PARKS AND OPEN SPACES: CHALLENGES AND OPPORTUNITIES OF SMART TECHNOLOGIES

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COMMUNITY SOLUTIONS NETWORK RESEARCH BRIEF

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Executive Summary

Public spaces shape our sense of belonging and contribute to our wellbeing and quality of life. It is in places such as our parks, plazas, squares, streets, sidewalks, and laneways that community is strengthened through interaction between friends, neighbours, and strangers. As we densify and live in smaller residential units, we are increasingly viewing the public realm as an extension of our daily living experience. We are placing greater emphasis and dependency on shared public spaces to be available and accessible whenever and however we need them. At the same time, our increasingly digital age brings growing opportunities for use of new technologies in our public spaces.

Smart city technologies such as wireless Internet networks, digital screens, smart street furniture, and digital placemaking efforts are changing our collective experiences in the city. These tools offer opportunities for spontaneous information collection, real-time responsiveness, improved efficiency, and civic participation. However, they also raise key concerns with respect to privacy, data management, and corporatization. Around the globe, cities are adopting smart civic infrastructure while simultaneously exploring how to create tech-free zones without mobile signals, Wi-Fi, satellite, and Bluetooth.

This research brief explores the risks and opportunities that arise when local governments consider the deployment of new technologies in public spaces.

Foreword

by Open North

First defined in 2018 by Lauriault, Bloom and Landry, an Open Smart City is one where all actors, including residents, collaborate in mobilizing data and technologies to develop their community through fair, ethical, and transparent governance that balances economic development, social progress, and environmental responsibility.

As Canadian communities across the country explore smart city initiatives, there is a pressing need to better understand the opportunities and risks presented by data and emerging technologies and put open smart city principles into practice.

Open North has commissioned a series of research briefs for policymakers and practitioners to provide insight into how data and technology intersect with challenges local communities are grappling with, such as food security and shared transportation. The research briefs identify complex policy issues from an open smart city lens, describe their importance and provide key considerations for policymakers.

This research brief explores the implications of deploying new technologies into public spaces. The public sphere shapes the urban experience and is a major area of discussion as communities balance the need to provide ample space for the public, as well as drive land use intensification. The COVID-19 pandemic has also demonstrated the importance of shared public spaces. As cities explore digital placemaking, public Wi-Fi, and install sensors in streets and plazas, it is necessary to examine the risks and opportunities of these technology options.

Introduction

Smart Technologies in Open Spaces

Communities across Canada are growing and changing. From small towns to our largest cities, there are many discussions about how to manage growth and change. In an effort to balance the need to welcome new people and to provide more housing opportunities, many communities are facing the tension between intensifying their use of land through increasing density while also trying to ensure there is ample public and open space for people to use and share. In these conversations, planning, designing and maintaining the public realm are important considerations.

The public realm consists of "the publicly owned places and spaces that belong to and are accessible by everyone. These can include municipal streets, lanes, squares, plazas, sidewalks, trails, parks, open spaces, waterfronts, public transit systems, conservation areas, and civic buildings and institutions" (Ontario Professional Planners Institute, 2016). Public gathering spaces play an important role in health as they shape people's sense of belonging and contribute to wellbeing and quality of life. It is in the public realm that community is strengthened through interaction between friends, neighbours, and strangers.

Living in smaller and taller residential units has prompted us to place greater collective emphasis and dependency on shared public spaces to be available and accessible whenever and however we need them: we hold potluck picnics and birthday gatherings in public parks, and we assemble in municipal streets and squares to celebrate sports team wins. The first half of 2020 faced the widespread arrival of the COVID-19 pandemic. With many of us first experiencing sheltering at home and then seeking to maintain social distance in public spaces, these experiences amplified our understanding of the value and importance of these spaces while also clearly demonstrating the limits of the spaces we have available.

The added pressure on common spaces is occurring in parallel to the accelerated speed at which we engaging with the natural and built environments using digital technologies such as social media platforms, expecting immediate and open access to information, and adopting and integrating new technologies into our daily lives and at a time in which technology vendors are actively designing and selling products for use in public spaces. We lounge in the park with a set of portable speakers powered by Bluetooth, we wait at transit shelters lit with advertising on digital screens pushing notifications to our mobile devices, and we stroll down streets while our mobile devices share our data while we use technology platforms to navigate spaces, read reviews of businesses, and upload our own observations and experiences.

