

Voices on Infrastructure: Productive cities

June 2016





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Introduction: Insights on cities



Jonathan Woetzel

McKinsey's Cities Special Initiative

Welcome to the June edition of *Voices on Infrastructure*, in which we focus on cities. Already, more than half the world's population lives in cities, and millions more move to urban areas every year. To meet their needs and expectations, infrastructure is critical.

The problem, according to [McKinsey research](#), is that the world is spending far less on infrastructure than is required to keep up with economic growth. Closing this gap, particularly in the complex urban context, will require ingenuity, dedication, and leadership. In this edition of *Voices*, we offer some of the best contemporary thinking on this subject. While McKinsey plays an important part in producing *Voices*, more than half the contributions represent the views of leading external practitioners, which are not always consistent with those of McKinsey.

City builders feature prominently. Fahd Al-Rasheed discusses the challenge of building a city from scratch, the King Abdullah Economic City in Saudi Arabia. From China, Tian Jinchun of the National Development and Reform Commission describes China's effort to create a modern Silk Road.

Mobility and access are critical elements of urban life. Architect and urban theorist Helle Søholt describes what makes public space great and how cities can achieve both mobility and civility. Jay Walder, head of a global bike-sharing company, reflects on how technology could change how people get around cities. Author Parag Khanna (video) maps the future of cities and examines how megacities are changing the world. McKinsey contributions include essay on how technology and social trends are changing urban mobility.

Governance is another important theme. Christopher Heathcote of the Global Infrastructure Hub provides an overview of how governments can encourage private-sector investment in infrastructure. John Means and Benjamin Barber, the founder of the Global Parliament of Mayors, examine how to harness the power of mayors. Michael Berkowitz (video) presents the Rockefeller Foundation's "100 Resilient Cities." Ashay Prabhu and Janna de Groot of Assetic, an asset-management firm, offer a practical approach that demonstrates how data can improve infrastructure productivity.

How cities evolve will be one of the defining features of the 21st century. We want *Voices* to be part of the conversation about how to do this — and invite you to join us. 

News from the Global Infrastructure Initiative



Tony Hansen

Director of the Global Infrastructure Initiative

This is the second edition of *Voices on Infrastructure*. Thank you for the positive feedback on our March edition, and please continue to let us know what you like and what you would like to see. The proposed theme for our September edition is engineering and construction; in December, we plan to focus on real estate.

We are also in full swing in lining up GII forums. The next summit will take place in Singapore from May 24 to 26, 2017, with the theme “Rethinking infrastructure: New solutions.” The agenda is a work in progress, but we expect to cover a wide range of topics, including master planning, building a marketplace for bankable projects, the future of construction, and using data analytics to improve asset performance. Please save the date.

On June 6, we hosted a roundtable in London on transforming data use in infrastructure organizations. The next two followed in Washington, DC: optimizing US federal real estate and facilities, on June 9, and bridging global investment gaps to finance sustainable infrastructure, on June 15. The latter included the launch of a new report from the McKinsey Global Institute, [Bridging global infrastructure gaps](#). Click [here](#) for more on previous and future roundtables.

In 2016, we will offer four GII innovation site visits. The first, on June 30, will be to the BROAD Group in Changsha, China. BROAD manufactures modular buildings that are reported to be five times more energy efficient than conventional ones and up to 30 percent cheaper to build. Later this year, we will go to GE Digital in California, Crossrail and Tideway in London, and King Abdullah Economic City in Saudi Arabia.

The goal of these visits is to expose GII participants to some of the most interesting innovations in global infrastructure. A CEO-led executive team hosts each visit. Let us know if you are interested in attending, and check back on this website for dates and information.

We look forward to continuing the GII journey with you. If you would like to let us know what you think of *Voices*, sign up for GII events, or receive more information, please contact us at info@giiconnect.com. 



Photo credit: Faisal Bin Zarah

Learn from the past, build for the future: Saudi Arabia's new city on the Red Sea

Fahd Al-Rasheed

To build a city from scratch, create a solid economic foundation.

Three millennia ago, Akhenaten began construction of the Egyptian city of Amarna—perhaps the first example of planned urban infrastructure in recorded history. Within a decade of Akhenaten's death, Amarna was abandoned—ancient evidence that building infrastructure and convincing people to use it are two fundamentally different challenges.

Building an economic infrastructure

King Abdullah Economic City (KAEC) is the world's largest privately funded city. Located about 100 kilometers north of Jeddah on the coast of the Red Sea, KAEC is a public–private partnership with the government of Saudi Arabia; it is built with private capital, independently of oil revenue. KAEC is an image of what Saudi Arabia could look like without hydrocarbons: a trade and logistics gateway offering companies access to a fast-growing regional market of 620 million people.

KAEC is master planned to accommodate a population of two million people over an area of 181 square kilometers—about the size of Washington, DC. Today, around 25 percent of the total area is either developed or under development. KAEC could be home to about 10,000 people by the end of the year. By 2020, 40 percent of the planned area will be developed, and the population should be around 50,000 people.

KAEC was conceived to attract new industries to the city by meeting latent demand within Saudi Arabia, which is the largest economy in the region. For example, 80 percent of Saudi Arabia's pharmaceuticals are imported; KAEC therefore encouraged leading pharmaceutical companies to establish operations in the city. Today, pharmaceuticals is one of its fastest-growing clusters.

More than 100 global and local companies are setting up operations in the city in non-oil industries, including pharmaceutical, automotive, logistics, and consumer goods. One European oil company operates a blending plant for its lubricants business in the city; a carmaker is assembling commercial trucks; an air-conditioner firm is getting ready for production and exports. Next year will see the addition of a bonded zone and sophisticated warehousing operations.

An integral part of KAEC's economic model is the construction of trade and logistics infrastructure. The city operates King Abdullah Port, a deepwater port and the first in the region to be built entirely with private capital. The port now has the capacity to manage 3 million containers a year. This will increase to 4.5 million by the end of 2016 and 20 million by the time it is finished in 2025.

The port is connected to the national road network to facilitate transportation, thus attracting companies that need improved access to the Saudi market. The port is also adjacent to the city's Industrial Valley light-manufacturing zone, allowing companies to ship raw materials in to their manufacturing plants and ship product out, either to the Saudi market or the broader region.

This economic infrastructure creates jobs and thus growing demand for residential and civic infrastructure, such as housing, schools, healthcare facilities, and recreation. KAEC builds this civic infrastructure to scale.

The “ghost cities” developed elsewhere are an eloquent example of the risk of building for long-term end use without an economic base. Facilities that lie idle until the population expands to support them are expensive to maintain. In a private-sector model, however, facilities must be economically viable almost from the outset to mitigate maintenance costs. Infrastructure is built to meet near-term projections and then expanded as the economic cycle gains momentum.

KAEC’s main medical center at the moment, for example, is a secondary-care facility providing emergency support, general medicine, laboratory services, and a rotating schedule of specialist clinics. There is insufficient demand for a full hospital in the city today. If built, it would be largely mothballed until the population expanded to accommodate it. Hospital construction is a project for the future.

