Open Smart Cities Guide V1.0

OpenNorth

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About this Guide

This guide is an output of *Open Smart Cities in Canada*, a research project led by OpenNorth and funded by Natural Resources Canada's GeoConnections program.

OpenNorth, founded in 2011, is Canada's leading not-for-profit organization specializing in open data and civic technology. We are an active member of a global community working in favor of inclusive and innovative ecosystems, improving government transparency and accountability, and increasing public participation in democracy towards enhanced citizen and community well-being. Guided by our core values and strong track record in applied research, we work to enhance data standards, shared governance models, and multi-stakeholder and multi-sectoral partnerships.

Acknowledgements

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Financial support is provided by GeoConnections, a national collaborative initiative led by Natural Resources Canada. GeoConnections supports the integration and use of the Canadian Geospatial Data Infrastructure (CGDI), an online resource that improves the sharing, access and use of open geospatial information.

Scope

This document intends to guide city stakeholders (public officials, civil society, technology innovators, private sector, academics, residents, etc.) toward formulating and strategically aligning practices with their agreed upon and unique Open Smart City vision. The Open Smart City definition and guide are relevant to city leaders and community leaders at multiple levels of governance (e.g., provincial, territorial, and federal).

How we came to define an Open Smart City V1.0

The Open Smart City V1.0 definition is the end result of a one-year collaborative research project. The research team first set out to understand what a contemporary smart city looks like. A socio-technological data assemblage approach was used to inform the collection of documents produced by smart city vendors, think tanks, associations, consulting firms, standards organizations, conferences, civil society organizations, including critical academic literature, government reports, marketing material, specifications and requirements documents (see our smart city E-Scan). In addition, to better understand emerging smart cities in Canada, four case studies were conducted for the cities of Edmonton, Guelph, Ottawa and Montreal and one inter-jurisdictional case study was conducted about the Ontario Smart Grid (see the *Open Smart Cities in Canada: Assessment Report*). Case studies reflect a collection of strategy, mission, and vision related documents, an inventory of smart city related projects and a series of semi-structured interviews.

We discovered that, although there are many definitions for a smart city and that no two smart cities are the same due to a combination of factors such as local context, governmentalities, political economies, and the actors involved, to name a few, essentially smart cities can be boiled down to a form of data and networked urbanism (see our definition of smart city below). Data and networked urbanism, even when driven in Canada by good intentions and best practices in terms of digital strategies, has its shortcomings, namely that it remains a form of innovation and efficient driven technological solutionism that is not necessarily integrated with urban plans, with little or no public engagement and little to no relation to contemporary open data, open source, open science or open government practices (see Open Smart Cities in Canada: Webinar 2). Data and networked urbanism is already part of city management and operations and broader considerations of data governance (e.g., data sovereignty, data residency and ownership) do not always inform procurement and corporate partnerships and proprietary solutions are the norm.

To better understand what an Open Smart City might look like, we looked for international best practices that included open data, open source, open science, open and interoperable standards or open government practices including civic technology, different forms of meaningful public engagement, as well as smart cities with a public interest focus or guided by values and ethical principles (see ethical governance below). During the course of this research we also discovered a number of concerns related to smart city technologies, such as mission creep emergent from private-public partnerships, surveillance, platform lock-in, biased Artificial Intelligence (AI) and machine learning, unsustainability of the life cycle management of Internet of Things (IoT) devices, lack of transparency of and access to proprietary solutions and an over emphasis on technology and a lack of focus on the resolution of complex and systemic social, economic and environmental urban issues. Numerous iterations of an Open Smart City definition were

formulated, reviewed, debated, and revised by international experts. The definition was also taken out for a 'test drive' in 3 public fora and was well received. We finally settled on the Open Smart City V1.0 definition provided below and have agreed that it will evolve as the concept matures and as new actors in domains such as law, ethics, urban planning, geography, cybersecurity, community development and so on provide input. We have already begun to see some public outcry with data and networked versions of the smart city resulting from the Waterfront Toronto's Sidewalk Labs project and we expect that as that project evolves there will be more demand for more open, transparent, accountable and democratic processes when it comes to data and networked urban space. In addition, we expect to see a number of new smart city examples in large and small cities and communities across the country as Infrastructure Canada's Smart Cities Challenge unfolds, and it is hoped that this Open Smart City definition will be useful to these projects, and that they will provide an example of what an Open Smart City typifies.

We recognize that an Open Smart City does not yet exist, but we did find a number of initiatives, programs, and practices as well as useful reports in Canada and globally that are Open Smart City like. The Open Smart City V1.0 Guide is being released as a living document that we will continue to refine, improve and grow as new examples and best practices emerge.

We look forward to your feedback, suggestions and contributions.

Sincerely,
The Open Smart Cities in Canada Team

Open Smart City Definition V1.0

For the purpose of this project a city is defined in the most simple way possible as follows:

A **city** is a complex and dynamic socio-biological-physical system. It is a territorially bound human settlement governed by public city officials who manage the grey (i.e., built form), blue (i.e., water) and green (i.e., land) environment and the people they serve as per their legal and jurisdictional responsibilities. Cities are much more complex than this, however, for the purpose of this exercise, we have limited ourselves to a functionalist and an administrative definition.

