



SMART PLANNING OUR FUTURE CITIES

SUPPORTING HEALTHY, EQUITABLE
AND SUSTAINABLE COMMUNITIES
IN THE DIGITAL AGE

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BACKGROUND

This research was conducted as part of the LSNetwork program (formerly LightSavers Canada) run by the Canadian Urban Institute (CUI). For over a decade, LSNetwork has supported the transition to networked LED streetlights and is now also helping communities effectively design and deploy Smart City Master Plans to improve quality of life at work, home, and play. LSNetwork will be publishing a Best Practices Guide for Smart City Master Plan Development that will be available at: <http://www.lsnetwork.org/>.

CONTEXT

The rapid rise of urbanization has, in recent years, coincided with a massive growth in connected devices (or things that talk to the internet). By 2020, it is predicted that 50 billion connected devices will exist (Evans, 2011). With this steady expansion of the Internet of Things (IoT), along with the kickoff of Infrastructure Canada's Smart Cities Challenge, there is significant opportunity for municipalities to empower their communities through technology and connectivity. To be competitive and prepared to respond to emerging urban challenges and opportunities, cities should be investing in their capacity to employ this connectivity to support smarter, healthier, and more equitable and sustainable communities.

Done properly, technological investments in essential infrastructure can lead to substantial community benefits. For example, the adoption of energy efficient

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light-emitting diode (LED) streetlights allows existing streetlighting infrastructure to host a communication network spanning the full reach of a city. This network can become the backbone of smart city services by hosting connected devices and communicating data. Another example is the implementation of smart meters, which forms a network connecting homes across the city. But with an increasing array of technology choices, the full potential of connected devices can be difficult for municipalities to navigate.

Developing a comprehensive Smart City Master Plan can be a proactive process for municipalities to identify their specific needs, unite stakeholders, and outline a roadmap for achieving effective and beneficial deployment of these solutions. The focus of this type of planning is to build a smart city from the ground up, to ensure technology is used to improve overall quality of life, and to address local challenges faced by citizens.

Many mid-sized cities face the challenge of having smaller budgets than larger metropolises; however, they have unique opportunities that position them to lead smart city initiatives throughout Canada. A smaller government and community can enable more conversation between departments and between government and citizens, resulting in a better understanding of true needs as well as the nimbleness to adopt and accept technology quickly. The scale of mid-sized cities also makes them ideal for realizing and measuring the impacts of technology which might be harder to isolate in a larger city. A 2017 study across the United States found that more urban technology projects are implemented and planned in mid-sized cities than in small or large cities (The US Conference of Mayors, 2017). As technology advances, citizens now expect digital solutions to be available. Mid-sized cities can lead this innovation.

The full potential of connected devices, with an increasing array of technology choices, may be difficult for municipalities to navigate.