Building a social infrastructure

A significant challenge with planned cities is creating spaces in which people want to live and interact while keeping the city affordable, particularly in Saudi Arabia, where there is a shortage of affordable housing. It is one thing to build a city that works. It is another thing to build one that lives.

Ultimately, the residents themselves will add color and vibrancy as they begin to define the space in which they live—opening boutique businesses, creating cultural neighborhoods, and initiating community-led programs. KAEC’s residential communities are built to encourage interaction, incorporating green spaces, community centers, cycle paths, and ready access to the city’s recreational facilities.

Social infrastructure also needs to adapt to emerging and future technologies. KAEC is constantly updating its master plan to adapt to the fact that technologies that were prohibitively expensive a decade ago can be installed today at low cost. The original master plan has evolved to incorporate advanced fiber optics, smart-utility networks, and a wide array of sensors to manage city operations.

Technology is also profoundly changing the relationship that people enjoy with their cities and city administrators. Citizens of KAEC can report municipal issues directly to the city management via a dedicated app, allowing information to be acted upon quickly while reducing the time and cost of providing essential community-care services. A central incident-control room monitors more serious issues such as traffic accidents and petty crime, coordinating the emergency and security services through a real-time city-information system.

Technology will be a major factor in city planning far into the future. The adoption of autonomous vehicles (AVs), for example, could have a profound impact on urban design. What will it mean to be able to significantly decrease the number of vehicles on the roads? What do AVs mean for residential spaces? To commuters? To parks and pedestrian areas? These are among the many questions that KAEC is working through today. The widespread use of AVs may be a decade or more away, but planning a new city requires thinking at least that far ahead.



Amarna is an object lesson in the dangers of building cities on little more than a political whim. Every city needs a reason to exist. It's not enough to build infrastructure: cities need to compete economically and be attractive to all kinds of people. Those that fail in these respects will, like Amarna, disappear into the deserts of history. By focusing on creating and maintaining a sustainable economic cycle, KAEC is applying the lessons of the past to build for the future. 🌐

Fahd Al-Rasheed is the managing director and group CEO of King Abdullah Economic City.

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Photo credit: Andrea Pucci

Sending the right infrastructure message

Christopher Heathcote

How governments can encourage private-sector infrastructure investment.

The International Monetary Fund (IMF) recently downgraded its global growth forecast to 3.2 percent; for the developed countries in the G-20, it predicted just 2.1 percent. Central banks clearly understand the problem and have deployed monetary tools with vigor.

Interest rates are already low; there is even talk of “helicopter money”—having central banks print money to increase the money supply and therefore create inflation.

There is another way to stimulate growth: invest in infrastructure. Returns to growth from infrastructure are well established. According to the IMF, a 1 percent increase in spending on infrastructure leads to an average of 1.5 percentage points in GDP growth over four years. In countries where infrastructure is well planned and well executed, the return is even greater—2.6 percentage points over four years. The difference suggests how important government is to ensure that infrastructure delivers the biggest possible dividend.

The private sector has a role, too. Indeed, every conference on the subject features panels on infrastructure as an asset class and on how multilateral development banks can open new markets with innovative risk-sharing offerings. But that misses the point: the problem is the dearth of financeable projects, not of ways to divvy up risks.

To address that issue, governments need to look more closely at their own activities. The private sector can help make markets more efficient, but it is government that provides the structure in which markets work. And when governments improve these fundamentals, the evidence shows that the private sector will be willing to jump in.

The United Kingdom, which was a pioneer in encouraging the private sector to get involved in infrastructure, provides one example. In 1997, the newly elected Labour government placed building infrastructure at the heart of its economic strategy; to do so, it needed to accelerate investment. At the time, there was no active market for private infrastructure investment, and few projects had been completed using private funding.

Five years later, the United Kingdom had the largest public–private partnership (PPP) infrastructure market in the world, with more than 900 projects in construction or at the preferred-bidder stage. The private sector competed hard; debt terms went from 7 years to as many as 30 as the market matured. Over the same period, the cost of finance fell. There have been changes to infrastructure finance since, but the private sector remains a powerful force—it is the major investor, for example, in the 25-kilometer tunnel under the Thames known as Tideway that is under construction. The private sector also successfully participated in such major projects as Crossrail and the Olympics.

Three actions shaped the UK market. First, the British government placed building physical infrastructure at the heart of its economic strategy. While maintaining its authority, the government also recognized the limits of the public sector’s expertise in areas such as procurement. On that basis, it made the case for working with the private sector. Second, the UK Treasury required that all new major projects had to be assessed

for suitability as a public–private partnership before being considered for public financing. This sent a powerful message, both to the government and to the markets, that PPPs were the preferred method of procurement. Third, the government vested decision making into a single body, the Treasury Taskforce, which was directly accountable to the Chancellor of the Exchequer. This led to better project selection and planning; standardization of contracts and structuring quickly followed.

Britain's experience demonstrated that a well-designed public-infrastructure strategy, backed by sensible reforms, can engage the private sector. Can these lessons be applied to emerging markets? The Philippines is trying. On taking office in 2010, former President Benigno Aquino III made infrastructure a strategic priority. His government established a PPP unit and gave it significant authority; the unit assembled a carefully planned pipeline of projects, supported by updated regulations that allowed public- and private-sector risk sharing. The government also contributed serious money; the budget allocated to infrastructure spending has risen from 2.2 percent of GDP in 2012 to 5.1 percent in 2016; 14 major projects are being implemented and 15 more are in the works. That has helped boost the country's infrastructure-quality ranking from 104th in 2010 to 90th this year, according to the World Economic Forum.

Colombia has followed a similar path. In 2011, President Juan Manuel Santos established a national infrastructure agency, and the legislature passed an infrastructure law in 2012 that provides tools to ease land acquisition. Today there are 40 greenfield road concessions being let at a value of \$25 billion, covering twice as many kilometers as in the past. The length of rail under concessions to the private sector is expected to more than double, from 900 kilometers to 2,000.

According to infrastructure and project-finance journal *JGlobal*, in 2015, Britain, Colombia, and the Philippines had private infrastructure markets (measured as transactions closed as a proportion of GDP) double that of the international average. There is no reason that other countries cannot follow suit.

Lack of capital is not the issue: \$106 trillion of institutional capital is available, in the form of pension and sovereign-wealth funds. The Organisation for Economic Co-operation and Development estimates that only 1.6 percent of this is directed to infrastructure. According to research from the Global Infrastructure Hub, 69 percent of institutional-investor funds want to increase allocations to the sector; there is particular interest in emerging markets.

What these funds need is a way to do this. The essential precursor to significant engagement with the private sector is political commitment. By providing leadership, defining a strategy, and creating effective planning and implementation agencies, governments can create the conditions that will encourage the private sector to invest

in infrastructure markets. That, in turn, can help countries build the road, sanitation, and transport projects that fuel economic growth—and improve the well-being of people and communities around the world. 

Christopher Heathcote is CEO of the Global Infrastructure Hub, a G-20 initiative whose goal is to increase the quality and quantity of global infrastructure projects. He has been involved with public- and private-sector infrastructure projects in Australia, China, Europe, Israel, the Ivory Coast, South Africa, Turkey, and the United States.

