

Cities of the 21st Century

2018 Smart Cities Survey

June 2018

Prepared by:



IHS Markit™

Technology and Innovation Task Force

Council on Metro Economies and the
New American City



THE UNITED STATES CONFERENCE OF MAYORS



**THE UNITED STATES
CONFERENCE OF MAYORS**

Stephen K. Benjamin

Mayor of Columbia, SC
President

Bryan K. Barnett

Mayor of Rochester Hills, MI
Second Vice President

Steve Adler

Mayor of Austin
Chair, Technology and Innovation Task Force

Greg Fischer

Chair, Council on Metro Economies and the New American City
Mayor of Louisville

Tom Cochran

CEO and Executive Director

US City Decision Maker Survey – A Collaborative project run by IHS Markit and the US Conference of Mayors

US Smart Cities - 2018

June 2018

US Conference of Mayors



Noman Akhtar, Analyst - Smart cities, noman.akhtar@ihsmarkit.com, +49 8989 5269 012

Introduction

- The term 'smart city' can be very mystifying. IHS Markit defines a smart city as one that uses an integrated information and communications technology (ICT) system to improve efficiency, manage complexity and enhance citizens quality of life, leading to sustainable improvement in city operations.
- The US smart cities market, have grown considerably compared to 2016 when the last survey was done. But like the global market, it is still at an early stage with a lot of room for new ideas and new business opportunities. Over 65% of the projects implemented in the United States are either trial or only covering parts of the city. Most projects are trials rather than commercial implementations as there are still some challenges faced in securing the projects and making them financially sustainable over time. National Funding schemes and national/ foreign initiatives to encourage market development benefited different cities in the United States in the last couple of years.
- The report combines data from the IHS Markit Smart Cities Intelligence service and the US City Decision Makers' Survey - a market survey performed in collaboration with the US Conference of Mayors. 51 cities participated in the survey, which ran from October 2017 until the mid of April 2018.
- IHS Markit Smart Cities Intelligence service tracks data on over 1015 smart city projects worldwide, dividing them into regions/ countries and by the following functional areas:
 - Mobility and transport includes, but is not limited to, smart ticketing, smart parking, and intelligent transport systems.
 - Energy and resource efficiency includes, but is not limited to, smart grid, environmental sensors, and irrigation management.
 - Physical infrastructure includes, but is not limited to, smart street lighting, smart buildings, and waste management.
 - Governance includes, but is not limited to, consolidated services platforms and mobile reporting apps.
 - Safety and security includes, but is not limited to, integrated video surveillance and predictive analytics.
 - Healthcare includes, but is not limited to, telehealth and remote patient monitoring.
- This report provides analyses on current smart city trends in the United States, such as what kind of cities are investing in smart city projects, common business and funding models, and what is influencing smart city development.
- This report, and related survey will be repeated on an annual basis; IHS Markit plans to repeat the survey in other regions as well as the United States, to develop a detailed body of data on the smart cities market from the point of view of city decision makers around the world.

Executive summary

- Bringing together latest technology, intelligent society, and well aware governing bodies helps in building sustainable environments that reduce environmental impact and offer citizens a high quality of life is the main objective behind numerous cities adopting smart city projects.
- The Internet of Things (IoT) is one of the main technology drivers behind smart cities. And it's not just the mundane utilitarian applications, such as automated meter reading, monitoring ozone levels, or counting traffic, IoT also brings exciting applications to help citizens and tourists experience and appreciate a city's culture, history, services, and more.
- The smart cities market has evolved as an effort to handle the challenges of mass urbanization; generally speaking, larger cities have stronger economies, so they not only have a clearly defined need for smart city projects: crucially they have the economic means to invest in them. However, it is clear from the survey that US smart city projects will not be limited to large cities, and that mid-sized cities will be home to many projects as well.
- The US smart cities market is at an early stage, but activity has increased in recent years because of new government initiatives, regulation and funding packages. Developing financially sustainable, and securing long-term funding for the operation of smart city projects is fundamental to enabling the global smart cities market to mature. Government funding, sustainable business models and commercial investor packages are influencing the type of projects that get developed.
- Regulating bodies would help the development of smart cities in long term. One such example is Envision Charlotte formally called Envision America - an initiative supported by the White House in 2015 to ensure progress and to provide resources for smart cities development.
- The goal of a smart city project is not to just implement new technology – according to the survey, the most common reason for investing in smart city projects is “improving governments responsiveness” along with improving the standard of living for its citizens. Although this goal may seem ambiguous, responsiveness and citizen satisfaction are very important for city economic growth and stability, as cities with large, socially engaged populations attract more business and investment.
- 38 cities out of the 51 that participated in the survey gave an estimate of how much cumulative budget their city spent last year. The combined budget for all the 38 cities is little less than \$1 Billion for 2017 and they do expect an increase in funding for 2018.

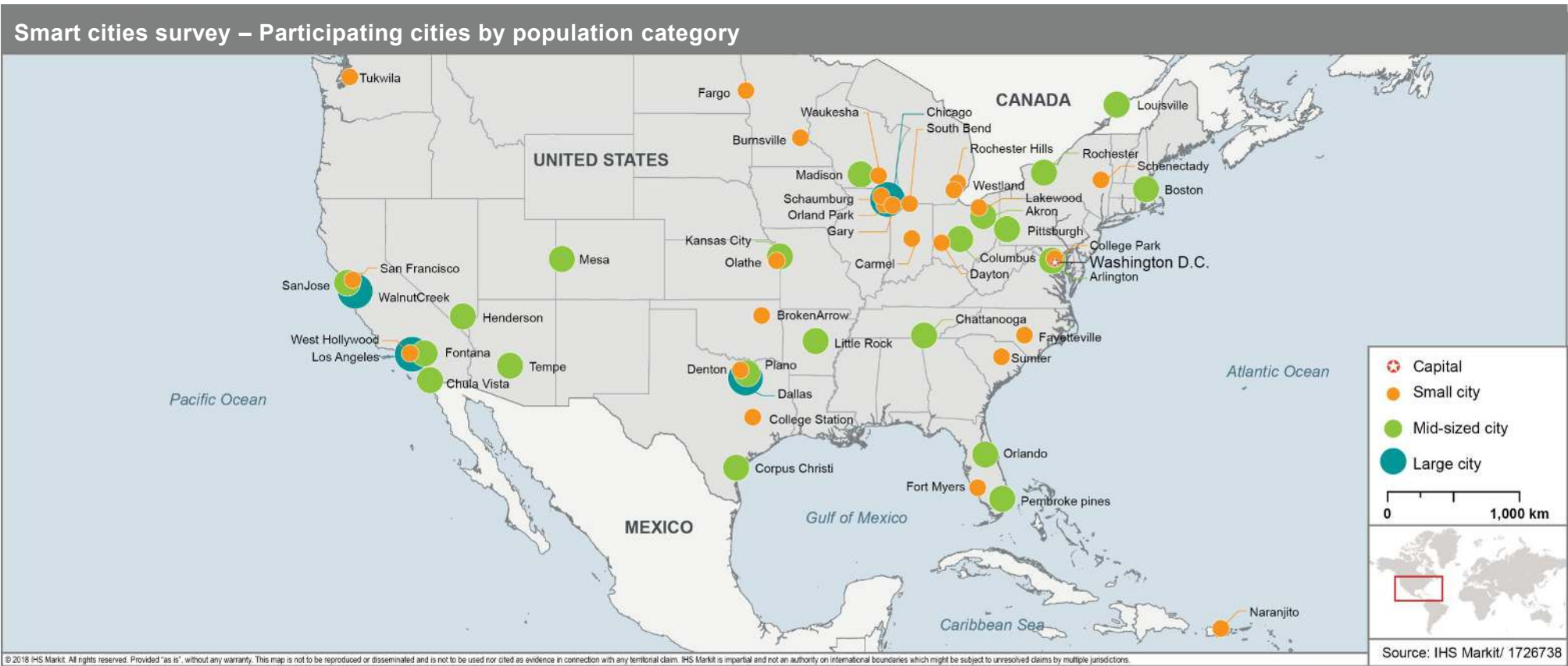
Definitions

- **Implemented projects** - Budget has been allocated in the current fiscal year, vendor(s) has/have been selected, a request for proposal (RFP) has been issued and deployment of either hardware or software has begun.
- **Planned projects** - The project proposal is developed, funds may or may not be identified/allocated, vendor selection is still pending, and no RFP has been issued.
- **Large city** – A city with a population of over 1 million
- **Mid-sized city** – A city with a population of between 150,000 and 1 million
- **Small city** – A city with a population of below 150,000
- **Build-operate-transfer (BOT)** – Under this business model, the municipality or city planners work closely with an external private partner, which develops the services and deploys the necessary infrastructure to enable the smart city project. In addition, the third party is also responsible for the operation and continued management of the infrastructure and services until such time that it is transferred back to the municipality.
- **Build-operate-comply (BOC)** – Under this model, the governing authorities provide a platform for smart city development, regulations that the third parties must adhere to, and an initial source of funding. The private partners are responsible for the development of the services and the deployment of infrastructure. Essentially, the municipality provides a platform for private enterprise and individuals to test their smart city applications and services.
- **Municipal-owned-deployment (MOD)** – In this model, the municipality or city planners take full responsibility for the development of the services and deployment of necessary infrastructure as it relates to their smart city project and goals. Subsequently, the public entity is also responsible for the operation of the system.

Methodology

- IHS Markit has aggregated data from a number of sources to create this report, including the results of the US City Decision Maker Survey – a collaborative project run by IHS Markit and the US Conference of Mayors.
- The survey was launched in October 2017 until the mid of April 2018. A total of 51 cities – participated and provided detailed information on smart city projects that they have implemented or are currently planning. This survey will be repeated on an annual basis, and IHS Markit plans to repeat the process in other geographic regions as well as the United States in the future.
- The survey was designed to determine how the US smart cities market is developing by reviewing projects that are being implemented or planned between 2017 and 2018. Participants were asked to answer a detailed series of questions about specific smart city projects; which covered topics including project goals, difficulties experienced when implementing smart city projects, and what type of funding and business models are most commonly used.
- This analysis not only provides insight into other cities that are implementing smart city initiatives, but also to technology vendors who are targeting the smart cities space. Cities will benefit from understanding what their peers are doing and learning from their experience, and technology vendors will benefit from understanding the cities' perspective through the implementation phase of a project.
- This report also includes an appendix with six case studies of specific smart city projects. The most successful smart city projects around the world are those that deliver tangible improvements for citizens; just as every city is unique, each smart city project must be carefully planned to suit that city's individual needs. The case studies in the appendix of this report feature a selection of cities that are adopting smart city technology to combat serious issues affecting them today. Examples include projects to collect better data about asthma and allergy triggers in order to influence city policy; to provide better transport for new mothers to receive necessary medical care; and to reduce energy costs by installing street lights that conserve energy by being automatically dimmed when the streets aren't occupied.
- Other data sources used in this report include interviews with technology vendors and other parties involved in smart city development, as well as data on smart city projects gathered through secondary research methods. Population data used in the preparation of this report comes from the US Census Bureau.

