

Voices on Infrastructure

Smart cities: Turning opportunity into reality

December 2017





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Introduction: Turning the smart city opportunity into reality

Welcome to the December 2017 issue of *Voices on Infrastructure*, a compilation of perspectives from McKinsey and industry experts on **turning the smart city opportunity into reality**.

In a world where technology is increasingly ubiquitous, it seems every city is a smart city. The mass deployment of broadband infrastructure, mobile phones, and wireless connectivity is just the beginning. The Internet of Things—a web of connected devices and sensors in the physical world—can interact with analytics systems, using machine learning to turn realms of real-time data into new insights and instant responses.

However, building a smart city means more than hardware deployment. What makes a city truly smart is how it uses all that technology to deliver better outcomes for its citizens. While debates in the past were often focused on the technologies themselves, the discussion must now turn to the needs of residents, the concrete problems to be solved, and how smart cities can be built to address those root problems. The authors in this compilation explore the application of cyber-physical technology around three main themes.

First is **bringing intelligence into the citizen's daily life** whether in water conservation and use, transportation, home sharing or security. Cities are increasingly realizing that the benefits of smart cities go far beyond efficiency gains: technology is helping cities become more livable and sustainable. Moscow's transportation program, for example, aims to save Muscovites a week of commuting time a year through an integrated, technology-enabled initiative to change the average citizen's mobility experience.

Second, **technology is changing how governments think about serving their citizens**. Governments are reimagining their systems and processes with an eye toward ensuring not just an improved living experience but also equitable access to infrastructure and programs, becoming more responsive and citizen-centric. From Pune, India, to Toronto, Canada, smart city technology is speeding up the metabolic rate of government.

Third, **the landscapes through which we move are transforming under our feet**. Initiatives from waterfront revitalization to greenfield city development are creating new venues for the deployment of technologies that can turn deserts into industrial valleys and rust belts into brain belts. Chinese cities are transforming by adopting technologies to green their riverfronts and prepare for a new industrial age, even as they bring back traditional concepts of human-based placemaking.

Implementing digital solutions on a citywide scale requires vision and persistence—which is why this issue of *Voices* brings together multiple case studies from around the globe. Mayors, experts, technology leaders, and residents themselves all have a role to play. We hope these perspectives help guide decision makers in shaping the smart cities of the future. 🌐



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News from the Global Infrastructure Initiative



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From intermodal transit software to smart grids, technology has become an essential component of how today's cities deliver and operate their infrastructure. While the ubiquitous promise of "smart cities" holds great potential, it also comes with risk and complexity. Success will require investment in flexible platforms that can accommodate rapid technological shifts, behavior change from administrators and the public, and potentially new models of governance.

In this final quarter of 2017, GII is exploring how companies and cities are turning the smart city opportunity into reality. In addition to developing this issue of *Voices*, we recently led a site visit to King Abdullah Economic City (KAEC) in Saudi Arabia on "planning, financing, and delivering a new city." The use of technology is a major component of developing this massive \$100 billion project; a recap of the key themes and lessons can be found [here](#). We also hosted GII roundtables in Paris and Frankfurt; the [Paris event](#), held during Paris InfraWeek 2017, explored the topic of reinventing France's construction sector, while the Frankfurt roundtable focused on [digitizing construction and infrastructure](#) — a major opportunity and priority for the industry today.

We were also thrilled to announce last month that the Fifth Global Infrastructure Initiative Summit will take place in London October 29–31, 2018. Our theme will be major project delivery and digital transformation, working in partnership with the UK Infrastructure Projects Authority. Consistent with previous GII summits, we anticipate an engaging discussion with 200 senior global infrastructure leaders from across the value chain. For more information, visit the [Summit homepage](#).

Looking ahead, we are excited to announce our first two GII innovation site visits in 2018 — one to Hyperloop One in California and Nevada in February and the other to Moscow's major urban growth projects in June. Please contact us at info@giiconnect.com if you are interested in joining one of these site visits.

Our first edition of *Voices* in 2018 will focus on charting the digital future of capital projects; the issue will feature an in-depth selection of articles, interviews, and videos exploring the business value of digitization and innovation, the ecosystem of solutions, and the steps to mobilize organizations for success. As always, we welcome your thoughts on *Voices*, and we hope you enjoy the Q4 2017 edition. For more details on upcoming events, [visit our website](#) or contact us at info@giiconnect.com. 



Building smart transport in Moscow

Moscow addressed its road and public transit congestion problems and developed one of the world's smartest and most-used public transportation systems. Here's how.



Maksim Liksutov

Moscow Deputy Mayor for
Transport

Smart transport is foundational to any smart city; it is a system that wields a vast array of information and communication technologies to improve efficiency, convenience, and safety across a variety of vehicles and infrastructure assets. But it is a daunting undertaking for cities looking to digitize, with hundreds and thousands of citizens taking daily rides that must run smoothly, cleanly, and on time. In this Q&A, Moscow Deputy Mayor for Transport Maksim Liksutov discusses the city's efforts to develop a smart transport system that Muscovites enjoy using and that anticipates their ever-changing needs.

McKinsey: Describe Moscow's transportation challenge and how the city has been addressing it.

Maksim Liksutov: Until 2010, the traffic situation in Moscow was close to critical: the road network had reached maximum capacity, and Moscow had one of the worst road traffic situations in the world. Thus, in 2011 the Government of Moscow and leading Russian and international experts developed the State Program of Moscow Transport Development to 2020. The plan centers on an analysis of large amounts of commuting data to reduce the load on the roads through a strategic approach to upgrades and new construction, as well as the launch of an intelligent transport system (ITS).

The ITS, which controls more than 2,000 video surveillance cameras, 3,700 road detectors, and 6,000 traffic lights, allows us to provide real-time response to traffic situations throughout the city rather than waiting for Muscovites to call emergency responders, law enforcement, or others to resolve issues. The mayor of Moscow was personally involved in developing and implementing the traffic-improvement measures that resulted in a significant reduction in congestion. Despite that, the number of registered private cars in Moscow increased by more than one million since 2010. In fact, according to the TomTom ranking,¹ Moscow was the most congested out of nearly 400 cities in 2010; by 2016, we had moved down to 13th. The traffic speed in Moscow increased by more than 13 percent—from 45 km/h in 2010 to 51 km/h in 2016. Such congestion reduction is among the best in the world.

We still experience congestion during peak traffic hours, but the improvement has been substantial thanks to the ITS, major changes in parking policies, and significant investments in public transportation, such as metro and buses. In 2017, Moscow won the TomTom award for parking, ranking first globally in quality of parking planning.

McKinsey: What steps is Moscow taking to increase use of the public transport system?

Maksim Liksutov: It is difficult for public transport to compete with the comfort of the car, so we set out to ensure public transport is safe, modern, reliable, accessible, and accommodates the needs of each passenger.

First of all, we have been upgrading our vehicle fleet. Since 2010, we have purchased more than 8,000 new ground transportation vehicles and 1,600 new metro train cars,

¹ "TomTom traffic index: Moscow," TomTom, accessed December 4, 2017, www.tomtom.com/en_gb/trafficindex/city/moscow.

all manufactured domestically. By the end of 2017, the share of new train cars being used on the metro will reach 37 percent, and ground transportation vehicles will be at 90 percent. Today, the average age of urban buses is less than five years, and 98 percent of our ground transportation vehicles are accessible to disabled passengers. The Moscow metro offers a special assistance service, and there are also “social taxis” to help the elderly and the disabled navigate the city.

Second, we have implemented several modern services found in the best transportation systems in the world, including electronic ticketing systems, a city bicycle system, bus lanes, and a regulated taxi industry. Today, more than 85 percent of trips on public transport are paid for with Troika transport cards, which were introduced in 2013 and enable seamless transfers between all types of surface transport. In 2017, Muscovites made 2.3 million city bicycle trips, twice as many as in 2015. Bus lanes ensure that public transport vehicles are given priority in traffic, which has improved the regularity of bus service in central Moscow; annual full-fare trips on surface transit increased from 586 million in 2010 to one billion in 2017. And thanks to high competition and legalization of the market, Moscow’s 47,000 legal taxis have seen a 16-fold increase in ridership since 2010.

Third, we have been focused on using data to improve the passenger experience and inform our public transport investments. In addition to helping streamline private car usage and traffic conditions, we use the ITS to collect an extensive data set on bus passenger boarding and alighting, frequency and speed, and load on roads and hubs. Mobile data and tracking systems give us an accurate picture of each bus’s movement. This informed our launch of a new bus route network called Magistral, which has given the more than 900,000 people working downtown access to an efficient alternative to metro travel that would require line changes.