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Public space and public values

An interview with Helle Søholt.

Helle Søholt is a founding partner of Gehl Architects, which she launched in 2000 with Jan Gehl, a fellow architect who had been studying the sociology of cities since 1966. Based in Copenhagen and with offices in New York and San Francisco, Gehl Architects aims to help clients create what it calls “cities for people.” Søholt herself has worked on projects around the world, including Beijing, Cape Town, Copenhagen, Kuala Lumpur, London, Mexico City, São Paulo, Seattle, and Vancouver. Trained as an architect in Denmark and the United States, she emphasizes improving the quality of city life and making people the center of urban planning. Søholt spoke with McKinsey in May 2016.

McKinsey: *What makes a great public space? A poor one?*

Helle Søholt: A great public space, first and foremost, is one that is used by people. Public spaces are defined by the activities that take place, the culture and identity of the communities they support, the social mix of people, the kinds of programming. On the physical side, a great public space needs to be well connected to its surroundings, easy to get to, and have “active edges,” meaning functions that help to bring people together and build community. It needs to feel safe and not be too noisy or windy or sunny or cold.

The opposite is a space that is derelict, disconnected from its surroundings, and not being used. People see it as unsafe; women, children, and the elderly would never dream of going there.

There can be too much focus on creating great event spaces with the idea of making places for tourists to enjoy. If we design spaces that are wonderful for residents, the city itself will be that much more interesting for visitors to visit.

McKinsey: *What do you do? And with whom do you do it?*

Helle Søholt: We have developed some on-the-ground methods for mapping public life. And when we go out into the streets, so do the people we are working with. We want to get them out of the offices in order to experience and see the city in a new way. In working with communities, sometimes we make temporary interventions. We'll experiment with a redesign of a square or a street, perhaps rerouting a local bus to create a nicer ambience. By measuring foot traffic before, during, and after such an intervention, we can see how people are, in effect, voting with their feet.

We work with cities, developers, foundations, and nongovernmental organizations. We also identify local partners that have an interest in these projects; these could be community groups, philanthropies, health organizations, transport entities, or NGOs. We did a prototyping festival in the redesign of Market Street in San Francisco, where we invited the community to come out and do different installations and test different solutions—everything from spatial design to technology.

McKinsey: *Roughly two-thirds of the world's population will live in cities by 2050. What does that mean to you as an architect?*

Helle Søholt: The social sustainability of cities is a challenging issue. The development of cities globally is also leading to pressures on mobility in terms of transport. There are a lot of problems—congestion, gridlock, and a lack of public investment in transportation.

This leads to poor environments. Congestion, for example, leads to poor air quality. We see our role as helping the cities we work in to innovate, to redesign their processes, to focus on what is important. Our ethos is to manage cities with an emphasis on improving the quality of people's lives.

McKinsey: *The population of Mumbai has more than doubled since the 1990s, to almost 22 million people. Are Gehl's principles appropriate for such fast-growing megacities?*

Helle Sørholt: Yes, I think our principles are applicable to any city. The public-space focus that we advocate—to me, this is a human right. And if there is any place where this is in danger of getting lost, it is in developing cities, where things are happening so fast. There is a desperate need to help these cities to manage urban growth. Of course, many of them are understaffed. They are short of resources and do not know how to manage or to work with planners. We are very aware, when we come into cities under such pressures, that our role is not only to develop a good plan or to implement a project. It is also to build capacity and provide support to the urban leaders, so they can make better decisions after we are gone.

McKinsey: *You have said that some cities are becoming too large. What do you mean by that? Why is this a problem? And what can be done?*

Helle Sørholt: It is super difficult to control the growth of cities because this is affected not only by urban factors but also by global ones and by conditions in rural areas. What I was thinking of was places like São Paulo and Mexico City. These are great cities, but because they have become so large, traffic in particular has become really bad. That influences people's lives in a way that is unheard of, and for the worse. People are spending three hours in traffic getting to and from work. That has a giant impact on people's health, their connection to their families, and general quality of life. In our own work, we try to retrofit existing urban centers, to make them more walkable and bikeable, with shops, parks, and public spaces.

McKinsey: *Is the car the enemy of the livable city?*

Helle Sørholt: I don't think the car is the problem in itself; in fact, I own a car. But too many cars is a problem, absolutely. The goal is to strike a balance. In too many cities, cars take up too much space. In the process, they squeeze people out of streets and squares and spaces and make the air dirty, too. Copenhagen is a good example of what this balance could be. About 30 percent of trips are made on public transit, 40 percent on bicycles, and 30 percent in cars. And this doesn't have to be expensive. Far from it. Big highways, for example, can be insanely expensive. Redesigning an existing road system to allow people to get around better by foot and bicycle is easy to do and relatively cheap.

McKinsey: *If there were an award for “most improved city” over the past 20 to 30 years, which city would win it?*

Helle Søholt: Let me give a few examples. Vancouver and Toronto are both admirable. They have been working systematically to favor density and to support public life, including transit. The renewal of the Toronto waterfront is a great achievement. Melbourne may be even better. In the early 1990s, it was known as a “doughnut city”—there was an empty hole in the middle where almost no one lived. Since then, the inner city has become a thriving urban center, adding 20,000 people. The city’s “laneways” of old, narrow streets were scary then; now they have been transformed into vibrant urban networks for pedestrians, with art shops, cafés, and new boutiques. That has added a fine-grain walkable network to the entire downtown. The laneways were there the whole time. It was a matter of rediscovering, redesigning, and repurposing.

Singapore has also been transformed dramatically over the past 30 years. This city is very top-down managed; from a certain perspective, this is not the most engaged way of doing things. But city leaders were also superambitious in their investments in the public realm. Finally, there’s Seoul. It took down the elevated highway above the Cheonggyecheon River, then restored the river and created a fantastic public space along it right through the center of the city. Seoul is also rethinking how the government is engaged, creating ways to help communities to help each other.

McKinsey: *What are some examples of simple things cities can do to improve daily life for their residents?*

Helle Søholt: Redesign streets to meet people’s needs for quality of life. Also, reconquer underutilized space to create small plazas, playgrounds, and parks. As cities get denser, people have less space at home, so it is important that the city itself should become an additional living room.

McKinsey: *If you could live in any city in history, from any time, what would it be and why?*

Helle Søholt: I’m content with Copenhagen. Ever since I was born, in the 1970s, I feel like every single year it has improved.

I’ve always wondered about Paris in the 1850s and 1860s, when Baron Haussmann carved out those huge boulevards and parks and squares. Paris must have been superdirty and polluted and intense and dense. What Haussmann did was quite radical, and it would have been fascinating to be at his side. 🌐

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Photo credit: Guenter Guni

‘One Belt and One Road’: Connecting China and the world

Tian Jinchen

China is leading the effort to create the world’s largest economic platform.

