

INSIGHT

Dream or dystopia

The future of cities

28 February 2019



For today's investor



“Flying cars are still a pipe dream. Artificial intelligence has not yet rebelled against its human creators.”

Cities will face severe challenges over the coming decades, including digital disruption, population management and climate change. How they adapt to these pressures will determine the winning – and losing – cities of the future.

Flying cars zip through the smoky air, dodging fireballs belched out by industrial chimneys. At ground level, citizens inch their way through traffic-clogged streets, using umbrellas to keep off the acid rain. Genetically engineered ‘replicants’ run amok through neon-lit skyscrapers.

Ridley Scott’s science fiction movie *Blade Runner*, released in 1982 and set in 2019, graphically illustrates the hazards of predicting what the cities of the future will look like. Now that we have caught up with the film’s timeline, some of its predictions seem quaint. Flying cars are still a pipe dream. Artificial intelligence has not yet rebelled against its human creators.

But in other ways *Blade Runner* now looks eerily prescient. Urban centres are struggling to respond to rapidly growing populations and the early effects of climate change, much like the fictional Los Angeles. Photographs of modern Chinese cities – with their crowded boulevards, gargantuan office buildings and pollution-tinted skies – often resemble scenes from the film.

The challenges of population density, resource scarcity and spiralling temperatures will only become more pressing over the coming years, while the introduction of new digital technologies could unleash further disruption. But for those cities that have the wherewithal to evolve and adapt, the future looks brighter than the dystopian visions of science fiction.

The future is spiky

In a sense, cities today are facing modern variations of problems that date back to the very earliest human settlements. While bringing together large numbers of people in one place yields huge cultural, scientific and economic gains, it has its downsides.

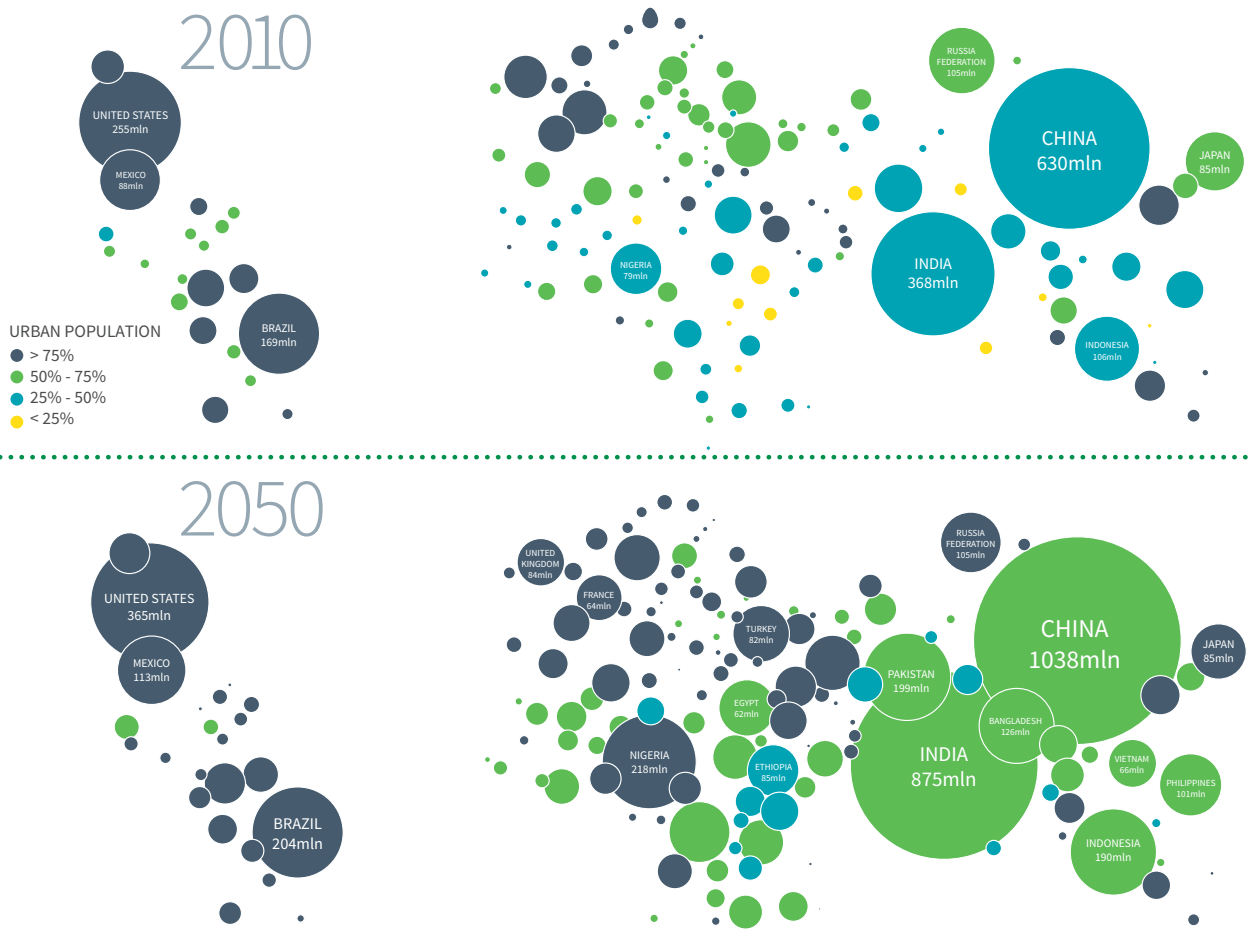
“The whole history of cities can be understood in terms of externalities, positive or negative,” says Chris Urwin, global director of real assets research at Aviva Investors.