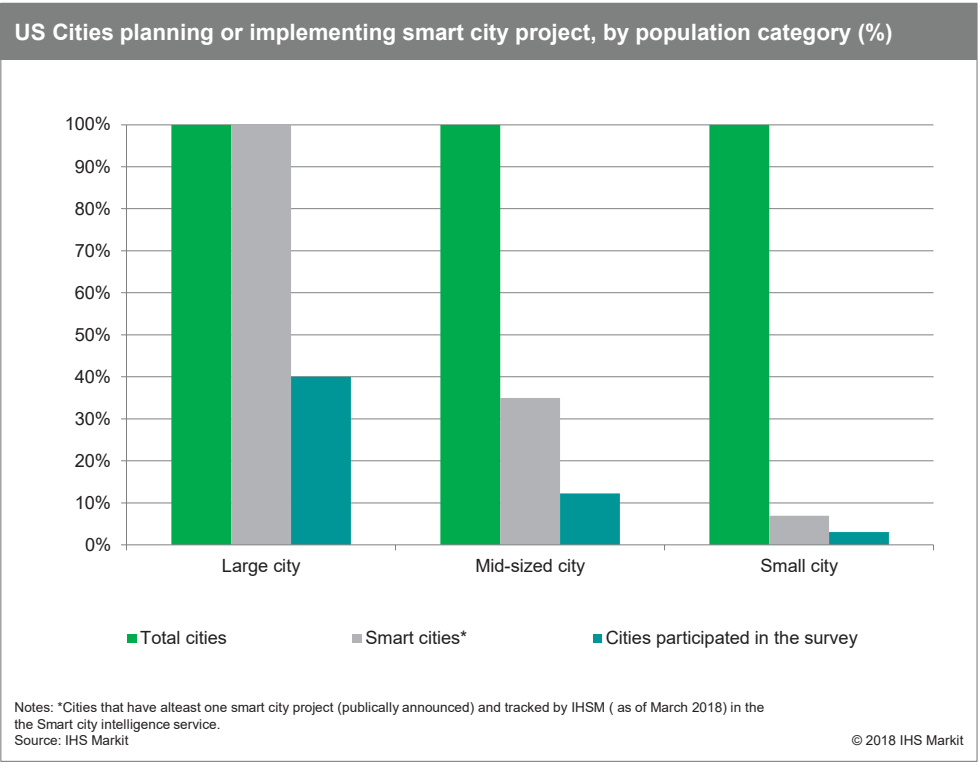
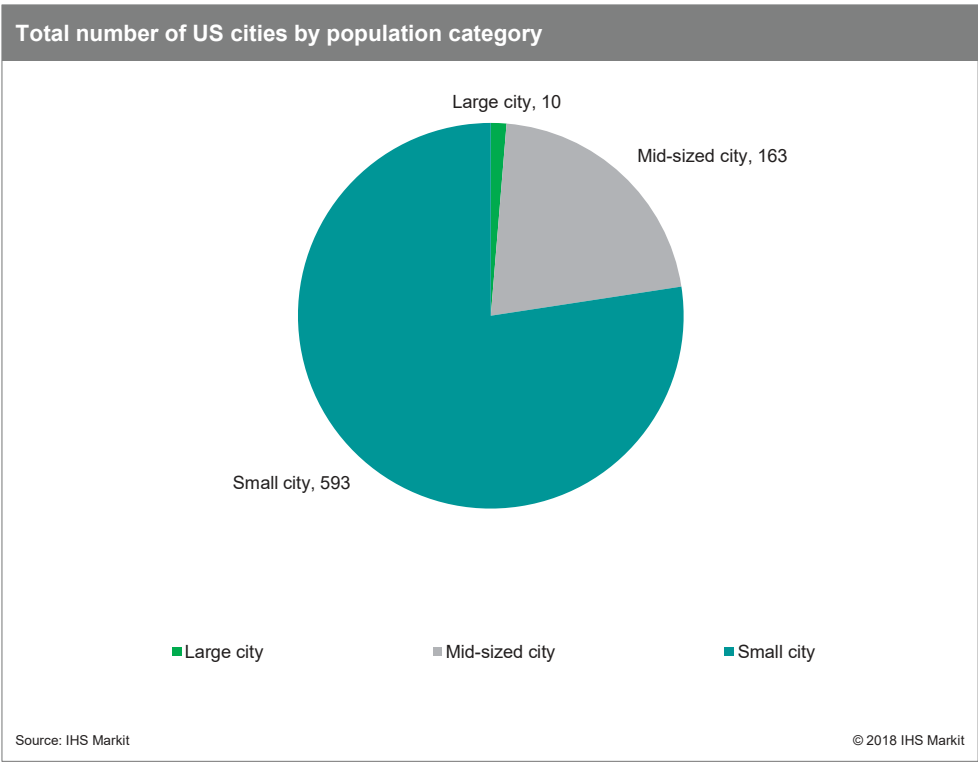
Participating cities in United States



Market size (1/4)

- There are 163 mid-sized cities in the United States and IHS Markit is collecting data of smart projects in 57 of them, which equates to approximately 35% of US mid-sized cities. Given the number of mid-sized cities already investing in smart city projects, IHS Markit predicts that a number of cities within the remaining 65% are either currently planning, pursuing grants or researching smart city projects, with the intention to announce them in the near future.
- The US smart cities market, similar to the global market is a very fragmented. It is still very young as most of the projects are in a trial phase rather than full city roll out.
- As of Q1 2018, IHS Markit - smart city intelligence market tracker, tracks over 100 cities of the United States which have at least one smart city related project.
- About 14% of the US cities have publicly announced their involvement with smart city related projects. 47% of them responded to the survey that was conducted via the US Conference of Mayor in 2017 – 2018
- 40% of the large cities participated in the survey but unsurprisingly all the large cities in the United States are involved in at least one smart city project
- Larger cities have stronger economies, and have a clearly defined need for smart city projects. However, these projects will not be limited only to large cities, as mid-sized and small cities will also be home to many projects. About half of the surveyed cities are categorized as a “small city” which is getting started and pursuing grants and resources.
- The chart in the next slide shows two charts. The first is the percentage of US cities by population category. The second is the percentage of total US cities in each city size category who have at least one smart city project announced publicly and the cities that participated in the survey by population size.

Market size (2/4)



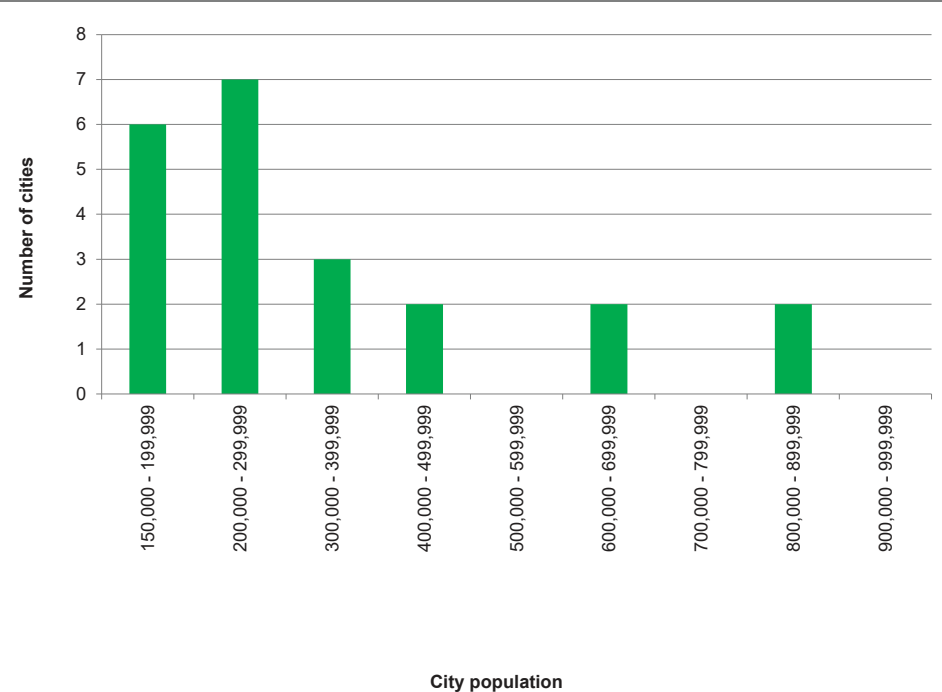
Analysing these two data points simultaneously creates not only a reflection of the current market, but also highlights which cities will provide the best opportunities for smart city development in the future.

Market size (3/4)

- Mid sized cities

- This slide gives more detailed analysis of the mid-sized cities that are currently planning or implementing smart city projects, and shows that there are more mid-sized cities with smaller populations represented than those at the larger end of the scale.
- Smaller mid-sized cities can act as a test bed for implementing smart projects before rolling out to the more complex environment of larger cities.
- By agreeing to become test beds, mid-sized cities not only attract commercial partners but it also boosts them in term of economic growth.
- Because there are so many more mid-sized cities than large ones – and all the large cities are already planning or implementing smart city projects – mid-sized cities represent the biggest opportunity for new smart city development.

Number of mid-sized cities* implementing or planning smart city projects, by population size



Notes: * participated in the Survey
Source: IHS Markit

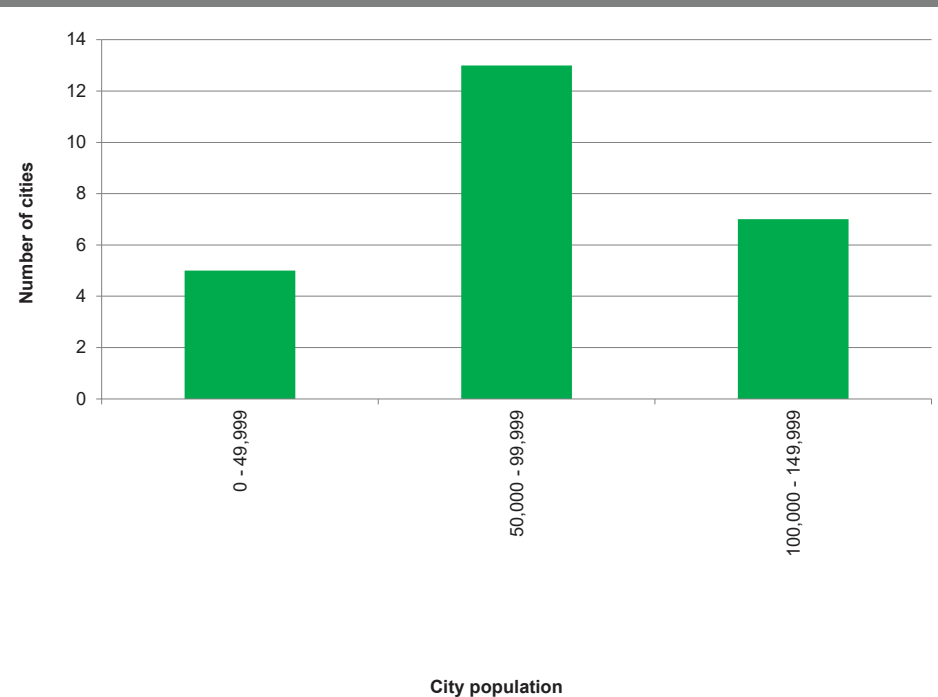
© 2018 IHS Markit

Market size (4/4)

- Small cities

- According to the survey, multiple projects have been initiated or implemented in mid-sized and small cities which in turn, influences the evolution of the smart cities market. These cities are likely to invest only in one or two specific areas: for example, implementing smart street lighting or an intelligent transport system, rather than developing a centralized operations system for the entire city.
- Technology providers are responding to this by developing modular solutions that can be introduced to the city gradually. Cities do not have to install everything at once; they can build their smart city solution gradually. This approach attracts mid-size and small cities who have budget limitations, or those that are not comfortable making a large one-time investment.