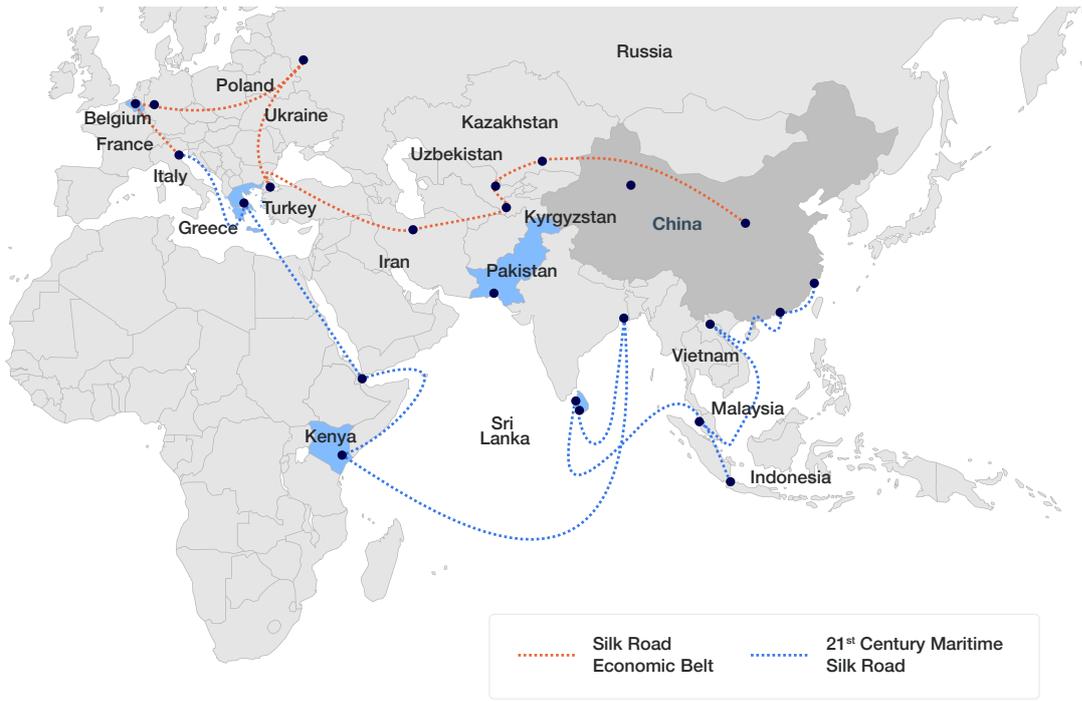
More than 2,000 years ago, China’s imperial envoy Zhang Qian helped to establish the Silk Road, a network of trade routes that linked China to Central Asia and the Arab world. The name came from one of China’s most important exports—silk. And the road itself influenced the development of the entire region for hundreds of years.

In 2013, China’s president, Xi Jinping, proposed establishing a modern equivalent, creating a network of railways, roads, pipelines, and utility grids that would link China and Central Asia, West Asia, and parts of South Asia. This initiative, One Belt and One Road (OBOR), comprises more than physical connections. It aims to create the world’s largest platform for economic cooperation, including policy coordination, trade and financing collaboration, and social and cultural cooperation. Through open discussion, OBOR can create benefits for everyone.

The State Council authorized an OBOR action plan in 2015 with two main components: the Silk Road Economic Belt and the 21st Century Maritime Silk Road (exhibit). The Silk Road Economic Belt is envisioned as three routes connecting China to Europe (via Central Asia), the Persian Gulf, the Mediterranean (through West Asia), and the Indian Ocean (via South Asia). The 21st Century Maritime Silk Road is planned to create connections among regional waterways. More than 60 countries, with a combined GDP of \$21 trillion, have expressed interest in participating in the OBOR action plan.

Exhibit

Several routes are proposed for the ‘new Silk Road.’



The effort has already made some practical achievements. China has signed bilateral cooperation agreements related to the project with Hungary, Mongolia, Russia, Tajikistan, and Turkey. A number of projects are under way, including a train connection between eastern China and Iran that may be expanded to Europe. There are also new rail links with Laos and Thailand and high-speed-rail projects in Indonesia. China’s Ningbo Shipping Exchange is collaborating with the Baltic Exchange on a container index of rates between

China and the Middle East, the Mediterranean, and Europe. More than 200 enterprises have signed cooperation agreements for projects along OBOR's routes. In 2014, China established the \$40 billion Silk Road Fund to finance these initiatives, and it has made investments in several key projects. These projects are just the start as OBOR enters a new stage of more detailed and comprehensive development. This work will see the development of six major economic corridors, including the New Eurasian Land Bridge, China–Mongolia–Russia, China–Central Asia–Western Asia, Indo-China Peninsula, China–Pakistan, and Bangladesh–China–India–Myanmar. These corridors will be the sites of energy and industrial clusters and will be created through the use of rail, roads, waterways, air, pipelines, and information highways. By both connecting and enhancing the productivity of countries along the new Silk Road, China hopes the benefits of cooperation can be shared and that the circle of friendship will be strengthened and expanded.

China seeks to take the interests of all parties into account so as to generate mutual benefits, including environmental management and closer cultural exchanges. We wish to give full play to the comparative advantages of each country and promote all-around practical cooperation. 🌐

Tian Jinchen is the director of the Western Development Department of China's National Development and Reform Commission.

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Rolling along: Bicycles, mobility, and the future of cities

How consumers and technology are redefining how people get around.

Jay Walder is the president and CEO of Motivate, a bike-sharing company with operations in 11 locations. Before starting Motivate, Walder was CEO of Hong Kong's Mass Transit Railway Corporation and also chairman and CEO of New York's Metropolitan Transportation Authority (MTA). He has also worked with Transport for London. He spoke with Simon London, McKinsey's director of digital communications.

McKinsey: *What are the big trends in urban mobility?*

Jay Walder: You have to start by asking, “What’s happening in cities?” They’re denser and more complex than ever before. Traditional travel patterns are being blown away, and that’s pushing us away from some traditional models. In New York, for example, we’ve seen a phenomenal shift downtown since 9/11, with the area becoming as residential as business. The far west side of Manhattan is becoming a combination of residential and office space. We’re seeing the development of technology hubs across the river in Brooklyn and Queens. You see such changes in many, many other cities as well. It’s not the same consolidation and centralization we saw before.

McKinsey: *So what does that mean for planners, builders, and infrastructure?*

Jay Walder: It’s harder. The traditional model of public transit is to get a lot of people into a vehicle that’s going to one place at one time, on a set schedule, and according to a pattern. Today, though, we’re used to things being on demand. So developing around the traditional urban infrastructure are a whole variety of nontraditional means of mobility, such as car sharing and bike sharing. In what I’ll call the *Mad Men* days of commuting, you commuted to work one way, and you went back the same way, and the pattern was very symmetrical. Now travel is becoming asymmetrical. You take a whole series of different modes across the day—a train, a bus, an Uber ride, bike share, walking, a ferry.

McKinsey: *Which emerging technologies are most likely to be transformative?*

Jay Walder: Bike sharing is actually one of the most revolutionary changes that we’ve seen within the urban transportation space. It’s redefined our idea of what public transit should be. Bike sharing creates a system for personal mobility. It is personalized mass transit. You distance yourself from the idea of stations and routes and schedules. Uber and Lyft in many ways reflect that, too, and there is great potential for autonomous vehicles. There are many challenges associated with this shift—technological, social, regulatory. But you can see them as the enablers of tremendous change in the city.