“Having lots of people in one place boosts productivity and fuels growth. But cities have always struggled with disease and crime; now they are facing issues around sustainability. The key task for policymakers and developers is to ensure the positive externalities outweigh the negative ones.”

This task is becoming ever more important as the planet urbanises at an unprecedented rate. According to the United Nations, 55 per cent of the world’s population now lives in urban areas, and this proportion is likely to increase to 68 per cent by 2050, or an extra 2.5 billion people. Other estimates from the European Commission – which has a different definition of what constitutes ‘urban’ – put these figures much higher.¹

The rate of change will be highly uneven, however (see figures 1 and 2). Some cities will continue to grow at pace, while many smaller urban centres will slowly depopulate, especially in advanced economies with ageing demographics. Experts have dubbed this trend ‘metropolisation’, or, more colloquially, ‘spikiness’. The leading cities are increasingly hoarding talent and resources, while the laggards are left behind.²

Figure 1: The rate of urbanisation differs between regions



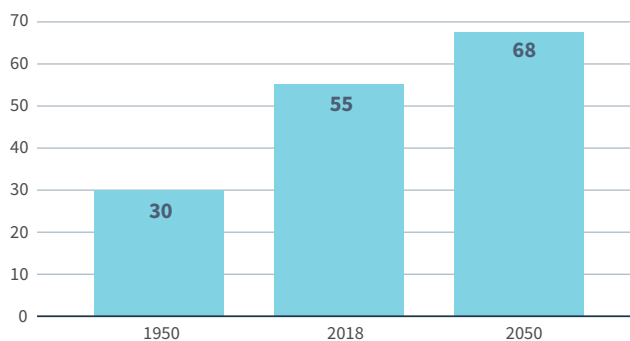
Source: Unicef, 2012.

The process is likely to speed up over the coming years, as the leaders look better equipped to mitigate the negative externalities of urbanisation while taking advantage of new technological solutions. And this dynamic has important market implications: for investors in real assets, it will become ever more important to choose buildings and infrastructure projects in strong locations, while the rise of new urban technologies will create corporate winners and losers, bringing risks and opportunities across asset classes.

“The rise of new urban technologies will create corporate winners and losers”

Figure 2: Growing urban population

% of global population living in urban areas



The world's urban population will have grown by 2.5 billion people in just 100 years
Source: UN, 2018.

“Digitalisation, and the ongoing transition to service sectors, is speeding up the process of metropolisation.”

Human capital

So what will the cities of the future need to stay ahead of the competition? The first requirement is that they attract human capital. As economies continue to shift away from heavy manufacturing towards service-based sectors, knowledge networks will become more important than physical supply chains. Research shows this trend favours a select group of cities.

