project label is less common. By contrast 'smart cities' is closely linked to Europe, and has been widely searched for in continental Western Europe where smart EU projects and smart city events are very established. 'Smart cities' is the only English language term that is most commonly employed in Europe; most other terms have their centre of gravity in North America or Australia.

Another significant trend is that the future cities discourse has created a lot of interest in the global cities of London and New York, despite neither being directly associated with projects bearing these labels. London is the city where searches for the term 'intelligent city' are most frequent, while New York has visible interest in 'compact', 'liveable' and 'green' cities. This suggests not only that the debate and level of engagement is advanced in these two cities, but that they have a high degree of conceptual, political and intellectual influence on how the terms are taken up elsewhere.

The themes and associations of specific phrases are explored more fully in Section 2 of this paper, but by way of an introduction:

- **Smart Cities** typically refers to enhanced city systems which use data and technology to achieve integrated management and inter-operability, but can also take on wider meanings to reflect social and political forms of smartness.
- **Sustainability and Sustainable Cities** tends to focus on cities designed to minimise environmental impact, and is often associated with low-carbon consumption.
- **Intelligent Cities** is an idea sometimes used interchangeably with 'smart cities', although some of its origin can be traced to the idea of 'virtual cities' in the 1990s. Often 'intelligent city' is used to describe the use of communication infrastructure and digital spaces to strengthen local innovation systems, solve problems and create more responsive public services (Allwinkle and Cruickshank 2011).

- **Liveable Cities** is a discourse that typically centres on how cities manage growth effectively, to ensure that commuting, the cost of living and the urban environment all meet rising citizen expectations.
- **Resilient Cities** is a concept growing in use, and has taken on a dual meaning. It is used both in reference to a capacity to withstand external environmental and social 'shocks', but also in relation to an area's economic adaptability and agility. It has both strong technical and engineering dimensions, but also can refer to qualities that individuals in a city ought to possess or acquire.

Other concepts currently enjoying popularity have emerged from the new ways of seeing the city as a series of networks, and a new understanding of city systems (see section 1.5). For example, urban metabolism is an idea with a long history dating back to Sir Patrick Geddes in the early 20th century in which energy flows are examined in order to understand transformation and how cities evolve over time (Huang and Chen, 2005). The concept of the city or urban ecosystem is also related to this idea, but considers urban areas not as a closed system or network, but one which interacts with (and must be responsive to) other surrounding environments.

1. 5   Future Cities – systems of cities and city systems

A systems approach to city thinking has a long heritage: fifty years ago, B J L Berry described "cities as systems within systems of cities". Ever since, systems thinking in relation to cities has posed challenges to urban scholars and planners (Berry, 1964; Advisory Committee on Technology and Society, 1998). From 2000, ideas about the nature of cities and their inter- and intra- dependencies have gained traction, and since the global financial crisis, the scale of interest in 'city systems' and 'systems of cities' has stepped up again (Figure 1.7).

The World Bank's 2009 World Development Report gave new traction to the idea of 'systems of cities' (Clark and Clark, 2014). It confirmed that all cities exist in an interdependent national or continental system, whose size and relationships determine each city's functions, specialisations and opportunities for manoeuvre. Larger cities in a given system often have more diversified and service-oriented economies. They have more potential to innovate, create new firms, and encourage mature and lower value-added industries elsewhere, as well as supporting complementary centres. They can be centrifugal forces. Smaller cities, on the other hand, are usually more specialised in either industry or services, although they may well produce or trade in more standardised goods. They may remain competitive by supporting larger cities, either by hosting relocated sectors, by offering service support functions, or by developing complementary specialisations.

This insight has important implications for the future of cities. It can help individual cities to select appropriate growth strategies or specialisations, and highlights complementary tasks for different tiers of leaders: Local government must lead and govern individual cities, and manage, coordinate, and integrate services, infrastructures, and policies across wider 'city-regional' geographies. National leaders must manage and shape the wider 'systems of cities' at a national level. Of course some tasks will still overlap. For example, both tiers of government are responsible for forging and growing international connections.

Fig 1.7. Usage of 'city systems' and 'systems of cities' terms in academic and policy documents since 1950
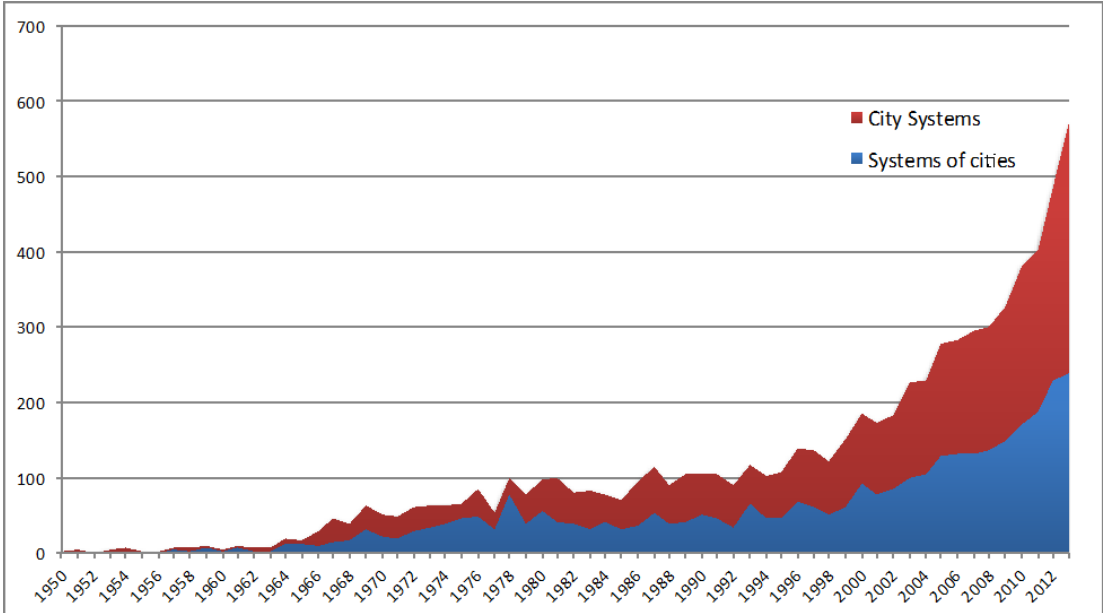
Source: Google Scholar

There has also been new recognition of the integration of systems and inter-operability of systems within cities and city-regions. As Mike Batty suggests in The New Science of Cities, cities can be seen as more than just places in space – they are systems of networks and flows. The interlinkages between the sets of infrastructure, services, and amenities that make up the operating and management platform of any city or city region create networks and functional systems. These in turn interact with other economic and environmental systems. These interlinked networks are often described in shorthand as 'city networks' or 'city systems' and are becoming increasingly popular modes of thinking about cities. By strengthening city systems, local leaders can actively shape and manage cities to achieve positive productivity, liveability, and sustainability outcomes. As section 2 shows, many different stakeholders and individuals involved in future cities are seeking to improve and intensify the efficiency and degree of city system integration.

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2.

HOW DO DIFFERENT COMMUNITIES OF INTEREST INTERPRET FUTURE CITIES?

Foresight

CATAPULT
Future Cities

2. HOW DO DIFFERENT COMMUNITIES OF INTEREST INTERPRET FUTURE CITIES?

There has been a huge rise in the range of government and non-government institutions actively engaged in addressing urban challenges and future development. This section examines English language interpretations of future cities among the following groups:

- Citizens
- Government (national and local)
- Corporate institutions
- Academic institutions
- Media and commentators
- Think tanks, policy institutes and research institutes
- Supranational and Inter-governmental organisations
- International financial institutions
- City networks
- Philanthropies
- City benchmarks and indices

2. 1 Citizens – residents, commuters, visitors

Citizens' interpretations of future cities, and visions for the future of their own city can be discerned and understood in a number of different ways:

- City governments directly consult with their citizens to better understand their own aspirations for the future of their city. Brisbane, Glasgow, Porto Alegre and Calgary are just a few examples among numerous cities that have asked their citizens to share visions of their future city in varied ways.
- Empowered by the internet, crowdsourcing is a new means by which interested parties can collate citizen ideas and interpretations of their future city. On a typical crowdsourcing website, such as those detailed in Figure 2.1, citizens submit their ideas for a specific future city. The website may collate the ideas purely for research or interest, but in some cases city authorities support and implement the most popular or successful ideas. Alternatively, as outlined in section 1.6, future city ideas may be crowd-funded, i.e. funded by contributions

from the public. In Kansas City for example, the locally owned and operated B-cycle bike-sharing scheme is now being expanded using crowdfunding (Rogler, 2014).

- The growth of social media has prompted the advent of 'Guerrilla urbanism' or 'DIY urbanism' – in which citizens, organised online, bypass official channels to bring about a change in their city. The events or projects organised in this way are typically small scale and/or short term such as pop up markets, ride-sharing or temporary park-making.

- Citizen action groups/pressure groups which seek to affect the future of their cities. Although these groups have been historically more organised and effective in developed cities, they are growing in visibility in developing cities. In Mumbai, for example, a number of citizen groups joined together to create the People's Vision Document. This unsolicited document was presented to the municipal corporation to influence the revision of the city's development plan.

Figure 2.1: Examples of English language crowd-sourcing of future cities ideas

Crowd Sourcing Programme	How it Works	Example Ideas	Initiator / Partners
Nexthamburg (Hamburg, Germany)	Citizen-driven future city vision achieved through long-term online dialogue and a series of sessions, venues and workshops for public collaboration. Nexthamburg collects and works on citizen proposals. The collective vision was published in a book and handed over to the local authorities.	More than 600 in all fields of urban development e.g. from 'free bike city' to new science parks.	Group of planners, journalists and cultural scientists. Supported from 2009 to 2011 by federal govt, now a not for profit citizens' platform.
Bristol Rising (Bristol, Connecticut, USA)	Citizens are invited to propose and vote on new uses for a vacant 17-acre former shopping mall site in Bristol, Connecticut. Ideas with over 200 votes were taken forward, assessed for financial feasibility, and eventually presented by Renaissance Downtowns (the site developer) to the appropriate city agencies.	Leading ideas: a piazza, performing arts centre, river walk, and social bookstore.	Developer of the site Renaissance Downtowns LLC.
My Ideal City (Bogota, Colombia)	Bilingual website which asks residents for input: e.g. raising questions from "how shall we house the city's 1 million commuting students" to "what is your favourite graffiti in the city"? Responses become a forum for debate and solutions.	Micro-housing was proposed as a solution to student housing.	BD Promotores Colombia – an international real estate development company (Headquartered in Spain)
Maker Cities	Maker Cities is a multiplayer online game which empowers people to imagine the future of their city in 2025. Players submit ideas, collaborate to refine each other's ideas, and ultimately develop simple prototypes to showcase their idea to the world.	Self-healing sensor grids, gyms as human-powered utility stations, 'Cloud School'.	Research initiative of The Institute for the Future (USA)

Analysis of the sources above it reveals the following recurrent themes in citizen interpretations:

Liveable Cities. Citizen suggestions about future city development tend to centre on liveability and quality of life. In Winnipeg, Canada, city authorities distilled Winnipeggers' thoughts into one collective citizen vision: "To be a vibrant and healthy city which places its highest priority on quality of life for all its citizens." Informal citizen groups have also expressed concern for quality of life improvements. One illustration is the social networking Parking Day phenomenon, in which citizens around the world turn car parking spaces into public parks on a nominated day each year. Recurrent ideas when vocalised by citizens asked about their 'ideal' future city include walkability, cycle-friendliness, better use of waterfronts and open spaces, safety (particularly in city centres), and health.

Smart Cities. There is evidence of citizen engagement with the concept of smart/digital cities. This is clear from the Maker Cities website (Figure 2.1) which includes many citizen suggestions related to technology, networking and integration of city systems. Example suggestions include 'Smart Alarms' that use sensors to understand citizens' daily routines, installation of super-fast broadband and entire city Wi-Fi areas. There are some indications, however, of a disconnect between smart city plans drawn up by cities, firms and universities, and the expectations that ordinary residents have of the role that technology will play in their future cities. One study suggests that citizens imagine future city innovations as accessories to living, rather than levers for major behavioural or environmental change (Gary, 2014).

Vibrant Cities. A corollary of liveability, the 'vibrant city', is a prevalent citizen theme. Formal consultation procedures typically find that citizens around the world seek vitality and liveliness in their future city visions. In Brisbane, for example, popular suggestions at the Ideas Fiesta for the future city included:

- A 24 hour city through extended hours for dining, retail, libraries and entertainment venues, and late night activation of city streets and spaces.
- Pop-up events – liberally regulated food carts, music, art, markets, laneway events, or outdoor cinemas.
- Publicly accessible roof tops, converted into gardens or food and drink destinations.

Similarly, in Glasgow, councillors distilled six key messages from citizen consultations on their aspirations for the city in 2061. The key messages referred to 'vibrancy', 'creativity', and a 'more thriving' city (Glasgow City Council, 2011).

Informal citizen action and guerrilla urbanism both embodies, and seeks to create, city vibrancy. 'Restaurant Day' is a worldwide food carnival in which local people (generally in contravention of city licensing laws) make and sell food in pop-up restaurants. Other examples include 'Chair Bombing', which involves citizens salvaging waste materials and using them to create street furniture, and 'Guerrilla gardening', in which citizens brighten abandoned, council owned or even private patches of the urban landscape by planting flowers, grass or plants. Guerrilla gardening has become an international phenomenon, with 'gardens' being created in cities from Copenhagen, where 1000 people created a "Garden in a Night" on a piece of empty land in the city centre, to New York where the first garden started in a city parking lot became so popular that the City Parks Department has now taken over its maintenance (Stenkjaer, 2010; Street Plans Collaborative, 2010). Crowdsourcing uncovers a similar yearning for vitality and vibrancy - citizens of Hamburg envisioned 'an unexpected cultural boom' in the Hamburg of 2020 as part of the NextHamburg project. Their vision painted a portrait of a culturally enriched city with neighbourhood cinemas, 11 new museums and an aviation centre, many of which would be funded via crowd-funding.

There are ever-increasing examples of local authorities supporting citizen 'vibrancy' ideas. Recent initiatives with council backing include: a crowd-funded 90m water slide installed in Park Street, Bristol, UK (Coldwell, 2014); "Play Streets" which are closed for cars to allow children to play safely and have been adopted by 24 local authorities in the UK (Duffin, 2014); and StreetPianos, which have been installed in 43 cities worldwide emblazoned with the instruction, "Play Me, I'm Yours". The creation of Cultural Teams or departments in many city councils indicates that cities authorities recognise their citizens' desire for vibrancy, and are trying to respond. City Cultural Teams are common in the UK for example, teams or departments exist in London, Manchester, Wolverhampton, Canterbury, Liverpool, Oxford, and Birmingham councils. They are also in evidence in many cities internationally, from cultural metropolises which could already be considered vibrant e.g. New York and Johannesburg, to smaller and quieter cities such as Newcastle (Australia) and Barrie (California).

2.2   Government

National Governments
Many (but by no means all) national governments are engaging with future cities as a positive phenomenon, in recognition of cities' capacities to be economic powerhouses driving national economies. As competition between cities becomes increasingly global (rather than national or regional) national government plans and support are a powerful differentiator for future city evolution.

National government interpretations of 'future cities' depend largely on the immediate challenges faced by their country and urban areas. Their national vision for future cities tends to cite cities that have overcome the challenges they currently face. For example, less developed countries, particularly those in Africa and Latin America, refer to themes of development, housing and financial self-sufficiency in their future city visions.

Certain national governments are conspicuous by their absence from the future cities arena. The US federal government in particular has no national policy or initiatives in respect to future cities. Perhaps more surprisingly, national governments also take a back seat in the Netherlands and Sweden, where city governments have taken the lead in future city planning and visioning. There are potentially a number of different explanations for these differences:

- In larger federal countries (such as USA, India, Canada, Australia) there is very limited tradition of strong spatial policies at the Federal tier and there is limited national consensus on how sub-national governments (States, Provinces, Regions) should manage their relationships with cities.
- In smaller and mature countries (such as Sweden, Netherlands) where the major process of urbanisation happened several decades, or even centuries, ago, there is a perception of a settled pattern of cities, and when this is combined with a high-level of city self-government, national governments see city matters as a local agenda.

There are no hard and fast rules about how national governments adopt city related policies (or whether they do so at all). It is probable that fewer than half the world nations have a national urban policy and fewer than 25% have a minister with responsibilities for cities.

There are a number of ways in which national governments engage with future cities, which reveal their ideals and interpretations. Their means of engaging include:

- Formulation of national strategies to direct the future development of all cities in their country. English language national urban strategies exist in Australia, Sri Lanka, Ghana, South Africa, Vietnam, Bhutan and Malawi. Other countries, including many in Africa such as Uganda and Mauritania, have national strategies under development or consideration.
- Funding for a 'demonstrator' city – a city which will pioneer the way to becoming a 'future city', providing a testing ground and model example for others to follow (see Box 2 for examples).
- Investment in future cities as an area of public sector expertise and an essential sphere of knowledge. The UK government's investment in the Future Cities

Catapult provides a good example of this. The Technology Strategy Board (a UK public body) will invest £50m over five years in the Catapult in order to help cities become smarter and more forward thinking (UK Government, 2013).

- Construction of model cities from scratch which embody the government's future city thinking (see Box 2 for examples).

Box 2: Demonstrations of future cities

In Japan, the Future City Initiative forms part of the Japanese government's "New Growth Strategy". Five major cities, as well as six cities affected by the 2011 tsunami, have been selected as future cities. They are expected to lead innovations in 'technology, socioeconomic systems, services, business models and city building' in order to become leaders in environmental sustainability, disaster resilience, and liveability. The Japanese government supports the selected cities with funding, deregulation and reforms to legal and tax systems (e.g. with the introduction of a 'green city' tax). The initiative will be statutorily supported by the passing of a new law, preliminarily called the Act on Future City Promotion.

Developing countries have embraced the trend of creating future cities 'from scratch', rather than through retrofitting or improving existing cities. Masdar City in Abu Dhabi is one such prominent example. The planned zero-carbon city – currently scheduled to be completed between 2020 and 2025 - has been predominantly funded by the government of Abu Dhabi. Similarly, Songdo International Business District in South Korea formed part of a national policy to promote low-carbon growth. Part of the city's funding originated from an $83.6 billion national fund earmarked for green investment.

Some future cities schemes do not adhere to compact city models, but instead are a conduit for metropolitan growth. In Kenya, Konza Techno City (dubbed the 'Silicon Savannah') is being promoted as a mechanism to achieve ICT-driven growth in the country as well as to de-congest central Nairobi. The new city of 5000 acres, 40 miles east of Nairobi, will function as an outsourcing and science park as well as upscale recreation zone. The Kenyan government hope to only fund 5% of the total cost, but were responsible for developing and approving the masterplan. Similarly, Tatu City is a new decentralised city to the north of Nairobi envisioned by Kenya Vision 2030 (the national development plan) is intended to be funded by the private sector. Like Konza, Tatu City is intended as a model which can later be replicated in Kenya and across sub-Saharan Africa.