Fourth, we sought to improve connectivity between city districts and relieve the load on metro and train stations by building the Moscow Central Ring, which encircles the city center and connects all of our metro rail lines. Within one year of operation, passenger traffic on this circular railway reached 400,000 trips per day.

Finally, we recently introduced a smart closed-circuit television (CCTV) system to ensure passenger safety. The CCTV automatically records and detects potentially dangerous situations, from unusual crowds to lost or abandoned items, and can even recognize faces. We anticipate that the new security system will provide a tenfold improvement in emergency response times for Moscow metro employees.

As a result of these efforts, Muscovites are making the public system their main mode of transport; the number of full-fare trips taken annually increased from 1.9 billion in 2010 to 2.8 billion in 2017. And today, intervals between trains during peak hours on the busiest lines are at 90 seconds, which keeps the system running smoothly. This indicator is a record among the world’s major underground systems.² Indeed, according to a 2016 study by Community of Metros (CoMET), an independent international association, Moscow has one of the world’s top three metro systems for passenger satisfaction with real-time information.

² Alexey Timofeychev, “18 little known facts about the Moscow Metro,” *Russia Beyond the Headlines*, January 19, 2016, rbth.com.

McKinsey: *How do you collect passengers' feedback on their experiences of using transport, and how you use this feedback to help make decisions?*

Maksim Liksutov: No initiative is implemented without considering the views of Muscovites. Moscow has two service centers that receive questions, suggestions, requests, and appeals from more than 5,000 people every week through telephone, internet, or personal contact. We also process all inquiries and suggestions submitted through social media networks.

Our latest tools for interaction with citizens are city transportation network mobile applications, which Muscovites have downloaded 3.5 million times. The apps can be used to plan a trip using public transportation, pay for parking, and find the nearest bike rental station. The "Moscow Assistant" app even allows residents to register parking violations. About 200,000 residents use the app, and more than 230,000 fines were created in 2017.

At the same time, we are constantly improving our data handling with the goal of anticipating the wishes of Muscovites. We use the same advanced analytics and data processing methods as mobile operators and leading internet services. But unlike these groups, we work with a large volume of diverse data that come from metro and bus trips, photo and video recordings of violations, vehicle tracking, tracking of mobile applications, and Wi-Fi use. With this data in hand, we process feedback from passengers and provide relevant and up-to-date information on city events. We can also change the route network, for example, if we see there is a new hub of activity in the city that needs public transport service. We have just started to develop the mechanism, and much remains to be done in this regard.

McKinsey: *What are the main problems that arise in the process of smart-city management and use of big data?*

Maksim Liksutov: Data protection is a primary concern in the management of any smart city. The introduction of smart technologies involves many risks, and we want to provide the most reliable protection available. This month, the Moscow Center for Traffic Management set up a new protective barrier for the virtual infrastructure of the ITS, including a set of advanced software protection measures that ensure full security. Now our ITS is defended by modern, cyber software and endpoint protection. The solution minimizes the risk of malicious software penetrating the city's databases and protects against leaks of confidential information and personal data.

McKinsey: *What is your vision of Moscow in 2025? How does it fit into the global landscape of smart transport technology?*

Maksim Liksutov: To start, we are committed to continuing to increase the convenience of ticketing and payment methods for public transport, exploring methods such as wearable ticketing technology.

In the realm of personalized travel, we recently began testing a new method of pushing information to metro passengers. Given the data obtained from Troika cards, we can recommend to each individual passenger the most convenient ways to use the city's public transport system (custom-made transport). We hope that in future, personalized information provision will become a convenient tool for managing passenger traffic, and the opportunities of big data will contribute to comfort and safety of Muscovites.

We understand that public transport plays an important role in reducing air pollution and creating a healthy city. As such, in the coming years Moscow intends to become the world leader in the development of electric public transport. With the city's buses carrying millions of people a day, procurement of an ecofriendly and comfortable fleet is a top priority. We will phase in electric buses over the next few years, and in 2021, Moscow will stop purchasing diesel buses, opting instead for an entirely electric fleet.

And of course, we will continue to create a more convenient route network that stays ahead of Muscovites' needs by providing buses and adding routes and stops based on what users say and technologies reveal are most needed.

McKinsey: *What advice do you have for other city leaders?*

Maksim Liksutov: I am not in a position to give it; every city, especially a megacity, is unique. Since we started reforming our transport system later than most world capitals, Moscow has had the opportunity to learn from and apply the experience of cities such as Beijing, London, Singapore, and Tokyo. We are working to implement the best solutions available across the world—and I know other city leaders are working to learn from one another and do the same for their home town. 

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Smart city resilience: Digitally empowering cities to survive, adapt, and thrive

In the age of the smart city, leaders must adapt their resilience strategy to match their evolving risk profile—otherwise they risk building a smarter but more fragile city.



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City leaders around the world are abuzz with the profound potential of incorporating smart technologies into everything from their transport infrastructure to water systems to power supply and, of course, to government services. Indeed, smart cities are beginning to come to life in various forms. However, as cities increase their digital dependency, their potential information and communications technology (ICT) attack surface expands dramatically. Cities might be smarter, but without a thorough understanding of cyber resilience, physical and digital crises could be more severe and disruption more sustained than ever before.

Cybersecurity plays a critical role in mitigating shocks and stresses by protecting the confidentiality, integrity, and availability of data and data-enabled infrastructure. However, security alone is not enough. *Cyber resilience* goes a step further by ensuring that ICT systems continue delivering services in the event of a security breach. For cities, cyber resilience can be understood through their capacity for readiness, response, and reinvention. Efforts to build cyber resilience are critical to both surviving and potentially even thriving in the face of cyberattacks or physical disasters.

Indeed, resilience can make a huge difference in the wake of a cyberattack; consider the UK National Health Service, which suffered a ransomware attack last year. But the hospital system had built in enough redundancies, backed up their data, and stayed on top of software updates so that they were able to continue functioning with only a slight delay. Their resilient data and security practices ensured they could continue operations even in the face of an attack.¹ On the flipside, a similar attack on several companies across the globe resulted in losses of millions of dollars due to significant business interruption.

Almost every city is strapped for cash and assets, however, and city managers around the world are struggling to balance investments in cyber resilience with a wide range of other pressing needs. It is essential that city leaders begin to focus less on balancing investments and more on ensuring they are making the *right* investments—ones that are built on a foundation of knowledge about the city’s unique threats, priorities, goals, and resources, as well as gaps in critical cyber resilience personnel.

The first steps toward cyber resilience

Cities will never be 100 percent “secure,” nor can they avoid danger entirely. But they can be resilient in the face of a wide range of stresses and shocks by making the right investments, in both the physical and cyber domains, to prepare for crises, react to restore normalcy, and learn from and adapt to the new status quo.

While city leaders tend to have a solid understanding of the physical threats facing them—from earthquakes to terrorism—their understanding of how to mitigate against cyber risk is often spottier. Building cyber resilience requires a profound shift in the way cyber threats are dealt with and assets protected—from focusing on breach prevention to understanding that cybersecurity failures will happen and that quick and efficient recovery capabilities

¹ Joseph Cox, “Ransomware targets UK hospitals, but NHS won’t pay up,” Motherboard, August 30, 2016, motherboard.vice.com.

are needed. In working with cities and governments around the world, we have found the following steps can help public sector agencies—and the many partners on which they depend, from private sector vendors to nongovernmental organizations—ensure that they are ready to respond effectively during and after a crisis.

1. Hire a knowledgeable resilience expert to lead the effort.

According to 100 Resilient Cities, an initiative dedicated to helping cities become more physically, socially, and economically resilient in the face of threats, one step cities can take is to hire a chief resilience officer.² Most cities today do not yet have the necessary personnel to build an effective strategy. As such, it is important as a first step to hire a manager with relevant experience who will be able to ask the right questions, examine how agencies are currently operating, and design a strategy that takes into account the city's unique situation.

2. Identify key threats and assess their potential impact on critical cyber systems and functions.

Every city is different. Understanding the significant and unique cybersecurity threats to a particular city, as well as their potential impact, is vital for ensuring that the city can effectively respond to them. For example, a city that is heavily reliant on bridges for egress will face different resilience questions for its traffic systems than one with more dispersed roadways. This clarity allows the city to identify and plan for the levels of cybersecurity efforts and investments needed.

