"Every place can surely prosper or grow sustainably, let's just create the conditions for them to do that. Let's not try and pick winners around which cities we want to support and which we do not."

Stephen Aldridge
Department for Communities and Local Government

Designing cities

How is the sustainability of a city influenced by the size, form and design of its buildings, infrastructure and services?

At a glance

In 1990, there were only 10 cities with 10 million inhabitants or more. These so-called 'megacities' were home to 153 million people, representing less than 7% of the global urban population. In 2015, the number of megacities nearly tripled to 28 and they were home to 453 million people, accounting for about 12% of the world's urban dwellers; 16 of these cities are found in Asia, 4 in Latin America, 3 in Africa, 3 in Europe and 2 in North America. By 2030, the UN expects that there will be 41 megacities, and much of this growth will take place in the global South. For example in 2014, China had six megacities and ten large cities with populations between 5 and 10 million, and one more megacity and six large cities will be added by 2030. The speed and scale of growth of these cities – and the sustainability problems they will encounter – provokes us to consider whether future cities (predominantly in developing countries) should follow the paths taken by existing cities. It must be considered whether future cities need an entirely new model of development and whether, in fact, cities in developed countries can learn lessons from those in developing countries.

Are bigger cities, better?

The way in which people view big cities has radically changed over the last 25 years. Once seen as dirty, dangerous places, giving rise to a 'flight to the suburbs', they are now thought of as places of opportunity and creativity, where people have higher incomes and expend less energy per capita. Edward Glaeser calls cities "our species' greatest invention, which will make us richer, smarter, greener, healthier and happier".

Proximity is claimed to make people more inventive, as bright minds feed off one another; more productive, as scale gives rise to finer degrees of specialisation; and more transport-efficient, as city-dwellers are more likely to travel on foot or by public transport and services are delivered by more efficient infrastructure. Part of this efficiency comes from the finding that the rate of growth of infrastructure is lower than the rate of growth of population, all while keeping service provision constant. This applies to all forms of infrastructure such as total road surface, length of electrical cables, water pipes or number of petrol stations. However, the increasing population density in cities also brings disadvantages such as congestion, overcrowding and social conflicts, which may impact negatively on health and wellbeing.

It is not clear how factors such as productivity, sustainability and social equality change with increasing city size. We therefore need to develop a 'dashboard' of indicators to help provide a snapshot of what is happening within a city, as well

Key questions

If a new model of development is required, how will it be defined? We identified three questions that require further research.

- Are bigger cities more environmentally sustainable and or better for the people who live there?

- Should we build outwards or upwards?

- Can infrastructure in large and diverse cities keep pace with the rate of change while continuing to provide essential services as populations grow, age and raise their standards of living?

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as a picture of how different aspects change over time. Which indicators are the best ones to represent the environmental and social sustainability of cities and what kinds of datasets could these be based on? Who would own the data, and how might they use them? Would these data – if available – show that bigger cities are more environmentally sustainable and better places for people to live and work in, or would they emphasise the disadvantages of excessive city size?

Diverse assemblages of species in nature are more resistant to change. Are cities more stable if they are more diverse? Are cities that are 'mosaics' of different spaces, developments, cultures and communities more resilient to shocks or long-term changes? Could this mixture also be important for the social sustainability of cities? If so, would the utility of a mosaic approach change with the size of a city; if so why, and in what way?

The answers to these questions may be entirely dependent on context, pointing one way in a city of central China but a different way in a Brazilian city. Despite this, it could be argued that an inevitable consequence of globalisation is that global megacities begin to resemble each other more than they do cities within their own country. Groupings of cities such as the C40 may reinforce these similarities. Are cities such as London, Paris, Shanghai and New York becoming more similar over time? Does this similarity mean they are less resilient or well-adapted to their unique surroundings or do their similarities allow them to share useful lessons?

> **"How do you not only grow the city in an environmentally sustainable way, but how do you also preserve a high quality of life for people living there?"**
>
> Mark Kleinman
> Greater London Authority

Linking infrastructure and social change

What binds a city together is the infrastructure that courses through it. If you want to intervene effectively at the social and physical level, a good starting point is the design and operation of infrastructure as it underlies everything a city does and everything a city is.

Radical re-imagining of infrastructure is difficult, even if the pace of social change suggests it is needed. The huge scale of infrastructure, and its costs, usually leads to a piecemeal approach to improvements, as small changes become affordable in ways that city-wide changes are not. This leads to incremental improvements but leaves the basic design unchanged.

London is a case in point. The city's population is now larger than it has ever been and is predicted to keep rising to nine million by 2020, 10 million by 2040 and maybe even 11 million by 2050. Current predictions indicate that between 40,000 and 50,000 new homes will be needed each year, which is double the number London has ever managed to build in a year (24,000) so there will need to be a sizable step change in house building to keep up with the demand. The creation of buildings requires the creation of supporting infrastructure, including both physical infrastructure such as drainage, water supplies and schools, and social infrastructure such as police and teachers.

Systems-level thinking is therefore going to be needed to answer questions about the performance of future

infrastructure, and how that infrastructure will influence people's lives and their quality of life. This challenge gives rise to a number of questions. What infrastructure is needed to support the projected speed and scale of growth? How good is the current infrastructure and how can it be extended? How will people use it and how might their needs change in the future? How can this infrastructure be delivered into a regulated market which primarily responds to current needs rather than anticipating what might be needed in the future?

Outwards or upwards?

Taller buildings obviously allow more people to be accommodated on a smaller land area. Height restrictions on buildings also restrict the supply of space, which pushes up the prices of housing and offices. However, much of the large multistorey housing that dominated some UK cities in the 1960s and 1970s has been torn down, not just because of age but because this type of housing became the focus of crime and violence. They became unpleasant places to live, and so socially unsustainable.

Instead, eight to ten storey buildings are becoming increasingly common in Seoul, Beijing, Washington DC and the City of Westminster in London. It could be argued that these smaller buildings are at a more 'human scale' and make it easier for people to recognise their neighbours and form a community. However, even in the 'two-storey Britain' of terrace houses and flats, many people still do not interact with their neighbours. Are there alternative ways to design buildings or urban spaces to encourage strong social communities and does this depend on whether the buildings are upwards or outwards? The answer is anything but clear.

The research challenge on the horizon

In order to answer this question, it is vital to be able to add context and be able to understand and take into account the similarities and differences between cities and the needs of the people who live in them. A global effort of comparative analysis is therefore needed to compare and contrast the performance of cities on an array of social, environmental and economic indicators. Such a rich database would allow something akin to structural factor analysis that could identify which aspects of the city size, form and design are most influential, as well as the context within which these effects are expected. This analysis could draw on techniques of case and cohort studies, supplemented by meta-analysis techniques used in medicine and the social sciences. It may be hard to detect overall patterns due to large variations between cities in their structure and functions as well as the needs of their residents. Recent developments in interrogating 'big datasets', generated by cities in real-time, will help to provide new insights on a variety of scales. The answer in the end might be that every conclusion is completely context-specific and that no general rules exist for the interaction between the physical and social lives of cities. We will not know unless we ask the question.

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