The future city themes national governments appear most concerned by are:

High Quality of Life. Countries which are well regarded for their high quality of life appear to appreciate this competitive advantage and continue to work towards future cities which offer a top class standard of living. The Australian national government, for example, in its national cities agenda Our Cities Our Future (Figure 2.2) outlines its plans and aspirations for creating a 'productive, sustainable and liveable future'. Similarly, in Norway, Cities of the Future is a collaboration between the Norwegian Government and the 13 largest cities in Norway to reduce greenhouse gas emissions and make the cities denser and more compact, favouring walking and cycling over car use (Framtidens Byer, 2011). This policy addresses wider climate change mitigation challenges, as well as offering more 'liveable' cities and a higher quality of life for future city residents.

Sustainable Cities. Searches of publicly available material suggest that sustainability is the most widely held central government vision for cities, even though the term takes on a broad range of meanings. National governments with national programmes or policies including a vision of 'sustainable' future cities include: Australia, Japan, Malawi, Sri Lanka, Bhutan and Scotland. The German government, specifically the Ministry of Education and Research, has funded a research project for "the Sustainable Development of Megacities of Tomorrow", which is focused on energy- and climate-efficient structures in urban growth centres (Australian Government, 2011; Government of Japan, 2012; Cities Alliance, 2012; UN-Habitat, 2012; Royal Government of Bhutan, 2008; Scottish Government, 2011; Future Megacities, 2014).

Figure 2.2: Key goals and objectives for Australia's urban future as outlined in the Our Cities Our Future strategy

		OBJECTIVES	
GOALS	PRODUCTIVITY	1.	Improve labour and capital productivity
		2.	Integrate land use and infrastructure
		3.	Improve the efficiency of urban infrastructure
	SUSTAINABILITY	4.	Protect and sustain our natural and built environments
		5.	Reduce greenhouse gas emissions and improve air quality
		6.	Manage our resources sustainably
		7.	Increase resilience to climate change, emergency events and natural hazards
	LIVEABILITY	8.	Facilitate the supply of appropriate mixed income housing
		9.	Support affordable living choices
		10.	Improve accessibility and reduce dependence on private vehicles
		11.	Support community wellbeing
	GOOD GOVERNANCE	12.	Improve the planning and management of our cities
		13.	Streamline administrative processes
		14.	Evaluate progress

Source: Australian Government (2011)

Integrated Systems. Several national governments refer to integrated systems when describing the future city. Given their national perspective, their focus is generally on an integrated system of cities, rather than integrated city systems. The German National Urban Framework, for example, recognises that "true cooperation and integrated activity could help secure a brighter future for the country's cities" (Clark, 2012). Similarly, Malawi's National Urban Framework describes the creation of better integrated and linked cities as a key aim (Cities Alliance, 2012). Sri Lanka's Urban

Vision aims to develop a system of 'competitive, environmentally sustainable, well-linked cities clustered in five metro regions and nine metro cities up to 2030' (UN-Habitat,2012). In Vietnam, a 2009 Prime Ministerial Decision outlined the objective of "Gradually developing Vietnam's urban system toward urban network model" (World Bank, 2012).

Given its city-state character, it is unsurprising that Singapore's Smart Cities Programme Office provides one of the few examples of a national interest in integrated city systems. It "focuses on the development of infocomm-based integrated networks, capabilities and solutions for urban environments with a systems-of-systems approach that enables Whole-of-Government synergies and integrated insights, which will contribute to the optimisation of key national resources across interdependent and inter-related city systems" (IDA, 2014).

Many of the wealthier OECD national governments have begun to focus on smart cities and technological networking when considering their future cities – the UK being a prime example.

Other Interpretations. More unusual conceptions of future cities do exist amongst certain national governments. In Japan, the creation of the 'human-centred' city is the underlying concept of the Future City Initiative. Health, aging and "vitality" are key priorities. In South Korea, Songdo IBD – the nation's flagship sustainable city (see Box 2) is described as a 'Ubiquitous City' or 'U-City'. This is a built environment where any citizen can get any services, anywhere, anytime, through ICT devices. For instance, home banking, telecommuting, teleconferencing, telemedicine and control of urban infrastructure are constantly available in the U-city (Lee et al, 2008).

Furthermore, not all national governments are tied to or focused on one theme for the future city - the Japanese government has adopted a particularly wide-ranging interpretation (Figure 2.3):

"Desirable future cities may consist in (sic) following elements: human-centred cities focusing on each individual including women, children and the elderly; green (low carbon) cities with advanced environmental technologies such as renewable energy, energy saving technology, eco building, smart cities equipped with smart basic infrastructure such as smart grids, sound material cycle cities working on sustainable consumption and production including 3Rs, and resilient cities against natural disasters and climate change." (Government of Japan, 2012)

Figure 2.3: Model of conceptual basis for Japan's Future City Initiative
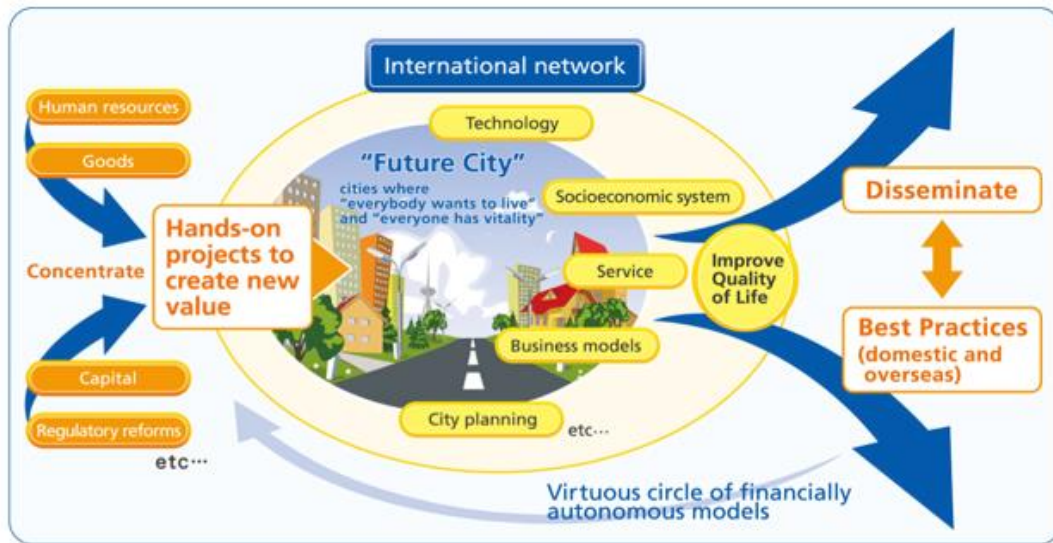
Regional, local and city governments

Regional, metropolitan and city governments tend not to be involved in conceptual or theoretical discussion about 'the future city' in the same way as research institutions, think tanks, the media or even to a certain extent corporates. There are some exceptions – for example, the City of Sheffield, which has collaborated with academia and the private sector to advance thinking and innovation in urban development via the Sheffield Urban Think Tank. Generally however, city leaders and their administrations are concerned with the future of their own city, the ways of optimising that future in the short to medium term, and the tactical / action-oriented ways to do that.

As such, the plans and development strategies for individual cities provide the best insights into a city government's own interpretation of (their) future city: they set out a vision for what their future city should look like, and how that vision should be achieved. These city plans can incorporate citizen feedback and the results of public consultations (see section 2.1). They are often made public, both to ensure transparency and accountability, and for the purposes of building a common 'vision' amongst the city's various stakeholders. Further insight into city government's future city priorities can be gleaned from individual initiatives in which local authorities invest. Common themes which emerge include:

Smart Cities. A number of city administrations are backing programmes which aim to make their cities 'smart'. Smart projects are particularly prevalent in Europe, where the European Commission has provided significant support (see section 2.7): Figure 2.4 shows examples from around the English speaking world. Under the overall

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umbrella of becoming a 'smart' city, there is significant variation in the areas addressed and projects implemented. Some cities, such as Vienna, take a holistic view of the smart city – implementing initiatives to cover everything from infrastructure, energy, green spaces and mobility to all aspects of urban life and development. Other cities focus on a very specific element of 'smartness' but might aim for full geographical coverage in the city – for example, Yokohama in Japan is pioneering a specific project based on the installation of energy management systems across the city.

Figure 2.4: Smart City projects backed by city governments

Region	Project	Key Focus Areas	Stakeholders (Lead partner shown in bold)
Europe	Sense Smart City (Skelleftea, Sweden)	Sensors to measure, monitor and communicate, and more efficiently allocate resources such as electricity, water, traffic and waste.	Swedish Agency for Economic and Regional Growth as managing organisation for EU Structural Funds; Skellefteå Municipality; Regional Council of Västerbotten; **Luleå University of Technology;** Skelleftea Kraft (power company); SQS and Explizit (Software Specialists).
	Smart City Wien (Vienna)	Broad ranging project incorporating education, buildings, transport, climate, people and administration.	**City of Vienna;** Siemens; Austrian Institute of Technology, Vienna University of Technology; Wien Stadtwerke; Wien 3420 (real estate development); Austrian Research and Testing Centre; raum & kommunikation (consultancy); Chartered Energy Institute.
	Smart City Malaga	Renewable energy; Smart metering; Smart distribution; Electric Vehicles	City of Malaga; A consortium of 11 companies spearheaded by **Endesa**; 14 research organisations including universities of Cordoba and Malaga.
North America + Caribbean	Montego Bay Smart City Integrated Operation and Control Centre	Integrated control centre monitoring / controlling seven systems linked to transport, crime prevention and disaster prevention.	**Inter-American Development Bank's** Emerging and Sustainable Cities Initiative; **South Korean government**. City of Montego Bay; National Ministry of Local Government and Community Development.
	Smart City San Diego	Renewable energy generation; consumer data to manage energy use; Smart grids	**City of San Diego**, San Diego Gas & Electric, GE, UC San Diego and CleanTECH San Diego.
Asia	Smart City Kochi	Provision of state-of-the-art infrastructure, environment and support systems to promote the growth of knowledge-based companies.	(Regional) government of Kerala; **TECOM Investments** (subsidiary of Dubai Holding);

| Region	Project	Key Focus Areas	Stakeholders (Lead partner shown in bold)
	Yokohama Smart City	Installation and management of energy management systems (EMS) in homes, office buildings and commercial facilities (e.g. factories). Linkage into a Central EMS.	**City of Yokohama** and over 30 other partners, including: Nissan, Toshiba, Hitachi, Panasonic and Accenture; Tokyo Institute of Technology; smaller Japanese cos; national government's Urban Renaissance Agency.
	Dubai Smart City	Transport; Communications; Infrastructure; Electricity; Economic services; Urban planning. Government services.	**Dubai Government**. High committee' of advisors includes private sector representatives: TECOM Investments, du and Etisalat (telecoms companies).
Africa	City of Tshwane – Smart City	E-learning, health, public services and ICT access	**City of Tshwane;** Tshwane University of Technology; Huawei (ICT company); IBM; Cooperation Framework on Innovation Systems, (COFISA), partnership between Finland and South Africa
	Smart City Joburg	A 'Smart and Caring City'; broadband; public safety; Integrated intelligence centre for public safety; integrated and smart metering of electricity and water.	**City of Johannesburg;** Bwired (Telecoms company); IBM

Integration of city systems is an important sub-theme of city government-led smart city visions and plans. The Dubai SmartCity strategic plan is a prime example as it is based on three central ideas: communication, integration and cooperation. It is the city government's goal that all city services and facilities should be made available on smartphones, and that all city databases should be integrated and made publicly available via "My Window to Dubai" - a live, online, real-time broadcast of the changing data.

Figure 2.4 also shows that almost all local authorities rely on collaborations with the private sector to fund smart city projects. Only the wealthiest have (e.g. Dubai, Vienna) launched their own independent schemes.

Liveable Cities. As section 2.1 showed, liveability is a key concern for many citizens considering the future city. It is perhaps unsurprising then that political discussion, particularly at a local level, increasingly centres around liveability to match the voters' concerns. Antipodean city governments in particular have a very strong focus on developing 'liveable cities', as these are viewed as comparative advantages. The Auckland Plan 2040 and the Melbourne Plan 2050 each detail their city council's strategy to become the world's most liveable city. As Figure 2.5 shows, local concepts of liveability relate to safety, economic vitality, attractiveness, 'greenness', cultural diversity, local identity, and connectivity. Within Australia, some local and state

government plans are in part shaped by national policy: the national Liveable Cities Program provides a $20m fund for state, territory and local government projects, and Canberra's city development plan was part funded under this programme.

Fig 2.5: Constituent Strands of the Auckland Plan
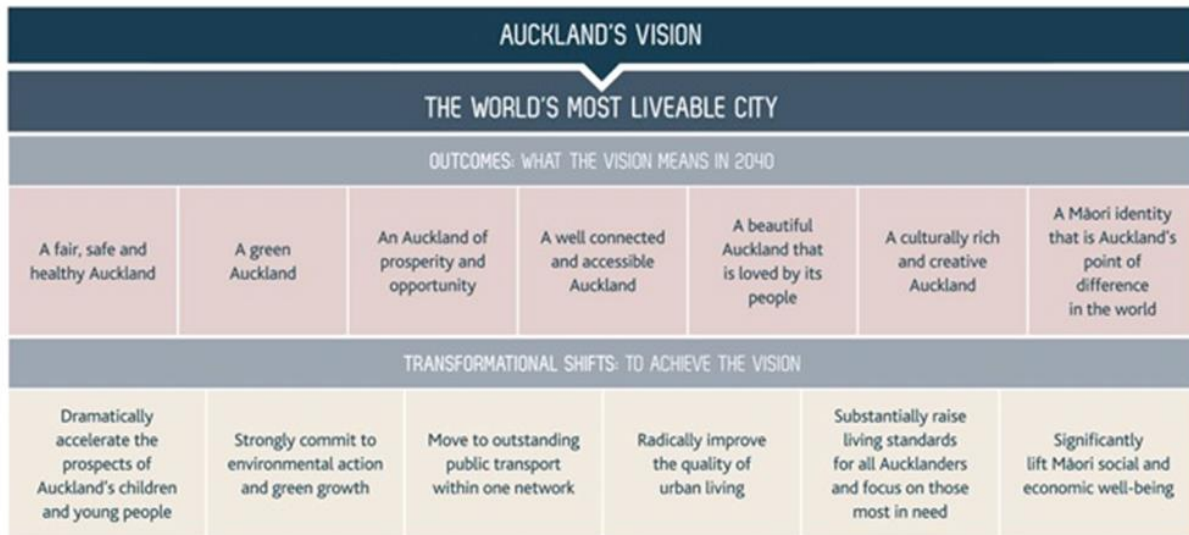
Source: Auckland Council (2014)

Green Cities. 'Greenness' is no longer a term at the cutting edge of future city thinking for policy-makers or academics. Nevertheless, many city governments have embraced the concept of the 'Green City' to fuel ambition and to build local identity and global profile. Vancouver aims to become the 'greenest city in the world by 2020', and Philadelphia's Mayor has set the city a goal of becoming the greenest in America. Salt Lake City and San Jose have both introduced 'Green City Visions'. In Scandinavia, Copenhagen, Malmo and Stockholm promote themselves as 'Green Cities' or 'Green Capitals'. The latter have eco-town projects within their metropolitan areas (Augustenborg Eco City and Hammarby Sjostad respectively).

In developed cities the ideas of 'greenness' rests on sustainable use of natural resources, combined with green space, urban density, green innovation and high take-up of low carbon transport options. Liveability is usually just one outcome strand of this broader commitment. In developing cities, green city projects refer instead to essential water and sanitation infrastructure to improve efficiency and access. For example, the Asian Development Bank is granting US$60 million for a Green City project in Burma's Mandalay, which will be maintained by the regional government (Eleven, 2014; Malmo City Council, 2009).

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2.3   Corporate institutions

Over the last decade, an increasing number of corporates have begun to contribute to global discourse about the future city. Cisco was one of the first major companies to do so: in 2005 it dedicated $25 million to researching Smart Cities over a five year period in the Connected Urban Development programme. Cisco was swiftly joined by other technology firms, including IBM which set up a Smarter Cities Initiative in 2009, and Siemens (see Box 3) which created its own Infrastructure and Cities division in 2011.

Today, companies from sectors as different as law (Bird & Bird), consumer goods (Unilever) and construction (Lafarge) are also thinking about future cities. It seems fair to assume that both the number of companies engaging with future cities, and the breadth of sectors represented, will expand further. At present future city engagement is particularly apparent among mega-corporates (e.g. GE, IBM, Philips, Citibank) and among firms based in the US, Germany, France, the UK and Japan. Corporates from the rest of Europe and Asia, and from Africa, are less visibly focused on future cities, although this situation changes with each passing year.

Box 3: Siemens and the future city

Siemens is perhaps the best example of a corporation which has made the 'future city' a fundamental part of its business.

In 2008, Siemens reorganised itself internally around the megatrends of the decade: changing global demographics, climate change, urbanisation and globalisation. In 2011, it took this reorganisation one step further by creating a standalone Infrastructure and Cities (IC) division, with 87,000 employees spread across varied offices globally. The division's objective was to exploit the $2 trillion annual market of city infrastructure spending.

In its efforts to do this, Siemens has developed a broad range of initiatives based around a "Sustainable Cities" brand. Perhaps most striking is its development of The 'Crystal' in Royal Victoria Docks, London: a $46million visitor attraction and knowledge centre which contains the world's largest exhibition focused on urban sustainability. The Crystal offers spaces for dialogue and learning around cities, and has welcomed more than 100,000 visitors to date.

Other initiatives include the development of The Green City Index, a benchmark produced with the Economist Intelligence Unit which assesses and compares more than 120 cities worldwide in terms of environmental performance. And through its

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collaboration with the C40 Cities Climate Leadership Group Siemens helps cities to measure, plan, and mitigate their greenhouse gas emissions. The company issues regular research publications, recent examples of which include a 'Toolkit for Resilient Cities' and 'Urban Planning for City Leaders', and was a key company in the World Business Council for Sustainable Development (WBCSD)'s global Urban Infrastructure Initiative.

Powerful drivers have encouraged the private sector's engagement with future cities. Most significantly, understanding future cities allows companies to better understand and be able to capitalise upon key growing metropolitan markets in urban services, lifestyle, and asset capitalisation. Cities are the customers of the future. By being involved in the debate on future cities, companies also hope to help shape the market, for example, to see policies developed and implemented that match their own innovation and R&D strategies. More obliquely, the concept of future cities can also provide companies with an effective marketing device, harnessing its imperatives, relevance, energy and glamour in particular when in discussions with city authorities – their customers. Public association with the future city can also promote collaboration and foster product innovation. Investing in future city research or thinking can even be a means of fulfilling Corporate Social Responsibility imperatives. Perhaps most usefully, the concept of the future city can create 'organising ideas' for other offerings, e.g. in climate change, sustainability, competitiveness, infrastructure, logistics or place-making: it can help provide new markets for products and services developed in other areas of the business that only need tweaking to be applied in a city context, rather than development from scratch.