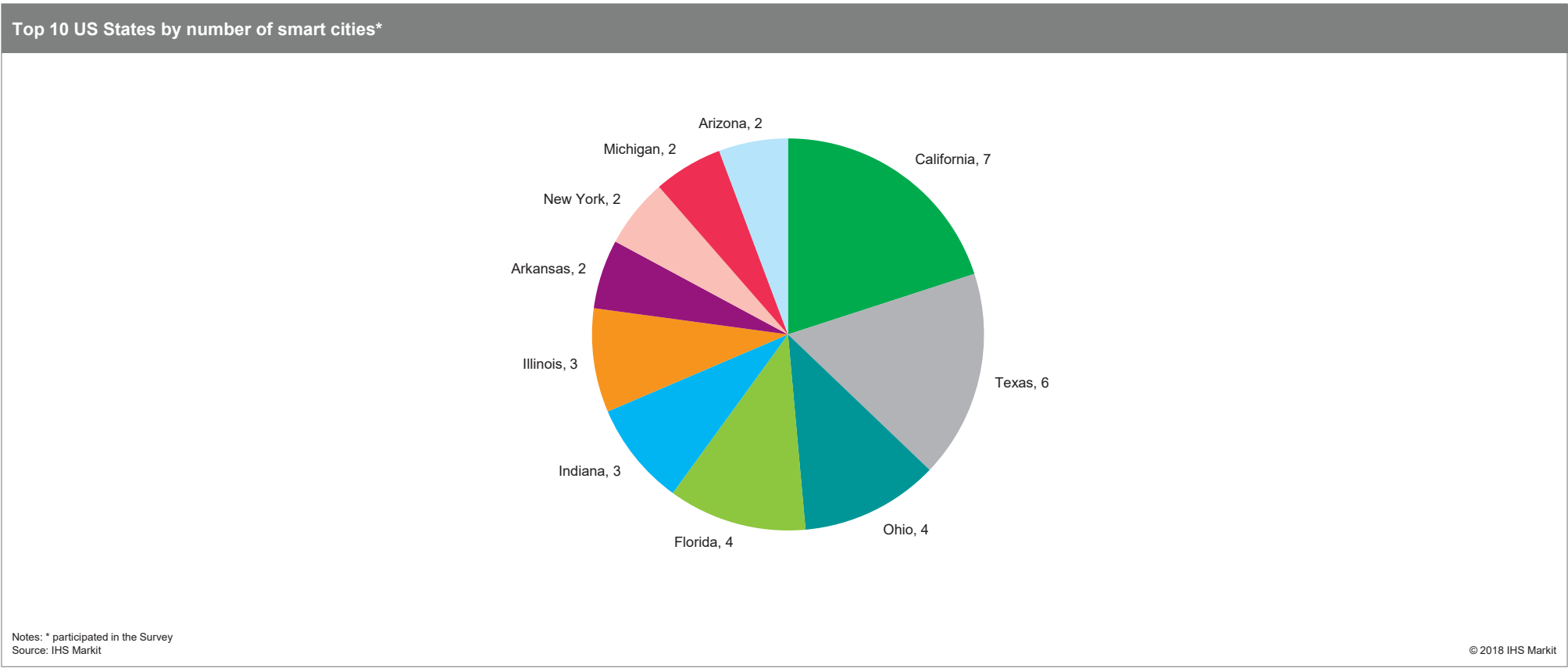
Number of Small cities* implementing or planning smart city projects, by population size



Notes: * participated in the Survey
Source: IHS Markit

© 2018 IHS Markit

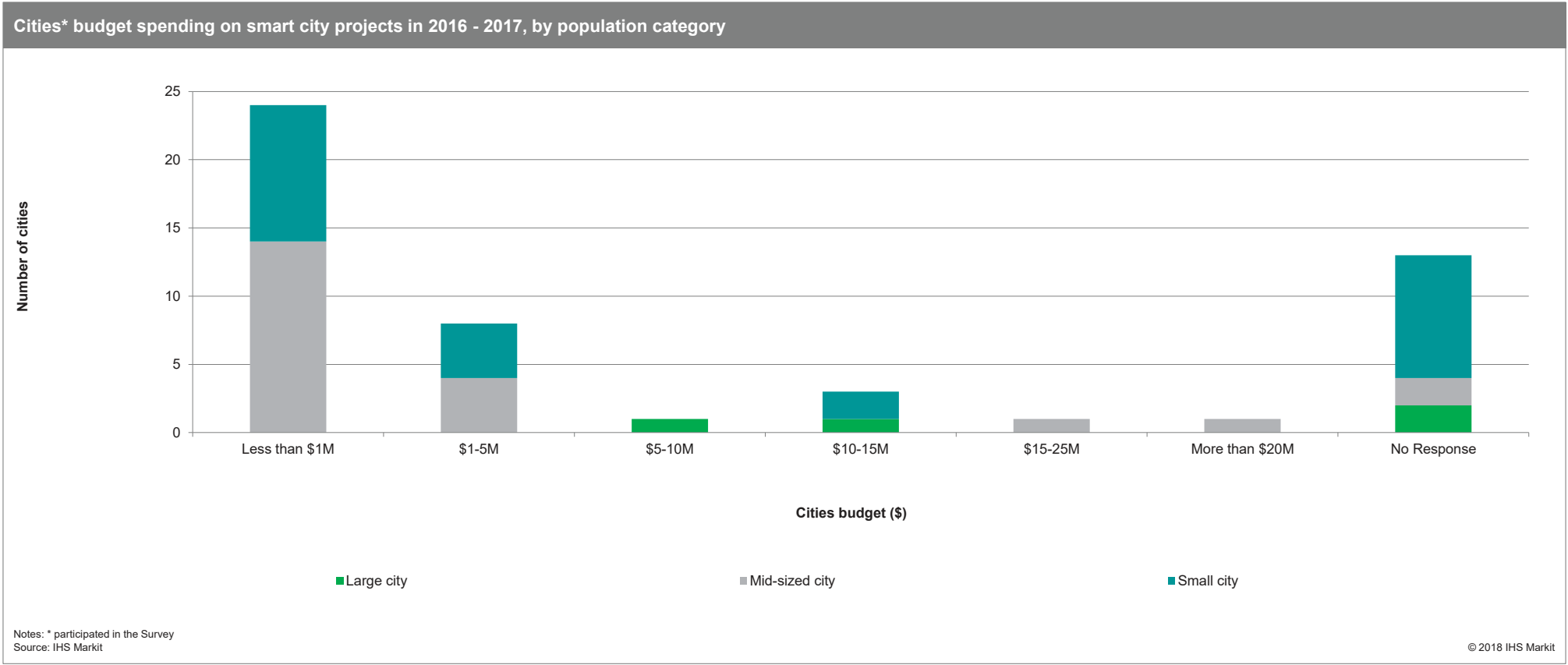
Cities in California, Texas and Ohio participated the survey the most



Smart city budget spending (1/2)

- 38 cities out of the 51 that participated in the survey gave an estimate of how much budget was allocated to spend on implementing and planning smart city projects in 2017.
- 24 of the 38 cities that answered this question estimated their spending to be less than \$1 million. Of the 24 cities in this category, fourteen were mid-sized, ten were small cities.
- Nine cities spent between \$1– 10 million, comprising of one large city and four cities in both small and mid sized cities.
- Another four cities which shared their 2017 budget estimated spending between \$10 million and \$25 million; this group included two small cities, one mid-size and one large.
- One mid-sized city – estimated spending over \$25 million.
- Mid-sized cities want to use these smart city projects to attract more citizens and strengthen economic development, or they might be expecting large population growth and want to prepare for that. Also, mid-size cities are sometimes more attractive to technology investors than large cities for the development of city-wide roll-outs because of the lower costs. Investing in small to mid-size cities allows the technology implementer to experiment their offering at a smaller scale before rolling out to larger metropolitan cities.
- Two large cities which answered the question, fall in the following categories – \$5 million to \$10 million, \$10 million to \$15 million. It is surprising that there are no large cities in the top two highest category i.e. in \$15 million and above – though this could be because of the small sample size of large cities.
- In terms of anticipated budget for 2017, about 72% are in favor of increasing the smart city budget while 20% wanted to keep the budget same as before

