



STRATEGY MEETS ACTION

SMART CITIES AND INSURANCE: EXPLORING THE IMPLICATIONS

An SMA Research Report



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KEY INSIGHTS FOR INSURANCE EXECUTIVES

The concept of smart cities is gaining momentum, and many cities around the world are developing smart city strategies and implementing specific projects.

- ✔ The world's population continues to migrate to cities, passing 50% urbanization and projected to exceed 70% urbanization by mid-century.
- ✔ Individual and business customers are increasingly residing in cities.
- ✔ Although the full realization of the smart city may be decades away, individual projects are underway in cities around the globe.
- ✔ The evolution of smart cities is changing the risks of both individual and business customers.
- ✔ Smart technologies have the potential to dramatically reduce risks for vehicles and property and improve people's health and well-being.
- ✔ Smart city projects and technologies introduce new risks. For example, cyber-risk and many different liability exposures are much higher for smart cities.
- ✔ The entities underwriting risk, and the liability in an automated, smart world, may change significantly.

Insurers should be planning now for the implications of smart cities for every line of business and product area. In addition, insurers should consider being involved in smart city planning, in both headquarter cities and those where they currently have a major customer base.

WHAT IS A SMART CITY?

(And Why Are They Important?)

The word “smart” is being applied to every noun imaginable these days, including things as diverse as homes, cars, watches, glasses, and even things like umbrellas, bras, and teacups. One of the most important invocations of “smart” is in the phrase “smart cities.” There are wide ranging activities related to smart cities underway around the globe that have very significant implications for the insurance industry. The first order of business is to determine what is meant by a smart city. SMA’s definition is as follows:

A smart city is one that is proactively leveraging connected world technologies to gather, analyze, and act upon real-time data to improve the lives of citizens; enhance mobility; create safer environments; optimize energy consumption and waste management; and contribute to the urban center of the future.

Source: Strategy Meets Action 2017

Smart cities will be critical to the future of the world since the population continues to migrate to urban areas. Consider these facts¹:

- ✔ In 2008, the world’s population passed the 50% threshold for urbanization (up from 14% in 1900).
- ✔ By 2050, over 70% of the population will be urbanized.
- ✔ There are 37 megacities today, with a population of more than 10M each.
- ✔ In the US, 80% of the population lives in urbanized areas.

There are three key segments that benefit from smart cities:

- ✔ **Citizens** – benefit through improved safety, health, and access; a pleasant living environment; clean air and water; and options to improve the management of their dwellings. (Citizens may include residents, visitors, or commuters, each with unique needs and the potential for benefit).
- ✔ **Business Owners** – benefit as a result of being provided with new options for managing properties (utilities, security), attracting employees and customers (easy access, pleasant and safe environment, nearby services), creating new or enhanced products, and cutting operational expenses on energy and transportation.
- ✔ **Governments** – benefit by being able to manage costs better, reduce pollution and congestion, improve access, provide new ways to manage infrastructure, add new services, and create an appealing environment for citizens and businesses alike.

¹ Population Reference Bureau, <http://www.prb.org/Publications/Lesson-Plans/HumanPopulation/Urbanization.aspx>

Figure 1 shows the beneficiaries of smart cities. Any given participant may experience benefits in multiple segments – for example, as a citizen and business owner.