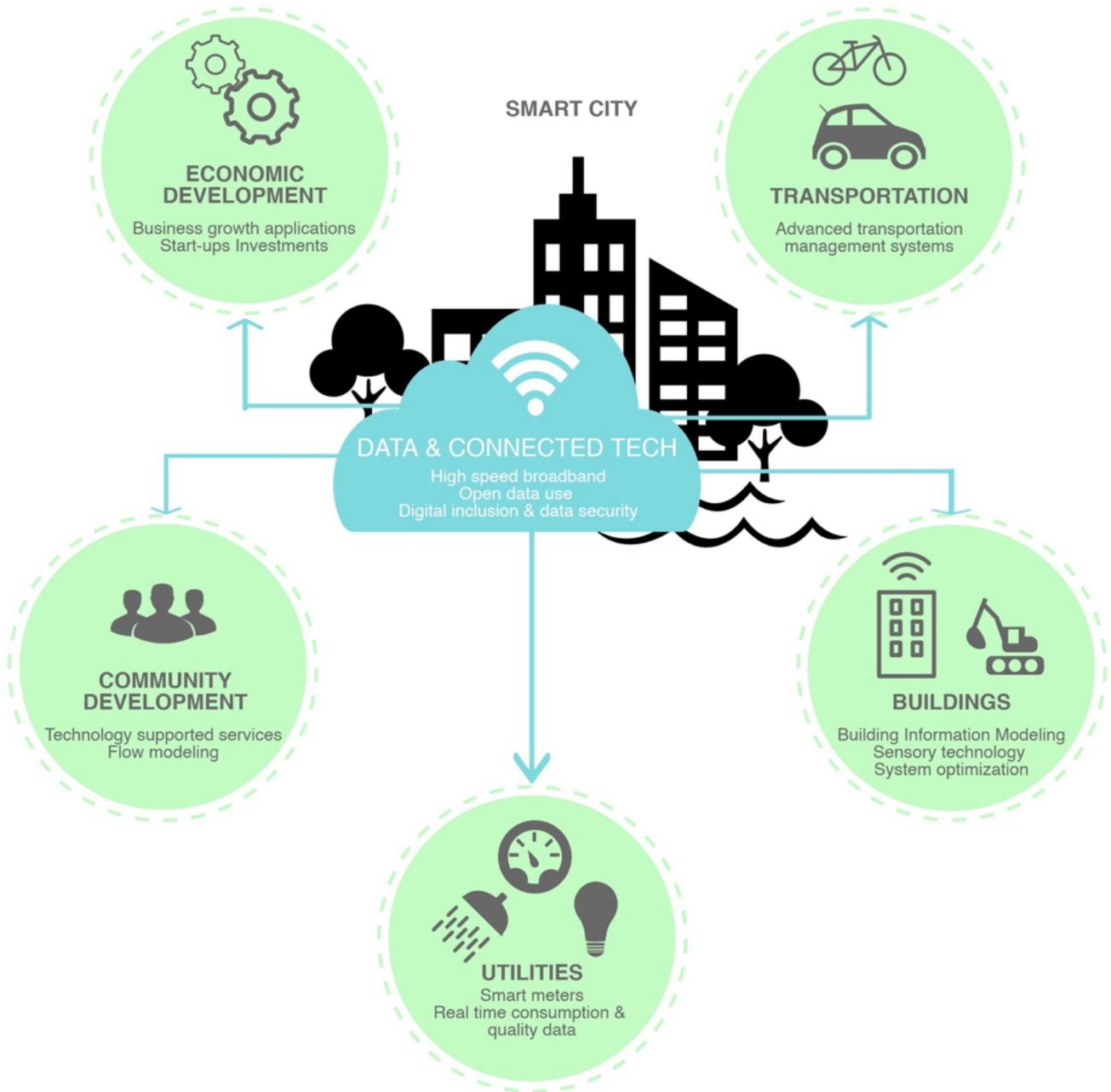
WHAT IS A SMART CITY?

There is no globally recognized definition of a “smart city,” which can add to the complexity of adoption by municipalities. Although early smart city initiatives were largely driven by technology, cities are beginning to shift the authority to citizens and capture this in the evolving definitions. A smart city approach should leverage technology to improve services and is driven by the community need rather than technology. Building a smart city happens from the ground-up, empowering citizens without technology pushing the agenda.

As defined by the LSNetwork, the term smart city is generally used to refer to improving overall quality of life for people at home, work and play through the use of data and digital technology integrated throughout the built environment. The technology is used to provide opportunities for economic development and to enhance urban services, resource conservation, and cost effectiveness. Key focus areas include: fostering innovation in industries and neighbourhood communities; creating and attracting talent; advancing urban infrastructure, transportation and utility performance; and improving community services (LightSavers, 2017). Figure 1 visualizes the components of a smart city and provides example technology solutions for each.



Figure 1: Components of a smart city with example solutions.



WHAT IS A SMART CITY MASTER PLAN?

A Smart City Master Plan identifies locally-significant community stresses, evaluates potential information and communications technology (ICT) solutions, and outlines a roadmap to achieve effective integration of selected solutions. Developing a plan can be a proactive method for cities to understand which, of the seemingly endless smart city solutions available, might successfully provide high social and economic returns.

Dr. Anthony Townsend¹ and Dr. Stephen Lorimer² (2015) describe this type of plan as “attempts to mobilize local stakeholders around visions, goals, and road maps to adapt to [the] external technological and economic pressures, within local social, economic and political constraints.” As the impacts of a smart city will affect and benefit the whole community, a plan requires new cross-city governance models and shared strategies.