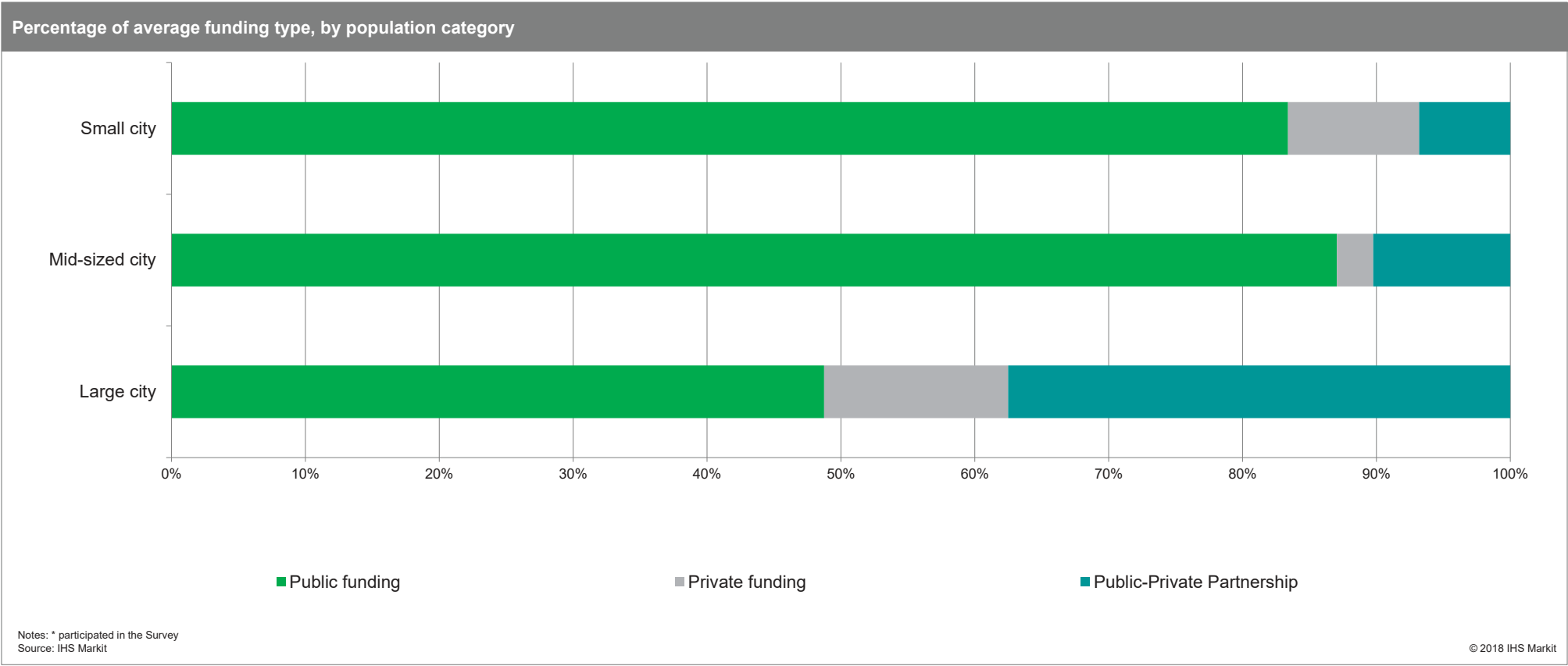
Smart city budget spending (2/2)



Funding Models (1/2)

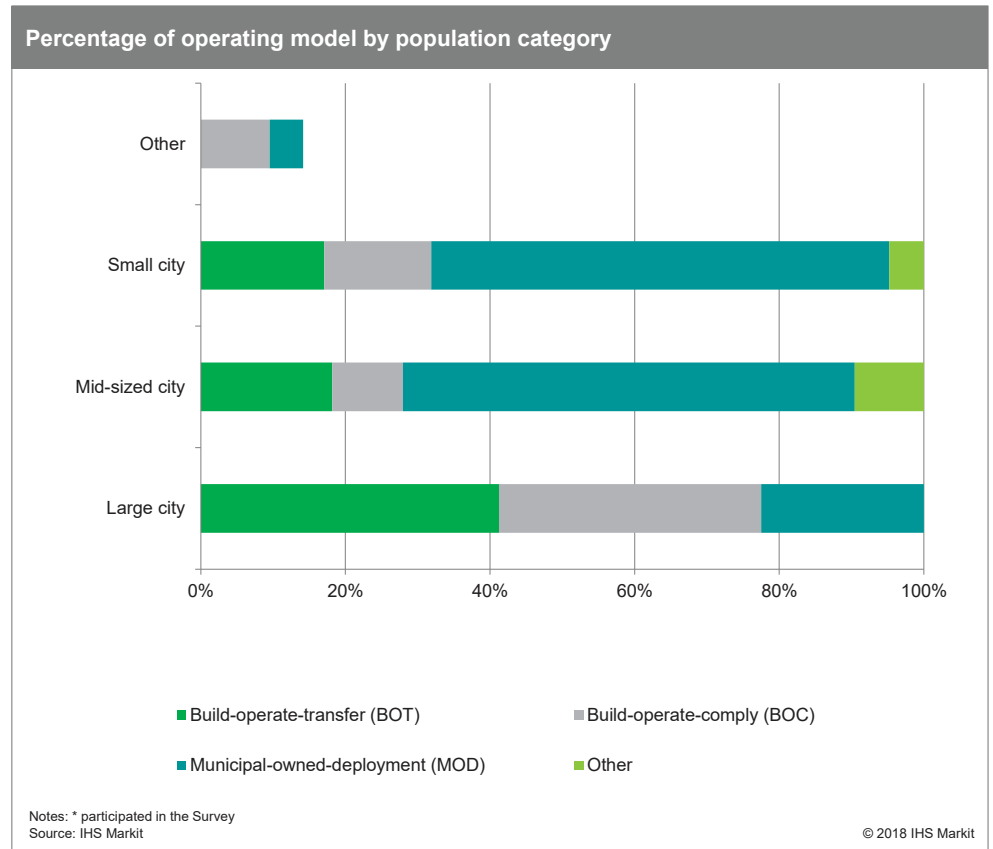
- There are currently no clearly defined, universally accepted standards or business models for smart city projects. This is partly because the smart cities market is at an early stage in its evolution, and also because each city is looking to smart city technology to solve different problems according to its own unique circumstances.
- Securing funding for smart city projects – both to sustain the project over time and to initiate work on the project – is a difficulty that still needs to be solved.
- Government funding packages and commercial investors are influencing the type of projects that get developed. However, creating sustainable business models is crucial for smart city projects to move beyond trials to full-city roll-outs.
 - One interesting example of a project addressing this issue is LinkNYC in New York, which receives revenue from the advertising space that it has incorporated into Wi-Fi kiosks distributed around the city. In addition to the advertisements, these kiosks provide other beneficial services to the citizens including community information and the ability to contact emergency services.
 - An example of PPP is the city of Sacramento, which announced a partnership with the traffic app company Waze to share data between one another in an attempt to ease traffic congestion and share real-time information on road closures and construction projects.
- The different funding types being used to implement smart projects through out the city can be classified into Public, private and public private partnership.
 - In the given sample, public funding turned out to be the most favored funding model followed by public private partnership (PPP).
 - Large cities tend to operate more on the PPP where as public funding is favorable in small to mid sized cities.

Funding Models (2/2)



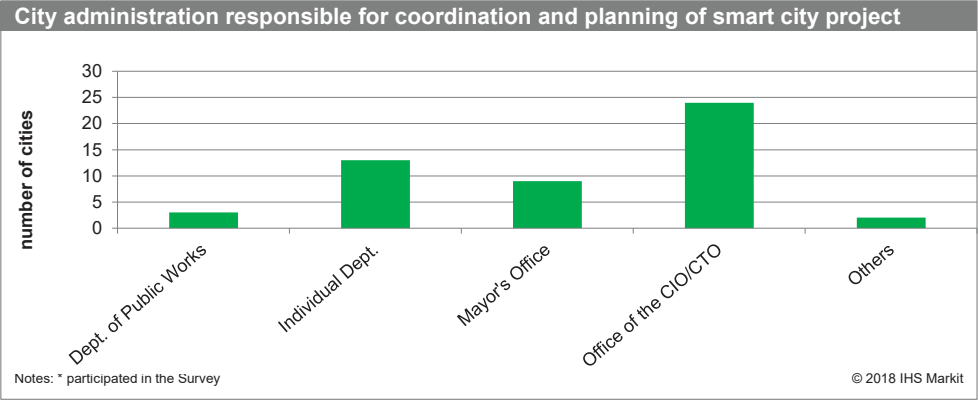
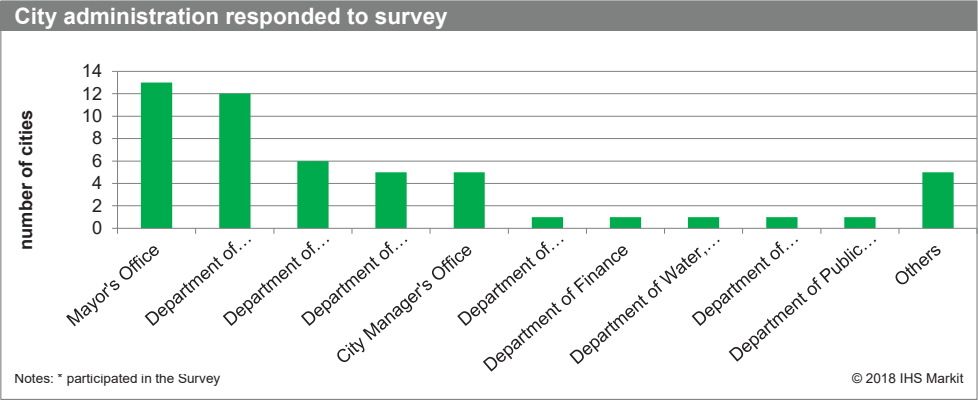
Operating models

- In a sample size of 51 cities (including implemented and planned projects), the municipal owned deployment (MOD) business model is the most common, distantly followed by the build-operate-transfer (BOT) business model.
- Participants were given the option to list other business models they are using including modified versions from the survey. For example, a “combination of BOT and MOD” or “MOD with a twist - the city will work with the technology provider to deploy the project and then the it will operate the system once deployed.” In some cases, participants indicated that they were still assessing different business models for planned projects.
- This situation will change as the market develops and smart city projects move beyond trials to full-city, commercial roll-outs; something that IHS Markit predicts will happen in the next five years.
- Although securing funds is one of the main challenges faced by the authorities, IHS Markit believes most projects will follow the MOD model. This is because many city planners want to have full responsibility of the services provided and to own the projects.
- One example of BOC (IHS Markit believes this is the current operating model) is the Living Lab in Dallas which is an innovation hub powered by AT&T. It includes smart city elements such as smart LED street lighting, enhanced network connectivity, smart parking, interactive kiosks, waste management, open data platform and end-to-end mobility solutions.



Responsible city administration

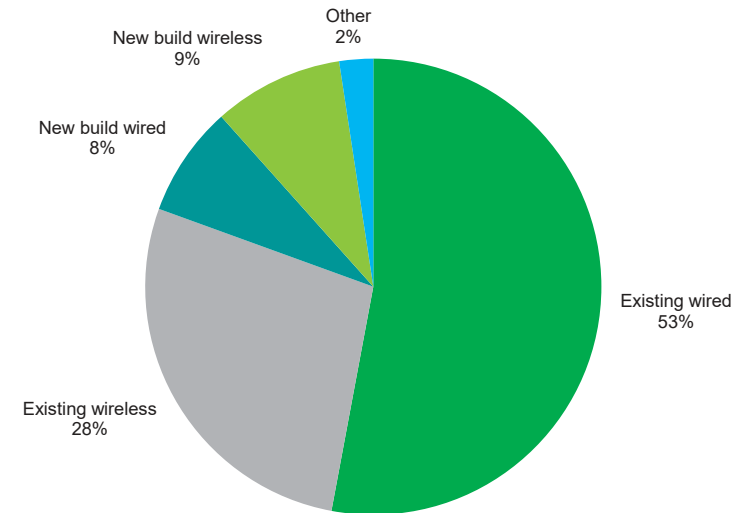
- Participants were asked to indicate which departments are responsible in planning and implementing smart city projects. Although some cities have created special departments that are dedicated to smart city implementation, the majority of cities are using existing teams and departments to achieve this. In some cases an individual department will take sole responsibility for smart city projects.
- The three most common individually named departments responsible for smart city implementation are: Office of CIO/CTO (24 cities), individual department (thirteen), and City Manager's Office (nine).
- Individual dept. includes department of economic development, sustainability, water and environment etc.
- The fact that so many different city departments were named in response to this question indicates that although some cities are creating dedicated departments to implement smart city projects, this is not the case across the board.
- As the market matures more cities may create dedicated smart city departments; however, smaller cities may not have the resources to do this.