Figure 1. Constituents That Benefit From Smart Cities



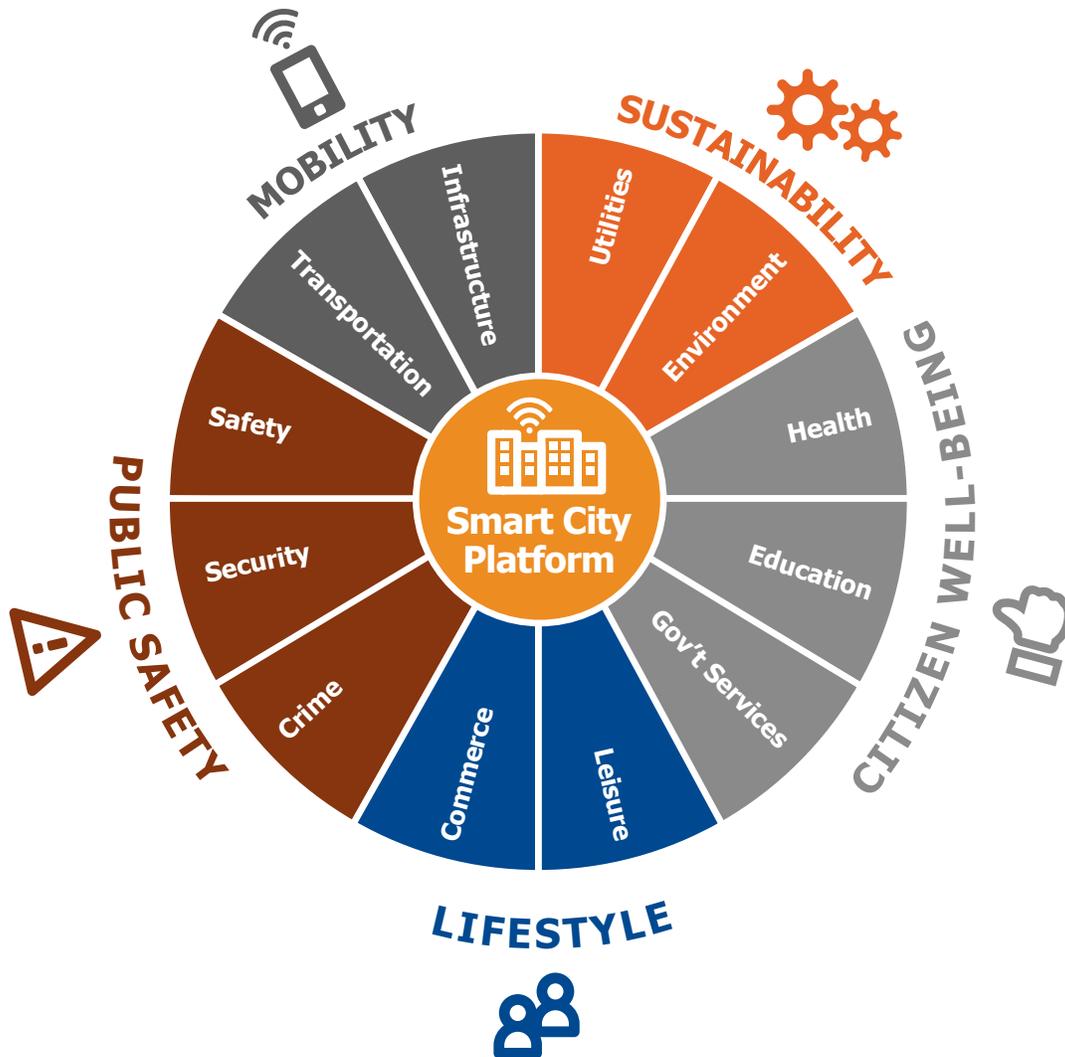
Source: Strategy Meets Action 2017

The vision of a smart city is compelling, but the realities of politics and money mean that the evolution toward a holistic smart city may take a generation. In the meantime, there are many cities around the world moving forward with important projects that will provide benefits to citizens, business owners, and government. Insurers should be aware of and capitalize on the smart city developments in the near-term, mid-term, and long-term.

HOW CAN SMART CITIES HELP?

Smart cities have great potential across many different areas, as depicted in Figure 2. Virtually every one of these areas has smart city projects underway in various cities around the world. The areas of greatest focus thus far are mobility (especially managing traffic congestion and parking), sustainability (especially for energy management and water monitoring), and public safety (with a concentration on crime and anti-terror initiatives).

Figure 2. Key Areas of Smart City Benefits



Source: Strategy Meets Action 2017

The smart city benefits, with specific examples for all of the key areas, are described as follows:



Mobility

One of the major problems that every large city faces is traffic congestion, which contributes to poor air quality, wasted time, and accidents. Improving urban mobility is, therefore, one of the top areas for smart city projects, often with significant funding and support from government organizations.

- ✔ **Traffic light sensors:** Sensors can monitor traffic flows for three primary purposes: to provide real-time traffic advice to drivers, conduct analytics on accidents to determine where new or changed traffic signals should be implemented, and leverage data for urban planning to make decisions on roadways and infrastructure.
- ✔ **Parking management:** Using sensors on parking meters and parking spaces for real-time feeds from parking garages will guide drivers to open parking spots (via a mobile app).
- ✔ **Autonomous vehicles:** Supporting and participating in autonomous vehicle trials for autos, trucks, taxis, and other commercial vehicles will prepare for their use.
- ✔ **Ride sharing:** Encouraging and supporting projects for car sharing and bike sharing are aimed at reducing the number of vehicles in the city.
- ✔ **Electric vehicles:** Projects to install or support charging stations and smart grids that enable local energy generated by residences and businesses to be used for car batteries will encourage electric vehicle adoption.

