

THE SMART CITIES REPORT

DRIVING FACTORS OF DEVELOPMENT,
TOP USE CASES, AND MARKET CHALLENGES
FOR SMART CITIES AROUND THE WORLD

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KEY POINTS

- **Smart cities are cities with connected infrastructure that integrate, analyze, and act on data from a variety of different IoT devices.** Few cities around the world have actually grown into truly "smart" cities, but as more cities address global barriers — such as budgetary constraints and cybersecurity concerns — the market is beginning to accelerate.
- **Unique societal challenges and market drivers are shaping the ways that cities in different parts of the world are using these technologies.** Smart-city technology providers need to be aware of the unique characteristics that are driving different regions to favor different types of smart cities projects and solutions.
- **Europe is the most highly developed region of the world in terms of smart cities.** Several of the world's most advanced smart cities are located on the continent, and the EU's aggressive targets for fossil fuel emissions cuts are spurring further smart-city development there.
- **Central and South America's cities are investing in smart transportation in response to high rates of urbanization and underdeveloped transportation infrastructures.** About 80% of these regions' populations live in cities, according to the United Nations, and that percentage is expected to rise to 90% by 2050.
- **North American cities have been slow to adopt smart-city solutions compared with Europe and Asia.** However, increased funding from the US and Canadian national governments for smart cities and new infrastructure indicate that the market is set to take off in the next few years.
- **Africa lags the rest of the world in smart-city development because of the region's lack of internet networking infrastructure.** However, this gives the region the chance to quickly roll out the latest internet networking technologies like low-power, wide-area networks (LPWANs) and, eventually, 5G networks because they don't have to upgrade existing infrastructure.
- **National governments in Asia, and particularly in China, are spending massive amounts on new infrastructure.** As big as many cities in Asia have grown, only 47% of the continent's population was urban as of 2014, so there's still a great deal of room for that share to rise. This means that cities in Asia are facing enormous pressure to adopt smart-city technologies to reduce pollution and overcrowding.

[Download the charts and data in Excel »](#)

INTRODUCTION

Smart cities are cities that leverage IoT devices like connected sensors, lights, and meters to gather and analyze data. This data provides insights on infrastructure, population, and public services, and enables cities to improve efficiencies that affect the lives of residents. Few cities around the world have actually grown into truly "smart" cities — most are still in the early phases of implementing some of these IoT technologies and have yet to administer data-processing and analysis tools that can turn vast troves of data from millions of devices into a real-time view of a city's activity and operations.

Smart cities hold enormous potential as a market for IoT solutions, but it's also an inherently slow-moving market. This is because smart-city development faces many global barriers, including tight municipal budgets, sluggish technology procurement guidelines for public agencies, privacy and cybersecurity concerns, and a pressing need for more IT staff at municipal agencies. Taking the time to deploy new, futuristic technologies can also be a luxury that many municipal agencies charged with the day-to-day running of a metropolis can't afford.

However, many cities are starting to address these challenges, and smart city development around the world is beginning to accelerate. This has given more technology companies an incentive to enter the smart-cities market. In 2016 alone, AT&T, Samsung, and SK Telecom have jumped in with different solutions and partnerships. Sidewalk Labs, Google's smart-city subsidiary, [announced](#) plans to build an urban district for testing new smart cities solutions and concepts and help [manage](#) traffic and public transportation in Columbus, Ohio. These companies are among many aiming to carve out a portion of the nascent smart-city market before it really takes off.

In this report, BI Intelligence compares and contrasts the development of smart cities throughout the world, and examines the driving forces behind this development. We also identify unique and shared barriers that need to be overcome to enable the market to take off more quickly. Finally, we detail some of the most common types of smart-city projects in different regions, such as smart parking and transportation, smart energy and sustainability, and smart public safety initiatives, and delve into some examples of each.

EUROPE: LEADER IN SMART CITIES

Europe is generally regarded as the leading region for smart-city development. Three of the top five global smart cities in Juniper Research's 2016 [rankings](#) are European. The EU has been proactive in encouraging smart-city projects throughout its 28 member countries, and the European Commission has earmarked 365 million euros to back the European Innovation Partnership on Smart Cities and Communities, which has been tasked with developing partnerships between city governments, technology providers, and researchers to accelerate smart-city development. Pan-European regulations that aim to drive down fossil fuel emissions have also been a major factor in smart-city development in the region.

Driving Factors

Focus Area	EU 2020 Targets
Energy	20% increase in energy efficiency — equivalent to turning off 400 power plants
Renewables	Derive 20% of total energy consumption from renewable sources
Greenhouse gas emissions	Reduce total emissions to 20% lower than 1990 levels
R&D and innovation	Invest 3% of total EU GDP (including private and public sector) in R&D and innovation

Source: European Parliament

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- **EU sustainability goals:** The biggest driving factor behind Europe's smart-city development has been the EU's aggressive goals regarding the reduction of fossil-fuel consumption. The EU's 2020 targets have pushed governments at the national, regional, and local levels to implement initiatives that reduce greenhouse gas emissions, leading to the adoption of smart city technologies throughout Europe. Meeting the EU's goals will require major upgrades to cities' transportation services and energy infrastructures because Europe is heavily urbanized: Nearly 75% of the EU's population lives in cities, and cities account for roughly 70% of the EU's greenhouse gas emissions. Some cities are setting even more aggressive targets for reducing emissions than the EU's targets. For example, London is aiming to cut its emissions to 40% below 1990 levels, compared with the EU's target of 20%. These energy goals have strongly influenced the types of smart-city projects being implemented in Europe.

- **Dense cities:** Many of Europe's cities are a thousand years old or more, so they have very dense urban landscapes that weren't built for modern transportation. For example, many older city centers feature winding alleyways meant for pedestrian traffic that are too narrow for cars. This means European cities have to be more creative with how residents are ferried around. They also tend to depend far more on public transportation than their North American counterparts. This focus on public transportation has helped lead to a large concentration of smart transportation projects on the continent that reduce road congestion and pollution, while offering more transportation options for inhabitants.

