GETTING TO THE OPEN SMART CITY
Table of Contents

Acknowledgements 1
Executive Summary 2
Glossary 3
The open smart city 4
Smart cities in the Canadian context 4
Defining smart cities 4
Why is ‘openness’ critical for smart cities? 6
Principles for designing open smart cities 10
Principles in practice 11
User-centered + inclusive 11
Open by default + tech-driven 12
Participatory + resilient and adaptive 13
Accountable and transparent 14
Conclusion 15
Endnotes 16
ACKNOWLEDGEMENTS

This paper was prepared by Zoya Sodhi, Project Manager, Evergreen; Jo Flatt, Senior Lead, Evergreen and Jean-Noé Landry, Executive Director, Open North for Future Cities Canada.

We would also like to thank Isabel Cascante, Program Director, Evergreen; Michelle German, Senior Lead, Evergreen and Julie Fader, Program Coordinator, Evergreen who provided additional feedback on the paper.

It is important to note that the views expressed in this publication are the views of Evergreen and Open North and do not necessarily reflect those of the Government of Canada.
The concept of a ‘smart city’ continues to undergo new interpretations in both the Canadian and international contexts. The common understanding is that smart cities use data and connected technology to accelerate innovation within local communities. However, smart alone does not account for inclusion or equity. In this paper, we perceive openness as a critical qualifier of this concept and present a new concept focused on the ‘open smart city’.

When we think about openness in the context of smart cities, it is important to consider interoperability, accessibility and equity, and engagement. These elements address potential risks which may arise from outsourcing public services, data sharing and opportunities to access data. Drawing from these elements, the paper articulates core principles for designing open smart cities and dives into case studies that illustrate how these principles work in practice.

Principles:

1. User-centered
2. Open by default
3. Tech-driven
4. Resource optimization
5. Accountable and transparent
6. Participatory
7. Inclusive
8. Resilient and adaptive
GLOSSARY

**Accessibility**
The United Nations defines accessibility as the provision of flexibility to accommodate each user’s needs and preferences.

**Artificial Intelligence**
The theory and development of computer systems that are able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.

**Civic engagement**
A process and practice that seeks to include residents in the decision making around city building. This can be led by individuals or groups, by public or private organizations, or by the government.

**Data standardization**
The United States Geological Survey (USGS) defines it as the rules by which data are described and recorded.

**Digital equity**
Equal access to technology, particularly broadband internet.

**Internet of Things (IoT)**
SAP defines it as a network of physical objects – vehicles, machines, home appliances, and more, that use sensors and APIs to connect and exchange data over the Internet.

**Interoperability**
The development and maintenance of systems, culture and procedures to enhance opportunities for internal and external sharing, transferability, exchange and reuse of information between systems.

**Machine learning**
SAS defines it as a method of data analysis that automates analytical model building. It is a branch of artificial intelligence based on the idea that systems can learn from data, identify patterns and make decisions with minimal human intervention.

**Open data**
The European Data Portal defines it as data that anyone can access, use and share. Governments, businesses and individuals can use open data to bring about social, economic and environmental benefits.

**Resilience**
The capacity of a city, its businesses, institutions, residents and communities, to survive, adapt and grow despite whatever stresses and shocks they experience.
THE OPEN SMART CITY

Smart cities in the Canadian context

Like cities around the world, Canadian communities are adopting new approaches and strategies to leverage technology and data to the benefit of their residents. As part of this movement, the Government of Canada has become actively involved in the smart cities dialogue, with the advent of the nationwide Smart Cities Challenge. This challenge acts as a medium to empower local communities to become more liveable, inclusive and economically prosperous by encouraging innovation and the use of data and connected technology. According to Infrastructure Canada, the federal body that implements the challenge, a smart cities approach refers to “achieving meaningful outcomes for residents through the use of data and connected technology”. This ambition is reflected in over 130 applications received as part of the competition from more than 200 communities, focusing on the topics of economic opportunity, empowerment and inclusion, safety and security, environmental quality, healthy living and recreation, and mobility. Communities both large and small, with populations ranging from 185 to 2.7 million, are demonstrating their commitment to harnessing technology for people.

The Smart Cities Challenge is a significant first step towards development and implementation of smart innovations in Canadian communities. Communities across the country have started to establish roles and units within local government, ranging from directors of innovation and chief digital officers, to civic innovation and smart city offices. These investments increase the public sector’s capacity to develop, test and implement solutions by applying technology, data analysis and design thinking to the challenges our cities face.

Defining smart cities

Globally, there exist different variations on what exactly constitutes the smart city, which can also be referred to as a digital city,
intelligent city, future city or connected city. Oftentimes, smart becomes a label for city services using technology: smart mobility, smart energy, smart infrastructure, smart data, with little insight as to how the process or outcome is “smarter” or whether it is creating meaningful and lasting impact for residents.