According to Jonathan Rothwell of the Brookings Institution, who has crunched OECD data on the topic, a small number of metropolitan areas account for 93 per cent of the world’s patent applications, even though they contain only 23 per cent of the global population.³ The leading cities also receive an outsized chunk of early-stage investment, enabling them to capitalise on technological breakthroughs. Between 2015 and 2017, ten cities attracted an annual average of US\$100 billion in venture capital investment – more than 60 per cent of the global total. San Francisco, Beijing and New York led the field.⁴

“Digitalisation, and the ongoing transition to service sectors, is speeding up the process of metropolisation,” says Souad Cherfouh, European real estate analyst at Aviva Investors. “This had led to widening inequality between cities. It’s imperative that cities attract tech-intensive sectors and take advantage of the associated concentration effects.”

The recent economic tilt towards ‘intangible’ investments in design and creative talent is contributing to metropolisation. As the academics Jonathan Haskel and Stian Westlake have observed, these investments favour industry clusters because intangible assets gain in value due to synergies and spillovers between innovative firms.⁵ As intangible-focused companies congregate in the same areas, they Hoover up the best talent from elsewhere, reshaping property market dynamics.

The ‘intangible economy’ is already transforming the urban environment, as digital platforms enable the sharing of offices (WeWork), labour (Uber) and residential space (Airbnb). And the rise of intangibles is also hastening another disruptive trend: the automation of jobs.

Cherfouh says cities whose office markets primarily compete on cost are likely to lose out as automation replaces huge swathes of back-office functions, with Eastern European cities such as Warsaw particularly vulnerable. By contrast, areas that boast high-quality universities and burgeoning tech clusters – including many in Europe, such as Paris, Copenhagen, London and Cambridge – should take digital disruption in their stride.

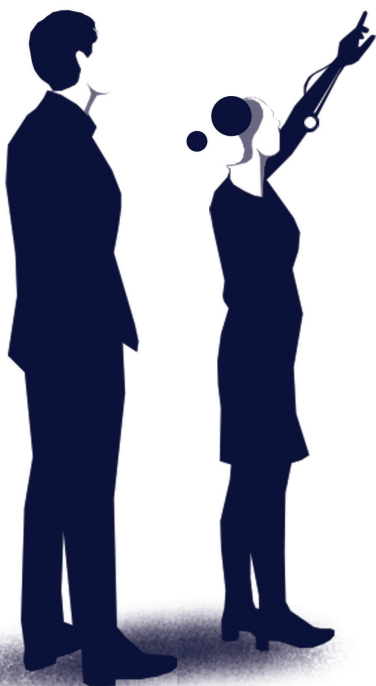
Efficient infrastructure

Attracting human capital is not just about providing employment opportunities and top-quality education - it’s about creating an environment in which people feel safe, comfortable and well-connected. To this end, fast-growing cities will need to ensure they have the infrastructure to comfortably accommodate growing numbers of people.

“High-quality infrastructure will be important, as will new technologies that enable the transmission of information, such as mobile apps that authorities can use to canvass public sentiment to inform policy,” says Parag Khanna, author of *The Future is Asian* and an expert on the dynamics of urbanisation.

The type of infrastructure required to keep a young, talented workforce happy will depend on the city’s geography. Many coastal cities, where space is at premium, are seeking to increase capacity in central districts by creating massive, state-of-the-art structures. Construction of super-tall skyscrapers, such as China’s 2,000 ft. Shanghai Tower, is becoming more feasible thanks to the advent of ‘smart elevators’. Some of the newer models can zip horizontally across floors, as well as up and down between them (boxed text, below).

As some cities build up, others are building outwards. The latter strategy often requires ambitious new rail projects to ensure central business hubs remain accessible to residents in the suburbs. London’s Crossrail railway and the €30 billion Grand Paris project – designed to expand metro connections between the centre of the French capital and its sprawling banlieue – are two examples. Once completed, Crossrail and the Grand Paris projects should ensure London and Paris are able to cope with the expected influx of new workers over the coming decades.



“As cities grow, they’re increasingly looking at localised transport to enhance their economic value,” says Darryl Murphy, head of infrastructure debt at Aviva Investors. “If you’re developing a city, you either build your living areas downtown, and have the workforce closer to the action, or you recognise your workforce is effectively out of the city in the suburbs, and you need to efficiently get them into the city. Improving connections to the suburbs increases a city’s competitiveness and productivity.”

Connectedness

Good infrastructure is not just about bulldozing new tunnels and laying new track, it is also about improving efficiency. Digital technologies can provide relatively affordable solutions in this area. The leading cities are likely to be connected in both senses of the word.