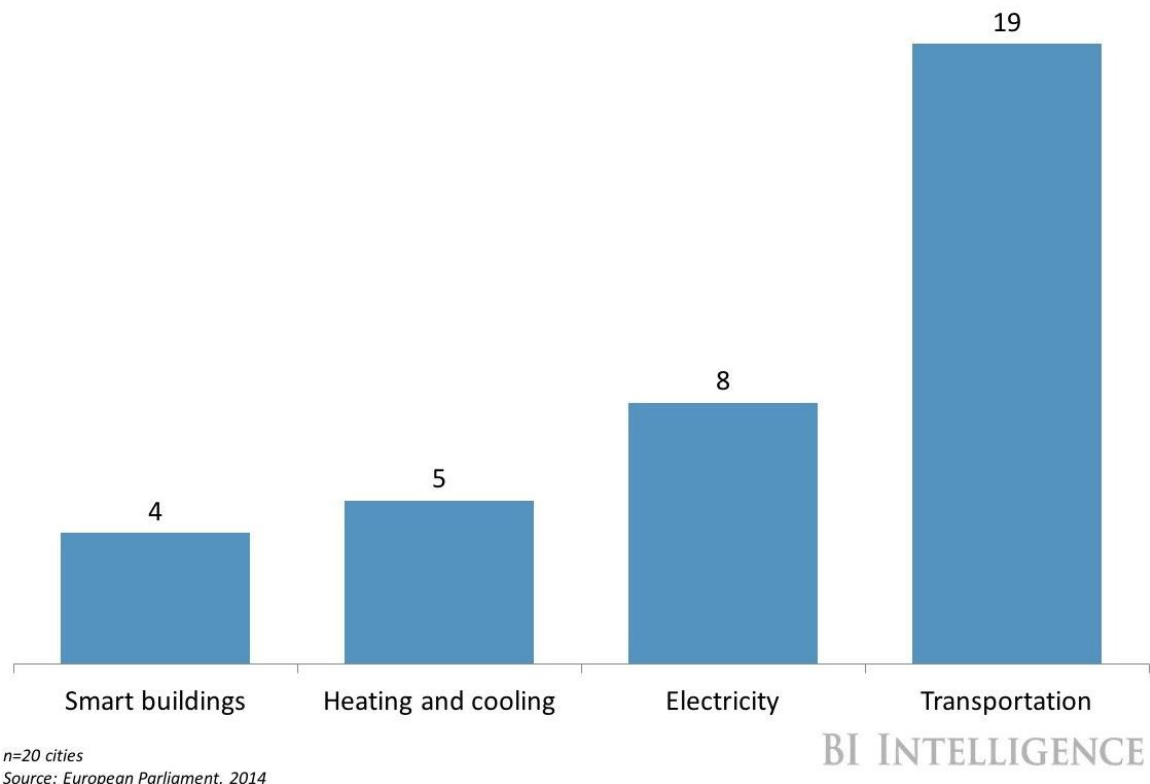
Top Use Cases

The most popular smart-city use cases in Europe fall within two categories: resource conservation and smart transportation. Both of these categories contribute to the overriding goal of urban sustainability that is driving the development of smart cities across Europe.

- **Resource conservation:** Smart grids, metering, and street lighting help European cities cut their energy usage and emissions to meet the EU's sustainability objectives. The European Commission [projects](#) that 72% of consumers in the EU will have smart electricity meters installed in their homes by 2020, and 40% will have a smart gas meter. Many smart-city projects in Europe also include the implementation of renewable energy sources, like solar roof panels for homes or buildings. Some cities have already completed or are planning such projects:
 - Vienna launched a "citizen solar power plant" project in conjunction with local utility provider Wien Energie to provide residents with home solar panels. The project involves a crowd-funding effort that allows citizens to buy half or full panels and receive a guaranteed annual return of 3.1% on their investment.
 - Barcelona has installed thousands of smart streetlights from Philips Hue that change the lighting based on the environment — the lights dim if the street is empty, for example. Additionally, the city's government worked with local utilities to deploy more than 19,000 smart meters throughout the city.
 - Amsterdam has been experimenting with [providing](#) home energy storage units and solar panels for households connected to the city's smart grid. The batteries help reduce demand on the grid during peak times by enabling residents to store up energy during off-peak hours. The solar panels also allow residents to sell spare energy from the panels back to the grid.

- **Smart transportation:** Smart transportation initiatives provide a variety of benefits including optimized public transportation routes, safer roads, and decreased infrastructure costs. Smart transportation projects have also been a primary tool in helping cities meet the EU's aggressive energy sustainability goals:
 - Paris launched its electric-car sharing program, [Autolib](#), in 2011 and has expanded the program's fleet to 3,000 vehicles. The connected vehicles can be tracked by GPS, and drivers can reserve public parking spaces using the car's dashboard.
 - Copenhagen uses sensors to track the city's bike traffic in real time, allowing it to continuously improve its routes. More than 40% of the city's population commutes every day by bike.
 - London [announced](#) in early 2016 that it would start testing a smart-parking initiative in addition to new electric car and bike-sharing programs. The smart parking initiative helps drivers quickly find a parking spot so they don't need to drive around in search of one, which could contribute to urban traffic congestion.

Number Of Smart City Projects Aligning With EU 2020 Targets



- **Citizen engagement:** Several European cities have launched citizen-engagement efforts that leverage digital technology to connect citizens with municipal agencies so they can report problems and receive updates on city services. These types of projects can be a vital part of the information-gathering side of a smart city, helping city officials make smarter decisions based on feedback from citizens.
 - London has opened up an abundance of city data by making it available in its [London Datastore](#). The portal offers the public information on metro delays, housing prices, and crime rates.
 - Hamburg created the [Nextthamburg](#) online community portal, where citizens can learn about city projects and discuss its policies. The community also helps citizens raise participate in crowdfunding initiatives to get projects they suggest off the ground.
 - Barcelona has opened up the data collected by the city's sensor network and government IT systems to developers and citizens to increase transparency and create new applications.

