



Advocacy for the Compact, Mixed-Use and Walkable City: Designing Smart and Climate Resilient Places

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Abstract. Urban areas currently account for 60 to 80 per cent of global energy consumption, 75 per cent of carbon emissions and more than 75 per cent of the world's natural resources. A conference on the appropriate transformation of urban systems is therefore important and timely, as it is essential to deal with the future increase in urban populations, current overconsumption and cities' growing footprints despite finite resources and limited availability of land. Therefore, it's timely to highlight the need for taking steps to address greenhouse gas emission reductions and the global nature of the challenge. While the knowledge of good urban design allowed us for centuries to design cities that functioned well and had beautiful proportions, now an entirely new set of questions about optimal city form and urban management have emerged that have not previously been asked.

In this keynote address, firstly I will outline the qualities of authentic urban places and offer a definition of 'Smart City'; and then I will argue that urban design still warrants a very high priority of good public space for face-to-face encounters as it sets the framework for success of any future urban development at an early stage and remains central to any successful low carbon outcomes. In all this, urban form, public space, density and the integration of low-carbon technologies all have a strong interrelationship.

Keywords. *Low-carbon city; climate resilience; over-consumption; authentic public space; urban density; new urbanisation models; smart city*

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Introduction: Transforming Cities

'What is the City but the People?'

William Shakespeare

Many times, cities have been called the powerhouses of our economy, and they can be generators of wealth, innovation and social inclusion; they provide economic opportunities and a good quality of life, and workers with specialized skills flock to cities to be near to the sorts of firms that hire them (New York City, San Francisco and London are good examples of this). More people now live in cities than in rural areas, and urbanisation is expected to continue, most notably in cities in the emerging and developing world (led by booming economies in China, India, the Middle East, South America and Africa). To manage this process of transformation and urban growth,

cities will need to be designed, retrofitted and managed to decarbonize their energy supply and minimize emissions and waste in all forms, encourage urban biodiversity, and allow eco-systems to flourish and provide inhabitants with the basic elements of wellbeing in a resource- and energy-efficient manner. So it comes as no surprise that the World Business Council for Sustainable Development notes that 're-envisioning the design and management of cities, green buildings and infrastructure systems will be central to the urban evolution' (World Bank 2010; WBCSD 2010, p. 39).

Throughout history, cities have been a focus of innovation. The concept of a "Smart City" promises to enhance the quality, performance and interactivity of our urban

environments, bringing significant convenience and value to citizens. Viable Smart Cities are now emerging around the world. While the term has been around for more than a decade, it is only in the past few years that emerging technologies, such as big data and Internet of Things, offer the potential for the dynamic, integrated digital infrastructure on which our 21st century smart cities will be built.

Each city has a basic underlying (partially intangible) system that gives it its identity and sense of place. It is impossible to come to an agreed definition of what constitutes good urban design for vibrant cities, and what constitutes the ability to express, in a single building, bigger urban ideas. Great cities are not always practical or efficient; they can be romantic, multilayered and poetic places, but they must also, increasingly, be resilient. The essentially visible structure of any city is laid out by its pattern of streets, boulevards, parklands and building blocks, and its network of public spaces, waterfronts, gardens and squares.

Walkability and connectivity (horizontally and vertically) have again become very important urban design principles: streets are for people and trees, not just for cars (Gehl 2010). In the twentieth century, streets, squares and public spaces have lost their prominence and relevance in shaping the culture and use of cities, which have become dominated by the automobile. Active mobility is on the rise again: if a city is walkable or can easily be experienced by bicycle – as in Copenhagen, Stockholm, Barcelona, Paris or Munich – it greatly adds to its liveability and quality.

Thousands of tiny details make up the character of a place, overlaid by cultural, spiritual and social qualities that form its identity. The cities we admire have evolved over a long period of time and, in line with economic, technical, cultural and social changes, have human-scaled urban solutions (often designed in an era when one could still cross town on foot and enjoy neighbourly relationships) that have been modified gradually as human society progressed. The idea of the city as a mixing pot for

people of different cultural, ethnic and class backgrounds has never lost its significance. Mixed-use buildings with appropriate density create a sense of ‘urbanness’ and vibrancy, which are essential criteria for any liveable city. Mixed-use buildings make the most of an urban area and can better complement what is already there. Much of this urban feel is dictated by the ‘urban grain’, the fine scale and the mix of all kinds of activities, both private and public.