Essentially, a Smart City Master Plan will connect agencies in order to lay out a comprehensive approach for developing and deploying smart city solutions to improve overall quality of life.

THE VALUE PROPOSITION

Developing and implementing a Smart City Master Plan is likely not driven by potential short-economic returns, as it will require significant additional funding, resources, and, often, in-house capacity building. What makes it worthwhile are the social and environmental returns that will improve the economy and community in the long-term.

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Building a smart city engages a diverse and extensive stakeholder group, including municipal agencies, industry insiders, academia, community leaders, and others. A Smart City Master Plan unifies these separate groups, breaking down information silos—which, in turn, allows thorough exploration of the potential social and environmental benefits.

DEVELOPING A PLAN

Based on a review of international initiatives and discussions with community and industry leaders, LSNetwork has identified several key best practices for mid-sized cities developing a Smart City Master Plan.

ENGAGE STRATEGICALLY AND WIDELY.

Smart city solutions can impact all people within a community, and therefore also require involvement from various municipal agencies and community leaders. Information and agency silos need to be overcome to build internal and external partnerships and foster collaboration. Partners should include academia, industry, civil society, and other levels of government.

¹ Author of *Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia* (2013) and internationally-recognized expert on the future of cities.

² Smart London Strategy and Delivery Officer at the Greater London Authority.

To build a smart city that improves quality of life for all people, smart city plans should be developed to solve the true community needs. These needs can only be identified through inclusive and extensive citizen engagement. As part of this preliminary engagement, the core Smart City Master Plan project team and champion should be determined.

ESTABLISH THE CONTEXT.

The strategic roadmap developed through a Smart City Master Plan is community-specific because each community faces different challenges, is in a different state of readiness, and has access to different solutions. By establishing the local context, the Plan and the technology applications it includes can be better fitted to the city. Knowing the current context will also define a baseline for results to be measured against. To establish the context, municipalities should:

- > identify their priorities and areas which are in need of improvement;
- > determine the community short- to long-term goals; and
- > assess data currently available relevant to these goals and identify what additional data needs to be collected to complete baseline knowledge.

DEVELOP AN AMBITIOUS, MEASURABLE, AND ACHIEVABLE PLAN.

The success of a Smart City Master Plan is largely dependent on designing a robust strategy grounded on a clear vision for the future of the city. The vision and mission should build on existing priorities and assets to align with local needs and goals, while also defining aspirational targets to energize and mobilize stakeholders. A comprehensive plan will:

- > describe the preliminary engagement;
- > provide an approach for ongoing engagement;
- > verify the context;
- > outline smart city strategies to overcome challenges;
- > design a roadmap to implementation with targets and timelines; and
- > identify mechanisms to measure success.

Fostering a new innovation ecosystem by partnering with academia as well as major tech companies and startups is key for incubating smart city ideas and delineating appropriate roadmaps. These partnerships may also leverage important sources of funding.

SELECT TECHNOLOGY TO EMPOWER THE COMMUNITY.

To encourage effectiveness and longevity of smart city solutions, Smart City Master Plans can require solutions that are designed:

- > to enhance digital inclusion and improve access for all citizens;
- > for interoperability; and
- > to evolve as new technologies become available.

EMBED SMART CITY THINKING.

Over time, smart city solutions will become the new normal and will be embedded within all city strategies as they are developed. A Smart City Master Plan ignites a cultural change:

- > municipalities will find new ways of working and collaborating;
- > citizens will be empowered through data and connected technology; and
- > skills and knowledge training will shift to support this technology revolution.

SMART CITY SOLUTIONS

Many existing national and international smart city solutions have been summarized under seven categories below.