Communication network

- Smart cities operate on information and communication technology (ICT) to enhance the livability of their cities, ensuring workability and sustainability. It requires ICT to monitor and optimize its resources, plan preventive maintenance and provide safety to its citizens.
- A city requires ICT network to control devices and collect data across the city. In some cases, smart city projects will require new networks to be deployed; this creates questions about who will own and control the network and data that is transmitted.
- In this sample of 51 projects, existing wired is the preferred communication network which uses Coaxial cables, ethernet and optical fiber. The second most preferred network is existing wireless which consists of cellular, Wi-Fi and Low power technologies.
- Seventeen percent of the cities which participated in the survey opted for building new infrastructure including both wired and wireless possibilities.
- Reasons to create new communication network involve
 - Growing community; current network not covering the new build locations
 - Increased and over loaded data traffic on existing networks
 - Project specific such as the wireless network for Automatic meter reading (AMI)
 - Extending infrastructure to meet mobility

Share of communication network



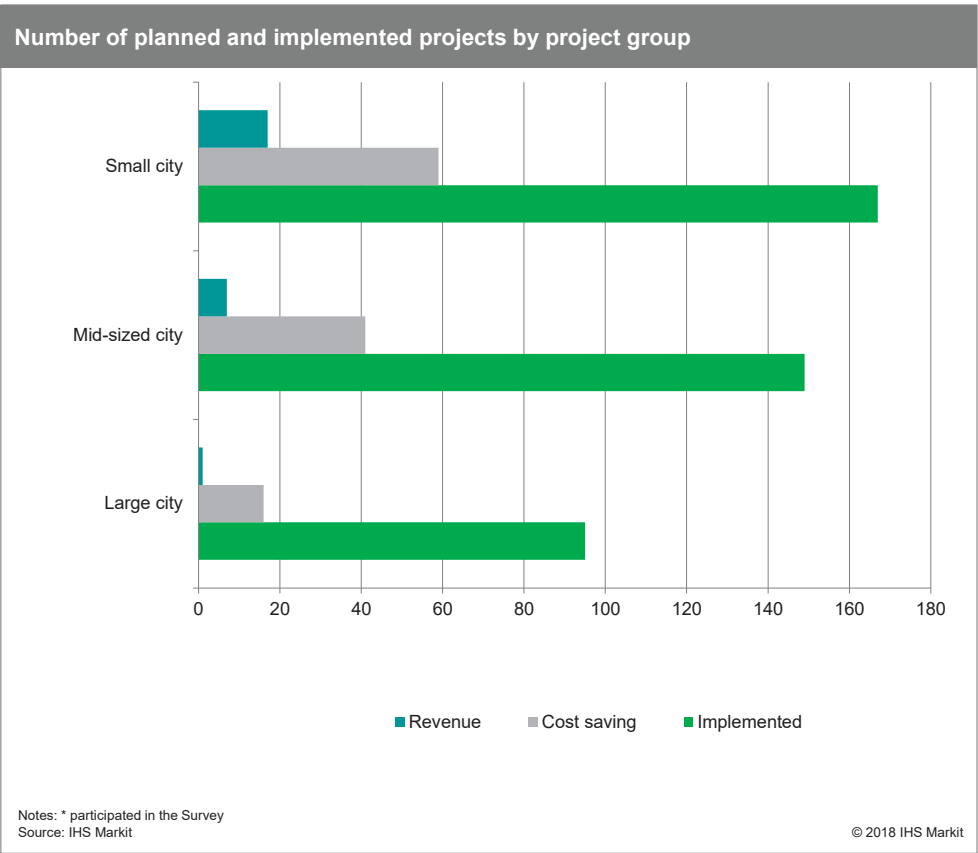
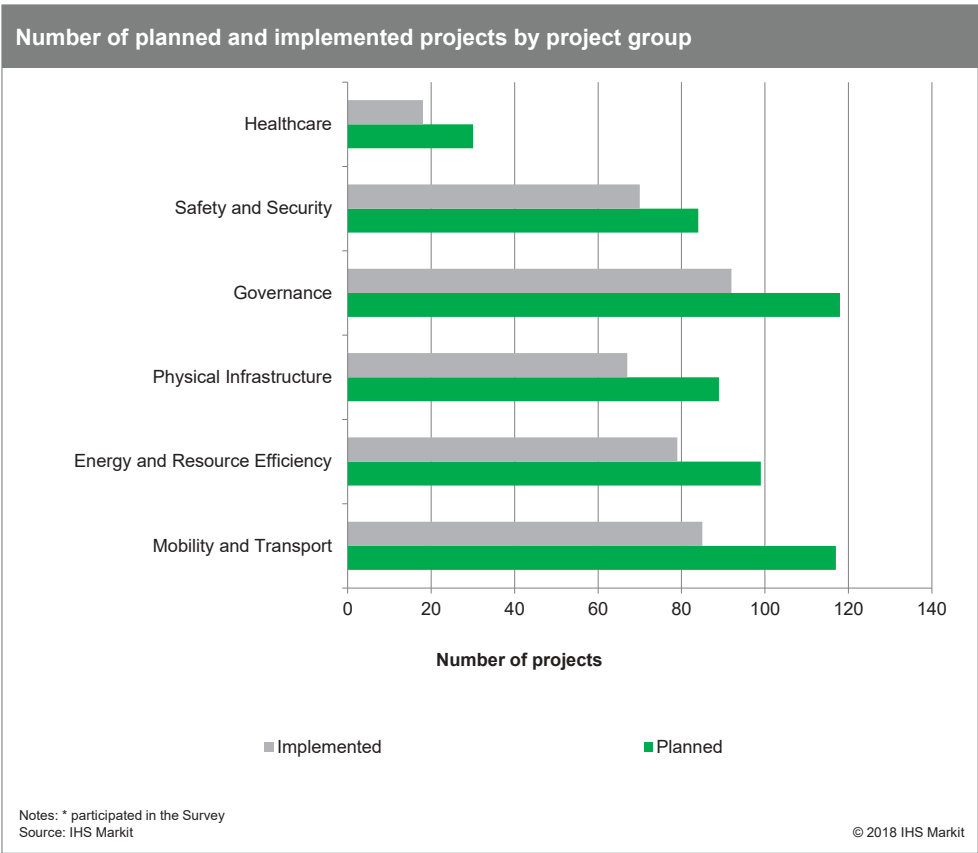
Notes: * participated in the Survey
Source: IHS Markit

© 2018 IHS Markit

Planned vs Implemented projects (1/2)

- The top three functional areas by number of implemented projects are: Governance (92), mobility and transport (85), and Energy and resource efficiency (75).
- The top three functional areas by number of planned projects are similar to the implemented project: Governance (118), mobility and transport (117), and Energy and resource efficiency (99).
- There are fewer healthcare projects – both planned and implemented – than any other functional area. This also reflects global smart city trends, where there are fewer healthcare projects than other categories.
- These results are interesting when compared with the IHS Markit smart cities project database, where energy and resource efficiency, physical infrastructure and mobility and transport are the most common types of projects.
- The three segments mentioned in the previous bullet about the IHS Markit Smart city database are the most popular globally because real-time benefits are achieved by both the customer and industrial partners. This makes the city more attractive for citizens and businesses.
 - Projects related to energy and resource efficiency category not only help the utility to have better control over the electric grid but it also allows customers to have better control on their bills.
 - Mobility and transport projects feature highly in the global smart cities market because mobility and transport issues can damage many different aspects of city sustainability. For example, traffic congestion not only causes health problems because of increased pollution, but can also prevent emergency vehicles from reaching accident sites in time.
- Out of 51 cities that responded to the survey, 20 cities answered the question regarding the number of projects that generated cost saving and five cities provided the revenue generated by the smart city project in 2017.
- About 24 projects in mid-sized and small cities generated revenue whereas 100 projects started to save operational costs in 2017.

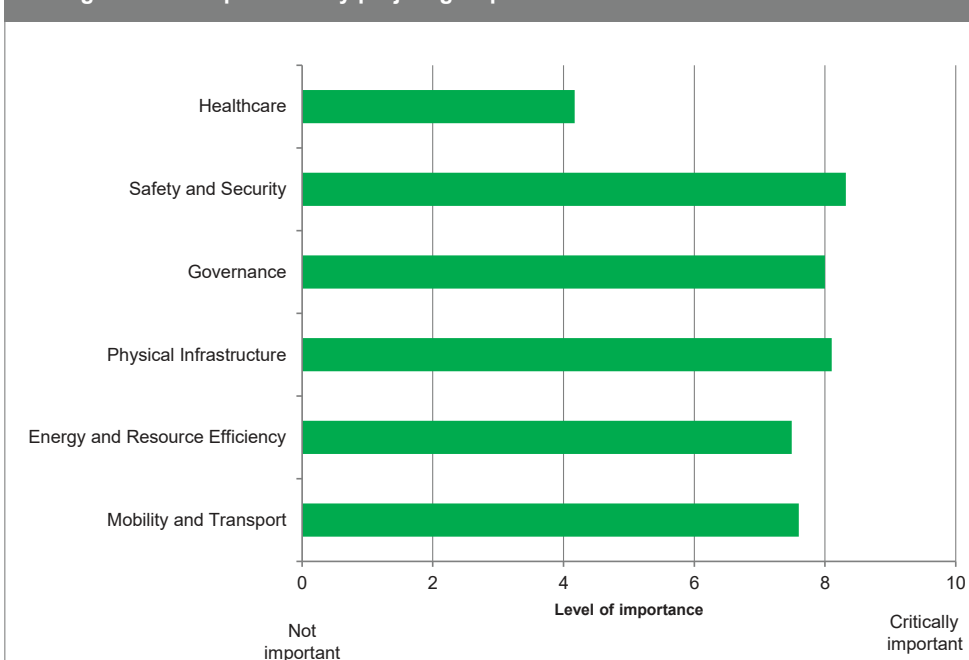
Planned vs implemented projects (2/2)



Importance of smart cities projects

- In addition to being asked to provide the number of planned and implemented projects in their city, participants were asked to rate the importance of developing smart city projects by the same six functional areas.
- The average importance rating is fairly uniform across five functional areas, (i.e. except healthcare, which has a considerably lower score than the other) This relatively low score could be because typically city authorities are not as heavily involved in healthcare projects as they are in the other project types covered in this survey.
- Based on the sample size of 51 cities, Physical infrastructure is the most important functional area in the US smart city market followed by Governance and safety and security
 - Physical infrastructure category is mainly focused on by the smaller cities whereas Larger cities tend to put relatively more importance to governance due to larger population density
 - Healthcare is the least important category which stands on 4.2 on the scale of 0 to 10 where 0 is the least important and 10 being the most critical.
- Although cities consider these six different functional areas to be of similar importance, there are more projects being implemented and planned in some functional areas than others. This could be because of limitations on funding – for example, certain funding packages and initiatives require projects to meet specific criteria, or focus only on particular functional areas: such as the Department of Transport's (DOT's) smart city challenge which awarded \$40 million to one winning city for the development of a smart city solution addressing mobility and transport challenges.