Market Barriers

- **Data privacy:** European citizens are highly sensitive to data-privacy issues, and governments in the region have enacted some of the most stringent privacy laws in the world. Nearly 70% of the respondents in a 2015 European Commission [survey](#) said that they were concerned about their data being used for a different purpose than it was originally collected for. This will likely be a growing concern with the advent of smart cities, as sensors and cameras installed by smart cities track residents' movements and activities without their knowledge. If cities and their technology partners are not extremely transparent about how they use this data, it could convince citizens that smart cities violate their rights around surveillance and privacy.
- **Upgrading legacy infrastructure:** European cities tend to be highly developed, so transforming them into smart cities requires retrofitting their existing infrastructure with sensors, smart lights, and smart meters. This can be a time-consuming and costly process that often forces cities to find unique solutions and shortcuts that mitigate the impact of implementing new technology on existing infrastructure. For example, European cities often can't use traditional parking sensors because they don't want to rip up historic cobble-stone streets, so they need to use alternatives like ultrasound sensors for smart parking initiatives, Munish Khetrapal, Cisco's managing director of smart cities and IoT solutions, shared with BI Intelligence. European cities are growing more experienced with finding these kinds of alternatives and workarounds, but this is still a factor that can slow down projects in the region.

CENTRAL AND SOUTH AMERICA: TRANSIT AND SAFETY ARE DRIVERS

Many cities in Central and South America have less-developed infrastructures than cities in Europe and North America, making them ill-equipped to handle issues related to overcrowding and congestion. Central and South America are some of the most heavily urbanized parts of the world, with about 80% of their populations living in cities, [according to](#) the United Nations. That percentage is expected to rise to 90% by 2050. Adopting IoT technologies can help these cities improve their public services to better cope with the pressures of urbanization and identify problems within their transportation, energy, water, and waste management systems. However, cities in this region have not received the same level of support for smart-city projects from their national governments as cities in other regions.

Driving Factors

- **Urban congestion:** Overcrowding has been the greatest driving factor in the development of smart cities in Central and South America. Huge megacities like Sao Paulo and Mexico City — both of which have more than 20 million residents — need to modernize their infrastructure to improve their quality of life and reduce congestion and pollution. This has prompted individual cities to kick-start projects that mitigate the growing pressures on their infrastructure, even in countries where the national governments haven't provided much material support for such projects.
- **Competitiveness:** As economically developing regions, Central and South America are working to attract more tourists and global businesses to boost their development. Smart-city technologies can help cities decrease traffic congestion and air pollution and improve the efficiency of public services. This can help Central and South American cities compete with those in other regions, particularly neighboring North America, in attracting talent that can draw more businesses to the region.

Top Use Cases

- **Smart Transportation:** Several cities in Central and South America are experimenting with transportation schemes to relieve dense traffic congestion. These projects also provide other benefits such as reduced air pollution and improved quality of life.
 - Santiago, Chile, implemented sensors for tracking traffic congestion and control centers where city officials can see the traffic data in real time. The city also implemented a variable automated pricing system for its highway tolls that charges drivers more during peak traffic times to dissuade congestion.
 - Bogota, Colombia, built a network of bike paths that connect with the city's rapid bus transit stops and introduced a bike-sharing initiative to reduce the number of cars on its roads.
 - Mexico City implemented a bike-sharing program with 6,000 bicycles and has also been experimenting with car-sharing programs to help reduce road congestion.
- **Public safety:** Because much of South and Central America has a tropical climate, cities have to prepare for sudden, intense rainfalls that can wreak havoc on services and infrastructure. IoT solutions and urban planning initiatives can help ensure cities are better prepared for coping with these incidents.
 - Curitiba, Brazil, has [built](#) a series of green spaces across the city designed to absorb water runoff during the region's rainy season. The parks are connected to a channel system that drains the runoff into local waterways, and monitoring sensors placed along the system help provide early warnings of flooding.
 - Rio de Janeiro built a monitoring and control center in conjunction with IBM that collects data about the city's weather, crime, and traffic. One of the center's primary purposes is to predict mudslides in the city's favelas by combining weather information with data gathered from hillside sensors.

Market Barriers

- **Lack of government support:** Many of the cities in this region that have implemented smart-city projects have done so with little support or funding from their national governments. This is in stark contrast to other areas of the world like Europe and the Asia-Pacific region, where smart-city development has become a national priority. This means cities in Central and South America can face serious resource challenges when planning and executing smart-city initiatives. Some countries in this region, such as Chile, have started to show more support for smart-city development, but more support is needed throughout the region to spur further development.
- **Lack of modern infrastructure:** Parts of Central and South America suffer from outdated or underdeveloped infrastructure. Governments in this region have not invested as much in transportation, energy, and other critical infrastructure as governments elsewhere in the world. This creates unique challenges and opportunities for smart cities projects in the region. As cities build out new infrastructure, it can be less expensive to embed sensors and other connected devices in that new infrastructure than retrofitting existing infrastructure with these devices. This gives cities in the region the opportunity to embed the latest technologies as they build out new road, water, and energy systems. However, constructing this new infrastructure is a time-consuming process in and of itself.