Public space is shaped by the width of the streets, boulevards and laneways, and the dimension of blocks, building heights and gaps between buildings, creating a pleasant scale and rhythm with a rich layer of surfaces and textures, details, materiality and surfaces to be experienced and enjoyed as one walks or cycles through the city. The ultimate goal of urban design should be rich experiences like these and opportunities for human relationships, which activate the potential for intervention at the neighbourhood level, enriching our lives as citizens. We all know such places – where urban design has improved quality of life and brought health, joy, social relationships and equity to urban living; as others have said before me, *a liveable city is a happy one*. This liveability is also enhanced when buildings are made from durable, locally sourced construction materials and when the re-use of old meaningful structures is incorporated into their design.

Sociologist Richard Sennett has extensively discussed the relationship between private and public life, asking what has happened to public life and public space in cities today (1974). Why can't these qualities become the basis of our urban thinking and future developments once again? Since it is very difficult to change urban form retrospectively, we need to shape the next generation of cities on the basis of such substance of urban form and a high-quality public space network that allows for informal and random social interaction between pedestrians with easy access to a mix of uses; with appropriate density, mixed-use programs and walkability, accepting these as drivers of our urban strategies. In this book the authors will argue that energy efficiency, low carbon emissions, reduced embodied energy and

sustainable life cycles should also be added as drivers of our future urban planning.

Urban design is intimately dependant on the economic cycle. Usually, much of the worst development emerges from a building boom, when there is too much development and not enough reflection. For centuries or even millennia, good and thoughtful urban design has combined and balanced artistic with scientific and technological knowledge to shape civic places that are rich in cultural diversity and history, and sought to continue the richness and complexity of the older city districts. The aim was always the creation of 'place', a concept defined as a meaningful specific location with emotional, spiritual and symbolic dimensions (Sitte 1889/1945; Jacobs 1961; Rossi 1966; Rowe & Koetter 1978; Alexander 1979; Norberg-Schultz 1980; Madanipour 1996; Kostof 1999; Krier 2003; Bosselmann 2008).

The attributes of compactness, mixed-use and walkability are a city's elegant and enduring qualities, where monumental civic buildings touch us and where quality density manifests itself through diversity in variations of 3 to maximum 10-storey urban blocks, supporting the public realm and streetscape (see Figure 1). They are also well-known principles of timeless urban design that should be applied to all new developments, and an experienced urban designer will always be aware of how to apply them generously to existing urban situations to ensure pleasant, human-scale, compact yet comfortable, mixed-use precincts and neighbourhoods (avoiding monotonous, repetitive buildings, which are so easy to create).

Today, many developments lack the monumental grandeur, aesthetic unity and continuity that we associate with the great urban achievements of earlier eras. But we can build on these distinctive characteristics of our cities while maintaining their sense of place, cultural diversity and walkability, to produce meaningful public-spirited works. In arguing for a new ethics of the urban condition, we can point out that the traditional urbanism of European cities - such as Barcelona, Paris, Berlin or Athens - is also ecological urbanism (Lehmann 2005; Brugmann 2009).

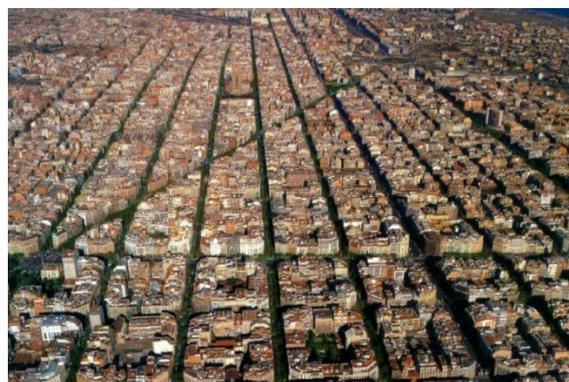


Figure 1: The European city model (here Barcelona) features frequently variations of 3 to maximum 10-storey urban perimeter blocks, supporting the public realm, mixed-use compactness and streetscape.

Cities and Their Public Spaces, Always Evolving

The commercialisation of urban public space and the increasing involvement of the private sector in the design of public space have frequently been criticised. In the age of communication technologies and networks, old public space typologies are being retrofitted to contemporary needs while new types of public spaces are emerging. In this regard, Mehta notes 'while modern societies no longer depend on the town square or the piazza for basic needs, good public space is required for the social and psychological health of modern communities' (Mehta 2014, p. 53).