Sustainability



Smart technology has great potential to improve the environment and monitor/optimize energy usage.

- ✔ **Water management:** Sensors can monitor the quality of water in rivers, lakes, and other bodies of water in or adjacent to a city. The second focus of water management projects is to monitor water flows and levels, detecting leaks and identifying problems with water removal during storms.
- ✔ **Utility management:** Smart building projects will enable landlords and business owners to optimize energy usage. Other projects are centered on power plants to track usage levels and ensure safety.
- ✔ **Waste management:** Real-time sensing of garbage levels in various bins around the city can optimize routing and pickup schedules for sanitation workers.
- ✔ **Air quality:** Sensors to monitor CO levels and detect the presence of toxins are already being tested in some cities.

Citizen Well-Being



A variety of digital, mobile, connected projects in cities have the objective of improving the areas of health, education, and government services.

- ✔ **Healthcare:** Cities are in the early stages of using connected devices and technologies to identify opportunities to improve the health and well-being of citizens.
- ✔ **Elder care:** Some cities are exploring the use of robots and smart home devices for elder care, while others are building new, connected communities for retired and elderly populations.
- ✔ **Neighborhood environment:** Amsterdam provides a Smart Citizen Kit that "measures the humidity, noise levels, temperature, CO, NO2, and light intensity of the neighborhood."²

² <https://amsterdamsmartcity.com/projects/smart-citizen-kit>



Lifestyle

New options and information about entertainment and new ways to buy and receive food and other items improve the convenience and enjoyment of the citizenry.

- ✓ **Delivery:** Experiments are underway in various cities for the delivery of restaurant orders, groceries, and other items via drones, small autonomous vehicles, or sharing economy solutions.
- ✓ **Urban design:** Even small cities are designing new urban community centers that are walkable and include a variety of connected devices and services.



Public Safety

Providing for the safety and security of citizens is an important responsibility for city governments. Several smart projects are underway.

- ✓ **Intelligent street lighting:** Turning street lights on or off based on whether anyone is present can reduce crime.
- ✓ **Body cams:** Outfitting law enforcement with body cameras to record incidents can be used in determining liability and improving law enforcement response.
- ✓ **Surveillance:** Installing cameras at strategic points with real-time feeds of activity discourages crime and provides evidence to be used in criminal investigations.
- ✓ **Disaster/emergency response:** Solutions in this area include providing a platform for the exchange of alerts about weather conditions and emergencies, riots, and other incidents that may put the public in danger.

The examples here represent just a small sampling of the specific projects that are underway around the world to make cities more livable and provide citizens and businesses with new services.

WHAT ARE THE IMPLICATIONS FOR INSURERS?

Key Questions for Insurers

In the long-run, there are big implications for insurers. As the population and the commercial activity moves to cities (especially the big cities), a number of questions relevant for insurance are raised.

- ❓ Will the small regional insurers decline (especially the small farm mutuals)?
- ❓ Will the combined factors of lower vehicle ownership and autonomous features devastate the auto and fleet insurance sectors, as some predict?
- ❓ Will healthier, accident-free city environments significantly affect mortality and morbidity tables?
- ❓ Will smart buildings anticipate and correct potential problems – and automatically react when problems do occur – resulting in a major decrease in property exposures?
- ❓ Will the nature of commercial businesses and the structure of industries change so much that insurers will need to rethink products and coverages?

These and many questions should be asked by insurers. Every line of business across property/casualty, life/annuity, and health insurance will be affected by the new capabilities introduced in smart cities.

How Risks Will Change

One important consideration for all insurers regarding smart cities is how growth affects efficiencies and risks. As city size increases, efficiencies increase due to economies of scale. It has been shown that a doubling of the city population results in only an 85% increase in the infrastructure and cost, representing a 15% benefit from scale. On the other hand, human factors like crime and traffic accidents increase at a higher rate; if the city increases by 100%, the human factors increase by roughly 115%.³

What this means is that, all other things being equal, the risks increase at a faster rate than the population. The implementation of advanced technologies in cities aimed at creating safer environments will be balanced against the natural tendency for risks to increase. What is also certain is that new risks will emerge, some foreseen, others unforeseen. Cyber-risk will undoubtedly increase as more people, places, and things get connected and generate data. Different kinds of infrastructure risks may arise due to malfunctioning software. The net is that the risk landscape is likely to change over time and insurers must be engaged in understanding the changes and providing solutions that meet the needs of individuals, businesses, and governments.