In Future Cities Canada’s previous discussion paper—How to be Smart(er) in Mid-Sized Cities in Ontario³—written in partnership by Evergreen and Code for Canada, the term smart city is defined as:

“A resilient, inclusive and collaboratively-built city that uses technology and data to better the quality of life for all people”

The discussion paper defines smart cities by looking at the associated impacts, taking emphasis away from the technological tools, and focusing on benefits to residents and the wider community. From this perspective, a smart city measures the impact on the natural environment and increases capacity to reduce that impact; improves two-way communication with the public and empowers residents to inform the city’s future; increases the effectiveness and reduces the costs of providing city services and other government operations; increases the city’s capacity to respond or recover from economic disruption; establishes strong connections through networks that support learning and collaboration on a regional, national and global scale; addresses issues of social inclusion by empowering and connecting groups inside and outside government; and resolves local problems through collective action, open data and other means of collaboration.

Given there is no universally accepted definition of a smart city, it is the responsibility of local governments, in partnership with the community, to define the smart city in their context by identifying desired outcomes and the information, strategies, and technological tools needed to get them there.
Why is ‘openness’ critical for smart cities?

The path to creating smart cities should be through a culture of openness, co-creation and shared resources. Openness can be understood in terms of open data infrastructure, open standards, open source information and open collaboration that enables building new or modifying existing services for residents at any scale. Having access to more data, and better tools to collect and analyse data, is changing the way we make decisions in our everyday lives and the ways in which city services are delivered. ‘Open data’, ‘Internet of Things’, ‘Machine Learning’, ‘Artificial Intelligence’ are some of the progressive technological developments in this direction.

When conceptualizing openness in smart cities, one may think of dichotomies such as ‘closed’ versus ‘open’ data-based information systems. A closed system in this context can be associated with closed forms of governance, proprietary information or data (ownership); proprietary methods of collecting, processing, analysing, and disseminating data (tools); and enforced irregularities with other systems (interoperability). Closed information systems may be highly efficient, but if they are incompatible with other systems they will be unable to exchange and use information effectively.

In this context, we have identified three distinct elements of openness, informed by research conducted by Open North⁴ and aligned with the International Open Data Charter⁵: i) interoperability, ii) accessibility and equity and iii) engagement.

Openness can be understood in terms of open data infrastructure, open standards, open source information and open collaboration that enables building new or modifying existing services for residents at any scale.
Interoperability
The term interoperability is defined as "the ongoing process of ensuring that the systems, procedures and culture of an organisation are managed in such a way so as to maximise opportunities for exchange and re-use of information, whether internally or externally."

A lack of data interoperability can be a major technological barrier for smart city implementation. When data is consistent in its format, classification, standards and language it enables the development of new services and data communication. In order to share data across borders and municipalities, we need provisions regarding jurisdictional accountability, a proper legal framework for cross-jurisdictional sharing of data information systems, a set of terms and a system to monitor data sharing.

When data is consistent in its format, classification, standards and language it enables the development of new services and data communication.

Without a shared set of data standards, data systems can become closed, disused, and eventually obsolete. Data standardization is a vital component of open smart city application that enables software systems, and the humans who operate them, to communicate with one another effectively. Increasingly, the smart city solutions that we propose need to be open to ensure compatibility and usability within the city and across sectors.
Accessibility and Equity
Even with openness in a city’s data information flows, inequalities may arise from the unequal distribution of where and from whom the data is collected, for example, the data collected from 311 service requests. Clark, Budney and Jang (2013) find that poorer neighbourhoods are less likely to provide 311 service requests. This data, which represents only a small fraction of the population, may be used to inform city-wide investment decisions and result in service provision and resource allocation that is biased towards certain districts or neighbourhoods. As we continue to leverage technology and seek to make evidence-based decisions using data, we have to ensure that the needs and perspectives we are considering represent all of our communities.

Data poverty is the situation in which one is deprived of the benefits of Open Data driven by the lack of access, use and representation within data. Without closing these digital divides, smart cities – even with a high level of transparency – will likely exacerbate existing socioeconomic inequalities within cities.

Equal representation in data is increasingly important and is not solely a technical problem. The City of New York describes this scenario as ‘data poverty’, and define it as, “the situation in which one is deprived of the benefits of Open Data driven by the lack of access, use and representation within data.” If local communities (eg. marginalised groups, Indigenous populations) are not accurately represented in the data collected by governments, it is difficult to make equitable and viable decisions. Without closing such digital divides and ensuring representativeness of data, smart cities – even with a high level of transparency – will likely exacerbate existing socioeconomic inequalities within cities.
Engagement

Engagement is critical to the success of open smart cities, pushing governments to interact with civil society, private sector, academia and citizens in a meaningful and collaborative manner. Scientific literature acknowledges the essential role of residents in building smart cities and argues the notion of empowerment of citizens and “democratization” of innovation should be added to this concept. Residents have the ability to identify priorities, strategies and goals that can influence an open smart city strategy and must be considered key actors at the center of the implementation process.