In all this we should remember that cities were never intended to be completed. Any city is inherently evolutionary, in constant transformation, and much in its character lies in the complexity and diversity of its urban spaces. However, with the impact of globalization, population growth, demographic change, climate change and the urgency of global warming, achieving sustainable urban development has become significantly more relevant as well as urgent and complex. The questions that characterize the contemporary city have now shifted; the spaces between buildings keep changing and the notion of 'Smart City' is discussed everywhere. Since the Industrial Revolution the process of urbanisation has

become ever more resource-intensive. The urbanisation process, constantly regenerated, dramatically affects all energy, water and material consumption. For these reasons, the urban perimeter block as housing type has many advantages: apartments share a circulation system, construction and wall spaces, and one can get easily good thermal performance and save construction materials by building blocks 3 to 10 storeys high. My research over the last decade has shown that energy use can drop by up to 30 per cent if people move from free-standing suburban houses to inner-city apartments in perimeter blocks (Lehmann 2010).

Cities are the single largest contributor to climate change. In the last century, the availability of cheap fossil fuels has been a driving force for rapid urbanization and the shaping of urban form. It has also enabled the increase of urban footprints and the development of car-dependent suburbs. Today we recognize that, in order to deal with the new set of challenges, a shift in scale and ambition is necessary, from individual-building scale to entire urban precincts and neighbourhoods, with a renewed focus on public space. Thus, the challenges vary from region to region: in Europe, the development task is less about building new, but rather about improving and upgrading the existing urban fabric. European cities have been built and their form is deeply rooted in a past that often freezes it in time and place.

On the other hand, in the US, Canada and Australia, the issue is to overcome car dependency and the legacy of sprawl (Hall and Tewdwr-Jones 2009). The situation is quite different again in the Asia-Pacific and Middle-East regions, where building entire new cities from scratch is an option. For instance, with China's rapid urbanisation process, we find new concepts of city emerging, allowing for radical new thinking about urban precincts and architectural group forms and advocating for an end to context as the all-determining factor. Here, the future is not about what buildings look like, but how groups of buildings support the public realm, perform and interact, and how they connect with each other to balance their operational needs (for instance, the energy

needs, waste water and surplus heat generated by buildings).

Mega Trends Shaping Our Urban Futures: New City Typologies Emerging

According to many experts, the impact of humanity on the earth is already overshooting the earth's capacity to supply humanity's needs – exceeding the carrying capacity – which is an unsustainable position (Rees 2006). As the Global Footprint Network (2013) points out, humanity is now using ecological resources and services at a rate it would take over 1.5 Earths to renew. We are on track to require the resources of two Earths well before 2050. Today, more than 80 per cent of the world's population lives in countries that use more than the ecosystems within their borders can provide and renew. These 'ecological debtor' countries either deplete their own ecological resources or get them from elsewhere. For instance, Japan's residents consume the ecological resources of 7.1 Japans; it takes 4 Italys to support Italy, while Egypt uses the ecological resources of 2.4 Egypts. Not all countries demand more than their ecosystems can provide, but even the reserves of 'ecological creditors' like Brazil, Indonesia and Sweden are shrinking over time. We can no longer sustain a widening gap between what the environment is able to provide and how much our infrastructure, economies and lifestyles require. The need to move to low carbon climate-resilient city planning is obvious.

In 2007 and 2013, the pivotal IPCC reports pointed out that human-induced greenhouse gas emissions are mainly a result of burning fossil fuels and land-use changes, but that there are also a range of other indicators impacting on emission levels (for instance, the link with population and economic growth, consumption, energy and water usage, industrial production, waste management, food supply, land-use planning, transport patterns and policy decisions, which are all critical). In the last 20 years progress in the area of international climate policy has been modest at best. Annual greenhouse gas emissions have increased by over one third since 1992 and keep rising. Acute conflicts of interest among industrialized, emerging and

developing countries remain persistent obstacles to a comprehensive global climate treaty. We also face increasing energy costs, transport congestion and housing shortages in most cities (Haas 2008; Berners-Lee and Clark 2013; Urry 2013). Despite all this, energy demands and the use of primary energy from fossil fuels – and consequently carbon emissions – are rapidly rising. Unfortunately, the green dream of weaning the world off fossil fuels remains far off.