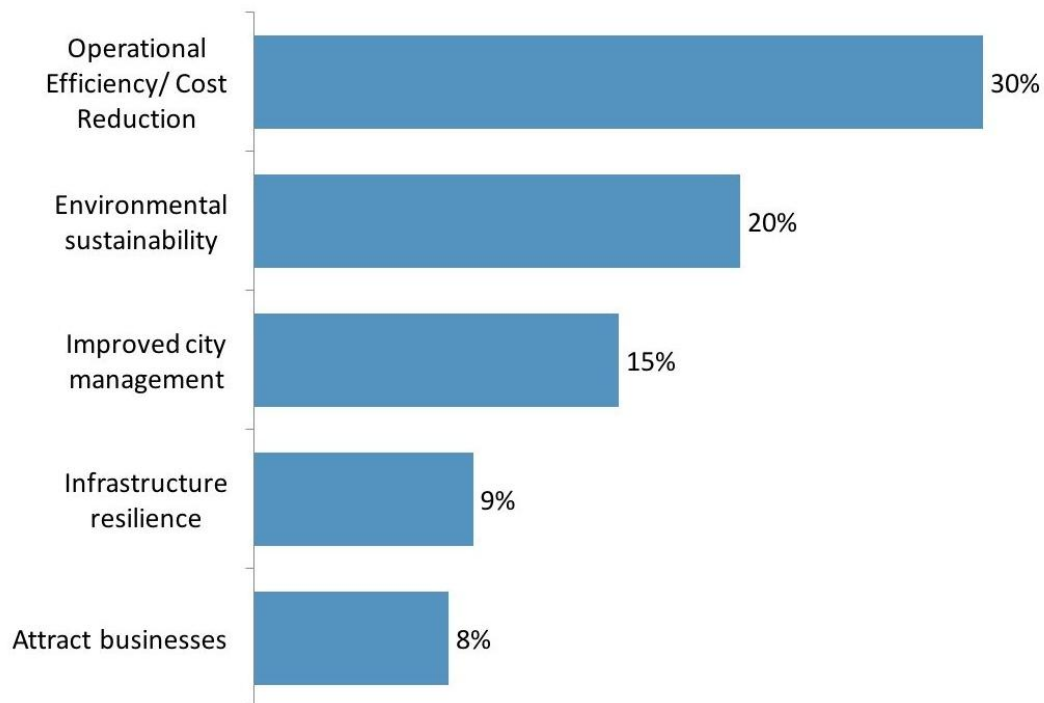
NORTH AMERICA: LAGGING BEHIND

North America is the world's most urbanized region, with more than 80% of the region's population living in urban centers, according to the UN. Despite this, the region has let Europe take the lead in smart cities so far, with Asia likely to eclipse it as well in smart-city development. That is largely because US municipalities have been hamstrung with tight budgets since the 2008 financial crisis. Additionally, there has been little support so far from the US federal government for smart-city projects, while Asian and European governments have made spending on infrastructure and sustainability a top priority. However, the lack of funding from the federal level has led cities to find ways that they can leverage IoT technologies to do more with less, and the federal government has recently launched some initiatives supporting smart-city development. In Canada, the national government is promising significant increases in infrastructure spending in the years to come, indicating that smart cities' growth will accelerate rapidly in the near future.

Driving Factors

Top Smart City Drivers

Q: What Is The Primary Driver For Smart City Projects In The US?



Source: Black & Veatch, 2015

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- **Budget constraints:** The US trails Europe overall in smart-city development, largely because of a lack of funding at the local, regional, and national levels that can be traced back to tight municipal budgets over the last few years. However, budget constraints have also been a driving factor for smart-city development, as US cities have been pushed to implement projects that can help them cut costs. Improved operational efficiency and cost reductions are the biggest driver of smart-city adoption, according to a Black & Veatch survey of US utility executives and municipal officials conducted last year. Smart-city projects that focus on citizen engagement and resource management can help cities achieve this mission of doing more with less.
- **Urban crime and safety:** In the US, cities that suffer from high crime rates have turned to smart-city technologies to help respond more quickly to incidents. Some cities have begun using ultrasound sensors to quickly alert law enforcement of the location of gunshots. Smart-city technologies can also improve road safety, which is a major issue for many sprawling US cities where most residents use privately owned cars rather than public transportation.
- **Infrastructure spending:** Canadian cities have generally made greater progress in the use of smart-city technologies. Eight Canadian cities were selected by ICF, a think tank focused on urban development, for its list of Smart21 Communities of the Year [finalists](#) in 2016. Canada's Liberal party won the national election in 2015 promising to [double](#) the national government's spending on infrastructure over the next 10 years, with a heavy focus on public transportation and sustainable infrastructure. Canadian cities will make great progress in implementing smart-city projects that align with these goals moving forward.

Top Use Cases

- **Public safety:** Technology that uses audio sensors to quickly alert police of the location of gunshots is being widely adopted in US cities to reduce gun violence. North American cities dealing with high traffic congestion have also turned to traffic sensors and data from connected cars to find ways to reduce traffic accidents.
 - New York City tested gunshot-detection technology last year in several police precincts spread around Brooklyn and the Bronx, and the mayor's office and police department are looking to [expand](#) the system throughout the city.
 - Camden, New Jersey, has been using gunshot-detection technology in some of its neighborhoods that suffer from high crime rates, helping its police department [cut](#) its response times to less than a minute in some cases.
 - New York City also piloted a connected-car pilot [program](#) in 2015, collecting data on 400 volunteers' driving habits. The city said its aim was to use the data to better understand driving behaviors in the city, including where drivers frequently make hard brakes or fast turns because of traffic conditions, providing information on where officials should look to improve roads.
 - San Diego is also [using](#) cameras embedded in connected streetlights to monitor pedestrian traffic and reroute vehicles when traffic peaks to avoid accidents involving pedestrians.