LinkNYC Kiosks

The emergence of smart city technologies in our cities has shown just how rapidly this situation is changing. For example, a new communications network in New York City called LinkNYC is replacing coin-operated pay phones with 9-ft-tall kiosk structures called Links. This project is run by Intersection, which emerged from a Sidewalk Labs investment (Sidewalk Labs is a subsidiary to Alphabet Inc. and a sister company to Google). Distributed across all five boroughs of the city, each Link has a high-speed wireless Internet hotspot

"LinkNYC" by Edenpictures. Licensed under CC BY 2.0

spanning 150 feet, two USB ports for charging mobile devices, and a touch-screen tablet with city services, maps, and directions (CityBridge, 2019). The USB outlets act as a power source and do not exchange data between devices and the Link. To freely access the Wi-Fi network, users must share their email address and consent to a privacy policy and conditional terms. Those with Apple devices have the option of signing in to a secure, private wireless connection that is encrypted.

Free phone calls can be also placed from a Link to any American number. Personal headphones can be plugged in for privacy and there is a dedicated 911 emergency call button. International phone calls can be made using a calling card. Accessibility standards have been embedded within each Link through zoom features, colour inversion controls, screen readers, volume control, hearing aid induction loops, and Braille markings. Each Link has two 55" high-definition display screens that feature advertising and public service announcements. LinkNYC's free advertising program allows for small businesses, nonprofits, and community groups to share neighbourhood information and local events. The funding model for the network is supported through advertising, sponsorships, and partnerships without financial payments from the kiosk user to the company.

The LinkNYC project is at the centre of the kinds of debates that emerge in other smart technology projects deployed in public spaces. In the early days of the project's launch, one of the more curious and unexpected uses was that some members of the public were using the kiosks to watch pornography (Huffington Post, 2016). RethinkLinkNYC, a community based organization that was an early opponent to the project, cited concerns about surveillance, data collection and privacy and the privatization of public spaces. The evaluation of the actual locations of the kiosks revealed that they were clustered in more affluent neighbourhoods raising questions about the extent to which this project exacerbated the digital divide (Correal, 2020). And, most recently, there are

claims that the consortium behind the project now owes the City of New York millions of dollars in overdue contributions (Lyons, 2020). This example from an American city is relevant in Canada too. There are numerous vendors pitching products to deliver "free" public wifi. And the concerns about unintended uses, surveillance and privacy, and corporate presence in public spaces are common across technology implementation projects, and ones that public decision-makers will likely encounter in projects in their communities.

As new products emerge, the possibility that the public realm could become more digital is imminent. The speed at which products are becoming available is faster than our current capacity to create governance frameworks and procurement protocols that balance opportunities while mitigating challenges. There are a range of people inside municipal governments with responsibilities for the public realm and the extent to which these staff have education and or training to respond to the opportunities and challenges that new technologies present is varied.

Urban planners and landscape architects have formal professional obligations to work in the public interest when developing vibrant, sustainable communities and guiding them through change. Other staff inside city halls across Canada have similar obligations, including parks and recreation staff and those people working in municipal licensing and standards. Our increasingly digital age brings growing opportunities for use of new technologies in our public spaces. This means that staff in municipal IT departments may have new responsibilities related to the public realm as well. Seeking to help decision-makers in Canadian communities inform their work, this brief explores key opportunities and challenges that emerge when smart city technology is deployed in the public realm. The goal is to expand our understanding of how we can adapt shared spaces in response to evolving digital and smart technologies, without compromising the public realm's underlying elements of inclusivity, openness, and shared ownership.

Why Thinking and Proceeding Carefully Matters

Key Considerations From a Policy Perspective—Why Technology in the Public Realm Needs Attention

All cities have private areas, such as homes and offices, as well as public areas to which we contribute resources for our collective benefit and ownership. Public areas are where people gather as neighbours and are mostly managed by municipal, provincial/regional, and federal governing bodies. What constitutes the public realm has changed over time. From the Greek agora to speakers corners in parks to farmers markets and grand large urban parks, public spaces vary in use, size and function.