Experts have identified the following mega trends affecting cities and shaping our urban future:

- Globalization: global economic power is shifting from Europe and North America to Asia and Latin America.
- Demographic change: urban populations are increasing, with an ageing population in many countries.
- We are moving towards a global knowledge economy, and the rise of this knowledge-intensive economy is reshaping our cities and workplaces.
- The global middle class is rapidly expanding, increasing consumption levels, especially in developing countries; at the same time, urban sprawl is still happening in many places, without regard for its consequences on urban infrastructure and loss of agricultural land.
- Climate change: greenhouse gas emissions keep rising; reductions are not happening as planned, nor as fast as necessary.
- The world could be running out of some resources, while we still waste so much energy, water, raw materials, food and space.
- Environmental degradation and fossil-fuel dependent systems jeopardize people's quality of life. For instance, the supply of drinking water has become critical and sea levels may rise very quickly.
- Urbanisation continues, causing challenges of social inclusion and equity, while there is more and more competition between cities to attract investment and a skilled workforce (which is the most important resource of all). With rising energy and fuel costs, car-dependent sprawl becomes unaffordable – will this lead to a suburban exodus?
- Social media can reveal issues and quickly circulate stories; for instance, large corporations polluting the environment.
- Mobility has emerged as a new paradigm. Mobility now characterises and dominates our lives, as we travel faster and farther, but still spend more time in transit (between home and work), which will lead to new roles for public spaces. Why does today's mobility still mean high-carbon travel?
- Smart environments: Surveillance cameras, smart meters and computers are getting installed everywhere, inside buildings and outside in public space – but unseen: ubiquitous computing is already with us, with computers in our cars, phones, fridges and toys. But we still have to use keyboards to input information. Information processing devices are steadily getting smaller and will soon be virtually everywhere, completely invisible and without the need for keyboards. By 2030, we will be surrounded by computers that perform autonomously, but will be utterly unaware of their presence. 3D-printers will allow for personal fabrication in every home. The ability to produce our own products in our very own homes will upset and completely change traditional models of manufacturing.
- Experts are moving away from simplistic linear approaches to urban development, to complex dynamic network systems and systems thinking, understanding the importance of interlinked and inter-reliant systems.
- More and more municipalities require an evidence base for their urban policies; they have a strong focus on low carbon mobility, renewable energy, waste management, resource recovery and the reintegration of biodiversity in the urban environment; some cities even have ambitious targets such as being 'climate neutral' or becoming the 'greenest city' in their region.

These mega trends are changing the way we perceive cities and how we understand the relationship between our own lifestyle, the city and the environmental crisis. Clearly, now that

we are heading towards a global population of 9 or 10 billion people by the end of this century, we will not be able to keep our high-energy-consumption lifestyles.

A Smart City Definition

In this context, we have to ask: What exactly are 'smart green cities'?

The basic principal behind 'green eco-cities' is living within the means of the environment and resources. For the benefit of the people living in the city, eco-cities reduce their greenhouse gas emissions by producing energy through renewable sources such as solar, wind, hydropower and biomass, use low carbon public transport, green infrastructure and reduce the embodied energy of buildings (Roseland 1997). Eco-cities produce energy on-site, so they require little or no energy from the outside and favour local, renewable and easily recyclable materials. Resources are conserved and recovered through waste management, recycling and the natural bio-filtration of stormwater (Lehmann 2014).

'Smart cities' are cities where the seams and structures of the various urban systems are made clear, simple and responsive through technology and design (which all became possible with the ubiquitous internet connectivity and the miniaturisation of electronics). Engineering firm Arup defines a smart city as 'a city where three specific networks interact and are integrated: the communications grid, the energy system and the so-called logistics internet (which tracks people and things through transport and supply systems)'. City transport systems and logistics are the obvious beneficiaries from such smart systems, where higher efficiencies and more productivity is promised (just think of real-time train arrival messages for waiting subway passengers). From the smartphones in our pockets and the cameras on the lampposts, to sensors in the sewers, the sidewalks and the bike-sharing stations, the contemporary city is permeated with networked information technology that collects data. If we trust the smart city's promise, technology could even solve our social problems that otherwise resisted; for instance, more equity in the distribution of resources.

Embedding computerised sensors into the urban fabric could lead to the so-called 'internet of things' that is promising better living through big data (for instance in the new-built smart Songdo City in South Korea, see Image 2).

However, there needs to be a real debate about the smart city; for instance, what we want technology to do for cities (Greenfield 2013). And the challenging question: who will own all the data the smart city generates and who will control it? Paul Mason noted recently (2015) that 'all these technologies are rapidly transforming our cities, and we need to think hard about who controls a system where all people and things are tracked, all of the time.' Clearly, we can't allow the tech giants or IT providers to rule smart cities – it needs a better solution and community involvement. Open source urban data generated from public services should always remain publicly owned (a position that the City of Madrid has adopted for their smart city project).