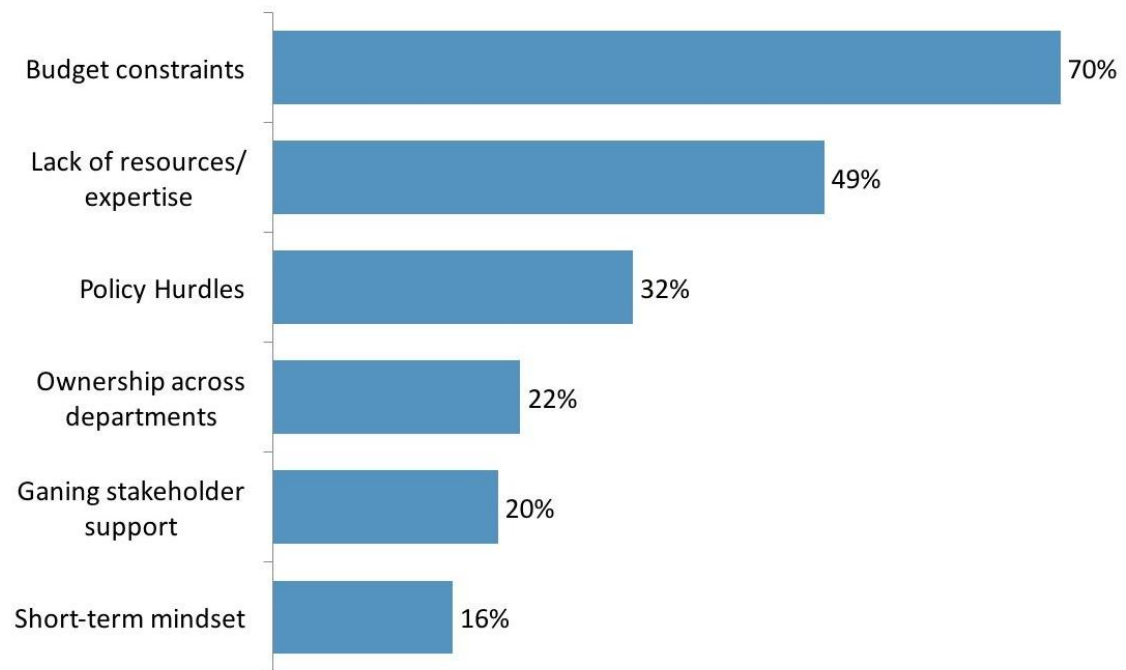
- **Citizen engagement:** City governments in North America have been making strides in opening up the data they collect to the public. These types of projects serve several goals for smart cities. They create more transparency around government activities and budgets, which has been a focus of cities in the US, where fiscal responsibility has been a major issue at every level of government. Open data projects also help inform citizens about public services they may not have been aware of before. Lastly, these projects allow developers to build applications using public data, helping cities improve current services and offer new ones at a low cost to municipalities. Seattle has opened up more than 1,000 public data sets for its thriving tech industry to build applications that improve the city's quality of life.
 - As part of the first phase of its Waterfront Toronto project, Canada's biggest city built out a web portal and mobile app that gives residents real-time information on transit info, traffic, and weather reports.
 - Chicago launched its [Data Dictionary](#) program, which opened up more than 1,000 data sets to the public in 2013 with the goal of gaining new insights into how the city can improve its operations.

Market Barriers

- **Budget resources:** In the US, lack of funding has been the biggest obstacle to the development of smart cities. This has made it difficult to launch the type of expensive smart transportation and smart energy projects that European and Asian cities have undertaken. About 70% of utility executives and municipal officials cited lack of funding as a major barrier for smart city development in the country in a 2015 survey by Black & Veatch. This lack of funding is the result of both tight municipal budgets at the local level as well as lack of funding from the US federal government for smart city projects. However, the federal government has just recently started to provide more resources for smart cities over the last year or so. In early 2016, the White House [launched](#) The Opportunity Project, an effort to open up public data from local governments to developers of smart-city applications. Additionally, the US Department of Transportation ran a competition where medium-sized US cities submitted proposals for smart projects, with Columbus, Ohio, recently [winning](#) the competition's award of \$50 million in funding for its projects.

Top Smart City Challenges

Q: Choose The Top Three Barriers To Developing Smarter Cities In The US?



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Source: Black & Veatch, 2015

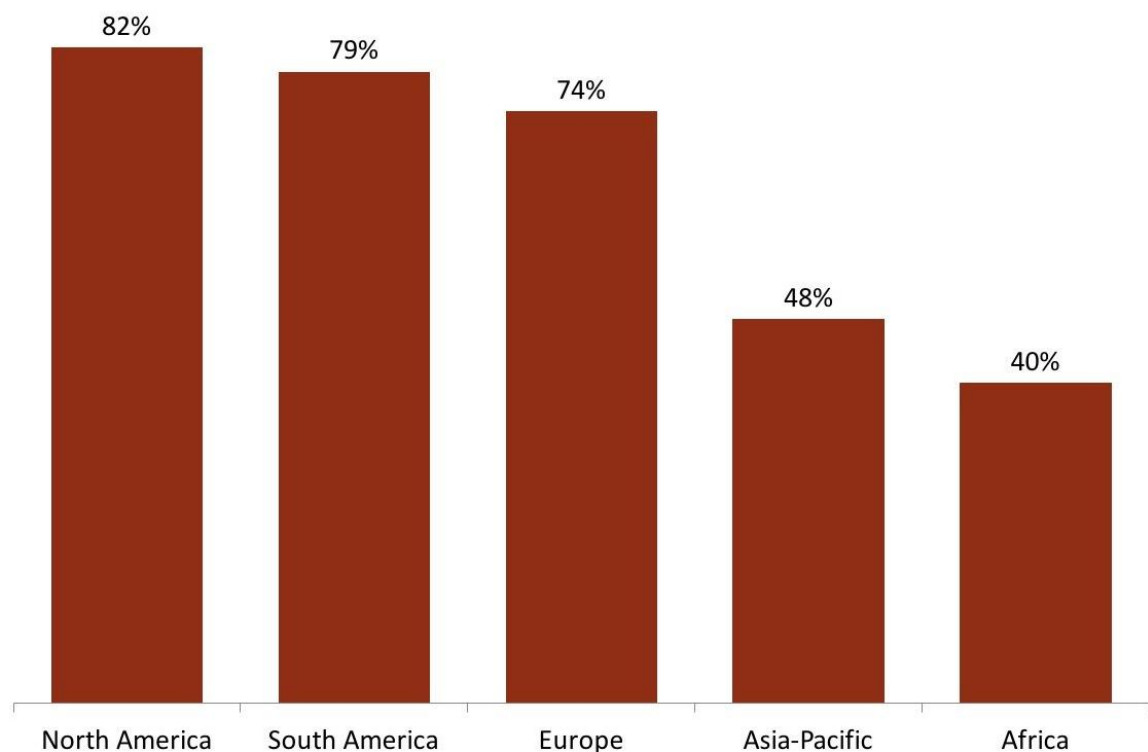
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- **Regulations:** Technology procurement processes are also a factor in slowing down the growth of smart cities in the US, where regulations often require municipal agencies to implement the lowest-cost technology solutions. That means that municipal agencies must go through a bidding process whenever they request proposals for technology solutions. If they can't find a bid that meets their budget requirements, then cities may have to delay the project until the next budget cycle. This can mean years of delays in some cases in getting smart city projects off the ground.