The good news and big picture are that smart city developments will counter the tendency for risks to increase. The implications for insurers will be experienced in defined, small areas at first. Projects and plans tend to be focused on specific areas with specific objectives, such as reducing vehicle accidents, anticipating equipment failures, improving access to government services, or more efficiently managing energy consumption.

Key Issues for Cities and Implications for Insurers

A whole range of issues must be considered as cities become smarter. Insurers must be aware of these as all have direct implications for the insurance industry. A short list of issues for consideration is as follows:

- ✔ Assigning liability if autonomous systems fail
- ✔ Addressing the increased cyber-risk, including the potential for hackers to take control of infrastructure
- ✔ The potential for decreased frequency, but increased severity of accidents (mega-events)
- ✔ An over-dependence on automated tech which may cause more rather than fewer accidents
- ✔ The repair costs for damaged systems and smart technology
- ✔ An increase in the security and privacy concerns associated with a dramatic increase in data
- ✔ Managing and leveraging massive amounts of data, something that few cities (or insurers) are prepared for today

Other major issues for city governments are the financial outlays and political mindsets needed for smart city projects. There are many great ideas, much potential, and growing enthusiasm for smart city projects in many areas, but they will be dependent on funding and government approval in many cases. In addition, most will involve the participation of multiple government entities and private parties, so substantial collaboration will be required.

³ West, Geoffrey. 2017. *Scale: The universal laws of growth, innovation, sustainability and the pace of life in organisms, cities, economies, and companies*. Penguin Books.

Implications by Line of Business

The different lines of business will be affected by a wide array of entities and circumstances.

- ✔ **P&C Auto:** Mobility is perhaps the most pressing area of smart city initiatives. These projects will ultimately lead to less individual auto ownership, an increase in ride sharing, a move toward autonomous vehicles, new public transportation options, and a shift toward more electric vehicles. In short, this segment is likely to massively transform, resulting in fewer vehicles and a dramatic reduction in accidents.
- ✔ **P&C Homeowners:** The migration to cities will mean more renters and condo owners, in addition to more high-value homes. The potential to leverage smart home/building technologies is significant as well. Smart building sensors generate a variety of discount and service opportunities for insurers. The geographic distribution of homes, as well as home values, will be significantly affected over the next generation.
- ✔ **P&C Commercial:** New types of businesses will spring up in cities, and existing businesses are likely to shift from rural to urban areas. Smart building technologies will reduce property risks for business owners. Commercial auto/fleet will benefit from the overall vehicle trends (telematics, autonomous vehicles, etc.).
- ✔ **Workers' Compensation:** Improved urban design and smart city solutions will mean more employees working at facilities in city centers. Commuting will be easier, and more livable cities will attract more employees to the urban centers. Smart solutions for worker safety will help to reduce accidents.
- ✔ **Life/Health:** Better air and water quality, improved fitness and leisure options, and enhanced public safety solutions should positively affect lifespans and the general health of the population. Insurers have the potential to promote and participate in these activities, partnering with customers to encourage healthier behaviors.

The world is becoming more digital and more connected, creating opportunities to improve risk management across every sector. Cities will be a big part of that change, and an increasing percentage of customers will reside and/or work there.

WHAT TECHNOLOGIES ARE VITAL?

There are many technologies that are already being deployed in smart city projects, and others will play an increasing role over time. The most vital enabling technologies are:

- ✔ **The IoT:** Sensors, embedded chips, and smart devices will be a big part of many projects, collecting real-time data and monitoring the status of buildings, infrastructure, and the environment.
- ✔ **Drones:** Surveillance, deliveries, and emergency response are roles that will be played by drones.
- ✔ **Autonomous vehicles:** Personal and commercial vehicles will become increasingly autonomous, going from having the ADAS features of today to the eventual level 5 vehicles that will be autonomous in every situation.
- ✔ **Geospatial:** Mapping and visualization technologies are already important for planning and real-time applications. In addition to traditional geospatial capabilities, 3D, indoor GIS, and temporal analysis (visualizing and animating change over time) will be increasingly important.
- ✔ **Wearables:** Many individuals are already using wearable devices for fitness and health purposes. Increasingly, workers and city employees will also use wearables for safety and health reasons.