3. Classify and prioritize critical services.

Every city relies on critical services and sensitive information that, if compromised, damaged, or destroyed, would dramatically impact the city's ability to function. Those have to be identified and then prioritized, which often involves tough tradeoffs, but it is essential for the city to be able to effectively respond in a crisis. For example, in the United States, the National Institute of Standards and Technology (NIST) offers authoritative resources, including “Standards for Security Categorization of Federal Information and Information Systems” and the “Protecting Critical Infrastructure Cybersecurity” framework, which can help cities make risk-based security decisions.³

4. Set cyber resilience goals.

Once threats and critical services are identified, the city needs to set its vision for cyber resilience. On that foundation, it can embark on a collaborative effort to set goals that describe the specific objectives they want to achieve. These goals might include ensuring the city has an effective open-data platform that can provide information to first

² Michael Berkowitz, “What a chief resilience officer does,” 100 Resilient Cities, March 18, 2015, 100resilientcities.org.

³ Both the standards and the framework are available at nist.gov.

responders during emergencies (acute shocks) or helping nonprofits better meet city residents' needs on a daily basis (constant stressors).

5. Develop desired cyber resilience outcomes for a crisis.

Unfortunately, we live in a world where it is not a matter of if these events will happen, but when. It's essential, therefore, that cities specify the desired outcomes for the city after a crisis and then identify the capabilities necessary to respond to those events. In the physical world, cities at high risk of earthquakes have established service-level agreements with their citizens—for example, they know what percentage of buildings can be cleared by rescuers within 24 hours. The same such outcomes and agreements should be built for cyber risks.

6. Determine the resources needed and define roles and responsibilities.

Finally, the city needs to look at their key threats, priorities, goals, and outcomes and identify what resources are required to deliver the cyber resilience vision. The effort should look across people, skills, technology, and funding, as well as map the responsibilities for actions that need to be undertaken both as a matter of course and in the event of a cybersecurity breach.

How Rotterdam is taking the lead on building cyber resilience

Only a select few cities have begun to think about cyber resilience as a priority for overall resilience. One of these is Rotterdam, the Netherlands' second-largest city. Taking its inspiration from the municipal motto of “stronger through struggle,” Rotterdam developed the first-ever city cyber resilience strategy. Given the central importance of the port to the city's economic well-being, the strategy emphasizes security of port-related ICT assets and cooperation between the public and private sectors to achieve long-term resilience goals. But the plan goes beyond a traditional approach to protecting critical infrastructure and tries to promote more cyber-based innovation, specifically calling on citizens, companies, and organizations to maximize their knowledge and technology use to increase resilience.⁴

Indeed, as cities develop resilience capabilities, they typically become more aware of how many of their resilience efforts depend on well-functioning ICT. In Rotterdam and other cities, managers rely on ICT every day, from making policy decisions to ensuring daily operations run smoothly. That remains true in a crisis. Online services play a critical role in city management but need their own resilience efforts—and this is where cyber resilience comes in. Though it has yet to be tested by an attack, the Rotterdam strategy is the first of its kind and may eventually offer a model for cities wishing to not just survive but thrive in the face of 21st century challenges.

⁴ Rotterdam resilience strategy: Ready for the 21st century, Gemeente Rotterdam and 100 Resilient Cities, 2016, resilientrotterdam.nl.

Cyber resilience is a journey, not a destination

Today Rotterdam is one of the few cities that has embraced cyber resilience; others have begun the journey but still have a long way to go. The novel approach to increasing cyber readiness of cities has only been enabled by recent technological innovation. Moreover, it is not easy to implement, as it requires cities to think, organize, and operate differently. It is even more difficult to measure, given its focus on being prepared for a crisis—which, when it comes, will not play by anyone's rules. Cyber resilience is nevertheless necessary as we continue our march toward a smart city future.

Embracing cyber resilience will not just ensure cities are more secure, it will create opportunities for cities to build comprehensive, long-term strategies that set them on a path toward digital transformation. These, in turn, will promote a culture of innovation, generate new avenues for investment, and contribute to vibrant and economically competitive cities. 

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Photo credit: Fu Siyan

Yangpu waterfront: From rustbelt to brainbelt

Plans are afoot to transform this Shanghai district into a world-class innovation hub. Here's how leaders hope to overcome challenges in an emerging city and bring their vision to life.



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Flanking the Huangpu River in the north east of downtown Shanghai, Yangpu is a locality where history rubs shoulders with modernity and tradition sits alongside innovation. Once dominated by heavy industry, Yangpu is now a center of commerce and hi-tech. Today, it is the focus of a government initiative to “relentlessly enhance Shanghai’s influence and competitiveness in global technology innovation and industrial transformation.”¹

China is advancing its openness and innovation strategy through policy initiatives at the national and regional levels, which ultimately shape decision making at the individual firm level. The country’s ambitious Belt and Road Initiative focuses on connectivity and cooperation between Eurasian countries and seeks to link some 65 percent of the world’s population via economic and infrastructure routes. In Shanghai, Yangpu is the beating heart of this global vision, and plans are afoot to transform the district into a world-class innovation and creative hub—a three-stage project spanning ten years.

Bringing the vision to life in Yangpu

By the end of 2020, the plan is for more than 100 innovation companies in intelligent manufacturing, digitization, and fintech to create 50,000 job opportunities on the Yangpu Waterfront. Its leaders hope to combine existing and newly developed infrastructure to offer:

- An innovation hub that attracts global resources
- A platform on which urban life will thrive
- A practice platform that prioritizes post-industrial transformation

This ecosystem will be jump-started in part through planned Sino-German cooperation that hopes to attract the next wave of manufacturing headquarters, establish German companies in China, and foster small and medium enterprise collaboration with a focus on smart manufacturing, digital technology, and creative design. Industry 4.0 initiatives will be central to this plan—involving the widespread adoption of data, analytics, automation, and advanced materials as part of a global manufacturing model, including manufacturing in Yangpu.

The second phase of development, slated to take place between 2021 and 2025, plans for further international collaboration at industry, technology, and educational levels. By 2030, Yangpu aims to be a world-renowned hub for creativity, commerce, and invention that is home to upwards of 15 Fortune 500 Industry 4.0 players, with more than 170,000 employed by innovative businesses. This vision calls for the local economy to rank among the top ten localities for doing business, while the number of patent applications per 10,000 people will rise from 3.3 to more than 100.

¹ The 8th Plenary Session of the 10th Shanghai CPC Committee.

Meeting challenges with solutions

There are, of course, challenges—not least that Yangpu Waterfront must compete on a global stage with other world-class cities to attract talent, inward investment, and employment opportunities. The strategy is to build on the area’s industrial legacy and establish an innovation ecosystem with a focus on Industry 4.0. This smart, sustainable, and sharable community will seek to attract and retain creative talent, entrepreneurs, and innovators with smart city solutions.

It will be equally essential to overcome the challenge of positioning the locality as “future-oriented” while retaining the district’s historical heritage. Development will in large part be informed by the need to establish an attractive living and working environment that balances commercial and residential priorities—essentially building an environment where innovators can live, work, learn, and play. Policy decisions will seek to facilitate this: for instance, qualified foreign professionals working for technology companies will be eligible for permanent residency.²

Last but not least, there is the challenge of how to provide affordable housing to accommodate young talent in a waterfront area where the average housing price is above \$12,000 per square-meter—exceeding prices in cities such as Dubai, Stockholm, or Sydney.³ This will involve creating modern living solutions for the younger generation: for example, creatively renovating abandoned warehouses and factories to provide rental apartments or lofts with shared facilities such as communal kitchens, gyms, living rooms, and even libraries. More than 60 percent of these new Yangpu dwellings could be based on this co-sharing model, creating affordability and accommodating more residents.

Key themes for emerging cities

What can other cities learn from this project? In practice, this vision is founded on three principal themes: targeted talent—especially “boundless innovators”; a focus on options that can grow a cluster of Industry 4.0 specialists; and smart city solutions that optimize the living and working environment.

Targeted talent. This will be underpinned by programs to attract talent, supported by education initiatives designed to build relevant skillsets and enhance global knowledge sharing. Planned initiatives include introducing China-Germany experimental schools, with a focus on practical skills, access to nature, personalized teaching, team learning, mental and philosophical education; top-tier business and engineering schools; and “smart sharing” events to encourage lifelong learning. These will go hand in hand with a new entertainment economy—theaters, shopping malls, and virtual reality spaces—to attract the right demographic.