In the 20th century, the development of cities was led by infrastructure—consider the way different rail lines opened up areas of London. It was, in effect, a case of “If you build it, they will come.” In the 21st century, cities are not going to be defined by that infrastructure anymore. They’re going to be defined by technology and the ways in which technology is brought into the city space. I’m not saying that large-scale infrastructure projects will not have a place. They will. But I think they will be surrounded by a whole set of other things that are going to be increasingly important.

McKinsey: *What is the potential of urban bike sharing?*

Jay Walder: I don't think we've even begun to see the full potential. Fifteen years ago there were 4 modern bike-share systems in the world; now there are almost 900. Think about what an impact this is having in an incredibly short period of time. In Chicago, rides have increased by 70 percent from March 2015 to March 2016, in New York by 110 percent, in Columbus, Ohio, by 66 percent. We're doubling the size of Citi Bike, and growing Bay Area Bike Share tenfold. And we are fielding calls and requests and ideas all the time. Why is this happening? I think bike sharing fits not just with our desire for mobility but also with our values. It fits with what we want to be as a society. We want to be healthier. We want to be fit. And it just makes us feel good.

McKinsey: *How big is bike sharing?*

Jay Walder: It's tiny. In New York, the MTA carries 5.7 million people every weekday on the subway, and another 2.5 million people on the bus. In April 2016, our bike-share system carried about 34,000. But I don't think that's the way to look at it. One of the things that you learn as you look at these types of challenges is that the impact is on the margin. I remember walking home one night at about 6 PM and stopped at the streetlight. As I waited, seven people went by on Citi Bikes. And I thought, "This is pretty neat."

McKinsey: *How different could cities be in 30 or 50 years?*

Jay Walder: They could be almost unrecognizable. So much of the way in which we've defined the nature of the city has been about the way in which we get around—from horse-drawn carriages to automobiles and to larger vehicles. What we're looking at today fundamentally reshapes that. In the horizon of 50 years or so, I would be tremendously surprised if we haven't redefined our cities in fundamental ways.

There are physical constraints to cities, so they are going to be in the business of reallocating and rethinking their physical space. That's going to open up opportunities for us to think about what we really want. That's going to be unusually exciting. We went through that process 100 years ago and reallocated the physical space to the automobile. That is already changing.

I am a big believer in the city. Despite all the technology that exists, what is most exciting about the city is the interaction of people within its space. If we had been having this conversation in the mid-1960s, for example, we might have had a hard time making that argument. That's the beauty of what's happened. Many people argued that these changes would be the demise of cities. Actually, it has ended up strengthening them. 

[For more, see video with Jay Walder.](#)

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Photo credit: Harald Sund

The power of collective action: Forging a global role for mayors

Benjamin Barber and John Means

By working together, cities can help solve global problems.

Cities are the world's oldest governance bodies; they remain the most direct, formal contact most of us have with government. They are where most people work, play, pray, and raise their families. Cities also provide real-life laboratories to test new policies. We have found that municipal leaders tend to be resourceful problem solvers, willing and

able to take action even when national governments are stalled. Speaking at the Global Infrastructure Initiative in late 2015, Atlanta's mayor, Kasim Reed, suggested that "Cities are going to move faster and lead because the federal structure is just not built to accommodate the rate of change that's going to be required globally." Mayor Park Won-Soon of Seoul highlighted the importance of pragmatism and proximity to citizens in urban innovation. "Everything revolves around the public. If a couple of policy makers were to just sit around a table randomly coming up with new policies, most of them would not be plausible, because they are not based on people's real needs."

Such innovation can happen only if city leaders are willing to seize the opportunity. We believe that mayors have an obligation to act pragmatically and inspirationally to serve their residents. We also believe that this is not enough.

Local leadership can lead to global solutions

Because many significant urban challenges are global, the problems related to crime, pollution, natural-resource shortages, and economic turmoil move fluidly across borders. Consider migration: the Office of the United Nations High Commissioner for Refugees estimates that more than 65 million people have been displaced from their homes and about a third are officially categorized as refugees. While national governments struggle to decide whether, whom, and how many people to accept, it is cities that must cope with the day-to-day realities of accommodating those who arrive, often in desperate straits and without legal status.

It is important to recognize that migrants can bring positive contributions. A recent report from Standard & Poor's Financial Services, for example, found that Turkey's economy has benefited from the influx of 2.7 million Syrians; the new arrivals, the report said, have provided a "positive shock." As McKinsey's Jonathan Woetzel [told the Global Infrastructure Initiative](#) and also noted in a [recent article](#), two-thirds of urban economic growth is determined by population flow. Migrants who become integrated into the urban community can provide significant benefits. How to make that happen is not something to be done strictly within the city limits, of course, but there are efforts to watch. Some cities, for example, have created voluntary identification cards for all residents; such official ID helps them enter the social and economic mainstream, for example, by allowing them to open bank accounts and access city services.

To deal with global challenges, cooperation and transnational networks are required, and cities around the world are recognizing this. Dozens of global networks of cities have been established to tackle specific issues such as climate change (ICLEI's C40 Cities), security (European Forum for Urban Security, Mayors for Peace, Strong Cities Network), and resilience (100 Resilient Cities). These groups are all relatively new, which

is not surprising; the interest in collective, cross-border action by cities is recent. Their common premise is that because cities are focused on delivering services rapidly and effectively, they are often able to test and refine possible approaches faster than national governments.

The action and impact of these networks is beginning to materialize. C40 has reported that member cities have taken more than 10,000 concrete actions to reduce greenhouse-gas emissions. One C40 member city, Oslo, has set the goal of becoming carbon neutral by 2050 and has laid out a comprehensive plan to achieve it. Recognizing that half of the Norwegian capital's carbon emissions were generated by transportation, the city has invested heavily in an electric-vehicle (EV) fleet and in EV charging stations, and it has worked with the national government to create tax incentives for EV purchases. The number of EVs registered in the city has more than tripled since 2008, and EVs account for almost a quarter of new-car registrations in the country. Along with 16 other developed cities, Oslo is part of the Carbon Neutral Cities Alliance, which aims to reduce greenhouse gas emissions substantially by 2050. Oslo's choice will not be for everyone; the point is that it is doing something new that others can evaluate and learn from.

The organization 100 Resilient Cities has helped its member cities—including Byblos (Lebanon), New Orleans and New York (United States), Porto Alegre (Brazil), and Semarang (Indonesia)—complete more than a dozen comprehensive resilience strategies. These define integrated approaches to resolve social, environmental, and economic challenges. One credit agency attributed the resilience strategy of the Hampton Roads, Virginia, region as a factor in maintaining the credit rating of area municipalities such as Norfolk. It specifically pointed to the region's work on mitigating flood risks.

When cities act individually, they can solve their own problems; when they act together, the hope is that they can help address global problems.