Take the leafy Chinese city of Hangzhou, where tech giant Alibaba has been working with the municipal government on a new model for transport management. By using artificial intelligence to process information gleaned from traffic cameras and vehicle GPS data, Alibaba has been able to tweak and optimise the flow of vehicles. Before the project began, Hangzhou was the fifth most congested city in China; it now ranks 57th. Emergency services were able to cut their response times in half.⁶

Data-driven methods could be particularly useful in improving transport networks in fast-growing emerging market cities, which can use technological ‘leapfrogs’ to keep pace, even if they lack the resources to build new physical infrastructure from scratch. Alibaba is currently working on optimising Kuala Lumpur’s transport infrastructure and may soon expand its ‘City Brain’ platform to other Malaysian cities.

In Western economies, too, so-called urban tech is a big growth area. According to research from the economist Richard Florida, investment in new urban technologies added up to more than US\$75 billion between 2016 and 2018, and the sector’s share of global venture capital investment has risen from 13 per cent to 22 per cent. Florida believes urban tech may now be the largest sector for such investment, outstripping pharmaceuticals and biotech.⁷

Established US tech companies are also getting in on the act, seeking opportunities to become involved in end-to-end urban planning solutions. Sidewalk Labs, a unit of Google’s parent company Alphabet, is working on a 12-acre waterfront neighbourhood in Toronto known as Quayside, which will feature an automated transit system.

However, the project has been criticised for its plans to harvest huge amounts of data from the neighbourhood’s residents. This suggests privacy concerns may limit the reach of digital infrastructure in certain cities.⁸ To some urbanites, the prospect of a technology company omnisciently tracking their every move is just as scary as Blade Runner’s renegade robots.

To allay such fears, urban administrations are bringing in independent review teams to ensure data is properly anonymised and protected. Take Chicago’s Array of Things project, an urban network of ‘programmable, modular nodes’ that provides citizens with real-time information on local weather patterns and traffic congestion hotspots. The public-private initiative that runs the scheme has appointed Indiana University’s Center for Applied Cybersecurity Research to review all use of citizens’ data on an ongoing basis.⁹

Sustainability

Another characteristic required by future cities is that they need to be sustainable. This is important both for long-term urban planning and resource management and for attracting human capital. A wealth of research shows the millennial generation is particularly concerned about the impact of human activity on the planet and their health. They are likely to choose places to live and work that take these preferences into account.

“Companies recognise the need to provide employees with green, sustainable environments in which to work. This is already transforming the built environment,” says Urwin.

Shifting consumer demands, along with the prospect of new green regulation in the coming years, will provide fresh incentives for companies to ensure their buildings are energy-efficient.

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According to CBRE research, the amount of US office space certified ‘green’ or ‘efficient’ by the leading providers of green kitemarks now stands at 38 per cent, up five per cent from 12 years ago.¹⁰ Recognising an opportunity, some investors are deliberately targeting poorly rated assets with the aim of profitably upgrading them to these higher standards.

Carlo Ratti, architect and professor at the Massachusetts Institute of Technology, says digital technologies can improve sustainability at the municipal level, too. “This process has already started, and its manifestations are everywhere; from energy to waste management, from mobility to water distribution, from city planning to citizen engagement.”

Smart technology is enabling cities to reduce their consumption of energy and natural resources. Take Barcelona, a city that has long suffered from periodic water shortages: during the sweltering summer of 2008, it was forced to import millions of litres of drinking water. The introduction of an AI-powered irrigation system has made a big difference; the system monitors soil moisture levels to reduce the risk of drought and avoid waste. The municipal water bill has since been cut by 25 per cent, improving the sustainability of the overall water supply.¹¹

Over the longer term, digital technologies reliant on the Internet of Things (IoT) could also enhance food security in cities. New innovations in hydroponic and aeroponic farming offer exciting possibilities for inner-city agriculture: by using data to strictly monitor and control the environment, these methods enable companies to cultivate plants in tight, confined spaces, without deep troughs of soil or large amounts of running water.

Although doubts persist over how scalable these projects are, the early signs are positive. Silicon Valley-based agritech start-up Plenty says it can derive 350 times as much produce out of an acre of land than conventional agriculture, using only one per cent of the water.¹² This prompts optimistic visions of cities in which buildings – perhaps office towers made redundant by automation – are converted into vertical farms, with foliage tumbling from the windows to attract bees and butterflies.