Companies' activities in relation to future cities are focused in several areas - analysis of these areas reveals the future city ideas with which corporates are aligning themselves:

- **'Future city' branded services or offerings.** Microsoft's future city brand is "CityNext". CityNext seeks to sell 'solutions' (such as cloud computing, data management tools, identity, security and device management) to cities globally, improving their efficiency, sustainability and cost savings. According to Microsoft, CityNext "empowers people—whether governments, citizens, or businesses—to transform their cities and their future".
- **Provide support and/or financial backing for city-led futurist initiatives or branding exercises.** This usually occurs where there is an alignment between the city scheme and the corporate's own interests. IBM's Smarter City programme is a good example - it provides cities around the world (16 cities in 2014) with pro bono consultancy advice on tackling a particular issue nominated by the city.

- **Carry out and sponsor research and dialogue on urban issues.** Deutsche Bank sponsors "Urban Age" a future of cities conference programme run by the LSE, while JP Morgan sponsors the Brookings Institution's "Global Cities Initiative". Some companies including Mercer, Siemens and PwC have developed their own benchmarks to measure aspects of city 'success' and develop future projections. Others, including Bombardier, Schneider Electric, and Cap Gemini, run competitions inviting participants to 'imagine' the future city, or to develop visions for future urban mobility, energy, or technology use. Architecture firms, including Gensler, Farrells, and Rogers, Stirk, Harbour and Partners, offer opinions on future city design, whilst consultancies AT Kearney and McKinsey have published reports on 'the City of the Future'. Phillips has developed the Liveable cities think tank to help make cities more authentic and inclusive, while Audi's Urban Future Initiative is a forum for innovation in urban mobility. Involvement in thought leadership can help corporates to shape future city discourse towards their own spheres of interest.

- **Collaborating with city authorities and city leaders to create innovations in city design.** IBM was one of the first movers in city collaboration, and has been commissioned by Rio de Janeiro to create a city-wide operation centre connecting all the city's 30 agencies, from transport to the emergency services. Barcelona uses Microsoft Azure (a cloud system) to host a platform that aggregates city statistics and makes them publically available. Firms such as Cisco in Songdo or Panasonic in Fujisawa use these flagship city projects to profile their comprehensive solutions capabilities in a living context (Micheler, 2011). Other firms, partner with cities to create 'living labs' in which they can innovate and carry out experiments in situ. Intel has developed a 'living lab' in collaboration with London, and Telefonica is a partner in the EU funded experimental laboratory, Smart Santander. Corporates can lend influence and financial support for cities bidding to win such initiatives from the EU or other supra-national organisations.

- **Collaborate with 'future oriented' businesses to propose urban solutions and help grow the market for these.** One of the broadest collaborations is the World Business Council for Sustainable Development (WBCSD). Although not solely focused on cities, the WBCSD has launched an Urban Infrastructure Initiative (UII), to bring businesses from different sectors together to create joined up and integrated urban sustainability solutions. Active member companies include AECOM, Schneider Electric, Siemens, TNT, Toyota, UPS and United Technologies. Similarly the Smart Cities Council is a coalition of prominent firms (IBM, GE, EdF, National Grid, Cisco), and smart city advocates and experts. These coalitions build and amplify the smart city proposition (DeKeles, 2012).

The future city themes to which major corporates are currently aligned are summarized in Figure 2.6.

Figure 2.6: Future City 'brands' of transnational corporates

Sustainable Cities	Global Cities	Liveability / Citizen-centred Cities	Smart Cities	Green/ Eco Cities	Imagined 'City of the Future'	Resilient / Future Proofed Cities
Siemens GE Arup Bouygues GDF Suez Veolia Ericsson United Technologies Acciona CEMEX	JP Morgan AECOM AT Kearney	Mercer Monocle Grosvenor E&Y Philips	Cisco Ericsson IBM Cap Gemini Bird+Bird Hitachi Fujitsu Panasonic	Bombardier Schneider Electric Siemens Panasonic	Audi Deutsche Bank Microsoft Atkins GDF Suez CEMEX	Siemens Arup Grosvenor Atkins Philips

Thematic interpretations of future cities are correlated to company sector. Resilience and environmental future proofing are, unsurprisingly, themes favoured by engineering firms. Sustainability is embraced by firms offering services in energy, water, waste, construction and environmental solutions. Technology and IT firms tend to focus on the smart cities market. Liveability or 'citizen' centred themes, as well as economic growth, market potential and innovation, are mostly the focus of consultancy firms, as well as Philips, which has a strong background in health and wellbeing. Firms in the transport sector, such as Bombardier and Audi, are active in the future of urban mobility. Global architectural practices tend to endorse the compact city and the flexible city.

Integrated City Systems

Integration and integrated city systems feature within the discourse of technology and engineering companies. Integrated city products form the fundamental offer to cities, and the motif of interconnection and holism is very visible, whether in urban security (IBM), energy (GE) or electricity (GDF Suez), or across sectors (WBCSD) (IBM, 2011). Holistic urban planning is often also advocated as a precondition for product effectiveness.

Several companies are developing the thinking around integrated city systems. Arup has analysed 15 'integrated' systems in Sheffield including transport, waste management and food supply to assess the city's resilience to climate change. GDF Suez's Urban Strategy Council is an internal think tank tasked with developing an integrated vision for "Cities of Tomorrow". The latter's inter-disciplinary committee of

independent experts shows the seriousness with which urban visions and solutions are being taken.

Not all companies necessarily use the word 'integrated', some prefer to refer to city 'networks' 'connections' or 'systems'. Ericsson, for example, focuses on networks and connections in its understandings of the future city. Their future cities brand titled, 'City Life', explains that 'building connections will be the key to our urban future' (Ericsson, 2013). Ericsson has created a Networked Society City Index to measure progress towards this goal. The index ranks 31 of the world's largest cities according to their ability to transform ICT into social, economic and environmental benefits.

2. 4   Academic institutions

As might be expected, English language academic institutions are at the cutting edge of research, thinking and discourse on future cities. They are contributing to future city discourse in a number of ways:

- **Running taught courses on future city themes.** Although cities and city systems have not yet emerged as widely recognized distinct academic disciplines, a handful of universities do run Masters courses or offer PhDs specifically on future city topics. These courses are shown in Figure 2.7, and are predominantly found in the UK and Western Europe. Many more universities offer courses or modules on future city themes as part of broader degree courses.
- **Research on future city themes.** Some universities run specific (usually inter-disciplinary) future city research programmes. The City Science Initiative at MIT, for example, researches and aims to develop urban strategies that can reduce carbon dioxide emissions and traffic congestion, and improve liveability and creativity. More commonly, however, individual disciplines as diverse as engineering, humanities, climate science and the creative arts are carrying out their own research in areas which aren't labelled as 'city solutions' as such, but do have the potential for big impacts in cities.
- **Modelling and visualisation of future cities.** Universities are amongst the most advanced 'modellers' of future cities. A field leader is The Centre for Advanced Spatial Analysis (CASA) at UCL (London) a specialist department which uses computer based visualisation for city planning, policy and design. Other academic institutions engaged in modelling include the Future Cities Laboratory, which prepares future models of Singapore, and the Why Factory which forms part of the Department of Urbanism at Delft University of Technology and focuses on visualising cities of the future from an architectural or urban design perspective. The Why Factory's visualisation themes include

Green Dream (sustainable architecture), The Vertical Village (a new model for development of Asian cities) and City Shock (which explores ten 'what if' scenarios).

- **Tracking City Performance**. Some universities engage in monitoring and benchmarking cities' relative performance, and the specific variables which they track reveal their future city priorities. The Liveable Cities programme – a collaborative project between the Universities of Southampton, Lancaster, Birmingham and UCL – is one example from the UK: it measures how cities operate and perform in terms of their people, environment and governance, taking account of wellbeing and resource security.

- **Engaging students in future cities through challenges or competitions**. It is important to note that it is not only at tertiary level that educational institutions are engaging with future cities. In the United States, a major national competition asked teams of middle school children to imagine the cities of the future. The project was run by DiscoverE, a foundation which aims to sustain and grow a dynamic engineering profession. As such, the emphasis of the competition is on use of computer and tabletop modelling of future cities, and on solving the engineering problems they present.

- **Direct collaboration with cities, to develop real solutions to urban challenges and collectively design urban futures.** Collaborations in the UK are taking place between Manchester Metropolitan University and the city, and Sheffield City Council and the city's two universities (in the form of the Sheffield Urban Think Tank) (University of Warwick, 2012). Smart Aarhus is an example of a Danish city-university collaboration

Figure 2.7: Future city graduate courses by theme

Course Theme	UK			Europe				Rest of World
Sustainable Cities	*Ma Sustainable Cities* London Metropolitan University Faculty: Social Sciences and Humanities	*Ma/Msc Sustainable Cities* Kings College London Faculty: Geography	*MRes Urban Sustainability and Resilience* UCL Faculty*: Civil, Environmental and Geomatic Engineering*	*MSc Sustainable Cities* Aalborg University, Copenhagen (Denmark) Faculty: Development and Planning	*MSc Sustainable Urbanism* UCL (UK) Faculty: Architecture, Building, Environmental Design and Planning	*MSc Sustainable Urban Development* Oxford University (UK) Faculty: Geography + Environment	*Msc Sustainable Urban Design* Lund University, Copenhagen (Denmark) Faculty: Architecture	*MSc Sustainable Cities and Communities* University Sains Malaysia Faculty: Humanities
Smart Cities	*MSc in Smart Cities and Urban Analytics* UCL Faculty: Centre for Advanced Spatial Analysis	*MRes in Smart Cities* UCL Faculty: Centre for Advanced Spatial Analysis		*MSc in Computer Science with Big Data, Business Analytics and Smarter Cities* Dublin City University (Ireland) Faculty: Computing	*MSc in Smart Cities* University of Girona (Spain) Faculty: Informatics and Applications	*MSc Energy for Smart Cities* KIC InnoEnergy (International) Masters School specialises in energy and engineering	*Post MSc Smart Energy Buildings and Cities* Eindhoven University of Technology (Netherlands) Faculty: Engineering	
Other	*2 x funded PhDs on Liveable Cities* Lancaster University Faculty: Arts and Social Sciences	*MSc Eco Cities* Cardiff University Faculty: Planning and Geography	*MSc in Healthy Cities* Southampton University Faculty: Geography	*MSc City Planning and Resilience* University College Dublin (Ireland) Faculty: Geography, Planning and Environmental Policy				

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The major themes revealed by a review of academic institutions' various future cities activities are:

Urban metabolism

Urban metabolism is one of four topics in the 2014 Harvard Graduate School of Design's Dean Design Challenge. Harvard, MIT, and Boston University recently embarked on a long-term research project funded by the National Science Foundation to try and track Boston's urban metabolism (Harvard GSD, 2013). The work of the Future Cities Laboratory in Singapore is also guided by the conceptual framework of urban metabolism (Figure 2.8) which sees the city as a complex system of flow management. The FCL tries to encourage a circular use and re-use of resources, and its research focuses on the consequences of resource allocation, distribution, and deployment through time.

Figure 2.8: Graphical Depiction of Future Cities Laboratory's concept of Circular Urban Metabolism
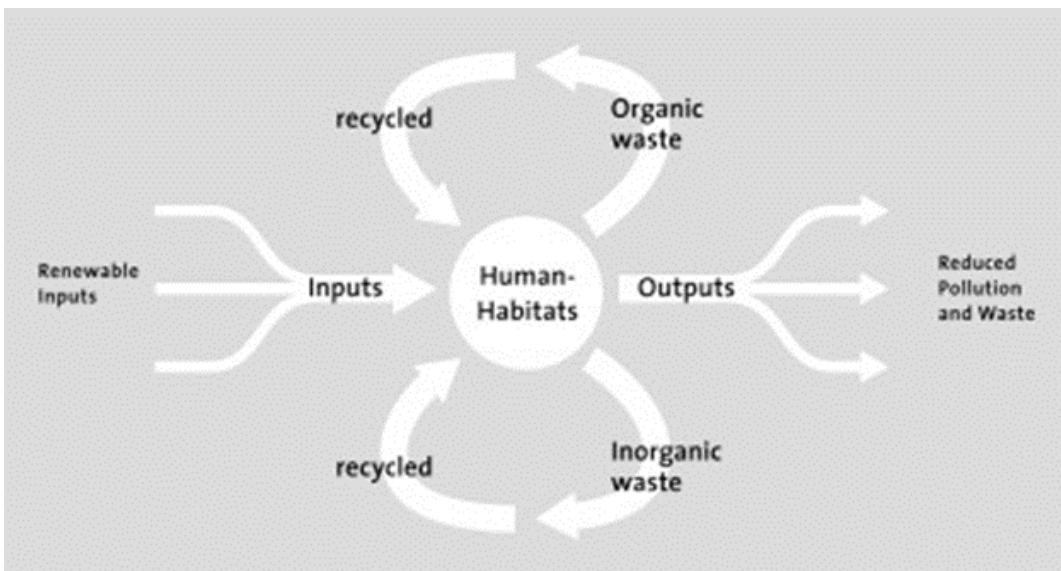
Source: FCL (2014)

Smart cities

Smart cities have emerged in the last few years as a key focus for taught university courses on future cities, and tend to be linked to engineering or IT faculties. Many of the specialist qualifications shown in Figure 2.7 are very recently established courses: the UCL and Dublin City University Smart Cities masters are all being run for the first time in 2014, and Cardiff's Eco-Cities and Girona's Smart Cities courses both launched in 2013. Smart city courses run in partnership with mega-corporates are also a new phenomenon, as evidenced by the new Dublin Smart Cities masters, which is sponsored by IBM (IBM 2013).

The most common emphasis of 'future city' modules taught by other disciplines, from geography to engineering to ICT to art and design, also appears to be on smart cities (for example the Universities of Arizona, Tel Aviv and Ohio all run modules on 'smart' or technological futures for cities).

Smart Cities is certainly the most frequent area of collaboration between universities and city governments. For example, the Open University is leading a project to transform its home town of Milton Keynes into a smart city. The £16 million MK:Smart project will draw together the growing amounts of data generated by the city in a central hub. It will use sources, ranging from satellites to crowdsourcing from social media and apps, analyse the information to find 'smart solutions' for managing resources and promoting business growth. Elsewhere, 'Smart London' is a Mayoral initiative chaired by Professor David Gann, Head of Innovation and Entrepreneurship at Imperial College Business School, looking at how London can best use technology and data to ensure it remains one of the world's most efficient and liveable cities. In Europe, Smart Aarhus is a partnership between the City of Aarhus, the Central Denmark Region, Aarhus University, the Alexandra Institute, VIA University College, the Danish Technological Institute, and the company Systematic. It aims to develop Aarhus into a Scandinavian model for digital urban development.

In terms of research, academic focus on smart cities can be found in a number universities: The Future Cities Research Centre at Trinity College, Dublin has a technological or 'smart' cities basis but fuses the hard and soft sciences to find workable ways of integrating technologies and data; The SENSEable Cities Lab at MIT (Boston, USA) investigates and anticipates how digital technologies are changing the way people live. The Future Cities Project/Porto Living Lab at the University of Porto, Portugal, is an example of a university carrying out research 'on the ground' in collaboration with a city, through the creation of a living lab which, aims to turn Porto into a smart city with embedded ICT, sensors and wireless platforms.

Innovative cities
Several academic institutions have embraced the phraseology of the 'innovative city' in their activities, but the term 'innovative' appears to encompass different and numerous meanings to an even greater degree than broad terms such as 'sustainable'. By way of example, in October 2013 Mori Memorial Foundation's Institute of Urban Development hosted the Innovative City Forum which explored sub-themes such as urban infrastructure, quality of life and ambience, creative industries and technological innovations (Innovative City Forum, 2013). Meanwhile, the Urban and Regional Innovation Research Unit (URENIO) forms part of the Faculty of Engineering, Aristotle University of Thessaloniki. Their research focuses on intelligent cities, and specifically local environments that can support R&D, innovation, human

skills and intelligence. In Singapore, the Lee Kuan Yew Centre for Innovative Cities (which is part of the Singapore University of Technology and Design) takes more of a 'smart' cities approach - focusing on the integrated use of technology and design to derive solutions for urban development and management.

Sustainable cities

Urban sustainability is the future city theme which has the longest history in academic institutions. Together with 'smart cities', it is the most prevalent future cities theme in Masters courses, and Sustainable Cities courses tend to be much longer established than others. Courses on sustainability are largely rooted in geography or planning departments. There is also a large amount of academic research in the field of sustainable cities, although, as with other interest groups, the topics and research areas encompassed within sustainability research can be highly varied. The Royal Melbourne Institute of Technology's Global Cities Research Institute aims to develop interpretations and strategies for building sustainable cities. It investigates physical spatial systems, communications, cultural experience, and the role of technology in mediating the experience of the urban environment. Meanwhile other institutions adopt a more 'environmental' interpretation of Sustainable Cities: 'Eco-Cities' - the Bruntwood Initiative for Sustainable Cities' is an initiative led by the University of Manchester which looks at how we can adapt our cities to the challenges and opportunities that a changing climate presents.

Other future city themes

Despite the dominant categorisations shown above, academic institutions do explore and research an incredible diversity of ideas in relation to the future city, many of which resist categorisation into particular 'themes'. Amongst the more niche future cities ideas explored by academic institutions are: an NYU art course which explores the design of the future city, and new techniques in green architecture, landscape, art, and urban planning; and The Oxford University Programme for the Future of Cities which focuses on the concept of the flexible city as one that responds better to evolving circumstances and is not limited by path dependency. In 2007 MIT opened a multimillion dollar research institute in Singapore to develop innovative solution to challenges of future urban mobility. Delft, Harvard and Newcastle Universities are amongst a growing group of institutions which offer 'resilience' modules amongst their engineering and urban planning courses.

2.5   Media and commentators

A review of the US and UK media, both mainstream (e.g. BBC News, Wall St Journal, Economist) and city-focused (e.g. UBM Futures, Atlantic Cities, Cities Today), reveals that 'future cities' has limited media coverage, and there is little coherence or

consistency in the conversation at present. The discourse is not focused and still very eclectic.

Despite the sprawling nature of the media dialogue on future cities, five major themes can be identified:

- Smart cities: technology and innovation
- Integrated cities: greater collaboration
- Infrastructure
- Environment and sustainability
- Liveability

Of these, smart cities, infrastructure, and environment and sustainability are the most well developed themes, whilst liveability and integration are emerging trends. It seems that 'smart cities' in particular has the potential to evolve towards a more comprehensive framework.

In the UK media, the Guardian has emerged as the most dedicated media commentator on future cities. In January 2014 it launched a Cities microsite which functions as an all-purpose forum for debate and ideas about the future of cities (Guardian, 2014). The site is supported by the Rockefeller Foundation, and contains sub-themes of 'Smart Cities' and 'Resilient Cities', the latter promoted by Rockefeller. The site encompasses all five of the themes outlined above, and also covers angles on city experience, art, architecture and inclusion, focusing fairly evenly on the good and the bad. The site is a unique showcase for a global media outlet, and despite its eclectic coverage has the potential to drive a more focused media conversation.

Outside of the US and UK, some additional observations can be made on the international (English language) media's approach – which broadly focuses on the same major thematic areas:

Technology and Innovation
In Dubai and the wider UAE, the media focuses overwhelmingly upon smart cities. This is largely a reflection of the initiatives underway in Dubai itself to become a leading 'smart sustainable city' in time for the 2020 Expo. The press report on the latest smart cities to be approved or opened (Emirates 24/7, 2014), and on the launch of new government plans, for public transport Wi-Fi, electric vehicle charging, and the recent 'Towards 2021' Initiative (see section 2.2) (Jacob, Allan and Shabandri, 2014). In October 2013, a future cities conference focusing on energy security, PPPs and water distribution at the Dubai World Trade Centre, run alongside the Cityscape Global exhibition, received widespread regional press coverage, (Emirates 24/7, 2013).