Different types of public spaces

Carr et al. (pp. 79-84) provide a useful breakdown of the variety of public spaces found in communities:

1. Public parks
2. Squares and plazas
3. Memorials
4. Markets
5. Streets
6. Playgrounds
7. Community open spaces
8. Greenways and parkways
9. Atrium/indoor marketplaces
10. Found spaces/everyday spaces
11. Waterfront

Collectively, public spaces such as these form our shared public realm. In the midst of urban intensification, growing diversity, and changes to policy and technology, the value and opportunities of the public realm has been underscored. Considered a city's "single most valuable asset," the public realm defines municipal character, quality, and success (Dixon, 2016, p. 3). Public spaces within it are "essential for the creation of vibrant communities" (Urban Land Institute, 2018, p. 3) and

"the beating hearts of our neighbourhoods" (Park People, 2017, p. 8) that "knit us together" to form a common identity and nurture civic pride (Benfield, 2013).

The Ontario Professional Planners Institute (OPPI) recently called upon its members to make the public realm a focus in their community building efforts (2016). The OPPI's Call to Action outlined parkland, streetscapes, multipurpose and adaptive reuse, public art, and programming as key areas for public realm improvement and animation. Each of these areas has multifaceted potential. For example, streetscape elements such as trees, furniture, lighting, transit shelters, paving, signage and wayfinding not only provide functional benefits like shade, light, rest, safety, and direction but also the opportunity to support identity and differentiation among neighbourhoods. Similarly, public art contributes to cultural expression and heritage interpretation and also lends opportunity to create key landmarks or focal points to serve as meeting places. Parkland provision, acquisition, maintenance, and funding bring many challenges but also opportunities for new and innovative models like linear parks and schoolyard use, along with important considerations of diversity, inclusivity, social equity, accessibility, and age-friendly design.

Benfield (2013) notes that the strength and health of our public spaces is more important than ever as we seek more sustainable approaches to address consumption and pollution in our communities. Indeed, a high-quality public realm builds community health, identity, and character. Research (e.g., Cattell et al., 2008) has indicated that the social interaction instilled within public spaces contributes to positive wellbeing and a sense of community. Public spaces connect people to places but also create "permanent or periodic opportunities" to connect people to each other (Dixon, 2016, p. 7).

Carr et al. (1992) describe essential human needs in public spaces. In addition to comfort and relaxation, these needs include passive engagement, active engagement, and discovery. Passive engagement involves observing one another, art and sculpture, and views and natural features, while active engagement involves interaction, direct contact, and socializing. Discovery represents stimulation, delight, and exploration. As communities become more dense and diverse, we

are placing greater emphasis on designing and programming open spaces for flexibility, adaptability, and inclusivity to meet many purposes and functions.

In an article published by the Project for Public Spaces (2014), professor Keith Hampton spoke to the importance of planning for new technology in the public realm:

> As much as we use trees and water and other amenities to encourage people to spend time in spaces, to provide them with privacy, and to facilitate group interaction, we need to start thinking about how we can use another infrastructure. Just as we would provide water fountains, food, or other amenities, we have to think about how the infrastructure of these technologies fits into public spaces. Power outlets, the sizes of tables to accommodate different types of uses, seating arrangements that encourage different types of interaction—on and offline.

Bonn (2016) echoes this, arguing that technology has the potential and capacity to change public space and the built environment in the same transformative way that the automobile changed transportation and the street network.

A body of recent academic literature (e.g., Abdel-Aziz, Abdel-Salam, & El-Sayad, 2015; Houghton, 2010; Jung, 2015) has discussed how digital technology and social media can contribute to placemaking. Retail, markets, public talks, and debates—all of which have previously taken place in the public realm—are now accessible online, and the researchers argue that digitization has prompted a new, adaptive public space with fluid technological infrastructure. The blending of online and offline worlds has led to the suggestion that as technology use in cities accelerates, people will interact in public spaces in more sophisticated ways (Kukka et al., 2014). Hampton (2007) found that people do spend time together when they are already connected online and thus create more robust local networks. Those who socialized on the Internet through a neighbourhood email list and website were more sociable with their neighbours in person and over the phone. Wireless Internet networks, digital screens, technology-enabled street furniture, and digital placemaking efforts have been positioned as opportunities to link the physical realm with the virtual one to create a shared sense of place.

In practice we see a range of technology deployments in public and quasi-public spaces. It is now commonplace for customers to be tracked in shopping malls via their mobile phones. Online review platforms (e.g. Yelp, Google Reviews) and other social media platforms (e.g. Instagram) rapidly distribute information that can lead to increased numbers of visitors to parks and recreation facilities. Home security technologies like smart doorbells blur the lines between private interest and public spaces with their surveillance of public spaces from public property. In 2019 Amazon (owner of Ring) posted a position for a "Managing News Editor" to curate crime stories informed by geo-tagged video footage gathered from Ring technology (Benton, 2019). While the presence of closed caption television is long standing in public spaces, these new technologies expand the range of tools and the types of information they gather.