Industry 4.0 focus. Themes include smart manufacturing, digital technology, and creative design. The goal is to build an open innovation platform linking top-notch innovation resources across the world, informed by initiatives such as Singapore’s Project Lighthouse, which involved

² South China Morning Post, <http://www.scmp.com/business/banking-finance/article/2081545/shanghai-municipality-yangpu-unveils-y12b-worth-start>

³ Global Property Guide, <https://www.globalpropertyguide.com/most-expensive-cities>

the development of a digital capability center (DCC) that dovetailed into A*STAR's Factory of the Future, a private-public partnership allowing local manufacturers to learn, test, develop, and scale Industry 4.0 solutions in manufacturing lines.

Future urban life model. Yangpu plans to work with solution providers to build an "intelligent future city." Smart city initiatives will incorporate low-carbon solutions and intelligent infrastructure to extend across buildings, transportation, and the landscape to include services, energy, waste management, and wider environmental perspectives. Both health and education services will benefit from smart technology, while environmental management will include real-time environment monitoring, as well as all-round diagnosis of energy consumption, carbon emissions, and water management. Smart technology will power and control lighting, automatically monitor building energy consumption, optimize

Yangpu Waterfront at a glance

Located in the east Yangpu district on the west bank of the Huangpu River, the Yangpu Waterfront Innovation Zone is approximately 10 kilometers from the downtown area of People's Square and is potentially well connected, being 25 kilometers from Shanghai Hongqiao International Airport and 35 kilometers from Shanghai Pudong International Airport; it extends over 463 hectares and is home to some 100,000 inhabitants. Subway Line 18 (under construction) runs through the zone, while Line 4 and 12 run close to it. The zone is connected to the opposite river bank via three ferry lines, a bridge, and three tunnels.

The northern Yangpu district boasts three of China's most distinguished universities, Fudan University, Tongji University, and University of Shanghai for Science and Technology, as well as the Shanghai University of Finance and Economics and the Shanghai University of Sport. Yangpu has 20 technology parks that are home to 6,700 start-ups.¹ The wider Yangpu district has a population 1.3 million and reported 8.1 percent economic growth in 2016, outpacing Shanghai's GDP growth of 6.8 percent.

¹ South China Morning Post, <http://www.scmp.com/business/banking-finance/article/2081545/shanghai-municipality-yangpu-unveils-y12b-worth-start>

interior energy management, and automate fire protection and security. Meanwhile, smart transport management systems will extend to congestion forecasting and dynamic signal optimization, vehicle identification and congestion charging, public vehicle management, and smart parking.

Many of these concepts are applicable to emerging markets in Asia, Africa, and South America, where cities often face similar challenges and global pressures. For example, urban districts emerging from the first round of industrialization may lag behind more recently developed areas in terms of attracting innovative industries and young talent. Building on this, it should be noted that many emerging-market cities are in competition to develop as regional or global innovation hubs. Yangpu underlines the prerequisites for

success: developing an ecosystem for young talent to work, live, learn, and play within a more cohesive neighborhood. Finally, the innovative co-living initiatives in Yangpu Waterfront demonstrate a way to reconcile the need to attract young talent to city environments with the skyrocketing real-estate prices that threaten to exclude them.

Innovative solutions to environmental issues are prominent in Yangpu Waterfront's vision as it seeks to balance a commercial future founded on technology with its heritage cityscape. Building and maintaining a living and working environment that attracts young, dynamic talent is crucial. And smart infrastructure and systems will tackle issues such as congestion, pollution, and employment, while providing health systems and an educational environment in line with the city's physical and economic growth aspirations. With these stepping stones in place, Yangpu—and emerging cities worldwide—could pave the way toward the global urban landscape of the future. 🌐

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Photo courtesy of Sidewalk Labs

Dan Doctoroff on how we'll realize the promise of urban innovation

To prepare cities for the future, we need to develop and deploy the services that will power them. It will take political courage, foresight, and coordination.



Dan Doctoroff

CEO,
Sidewalk Labs

A convergence of digital technologies—location services, sensors, the Internet of Things—is reaching critical mass of acceptance in the digital world such that they will soon be deployed in physical spaces. But many barriers exist—including “not in my backyard” mentalities, bureaucratic misalignment, privacy concerns, a lack of funding that is only intensifying, and a lack of understanding of what’s possible. In this Q&A, former New York City Deputy Mayor and current Sidewalk Labs Chairman and CEO Dan Doctoroff discusses what it will take to improve future cities—from political courage to flexible infrastructure that acts as a platform for development.

McKinsey: *Sidewalk Labs is working with cities to develop ideas through teams of urbanists and technologists. What promising or exciting learnings can you share from these endeavors?*

Dan Doctoroff: Our hypothesis is that a combination of technologies, thoughtfully applied and integrated, can fundamentally alter nearly every dimension of quality of life in an urban environment. To get there, we’ve surveyed innovations across a range of domains—mobility, infrastructure, buildings, public space, social and community programs, even governance—that are available today or will be soon. We’re convinced that by implementing a set of technologies—autonomous vehicles, modular building construction, or new infrastructure systems—we can, for example, reduce cost of living by 15 percent. With new mobility services and radical mixed-use development that brings homes near work, we can give people back an hour in their day. With new materials and weather-mitigation technology, we can improve the usability of outdoor space in a cold climate. With adaptable loft structures and outcome-based codes, we can make buildings dramatically more flexible.

McKinsey: *How will Sidewalk Labs bring this future to bear?*

Dan Doctoroff: We have just announced a new partnership with Waterfront Toronto to develop the city’s Eastern Waterfront in a way that could serve as a model for what this set of technologies across all these different dimensions could actually produce in a real place. We’re calling this joint venture Sidewalk Toronto, and we want to achieve five objectives:

1. Build the most innovative district in the world.
2. Demonstrate that we really can meaningfully improve quality of life.
3. Prove that this type of urban space is a place that people want to live and to which employers want to relocate.
4. Show that this can be a platform for urban innovation clusters on which people can develop new products and services.

5. Prove that this is replicable in other neighborhoods in Toronto and cities around the world. We don't expect somebody to lift up the idea and plop it down in another location, but we do hope to serve as a model. Cities are eager to learn from other cities. I saw this when we opened up the first section of New York's High Line in 2008; within a year, there were 36 "High Lines" under development around the world. And we believe that if we thoughtfully document what we're doing here, and obviously assuming that we're successful in achieving these quality-of-life benefits, other cities will begin to take greater risks in deploying these ideas.

Of course, it will take time; we're talking about something that could eventually house as many as 100,000 people—and maybe as many jobs. For that sort of absorption, you're talking 15 to 20 years, which really is not a long time in the world of infrastructure development. Consider that we laid the groundwork for New York's Hudson Yards, the largest private real estate development in US history and the largest NYC development since Rockefeller Center, in the city's Olympic bid back in 1996. In that case, we saw the Olympic Games as a catalyst for getting things done that were politically impossible or financially unfeasible by getting deadlines in a globally significant, competitive process.

McKinsey: *What type of political leadership is required—at a national, state, and metropolitan level—to enable innovation and transformation at scale in cities?*

Dan Doctoroff: At all political levels, it's going to take visionary leadership that understands the potential and has the technical capacity to evaluate both the gains and risks at stake. More importantly, political leaders need the courage to overcome the natural resistance that comes with any changes. I'll give you an example: In 2007, when I was deputy mayor of New York, we made a proposal for congestion pricing. London has it, Singapore has it, Stockholm has it. We thought it was a no-brainer for Manhattan, because every analysis we did found that only 5 percent of commuters from the outer boroughs drove into Manhattan. The other 95 percent took mass transit. Under our proposal, each member of that 5 percent would pay \$8 for crossing into and out of Manhattan between 8 a.m. and 8 p.m., and the funds we raised would be completely dedicated to improving the mass transit system.

We could not get it done. The 5 percent squawked louder, and the decision makers in the state legislature listened to them. In the end, it's harder for people to appreciate a positive than it is to fear a negative, particularly when those benefits—train station upgrades and enhanced bus service, for example—are harder to describe.

So you need leaders who are capable of analyzing the problem, understanding the technology, and communicating the benefits and the costs in an honest way—and who are willing to take the political heat from some percentage of the population. That courage is unfortunately not as common as we'd like.