Average level of importance by project group

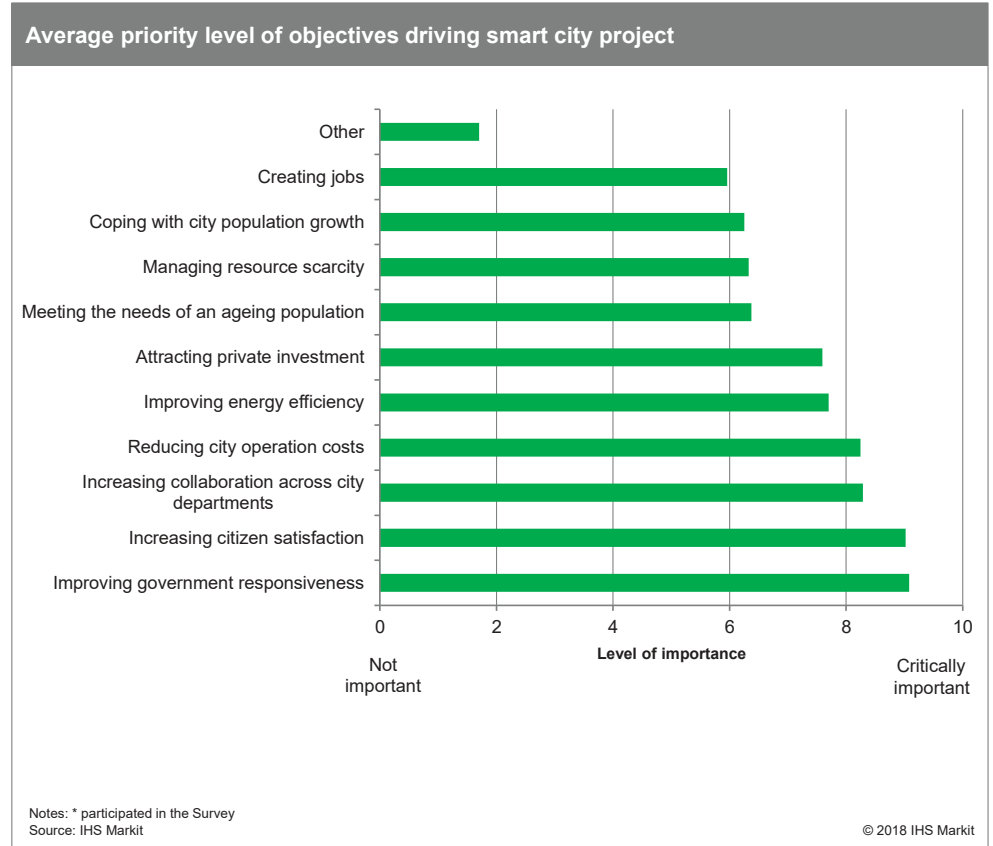


Notes: * participated in the Survey
Source: IHS Markit

© 2018 IHS Markit

Objectives behind implementing smart city projects

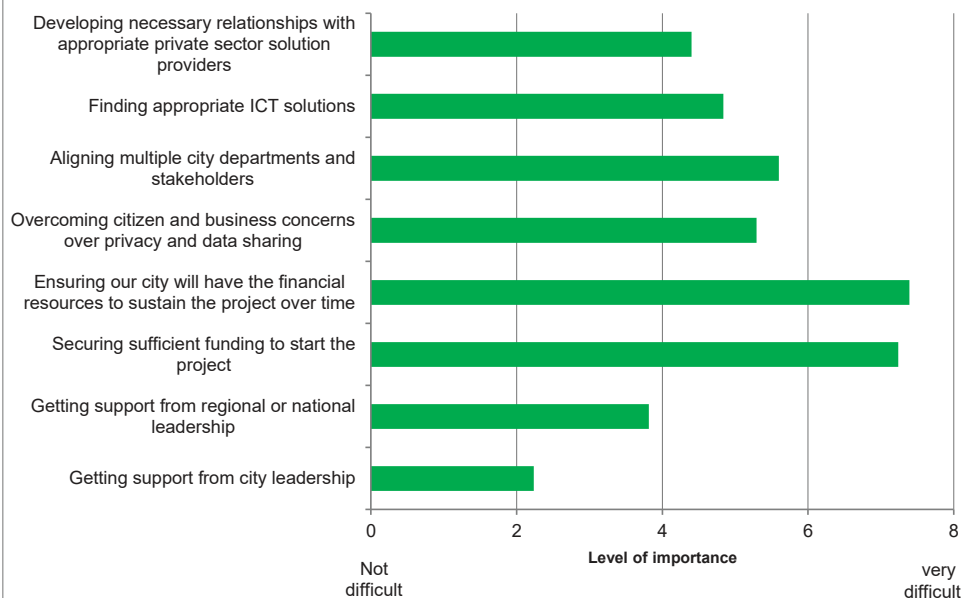
- Smart city projects have been developed around the world to meet a wide variety of objectives, from reducing city congestion to improving public safety.
- Bringing together technology, government, and society, smart cities are intelligent, sustainable environments that reduces environmental impact and offer citizens a high quality of life.
- It also brings exciting applications to help citizens and tourists experience and appreciate a city's culture, history, services, and more.
- The top three priorities for US smart city projects participated in the survey in term of objective are improving government responsiveness (9.1), increasing citizen satisfaction (9.0) and increasing collaboration across city department (8.3)
- Coping with population growth and creating jobs were rated as the least important priorities for smart city project development.
- Survey participants were given the option to mention other priorities that weren't included on the list; several cities highlighted their focus on public safety, cyber security, environmental monitoring etc.



Challenges faced by cities in implementing smart city projects

- Although there are many reasons why cities are interested in developing smart city projects, there are also challenges to development that are affecting the evolution of the smart cities market.
- Interestingly, the highest average difficulty rating for any challenge is below 7.5, indicating that the challenges facing smart city development are considered by city decision makers as being not very difficult.
- Unsurprisingly, the two challenges with the highest difficulty levels are “ensuring the city will have the financial resources to sustain a project over time” and “securing funds to start a project”. Whether upfront investment costs or ongoing operational costs, funding is an issue. After funding, the next biggest challenge is the collaboration of city departments.
- The challenges with the lowest average difficulty rating are getting support from city leadership (2.2) and getting support from regional or national leadership (3.8).
- This indicates that there is strong support from government leadership at the local, regional and national level, but that securing financial support for long-term projects remains a challenge.

Difficulty faced by cities by Challenges



Notes: * participated in the Survey
Source: IHS Markit

© 2018 IHS Markit

Conclusion

- Although the US smart cities market is at an early stage, it is poised to grow quickly as many cities are currently planning and implementing projects. Rather than being limited to large cities, mid-sized cities below one Million population will represent a large opportunity for smart city development. However, funding remains a challenge which needs to be overcome in order for smart city projects to develop beyond trials and bring positive improvements to cities across the United States.
- Although government initiatives are helping encourage growth in the sector, they are not sustainable sources of funding for long-term projects. The majority of smaller cities surveyed estimated a cumulative budget of less than \$1 million – this is quite a modest sum, and indicates that for the near future the majority of US smart city projects will remain small in scale.
- In years past, due to funding priorities smart cities projects were a lower priority. However, this is changing as numerous cities have developed strategic plans, objectives and initiatives to start and build out projects. Two reasons for this change in priority are these developments can provide better services to residents and save time and resources for the city.
- The US smart cities market is at an interesting stage, where there is a lot of activity and many planned projects across the country, focusing on a wide range of city challenges. The progress of projects in the United States will be watched closely by cities around the world looking for ways to meet similar challenges.



Case Studies

- Dallas
- Las Vegas
- San Francisco
- Chicago
- New York

Dallas - Overview

• Key Facts

- According to the United States Census Bureau, Dallas had an estimated population of 1,317,929 as of July 2016, making it the 9th most populous city in the country. Dallas' population grew about 10% compared to 2010 (1,197,816). In 2016, its population density was 3,745 per square mile.
- IHS Markit Economics reported that Dallas had a GDP per capita of \$65,550 in 2017 (\$64,271 in 2015 and \$64,194 in 2016), which was higher than levels in London (\$55,947), Tokyo (\$43,884), and Seoul-Incheon (\$36,002).

• Overview

- In September 2015, the City of Dallas launched the Innovation Alliance, a public-private partnership that comprises of 31 partners.
- In June 2016, the United Way of Metropolitan Dallas, a nonprofit that provides funds to educational, financial stability, and health programs, invested \$205,000 to the Dallas Innovation Alliance. The investment was used to support the Alliance's operation for that year.
- In January 2018, the Dallas Innovation Alliance announced several projects such as smart water management (collaboration with Itron), smart parking (collaboration with ParkHub), public Wi-Fi installation (collaboration with AT&T, Cisco, Nokia and Scientel), and research on mobility (collaboration with Toyota Motor North America).



Smart city project – Dallas (1/2)

Dallas OpenData

- Project scale: Full city rollout since 2017.
- Stakeholders: Socrata and the city government.
- The open data platform allows the public to access data and information published by city authorities. This platform aims to encourage a two-way communication between Dallas' citizens and its government.
- To date, Dallas Open Data portal has over 100 datasets across seven categories i.e. Budget and finance, City infrastructure, City services, Economic development, Geography and boundaries, Government, Public safety.

Non-emergency city services (Dallas 311)

- Project scale: Full city rollout since 2013.
- Stakeholders: The city government.
- Through Dallas 311, public can request services (remove bulky trash, trimming of weeds) or lodge non-emergency reports (parking, sign violations). The appropriate city department will take actions to resolve those issues and the requester is also able to check on the progress of their submitted ticket via the service.

Advanced Traffic Management System

- Project scale: Partial city pilot program since 2017.
- Stakeholders: The city government and Ericsson
- Through this system, city authorities will be able to obtain and analyze real-time data from sensors and cameras. As a result, informed decisions can be made to manage and control traffic situations via connected traffic lights and message boards.