“This technology is potentially a huge breakthrough in improving food security and sustainability,” says Steve Waygood, chief responsible investment officer at Aviva Investors. “By repurposing buildings to create carefully controlled IoT environments, with closed loop feedback systems, companies are creating new ways to grow food. It’s sci-fi stuff, but it provides hope for the future.”

Resilience

As climate change begins to remodel the physical environment, cities will need another key characteristic: resilience. In the Blade Runner sequel, set in 2049, Los Angeles is protected by a huge flood barrier to fend off the tides, reflecting contemporary concerns over rising sea levels.

Cities are facing heightened flood risk in the here and now, and existing protections are showing signs of strain. Take London’s Thames Barrier. Constructed for £534 million in the 1980s, it was expected to be raised no more than once or twice a year. It is now being put to work far more often as the tides creep higher; in 2014 the barrier was raised 41 times.

Most large cities evolved near canals, rivers or the sea as a result of maritime trade, and coastal cities in Asia would be particularly vulnerable should climate change lead to a drastic rise in sea levels. Research shows that, if carbon emissions are not curtailed, global temperatures would rise six degrees by 2100, more than enough to unleash disastrous flooding in coastal cities from Miami to Osaka to Shanghai. Buildings in the worst-affected areas may become uninsurable.

The prospect of mass flooding may be decades away, but cities are already taking steps to upgrade their defences. Investing in flood barriers like the Thames Barrier is just one option: in the densely populated southern provinces of China, local governments are investing in huge drainage systems and upgrading urban infrastructure to create so-called ‘sponge cities’, featuring permeable concrete pavements that can absorb water and mitigate the risk of flash floods.¹³

Urban planners are also facing up to the possibility that it might not be possible to completely hold back the tide. As oceans begin to encroach, cities such as New York are considering ways to equip at-risk buildings with docks and elevated walkways.¹⁴ And in other US cities, the risk of

flooding has already reshaped property markets. A recent Harvard University study, which surveyed data going back to the 1970s, found that homes on the Miami coast are now worth 10 per cent less than they would be if climate change wasn't an issue.¹⁵

Urwin says it will be increasingly important for real estate investors to identify and understand their exposures to regions at risk of physical damage from climate change. At a strategic level, they might consider tilting their global portfolios away from at-risk countries (especially those that are not well positioned to invest in the infrastructure necessary to protect them) and favour markets where the local implications of climate change are less concerning, such as parts of northern US, Canada and Scandinavia.

Aside from physical threats, cities need to be resilient in the face of pollution-related public health hazards, cyber attacks and terrorism. As digital technologies become more integrated into urban infrastructure, the risk that these technologies will become outdated – and therefore vulnerable – increases. As Ratti points out, smart cities will need to be “futureproofed”. The need to protect cities’ digital infrastructure could open up opportunities for cybersecurity firms to develop solutions.

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Governance and planning

Implementing the necessary adaptations to keep cities attractive, sustainable and resilient is easier said than done, however.

Much will depend on the effectiveness of their governance models. One crucial question is whether cities opt for top-down planning or a less-structured approach, in which a competitive, tech-fuelled decentralisation is the preferred method of generating solutions.

The top-down approach is exemplified by cities built specifically with connectedness and sustainability in mind, such as Masdar City in the Abu Dhabi desert. The project features an autonomous transit system and acres of solar panels to reduce carbon emissions. But as of 2019, Masdar resembles a ghost town, with fewer than 2,000 residents in a city designed to accommodate 50,000.¹⁶

Integrating smart gizmos and sustainability tech is more difficult in older European cities, with their winding streets, heritage architecture and strict planning laws. Then again, these features are part of what makes these cities attractive places to live and work, enabling them to retain the human capital they will rely on in future.

Khanna suggests the ‘top-down’ versus ‘bottom-up’ choice is not as binary as it might appear. “To me it’s a multi-level feedback loop. It is easy to look at countries like Vietnam or China and say, ‘top-down is the way to get things done’. But if that were true, why are cities in democratic countries in Europe still the most desirable to live in?

“It has to do with wealth, technology, voter preferences, industrial composition. It’s not as easy as to say, ‘if we were all authoritarian the world would be a more sustainable place’. Let’s not focus on politics and regimes, let’s focus on the cost of technology and incentives. That would be the correct way to understand what’s going on.”