Infrastructure

The future city focus of the Indian press is oriented towards land use planning and infrastructure. Slum dwellings, urban sprawl and congestion are major issues in Indian cities, and the media's conversation centres on how these problems should be solved in the future city. Commentators in the major English newspapers (notably the Hindustan Times and Times of India) call for proactive governance and an end to corruption to optimise planning decisions and outcomes in the future. The future city debate has grown more urgent in light of India's rapid pace of urbanisation. The Times of India has recently co-chaired workshops with EMBARQ India to explore sustainable transport options for the city of Gurgaon (a satellite city of Delhi), and regularly covers Chennai's participatory model of urban management. The 'smart city' is a less prevalent theme, but does still form part of the media discourse, not least because of the label of smart attached to township projects in Kochi, Navi Mumbai and now Bangalore (Times of India, 2014a, 2014b; Correa, 2013). The increasing visibility of urban issues in Indian politics and the media appears to be partly attributable to the large urban youth population (more than half of Indians are under the age of 25) who are increasingly vocal, connected (online), and ready for and demanding change (Straits Times, 2014; Mustafi, 2012).

Multiple themes

In Japan, the Japan Times and Asahi Shimbun frequently run stories on a spectrum of future cities topics. The role of technology and innovation in the future city appears to be the most frequently recurring theme, particularly in relation to transport (for example, electric cars, smartphone apps which improve public transport experiences etc.). The Japanese media are also concerned with liveability and its link with health - there is a strong focus on ageing, and how future cities should be designed to cater for elderly populations. There is also some limited coverage of urban metabolism as a future city concept, a possible legacy of the Metabolists, a group of influential Japanese architects and city-builders in the 1950s (Japan Times, 2013; Asahi, 2014; Worrall, 2011).

The diversity of future cities activity in Singapore is reflected in the Singaporean media. The Straits Times is the city-state's most widely read English language broadsheet, and reports on future city publications, research and events are relatively frequent. For example, The Straits Times has reported recently on: the World Cities Summit (held in the city) which called for more liveable and sustainable cities; the publication of a government white paper on Singapore's future sustainability; and government innovations in transport planning. Research associates from the Centre for Liveable Cities (Jessica Cheam) and the Future Cities Laboratory (Dr Alexander Erath) are contributors to the newspaper.

2. 6   Think tanks, policy institutions and research institutes

Of the think tanks, policy institutes and research institutes which publish and/or operate in the English language, a handful focus entirely on future cities (e.g. the Future Cities Institute, the Future Cities Collaborative). Others deal with a broader subject area but are undertaking workstreams which explore the future of cities. Some cities even have their own think tanks e.g. the Sheffield Urban Think Tank, to help them plan for and deliver successful urban futures.

There is an extremely variable focus on the future across think tanks and research organisations, but the most common futurist urban issues they explore appear to be:

Future urban mobility
Think tanks researching for less car dependent or smarter mobility cities are among the most common form of future urban thought leadership. The Audi Urban Future Initiative, the European Parliamentary Research Service (the European Parliament's think tank) and Forum for the Future are three such examples. Such organisations often explore alternative transport and commuting methods. 'Smarter than Car', for example, is a Beijing based think tank which has defined new concepts such as Bicycle Urbanism, Negotiated Flow and Bicycle Livelihoods as approaches to facilitate future urban movement. Think tanks in this area are typically advocates for greater integration of transport options. The EPRS and Canadian Urban Institute both argue for better integration of the different urban mobility modes to encourage citizens to change their mobility choices. Similarly, the Forum for the Future report Megacities on the Move finds that real time traffic information and virtual meetings will have a role to play in improving efficiency (Canadian Urban Institute, 2014; Forum for the Future, 2010).

Smart and digital futures
A number of think tanks and research institutes have sprung up in recent years which focus predominantly on smart or digital cities. These include the Future Cities Institute (Australia), Sustainable Digital Cities (Australia) and the Fraunhofer Fokus Centre for Smart Cities (Germany). They explore how to create innovation ecosystems for city growth, and generally advocate integrated city systems. The Fraunhofer Fokus Centre works in partnership with business, government and the EU to develop practical, demand-oriented initiatives for application in developed and developing cities. Other think tanks have individual initiatives or research programmes on the topic of digital or future cities. For example, The Institute for the Future (USA) has developed a 'forecast map' called 'The Future of Cities, Information and Inclusion' which charts the crossover between urbanisation and digitalisation. It identifies the harnessing of data as a critical issue for the next decade and beyond (IFTF, 2011).

Future of specific cities

Several policy institutes and think tanks are considering how to secure optimum futures for a particular city. These think tanks often have a strong economic emphasis to their work. In New York, the Center for an Urban Future is dedicated to providing solutions for growing and diversifying the local economy, expanding economic opportunity and targeting problems facing low-income neighbourhoods. In the UK, the Centre for London aims to develop new ways of addressing the challenges London faces, and to foster fresh thinking about its future. Housing and infrastructure in Future London are major workstreams. The Centre also explores how London can remain an economically competitive global city in the future, whilst also building stronger ties with the rest of the UK.

Sustainability

The question of how to achieve a Sustainable City is one which is frequently tackled by think tanks and research institutes. However, the term 'sustainability' does not have a clearly defined meaning when used by these organisations, and the sub-themes and agendas encompassed can be quite different. For example, Sustainable Cities International focuses on the traditional 'resource based' interpretation of sustainability – it looks primarily at energy use, urban air and water. For the Future Cities Collaborative, however, the stated aim of 'building sustainable cities' is an umbrella for a broader remit. The Collaborative: works with mayors to encourage urban revitalisation and improved liveability; looks at alternative transport possibilities; place making, disaster management and urban design; and researches more adaptive solutions to energy and water demands. Meanwhile, the Intel Collaborative Research Institute on Sustainable Connected Cities adopts a 'human centred' interpretation of sustainable cities and is concerned with enhancing and changing how people live, interact and engage with cities (Schöning et al, 2012).

Character of the built environment

The Royal Institute of British Architects think tank, 'Building Futures', aims to promote public and political debate on the future of the built environment, and its socio-economic and environmental impact over a twenty-year horizon. It seeks to map how digital technology, rising sea levels or the UK's ageing population may come to shape the future city. The Why Factory (see section 2.4 above) also produces models and visualisations of the built environment in cities of the future.

The emerging themes we describe above highlight that most English-language urban future think tanks are based in the developed world. There appear to be fewer institutes considering the future city in developing nations, however, those that do tend to tackle rather different issues. The African Centre for Cities (2013), for example,

explains that in Africa, preparing cities for the future is an urgent political and governance challenge:

"[I]ssues of adequate food supply, affordable shelter, employment opportunities, water and waste management, public transportation, crime and disease, and environmental degradation and climate change…intertwine with critical social processes such as exclusion and conflict, which require effective socio-political management institutions and processes."

City planning is a particularly key issue for many developing nation think tanks working in the future cities space. The Africa Research Institute for example frequently publishes on urban planning: see for example, its recent publication Who Will Plan Africa's Cities? (Africa Research Institute, 2013).

Prathima Manohar, founder of The Urban Vision, an Indian think tank, expressed the difficulties for developing nations in engaging with the future in an interview with the Financial Times, explaining "Policymakers are struggling to deal with the present and are finding it impossible to look at the next wave of urbanisation, which will be bigger and will grow at a very fast pace." (Fontanella-Khan, 2010)

2.7   Supranational and inter-governmental organisations

Inter-governmental and supranational organisations have become increasingly engaged and influential on urban issues and challenges. An inter-governmental organisation – such as the United Nations, NATO and the World Bank - is a treaty-ratified association of states designed to promote and execute international co-operative agendas in areas such as peace-keeping, environmental protection, or economic growth. Inter-governmental organisations may have some 'supranational' features or agencies, whereby states accept that decisions made at the higher level are binding both in theory and practice. This section includes the World Bank in its analysis due to the bank's global focus and links with the United Nations, but other international financial institutions are reviewed separately in section 2.8.

The sheer size and breadth of focus of most inter-governmental organisations means that they do not tend to have an organisation-wide consensus about what the future of cities either means or should look like. The UN, for example, has many sub-divisions that operate and affect the future cities dialogue separately. Their interpretations of the future city align with their own specific remits. For example, UNISDR, the UN Office for Disaster Reduction Risk is concerned with city resilience. It runs a 'Making Cities Resilient' campaign, which provides support and recommendations for cities and local government. Meanwhile, UNEP, the UN's environment programme, is

concerned with carbon neutrality, reduced greenhouse gases and the green economy in the future city. Even UN agencies, which would not at first sight be linked with the future cities agenda, are carrying out work which will affect future cities – for example UNESCO (in heritage preservation), UNHCR (refugees and migration) and UNICEF (children's citizen voice).

Equally, the European Union's responsibilities are extremely broad, and cover economic, social, political and environmental spheres. Its vision for the European City of Tomorrow, therefore, covers very general principles. The envisioned city is a place of advanced social progress, democracy, cultural dialogue and diversity, environmental regeneration, and an engine of economic growth (EU, 2011). Despite the extensiveness of supra-national organisations' involvement with future city thinking, certain themes are apparent or prevalent. This section outlines these key themes, but also summarises some of the broader ideas on the future city that the organisations have developed, which have had profound implications for how national policymakers and corporate decision-makers understand the future city.

Systems of cities and city systems

In 2009, the World Bank's landmark World Development Report identified the concept of 'systems of cities', and recognised the distinct roles played by larger and smaller cities within a national or regional system. The complementary economic functions of cities within a system have immediate implications for planning the future of cities in terms of where innovation can be fostered, what sectors are to be encouraged, and how transport can best serve the overall system functionality. The Bank's urban strategy focuses on partnering with national and city governments to build these productive systems of cities.

The Organisation for Economic Co-operation and Development (OECD) has been instrumental in leading the move away from 'one-size-fits-all' national urban programmes. It recognised that a much deeper engagement with spatial policies and with the relationships between cities in a regional or national system is necessary in order to secure optimal outcomes for future cities (Clark and Clark, 2014). Its future cities policies and programmes tend to demonstrate to and assist with city leaders in maximising productivity and employment growth, with a keen eye on sustainability and affordable housing (OECD, 2014a).

In 2014, UN Habitat has produced a consensus document that describes The City We Need (Figure 2.9). This establishes essential paths for building a New Urban Agenda towards the 2016 Habitat III Conference, which is run with a number of global partners (UN Habitat, 2014).

The City We Need is a very clear overview of the future cities discourse within UN-Habitat and its partners. It is adamant that public service provision and systems upgrades alone "do not address basic structural problems nor do they offer answers appropriately scaled for tomorrow's challenges." Instead, it calls for a "well-coordinated system of systems".

"Consider [a city's] complex and interlocking systems: engineering arrangements, social and cultural organizations, economic structures and environmental components. If like a tree where different parts work in harmony, they heighten possibilities for prosperity. But if like a machine they run amuck, they malfunction and heighten human frailty" (UN Habitat, 2014).

Figure 2.9 Cover of The City We Need

It is significant that the terms 'smart' or 'integrated' do not appear once in *The City We Need* document. Instead, its social and governance focus means that inclusive (6 mentions), planned (6) and resilience (4) are more central to the narrative.

Smart cities

The European Commission has taken considerable interest in the smart cities agenda. In 2011 it launched the Smart Cities and Communities European Innovation Partnership to boost the development of smart technologies in cities by: pooling research resources from energy, transport and ICT; and concentrating them on a small number of demonstration projects which will be implemented in partnership with cities. In 2013, €365 million in EU funds were earmarked for demonstration of these types of urban technology solutions.

One example is GEYSER ("Green nEtworked data centres as energY proSumers in smaRt city environments"), an international consortium of ten European organisations awarded €3m funding to achieve the intelligent integration of energy-efficient networked urban data centres, powered partly by renewable energy. GEYSER aims to trade off energy (i.e. power and/or heat) exchanges with smart city infrastructures against workload exchanges with other Data Centres in its network (Wattics, 2014).

Horizon 2020 is the EU's new funding programme for research and innovation. It has a total "pot" of nearly €80 billion in funds available over 7 years (2014 to 2020), of which €92.32 million in 2014 and €108.18 million in 2015, are being allocated for

smart city projects. Under the funding programme, cities apply for funding for their own 'lighthouse' projects i.e. demonstrator projects. Those cities that propose schemes with a holistic approach to the three pillars of low energy districts (integrated infrastructure and sustainable mobility) and which are easily replicable across the EU will be favoured (EU, 2014). The Smart Cities Stakeholder Platform is the European Commission's new web-based platform for those interested in smart urbanism. Open to anyone who registers, it aims to cultivate smart cities by bringing stakeholders together from across Europe to exchange ideas, launch projects and improve policy at local, regional, national and EU level.

The World Bank is also involved in the 'smart city' space. Its ICT sector collaborates with urban sector staff to make operations smarter, but there has not yet been an adjustment in lending activities to respond to the opportunities or challenges around smart cities. Instead the Bank is involved in preparing local governments themselves to be smarter clients. Where the Bank has been active is in targeting improvements in particular systems, namely water metering, electricity metering, building energy, and energy efficiency more generally. It is also active in basic transport innovation, such as street lighting to improve traffic flow and electronic citywide systems. It aims to develop a toolkit for cities thinking about e-government holistically, so that they can make informed choices when private sector firms approach them to sell a given system. Urban Sector Manager Abha Joshi-Ghani has said that "smart cities" in developing country contexts is "really about good governance. It's about giving basic services to our citizens. It's about liveability. It's about how we are using our resources. It is how a city functions on a day-to-day basis... doing more with less" (Clark and Moonen, 2014).

The OECD also works to develop ICT applications for smart grids, smart sensor networks, and systems in the water and health sectors (OECD, 2014b).

Sustainable development
Amongst the supranational organisations engaging with sustainable urban development, is the World Bank's Low Carbon, Liveable Cities Initiative, launched in 2013, helps cities finance sustainable development, building fiscal and data capacity. Furthermore, its Sustainable Cities Initiative focuses on building adaptability and mitigation capability across Europe and Central Asia.

The OECD's future cities policies and programmes tend to demonstrate and assist city leaders in maximising productivity and employment growth, but with a keen eye on sustainability and affordable housing. In 2013 the OECD held an International Conference on Future of Cities in Kitakyushu, Japan, where the Green Growth in Cities report highlighted the role green investment can play in generating growth and jobs.

It drew on case studies of Paris, Chicago, Kitakyushu and Stockholm to identify green policies that can respond to urban growth priorities, and suggested how to implement and finance them.

UN-Habitat, the UN agency for human settlements, is one of the most active UN bodies in the future cities conversation. It hosts the bi-annual World Urban Forum, one of the largest city conferences in the world. Although themes of the WUF have been varied, there has been a general trend towards sustainable or 'balanced' development as an organizing idea (Figure 2.11). In 2012, the WUF entitled The Urban Future covered themes of urban planning institutions, prosperity, productivity and mobility.

Figure 2.11: Themes of UN Habitat's World Urban Forum since 2002

Source: Wuf7 (2014)

Cities without slums

The Cities Alliance, formed in 1999, is an unusual partnership organisation in that it unites several supra-national and inter-governmental organisations, namely the World Bank, UN-Habitat and the European Union. It also has a wider range of partners, including city networks (Metropolis and UCLG), national governments (including the USA, Australia, Norway and the Philippines) and NGOs (Slum Dwellers International and Habitat for Humanity International).

Shortly after its formation the Alliance produced the Cities without Slums Action Plan, a plan with a proposed target of improving the lives of 100 million slum dwellers by the year 2020. This joint plan signified the first time such a measurable target had been set in the international development arena (Cities Alliance, 2014a). It was subsequently incorporated into the United Nations Millennium Declaration in 2000 as Target 11 of the Millennium Development Goals. Progress in achieving the Cities without Slums goal will be monitored through two indicators: (i) the proportion of people with access to improved sanitation; and (ii) the proportion of people with access to secure tenure (Cities Alliance, 2014b).

2. 8   International financial institutions

International financial institutions (IFIs), including the World Bank, are active
participants in the future cities discourse, shaping future urban development through
their lending policies. A 2014 paper produced for the Future Cities Catapult, 'Urban
Innovation and Investment: the Role of International Financial Institutions and
Development Banks' (Clark and Moonen, 2014), examines these policies in detail.

International financial institutions and development banks operate at global, regional
and sub-regional levels, and may have both public sector and private sector lending
arms (Figure 2.12). Roughly 10-15% of the total portfolio of most IFIs goes to
designated 'urban' programmes, in addition to sector spending that also impacts city
development. As a result, IFIs have become critical development partners to cities,
supplying invaluable technical and knowledge support and tailored solutions, based
on their unique experience of investing in challenging urban environments.

*Figure 2.12: Typology of international financial institutions and development banks
engaging with future city needs*
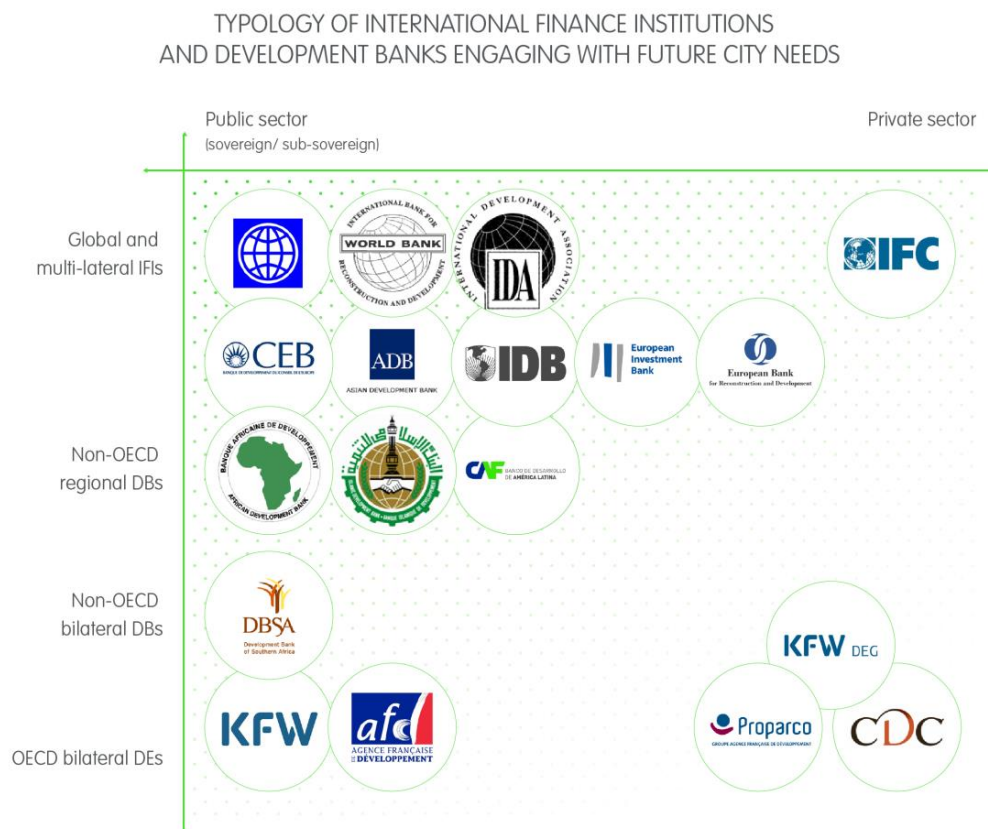
Source: Future Cities Catapult (2014) (adapted from Clark and Moonen)

Future-oriented partnerships with cities are a growing feature of IFI practice. An examination of IFIs' lending policies is a good indicator of their future city conceptions and concerns. The early development stage of most IFI clients means the finance institutions tend to draw on ideas of resilience, inclusiveness and sustainability rather than smartness or digital solutions.