In a recent study of the Government of Canada's Smart Cities Challenge, 33 applications to the Round One award pool proposed using some kind of digital technology in public spaces (Lenarcic Biss, 2020). There were seven general types of technologies identified:

1. Public Wi-Fi / Hotspots
2. Device Charging Stations / Hubs
3. Digital Screens / Kiosks
4. Smart Transportation Infrastructure (e.g., smart traffic signals, smart pedestrian crossings, smart sidewalks, parking sensors)
5. Smart Street Furniture (e.g., smart lamp posts, smart benches)
6. Digital Public Art
7. Digital Wayfinding

The ranges of the technologies included in these applications or a visit to a smart city trade show floor will quickly demonstrate that vendors perceive a rapidly expanding market for these kinds of tools. Local governments in Canada will have to "hurry hard" to respond to the range of opportunities and challenges these new tools present.

Potential Risks and Opportunities

Integrating smart and digital technologies within the public realm facilitates new ways for communities to thrive but also brings new challenges. Table 1 outlines what the media and academic and grey literature (e.g., Alawadhi, 2017; Appio, Lima, & Paroutis, 2019; Atkin, 2018; Canadian Urban Institute, 2018; Chattopadhyay, 2018; Kitchin, 2016; Robinson, 2019; Sodhi, Flatt, & Landry, 2018; Young, 2019) have noted as opportunities and concerns to consider:

There is no one-size fits all way to address the concerns. Leaders could first ask the questions: is this technology actually needed and what value does its deployment offer to the community? Media articles (e.g., Dolcourt, 2016; Schwab, 2017; Stern, 2019) have highlighted private spaces such as restaurants, adult retreats, and flexible workspaces that have banned cell phone and laptop use as a means of promoting face-to-face (rather than virtual) connection. On this same

Table 1: Risks and opportunities of integrating technology in public spaces.

	Opportunities	Risks
Data-driven decision making	Technologies such as spontaneous information collection can improve functioning, delivery, efficiency, and sustainability of city services (e.g., waste pickup, traffic flow).	Public spaces can become overly influenced by corporate goals (e.g., testing new technologies for company profit).
Who owns and controls the data?	Municipal management and control of data can ensure it is made openly available for public ownership, use, and decision-making.	Private ownership and governance of the collected data can result in it being shared and commoditized without benefiting the community.
Inclusion	Technology in a public space can engage socio-culturally diverse and actual users of the space to better understand their wants and needs.	Limits to technological availability can lead to inequities (e.g., costs to access wireless Internet within a private business establishment) or biased information collection.
Consent and participation	Citizens can be empowered to meaningfully participate and collaborate in determining their communities' unique technological needs and desired outcomes.	To access technologies such as wireless Internet or device charging stations, users often must consent to collection of their personally identifiable information, which can lead to data hacking or identity theft.
Safety vs. surveillance	Technologies in public spaces can increase safety through real-time observation and responsiveness (e.g., lighting, accident reports).	Surveillance and monitoring technologies in public spaces (e.g., cameras, trackers) can compromise privacy, particularly if there is no means for people to "opt out." Vandalism of street furniture can impede its technological capabilities.

thread, and given the concerns noted above surrounding technology in public spaces, cities such as Hobart, Tasmania are exploring how to create tech-free zones without mobile signals, Wi-Fi, satellite, and Bluetooth (Jaffe, 2019; MacDonald, 2018). Interestingly, technology is necessary to create these zones, and in other neighbourhoods Hobart is simultaneously exploring adoption of smart technologies such as information kiosks, Wi-Fi routers, charging stations, and sensors within transit shelters, park benches, and waste bins.

Research indicates the clear health benefits of parks and green space (van den Berg et al., 2015). For example, research has shown that spending time in restorative natural environments such as a park or arboretum allows the brain to recover from the mental fatigue of stress and information processing (Berto, 2005; Kaplan, 1995). However, a recent study indicated that this effect lessens when portable electronic devices such as laptops are used in green spaces (Jiang, Schmillen & Sullivan, 2018). After completing an attention test, participants spent a 15-minute break either in a park space filled with greenery or in a concrete area; in each location, half the group had access to digital devices with Internet access and half did not. Following the break, another attention test was completed and revealed that the only group that scored significantly higher consisted of those who had spent their break in the park with no devices. In fact, the participants in the park with laptops showed the least improvement, regardless of the number of minutes they spent on their device or their demographic characteristics. These findings suggest that in an age of increasing technologies, it is important to maintain green spaces that can be experienced without electronics. These examples serve as a reminder that technology might be deployed in some but not public spaces.