Based on research conducted on civic engagement in smart cities, the contribution of residents can be broadly understood in three distinct ways: (1) ‘Residents as democratic participants’ where they influence the decision making processes, (2) ‘Residents as co-creators’ where they act as providers of information and knowledge to propose better solutions (eg. Hackathons); and (3) ‘Residents as Users’ that help to collect data using mobile services, online and other technological tools to refine innovation in smart cities.
Principles for designing open smart cities

Based on the context above, and building on our definition and understanding of smart cities, we define open smart cities as places where:

“Residents, civil society, academics, and the private sector collaborate with public officials to mobilize data and technologies when warranted in an ethical, accountable and transparent way to govern the city as a fair, viable and liveable commons and balance economic development, social progress and environmental responsibility.”

This definition, prepared by Open North through its Open Smart Cities Guide, offers a great starting point for Canadian cities. Expanding it further, we have identified the following key principles for developing an open smart cities approach.

- **Resilient and adaptive**
  Prioritizing well-being of citizens, enhancing local ability to reduce impact from natural environment and increasing the city’s capacity to respond to economic and physical disruptions.

- **User-centered**
  Recognizing that technology should be built for purpose and designed with the user in mind and the problem that it intends to solve.

- **Open by default**
  Making data open by default such that it is secure, respects personal privacy, and grants people authority over their personal data.

- **Inclusive**
  Empowering and connecting groups inside and outside government, especially marginalized groups.

- **Participatory**
  Stewarding a culture of participation where governments, civil society, private sector, academia and residents co-govern and share rights and responsibilities to advance problem-solving.

- **Accountable and transparent**
  Operating with organizations that are ethical, accountable, transparent and provide the platform for discussion and means to engage.

- **Tech-driven**
  Using technologies that are fit for purpose, can be repaired, open-sourced, standards-based, interoperable, durable, secure, scalable and where possible locally procured.

- **Resource optimization**
  Improving the effectiveness and reducing costs of providing city services and other government operations.
PRINCIPLES IN PRACTICE

This section takes a deeper dive into the abovementioned principles and offers illustrative global case studies of these principles in practice.

User-centered + inclusive

A diverse and large group of users and stakeholders should be involved in the development and implementation of smart solutions, from the beginning of the planning process, throughout delivery, and as part of evaluation. These processes should use digital and non-digital tools to engage with residents, with attention given to identifying and evaluating the needs and entry points for different communities and audiences. It is important to understand who users are and incorporate their perspectives into the design process by adopting relevant, customized, and culturally appropriate engagement methods. Internet forums, mobile phone applications, GIS-based tools and social media channels all present opportunities to connect with those who have broadband accessibility. In the open smart city, consideration should be paid to who might be left out of this digital process, and how to integrate offline solutions.

Who’s doing it?

Helsinki applied user-centered design, with the participation of its residents, to generate innovative ideas for the use of its Central Library. The role of libraries has changed. They are rapidly turning into community hubs that foster creativity and innovation. For Helsinki City Library and the new Central Library, service design means designing the premises and services together with the library users.

The participatory planning of the Central Library began with a ‘megaphone invitation’ to all of its users. Opinion leaders and celebrities encouraged residents to come up with ideas for the role that the library in the center of the town could adopt. Once the open and participatory planning had gotten off to an impressive start, it was continued with participatory budgeting, an architecture competition, and networking activities with city leaders. There were also workshops directed at partners from across sectors, and developed a community called the ‘Central Library’s Friends’ to enable sharing and co-creation.
Open by default + tech-driven

An open smart city should make use of interconnecting infrastructures (i.e. networks, sensors, digital devices) and enable access to open data that will support the development of smart technologies to solve some of the city’s most pressing urban challenges. Smart city development will benefit from solutions that are interoperable with other technologies to address more than one problem and ensure different stakeholders do not work in silos.

Who’s doing it?

Bristol has been recognised in the UK Smart Cities Index 2017 as leading the way in areas such as open data access and making technologies interoperable in their functionality. Announced in 2015, “Bristol Is Open” is Bristol’s flagship initiative, aiming to make open data a reality for its citizens. Small sensors, including smart phones and GPS devices of willing participants, source information to three new fast networks in the centre of Bristol on different urban aspects of city life, including energy, air quality and traffic flows. A city operating system hosts this machine-to-machine communication, allowing the development of a wide range of smart applications to monitor complex issues such as air pollution and traffic congestion. All the generated data is anonymized and made public through an ‘open data’ portal. Once these three networks are fully established in the Bristol city centre, they will be further scaled out and extended to the wider city region, to Bath, parts of North Somerset and South Gloucestershire, as a means of interconnected infrastructures (i.e. networks, sensors, GPS devices).