The most common 'themes' or areas of IFI (future-oriented) urban lending are:

Integrated city systems

Since 2008, IFIs have been gradually incorporating aspects of integrated multi-sector development and 'city systems' thinking into their approach to cities. This is a response to surging demand for urban services, a deeper understanding of urban processes, and the need for integrated solutions. Innovation for IFIs tends to refer to the next stage or next threshold of priorities in a specific context of incremental development. In practice, this means support for: metropolitanisation processes; smarter investment in infrastructure; promotion of long term and resilience thinking; empowerment of city management systems; help to shape national urban policies; adaptation of financing instruments to support combined approaches and life cycle financing; and the mobilisation of citizens around investment needs. IFIs that have adopted positive ideas of integrated urban systems include the Asian Development Bank, the Islamic Development Bank and the European Investment Bank.

Future urban mobility

Transport infrastructure and mobility are a key area of investment for many IFIs, comprising up to a third of total lending. Development Banks often need to fill a financing deficit in this area because the long construction risk periods create difficulties in obtaining affordable project finance from conventional lenders. IFIs are active in part-financing metro systems, bus rapid transport networks, and high-speed urban freeway projects, as well as multi-modal systems (Clark and Moonen, 2014).

Sustainability

IFIs use the term sustainability frequently in relation to their future cities investments, to indicate not just low-carbon aspirations, but also cities that are well managed, well planned and efficient. For example the Inter-American Development Bank's Emerging and Sustainable Cities Initiative, established in 2011, helps growing medium-sized cities make more informed planning decisions and take fast actions towards smart urban development. It focuses not just on environmental sustainability of growth, but on comprehensive urban development, fiscal sustainability and good governance. Sustainability is also one of the European Investment Bank's priority areas for additional funding, as part of its ambition for lower-carbon growth and effective urban mobility (Cities Alliance, 2014b). An energy-efficient power system is also important

for IFIs working in challenging environments such as KfW and the European Bank for Reconstruction and Development (EBRD).

Resilience

A number of IFIs focus on building resilience in their investee cities – usually referring to the capacity to withstand climate change. The Asian Development Bank's Urban Climate Change Resilience Fund is supporting and scaling up initiatives across 25 medium-sized cities in Asia to mitigate against unusual weather events and sustained periods of flooding and drought. Similarly, The African Development Bank's Clean Technology Fund (CTF) offers a mix of financial incentives, risk mitigation tools, technical assistance, and knowledge transfer to help make adaptation and mitigation investments more attractive to private investors. KfW is also moving towards the idea of resilient cities, and is using data in order to understand what kind of basic climate change investments can be most effective (Devex, 2013). Resilience does not yet tend to imply economic or social capabilities in these IFI framings, but instead tends to be used to help cities think about the longer-term and the importance of responding to external shocks.

2.9   City networks

Cities are assembling in national, regional or international networks to share experiences and information, to work towards shared goals or in relation to common interests, or to achieve critical mass for lobbying or political purposes. These networks of cities make important contributions to the discourse on the future city more generally. Membership of an influential network can provide cities with a real possibility of influencing the future cities debate, as well as providing cities with an opportunity to share ideas and learn from the experience of others.

Some networks connect cities not only with each other, but also with other stakeholders, including the private sector. The World Economic Forum connects business, political, academic and other leaders, offering an environment for urban developers and the private sector to exchange best practices. Its Future Urban Development Initiative seeks to foster greater collaboration in order to accelerate the transition towards innovative urban development models. Under the Champion City scheme, the WEF brings together experts from different sectors in a nominated city (Tianjin was the inaugural city in 2012) to identify strategies and outline implementation paths to address key urban development challenges.

The largest (and probably most influential) city networks consider, discuss and seek to affect a very wide range and large number of urban issues and future city themes. These might include climate change, safety and security, transport, art and culture, education, or housing. For example:

- **United Cities and Local Governments (UCLG).** An influential network which represents local governments on the world stage and supports international co-operation between cities. It is concerned with a full range of city issues, including climate change, gender equality, local finance, disaster risk reduction, social inclusion, migration, culture and water and sanitation. In 2010 at UCLG's third international congress, the constituent members adopted "The City of 2030 – Our Manifesto", outlining common goals for the future city. The range of goals is striking – the future city is described as (amongst other characteristics): a democratic, self-governing city; an inclusive city; a city with a vision; a liveable city; a creative city; a secure city; a mobile city; a city without slums; and a cleaner, greener, more compact city (UCLG, 2013).

- **Metropolis (World Association of the Major Metropolises).** Brings together representatives from many emerging and developed cities to debate shared challenges. Based in Barcelona, it runs initiatives in the areas of Governance, Social Inclusion, Urban Innovation and Sustainability. The theme of its 2013 Annual Meeting was 'Caring Cities' which encompassed sessions on Safer Cities, sustainability, city financing, housing, Smart/Agile Cities, citizen engagement, resource resilience, urban innovation, food resilience and transport (Metropolis, 2013).

- **Eurocities**. A network of local governments from over 130 of Europe's cities (and 40 partner cities) drawn from across 35 countries. It works with the European Parliament and European Commission influencing policy 'to ensure that it is based on front line experience and to increase recognition and resources for cities'. It provides a forum for knowledge exchange, and seeks to influence citizen behaviour (Eurocities 2014a). Eurocities supports the EU's 2020 Strategy (which sets out targets in employment, R&D, climate change, education and social inclusion) and describes its own priorities as 'citizens, climate and jobs'. These broad priorities house a multitude of sub-themes from smart cities, to urban regeneration, education and mobility (Eurocities 2014b).

Conferences, whilst not networks in themselves, constitute important networking opportunities in which cities, the private sector, academics and civil society groups can join together to share knowledge, experience and lead thought development. Their agendas can provide valuable insights into the future city concerns and priorities of both cities themselves, and the broader networks of actors and stakeholders with whom they work. A scan of recent and upcoming future city conferences reflects extremely broad interpretations of the 'future city', for example: 'Arab Future Cities Conference', Doha April 2014 (smart cities); 'Future Cities', Dubai September 2014 (resilience and sustainability); 'The Future of Our Cities', Hastings 2014 (climate

change); 'Future Cities', Copenhagen November 2013 (green cities, intelligent energy use and big data); 'Cities of the Future: BRE Trust Research Conference', London February 2014 (energy, infrastructure and wellbeing); and 'Cities of the Future: Innovation in Practice', Istanbul September 2013 (water security). As with formal city networks, the largest conferences and those which attract the most significant numbers of city leaders tend to cover a large number and diversity of future city themes within one conference. For example:

- In Asia, the World Cities Summit 2014 will convene Mayors, ministers and city leaders to discuss liveable and sustainable cities. Six thematic tracks will be pursued and discussed: Safe and Liveable Cities; Will Mayors Rule the World; Making Plans into Reality; Building Resilient Cities; Innovative Urban Solutions for Liveable and Future-ready cities; and Future Mobility.
- The New Cities Summit claims to be "the leading global event on the future of the urban world". In its three years of operation, it has facilitated "Re-thinking Cities" (2014) - the transformation of the 21st metropolis through technology, as well as the "Human City" (2012) , the future of urban mobility, big urban data and future proofing cities.

Whilst the largest city networks and conferences focus on a large and diverse range of future city themes, a couple of issues emerge as recurring concerns. These most prevalent future city themes do not only concern 'mega-networks', but have also spawned a plethora of more tightly-focused city groupings:

Climate change and environmental mitigation
City networks most visibly convene around the environmental sector in pursuit of tightly defined aims. There are several potential explanations for this. First, most city leaders share the view that not only is climate change very urgent, but also that prevention and mitigation strategies are a key responsibility of those in charge of the built environment and transport systems. City governments tend also to have some important administrative responsibilities and fiscal capabilities in these sectors.

Second, there has been a perceived failure of national governments to take sufficiently bold actions to address climate change, whereas city leaders have found it easier to gain local citizen support. In some cases this is due to urban problems, such as poor air quality, threats from flooding and other impacts of extreme weather, and concerns about food security.

Lastly, cities have received support from influential leaders (Bill Clinton, Al Gore, Michael Bloomberg, and others) and from inter-governmental organisations such as

the World Bank, UN and OECD. Examples of influential climate change-focused city networks include:

- **The C40 Cities Climate Leadership Group (C40)**. A network of the large international cities committed to "resilient and liveable megacities-demonstrating action, impact, and opportunity."
- **The Asian Cities Climate Change Resilience Network (ACCRN).** A network of ten core cities in India, Indonesia, Thailand and Vietnam, part-funded by the Rockefeller Foundation, experimenting to collectively improve the ability of the cities to withstand, to prepare for, and to recover from the projected impacts of climate change.
- **The World Mayors Council on Climate Change**. A network of over 80 local government leaders working to reduce global greenhouse gas emissions.
- **Energy Cities**. The European Association of local authorities in energy transition. With more than 4,500 member cities, Energy Cities has a long-term vision of a low energy city with a high quality of life for all.
- **The South-East Asia Eco-Cities Network.** A network recently established by the Industrial Development Organisation to share knowledge and learn from Japan's eco-cities achievements. The five cities are Pintan, China; Iskandar, Malaysia; Cebu, the Philippines; Map Ta Phut, Thailand; and Da Nang, Vietnam (Eco-Business, 2013).
- **ICLEI (known as Local Governments for Sustainability).** An international association of over 1000 cities local and metropolitan governments that seeks to prepare cities for sustainable development. Originally focused purely upon environmental initiatives, it has broadened its mandate to the whole sphere of 'sustainability', to include smart infrastructure and green economic transition. ICLEI also runs a Future City Leaders initiative - a global network and capacity building programme for young elected municipal leaders interested in urban sustainability.

Secure cities

City networks working towards developing secure and safe future cities are visible around the world.   The proliferation of these networks is partly attributable to the fact that cities are the perceived targets of major security threats: whether criminal, terrorist or even nuclear. They are centres of trafficking (drugs, weapons, or human), organised, violent and petty crime. As such, crime prevention and security issues are of particular importance to cities and city leaders. Furthermore, just as with climate change, there has been a perceived failure of national governments to achieve results in securing safe cities, or even to co-operate fully in relation to cross-border security issues (Barber, 2013). Examples of city networks aiming to achieve secure future cities include:

- **European Cities Against Drugs.** Europe's leading organisation promoting a drug free Europe. The network has 249 city members across 30 European countries, including 20 capital cities. The organisation hosts annual Mayoral conferences, and works to develop initiatives against drug abuse, opposing legalisation and promoting policies to eradicate drug abuse (ECAD, 2014).
- **Mayors for Peace.** A network established by the Mayor of Hiroshima in 1982, which aims to provide a means for cities to work together for the abolition of nuclear weapons. It has 6,000 member cities from 158 countries across the world. The organisation's 2020 Vision Campaign sets a goal of abolishing nuclear weapons by 2020 (Mayors for Peace, 2014).
- **European Forum for Urban Security.** A Paris based network which unites 250 local authorities from 17 countries working on all major issues relating to urban safety and security. Its Cities Manifesto calls for the promotion of long term, proactive crime prevention policies. Signatories agree to invest in crime prevention "to guarantee that the security of future generations, indispensable to the quality of life in cities, is a basic right for all" (EFUS, 2014).

Healthy cities

Although a less widespread focus than climate change or urban security, a number of city networks around the world are focused on healthy future cities themes. In the USA, both the US Conference of Mayors and the National League of Cities run 'Healthy City' programmes which seek to develop cities as centres of healthy eating and active living (Leadership for Healthy Communities, 2014). Within Europe there are more than 30 'National Healthy Cities Networks', which have been designated as such by the World Health Organization (WHO). The WHO's objective is that the city networks should create a supportive environment which enables cities to put health improvement and health equity at the core of all local policies (UK Healthy Cities Network, 2014). In Asia, the Alliance for Healthy Cities has city members from Australia, Cambodia, China, Japan, South Korea, Malaysia, Mongolia and Vietnam amongst others. Network members also include national governments, NGOs, private sector businesses and academic institutions. Members subscribe to the WHO's approach to 'Healthy Cities', incorporating health issues and health concerns into all aspects of public policy (Alliance for Healthy Cities, 2014).

2.10   Philanthropic organisations

Philanthropic foundations, primarily in the US, but also in the UK and Japan, have become major forces in the future cities sphere. They engage in the future cities space as a means of 'giving back' to society, in accordance with their overall objectives and founding principles. They possess the endowments, attributes and assets to support urban innovation locally, often engaging with multiple local governments and

jurisdictions. Many foundations are more active than ever in partnering with other stakeholders to solve long-standing problems of urban fairness, access and productivity.

Major philanthropies have significant funds to spend on furthering their future cities agendas, and invest these funds in a variety of ways; direct city spending, research sponsorship, awareness-raising through collaborations e.g. the Rockefeller Foundation sponsorship of the Guardian Cities micro-site. Similarly, the Ford Foundation sponsors *urb.im* - a social platform which engages urban practitioners and social activists in focused problem-solving to reduce urban poverty in developing countries.

Although the roots of many philanthropic foundations are in the US, their reach and influence on cities and their futures is broad: The Rockefeller Foundation's 100 Resilient Cities campaign (see further details below) received applications from 400 cities across 6 continents (Rockefeller Foundation, 2014b): The US based Bloomberg's Mayor Challenge is open to any European city with more than 100,000 residents; and since its launch in 2007 the Gates Foundation Urban Poverty Special initiative has committed nearly $150 million to organisations working in urban centres in Africa, Asia, and Latin America.

The major future city themes addressed by philanthropic institutions include:

The inclusive city
Philanthropic institutions often interpret future cities through the lens of poverty and inequality reduction, and see the city of the future as a vehicle for promoting inclusion.

The Ford Foundation is a very influential organisation engaging with the future of cities. The Foundation has a long history of international involvement with long-term city development, including metropolitan planning in cities like Calcutta, Delhi and Ahmedabad in the 1950s and 1960s. After a hiatus, it is now promoting an optimistic view on the potential of cities, led by empowered Mayors, to pursue urban sustainable development goals through good policy and planning (Don Chen, personal communication, April 22nd 2014). Its programme, 'Just Cities', invests (and leverages co-funding) in initiatives for sustainable, inclusive and just city futures. Its programme's aim is to 'advance a vision of how fairness, opportunity and equity can serve as the defining features of this new era of urbanization.' (Ford Foundation, 2014).

George Soros' Open Society Foundations works to 'build vibrant and tolerant societies whose governments are accountable and open to the participation of all people' (Open Society Foundations, 2014). Their cities work aims to find solutions to urban

challenges which impede opportunity and justice. Recent forward-looking cities projects include: the 'At Home in Europe' project which supports innovative city-based initiatives, enhancing opportunities for full and equal citizen participation; and 'Living Together', a range of projects which promote inclusion of minority groups in 11 cities in Europe (Open Society Foundations, 2014b). Similarly, the Bill and Melinda Gates Foundation's 'Urban Poverty Special Initiative' focuses on building the capacity of organisations working on the ground with the urban poor, integrating the voice of the poor into the urban planning process and building city-level partnerships.

In the UK, the Joseph Rowntree Foundation, which has an overall aim of inspiring social change, has a focus area of 'Cities, growth and poverty' looking at how to more effectively link urban growth and jobs to households in poverty.

Figure 2.13 illustrates the breadth of areas in which philanthropies concerned with the inclusive city are active.

Figure 2.13: Themes encompassed within the concept of a 'Just' or 'Inclusive' city

Source: Future Cities Catapult (2014) (adapted from Clark and Moonen)

Even where inclusivity is not the main future city focus of a particular philanthropic organisation, smaller projects still deal with inclusion and poverty reduction. For

example, the Rockefeller Foundation focuses primarily on Resilient Cities, but also runs 'Informal City Dialogues' in which it works with residents of Lima, Accra, Manila, Chennai, Nairobi and Bangkok to find out how innovation in the informal sector can be used to create resilience and inclusion in future cities.

Resilient cities

The Rockefeller Foundation has firmly focused its attentions on resilience of future cities. Its 100 Resilient Cities Centennial Challenge (Figure 2.14), launched in 2013, will select 100 cities which have demonstrated commitment to building their capacities to prepare for, withstand and recover or even thrive from shocks and stresses. It will provide them with technical support and resources for developing and implementing urban resilience plans for a 3 year period.

The Challenge defines resilience as bouncing back and emerging stronger from unexpected shocks - climate change, environmental hazards, war, terrorism or civil unrest - rather than economic or market turbulence. 33 of the

Figure 2.14 Welcome Page of Rockefellers 100 Resilient Cities Centennial Challenge

final 100 cities have been selected so far (as of March 2014) and these cities are generally those at risk from rising sea levels, civil unrest or natural hazards e.g. New Orleans, Rotterdam, Christchurch, and Ramallah (Rockefeller Foundation, 2014b).

Leaders of the future city

Bloomberg Philanthropies, founded by former Mayor of New York Michael Bloomberg, sees future cities as spaces whose character will be determined by their leadership. The Bloomberg Mayors' Challenge competition, initially run in the USA and since extended to the EU, seeks to inspire city leaders to come up with bold ideas that solve major problems and improve city life – which can ultimately be shared with other cities. The city with the most innovative and transferable idea receives $5million to put it into action. The intention is to transform the way local government thinks and works. It has also entered into partnership with NYU's Robert F. Wagner Graduate School of Public Service to develop resources for city leaders across the world.

Climate change and sustainability

The Clinton Foundation's Clinton Climate Initiative (CCI) reflects Bill Clinton's personal interest in climate change mitigation. The CCI Cities program works in partnership with the C40 Cities Climate Leadership Group, a network of 63 cities from around the world, in order to implement meaningful and sustainable climate-related policies and programs. It works in a broad range of areas in order to improve climate change outcomes in cities of the future, specifically: Energy; Finance and Economic Development; Measurement and Planning; Sustainable Communities; Transport; Waste; Water; and Adaptation.

Other collaborations between foundations have also been set up to pool knowledge and money around urban sustainability. The Funders' Forum on Sustainable Cities is a foundation-led network committed to engaging in sustainable and inclusive growth in cities by addressing urban poverty, opportunity and governance. The lead foundation is the European Foundation Centre in Brussels, whose 2014 annual assembly explores urban social movements. The Forum's work pays attention to managing population and infrastructure size and needs in expanding cities, investing in community well-being and safety, and sustained leadership and proper policy execution. Partner foundations must show interest and commitment to dialogue and patient solution-building, and participate at the annual World Urban Forum. Other participating foundations include the Charles Stewart Mott Foundation, The Ford Foundation, The German Marshall Fund of the United States, Fundação Calouste Gulbenkian, Fundación AVINA and Realdania, with membership expanding rapidly in 2014 (European Foundation Centre, 2014).