Figure 2: There is frequently a reference to Singapore as a smart city that has become denser and greener at the same time, while displaying leadership in green urbanism and place-making. New Songdo City in South Korea (Figure 2) is a new-built smart city whose roads and water, waste and electricity systems are dense with electronic sensors, but lacks green place-making (Image: Nicolette Mastrangelo)

Interestingly, we can now bring the notions of the green sustainable city and the smart city together: combining the postmodern flaneur with the techno-utopian engineer. While global

city hubs usually evolve naturally over time, the success of Freiburg, Copenhagen and Singapore illustrates that sustainable smart city models can be deliberately created to establish a positive reputation; and that densification and an increase of green space at the same time is possible. A smart city might be a low-carbon city, or a city that's easy to move around. The Compact City, the Green City, the Regenerative City, the Eco-City, the Smart City, and so on – they can all be the same place (see Figure 2).

New Decentralized Infrastructure for the Smart City

Cities thrive and, contrary to expectations that communications technology would make location less relevant, we are finding that twenty-first-century life is increasingly dependent on the clustering of diverse information technologies at one place, as a dense network of urban amenities (from playgrounds to swimming pools and libraries), institutions, innovation and human capital. Maintaining innovation all the way through to project delivery is important. We can see this with Masdar (UAE) and Tianjin Eco-city (P.R. of China), two outstanding demonstration projects that have set themselves up as hubs for green smart technology enterprises and research, so called 'living laboratories'. Social inclusion and the use of ICT are perhaps the most important aspects of Tianjin Eco-city, where 25 per cent of all housing is subsidized for low-wage workers and their families. Once completed, it is hoped that in Tianjin Eco-city around 90 per cent of all travel will be made on foot, by bicycle or via public transport.

We can also find interesting ideas about smart city development in New Songdo City: this newly built city on reclaimed land, 50 kilometres southwest of Seoul, is the test site for a new type of ICT infrastructure: offering effortless access to high quality services, knowledge transfer, mobility, communication and connectivity to social infrastructure. The Amsterdam Smart City project is another good example of how information technologies can be applied to optimize infrastructure and traffic flow, and provide substantial services to the population.

Ideally, a smart city integrates the flows and supply chains of all key resources – energy, waste, water, food and transport – using innovative technologies to achieve a more resource-efficient city (Lehmann 2012b). In many ways, infrastructure again plays a key role. The recent United Nations Environment Programme report *City-level Decoupling: Urban Resource Flows and Governance of Infrastructure Transitions* (UNEP, 2013) explores the key role of cities as societal 'nodes' where much of the current unsustainable use of natural resources takes place (and where the greatest potential exists for sustainability-oriented innovations), focussing on the key role of infrastructure in directing material flows and therefore resource use in the urban context.

But there is also critique of the smart city concept and the dangers from accumulation of big data. The data explosion is radically transforming our lives, where systems are systems of interconnected systems, becoming ever-more complex, and we may lose the ability to understand how they work. As the complexity of systems grows, so too do their vulnerabilities.

Therefore, experts ask: Could the increased dependency on technology actually make the city less resilient? While new technology can be advantageous, it does not replace compact, walkable, mixed-use communities and a good relationship between housing and employment.

Today, we are able to capture 'big data' about cities and their urban systems through the use of ICT that allows us to gain reliable and analytical insight into different urban scenarios, either existing or likely to evolve. This enables us to better monitor and lead the operation of our urban systems and to use these predictive models to identify potential risks or future demands. It also allows for better, evidence-based decision making through anticipation of likely demand and events, rather than merely reacting to demands or pressures. IT experts point out that in our post-Fordist networked society social exchange and productivity are increasing with density of communication and information flow. Obviously, services cannot be designed in isolation if infrastructural co-benefits are to be harnessed. Forward-looking

urban infrastructure decisions are essential as these have long-lasting ramifications.

Decisions made in infrastructure development today will determine the effectiveness of cities in delivering services for decades to come. Smart grid and distributed energy generation technologies have become cost-effective alternatives. This is why the district and precinct scale is the appropriate scale for decisions relating to the relationship between public space (supporting walkability) and infrastructure (supporting the provision of sustainable services).

Adam Greenfield criticises the naivety with which the smart city is getting embraced, arguing that the smart city may be neither very smart nor very city at all. He challenges the prevalent cultural understanding of the current deployment and promised possibilities of networked IT, noting (2013): 'The potential of the devices now available is rich, but our awareness of the powerful ways in which these systems and their use will alter our world – our policies, economies and built environment – is limited.' He argues that not only is the existing definition of the smart city too narrow, but it also promotes an undesirable vision of a future city with centralised computational surveillance and control, driven by those in power.