Therefore, the open platform allows companies of all sizes to act as test-beds for new technology in a real-world environment rather than just inside a laboratory. Bristol has a wealth of local companies and start-ups, some of whom have already started working with Bristol is Open to trial run their technologies. A noticeable example is Zeetta Networks, who have developed an interactive programmable open platform that connects multiple elements to Bristol’s open platform to solve some of the city’s urban challenges.
Participatory + resilient and adaptive

Develop and scale multi-stakeholder city working groups or committees that deliberate and negotiate value-based concepts such as urban resilience, adaptability and inclusion. To ensure that smart cities meet local resilience and sustainability needs, participatory smart city planning requires a level of consensus on future goals.

New Orleans is one of the first cities to develop a holistic resilience strategy, bringing together a vision and plan to adapt and create equal opportunities for all its citizens and transform city infrastructure systems in the advent of major emergencies. From Hurricanes Katrina and Isaac to the Deepwater Horizon Oil Spill to the city’s frequent ‘boil-water’ advisories, New Orleans has learned important lessons about what it takes to become a vibrant, resilient city that serves all its residents—particularly its most vulnerable populations.

A key challenge of implementing resilience projects is that, by their very nature, they cross silos and sectors and their implementation requires strong collaboration and buy-in from multiple agencies. It lays special emphasis on educating and advancing understanding of resilience principles at the local, regional, and national level. The city of New Orleans set up a Resilience Design Review Committee—an interdepartmental committee that reviews all capital projects that are meant to enhance resilience to ensure consistency, quality, coordination and public transparency. From a design perspective, the city is working towards embedding resilience thinking into its smart city development process.

For regional efforts, the city launched the region’s first Regional Resilience Committee, which brings together representatives from neighboring jurisdictions and agencies to discuss resilience priorities, including environmental protection, storm readiness, and transportation. To enhance inclusive outreach locally, it approached communities and marginalised groups to increase awareness and capacity and get feedback on resilient specific projects.
Accountable and transparent

Accountability and transparency are critical as local governments, sometimes in partnership with the private sector, collect data to inform decision-making and develop technological solutions. The infrastructure, governance, and ownership need to be clear at the outset and informed by community. It is important to consider what governments should be doing in the areas of transparency, engagement and accountability to qualify as “open governments”. An immediate call to action came through the Open Government Partnership (OGP) Platform that provides a commitment to making city governments more open, accountable and responsive to its residents using open data technology.

Who’s doing it?

New Zealand recently welcomed the OGP platform and considers it an important opportunity for its city government to introduce new initiatives to strengthen transparency, engagement and accountability with its residents. These initiatives have been identified across a wide range of priority areas including increasing transparency of political party finances; implementing a new government strategy to promote ‘evidence-based policy making’; establishing a public register of trusts and of the beneficial owners of companies; extending asset disclosures by public officials; increasing transparency of procurement; and actively promoting the importance of ethics and integrity through civics education. After wide public consultation, the government is in the process of developing a cross-government National Action Plan for the Open Government Partnership that will prove to be a ready vehicle both for civil society and the government to develop ambitious, meaningful and relevant commitments.

Such open government systems, produced through public engagement, are likely to be more effective, enhance perceptions of legitimacy and justice and cultivate the capacity for fair and informed deliberations for its residents.
CONCLUSION

Smart cities are becoming an increasingly significant part of our world as our dependency and use of data and technology continues to rise. As such, this discussion paper explores the implementation of the concept of ‘openness’ into the existing smart city context. Specifically, the paper analyses how openness is achieving more accessible and equitable smart city outcomes by increasing transparency, interoperability and engagement in the face of urban issues and concerns.

By ensuring openness in data infrastructure and city processes, and enabling public scrutiny and governance of these systems, residents can reclaim some control over what data is collected and how it will be used. Simultaneously, cities can deal with more complex problems by providing space for stakeholders to more effectively deal with problems and solutions in the short and long term.

This paper builds on the work being led by Future Cities Canada in close collaboration with Open North to bolster a culture of change, continuous improvement and innovation in Canadian communities and to create a platform for a pan-Canadian dialogue on the opportunities presented by smart cities approaches.
Endnotes

5. https://opendatacharter.net/principles/
7. 311 service request provides residents, businesses and visitors with easy access to non-emergency City services, programs and information 24 hours a day, seven days a week in Toronto. www.toronto.ca/home/311-toronto-at-your-service/
11. http://www.opennorth.ca/projects#1
14. https://www.bristolisopen.com/overview/