The Ellen MacArthur Foundation, based in the UK, is primarily concerned with promoting resource efficiency and movement towards a 'regenerative circular economy' and a sustainable future. The Foundation engages with future cities as a key space in which the circular economy will be built. It promotes third party activities, events or initiatives which deal with future cities from a point of view of resource or energy efficiency (Ellen MacArthur Foundation, 2014).

Samsung, the multinational corporate, also carries out philanthropic activity in this area. As a corporation, its corporate social responsibility focuses are on children and the environment, and this carries into its future cities philanthropy. Samsung's Global Youth for the Environment Forum promotes urban environmental awareness amongst school children, with lectures on topics such as Climate Change and Sustainable Cities, and the Roles of Municipalities in Building Sustainable Cities (Samsung Village, 2014). The Mori Memorial Foundation, based in Tokyo, is a major philanthropic foundation and research institute focused on the future of cities. Established in 1981, it aims to create urban environments that 'lead to sustainable life for all'. The foundation adopts

a broad interpretation of 'sustainable' which encompasses environmental, social, political and financial considerations. Particular focus areas are ageing in the future city (particularly in Tokyo), and city attractiveness to both inhabitants and visitors – an idea explored by the Foundation's Global Power City Index (see Box 5), (Mori, 2014).

Integration of city systems is not yet a theme widely taken up by philanthropic institutions. The Ford Foundation is one exception, which notes that Just Cities will only be created with "fresh thinking and new partnerships that reach beyond municipal borders, unite the public and private sectors and offer integrated approaches to perennial challenges like transportation, housing, education and the environment".

2.11   City indices and benchmarks: key trends in notions of successful cities/future cities

Urban indices produced by multi-governmental institutions, business consultancies, research foundations, media outlets and cities themselves, have become one of the most important means of tracking future city trends and patterns. Their assessments of performance and perception provide a distinctive insight into how cities are coping with the accelerated pace of change and the demand for new strategies and approaches to internationalisation. They also illustrate what different groups consider important about cities in comparative and competitive perspective, both now and in the future.

A recent 2013 analysis of over 150 national and international indices worldwide provides several important pointers of city success in the medium-term future (Moonen and Clark, 2013). These include studies by organisations as varied as the Economist Intelligence Unit, the Chinese Academy of Social Sciences, UBS, IW Consulting (Germany) and Perú Económico (see Appendix 1). The review identified ten categories of indexes, rankings and benchmarking studies that variously reflect the priorities of citizens, mobile global firms, investors and visitors:

- All-round urban provision (7 indexes)
- Finance, investment and business environment (25 indexes)
- Macroeconomic performance (10 indexes)
- Quality of life (29 indexes)
- Knowledge economy, human capital and technology (18 indexes)
- Infrastructure and real estate (19 indexes)
- Environment and sustainability (14 Indexes)
- Image, brand and destination power (12 indexes)
- Culture and diversity (8 indexes)
- Cost of living and affordability (8 indexes)

Box 4: How City Indices and Rankings work

Indices draw on a complex synthesis of available data, expert analysis and perception surveys to develop ideas about what does, and will, constitute city success. Indices are not only a source of 'home truths' about the comparative strength of a city's provision in a given area. They also provide insight into what kinds of city are likely to thrive in the future.

The Global Power City Index, devised by the Japan's Institute for Urban Strategies and the Mori Memorial Foundation in 2008, has been a highly influential index that has highlighted the strengths and weaknesses of large cities. The GPCI aims to be a valuable tool for establishing future-oriented urban strategies, especially for Tokyo. It assesses quantitative performance in the areas of Economy, R&D, Cultural Interaction, Liveability, Ecology and Natural Environment, and (transport) Accessibility. Unusually, it collates these results to assess how well cities provide for the needs of different citizens - for managers, researchers, artists, visitors and residents - to consider which demographics are being properly served. Although the established world cities perform very well in this index, medium-sized central European cities such as Frankfurt, Berlin, Zurich and Vienna all excel.

PwC's Cities of Opportunity series is deliberately focused on how prepared cities are for an uncertain future. Its 2012 edition contains a new section entitled 'The City Tomorrow', which draws from Oxford Economics' research on regional and world models. PwC has produced a model which gauges how cities will far in five "what if" scenarios, depending on the trajectory of trade, economy, technology and social demands over the next decade. Cities such as Toronto, Stockholm and Sydney are consistently well-rated in this index, because of their economic and liveability balance and their adaptability to new trends.

fDi Magazine's Cities of the Future combines large datasets with an expert judging panel to assess the capacity of cities to promote inward investment over the medium term. The main categories are not just economic scale and cost efficiency, but also human resources, quality of life, business friendliness and FDI promotion strategy. As such, cities with strong higher education institutions and attainment, reliable health and school systems, existing concentrations of high-tech and knowledge firms, and incentives and vision for future investor types, score well. In their respective continents, the cities of Edinburgh, Bangalore and Santiago de Chile all perform very strongly, even when their macro-economic conditions are not that highly rated.

The Hamburg Economic Development Board and Berenberg Bank have combined to produce a biannual economic index ranking the 30 German cities of the future, where productivity levels are high, innovation systems function well, and international connectivity and flow is large. It views German city future success as depending on attracting corporates, a strong regional political framework, sound public finance, fast networks within the region, and the development of strategic development pathways.

Source: Moonen and Clark (2013)

Indexes covering liveability, green cities, international image and cost of living have become widely read and very influential internationally because of the appeal of comparing city progress. Our study has found that a significant share of future cities language use is linked to or inspired by results and phraseology derived from international indices. They have inspired local debate about infrastructure projects, air pollution, social mixity and ingredients for long-term tourist attraction.

When examined in aggregate, indices results and trends also show several important factors that are linked to future success and potential:

- Political stability and business framework play a growing role in cities' capacity to attract investment. The largest global city economies not only benefit from scale, but also possess the openness, reliable business environments and legal and regulatory frameworks that assure increasingly risk-averse investors (as well as tourists, students and firms).
- Position in regional system - Cities still operate in a regional system that has distinct assets that will shape how they evolve in the next 2-3 economic cycles. European cities have peerless reputation for tolerance, diversity, openness, culture, architecture, history and entertainment. North American cities excel as a group for human capital, diversity and technology sector competitiveness (energy, pharmaceuticals, biotechnology and IT). Leading Asian cities tend to possess high infrastructure investment capabilities and the fastest growing consumer spending demographic. Latin American cities tend to share similar challenges around metropolitan governance, fiscal decentralisation, informal housing, congestion and declining working-age populations.
- 'First-mover' cities in key sectors are generally more resilient to global economic changes. Leading start-up and innovation cities such as Boston, San Francisco and Tel Aviv have maintained their positions as world-class 'ecosystems' for entrepreneurship. Prominent financial centres such as Zurich

and Toronto have retained or strengthened their position, at the expense of less mature centres, even as emerging business capitals have become more important nodes. Similar trends also appear for those cities that made early initiatives in international higher education or the green economy.

- Medium-sized cities are proving more capable of combining economic dynamism with liveability and environmental imperatives. German, Scandinavian and Canadian cities of between 1 and 4 million population are showing how to blend a specialised institutional and corporate presence with attractive lifestyle, high quality education at all tiers, and tangible commitments towards sustainability. Others of similar scale are replicating and adapting these approaches, for example in Latin America with a specific programme - Ciudades Emergentes y Sostenibles - run by the Inter-American Development Bank.

- Finance and investment tools are beginning to have an impact on cities' capacity to ensure infrastructure systems are functional and competitive. Recent forecasts suggest that larger developing cities will need to invest 40% of their growth over the next generation to maintain adequate infrastructure and assets, compared to around 20% for more developed cities. The strong performance of some emerging cities is linked to their span of service delivery control, their wide access to locally-generated tax revenues, and their productive mutual arrangements with higher tiers of government. Among developed cities, the capacity to attract private sector investment has been critical to performance since 2008.

3.

SHAPING

THE FUTURE

CITY

Foresight

CATAPULT
Future Cities
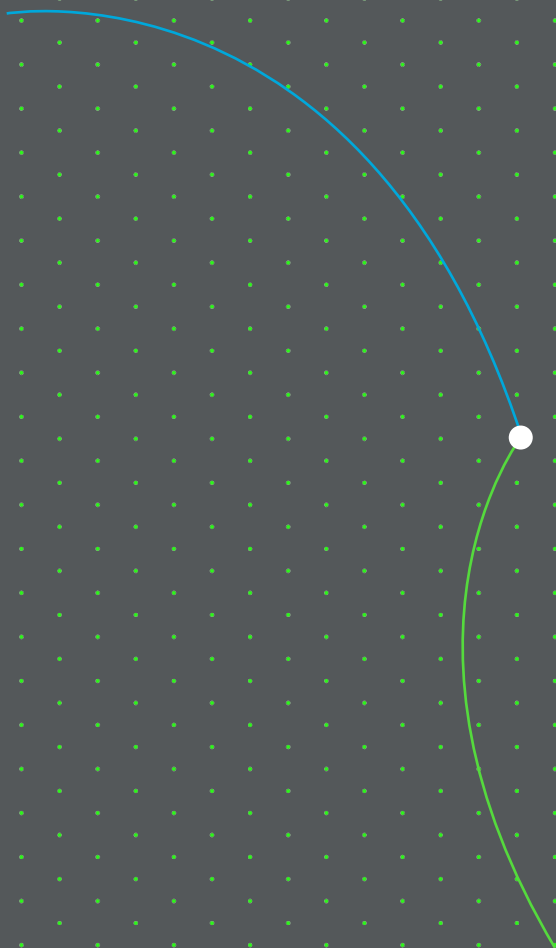
3. SHAPING THE FUTURE CITY

Discourse around future cities has developed a breadth and depth which has not been seen before. Ideas, ideals, projections and predictions are springing from an ever increasing array of stakeholders. Fortunately, contextual changes in recent years means that cities are becoming better equipped than ever before to act on these new ideas and projections.

Of course, it is important to recognise that cities around the world are highly diverse social, economic, environmental and political entities. Cities vary hugely in terms of size, wealth, demographics, level of development, quality and standard of living, institutional framework and their degree of political and fiscal autonomy. These variables combine to create highly place-specific contexts which are extremely important. These specific circumstances will inevitably affect the pathways that individual cities take, and the degree of control they have over their own futures. Nonetheless, the emergence of new governance frameworks in recent years, including the development of new tools and systems, means that cities are becoming better equipped than ever before to plan for and shape their futures. Major new developments include governance, finance, technology and leadership.

3.1 Governance

OECD analysis in 2009 highlighted that in the new wave of globalisation, most important domestic policies have increasingly strong cross-sectoral and inter-governmental dimensions. Most services and policies, whether in education, transport, planning, housing, waste, energy, immigration, or the economy, involve multiple tiers of government, and no tier of government is able to act effectively alone. The complexity of governance has prompted a rethinking of 'one-size-fits-all' national urban programmes and policies, and city and metropolitan development strategies. Over the past five years, several global organisations (including the OECD, World Bank and UN) as well as national governments, have grasped the need for a much deeper engagement with spatial policies, and with the relationships between cities in a regional or national configuration (the 'system of cities'). This is especially the case in democratic upper-income nations, but system-aware policies are also appearing in middle-income nations. Governments recognise, for the first time, the need to improve the quality and fluidity of city clusters and metropolitan agglomerations, and the importance of such clusters and agglomerations operating through well led and managed city systems. These latest developments give new impetus to the tasks of economic development, spatial planning, and governing metropolitan growth.

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The scale and speed of urbanisation has meant that many cities have grown beyond their historic boundaries, and have sprawled to form larger metropolitan areas. This has led to challenges in fostering joined-up metropolitan coordination around land-use, transport, business clustering, sustainable growth and identity. The alignment of institutions, investment, and infrastructure with the functional geography of an expanding metropolitan area can be practically difficult to achieve. Thus a second new feature of the governance landscape is the wide range of metropolitan governance innovations. These innovations include consolidation of certain specific powers, such as planning powers (e.g. New York), partnerships between neighbouring municipalities (e.g. Zurich, Amsterdam, Gdansk-Gdynia-Sopot in Poland), and agreements with national/state governments and/or the private sector (e.g. the UK's 'City Deals'). Making new governance arrangements efficient and effective will be key to the viability and success of other future city initiatives.

3.2   Finance

The recent direction and development of cities has been largely shaped by the public finance system: the means of financing public goods and services, the raising of tax revenues and the allocation and distribution of money. Traditionally, instruments for municipal finance, whether revenue-generation, transfers from higher tiers of government, expenditure responsibilities or the capacity to borrow money, have tended to be controlled by central government and to constrain urban areas from making long-term investments to shape and determine the future of their cities.

Many cities – including cities in the UK - are still compelled to petition wealthier tiers of government to 'win' backing for trophy projects and to compete with other jurisdictions for sources of revenue. In some more decentralised systems, for example in Sweden and Norway, cities have acquired stronger powers to pursue and recruit finances and have greater autonomy to determine their own strategic direction and futures. These greater powers are not without their issues: they can hinder inter-municipal cooperation, lead to the distortion of planning policies in favour of increased revenues, or can promote competitive tax cost cutting between neighbouring areas. Nonetheless, calls for greater fiscal autonomy at the metropolitan level are growing louder in nations as diverse as the UK (McGough, 2014), Canada, Zimbabwe and countries in South Eastern Europe.

Crowd-funding mechanisms (mostly online) are also increasingly accessible for varied projects and innovations, many in cities. Although to date most funding is for creative arts and technologies, small-scale infrastructure projects are also beginning to be crowd-funded. Recent examples include the Luchtsingel pedestrian bridge in Rotterdam, the greening of Stephenson Square in Manchester, the pedestrianisation

and greening of a flyover in Liverpool, and the extension of fibre broadband connections in Kansas City (Alperovich, 2013; Spacehive, 2014; Friends of the Flyover, 2014; Neighbor-Ly, 2014). We may see this trend continue, or potentially even grow to encompass larger scale infrastructural projects.

3.3   Technology

Technological developments have opened up a new world of possibilities for cities. IT promises greater integration of city services and products than ever before. Different city functions such as health, energy, water, waste, communications, buildings and transport have the potential to be integrated into networks which optimise their efficiency and outputs. New cities are being built with technology at their core to facilitate the creation of such integrated networks. In South Korea's Songdo City, for example, technology will connect every component of the city including schools, offices and homes. Residents will be able to control functions of their homes remotely. In Rio de Janeiro, IBM has created a central control system which integrates and analyses data from 30 city agencies, including weather forecasts, traffic conditions, and information from the emergency services (Cisco, 2014; Singer, 2012).

Existing cities are also carrying out technological upgrades and connecting everyday objects together via the internet in order to boost efficiency of urban infrastructure. This connection of physical objects, the 'Internet of Things', provides scope for cities to completely overhaul their operation and management. One inevitable effect is that cities today are one of the biggest new customers for technology companies. As section 2 explored, many cities have already begun to collaborate with large technology firms, including Cisco, IBM, Intel, Microsoft and Siemens, to better integrate their existing infrastructure and improve operational efficiency (Siemens, 2013).

The explosion of measurements and statistics produced by and available to cities – the emergence of 'big data' – is providing new opportunities for citizen engagement and citizen-led innovation. Mobile phone technology, 'apps' and social media allow citizens to record complaints, ideas, images and suggestions whilst on the move. City authorities and communities can also use ever-growing bodies of data to improve understanding of citizen behaviour and service usage, and build transparency and accountability by opening up their records and statistics for public consumption – the growth of 'open data'. With the growth of technology and datasets also come new privacy, surveillance and data misuse challenges for future cities. Cities also face challenges around data quality and comprehensiveness, data collection and analysis – particularly aligning data from different sources - and of course managing the sheer volume of data which is produced. Big data needs to be robust, accessible and 'interpret-able' if it is to provide cities with meaningful opportunities and solutions.

3.4   Leadership

A new era of strong leadership means city leaders take an increasingly proactive role in leading city agendas. As cities face new challenges and pressures, cities and city leaders are responding in creative ways. Many are appointing city leaders for the first time – Tbilisi (Georgia), Bristol (UK), Geelong (Australia) and Shahat (Libya) are just some of the cities that have recently introduced direct election of mayors. Elsewhere, city leaders are adopting innovative forms of partnership working, for example in urban regeneration and infrastructure development, or are developing mechanisms for public participation e.g. through participatory budgeting. These tools will assist in the shaping of the future city.

There is a growing consensus and recognition that individual city leaders can catalyse real change in cities (Acuto, 2013). They benefit from a proximity to their electorate, and often adopt a pragmatic 'can do' ethos which has seemed to elude national leadership. Their charisma and vision can help them play the part of ambassador and honest broker for a city, and can even help cities to develop their own brand or 'personality'. From Michael Bloomberg and Thomas Menino in the US, to Patricia de Lille in Cape Town and Ron Huldai in Tel Aviv, cities worldwide are benefiting from leaders who are focused, consistent, visible and influential.

4.
CONCLUSIONS

4. CONCLUSIONS

4.1   The future of cities: an emerging science

Current thinking about future cities is more wide ranging and diffuse than ever. Although research, planning and speculation about the future of cities is not new, today's context is distinctive. At least four macro trends are visible: the surpassing of 50% urbanisation globally; the expansion of cities into metropolitan areas and regions; the seriousness of environmental and climate change challenges; and the shift in the centre of gravity of the global economy combined with population mobility. Together, these factors are focusing minds and attention on the future much more clearly.