Many concerns identified in Table One are ethical in nature and highlight the need for a clear understanding of the governance, collection, management, and use of data obtained by these technologies. For example, preliminary research findings have indicated that 88% of Canadians are concerned on some level about their privacy in the smart city context (Bannerman & Orasch, 2020). Transparency, openness, and collaboration can harness technologies to their full potential to support quality of life in communities.

The Opportunity and Necessity to Take Early Action

Ethical, democratic and effective use of smart city technology in public space requires foresight and planning. In order to seize opportunities and mitigate challenges, local governments need to do legislative, governance, planning and design work ahead of technology decision-making and deployment. In her study of the Round One Smart Cities Challenge, Lenarcic Biss (2020) found that of the 33 communities proposing smart city technology use in the public realm, only nine of these local governments referred to its use within their planning policies. Most of the communities made reference to using technology for digital screens and kiosks. Public Internet access, digital public art, and smart transportation infrastructure were also common, and there were fewer examples of plans for device charging stations and digital wayfinding. No references were found for plans to integrate smart street furniture.

These findings suggest that, in general, Canadian municipalities are aspirational in their intentions to integrate technology in public spaces, but they are not yet at the stage of implementation in terms of governance frameworks, policy directives, design strategies and actual projects. For example, more municipalities proposed these technological solutions in their SCC submissions than in their Council-approved municipal plans and policies, given the support from Infrastructure Canada. Additionally, two thirds of the communities of focus were not found to propose or plan for technological interventions in the public realm. This research indicates that there is time to initiate proactive conversations and to develop and advance policies that will ensure and support the nimble and meaningful integration of technologies in the public realm. There are myriad opportunities for local governments to weave strategies for smart city technologies in the public realm into their long range or comprehensive land use plans. Other tools such as zoning bylaws, secondary plans, open space master plans, design review panels, and parks and recreation plans and strategies can also include directives on how this technology may or may not be deployed. There are also new opportunities for digital strategy teams to identify these same opportunities and challenges related to using this technology

in public spaces in their digital master plans too. As Canadian communities move forward, it is imperative that these kinds of directives are included in both physical and digital planning and design documents.

At the time of writing, communities across the globe are struggling to manage the spread of the coronavirus (COVID-19) pandemic. To reduce the risk of transmission, citizens were initially urged to stay at home and keep a physical distance from one another. Public spaces such as park amenities and playgrounds were initially closed (Moore, 2020) and eerie photos emerged of empty streets, piazzas, and squares (Taylor, 2020). In the wake of restrictive policies that ban in-person gatherings, people with access quickly started using digital technology to maintain connections: offices have adopted remote work models; courses have transitioned to exclusively online formats; celebrations that formerly took place in bars or public parks are now streamed through video conferencing platforms. But in other parts of our communities, with libraries closed, campuses and schools shuttered, other community member's access to communal and free technology and wifi abruptly ended.

Our increasing digital dependence is accompanied by changes in public space use. Urban designer Ken Greenberg wrote:

> *Everyone . . . is attempting to invent digital versions of themselves to carry and maintain contact with their publics and constituencies. This makes sense, and will surely result in some ingenious and positive innovations. I am worried, however, that this could become permanent and lead to a sense that shared physical places have become redundant and can be replaced by digital spaces. I fervently hope that the social distancing we are now experiencing does not become the new norm when this pandemic passes. (Ryerson City Building Institute, 2020).*