Smart city project – Dallas (2/2)

Smart LED streetlight system

Project scale: Partial city rollout since 2017.

Stakeholders: AT&T, GE, Philips and the Dallas Innovation Alliance.

The smart streetlight system is integrated with sensors that collect live data such as foot traffic and noise detection. This had positive impact on local businesses using smarter marketing, decreased crime rate, and saved energy consumption. The system also allows remote access and alerts to operators if repair or maintenance work is required.

Interactive digital kiosks (WayPoint kiosks)

Project scale: Partial city rollout since 2017.

Stakeholders: CIVIQ Smartscales, AT&T and the Dallas Innovation Alliance.

The interactive digital kiosks, called “Waypoint kiosks”, is a 55” touch screen display which displays interactive city map, information on public transport regarding schedule and routes also providing USB charging ports. The intention of these kiosks is to enable the public to explore the city of Dallas conveniently.

Environmental sensors

Project scale: Partial city rollout since 2017.

Stakeholders: Ericsson and the Dallas Innovation Alliance.

Environmental sensors were installed to measure environmental elements including temperature, humidity, atmospheric pressure and particulates.

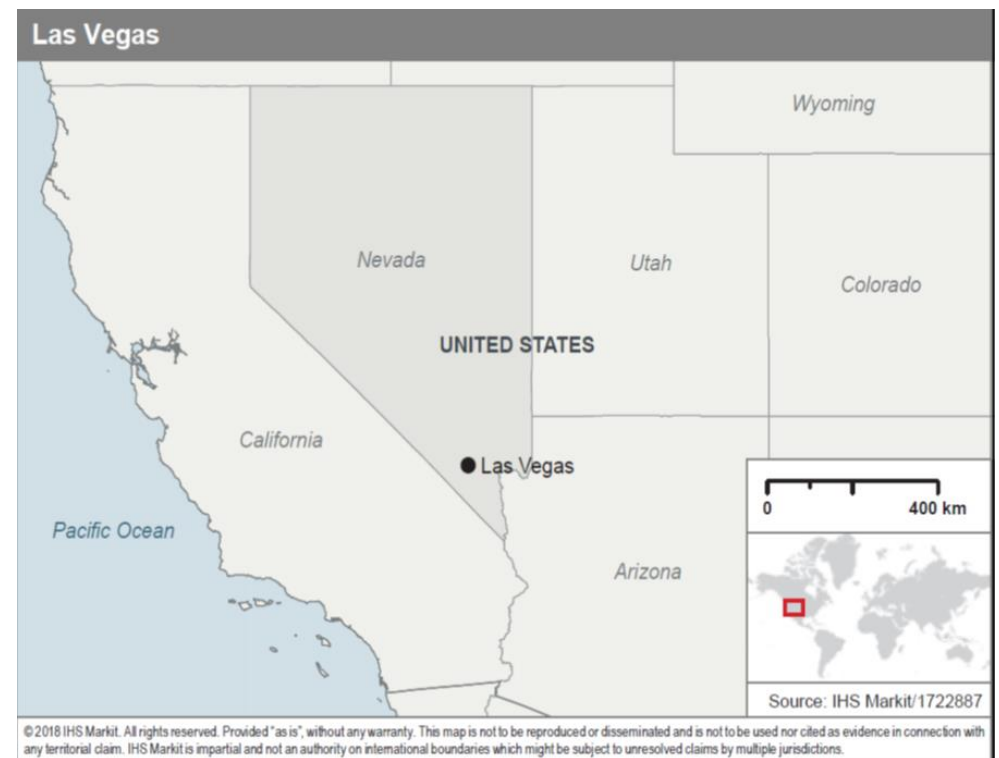
Las Vegas - Overview

• Key Facts

- The U.S. Census Bureau estimated the population of Las Vegas-Henderson-Paradise metropolitan area at 2.2 million, with population density of 108 people per km², in 2017.
- Based on data from IHS Markit Economics, the Las Vegas-Henderson-Paradise metropolitan area recorded a nominal GDP of \$111,649 in 2016. That is an increase of 28.2% versus in 2012.

• Overview

- In 2016, the City of Las Vegas launched the Innovation District in downtown Las Vegas serving as an innovative testbed for smart city initiatives.
- In 2017, A partnership was formed between the City Council and Cisco to strengthen Las Vegas's commitment to be a smart city by 2025. The purpose of this partnership is to use Digital Platform to gather data surrounding the city's mobility, utility, and environmental issues.
- In March 2018, the Smart Cities Council awarded Las Vegas with a Readiness Challenge Grant. It enables Las Vegas to receive assistance in accelerating its smart city efforts. The assistance involves utilization of smart city case studies and collaboration with industry experts to develop sustainable smart city implementations.



Smart city project – Las Vegas (1/2)

Vehicle-to-Infrastructure (V2I)	Project Scale: Full city rollout since 2016.
	Stakeholders: Audi, Traffic Technology Services (TTS), and the Regional Transportation Commission of Southern Nevada (RTC).
	In collaboration with TTS, Audi launched Traffic Light Information, its smart vehicle assistance technology for its selected vehicle. Real-time traffic data is sent from Las Vegas's connected traffic lights to these vehicles' built-in computer through 4G or LTE connectivity. This allows the vehicle to display a timer indicating when a traffic light will turn green. This decreased the car having to use the brakes during a standstill in traffic providing fuel efficiency by 15%.
Vehicle-to-everything (V2X)	Project Scale: Pilot from January till July 2018.
	Stakeholders: Siemens, Brandmotion, Commsignia, the city government
	Vehicle-to-everything (V2X) is a technology that enables vehicles to communicate with other vehicles, objects, and infrastructure. V2X technology is an integral part of connected and driverless vehicles. Having V2X technology helps prevent collisions, as drivers and vehicles are notified of an approaching pedestrian or vehicle prior to any encounter. Aside from the hardware such as sensors and connectivity infrastructure, project partners also launched a software application and digital platform. The hardware (sensors, connectivity modules, on-board units) work together with the software (applications) and platform to allow vehicles, drivers, and pedestrians to communicate with intersections, corridors, and traffic signals on the road.
Artificial Intelligence (AI) traffic management	Project Scale: Partial city pilot program in 2017.
	Stakeholders: Waycare, the Regional Transportation Commission of Southern Nevada (RTC), the Nevada Department of Transportation (NDOT), and the Nevada Center for Advanced Mobility (NCAM).
	This program measure the effectiveness of predictive analytics in preventing traffic accidents and congestion of up to two hours prior. It also includes weather reports, speed limits, and traffic light timing to produce an accurate predictive traffic analysis.

Smart city project – Las Vegas (2/2)

Smart streetlights	<p>Project Scale: Partial city pilot program in 2016.</p> <p>Stakeholders: The city government and EnGoPlanet.</p> <p>LED smart streetlights were installed to cover over 7000 sq. feet of area which is not powered by grid energy. The Light harnesses energy from kinetic tiles located on pavements from walking pedestrians and sunlight using photovoltaic panels and storing it in batteries. It also has Motion sensors to detect a presence and turn on the smart street lights when required, air quality sensor along with USB ports, wireless charging, and providing a free public Wi-Fi network.</p>
Las Vegas Open Data	<p>Project Scale: Full city rollout since 2018.</p> <p>Stakeholders: The city government.</p> <p>This platform includes information regarding the city's financial budgets, city management, economic developments, and community. There are over 400 datasets comprised of 14 categories.</p>
GOVegas smartphone application	<p>Project Scale: Full city rollout since 2017.</p> <p>Stakeholders: The city government.</p> <p>The GOVegas App encourages engagement between the community and the city government in the city. It enable users to obtain information regarding real-time updates of city transits, directories, maps, local events, and attractions. Additionally, users are able to report and request services on issues surrounding the city environment. For instance, clogged drains, malfunctioning traffic lights, vandalized infrastructures, and littering.</p>

San Francisco - Overview

- **Key facts**

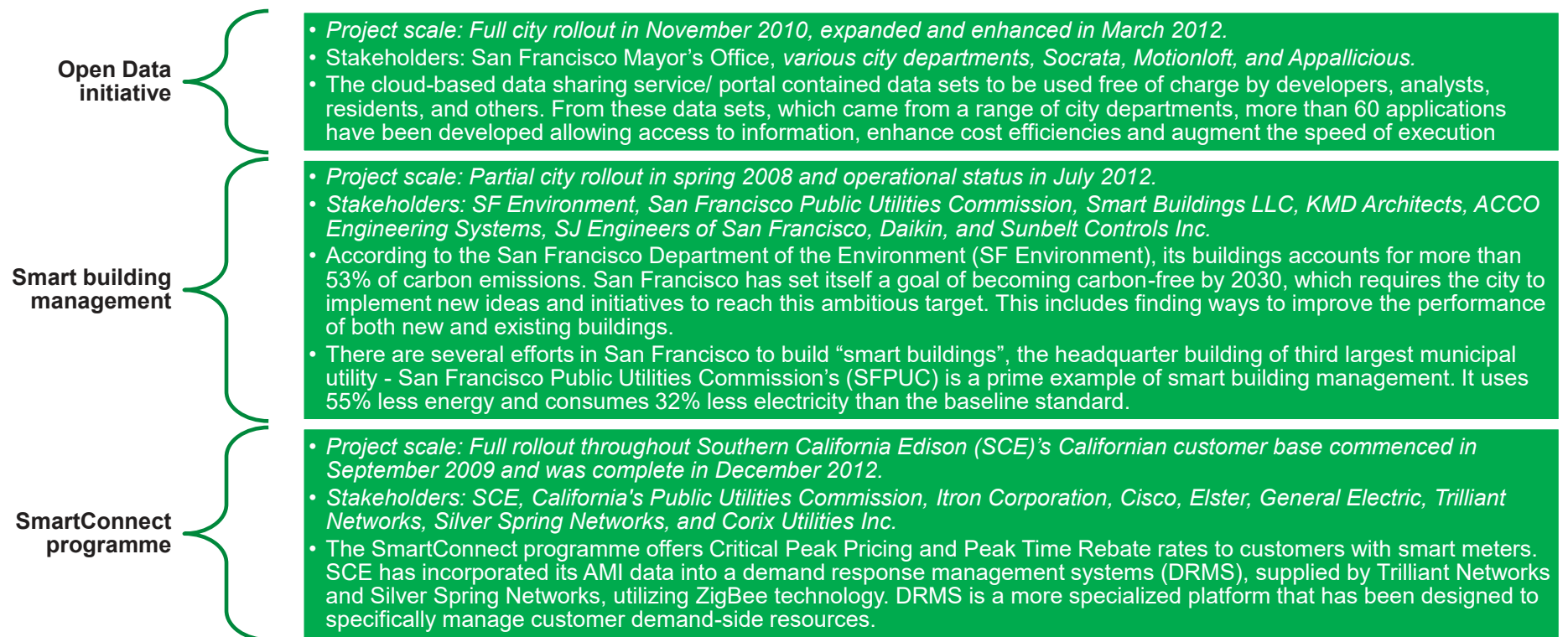
- San Francisco has an estimated population of 864,816 (2016) and it is the fourth most populous city in California, however its population is significantly larger at around 8.7 million when including both the city and the Bay Area.
- San Francisco's nominal gross metro product (GMP) in 2016 is estimated at \$456.5 billion.
- San Francisco has seen a significant population growth over the last decade. This has put significant stress on the city's infrastructure. Particularly, an increased number of vehicles on the road has created traffic problems resulting in clog up roads and a more unsafe and unhealthy environment.