Systems thinking
Technological and conceptual breakthroughs in the way we think about cities and recognise their potential has added a great deal of momentum to these mega trends. One such breakthrough is the thinking about cities in systemic terms. Knowledge teams within the OECD and World Bank have begun to develop a much more detailed sets of insights about 'city systems', 'systems of cities', and 'system of systems', drawing from scientific and academic understandings of complexity theory and regional science (World Bank, 2009; Clark and Clark, 2014). System thinking, when applied to cities' has begun to provide new practical and analytical models of getting to grips with the bewildering complexity of urban life.
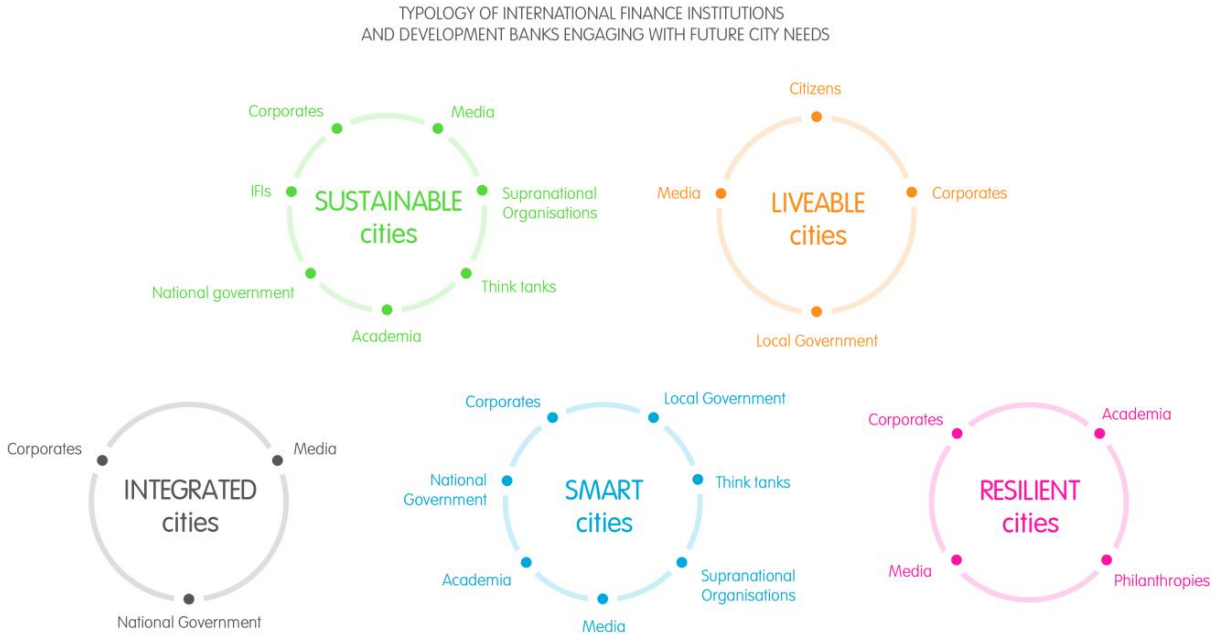
The fate of fads
As we have seen, the Future City lexicon has been growing for over 20 years, with different phrases and buzzwords becoming more popular at different times. Sustainable cities, digital cities, eco cities and smart cities have all had their spot in the limelight, and resilient cities is now enjoying its own spell as a guiding terminology among research, policy and technology communities.

First movers and their motivations
During the peak of each phrase's popularity, influential 'first-mover' organisations have offered definitions and clarifications to try to create a consensus about what a term means for cities and how to prepare them for the future. Despite initial attempts to consolidate future cities lexicon into a globally agreed set of terms, there is still no established and authoritative set of meanings. Smart cities, for example, are still associated with either sensors and household data, integrated citywide systems management, or the social and economic knowledge of citizens. Liveable cities may refer to cultural and diversity assets, environmental quality, or even daily convenience. Sustainable cities may signal low-carbon energy usage, green space and transport, or

neighbourhood participation. In other words, the dominant future city ideas are not yet firmly 'branded'. The choices made by corporates are driven by competitive dynamics while those made by governments and decision-makers often reflect aesthetic and political choices rather than clear grasp of distinct meanings.

Figure 4.1: Most common themes or phrases revealed in an English language scan of 'future cities'

TYPOLOGY OF INTERNATIONAL FINANCE INSTITUTIONS
AND DEVELOPMENT BANKS ENGAGING WITH FUTURE CITY NEEDS

SUSTAINABLE cities
Corporates — Media — Supranational Organisations — Think tanks — Academia — National government — IFIs

LIVEABLE cities
Citizens — Corporates — Local Government — Media

INTEGRATED cities
Corporates — Media — National Government

SMART cities
Corporates — Local Government — Think tanks — Supranational Organisations — Media — Academia — National Government

RESILIENT cities
Corporates — Academia — Philanthropies — Media

Source: Future Cities Catapult (2014) (adapted from Clark and Moonen)

Choosing future city vocabularies: One size does not fit all

One of the reasons for the complex and overlapping evolution in future cities language over time is that cities themselves are extremely varied. Not only are there enormous differences in size and population (from urban 'villages' the size of a London suburb, to sprawling conurbations more populous than the UK), cities are also at very different stages of maturity, development and living standards. Some have a core urban fabric and culture that dates back for several hundred years, while other so-called 'instant cities' have been created from scratch in the last 20 years. The word city, then, today covers a tremendously broad range of social, economic and environmental entities, whose future priorities and vision will inevitably differ.

One of the chief limitations with the highly branded, and somewhat faddish, nature of the language around future cities and city solutions is that most formulations involve a recipe, formula, or a template for success or progress. The problem is that with such

diversity in the character and the systems of cities it is almost impossible to capture the nuances of individual cities and the multiplicity of cities within a catch-all formula.

Self-governing cities

The entities we know as cities also vary hugely in their degree of self-government. Some cities are fully self-governing or have a strong and well-financed metropolitan system of government. Many others are collections of under-resourced and fragmented municipalities. In general, the political and financial empowerment of cities around the world is out of sync with their perceived economic importance. This disparity has become a major catalyst for debate, advocacy and research about the future of cities. Future city languages have sprung up to convey ideas about desirable cities because they add to the case for improving the contexts and capabilities of city government.

Leadership of language

The choice of language in which to express ideas about future cities is, therefore, often a matter of leadership. The discipline of future cities is an 'emerging science' whose methods, concepts, and language are still to be conclusively established. What is instead visible is a constant process of creation, adaptation and adoption of new language. New, or reworked, phrases have helped to illuminate new ways of thinking and bring in new stakeholders, but often at the expense of a coherent set of propositions about cities. The language of future cities is still faddish. Furthermore, as newly engaged countries and cities take up and institutionalise new language in their urban programmes and projects, the prospect of global consensus around terminology, if not concepts, becomes ever more challenging.

4.2   Geographic trends

This review has indicated that some terms have a firm geographical anchor, while others have diffused globally quite evenly. Eco cities has endured most in China and the Middle East, while smart cities have been widely accepted in Europe and North America. 'Green cities' and 'compact cities' still have firm relevance in North America and Australia, while in India 'sustainable cities' and 'innovative cities' are widely used. Perhaps most significantly, it is 'future cities' that has the broadest cross-section of appeal in the English language, generating interest not only in the UK, North America and South Asia but also in Latin America.

While the success of terms is constantly fluctuating, it is likely that older terms will continue to remain popular due to their historical legacy and their enduring appeal to niche audiences. The 'compact city', the 'inclusive city' and 'youthful city' all retain a resonance in specific contexts, and long-term eco and digital city initiatives will ensure these terms are still in use for at least the next couple of decades. This suggests that

awareness of national preferences in future city labelling practices, and how this labelling relates to wider strategies, will be important in engaging effectively with governments and decision-makers.

Language choices are key to driving support

The choice of future city vocabulary is important in helping cities generate momentum behind the transition from one cycle of development to the next. The Japanese interest in compact, dense and comfortable future cities reflects concern with the demographic future of their cities, as the population average age reaches a record high. The African megacity priority for model suburban high-tech districts reflect an urgent concern to be competitive in higher value sectors. And the preoccupation in Dubai with technological integration and 'smartness' are a response to doubts about its long-term economic and environmental viability after the financial crisis. Future city language is often about aspiration and mobilising groups behind important agendas

Some nations are taking a lead

Several countries are more active in citing and engaging in future cities than others: Japan, Singapore, UK and the UAE are particularly prolific. It does not appear to be the case that individual countries or regions are separating developing, detached interpretations of what the future should be or how it should be conceptualised. Interpretations orbit around a broad consensus on the appropriate set of themes and priorities, and the area of priority may often reflect what is economically most urgent and politically most achievable. An important visible trend is the existence of a relatively small number of influential bodies or individuals who are the source of authoritative knowledge and are driving the agenda – an agenda which is then picked up by other stakeholders around the world and shaped to their own needs.

4.3   Generators, adopters and adapters

A review of future cities ideas, terminologies and practice over time indicates that there are three kinds of stakeholder in future cities: the generators and thought leaders; the pragmatic adopters; and the creative adapters (Figure 4.2). We explain these different roles below, and list stakeholders where appropriate. As this is principally an English language scan, it may not capture the entire future cities market, but our review indicates that the major players listed below comprise a clear majority of the global innovators in this field.

Generators

A set of innovators, thought leaders and agenda drivers are emerging in the future cities space. These individuals and organisations are the 'generators' or influencers whose innovation catalyses and inspires activity worldwide, in both policy and commercial circles. Among this group of 'generators' are:

- **The think-tanks and thought-leaders:** he Centre for Liveable Cities in Singapore, Stockholm Environment Institute, McKinsey Global Institute, GaWC, The Climate Group, Mori Memorial Foundation, African Centre for Cities and Michael Bloomberg and Bloomberg Associates.
- **The inter-governmental organisations and their specialist departments:** UN-Habitat, EU regional policy, World Bank and WBI, Cities Alliance and OECD Territorial Development.
- **Academic urban laboratories:** University College London Urban Lab, MIT Senseable City Lab, Harvard Graduate School of Design and Center for the Environment, LSE Cities, Brookings Institution, Chinese Academy of Sciences, Columbia University and NYU.
- **The technology developers and vendors:** Siemens, Cisco, Arup and IBM.
- **City networks:** UCLG, EuroCities, CityNet, C40, ICLEI and many others.

It is from these institutions, individuals, and networks that new interpretations of future cities are cultivated, developed, disseminated and first applied.

Adopters

A second group of actors adopt the ideas for themselves. This is well illustrated in the corporate world, where the ideas generated by Siemens, IBM and Cisco have been picked up by a wider group of multi-nationals, such as Cap Gemini, Accenture, Schneider Electric and Hitachi, as well as those in sectors as diverse as construction (Cemex) and law (Bird and Bird). Financial institutions, philanthropic organisations and university departments also adopt future city language and build programmes and initiatives around them. Adopters turn new future city ideas into globally relevant practice.

Adapters

As ideas diffuse around the world, terms are picked up by even more users who adapt terms and ideas for their own purposes. This adds to the complexity of the existing lexicon, and the diversity of meanings and themes encompassed within any one term. Adapters are often city governments or private sector providers that look to use monikers such as 'smart city' or 'city of innovation' to establish a new project, vision or market in a local setting.

One example of adaptation is the idea of the 'liveable city'. When it first emerged in the English-speaking world, the phrase was used mainly in the context of quality of life debates amid concerns about pollution, congestion and safety. The term was picked up very early in Singapore, however, where it also refers to a city's global (economic) competitiveness. Singapore's liveability discourse and agenda, which was developed to

a large extent by the city's Urban Redevelopment Authority, has become a defining benchmark for other Asian cities seeking to make the transition towards higher value economy and higher functionality city systems (Roy and Ong, 2011). Meanwhile, the World Bank has also adapted liveability to incorporate low-carbon goals, as part of its Low-Carbon Liveable Cities (LC2) Initiative. Liveability, in this context, refers to the putative long-term benefits of 'climate smart' development (World Bank, 2013a).

A similar pattern is visible in the case of 'sustainable cities'. In the years following the 1992 UN Rio Earth Summit, sustainability was a term which largely had ecological connotations. Since then it has come to encompass economic, environmental and social priorities. Most recently, the World Bank report Financing Sustainable Cities adapts the term sustainability to mean the long-term viability of a city's fiscal capacity and investment channels. In this case, the content of sustainability is considered less important that the ability to pay for strategic needs (World Bank, 2013b). This example shows that large organisations can be thought leaders at the global level and adapters at the local level.

Fig. 4.2 Typology of future cities stakeholders

TYPOLOGY OF FUTURE CITY STAKEHOLDERS
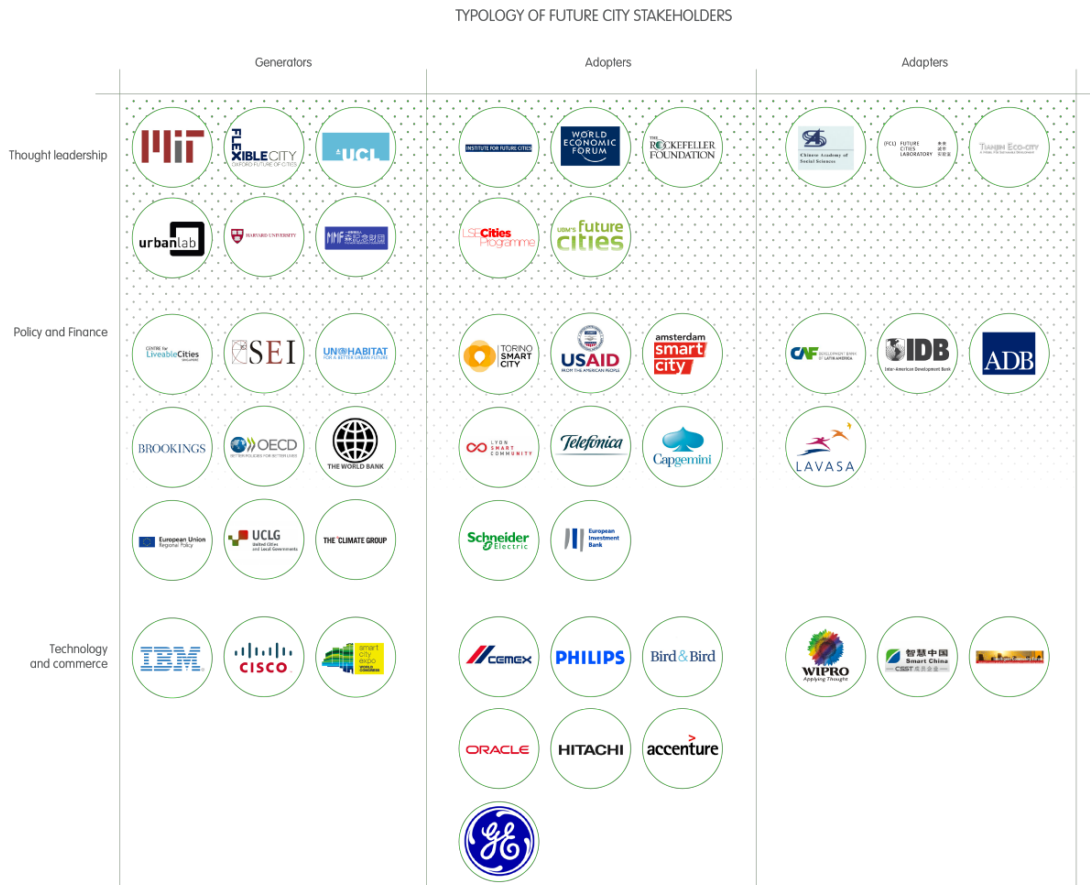
Source: Future Cities Catapult (2014) (adapted from Clark and Moonen)

This three tier engagement with future cities – generation, adoption, adaptation – can be helpfully visualised by exploring the life cycle of a single term. We have studied the rise of the 'resilient cities' concept since the mid-1990s. Figure 4.3 tracks the appearance of the exact term in a Google search over time. The term first appeared in 1995, and began to establish itself in the aftermath of 9/11, amid concerns about how New York would bounce back from the shock of mass terrorism. A close study of resilient city thinking reveals that just a handful of thought leaders were working to develop the idea in the 1990s, in Japan in relation to natural disasters, and in the USA in relation to the science of city form.

Around the turn of the millennium, bodies such as the UNCRD, planning departments at MIT and University of North Carolina, began to explore resilient cities with more critical mass and momentum. The US was the centre of this emerging resilience discourse, as cities began to face the challenge of responding to potential terrorist and other external threats. By the mid-to-late 2000s, scholars in Australia and the World

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Bank's East Asia department began to publish influential primers on resilient cities, which began the 2nd phase of adoption, by city pressure groups and multi-city networks.

Since 2008, technology firms' R&D has adapted resilience to their own market ambitions, while cities and municipalities have adapted ideas of resilience to the challenge of employability and multi-cultural harmony. All the while new university programmes and media outlets have continued to adopt the language of resilience, cementing it as one of the major frames of reference for thinking about future cities today. Resilience is still in the first phase of its life cycle as it continues to multiply outwards to new parts of the world.

Fig 4.3 Generators, Adopters and Adapters of 'Resilient Cities' thinking over the past two decades
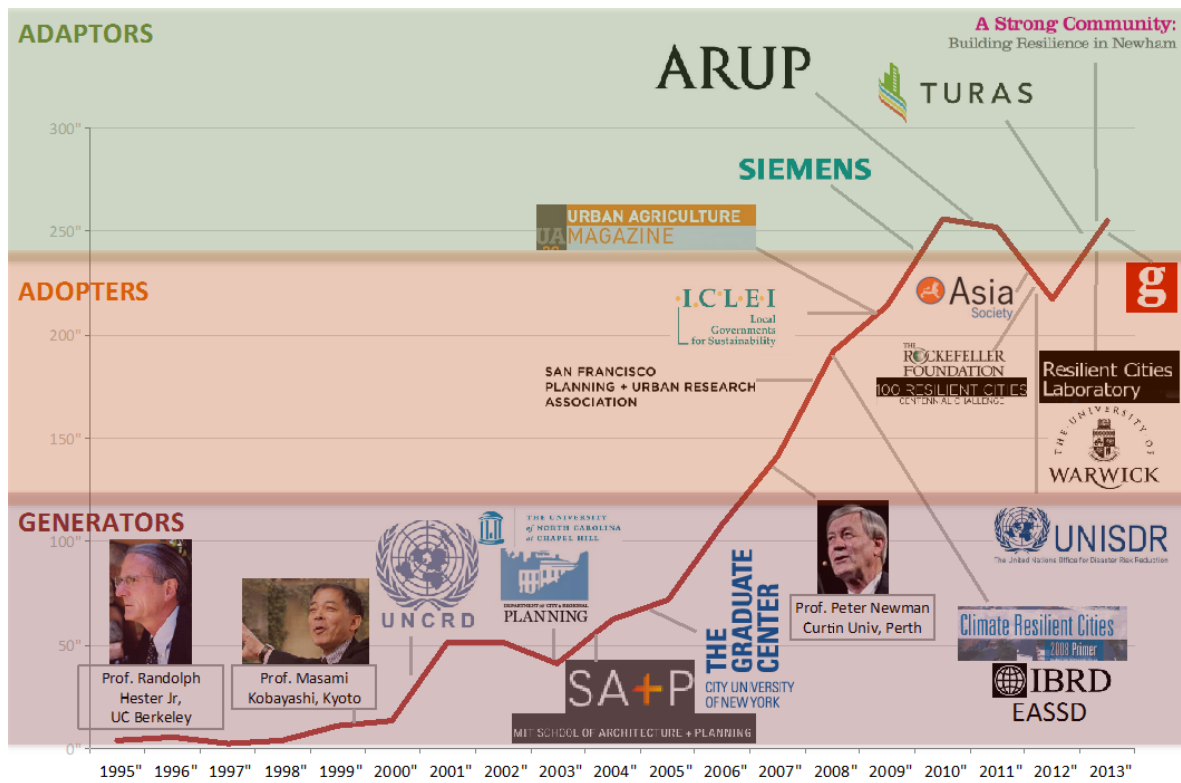
Source: Moir, Moonen, and Clark using Google data

4.4   Cycles of future cities thinking

Future cities thinking at the global level has moved into a new gear over the last decade, but it is clear from this review that we remain in its first 'wave' or cycle. Agenda-creators and thought leaders have emerged, but with so many different organisations adopting and adapting their insights, there is a huge amount of jostling for position – to become the go-to firms, designers, think-tanks, funders, and even cities to learn about successful urban innovation.