AFRICA: UNTAPPED POTENTIAL

Africa has less developed infrastructure and lower urbanization than the other regions mentioned in this report. This has led to minimal smart city development so far, but Africa has enormous potential for smart-city growth as urbanization there accelerates over the next few decades. The percentage of Africa's population living in urban centers grew from 19% to 39% from 1960 to 2010, and will hit almost 60% in 2050, when the continent's total urban population will top 1.1 billion, according to [estimates](#) from the African Development Bank. This means that African cities will increasingly come under the strain of overcrowding, pollution, and congestion that cities in other parts of the world are experiencing.

Percentage Of Population Living In Cities, By Region



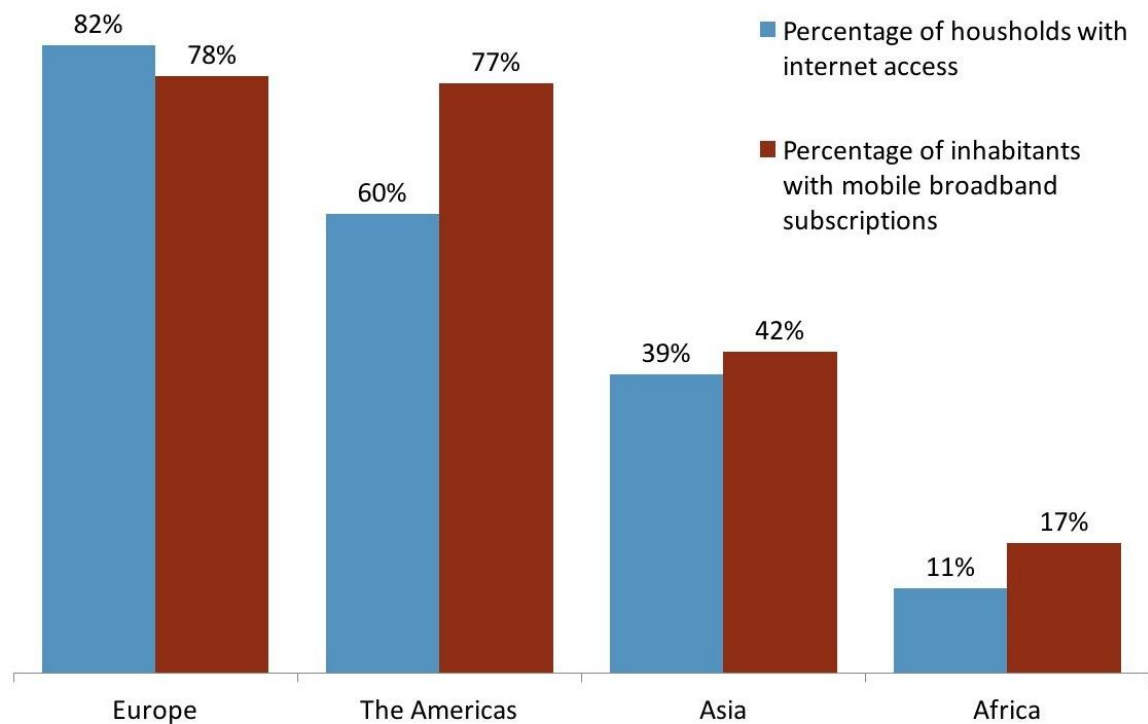
Source: United Nations, 2014

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Driving Factors

- **Growing internet access:** Expanding internet access is an urgent objective for many governments in Africa. Africa significantly trails other regions in the world in internet access for its residents, even in urban centers. This has made expanding access and network coverage a major priority for African cities. Although this is a major barrier to economic development in much of Africa, it also provides a potential benefit. Large parts of the region will be able to freshly implement the latest internet networking technologies, allowing them to avoid the costs and challenges in upgrading existing analogue communications infrastructure, as more developed regions have experienced.

Internet Access And Mobile Broadband Penetration



Source: International Telecommunications Union, 2015

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- **Lack of legacy infrastructure:** While a lack of modern infrastructure creates problems for many African cities, it also creates opportunities for rapid smart-city development. As African cities start building out more infrastructure, they'll be able to embed connected devices like sensors and smart meters into new roads, waste management infrastructure, and water pipes. Also, African cities don't have the large resources tied up in maintaining existing infrastructure that more developed cities do, meaning they can devote more resources to new infrastructure and smart cities projects.

Top Use Cases

- **Free internet access:** Providing public Wi-Fi is a common smart-city initiative throughout the world, but it is a particularly significant use case for African cities, which lack modern telecommunications infrastructure. Public Wi-Fi hotspots provide mobile broadband access for cities' residents while also laying the internet infrastructure for connecting other devices like sensors or smart lights.
 - Cape Town plans to install 300 Wi-Fi hotspots around the city by the end of 2016 as part of the Smart Cape Project, an initiative aimed at providing internet access for all of the city's residents.
 - Kigali, Rwanda's capital, started [offering](#) free public Wi-Fi hotspots in 2013 in an effort to spread free internet access throughout the city.
- **Smart transportation:** Many African cities have underdeveloped transportation infrastructure, making it particularly difficult for them to handle growing traffic congestion as urban populations grow. Some African cities are leveraging IoT technologies to help mitigate this problem by tracking traffic flows to identify the worst congestion points.
 - Nairobi, Kenya, has partnered with IBM to analyze data from the city's CCTV cameras to track traffic throughout the city and spot congested areas.
 - Accra, Ghana, built a central control tower for monitoring the city's road traffic in 2012. The control center analyzes data from smartphone signals to track the city's traffic patterns.