	<p>STREETLIGHTS The existing and pervasive infrastructure of streetlights makes them an obvious choice for hosting a citywide communication network that can be leveraged as the backbone for applying smart city solutions. As streetlighting networks are usually evenly deployed throughout a municipality, they provide one of the most equitable means of deploying technology. This network can also be used to monitor and control streetlighting to reduce maintenance and electricity costs.</p>
	<p>TRAFFIC & PARKING Traffic and parking optimization leads to reduced time-on-road for cars and correspondingly reduces greenhouse gas (GHG) emissions. Sensors of real-time traffic can be used to control smart traffic signals to increase travel speeds and reduce intersection delays. Data from parking sensors can direct drivers to empty spaces via mobile apps while informing law enforcement of parking infractions.</p>
	<p>ENVIRONMENTAL MONITORING For environmental monitoring, current technology offers a wide range of options. Sensors are able to monitor and report weather conditions, air quality (i.e. various pollutants), ground conditions, and noise. This data can benefit citizens, policy makers and researchers by providing information on the health and environmental risks of ambient conditions.</p>
	<p>SAFETY & SECURITY There are also extensive smart city applications available for safety and security. One such application commonly mentioned by suppliers is gunshot detection. This type of sensor can be used to trigger image capture in the area when a shot is heard and alert emergency responders who can be directed by flashing streetlights. A similar system can be deployed for traffic accident detection.</p>
	<p>CONNECTED CORE CITY SERVICES Waste management, road salt applications, flood management, and utility efficiencies have been shown to improve through networked sensor technology. Some potential benefits, for example, are: optimizing water and electricity use with smart meters; minimizing salt use by applying based on ground temperatures; and emptying waste bins when full, with optimized collection routes.</p>
	<p>REVENUE GENERATION As one way to offset the costs of deploying new technology, cities can look for additional revenue generation opportunities. Some already being used include fees for Wi-Fi hotspots and electric vehicle charging stations.</p>
	<p>COMMUNITY EMPOWERMENT Through open data and inclusion efforts, smart city applications can more deeply connect citizens to city leadership and to each other, and build the capacity of citizens to make informed decisions. Efforts can include using technology to make services and information more accessible to vulnerable populations. ICT solutions also provide the opportunity for real-time feedback and iterative interaction between government and community, giving residents more influence in policy and decision-making.</p>

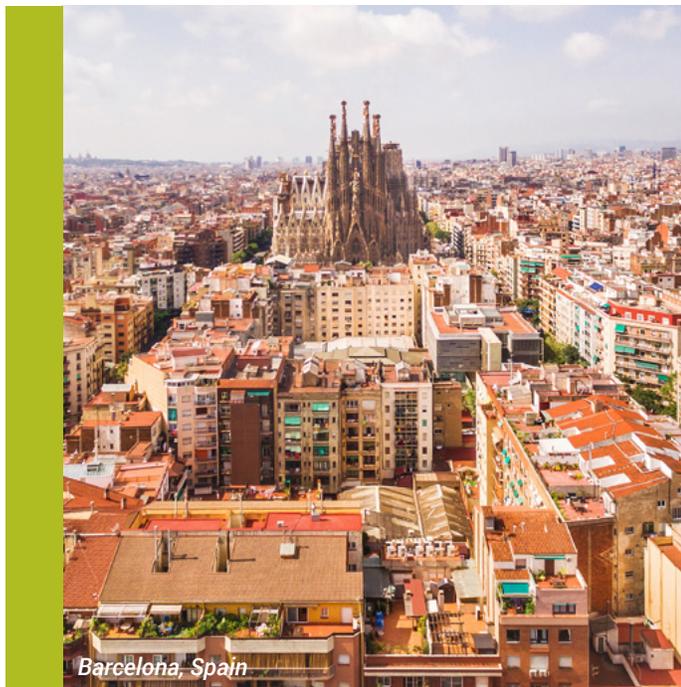
WHO'S DONE IT?

The extent of possibilities intelligent communities offer can be overwhelming for many communities; however, over the past 10 years, select global cities have tackled this challenge with the implementation of smart city master planning processes. Smart planning allows city governments and urban planners to become leaders in the technology revolution.