- **Overview**

- In December 2015, San Francisco was one of seven finalists in the U.S. Department of Transportation (DOT) and Vulcan Inc's Smart City Challenge for the transportation segment. Eventually Columbus, Ohio was declared the winner of DOT in June 2016. Despite arriving short on winning the Smart City Challenge, San Francisco's smart city challenge initiative is going ahead even without the DOT funding.
- Another milestone in smart city initiatives was California Public Utilities Commission's (PUC) mandate in 2008 that all utilities in the state had to switch to smart meters as part of the general smart grid initiative, backed by the Obama administration and the Department of Energy (DOE).



Smart city project – San Francisco (1/2)



Chicago - Overview

• Key Facts

- Chicago is one of the largest cities in the United States with a population of 2.7 million as of 2015.
- IHS Markit Economics reported that Chicago had a GDP per capita of \$60,956 in 2017 (\$59,450 in 2015 and \$60,022 in 2016) which was ranked as 33rd in the list of GDP per capita. The GDP per capita is higher than levels in London (\$55,947), Tokyo (\$43,884), and Seoul-Incheon (\$36,002).

• Overview

- The city launched its smart city initiatives in September 2013. Its strategic program, named The City of Chicago Technology Plan, focuses on five main strategies: Next-generation Infrastructure; Every Community a Smart Community; Efficient, Effective, and Open Government; Civic Innovation; and Technology Sector Growth.
- The first two strategies seek to enable Chicago's citizens and businesses to be digitally connected and engaged, while the others are seen as growth strategies building on top of the results of the first two strategies. The plan's vision articulated in the strategy is to ensure Chicago being a leading city globally.



Chicago - Overview

• Key Facts

- Chicago is one of the largest cities in the United States with a population of 2.7 million as of 2015.
- IHS Markit Economics reported that Chicago had a GDP per capita of \$60,956 in 2017 (\$59,450 in 2015 and \$60,022 in 2016) which was ranked as 33rd in the list of GDP per capita. The GDP per capita is higher than levels in London (\$55,947), Tokyo (\$43,884), and Seoul-Incheon (\$36,002).

• Overview

- The city launched its smart city initiatives in September 2013. Its strategic program, named The City of Chicago Technology Plan, focuses on five main strategies: Next-generation Infrastructure; Every Community a Smart Community; Efficient, Effective, and Open Government; Civic Innovation; and Technology Sector Growth.
- The first two strategies seek to enable Chicago's citizens and businesses to be digitally connected and engaged, while the others are seen as growth strategies building on top of the results of the first two strategies. The plan's vision articulated in the strategy is to ensure Chicago being a leading city globally.



Smart city project – Chicago

Smart street lighting pilot project	Project scale: Pilot launched in 2015.
	Stakeholders: Commonwealth Edison (ComEd) and Silver Spring Networks.
	ComEd equipped around 750-800 streetlights with LED lighting fixtures, and with Silver Spring Networks' monitoring and control solutions leveraging the smart grid network infrastructure. The goal is to test advanced functionality such as remotely controlled street lighting and scheduling, outage and maintenance alerts, and support for public safety.
Wi-Fi kiosks	Project scale: Pilot project launched in January 2017.
	Stakeholders: AT&T and CIVIQ Smartscales.
	Within AT&T's smart city spotlight pilots, waypoint devices were installed in downtown Chicago for providing high-speed, public Wi-Fi connectivity. It also included CIVIQ's Mobility Experience (CME), which is a solution to connect devices, people and services to improve citizen engagement and city services.
	The WayPoint devices are equipped with 55" touchscreen displays, which can provide diverse information from various sources ranging from real-time transit schedules to advertising and city-service announcements. The WayPoint devices can also be equipped with NFC technology, USB quick charging ports, and customer information/emergency intercoms. Other features are embedded cameras, small cells, beacon technology, sensors and data analytics. In Chicago, the WayPoint devices provide multiple services and digital applications, such as interactive information about transportation services, safety alerts, and free Wi-Fi.

New York city- Overview

- **Key facts**

- New York has a population of an estimated 8.6 million and is the largest city in North America by population.
- New York's nominal gross metro product (GMP) in 2014 was approximately US\$1.282,4 billion, with a nominal per capita GMP of approximately US\$149,118.

- **Overview**

- In 2007, New York released a plan called PlaNYC 2030, the city's first sustainability plan. The plan later updated in 2011 and was expanded to 132 initiatives with more than 400 specific milestones for year-end 2013.
- January 2014, he announced the release of OneNYC short for "One New York: The Plan for a Strong and Just City". The plan builds on prior long-term sustainability plans for New York City and PlaNYC 2030.
- The Mayor's Office of Sustainability oversees the development of OneNYC and shares responsibility with the Mayor's Office of Recovery and Resiliency for ensuring its implementation.



Smart city project – New York City(1/2)

- **Communications-Based Train Control (CBTC) signaling system**

- Project scale: Partial city rollout, operational in 2006.
- Stakeholders: New York Metropolitan Transportation Authority (MTA), Joint Venture of Siemens Transportation Systems Inc. (formerly MATRA Transports International), Union Switch & Signal, Inc. and RWKS Comstock; Booz Allen & Hamilton, ARINC, Inc., Advanced Technology Systems Group (ATSG), Cisco, and SYSTRA.
- The New York Metropolitan Transportation Authority (MTA) is gradually implementing Communications-based train control (CBTC) systems across its subway network. CBTC is a signaling system that uses the telecommunications between the train and track equipment for traffic management and infrastructure control. By using CBTC systems, the exact position of a train is known more accurately than with traditional signaling systems.

- **SmartLink travel card**

- Project scale: Full city rollout, operational in July 2007
- Stakeholders: The Port Authority Trans-Hudson (PATH), Cubic Transportation Systems Inc., eAccess (a subsidiary of Cubic's), G&D, and NXP.
- SmartLink is a RFID-enabled contactless credit card-sized smartcard that can be used to pay for transportation fares. It was designed to replace QuickCard, the paper-based farecard.

- **SmartPark**

- Project scale: Partial 3-month pilot in the Bronx area of New York City January-March 2012, backed by two additional technology pilots in spring 2013.
- Stakeholders: New York City Department of Transportation (NYC DOT), ACS, Ipsens, Streetline, and Xerox.
- Parking sensors were embedded in parking spaces along Arthur Avenue and East 187th Street in the Bronx, which were able to detect whether a parking space was vacant. The sensors transmitted data to wireless gateways mounted on street light poles, which sent the information to cellular and wireless networks and back to DOT. Drivers looking for a parking space could look up available spots, pay for the parking using Web-based applications or a smartphone.

Smart city project – New York City(2/2)

- **LinkNYC**
 - *Project scale: Full city rollout over 12 years (2014-2026).*
 - *Stakeholders: The city government, CityBridge Consortium (consisting of Qualcomm, CIVIQ Smartscapes, Titan, Control Group (Titan and Control Group merged in June 2015, forming Intersection)), Ruckus Wireless, Antenna Design, Vonage, and Sidwalk Labs, with a dotted line to Alphabet (Google's parent company).*
 - LinkNYC is a municipal initiative, setting up a new kind of a communications network, bringing fast and free public Wi-Fi to millions of inhabitants of New Yorker, small businesses, and visitors. The program was in an effort to increase Internet access throughout the New York City metropolitan area.
- **NYC recycling initiative**
 - *Project scale: Partial city rollout commencing March 2013 and ongoing.*
 - *Stakeholders: New York's Mayor Office, the Times Square Alliance, NYC Department of Sanitation (DOS), Big Belly Solar, Alcoa Foundation, Vector Media, Downtown Alliance, and Pratt Industries.*
 - Solar-powered canisters were installed to encourage public space recycling. It had three sections for recycling cans & bottles, paper, and general waste. The units use solar energy to compact trash and they hold five or six times the capacity of traditional sidewalk waste bins. During the pilot, data was collected from the units, which were equipped with monitoring systems to measure fullness and frequency of servicing, and then transferred data via Wi-Fi to customer website where operators were able to access reports on collection and efficiency.

IHS Markit Customer Care

CustomerCare@ihsmarkit.com

Americas: +1 800 IHS CARE (+1 800 447 2273)

Europe, Middle East, and Africa: +44 (0) 1344 328 300

Asia and the Pacific Rim: +604 291 3600

Disclaimer

The information contained in this presentation is confidential. Any unauthorized use, disclosure, reproduction, or dissemination, in full or in part, in any media or by any means, without the prior written permission of IHS Markit Ltd. or any of its affiliates ("IHS Markit") is strictly prohibited. IHS Markit owns all IHS Markit logos and trade names contained in this presentation that are subject to license. Opinions, statements, estimates, and projections in this presentation (including other media) are solely those of the individual author(s) at the time of writing and do not necessarily reflect the opinions of IHS Markit. Neither IHS Markit nor the author(s) has any obligation to update this presentation in the event that any content, opinion, statement, estimate, or projection (collectively, "information") changes or subsequently becomes inaccurate. IHS Markit makes no warranty, expressed or implied, as to the accuracy, completeness, or timeliness of any information in this presentation, and shall not in any way be liable to any recipient for any inaccuracies or omissions. Without limiting the foregoing, IHS Markit shall have no liability whatsoever to any recipient, whether in contract, in tort (including negligence), under warranty, under statute or otherwise, in respect of any loss or damage suffered by any recipient as a result of or in connection with any information provided, or any course of action determined, by it or any third party, whether or not based on any information provided. The inclusion of a link to an external website by IHS Markit should not be understood to be an endorsement of that website or the site's owners (or their products/services). IHS Markit is not responsible for either the content or output of external websites. Copyright © 2018, IHS Markit™. All rights reserved and all intellectual property rights are retained by IHS Markit.



**The United States
Conference of
Mayors**

1620 Eye Street, NW
Washington, DC 20006
Tel: 202.293.7330
Fax: 202.293.2352

**The Council on Metro Economies
and the New American City**

1620 Eye Street, NW
Washington, DC 20006
Tel: 202.861.6712
Fax: 202.293.2352
newamericancity.org