That is the rationale of a new network, the Global Parliament of Mayors (GPM), which aims to encourage cities toward collective policy actions. The GPM will convene for the first time in The Hague in September. Dozens of mayors have already participated in planning sessions and many have already committed to participate, including leaders from Amman, Cape Town, Quito, Rotterdam, and Warsaw. The GPM hopes to set ambitious goals—at first focused on climate and migration—and then to devise pragmatic, bottom-up common policies based on successful innovations that already exist and based on the work of other global networks. Cities can opt in to, or out of, these policies, based on their specific needs and circumstances.

The GPM and other networks cannot replace or replicate municipal or national governance. What they can do is to help forge a global role for mayors. By coming together, these leaders can start to agree on strategic objectives, identify common solutions, and make a collective difference for the world's toughest challenges. 

Benjamin Barber is the author of *If Mayors Ruled the World: Dysfunctional Nations, Rising Cities* (Yale University Press, September 2014), *Jihad vs McWorld: Terrorism's Challenge to Democracy* (Ballantine Books, July 1996), and the forthcoming *Cool Cities: Urban Sustainability in a Warming World*, and he is the founder and president of the Global Parliament of Mayors Project. **John Means** is a partner in McKinsey's Washington, DC, office and serves on the advisory board for the Global Parliament of Mayors.

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Using ‘asset genetics’ to unlock hidden capital

Janna de Groot and Ashay Prabhu

Understanding an infrastructure asset’s unique characteristics can extend its life span—and save money.

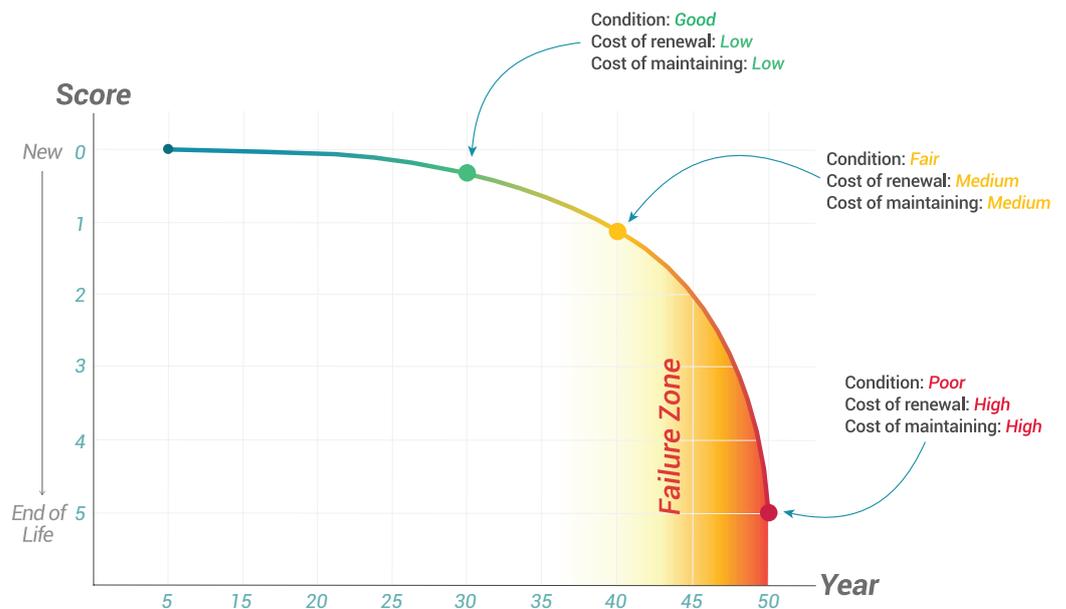
To continue to grow, the world needs to invest in new infrastructure—and it is not keeping up. According to recent McKinsey research,¹ current infrastructure spending is \$2.5 trillion to \$3.0 trillion a year, far short of the \$6.0 trillion needed to meet average annual demand to 2030.

¹ Aaron Bielenberg, Mike Kerlin, Jeremy Oppenheim, and Melissa Roberts, *Financing change: How to mobilize private-sector financing for sustainable infrastructure*, January 2016, globalinfrastructureinitiative.com.

The need to renew existing infrastructure is also acute, and doing so will be expensive. Once an asset—whether it is a road, a bridge, a pipeline, or a rail track—degrades beyond a certain point, it enters the “failure zone” in its life cycle (Exhibit 1). The cost to maintain such assets is high, adding further financial pressure. In addition, the service an asset provides declines substantially when it is not renewed.

Exhibit 1

Renewal and maintenance costs rise quickly when an asset reaches the ‘failure zone.’



Source: Assetic

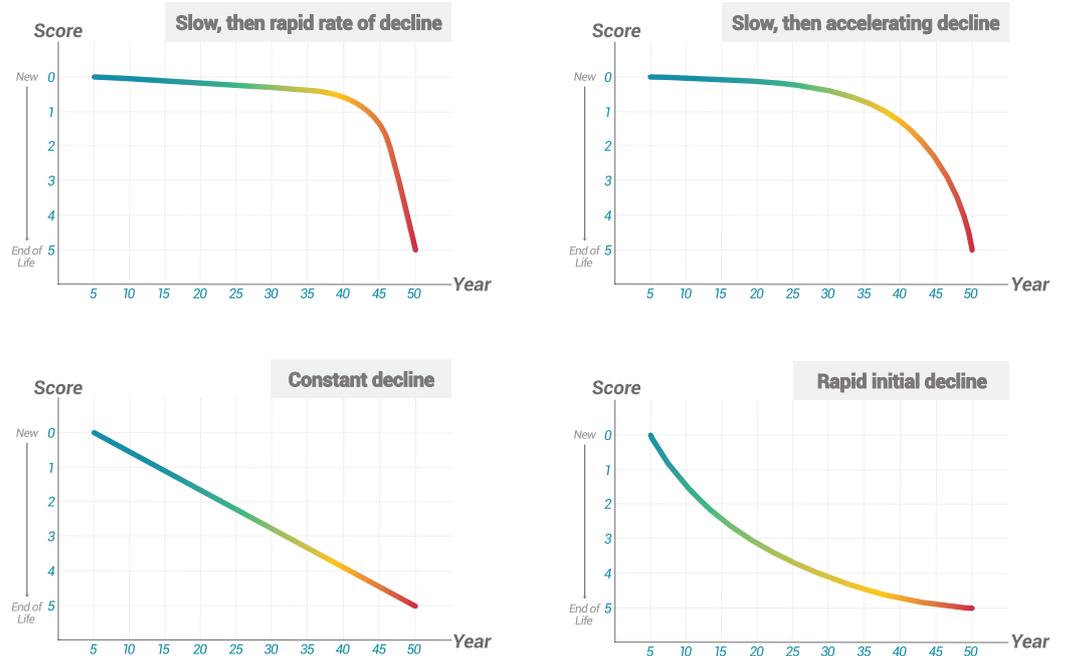
Investing capital in existing infrastructure at the right time reduces the proportion of assets that enter the failure zone. When an asset reaches that juncture, it can become necessary to pour in emergency money. By paying attention to the factors that help estimate the point in the asset’s life cycle where it makes sense to invest in renewal, such emergency spending can be avoided, unlocking capital for new projects. In this article, we explain how the concept of “asset genetics” can help.