McKinsey: *Technology has a dramatically shorter lifecycle than most infrastructure assets, which are often built to last 100 years or more. How can we ensure that infrastructure will*

be able to adapt to new tech developments, scale rapidly, and accommodate market disruptions?

Dan Doctoroff: You have to plan and design the infrastructure so that it is as flexible as possible. We use the analogy of the smartphone as a platform. What makes the smartphone magical is not necessarily the hardware, which evolves over time with new releases, or the software, which is upgraded every few months. It's really the fact that there are millions of application developers who are using the infrastructure to create something that no one imagined before.

You have to think about the city as a platform. The hardware equivalent is the traditional infrastructure—the roads, utilities, and now digital infrastructure. The infrastructure itself must be as modular, replaceable, and upgradeable as possible. For example, take utility networks in cities. Today, if you want to change or update a utility, you have to dig up the streets, which is very disruptive to pedestrians and traffic and very expensive. But if you designed a city with accessible utility channels, you could make it easier and cheaper to upgrade utility networks and reserve space for new types of connections we haven't yet imagined. Then you need design guidelines to bring coherence and consistency. Finally, you need some launch applications to make the place inhabitable at the beginning, such as traffic management systems or air-quality monitoring systems. But you can't view this as a top-down exercise in creation. What makes it work is thousands of businesses, local organizations, researchers, and others building on top of the platform, responding to or anticipating new tastes, technologies, and needs, keeping it current and always evolving.

McKinsey: *Cities worldwide are facing massive supply constraints—from housing to education to transportation. How can technology help ensure equitable access to the resources and improve livability? How do we ensure people aren't left behind?*

Dan Doctoroff: New technologies offer the potential to reduce inequality on multiple levels. The work that we've done, particularly in housing and transportation, indicates that you can meaningfully reduce the cost of living, improve health outcomes, and increase access to opportunities. For example, consider that today, 30 to 40 percent of the average American city is consumed by roadways and parking. If you can carve that back by half, which we believe is possible if autonomous transit fleets take hold, then you create meaningfully greater open space, which improves access to the outdoors and creates new opportunities to build housing. And that's just one technological advance—a significant one, but there are so many more. 

[Dan Doctoroff is the chairman and CEO of Sidewalk Labs. His book, *Greater than Ever: New York's Big Comeback*, was released in September 2017.](#)

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Photo courtesy of TaKaDu

How the water industry is going digital to boost efficiency

Water scarcity is a problem worldwide—but improved water-supply networks are starting to make a dent in the problem.



Amir Peleg

Founder and CEO,
TaKaDu

Water scarcity is undoubtedly one of the key issues facing the world today. Research published last year in [Science Advances](#)¹ concluded that four billion people worldwide (two-thirds of the global population) are affected by severe water scarcity for at least one month of the year. What does this mean? Nearly a billion people currently have no access to clean, safe drinking water. And this shortage doesn't only affect rural areas. While urban areas are more likely to have water-supply networks, increasing urbanization in both emerging and advanced nations is straining water supply. And the problem is likely to worsen: a United Nations report predicted that by 2030, global water demand will outstrip supply by 40 percent.²

Several factors contribute to a rising demand for water, including population growth, climate change, and changes in global lifestyles such as increased consumption of grain, meat, and cotton clothing, all of which have a high “water cost.” Furthermore, there's evidence to suggest that vast quantities of water are wasted. The World Bank estimates that utilities worldwide lose about 25 to 35 percent of their water due to leaks and bursts.³ And Bluefield Research estimates that in Europe alone, utilities lose more than \$10 billion annually to this nonrevenue water (NRW).⁴

The good news is that new technologies can help utilities and cities to better manage both demand for, and supplies of, clean water.

The benefits of connecting the water grid to smart-city infrastructure

A smart city is often described as a “system of systems,” where the Internet of Things (IoT) and analytics converge with traditional infrastructure, buildings, and 24/7 operations. Smart cities use IoT and analytics capabilities to reach operational efficiency and improve service levels, sustainability, and economic vitality. In other words, in a smart city, previously siloed sectors such as power, transport, emergency management, and water all work in sync.

While cities around the world have made significant strides in digitizing other areas of infrastructure, including transport and energy, most have yet to connect their water supplies to their smart-city strategies and systems. But the existing threat of scarcity—and the knowledge that it will get worse—should push more cities toward smart water-management systems. In many cases, such digital technologies have real potential to transform the way cities manage water by reducing water loss and improving efficiency, water conservation, and customer service.

Smart water-management systems accomplish these goals by increasing network visibility, facilitating predictive maintenance, and ensuring faster response times for

1 Mesfin M. Mekonnen and Arjen Y. Hoekstra, “Four billion people facing severe water scarcity,” *Science Advances*, February 2016, Volume 2, Number 2, advances.sciencemag.org.

2 Policy options for decoupling economic growth from water use and water pollution, United Nations Environment Programme, March 2016.

3 Tony Freyberg, “Water leakage? Look to the clouds,” *Water and Wastewater International*, Volume 27, Issue 2, www.waterworld.com.

4 Leakage management in Europe: Water utilities develop multi-vendor strategies, Bluefield Research, April 2017, bluefieldresearch.com.

events such as leaks, bursts, operational failures, quality incidents, and changes in water pressure. Bluefield Research forecasts that the US municipal water sector will spend more than \$20 billion on software, data, and analytics solutions over the next decade, with similar spending levels in Europe.⁵

Israel is an example of how water technology can revolutionize the sector. The country's developments in this area were highlighted in a recent study by the World Bank Group, which noted, "In recent years, with the advent of information and communications technologies, many high-technology concepts have penetrated the [Israeli] water sector, such as algorithm-based leak detection and cloud-based fixed leak detection."⁶ Israel used to be one of the world's most water-stressed countries, but as a direct result of technology-enabled water management, it is now actually selling water to its neighbors.

Case studies: Transforming data into knowledge

Unitywater, a water and sewage utility in Queensland, Australia, set out to establish a smart water grid in 2013. Its goals were to improve network visibility and efficiency, reduce water loss, and save energy costs. Unitywater set up district metered areas, or closed-supply zones, and deployed real-time sensors such as flow meters, water-quality sensors, and pressure gauges, which record measurements every couple of minutes and constantly transmit the data to a central server. Unitywater then began working with TaKaDu, whose cloud-based event management solution uses big-data analytics and predictive algorithms to save the utility from drowning in that data. The solution allows Unitywater to compare network and asset performance and prioritize events against specific indicators. With greater network transparency, Unitywater established a dedicated team to collect information on events, such as bursts, faulty assets, and hidden leakage, to improve early leak detection and repair cycles.

The system's implementation resulted in a huge reduction in water loss; the utility achieved an estimated AU \$16 million (US \$12.3 million) in savings over a three-year period by plugging underground leaks and preventing 6.5 billion liters of water loss.⁷ In addition, the system has helped improve customer service through faster response rates to incidents and increased network uptime. With greater insight, contact-center staff can respond to customer inquiries and issues about water supply and water pressure quicker and more accurately than before.

US utilities are also looking at data-driven solutions for water efficiency; for example, in early 2017 the Knoxville Utilities Board (KUB) in Tennessee took steps to improve customer service and reduce NRW. KUB created district metered areas within its water distribution system to partition the network and added sensors and meters to monitor pressure and flow. This process allowed KUB to gain near-real-time analysis and alerts for network incidents. As the number of sensors grew, KUB switched to TaKaDu's cloud-based solution to manage an increasing volume of data, yielding greater levels of network visibility.

⁵ U.S. smart water: Defining the opportunity, competitive landscape, and market outlook, Bluefield Research, bluefieldresearch.com.

⁶ Philippe Marin, Shimon Tal, and Joshua Yeres, Water management in Israel: Key innovations and lessons learned for water scarce countries, The World Bank working paper, Number 119309, August 2017, documents.worldbank.org.

⁷ "Unitywater teams up with TaKaDu to make cloud-based network monitoring a reality for small water utilities," Water Online, May 4, 2016, wateronline.com.

The digital future for water

When it comes to operational changes, the water industry is known to be conservative, slow, and risk averse. This reluctance partly stems from the noncompetitive nature of the water industry, among other factors. Too often, utilities only address shortages when a crisis hits. And although some regulators are beginning to push utilities toward improved customer-service practices, many still fail to put the customer and efficiency at the center.