- ✔ **Artificial Intelligence:** AI and machine learning will become pervasive in smart cities (and society at large). The massive volumes of real-time data will require AI/ML to monitor activities in real-time and make recommendations or even take automated actions. AI will also be used extensively for citizen interactions; virtual assistants, chatbots, and voice interfaces will be ubiquitous.
- ✔ **Big Data:** The amount of data that will be generated from connected devices in a city is staggering. A single autonomous vehicle alone generates four terabytes of data per day. Add in data from sensors and chips in roads, buildings, traffic lights, machines, people, and many other things, and it is clear that platforms to manage the data volumes and support advanced analytics will be required.
- ✔ **User Interface Technologies:** Advanced modes of UI including voice, haptic controls, ultra large displays, virtual displays, and augmented reality will be how citizens and employees will access information and services, and manage the buildings and infrastructure.
- ✔ **New Networking Technologies:** The millions of connection points generating data in a city must rely on orders-of-magnitude advancements in networking capacity and speed. Technologies such as low power/wide area networks, 5G technologies, and mesh networks will be core requirements for the smart cities of the future.

A series of proven mature and maturing technologies are also critical parts of the foundation for smart city projects. These include mobile, cloud, analytics, social media, and telematics, all of which will be incorporated into many projects.

WHAT ARE THE ROLES OF GOVERNMENTS AND CONSORTIUMS?

The Role of City Governments

Although is it wise for city governments to develop holistic smart city plans, the journey toward the evolved vision will likely be taken in many small steps. The role of city governments will be to share best practices, provide seed funding for private development, leverage public funding for public works projects, and encourage individual projects to adhere to standards. Some cities may also choose to establish big data platforms and/or high capacity networks to support smart city projects.

The Role of Consortiums

Some of the important consortiums and associations that are actively involved in promoting smart city developing include:

- ✔ The US Department of Transportation (especially via the US Smart City Challenge)
- ✔ The National League of Cities (US)
- ✔ Smart Cities Council (Global)
- ✔ CityMakers
- ✔ Smart City Consortium

These consortiums, along with national governments and political unions such as the European Union, are providing funding and support for smart city ventures.

WHICH CITIES ARE CONSIDERED LEADERS?

Many cities are marketing themselves as “Smart” – the new buzzword – to attract businesses and individuals. Some already consider their cities to be smart due to widespread wireless access and mobile apps. However, these capabilities only represent the first wave of being smart; the true goal of smart cities reaches far beyond mobile. Many recognize the power of being a smart city and have taken specific actions to implement emerging tech for real-time data processing and solutions across a number of different areas. Megacities are among the frontrunners, but some mid-sized and smaller cities are also leaders:

Dubai: With its Smart Dubai initiative, it has been one of the most vocal about becoming a smart city, serving as an inspiration and experimental lab for other cities around the world. Dubai is investing in a variety of smart city projects, creating a city-wide big data platform, and promoting blockchain initiatives for city services.

Singapore: Virtual Singapore already includes sensors, cameras, and pervasive Wi-Fi, with projects for traffic flow, smart parking, crime reduction, and citizen services, among others.

Columbus, Ohio: This mid-sized city won the US DOT smart city challenge and the related \$40M in funding. The smart city focus is on mobility and reinventing transportation with the goal of reducing accident fatalities and damage. The implementation in progress includes sensors on traffic lights, analysis of intersections, vehicle-to-vehicle communications, and autonomous truck testing.

Barcelona: Air quality and traffic management are front and center in this city’s smart city plans. (Traffic has already been significantly reduced through traffic remodeling). Other projects include a smart grid for energy management and smart meters.

Eindhoven, NL: This city aims to become a “city of light” and is building a smart lighting grid upon which city services can be based (especially public safety applications). The city is also building sustainable communities, implementing smart parking, and initiating a variety of other smart city services.

Paris: The CityMakers organization is a partnership between the City of Paris, AXA, Renault, and others. The initial phase is concentrated on mobility, including infrastructure, electric vehicles, and new in-car services.

London: London plans to invest £4B over the next decade in roads and smart traffic projects to address the huge congestion and pollution problems faced by the city.

Wellington, NZ: Water quality monitoring is a major project underway in this city. Real-time data is sent from sensors in the harbor to monitor the sediments that flow from the river into the harbor.

Amsterdam, NL: Amsterdam has one of the most aggressive approaches. At last count, their smart city idea has spawned over 80 pilot projects. [An interactive map showing the projects is available here.](#)

There are hundreds of other cities of various sizes around the world that are either in the planning stages or have initiated smart city projects.

HOW ARE INSURERS INVOLVED?