What is asset genetics?

The unique characteristics of an infrastructure asset—such as its location, construction materials, usage statistics, physical condition, and maintenance history—constitute its DNA, or its asset genetics. These factors determine how fast the asset degrades and how long it can last: in short, the shape of its life-cycle profile (Exhibit 2). Using the data embedded in an asset’s genetic code can help to optimize spending and thus cut future costs.

Exhibit 2

Several life-cycle profiles are common for infrastructure assets.



Source: Assetic

Imagine a rail-network operator that is managing a portfolio of thousands of assets worth \$10 billion. Typically, such an asset portfolio degrades at a rate of 3 to 4 percent a year, or \$350 million of value. An approach emphasizing asset genetics helps identify the right time to invest in the renewal of the right assets to reduce the rate of decline by half—without needing to spend more money.

There are three steps to make this happen.

Understand the assets. This means compiling relevant information, such as age, location, and condition from on-site visits, surveys, and data collection. For example, a rail owner or operator needs to know what its assets are, where they lie, and how they should be segmented according to characteristics such as construction material, location, and usage. It can then develop a life-cycle profile for each segment, including average useful life and typical maintenance costs at different points in the life cycle. The owner or operator can then use current condition data to determine where each asset is in its life cycle.

Set up a framework. The next step is to tap into the knowledge of internal and external experts to create a framework for evaluating options and determining when to intervene for each asset segment (early, middle, or late in the life cycle). The goal is to recognize the different points where investment might be appropriate, the cost of the treatment, and its impact on overall portfolio-maintenance costs. For a rail operator, this would involve

understanding the costs, benefits, and optimal time to rehabilitate its tracks, which is much less expensive than replacing them.

Decide what to do. The framework described above can offer clarity about available options. At this point, financial-optimization models should be used to determine the best combination of interventions across the portfolio. Software can be used to determine the type, timing, and level of investment to produce the lowest renewal and maintenance costs and best service.

Taken together, these three steps can reduce the proportion of assets that enter the failure zone and thus lower renewal and maintenance costs significantly.

Where do we go from here?

Almost every agency in the developed world has the required data on asset genetics; it's a matter of putting the information together. Developing an understanding of asset genetics will better prepare infrastructure owners and operators to take advantage of what technology has to offer, particularly since that technology is about to get much better. The Internet of Things will make infrastructure assets smarter, allowing them to communicate information in real time to intelligent systems. Already, satellites detect water leaks, drones inspect power lines, and vehicles equipped with lasers evaluate road conditions. What is lacking is the ability to apply that data in a structured way that improves future outcomes.

In the next decade, that will change, and intelligent assets will learn to self-monitor and assess. Asset-genetics data—such as the number of breaks per year in a pipe, structural vibrations in a bridge, or the noise and meter readings of a pump—will flow constantly. Systems will apply predictive analytics to optimize the work required, from a simple inspection to complete replacement. When an infrastructure operator commissions a new asset, its expected lifetime performance, treatments, and failure rates will be mapped out and optimized from the start and continuously calibrated using real-time data.

Infrastructure is made of more than bricks and mortar, concrete and steel. To an extent that is often underappreciated, it is also made of information. By understanding the DNA of assets, and then using that information, infrastructure can last longer at lower cost, unlocking capital that can be invested in new projects. 

Janna de Groot is the general manager for product, marketing, and strategy at Assetic, a Melbourne-based infrastructure-asset-management firm; **Ashay Prabhu** is a cofounder and joint managing director of Assetic.

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How to keep cities moving: Ideas for America's urban leaders

Shannon Bouton, Stefan Knupfer, and Steven Swartz

There are signs that America's city dwellers are beginning to change the way they get around. Here is how city leaders can plan ahead.

American cities are facing urgent challenges when it comes to a fundamental aspect of urban living: getting around. Heavy traffic, long commutes, and environmental concerns, especially air pollution, are giving US city dwellers good reasons to consider alternative modes of transportation. At the same time, new models are emerging that offer appealing

options. In the future, advanced automotive technologies could mean that people will use cars much differently than they do today.

Together, these factors are bringing urban mobility to a tipping point. US cities have the chance to provide people with easier and better ways to travel, while making their communities more livable and sustainable. Seizing that opportunity will require leaders to rally transit-system operators, infrastructure investors, urban planners, private firms, and technology providers.

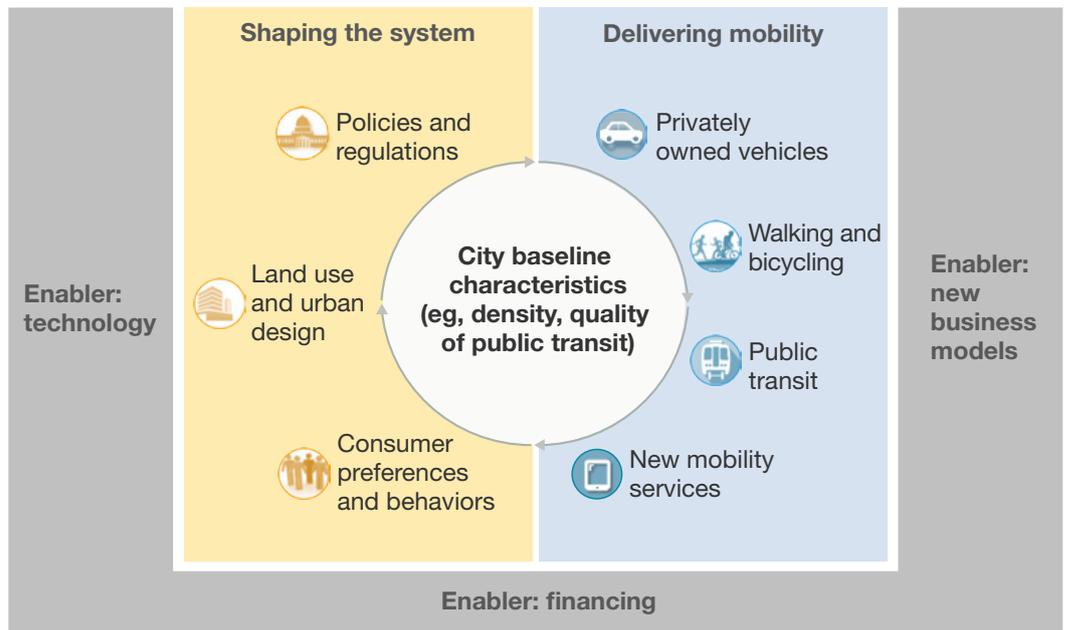
In this article, we look at the forces that are reshaping urban mobility, and we consider how these forces are playing out in different types of cities. We conclude with a set of ideas for how US city leaders can help improve travel—and the lives of their residents.

Understanding urban mobility: Seven factors

For city leaders, it is risky to make decisions about infrastructure investments and other matters related to mobility without considering how these choices affect entire transportation systems. To help think through underlying forces and how they interact, we consider seven factors that will define how cities move in the future (exhibit).