However, digital water-management tools represent a paradigm shift for the water industry from being reactive to being proactive and optimized. This shift is analogous to the adoption of customer relationship management (CRM) technology within retail industries such as banking and mobile phones—which completely revolutionized the way those companies deal with customers.

Water utilities recognize that water is a crucial commodity and are beginning to harness the vast quantity of network data available to improve customer service, reduce water loss, and improve water efficiency. Looking forward, utilities can more efficiently serve their customers through better business decisions influenced by this data and uncover ways to connect to other systems—traffic, energy, and so forth—that are sprouting up in increasingly smarter cities. 

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Photo credit: Igor Ovsyannykov

Combating the challenges of urbanization in emerging markets: Lessons from India

India's smart-city program offers a road map for cities working to prepare for mass urbanization with limited funds.



Suveer Sinha

Partner,
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In the next 15 years, about 200 million people will move from rural areas in India to the country's urban centers. The shift will be massive, almost equal to the current populations of France, Germany, and the United Kingdom combined. While urbanization increases productivity and improves GDP per capita over the long term—by 2030, urban centers in India will generate nearly 70 percent of the country's GDP¹—it also causes significant pressure in those urban centers. How can these cities plan to accommodate the growing population in terms of living space, jobs, and transport?

Government data estimates that India's cities would need \$1.2 trillion in capital funding over the next 20 years to keep up with the demands of their growing populations. But the country has nowhere near that amount to spend: India requires around \$134 per capita to support urbanization capital expenditure (capex), but it actually spends around \$20 per capita.² This discrepancy has caused several problems: only 30 percent of sewage is treated, 24 percent of the urban population lives in slums, public transit usage is declining, and almost half of all city drivers spend more than 12 hours a week stuck in their car.³

And India is not alone in these struggles. Cities in many emerging markets are also facing similar strain as people flock to work and live in urban centers.

At first, it may seem counterintuitive to suggest that these cities, struggling to keep up with even their citizens' most basic needs, should begin building themselves into smart cities. This is where it becomes important to broaden the definition of smart cities and not restrict it to implementation of just technology solutions. The right effort to make a city smart will incorporate a focus on sustainability, resource productivity, economic development, and job creation, as well as getting basic core infrastructure right to enable decent quality of living.

Several lessons for emerging markets around the world are to be found in India's Smart Cities Mission, the government's high-profile program to help its urban centers combat the challenges of urbanization. The program aims to assist several Indian cities in kick-starting urban renewal. While the program's capex expenditure will fall short of the \$1.2 trillion required to keep pace with urbanization, it's an important start and offers several best practices for city leaders in emerging countries.

Engage citizens early and often

With limited funds, it is critical that cities use their money to solve the challenges that citizens are most concerned about. Thus, efforts must begin with a comprehensive citizen engagement initiative. Under India's program, every city identified one or two core pan-city issues that it would like to solve. Different cities across India chose mobility, governance, water, energy, security, and solid waste management as their top themes. For example, while Pune selected mobility and water as the main pan-city themes, Bhubaneswar selected intelligent city operations. Most cities that came out on top of the

¹ "India's urban awakening: Building inclusive cities, sustaining economic growth," McKinsey Global Institute, McKinsey.com.

² *Ibid.*

³ Jaspal Singh, "City public transportation developments in India," *Intelligent Transport*, December 14, 2016, intelligenttransport.com; Amit Jain, "India loses billions of rupees to traffic jams. Is ride-sharing the solution?," World Economic Forum, October 6, 2016, weforum.org.

competition engaged extensively with residents to identify their core concerns. By asking citizens for their input from the very beginning, the program ensures citizen support later in the process—though this support also depends on maintaining two-way communication with citizens. City authorities must share updates on a regular basis while seeking input on progress, the quality of execution, and new ideas.

Use competition to improve quality of planning and to encourage innovative funding sources

The Smart Cities Mission granted funding to cities based on project proposals submitted by each city. The competition between cities resulted in high-quality submissions that identified specific objectives and resources and were aligned with citizens' expressed priorities. While every city was given seed capital from the government, they were encouraged to come up with innovative sources of funding to bridge the gap between this seed capital and the money needed to fulfill their plans. These source ideas included land monetization, public-private partnerships, and other sources of revenue like developmental charges.

Think beyond technology

While technology is a primary driver of India's smart-city development efforts, the government also encourages cities to think about development more holistically. Each city came up with a plan to develop a relatively small area (approximately 1,000 acres) and improve its living standards by addressing core infrastructure challenges such as water access, solid waste management, and open space. For example, Kochi devised a plan to retrofit seven square kilometers of land, linked throughout by waterways. This plan included the creation of seamless multimodal transportation, the renovation and renewal of open spaces, and the inclusion of essential public services such as sanitation, water, and waste management.

This approach had a threefold effect: citizens and city authorities imagined, for the first time, how a relatively small area could be developed and revitalized to achieve higher standards of livability; funding sources were more accessible for planning these pockets of land, given their smaller size; and citizens were more compelled to pay for these developments via betterment levies once they witnessed the real benefits of these neighborhoods.

Move rapidly on quick-win projects while keeping an eye on core issues

Identifying and rapidly executing quick-win projects is critical to building momentum and winning citizens' confidence. In India, leading cities identified and implemented a set of quick-win projects such as rejuvenating urban spaces, redesigning streets, and deploying technologies including smart parking or integrated city applications. These projects demonstrated short-term results and increased stakeholder buy-in. At the same time, these cities also prioritized larger, long-term strategic projects, such as ensuring 24/7 water supply, and began making progress on them with the knowledge that such projects would take longer to implement.

One example of this quick-win strategy played out in Pune. Leaders set out on a quick-win placemaking mission—that is, creating public spaces that capitalize on existing assets to promote health, happiness, and well-being—to rejuvenate urban centers. The city redesigned streets to improve safety and walkability and brought multiple use cases to citizens through a smart element project that created and wove together six key components:

1. Wi-Fi hotspots across strategic locations such as parks, hospitals, and other public spaces;
2. Environmental sensors to monitor critical parameters such as air quality and noise pollution;
3. Public announcement systems to broadcast both general and emergency messages to improve communication and public awareness;
4. An emergency response system to increase citizen safety;
5. A variable message system that deployed electronic display boards, placed across the city, to broadcast messages, alerts, and city updates; and
6. A scalable command and control center, which assimilated data from all of these elements to monitor and manage smart-city operations from a single hub.

Meanwhile, it kept an eye on the core issue of focusing on long-term mobility by working to enhance bus infrastructure and kick-start its metro project.

Think holistically about funding

Many cities came up with innovative ideas to fund the smart-city plan. For example, Bhubaneswar established seven public-private partnership projects to raise US \$42 million (INR 2,725 cr), which covered almost half of its total smart-city plan cost of US \$70 million (INR 4,537 cr). The Smart Cities Mission also encouraged cities to think beyond capex to operation and maintenance, both in terms of funding and the operating model. For example, Pune used revenue from the operation of electrical buses to fund the operation and maintenance gaps as their bus fleet expanded.

Ensure vendor participation through a partnership approach

Many smart-city projects are relatively small, which does not attract large investors. And in India, some of these projects are being executed for the first time, which means the city must significantly rework the solution to apply locally. For example, implementing a sophisticated traffic management system in India or another emerging market is vastly different from doing so in a developed economy, as emerging markets tend to have a different transportation mix—for example, a large

number of two-wheeled scooters and motorcycles. In such a situation, it is important to have a partnership mind-set to tailor and cocreate the solutions with vendors, so that these solutions are truly effective in the emerging-market context.



Citizens are not looking for one-off projects; they are looking for solutions that will fundamentally affect their lives. Following the above tactics in implementing a smart-city program can help leaders in emerging markets develop and achieve these solutions. And ensuring everyone across the value chain, especially city authorities, is aligned and focused on the solution is perhaps the single most important point that will make a smart-city mission successful. 

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Smart cities, home sharing, and the innovation that makes it work

How home sharing is reshaping cities and travel—and the many opportunities for continued innovation.



Margaret Richardson

Global policy development,
Airbnb

Home sharing has become an important part of modern tourism. In cities across the globe, technology platforms connect travelers and locals. The rise of home-sharing company Airbnb reflects the increasing accessibility of modern cities. Since the company was founded in 2008, its users have hosted more than 200 million guests in more than 65,000 cities and 191 countries around the world—from Iceland to South Africa to Indonesia. In this Q&A, Airbnb global policy development leader Margaret Richardson talks about the relationship between cities and the sharing economy and how the public and private sectors can work together to install regulations that enable the continued growth of the sharing economy.