Figure 3: The perfect surveillance at Rio de Janeiro's Intelligent Operations Centre, created by IBM, using thousands of CCTV cameras distributed over the city centre to control and manage traffic movement, parking and urban flooding: 'Permanent control of the entire city, 24/7' (Image: World Resources Institute, 2013)

New Citizen-Centric Applications for the Smart City

City-wide smart services can improve urban governance and deliver real benefits to the population. Thus, urban governance is changing; as Hendriks notes: 'Governance usually refers to the steering of service domains or problem areas characterized by interdependence among various involved parties and organizations' (Hendriks, 2014, p.555).

According to Pennell, 'the term *smart city* has grown to collectively address the way in which policy makers today are harnessing the digitization of the world to counter challenges facing citizens living in urban areas; challenges ranging from the administration of inefficient citizen services through to securing resources for future generations and economic growth.' (Chris Pennell, 2016)

For most of the time, improving urban areas has meant modernising or retrofitting existing infrastructure through an increasing array of digital applications, but developing city-wide smart services is costly and for many cities not an option. The smart city concept has recently been rethought and cities are considering alternative approaches aimed at delivering the widest benefit with the most efficient use of their limited resources. Increasingly, this approach is being built around citizens, negating departmental silos in the administration of cities, and better utilizing the increase of smart devices and private sensory networks.

Citizens and business are being asked to pay for this investment through tax increases, while in exchange, citizens expect instantaneous and personalized services. Citizens also want to be considered as active components in the process. This is leading to the rise of the notion of the "citizen-centric collaborative city", where technology is used to leverage citizen's participation for urban sensing through the constant exchange of information between residents and city institutions. Urban Living Labs (ULLs) have emerged as a mode of governance that brings stakeholders together to experiment and produce solutions in real world settings (Voytenko, McCormick, Evans and Schliwa 2015; Evans, Karvonen, Raven 2016).

Cities are moving from the top down approach and are turning to grassroots, bottom-up processes for sensing the dynamics of citizen participation, data analysis, information sharing and dynamic decision making, supported by a smart governance structure (Castan Broto and Bulkeley 2013). Effective partnerships between universities and cities are increasingly important to deliver sustainable, innovative and smart urban development (e.g. 'Smart Campus'). But while a wealth of expertise exists, knowledge and experience is currently fragmented and underexploited (Hodson and Marvin 2014).

Conclusion: A New Set of Questions and Challenges

In the near future, the relevance of face-to-face encounters in high-quality public space in cities will not lose importance, despite the rise of the IT network society.

The smart-city rhetoric is all about efficiency, optimisation, predictability and security through surveillance, and so on. All these things make a city bearable, but they don't make a city more poetic or valuable. While the knowledge of good urban design allowed us for centuries to design cities that functioned well and had beautiful proportions, now an entirely new set of questions about optimal city form and urban management have emerged that have not previously been asked, such as:

- How can we use new urban development approaches to transform and retrofit our existing cities to emit much less greenhouse gas?
- What are the behavioural, technological and urban design options for better managing this change?
- Which city form, density and size is best for enabling low-carbon affordable mobility and

public transport? For instance, can we establish an optimal range of density for sustainable city form and decentralized systems generating on-site energy?

This thinking about urban futures goes far beyond conventional or traditional ideas of aesthetics (of the 'City Beautiful' type) or functional and organizational city form (of the 'Ville Radieuse' type): this is about the long-term sustainability of urban settlements and communities. It forces us to look at cities in a completely new way, and new types of city are likely to emerge.

However, there will be no quick urban fix to the problem of global warming. This means that we need to apply incremental approaches as well as seeking major economic and social change with strategies that will work, to envisage and apply a new, daring and ambitious environmentalism to radically re-engineer our urban settlements and concepts.

The list of new challenges opens up many possibilities for innovative design thinking at different scales; for instance, we are likely to develop new kinds of smart infrastructural systems that better engage with the social and environmental conditions that continuously reconfigure the city today. In all this, urban design still warrants a very high priority as it sets the framework for any future urban development at an early stage and remains central to successful low carbon outcomes in which urban form, public space, density, infrastructure and the integration of low-carbon technologies all have a strong interrelationship.

The 21st century promises to be very different from the 20th century - so why are cities being planned using components that were developed during the last 100 years?

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