As we approach the end of this first cycle and the transition into a second cycle, we observe that the concepts behind the branded language are increasingly merging. In terms of detail and vision, the future city concepts are often highly compatible with each other, even if the language differences imply distinctiveness or incompatibility. As stakeholders become rapidly more informed about global practice in the future city sphere, a high degree of crossover and overlap is taking place.

As future thinking continues to evolve, we expect to see thought leaders consolidate, partner and extend their influence. In some parts of the world these ideas may settle and become mainstream currency. This step change will mark the start of a second future cities cycle, based on a more consistent and well defined set of principles.

The review of future cities vocabulary also suggests, however, that we can expect new terminologies to emerge, and existing ones to endure. This pattern of emerging and persisting language will occur at different speeds in different parts of the world, and in different sectors and communities. As such, there will no unified channel of communication, and no single agreed model or framework, about future cities.

It will continue to be important be aware of and responsive to the different ways future cities are described and imagined, because they show how cities matter and in what ways they will need to succeed. Awareness of future city language also helps understand longer term trends and avoid succumbing to fads. As the discourse of future cities becomes more multi-disciplinary, evidence-led and conceptually watertight, understanding the intention and meaning of all the terms in play will become a key part of sound decision-making.

APPENDIX 1: 150 URBAN INDICES AND BENCHMARKS

Source: Moonen and Clark (2013)

	Name	Type	Scope	# Cities	2008	2009	2010	2011	2012	2013	2014	2015
1.1	MORI Global Power City Index	6 field all-round city ranking	Global	40		●	●	●	●	●		
1.2	Global Urban Competitiveness Project	Quantitative-led economic focused indicator study	Global	500	●	●	●		●			
1.3	PricewaterhouseCoopers/Partnership for New York City: Cities of Opportunity	Select city in-depth coverage	Global	27	●		●	●		●		
1.4	AT Kearney Global Cities Index	5 field all-round city ranking	Global	65		●	●		●			
1.5	Knight Frank: Global Cities Survey	4 field all-round city ranking	Global	40		●	●		●	●		
1.6	Economist Intelligence Unit and Citigroup: Hotspots	6 field competitiveness ranking	Global	120					●	●		
1.7	UN-Habitat City Prosperity Index	5 field all-round city ranking	Global	100+					●			

Finance, investment and business environment Indexes

	Name	Type	Scope	# Cities	2008	2009	2010	2011	2012	2013	2014	2015
2.1	Z/Yen Global Financial Centres Index	Executive survey	Global	80	● ●	● ●	● ●	● ●	● ●	● ●		
2.2	Cushman & Wakefield European Cities Monitor	Executive survey	Regional	36		●	●	●	●			
2.3	Globalization and World Cities Group (GaWC)	Company location survey	Global	500+		●		●				
2.4	fDi Intelligence: Cities of the Future	Data indicators plus expert assessment	Regional	600+		● ●	●	● ●	● ●	● ●		
2.5	IBM: Global Location Trends	Investment project count	Global	20			●	●	●	●		
2.6	Global Services and Tholons: Top 100 Emerging Global Outsourcing Cities	Industry survey and secondary research	Global	100			●	●	●	●		
2.7	Toronto Board of Trade Scorecard on Prosperity	Comprehensive data indicators	Global	24		●	●	●	●	●		
2.8	AméricaEconomía Best Cities to Do Business in Latin America	Comprehensive data indicators and survey	Regional	37	●		●	●	●			
2.9	Centre of Thought on Competitive Strategies (CEPEC) Urban Investment Attraction Index	Data indicators	Regional	48			●	●	●			
2.10	IW Consulting German City Comparison	Comprehensive data indicators	National	100		●	●	●	●	●		
2.11	Capgemini US Metro Wealth Index	Population tracker	National	10		●	●	●	●			
2.12	The Business Journals/Portfolio.com: Small Business Vitality Rankings	Six part data formula	National	100				●		●		
2.13	Forbes Indexes on Billionaires	Population tracker	Global	10	●	●	●		●	●		
2.14	KPMG Competitve Alternatives 2012	Tax calculation	Global	41			●		●			
2.15	Chinese Academy of Social Sciences' Blue Book of Urban Competitiveness	Quantitative-led economic focused indicator study	National	294						●		
2.16	KPMG: Global Cities Investment Monitor	Investment data indicators'/Executive survey	Global	22					● ●	●		
2.17	Menon: Leading Maritime Capitals of the World	Quantitative economic and business indicators/Expert survey	Global	12					●			
2.18	USA Today: Best US cities for Technology Start-ups	Quantitative investment data	National	10					●			
2.19	Top 50 Chinese Cities with Strongest Investment Potential	Quantitative trade and investment data	National	50					●			
2.20	Indian Institute of Competitiveness: Indian City Competitiveness Report	Quantitative trade and investment data	National	50			●	●	●			
2.21	US Federal Spending in Scientific Research	Quantitative investment data	National	50					●			
2.22	Brookings Institution: Export Nation	Quantitative export nation	National	100					●			
2.23	Rigzone: Oil and Gas Cities	Industry specific metric	Global	20						●		
2.24	Hamburg Economic Development Board and Berenberg Bank: 30 German cities of the future	Comprehensive future assessment	National	30						●		
2.25	Perú Económico: Top Cities to Live	8-dimension study	National	24						●		

Macroeconomic performance indexes

	Name	Type	Scope	# Cities	2008	2009	2010	2011	2012	2013	2014	2015
3.1	Brookings Institution: Global Metro Monitor	Employment and growth Tracker	Global	300				●	●	●		
3.2	PwC: Global Metropolitan GDP	GDP analysis and forecast	Global	151		●						
3.3	McKinsey Urban World Top 25 Hot Spots by 2025	GDP and household income forecast	Global	25				●	●			
3.4	MarketWatch: Best US Cities for Business	Employment and growth Tracker	National	101	●		●	●	●	●		
3.5	Brookings US Metro Monitor	Employment and growth Tracker	National	100		● ● ●	● ● ●	● ● ●	● ● ●	● ● ●		
3.6	Kiplinger Best Cities for the Next Decade	Creative employment, income and growth tracker	National	367			●	●	●	●		
3.7	Milken Institute: Best Performing Cities	Employment and growth Tracker	National	200	●	●	●	●		●		
3.8	Ajilon: Top 10 Cities for Employment											
3.9	Area Development: 100 Leading Locations for 2012 which MSAs Rank Highest for Economic & Job Growth?	Economic and job growth tracker	National	365						●		
3.10	LSE: European Metromonitor Cities and the economic recession since 2008 (Three ways of measuring reliance)	Economic and job growth tracker	Regional	150							●	

Quality of Life Indexes

	Name	Type	Scope	# Cities	2008	2009	2010	2011	2012	2013	2014	2015
4.1	Economist Intelligence Unit – Livability: Liveability Ranking	Comprehensive metrics	Global	140	•	•	•	•	••			
4.2	Mercer Consulting Human Resources: Quality of Living Survey	Comprehensive metrics	Global	221	•	•	•	•	•			
4.3	IBM: Commuter Pain survey	Key metrics	Global	20			•					
4.4	Monocle Magazine: Quality of Living Index	Editor assessment	Global	25		•	•	•	•	•		
4.5	Gallup/Healthways Well Being Index	Resident survey	National				•	•	•	•		
4.6	Eurobarometer: Perception Survey on Quality of life	Resident survey	Regional	75			•					
4.7	AskMen Top 29 Cities to Live In	Informal measures	Global	29		•	•					
4.8	CII/IFC Livability Index, India	Metrics	National	50			•	•				
4.9	Symantec: Riskiest Cities for Cybercrime (US)	Data-led	National	50			•	•	•			
4.10	Richard Florida and Charlotta Mellander: Top 25 Cities for College Graduates	Economic and population metrics	National	223			•	•				
4.11	Portfolio.com/The Business Journals: Best Places for Young Americans to Live	Economic metrics	National	67			•					
4.12	NAVTEQ: Europe's most congested cities	Traffic data	Regional	10				•				
4.13	Cycling Plus: Britain's Top 20 Cycling Cities	Key metrics	National	20			•					
4.14	AskMen: World's most bicycle-friendly cities	Informal metrics	Global	10				•				
4.15	Bicycling Magazine: Most Bike-Friendly Cities in America	Informal metrics	National	20			•					
4.16	Forbes: Top 25 Cities for Shopping	Informal metrics	National	25				•				
4.17	portfolio.com/The Business Journals: Top Retirement Metropolitan Areas	Key metrics	National	157				•				
4.18	Farmers Insurance Group of Companies: most secure large cities in the US	Comprehensive metrics	National	379		•	•	••	•	•		
4.19	Careerbliss Happiest Cities to Work	Company review analysis	National	50				•				
4.20	Kiplinger Top 10 Cities for Commuting	Key metrics	National	10				•				
4.21	TomTom Congestion Index (Europe and North America)	Traffic congestion analysis	Europe and North America	57	•	•	•	•	•			
4.22	WalkScore Walking and Public Transit Rankings	Public transport and walking data analysis	National	50					•	•		
4.23	Reconnecting America: Are We There Yet?	Connectivity metrics	National	366					•			
4.24	QS Best Student Cities 2012	Aggregations of existing data	Global	50+					•			
4.25	SportBusiness Group Ultimate Sports Cities	Sport delivery metric	Global	25					•			
4.26	Copenhagenize Bicycle Friendly Cities	Cycle-friendliness metric	Global	20				•		•		
4.27	EIU Best Cities – Spatially Adjusted Liveability Index	Liveability study + spatial environment metric	Global	70					•			
4.28	Travel and Leisure: Quality of Life and Visitor Experience (USA)	User survey across 12 metrics	National	35						•		
4.29	Office of Strategic Communications (CGE): Top 10 Cities to Live in Mexico	Telephone survey	National	10						•		

Knowledge economy, human capital and technology Indexes

	Name	Type	Scope	# Cities	2008	2009	2010	2011	2012	2013	2014	2015
5.1	Buck Consultants: Tech Cities Index	Comprehensive technology competitiveness metrics	Regional	31	●				●			
5.2	Robert Huggins Associates: World Knowledge Competitiveness Index	Comprehensive R&D/knowledge economy metrics	Global	145	●							
5.3	2thinknow Consulting: Innovation Cities	Comprehensive benchmarks	Global	445	●	●	●	●		●		
5.4	AON Consulting People Risk Index	Demographic/ education indicators	Global	138				●	●	●		
5.5	Ericsson: Networked Cities	ICT data and city performance metrics	Global	25				● ●	●			
5.6	Christian Matthiessen, Annette Schwarz and Søren Find: World Cities of Scientific Knowledge	Bibliometric research data tracker	Global	100			●					
5.7	QS: World University Rankings	Comprehensive university assessment	Global	200+	●	●	●	●		●		
5.8	ShanghaiRanking Consultancy: Academic Ranking of World Universities (ARWU)	Comprehensive university assessment	Global	200+	●	●	●	●	●	●		
5.9	Financial Times: Business School rankings	Comprehensive business school assessment	Global	50+	●	●	●	●	●	●		
5.10	Centre for Cities: Outlook	Unemployment and knowledge job tracker	National	63	●	●	●	●	●	●		
5.11	Astbury Marsden: Preferred Location Survey	Survey	Global	6					●			
5.12	Wall Street Journal: Innovative City of the Year	Reader nomination	Global	25						●		
5.13	Scientific Reports – Characterising Scientific Production and Consumption in Physics	Single source scientific research quantification.	Global	2,000+						●		
5.14	EIU-Bank of Communications: Sea Turtle Index	Multi-metric ROI for foreign students	Global	80							●	
5.15	CNN Money and Fortune: Best new global cities for start-ups	Informal metrics	Global	7					●			
5.16	ARC Centre of Excellence for Creative Industries and Innovation: Creative Cities Index	Comprehensive eight-dimension study	Global	6						●		
5.17	IDC Spanish Smart Cities Index	94 indicator study	National	44						●		
5.18	UBM Future Cities: Top 10 Internet Cities	Internet and innovation study	Global	10						●		

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Infrastructure and real estate Indexes

	Name	Type	Scope	# Cities	2008	2009	2010	2011	2012	2013	2014	2015
6.1	Mercer Consulting: Infrastructure survey	Comprehensive metrics	Global	220		•			•			
6.2	fDi Intelligence: Global Free Zones of the Future	Comprehensive metrics and expert assessment	Global	66			•			•		
6.3	Urban Land Institute (ULI) and PwC: Emerging Trends in Real Estate	Investor survey	Global	100+	•	•	•	•	•			
6.4	Citi bank and Knight Frank: Wealth	Trend data	Global	60+		•	•		•	•		
6.5	Cushman & Wakefield: Main Streets Across the World	Trend data	Global	269		•	•					
6.6	Cushman & Wakefield: International Investment AtlasCushman & Wakefield: International Investment Atlas	Trend data	Global	20			•	•				
6.7	Cushman & Wakefield: Office Space Across the World	Trend data	Global	150+				•				
6.8	Cushman & Wakefield: Industrial Space Across the World	Trend data	Global	100+					•			
6.9	LaSalle: European Regional Economic Growth Index	Trend data	Regional	104			•			•		
6.10	CB Richard Ellis: How Global is the Business of Retail?	International retailer survey	Global	100+	•	•	•	•	•	•		
6.11	Akamai: Broadband Cities – The State of the Internet	Trend data	Global	100+			• • •	• • •	• • •	• • •		
6.12	Emporis Skyline Ranking	Trend data	Global	100	Ongoing							
6.13	Real Estate Investment Network: Top Canadian Cities for Investment	Economic metrics	National	10			•	•	•			
6.14	US News: 10 Best Cities for Public Transportation	Spending and ridership figures	National	10				•				
6.15	KPMG: International Infrastructure 100, World Cities Edition	Expert judging panel assessment	Global	c.25					•			
6.16	Jones Lang LaSalle: Global Capital Flows	Real estate transactional data	Global	50			• • •	• • •	• • •	• •		
6.17	Cushman & Wakefield: Winning Cities	Real estate transactional data	Global	50					•	•		
6.18	Savills: World Cities Review	Real estate transactional data	Global	10				• •	•	•		
6.19	Knight Frank: Prime Global Cities Index	Luxury property data	Global					• •	• • •	• • •		

Environment and Sustainability Indexes

	Name	Type	Scope	# Cities	2008	2009	2010	2011	2012	2013	2014	2015
7.1	Mercer Consulting: Eco-City Index	Infrastructure metrics	Global	220			•					
7.2	Siemens/EIU: European Green City Index	Comprehensive environmental indicators	Regional	80+		•	•	•				
7.3	Centre of Regional Science/Delft University of Technology: European Smart Cities	Comprehensive sustainability indicators	Regional (mid-size)	70			•					
7.4	Forbes: World's Smartest Cities	Editor assessment	Global	10		•						
7.5	Ethisphere Institute: 2020 Global Sustainability Centres	Indicators and subjective measures	Global	20	•							
7.6	Business Courier: Green City Index (US)	Semi-comprehensive environmental indicators	National	41			•					
7.7	Forum for the Future: Sustainable UK Cities Index	Environmental indicators and plan assessment	National	20	•	•	•					
7.8	SustainLane: US Sustainability Rankings	Comprehensive environmental indicators, surveys	National	50	•							
7.9	Corporate Knights: North America's Most Sustainable Cities	Comprehensive environmental indicators	National/ Regional	20	•	•	•		•	•		
7.10	NRDC: Smarter Cities	Environmental indicators, online survey	National	100+	•	•	•					
7.11	EPA: Top 25 Cities with most Energy Star Buildings	Building Count	National	25		•	•	•				
7.12	Boyd Cohen: Top 10 Smart Cities on the Planet	Author assessment based on secondary `benchmarking	Global	10					•			
7.13	Coastal City Flood Vulnerability Index	Comprehensive environmental, social and political study.	Global	9					•			
7.14	Clean Edge: Metro Clean Technology Index	Clean technology indicators	National	50					•			

Image, brand and destination power Indexes

	Name	Type	Scope	# Cities	2008	2009	2010	2011	2012	2013	2014	2015
8.1	Euromonitor International's Top City Destination	Data tracker	Global	100		•	•	•	•	•		
8.2	ECA International: Location Rating Survey for Asian expats	Quality of living analysis	Regional/ global	400+	•	•	•	•	•			
8.3	International Congress and Convention Association (ICCA) Rankings	Data tracker	Global	100	•	•	•	•	•	•		
8.4	The Greater Paris Investment Agency Global Attractiveness Survey	Executive survey	Global	25	•							
8.5	Anholt/GfK Roper Brands Index	Resident survey	Global	50		•		•				
8.6	Forbes' World's Happiest Cities	Resident survey	Global	10		•						
8.7	MasterCard Global Destination Cities Index	Quantitative economic indicators	Global	132					•	•		
8.8	Hogg Robinson Group Hotel Survey	Data tracker	Global	50					•			
8.9	Public Affairs: Asia Location Branding	Brand survey	Regional	25					•			
8.10	AMR and the Research Institute: The Global 2012 City Reputation Index	Brand survey	Global	50					•			
8.11	City RepTrak™ Topline Report: the world's most reputable cities	City reputation survey	Global	100+					•			
8.12	Condé Nast: The friendliest and unfriendliest cities in the world	Traveller survey	Global	100+						•		

Culture and diversity Indexes

	Name	Type	Scope	# Cities	2008	2009	2010	2011	2012	2013	2014	2015
9.1	Global Language Monitor: Fashion Capitals	Media frequency tracker	Global	40	•	•	•	•	•			
9.2	Forbes' Best Cities to Eat Well	Respondent survey	Global	10			•					
9.3	Forbes/Nerdwallet: Best Cities for Entrepreneurs	Metropolitan statistics	National	52				•		•		
9.4	Flavorwire: Best Cities for Young Artists	Editor assessment	Global	8				•				
9.5	The Art Newspaper: Exhibition and Museum Attendance	Visitor frequency statistics	Global	100+					•			
9.6	Europedia: Michelin Guide	Summary of restaurant data	Global	100+					•			
9.7	Monica Skórska and Robert Kloosterman: Global Arts Centers Index	Analysis of arts and finance	Global	50+						•		
9.8	Martin Prosperity Institute: Ranking Global Cities	4-field creative class study	Global	61						•		

Cost of living and affordability Indexes

	Name	Type	Scope	# Cities	2008	2009	2010	2011	2012	2013	2014	2015
10.1	Cost of Living and Affordability	Goods-accommodation price tracker	Global	200+	•	•	•	•	•	•		
10.2	ECA International: most expensive cities worldwide	Goods-accommodation price tracker	Global	390+	• •	• •	• •	• •	• •	• •		
10.3	UBS: Prices and Earnings	Wages, prices and rents tracker	Global	73		•		•	•			
10.4	UBS: Big Mac and iPod Nano Indexes	Wage:cost ratio tracker	Global	73		•			•			
10.5	Pricerunner: Most Expensive Cities	Retail price tracker	Global	33		•						
10.6	Demographia: 2010 International Housing Affordability Survey	Trend data	English speaking nations	272			•	•				
10.7	Price of Travel: European Backpacker Index, Public Transportation and Taxi Prices	Travel and accommodation cost check	Regional/ Global	40-80				•				
10.8	Kiplinger: 10 Best Value Cities for 2011	Cost check	National	100				•				

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WHAT ARE FUTURE CITIES?
ORIGINS, MEANINGS AND USES

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