Thus far, it has been primarily the large, global insurers that are involved in a visible way. The deployments of emerging technologies in cities will ultimately affect all insurers in some way, whether they are directly involved in supporting smart city initiatives or not. Current examples of leadership from insurers include the following:

- ✔ **AXA** is a partner in the CityMakers organization focused on smart city plans for Paris. AXA has invested in startups, such as one that offers favorable finance and insurance options for new vehicles that owners are willing to put on a car sharing platform. The insurer also has new trip insurance and smart living insurance solutions on the drawing boards.

- ✔ **XL Catlin** has Smart City activity going on in their innovation labs and is beginning to think about how it affects their normal commercial lines offerings. The company believes that, from a P&C standpoint, smart communities will have insurance needs that are different from those of traditional communities. For example, cyber-risk is much more of a threat for a smart city than a non-smart city.
- ✔ **Zurich Insurance** has partnered with the World Economic Forum on six key areas of innovation – one of which is Smart Cities.
- ✔ **Allianz** is investing and collaborating in a smart city partnership with the city of Dortmund, Germany. In addition, Allianz has launched an innovation lab in Singapore to seek solutions for smart city living, mobility, and connected health care.
- ✔ **Swiss Re** has been doing extensive research on emerging risks that affect cities, such as new forms of mobility, prolonged power outages, and cyber-risk. Their view is that increased interconnectivity may lead to increased large losses, but also creates opportunities for new insurance products.

Others, while not necessarily involved in smart city initiatives, are playing important roles in funding and innovating via InsurTech and emerging technologies that will be at the center of smart city projects. These include:

- ✔ **Munich Re/HSB:** As the leader in IoT projects for insurance, they have made a series of investments and partnerships in InsurTechs that offer smart home and property solutions.
- ✔ **American Family:** An early proponent of smart home solutions and the potential for insurance, AmFam has invested in many startups and incorporates smart home devices in their homeowner's insurance solutions.
- ✔ **Progressive:** The pioneer in auto telematics for insurance has now been joined by Allstate, State Farm, and many others in collecting real-time telematics data and offering insurance solutions based on that data.
- ✔ **Liberty Mutual:** A front-runner in commercial fleet telematics, Liberty Mutual offers a range of telematics solutions.

New partnerships and new projects are being launched everyday by insurers leveraging emerging technologies and real-time data to manage risk, improve customer communications, and optimize operations. While these projects are not strictly aimed at furthering the progress of smart cities, they will increasingly be used in them.

HOW SHOULD INSURERS PREPARE?

Not all insurers have a large customer base in urban areas, but every insurer should follow the developments in smart cities. Those with customers in the cities will be wise to understand how behaviors and risks are shifting. Those with limited urban customers should recognize that many of the smart technologies and solutions implemented in cities will migrate to the rural areas in the future. SMA's advice for insurers seeking to prepare for and capitalize on the evolution of smart city solutions should consider these actions:

- ✔ **Track Emerging Tech:** All insurers should actively follow those emerging technologies that will have the highest impact on their business, such as autonomous vehicles, AI, drones, the IoT, blockchain, and many others.
- ✔ **Follow Smart City Projects:** Be aware of the projects that are underway, especially those in nearby cities or cities where you have a large customer base.
- ✔ **Engage in Initiatives:** Where appropriate, join consortiums or partner with local governments to promote smart city projects, especially those aimed at reducing risks and improving public safety.
- ✔ **Build Big Data and Analytics Capabilities:** In any future scenario for insurers, having the platforms and expertise to manage, analyze, and act upon large streams of real-time data will be essential.

- ✔ **Design New Products:** Leverage innovation to develop new products and coverages that address new or increased risks created by smart cities, or provide insurance in new areas or to new customer segments.

Smart city initiatives are propelling the use of emerging technologies forward and acting as a catalyst for connected world solutions. The implications for the insurance industry are immense in the long run, but even now there are projects and plans that have important implications for every segment of the insurance industry. Taking a proactive approach to the smart city movement is a wise strategy for insurers today.



ABOUT STRATEGY MEETS ACTION

Strategy Meets Action (SMA) is dedicated to helping the business of insurance modernize, optimize, and innovate for competitive advantage. Exclusively serving the insurance industry, SMA blends unbiased research findings with expertise and experience to deliver business and technology insights, research, and advice to insurers and IT solution providers. By leveraging best practices from both the management consulting and research advisory disciplines, we take a unique approach – offering an unrivaled set of services, including retainers, research, consulting, events, and innovation offerings. Additional information on SMA can be found at www.strategymeetsaction.com.

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