McKinsey: *How can a connected smart city benefit cities and city residents?*

Margaret Richardson: A key component of a smart city is technology-enabled, people-to-people home sharing, which fosters healthy, sustainable tourism. This can have incredible benefits for cities. We are seeing more governments use tax revenue generated by home sharing to help fund the development of affordable housing programs, aid for the homeless, destination marketing, and other important public services. In Portland, for example, the city voted to dedicate at least \$1.2 million annually in lodging taxes from short-term rentals to the city's Housing Investment Fund.¹ And Chicago instituted a 4 percent tax on Airbnb hosts that the city is dedicating to house homeless families with school-age children. In one year, the tax raised \$2.8 million for the initiative.² In scaling these types of interventions, technology providers and governments can bring enormous benefits to the smart cities of the future.

McKinsey: *Some cities have struggled to update their regulatory frameworks to accommodate the rapidly evolving sharing economy, while others have moved swiftly. As cities grow smarter, how do you see the interface between cities and the sharing economy playing out in regulatory and other arenas? Where do you foresee challenges?*

Margaret Richardson: When society transitioned from the horse and buggy to the car, new rules were needed to govern new technology. The same is true today—just on a faster time frame and larger scale. Every municipality faces unique challenges, from zoning to tax issues, and companies facilitating the expansion of the sharing economy must commit to working with governments to develop innovative, customized frameworks that meet those specific challenges. At the heart of every smart piece of regulation is collaboration. When we work together, we can develop solutions that meet the needs of cities, residents, and travelers. As we continue to work with governments across hundreds of jurisdictions, we carry these lessons with us. Collaboration will ultimately be the key to jurisdictions' ability to craft laws that support innovation while protecting health, safety, and economic opportunities for their residents.

¹ Michael Anderson, "Portland dedicates short term rental lodging tax to Housing Investment Fund," Housing Trust Fund Project, Winter 2016, housingtrustfundproject.org.

² Tanveer Ali, "In one year, Airbnb tax raises \$2.8 million for Chicago homeless services," DNAinfo, July 27, 2017, dnainfo.com.

McKinsey: *What do you believe drives innovation?*

Margaret Richardson: Innovation starts with identifying a need. Airbnb began when our cofounders recognized that all of the hotels in San Francisco were sold out ahead of a major design conference, but many people still needed a place to stay. They blew up some air mattresses, built a website, and launched what would eventually become the world's largest home-sharing platform. Ultimately, necessity is the mother of invention. In our current landscape, with cities changing alongside rapid technological advancements, these needs will continue to be met by creative innovators.

There is no shortage of opportunities for new ideas to bolster cities and improve infrastructure. We've already seen how this can happen when it comes to response to major disasters. In the wake of Hurricane Sandy in 2012, our host community started volunteering their space for storm victims. These gestures led to the development of Airbnb's Disaster Response Program, which helps connect residents, as well as emergency relief workers and volunteers, with hosts willing to offer temporary housing. In the wake of Hurricanes Harvey and Irma, more than 1,000 hosts opened up their homes, free of charge. This is only the beginning, and we are excited to see how technology companies and smart cities can further assist displaced people around the world. 🌐

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Putting citizens first: How Latin American cities can be smart

For Latin America's cities to remain competitive, they must understand their citizens' experiences and needs—and design policies accordingly.



Andres Cadena

Senior partner,
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Patricia Ellen

Partner,
McKinsey & Company

Citizens have always been the cornerstone of public policy but, as population growth slows in Latin America and around the world, they are becoming an even more precious resource—for their work, their spending power, and their contributions to society. For the region's cities where 80 percent of citizens now live, every erg of managerial power needs to be on the smart management of cities.

The economic benefits of smart city management are increasingly clear. Worldwide, McKinsey estimates that smart cities have potential to create as much as \$1.6 trillion of additional value, including considerable benefits to consumers, by 2025. In Brazilian cities, smart city transportation could create up to \$14 billion of value during this period.

Seizing the value of smart cities will require factoring citizens' experiences and needs into the equation right from the outset.

People matter for growth

Slowing population growth threatens the trajectory of growth across Latin America. An expanding population has driven almost 80 percent of GDP growth over the past 15 years. From 2000 to 2015, employment grew at a compound annual rate of 2.3 percent, but between 2015 and 2030, that rate is expected to drop to less than half to only 1.1 percent a year.

This radically changes the equation for the managers of cities that are the lifeblood of Latin American economies: the region's 198 large cities—defined as having populations of 200,000 or more—are set to generate 65 percent of GDP growth in the period to 2025.

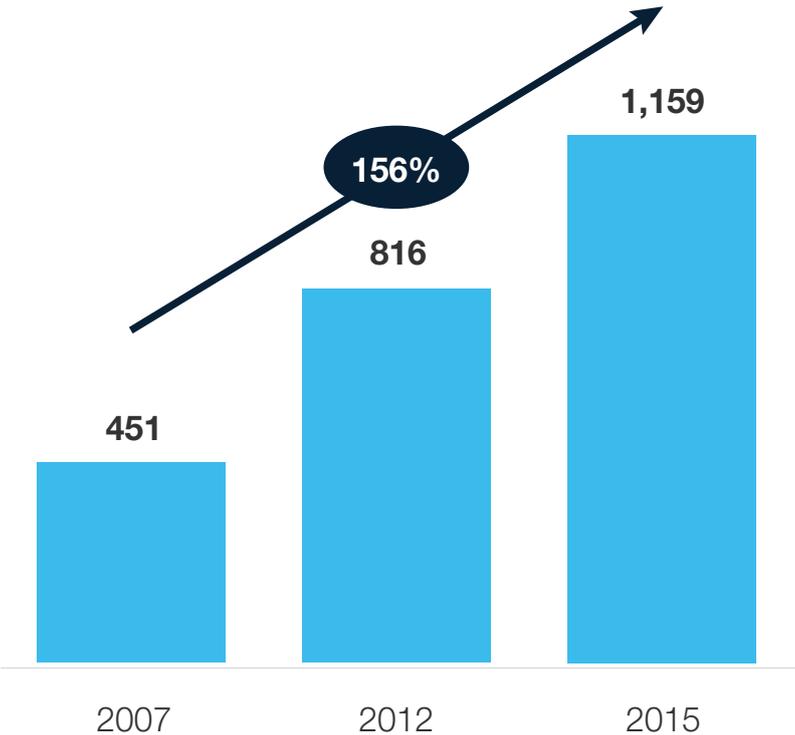
Cities will increasingly need to compete to attract the people they need to thrive. Migration from rural to urban areas is slowing, but city-to-city migration continues. The modern digital era gives citizens the power of choice about where they live. In the past, they used to follow job opportunities; now those job opportunities can come to them. Manufacturing jobs tied to a factory location now account for less than one in ten jobs across developed regions; many retail and service-sector jobs, the largest and fastest-growing job categories, tend to follow people. A rising number of digital jobs can be performed at a distance, and older knowledge workers may choose more flexible work arrangements in their jobs as they approach retirement. Digital platforms enable people to be matched to jobs wherever they are.

Those cities that retain the citizens they have and attract newcomers will thrive; those that fail to keep their citizens and make themselves appealing to new workers and families will not. In the past, cities' economic strategy hinged on appealing to businesses; increasingly it needs to focus on what they offer to citizens and the skills they bring. If they do, businesses will come.

There is much for city managers to do to compete successfully for these increasingly empowered citizens, not least in creating stable, formal employment, which requires mayors to broaden their focus from land planning to genuine economic development. In many respects, however, Latin America’s large cities today are failing them. There is too little housing, badly designed and insufficient infrastructure, widespread fears for public safety, and inadequate public services including education systems. The result is miles of slum dwellings, gridlocked roads, and deepening citizen dissatisfaction. Even throwing money at the problem is not necessarily solving deep-rooted problems. In Brazil, federal public spending has risen by 156 percent between 2007 and 2015, but the satisfaction of the population with public services—education, urban mobility, transport infrastructure, and health care—has trended steadily downward (Exhibits 1 and 2).