GLOBAL SMART CITY LEADERS

BARCELONA, SPAIN

Barcelona was a pioneer of smart city planning and IoT solutions. The city's first Smart City Strategy was a top-down approach involving major urban infrastructure projects in streetlighting, transportation, energy, and water. By 2014, Barcelona was saving \$58 million a year from its smart water initiative, and it had increased parking revenues from multistory car parks by \$50 million and had created 47,000 jobs. (Guglielmo, 2014)



But not all projects were successful. Occupancy sensors put in street parking were found to be triggered by underground subways and ultimately unused by drivers. By continuously reviewing and revising its plan, Barcelona is now approaching its strategy with a citizen-centric focus—looking at what technology can do for the people. (Tieman, 2017)

DUBLIN, IRELAND

The City of Dublin published its first Digital Masterplan in 2013 with a vision to position Dublin as a global leader in technology innovation to drive “economic compet[et]iveness and a cohesive and sustainable society”. Its initiatives focused on empowering citizens using technology, such as providing broadband fibre to every home. The objective is to ensure prospective Irish employees are job-competitive, which, as the Masterplan states, requires access to 10Mbps connectivity at home. (Digital Dublin, 2013)

In 2016, Smart Dublin was launched as an initiative of the four local authorities, including City of Dublin. Continuing to focus on community engagement to drive the smart city process, the initiative works to consolidate the digital efforts of each authority and engage solution providers and researchers with the community to improve city life. (“Smart Dublin”, 2018)

VANCOUVER, CANADA

Vancouver's Digital Strategy, also developed in 2013, reviews the city's current digital maturity, identifies goals, and outlines a three-year action plan roadmap. It positions data as the architect of a smart city that connects citizens, businesses, and governments. Vancouver completed extensive consultation with stakeholders to drive a citizen-centric plan that promotes widespread adoption. (City of Vancouver, 2013)

Following the action plan, Vancouver is now in a two-year technology transformation phase with the ultimate goal of becoming a "smart, intelligent, connected, green city" (Adcock, 2017). Such a transformation is an aspiration for all our future cities in this digital age.

Vancouver, British Columbia

LEADERS IN MID-SIZED SMART CITIES

MILTON-KEYNES, UNITED KINGDOM (POPULATION: 255,700)

Milton-Keynes initiated the *MK:Smart* program in response to being one of the fastest-growing cities and economies in the UK. The objective of the smart city strategy is to support sustainable growth without exceeding infrastructure capacity, while meeting key carbon reduction targets and making it one of the top economic cities in the UK. The program's initiatives are focused on energy, water, and mobility. MK:Smart developed a coalition of 21 partners including council, universities, and industry. ("MK:Smart", 2018)