Many others are questioning the effects of the coronavirus outbreak on future city planning and densification (e.g., Badger, 2020; Bozikovic, 2020; Kimmelman, 2020). Giacobbe (2020) posits how design changes like hands-free technologies will be implemented in the built environment. Importantly, Rosmarin (2020) shares how the pandemic has highlighted the necessities and shortfalls of digital infrastructure, such as broadband Internet networks, for promoting information sharing and human interaction. Urbanists and placemakers are suggesting strategies and recommendations for pandemic-proofing our cities (e.g., Florida & Pedigo, 2020; Peters, 2020) and ensuring that public spaces can support community health (Storring & Peinhardt, 2020). Shenker (2020) discusses the pandemic's impacts on digital intensification, including how technological innovations such as trackers and surveillance have helped to analyze viral transmission: "If one of the government takeaways from coronavirus is that 'smart cities' . . . are safer cities from a public health perspective, then we can expect greater efforts to digitally capture and record our behaviour in urban areas." And importantly, leaders like Jay Pitter (2020) and Tamika Butler (2020) are emphatically reminding everyone whose work impacts communities that the rights, needs and lives of Black, Indigenous and People of Colour must be centred and addressed in all efforts moving forward whether these projects are digital or not. Subsequently, this brief is timely as our cities adapt and, in time, recover from COVID-19 and address anti-Black, anti-Indigenous and other forms of racism, oppression and exclusion, and prepare for important conversations around the changing future of the public realm.

One of the challenges of framing municipal strategies in Canada is that because municipalities are "creatures of the Province", there is a tendency to focus recommendations for smart city efforts on sub-state (e.g. Provincial) and local responses. On one level this makes sense since land use planning frameworks are directed provincially. But the wide variety of interest and readiness among Canadian local governments from coast-to-coast-to coast has not yet led to momentum here. Another challenge arises because many of the related digital governance and legal frameworks are national (e.g. privacy legislation) and many of the vendors are non-Canadian or multinational in scale (e.g. Siemens, Sidewalk Labs). It is neither sufficient nor efficient to have individual municipalities attempting to try to frame their own comprehensive responses individually yet there is no natural mandate provincially or federally either. There is however a pressing need for direction as to how to inclusively and democratically frame smart city actions. Canadian municipalities and civil society have an important opportunity to collaborate to build the missing governance frameworks they need supported by Provincial and Federal government efforts.

The Open Smart Cities Guide V 1.0 (Lauriault, Bloom & Landry, 2018) provides important direction to people across public, private and civil society organizations seeking to bring technology solutions to communities. Its focus on open, ethical, transparent and accountable decision-making set a clear agenda for the governance of digital projects in community settings. As professional urban planners, we see potential in the further growth and development of the open smart city context to also include a framework that addresses the interface between technology and built spaces. Robinson's research asks the question: who is planning the Canadian smart city? This question is driven, in part, by the significant gaps that exist between land use planning and design processes and digital governance (Robinson, 2019; Johnson et. al, 2020; Robinson, 2021). While the Sidewalk Labs proposed project on the Toronto Waterfront is no longer proceeding, the 30 month process of planning and public meetings clearly demonstrated the challenges that come when technology solutions are proposed to be used in public spaces and broader precinct development projects. Future iterations of the Open Smart Cities Guide V 1.0 could evolve to provide direction here as well.

Conclusion

Canadian local governments have a number of technology choices available should they choose to use them in public spaces. We can expect in the next 2-5 years the range of options to expand with increasing pressure in the sales pitches of vendors for municipalities to show they are "innovative" by using new technologies.

The adoption of these technologies in public spaces brings both opportunities and challenges that need careful consideration. Canadian municipalities can get a head start by engaging their community members in discussions and reflections about which kinds of technologies may or may not be desirable and needed. It is imperative that these engagement efforts reflect the diversity of the communities in which these technologies may be used in order to ensure the needs and concerns of all residents are duly considered. It is possible that during post-COVID recovery we will see a pause in the pursuit of big smart city projects while governments redirect budgets to the pandemic recovery. This pause presents an excellent opportunity for municipalities to get their smart governance houses in order. In a time when there is little action taking place, there is an opportunity for municipal leaders to convene public discussions about what roles technology might play in their communities. This plan-during-a-pause approach served Copenhagen well when it was nearing bankruptcy in 1993. They used that challenging time to explore how their city might build a better active transportation system. The result, almost thirty years later, is a world-leading cycling network.

Some of the challenges that arise from using these technologies require leadership or partnerships with Provincial and Federal governments, particularly around privacy issues. But progressive municipalities need not wait for higher orders of government to begin to think through the other issues. Smart city technologies should be subject to the same rigorous municipal planning, design and review processes as other civic infrastructures. The Open Smart Cities Guide V 1.0 can help Canadian local governments begin these conversations. And, over time, this Framework can also evolve to more specifically address the challenges and opportunities that arise when smart city technologies are deployed in real places with real people.

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