Public-private finance initiatives can help governments and companies share the burden – and the rewards – of new projects. For example, city authorities may be able to monetize the data they collect from smart technologies by charging companies that want to use it to develop new applications, while putting in place the necessary protections surrounding data privacy.

As a recent research paper from Deloitte highlighted, smart city infrastructure investment could result in the reallocation of risk and reward between the public and private sectors, creating “new partnership models for front-end investment and revenue sharing, including pay-for-performance related to service improvements or access to services”.¹⁷

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Dream or dystopia?

Getting the right model for sustainable urbanisation could not be more important: the future of the planet literally depends on it. But the commitment of many municipal leaders to fighting climate change – even as federal governments drag their heels on the issue – offers hope.

Getting the right model for sustainable urbanisation could not be more important: the future of the planet literally depends on it

“This has to do with the growing economic and fiscal authority cities have and the growing sense of responsibility mayors and municipal leaders have taken on,” says Khanna.

“Increasingly, people realise that being mayor of the biggest city in a country is as important as being a federal minister. There is also the fact that cities are ground zero for issues such as environmental sustainability and affordable housing and transportation.”

At the International Mayors Climate Summit in June 2018, Los Angeles mayor Eric Garcetti announced the city aims to cut its emissions to a net zero level by 2050 – one of the most aggressive targets in the world. Among the measures Garcetti has introduced are plans to increase the number of energy-efficient buildings and replace the city’s public vehicles with electric models.¹⁸ If it achieves these objectives, Los Angeles’ future could look very different from the smoggy conurbation imagined in Blade Runner. And, as other cities begin to follow its example, a new model of the future metropolis could emerge: green, sustainable, smart and – above all – liveable; a dream rather than a dystopia.

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Investment implications of smart cities

The rise of new urban technologies, powered by artificial intelligence and the Internet of Things (IoT) – a digital infrastructure that enables objects to ‘talk’ to each other and autonomously respond to human needs – is likely to create opportunities for investors.

Much hype has surrounded the potential for the IoT to transform cities and improve sustainability – switching on street lights when people walk beneath them; activating sprinklers when public lawns need watering – but from an investment perspective, perhaps the most interesting aspect of the IoT is the way it will enable industrial manufacturers to preserve revenue streams after the point of sale.

Take one of the more futuristic developments – smart elevators. Companies such as German multinational Thyssenkrup have created IoT-connected lifts that not only move up and down between floors but laterally across them, facilitating the construction of larger, more intricate buildings. Other companies, such as Finland’s KONE and Swiss manufacturer Schindler, are also innovating with smart elevator technology.

Smart elevators have many advantages, not least the fact they are constantly ‘talking’ to their manufacturers, providing data on performance and usage that can be fed back to optimise the flow of people around a building. This can also provide data on when elevators will need to be repaired, allowing companies to secure contracts for ongoing ‘predictive maintenance’.

“The problem with lifts is that they break down,” says Giles Parkinson, global equities fund manager at Aviva Investors. “But an operator of a smart lift will know whether a particular motor has begun to vibrate, and it will know when that motor will need to be replaced within a certain time period to a 99 per cent confidence interval, so it can fix the problem before the lift fails. This means buildings with smart lifts are more efficient and could charge higher rents.”

Security is another sector that will gain a boost from IoT technology. Electronic locks equipped with video systems and facial recognition are well established in the corporate world, but are becoming more common in residential buildings, too, especially in fast-growing, densely populated cities where security is a concern.

In South Korea, around 80 per cent of new locks installed in residential properties are electronic. And in the West, Amazon Key, a service that enables customers to unlock their homes remotely to allow couriers in and out to deliver packages, is rising in popularity. As with smart lifts, the manufacturers of the technology can benefit from revenue-servicing contracts and software upgrades.

Citing these examples, Parkinson argues companies able to use smart technologies to develop specific solutions to urban problems are likely to be the chief beneficiaries as the IoT sends out its digital tentacles into cities.

“Companies providing the brute computing power these technologies run on, whether it is IBM’s Watson or General Electric’s Predix, have been hailed as the winners. But I prefer to look at companies that will be able to use these new technologies to build new data-sets and cement a competitive advantage” .

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