Exhibit 1 Federal public spending

R\$ billions, current values for 2015¹



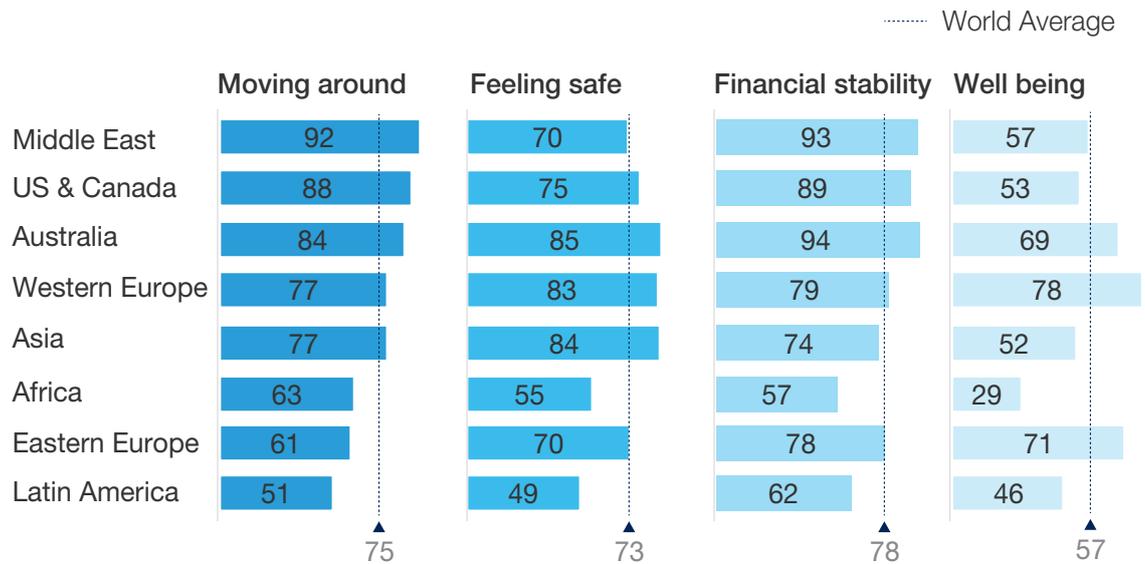
McKinsey&Company

Exhibit 2

Latin American cities underperform across all citizen journeys, particularly around transportation and safety

City performance across key citizen journeys, by region

Index¹, 100 = best



¹ Indexes cannot be compared across different macrojourneys as they are calculated as relative not absolute values

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It may, of course, be that people’s expectations are rising beyond what governments are able to deliver within budget constraints. But it may also reflect the fact that urban management today is not set up to focus first and foremost on citizens. If it was, money might be invested more wisely and results would improve.

Realizing the “smart city” vision

The considerable rewards of smart cities will only be realized if they put citizens front and center of strategy—and that means understanding them: who they are, how they spend their days, and how they interact with city services—and then design policies accordingly. Citizen-centric governance is, in many ways, no different from the way that corporations focus on user experience when delivering their services. A working mother of three who lives in a residential neighborhood will have very different needs to

the 72 year old widow who lives in a retirement home. They will interact with city services very differently.

The more detailed the understanding of citizens the better for practical policy. Different citizen journeys involve multiple touchpoints associated with different public services. Do they commute via public transport or do they walk? How much cost and time do they spend? How many times does a citizen visit the health center or hospital, and for what reason? What jobs do people do, and are they formal or informal? Such a data goldmine can inform targeted and effective public-services provision.

It was this promise of data-driven smart growth that lay behind the development of [City Voices](#), a tool developed by McKinsey that captures and analyzes citizens' sentiment across key aspects of city life to help leaders understand what matters most to their constituents. It gathers feedback, at a very local level, across a variety of demographic groups as they experience some 30-plus interactions with their cities—for example, a neighborhood bus service.

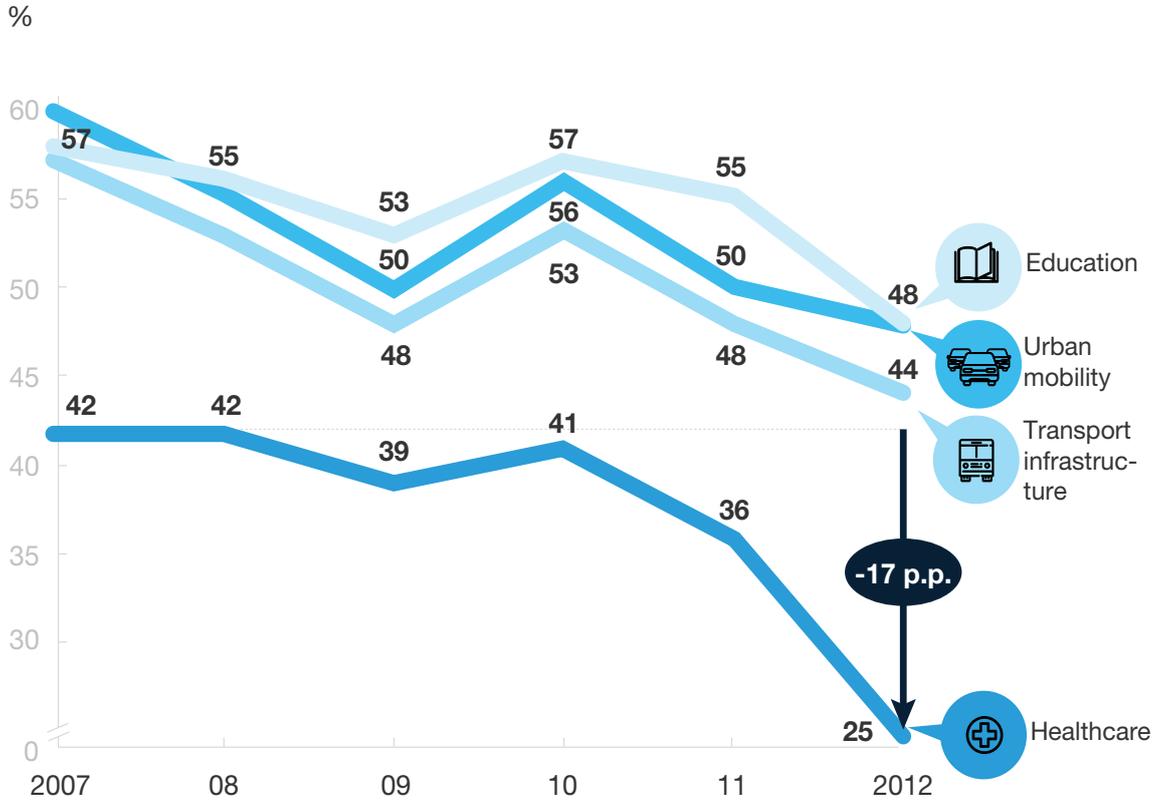
The idea for City Voices arose during a series of McKinsey urban-planning projects in Brazil. Social media technologies and analytics were gaining ground at the time, and we used a simple platform to ask citizens about their daily hopes and frustrations while gathering their votes on different city planning ideas. That input proved invaluable for the projects and McKinsey looked for ways to develop the platform into a solution that could be put to broader use. McKinsey conducted a thorough study of different citizens and journeys, identified a list of more than 150 different metrics, and then whittled them down to a key 30, which were then subjected to sentiment analysis algorithms to arrive at the insights that could underpin public policy. In 2016, the solution that became City Voices won McKinsey's [New Ventures Competition](#), and it is now being used to inform our work in many cities in the region and around the world.

Today, City Voices reveals that Latin America's cities are underperforming on all citizen journeys examined thus far, particularly on transport and safety (Exhibit 3).

However, many Latin American cities are responding to the imperative to embrace smart urban growth centered on citizens. In Brazil, efforts are underway to build its first new smart city from scratch. The planned city will cover 330 hectares and be home to 21,000 inhabitants. The focus is entirely on the needs of citizens from good quality housing for those on low incomes to local IT systems, schools, libraries, transportation systems, hospitals, power plants, water-supply networks, waste management, law enforcement, and other community services. Colombia has invested more than \$100 million in smart city initiatives and is moving toward open digital cities. Medellín, for instance, now has an Internet of Things-based system to reduce traffic, accidents, and improve emergency response times. In Argentina, Buenos Aires' Smart Lab is a cross-government entity that works with citizens to co-create ways to improve living standards.

Exhibit 3

Brazilian population's satisfaction with public service



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Identifying issues is, of course, only a starting point: solving them through well worked through policies and putting those policies into action on the ground are where the real work lies. But the verdict is clear—bold policy anchored to deep knowledge of citizens and their needs is the way to create many more smart city success stories. 🌐

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