Market Barriers

- **Telecommunications infrastructure:** A major challenge for developing smart cities in Africa is the relative lack of broadband and telecommunications infrastructure in parts of the region. One in five people living in Africa had internet access in 2015, according to the International Telecommunications Union (ITU), the UN's information technology agency. Africa was also the only region in the world where mobile broadband penetration was still below 20%, the agency [said](#). The region needs greater investment in building out its information technology infrastructure in order to connect smart cities. Low-power, wide-area networks (LPWANs) that offer internet connectivity for sensors and other IoT devices could be an important component for smart cities in Africa, as these networks are cheaper to set up than traditional cellular networks.
- **Lack of government support:** Some national governments in Africa, like South Africa's and Rwanda's, have made smart-city development a national priority, but many other national governments are not allocating resources for smart city projects in their countries. This means that smart-city development in Africa will likely take place very slowly outside of these pockets where national governments are prioritizing smart cities. As urbanization accelerates, more national governments will likely be forced to invest in smart city projects to relieve congestion and overcrowding. Until then, many cities in the region will have to rely heavily on resources from the private sector to help them jumpstart such projects.

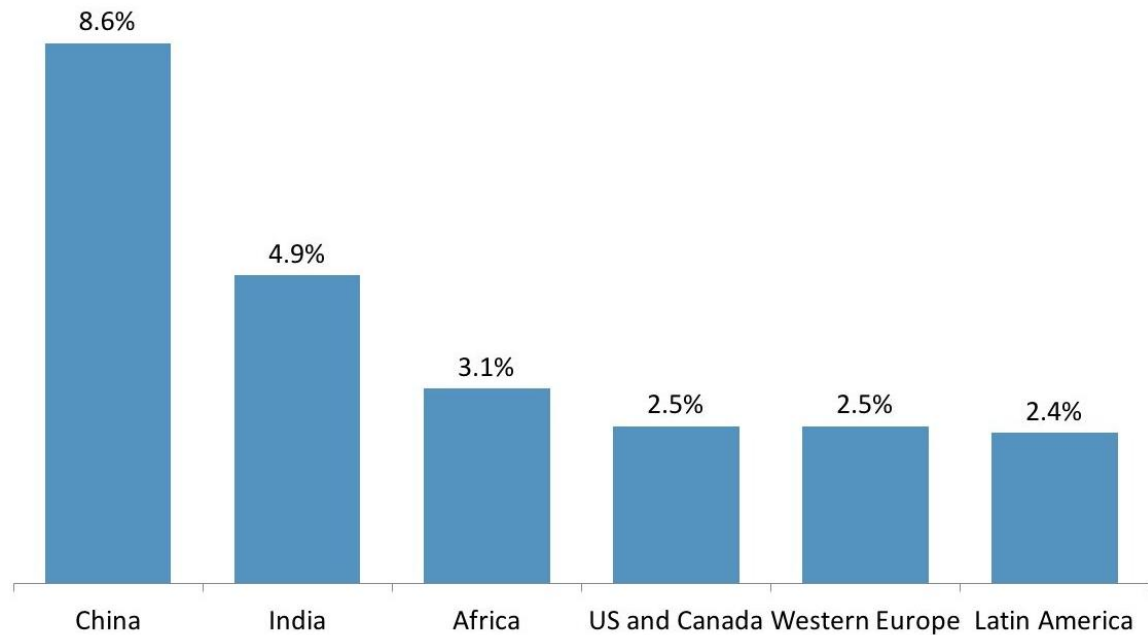
ASIA-PACIFIC: EMERGING SUPERPOWER

Asia is already starting to realize its massive potential as a smart-city market. Cities like Singapore and Seoul, South Korea consistently rank among the world's smartest cities. Asia is home to many of the world's biggest cities, like Tokyo, Mumbai, and Shanghai, that are coping with extensive overcrowding and congestion problems. As big as many cities in Asia have grown, only 47% of the continent's population lived in cities as of 2014, so there is still a great deal of room for further urbanization. This means that cities in Asia are facing enormous pressure to adopt smart city technologies to reduce pollution and overcrowding, and easing strains on their road and utility infrastructures.

Driving Factors

- **Government support:** Several national governments in Asia, recognizing the growing need for smart-city technologies in their metropolises, have pledged to devote national resources to smart-city projects. China's Ministry of Housing and Urban and Rural Development has set aside a \$16 billion investment [fund](#) for 193 localities and economic development zones throughout China to put towards smart city projects. India's government has [pledged](#) to invest \$15 billion in developing 100 smart cities throughout the country by 2022. Singapore's government's latest five-year plan includes more than \$13 billion of public investment in technology solutions that help solve national problems and spur economic growth in the city-state. In addition to alleviating issues stemming from urbanization, national governments hope the smart city projects they fund will also help make their cities more competitive in attracting talent and businesses compared to European and North American cities.
- **Infrastructure investment:** Existing infrastructure in some parts of Asia is badly out of date, and governments in the region are allocating more investment for infrastructure upgrades. India's government [announced](#) in 2015 that it would invest \$133 billion over the next five years in the country's sprawling but decaying railway system. While some major cities in Asia like Delhi and Bangkok are building out relatively new metro systems for public transportation, others like Jakarta and Manila badly need new public transportation options to relieve their congested roadways. And China's government [spends](#) more on infrastructure than all of Western Europe and North America combined. All of this investment creates opportunities for smart transportation, energy, and resource-management projects that collect valuable data about new and existing infrastructure.