Exhibit

Seven factors affect urban mobility systems.



Source: McKinsey Analysis

1. Privately owned vehicles

Four major technological trends could improve urban mobility. In-vehicle connectivity, combined with real-time analytics, could reroute drivers to avoid traffic congestion and even prevent congestion from forming. Electric power trains can make cars more energy efficient and reduce local air pollution from tailpipe emissions. Car-sharing services could allow each vehicle to be used more intensively, perhaps reducing the number of cars on the road. Advanced driver-assistance systems that provide precollision warnings, blind-spot monitoring, emergency braking, and other safety features are proliferating—and clearing the way for autonomous vehicles (AVs), or self-driving cars, to gain wide acceptance. AVs could cut accidents by as much as 90 percent, according to preliminary estimates, saving thousands of lives and up to \$190 billion a year in the United States by 2050. Autonomous driving could also improve the flow of traffic, leading to better use of existing road capacity and reducing the need to build or widen roads, and could free passengers to perform other tasks.

2. Walking and bicycling

While pedestrian zones are not new, cities such as New York are closing more areas to vehicle traffic and implementing other pedestrian-friendly changes. Many cities are also trying to make bicycling safer, easier, and more popular. Bike-sharing systems have proliferated—more than 70 are in place across the United States—and some large cities are setting aside more of their roadways for cyclists.

3. Public transit

Light rail is making a comeback in some parts of the United States: construction on nearly 20 projects across the country was scheduled for 2016.¹ Public transit in US cities also faces competition from new private-transit models. To preserve options for city dwellers and prevent more vehicles from taking to already-clogged streets, some cities are using data to improve public-transit performance and developing software to help riders plan trips on mass transportation.

4. New mobility services

New options, such as e-hailing, could profoundly change the way people travel. Investment is pouring into this sector—more than \$9 billion of venture capital globally in 2015—and consumers have proved receptive. While not all start-ups will survive, their collective efforts will likely improve technologies, business models, and user experiences. AVs could also play a role in making such services more appealing. It is difficult to predict how fast autonomous cars will make their way into the marketplace, especially given uncertainty about regulation. Ultimately, though, driverless vehicles

¹Yonah Freemark and Steven Vance, "Transit Explorer," *The Transport Politic*, January 6, 2016, thetransportpolitic.com.

could almost halve the cost of e-hailing and shared e-hailing by eliminating the cost of the driver.

5. Policies and regulations

Urban-policy decisions made today will determine how mobility evolves for decades. Having reviewed the long-term transportation plans of more than 25 major cities in the United States and elsewhere, we see a trend toward making public-transit, biking, and shared-transportation options more attractive.

6. Land use and urban design

Urban planners are in a position to pursue transit-oriented development: high-density, mixed-use environments organized for easy access to public transit. As new services become more popular, city officials will need to think beyond principles of transit-oriented development and come up with urban designs that allow traffic to flow smoothly and protect pedestrians and cyclists.

7. Consumer preferences and behaviors

Consumers are learning to make practical trade-offs when comparing the costs, convenience, and environmental effects of various transit options. In the United States, where a love of cars runs deep, vehicle-ownership rates have declined in recent years. Surveys have found that American millennials use public transit almost three times more often and are 23 percent less interested in owning a car than the generation that precedes them. They are also more likely to use services like car sharing and e-hailing.

Different cities, different changes

Cities will not all develop in the same way. The pace of transformation is going to differ; the forces at work are not the same. But some cities are akin to one another and therefore face common challenges and opportunities. Within the United States, we see three major city types in which technologies, business-model innovations, policies, and consumer preferences seem likely to play out in similar ways.

Established megacities are large, prosperous metropolises that are densely populated, with relatively low car ownership and well-functioning public-transit systems. New York is a good example. Many of these cities are trying to manage traffic with new road designs and restrictions and to encourage walking and cycling. New services such as e-hailing are already routine. The result is likely to be less reliance on individually owned vehicles—but another possible result is less public-transit use as convenient private-transit options expand.

Mature, advanced cities are also prosperous and feature good public transit but tend to be smaller. Think of Portland, Oregon (population: 620,000), which has a well-established transit system, including buses, streetcars, light rail, and commuter rail. Riders can buy and use tickets with a smartphone app, and a fully electronic fare system is planned to be launched in 2017. The city is also home to a number of formal van-pooling services and an extensive network of bike lanes and paths.

Car-dominated, mature cities include most large US cities, particularly those that developed in the second half of the 20th century. Los Angeles may be the ultimate example. In cities like these, past decisions have established a status quo that all but requires people to own cars to get around. Fundamental change could take decades. In the meantime, e-hailing companies are becoming popular. As in-vehicle connectivity spreads, that technology could help ease congestion and improve safety.

The road ahead: Considerations for city leaders

As the US urban population grows, so will the demand for urban mobility. There are several ways to get on the right track.

One is digitizing public-transit systems so bus and train travel can be coordinated with private on-demand services. Los Angeles recently launched an app called Go LA that combines information about different kinds of transit to let users seamlessly plan trips that fit their preferences regarding affordability and speed. Organizations working with the app include taxi companies, ride-hailing services, and parking providers.

City leaders can also begin to consider how to incorporate new technologies and transit businesses in ways that improve urban environments, especially by reducing traffic and pollution. Regulations are needed to protect consumers, but policies that were created before the advent of e-hailing and other new services can inadvertently bar those services from operating. Thinking about issues like data sharing and ownership; equitable access to transportation, competition, and licensing; and the use of infrastructure can help officials expand options for city dwellers.

As more people take advantage of new services and public transport, city planners can use urban design not only to accommodate these ways of getting around but also to make transit systems more efficient and to put land and infrastructure-investment capital to better use. In some cities, parking lots take up one-third of all land area. Some of that land could be turned into bike lanes and places where on-demand vehicles can pull over to pick up or drop off passengers. Encouraging transit-oriented development can create the population density that creates demand for public transit.

When it comes to optimizing decisions about land use, urban design, and infrastructure investment, new technologies can provide city officials with the data and analytics they

need to understand transit-use and movement patterns and even to make adjustments in real time. The US Department of Transportation recently announced a partnership with Sidewalk Labs, a unit of the technology company Alphabet that aims to help cities manage traffic by analyzing data from smartphones, remote sensors, and other sources. Seven US cities will take part in the initial development effort.



Unless US cities change the way they think about mobility, rising demand will stress their infrastructure, as well as their residents' nerves. There is a better way. By rethinking rules written for a different era, municipal authorities can make getting around more flexible, more affordable, faster, and safer. 

[Download the full report on which this article is based, *Urban mobility at a tipping point*, on McKinsey.com.](#)

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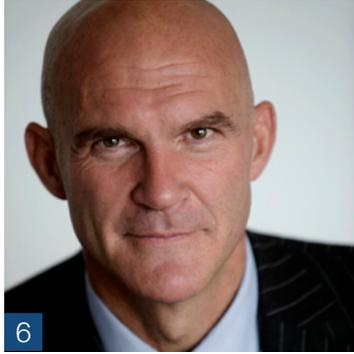
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