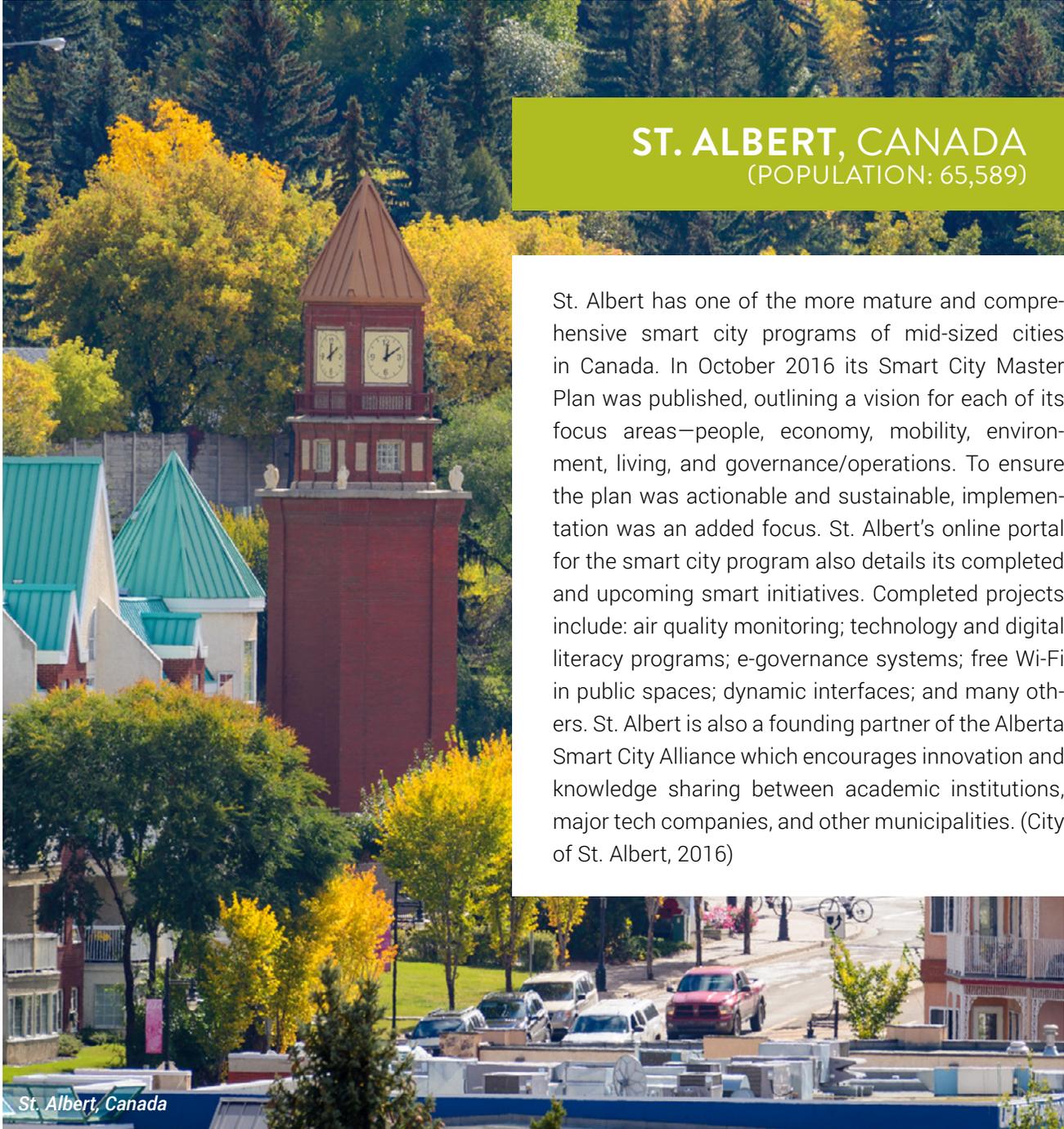
The key technical infrastructure component is the MK Data Hub. Developed by Open University, the hub brings together data from government, business, and private contributors to enable their use in analytics and software applications. Currently, 261 open data-sets are available. ("MK:Data Hub", 2018)



KITCHENER, CANADA (POPULATION: 204,668)

In January 2017, City of Kitchener council approved the city's first digital strategy, Digital Kitchener, with actions for developing a smart city. The strategy focuses on building a city that is connected, innovative, inclusive, and responsive, as well as driven by collaboration and economic ambitions. The plan presents specific smart initiatives existing in the city—for example, smart streetlighting with machine learning capabilities, North America's largest tech-incubator, hackathon programs, and innovation hubs. Along with these initiatives, the plan also provides high-level actions for achieving its digital objectives. (City of Kitchener, 2017)

Kitchener, Canada



ST. ALBERT, CANADA (POPULATION: 65,589)

St. Albert has one of the more mature and comprehensive smart city programs of mid-sized cities in Canada. In October 2016 its Smart City Master Plan was published, outlining a vision for each of its focus areas—people, economy, mobility, environment, living, and governance/operations. To ensure the plan was actionable and sustainable, implementation was an added focus. St. Albert's online portal for the smart city program also details its completed and upcoming smart initiatives. Completed projects include: air quality monitoring; technology and digital literacy programs; e-governance systems; free Wi-Fi in public spaces; dynamic interfaces; and many others. St. Albert is also a founding partner of the Alberta Smart City Alliance which encourages innovation and knowledge sharing between academic institutions, major tech companies, and other municipalities. (City of St. Albert, 2016)

St. Albert, Canada

Source: *Jeff Wallace flickr account*

CONCLUSION

Data and technology is transforming and redefining the cities we live in. This digital revolution, once led by industries, is now being harnessed by governments to empower citizens. Smart City Master Plans are enabling municipalities to support community goals by leveraging their networks as platforms for smart city strategies. The scale of mid-sized cities uniquely positions them to lead this movement and foster innovation by knowledge sharing between communities.

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IMAGE SOURCES

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