Average Infrastructure Spending As A Percentage of GDP, 1992-2013



Source: McKinsey, 2016

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Top Use Cases

- **Smart-from-scratch cities:** One of the unique smart city use cases implemented in several parts of Asia is new cities or districts built from the ground up as smart cities with sensor networks and connected infrastructure. This novel use case is very expensive, so it's rare in much of the world. But with the enormous investment that Asian governments are making in new urban infrastructure, the cost of connecting this infrastructure is a relatively small expense. It's extremely difficult to measure the ROI for these types of smart-city projects because they can be so expensive and far-reaching. If these "smart-from-scratch" cities and districts prove worthy of the investment, then other developing regions, particularly Africa, could adopt this use case as well.

- Songdo, South Korea, is probably the most well-known of Asia's smart-from-scratch urban centers. The city, built on reclaimed land adjacent to South Korea's capital, Seoul, boasts a sensor network that provides real-time data on traffic, energy use, and weather conditions. It also features a network of charging stations for electric cars, and a waste management system that transports waste directly from homes through a series of tunnels to waste-processing plants.
- Lavasa, a smart-from-scratch urban project in India, is a private initiative of the Hindustan Construction Company located two hours away from the city of Pune, a hub for India's IT industry. The project is far from completion, but when fully developed, the small city will be connected by a 42-kilometer fiber-optic network that will help connect buildings, households, and infrastructure to the internet. Residents will also be able to access public information about city services, construction projects, and transportation systems through an online portal.
- Great City, a new district that will be developed as a satellite of the Chinese mega-city of Chengdu, will include sensors, smart meters, and other smart city solutions to reduce the district's wastewater by 58% and its energy consumption by 48% compared with other districts of similar size.
- Saudi Arabia has [contracted](#) Cisco to help connect four new "economic cities" that the government is building to grow the country's IT sector to reduce the country's economic dependence on hydrocarbon exports.

- **Smart energy:** Asian cities have been at the forefront of implementing smart city solutions that reduce energy consumption and carbon emissions. Some overcrowded cities in the region suffer from air pollution that dramatically impacts residents' quality of life, forcing municipalities to take action. Some Asian countries have also implemented aggressive plans for cutting carbon emissions, giving local municipalities an incentive to cut their energy consumption. Japan, for instance, [pledged](#) last year to cut its greenhouse gas emissions by 26% by 2030 from 2013 levels.
 - Tokyo has [implemented](#) a number of programs to incentivize the use of technology to cut buildings' energy consumption. For instance, the city offers subsidies to residential buildings that install rooftop solar panels, solar-powered heating systems, and battery cells for energy storage. The city also implemented a cap-and-trade program for carbon emissions from large buildings, giving these buildings an incentive to implement smart lighting and other solutions that will cut their carbon footprint.
 - Osaka has collaborated with the Osaka Gas energy utility on a smart-home project to implement solutions that cut households' energy consumption. The households involved in the project used 88% less energy than similar households in the city.
 - Shanghai has implemented smart-grid technologies to help prevent blackouts when energy demand in the sprawling metropolis peaks, while also the city's carbon footprint and preparing the city's grid for integrating more green energy sources as China invests more in wind and solar energy.
 - Tianjin, China, is expanding a pilot project with GE's Current smart-lighting subsidiary to install smart LED street lights throughout the entire city, which will cut the city's electricity usage.

- **Smart transportation:** Overcrowding has led to horrible traffic congestion in many cities in the Asia-Pacific region. This contributes to air pollution and also makes the cities less attractive to potential newcomers and businesses. In response, cities in the region are launching various smart transportation projects to better manage traffic congestion and take cars off their roads.
 - Hong Kong has implemented a traffic control center that monitors the city's traffic via CCTV cameras and can adjust traffic lights in real time in response to congestion in a given area.
 - Taipei has also established a similar traffic control center and feeds live updates about traffic conditions to drivers of public transportation vehicles to help them avoid congestion and delays.
 - Singapore has partnered with MIT spinout nuTonomy to test driverless taxis on the city's streets. The electric self-driving taxis help reduce emissions and could help reduce the number of cars on the city's roads.

Market Barriers

- **Lack of talent:** While the funding and support from national governments is certainly there for accelerated smart-city development in Asia, cities will also need to hire a great deal of IT talent to execute and manage their smart-city projects. This will require greater investment in education on the part of national governments in order to graduate the requisite number of new hires that will be needed to staff municipalities. It will also require municipalities to find ways to attract new talent that may be more likely to opt for more lucrative employment in the private sector. Without the necessary skills in their workforce, municipalities will likely face delays with their smart-city projects, and could find it difficult to get the expected return on their smart cities investments.
- **Finding locally relevant solutions:** With sufficient funding, cities in Asia will have to make sure that they use their resources for smart cities projects wisely. There is a risk that cities could sink a great deal of money into the newest and most appealing technologies without actually solving their social issues and infrastructure problems. This will require cities to put extra effort into researching and tailoring solutions that address their unique political, social, and economic landscapes, according to Justin Bean, Hitachi's director of smart-cities solutions marketing. It's far easier to implement simply implement solutions that have worked for other cities, but in many cases that can lead to money being wasted.

THE BOTTOM LINE

- Smart cities are cities with connected infrastructure that integrate, analyze, and act on data from a variety of different IoT devices.
- Unique societal challenges and market drivers are shaping the ways that cities in different parts of the world are using smart cities technologies.
- Europe is the most highly developed region of the world in terms of smart cities.
- Central and South America's cities are investing in smart transportation in response to high rates of urbanization and underdeveloped transportation infrastructures.
- North American cities have been slow to adopt smart city solutions compared with Europe and Asia.
- Africa lags the rest of the world in smart cities development because of the region's lack of internet networking infrastructure.
- National governments in Asia, and particularly in China, are spending massive amounts on new infrastructure.

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