Our observations indicate that how smart cities are framed and how they are being rolled out best resemble the following definition:

Smart cities in the common sense of the term and as per their current manifestations are "[technologically] instrumented and networked [cities], [with] systems [that are] interlinked and integrated, and [where] vast troves of big urban data are being generated [by sensors] and used to manage and control urban life in real-time".[1] Public administrators and elected officials invest in smart city technologies and data analytical systems to inform how to innovatively, economically, efficiently and objectively run and manage the cities they govern. Predominantly, a smart city is about quantifying and managing infrastructure, mobility, business and online government services and a focus oriented toward technological solutionism.

An **Open Smart City** is 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.

An **Open Smart City** includes the following five characteristics:

1. Governance in an Open Smart City is ethical, accountable, and transparent. These principles apply to the governance of social and technical platforms which includes data, algorithms, skills, infrastructure, and knowledge.
2. An Open Smart City is participatory, collaborative and responsive. It is a city where government, civil society, private sector, the media, academia and residents meaningfully participate in the governance of the city and have shared rights and responsibilities. This entails a culture of trust and critical thinking and fair, just, inclusive and informed approaches.
3. An Open Smart City uses data and technologies that are fit for purpose, can be repaired and queried, their source code are open, adhere to open standards, are interoperable, durable, secure, and where possible locally procured and scalable. Data and technology are used and acquired in such a way as to reduce harm and bias, increase sustainability and enhance flexibility. An Open Smart City may defer when warranted to automated decision-making and therefore designs these systems to be legible, responsive, adaptive and accountable.
4. In an Open Smart City, data management is the norm and custody and control over data generated by smart technologies is held and exercised in the public interest. Data governance includes sovereignty, residency, open by default, security, individual and social privacy, and grants people authority over their personal data.

[1] Kitchin (2015)

5. In an Open Smart City, it is recognized that data and technology are not the solution to many of the systemic issues cities face, nor are there always quick fixes. These problems require innovative, sometimes long term, social, organizational, economic, and political processes and solutions.

Overview of Guide

The **Open Smart Cities Guide V1.0** is structured according to the five characteristics of an Open Smart City and will include relevant tools, resources, examples and applications from Canada and abroad. As discussed, this is intended as a living document, and new material will continually be added over time.

1. **Governance** in an Open Smart City is **ethical, accountable,** and **transparent.** These principles apply to the governance of social and technical platforms which include data, algorithms, skills, infrastructure, and knowledge.

According to the UN Habitat for a Better Urban Future, **governance** is defined as:

> *"the enabling environment that requires adequate legal frameworks, efficient political, managerial and administrative processes to enable the local government response to the needs of citizens. It can be defined as the many ways that institutions and individuals organize the day-to-day management of a city, and the processes used for effectively realizing the short term and long-term agenda of a city's development. Urban governance is the software that enables the urban hardware to function. Effective urban governance is characterized as democratic and inclusive; long-term and integrated; multi-scale and multilevel; territorial; proficient and conscious of the digital age".*[2]

Open Government provides an additional dimension to urban governance, as described in the Open Government Partnership (OGP). The following lists the open government declarations that OGP members commit to and it is recommend that smart cities be guided by these:

- Increase the availability of information about governmental activities
- Support civic participation
- Implement the highest standards of professional integrity throughout administrations
- Increase access to new technologies for openness and accountability

[2] https://unhabitat.org/governance/

The OGP website includes a number of useful resources and relevant thematic areas that smart cities actors can refer to and apply in their smart city governance models. The OGP also endorses the Open Data Charter which will be discussed later in this guide.

The following principles, documents and projects will help Open Smart City actors formulate an ethical, accountable and transparent Open Smart City governance model. Ideas from these can be used to guide agreement on the creation of the Open Smart City mission, vision and mandates and the drafting of strategic Open Smart City plans, roadmaps and key performance indicators.

Ethical Governance:

Ethical principles are starting to appear in smart city plans and the following are some examples:

- The following **principles are part of smart city strategies** and plans for the cities of ***Montreal***, ***New York***, ***Barcelona*** and ***Helsinki***, as well as the ***Province of Ontario***:
    - equity, inclusivity, protection of trust, technological sovereignty (the ability of citizens to set the terms of use and intended purpose of technology), honesty, accessibility to government information, openness & open architectures, honesty, privacy by design, and fairness.
    - These principles are discussed throughout this Guide, and found not only in smart and digital strategies, but also in some urban strategic plans (i.e., Helsinki and New York).
- La ville intelligente au service du bien commun a report published by the ***Province of Quebec's Commission De L'éthique En Science et en Technologie*** offers ethical guidelines for smart cities that serve the public interest. The guide identifies risks and includes checklists, ethical questions for public officials to ask and principles geared to specific scenarios.
- The ***Barcelona City Council*** has introduced ethical clauses in their Information Communication Technologies (ICT) **calls for tender**.[3] Barcelona is also a member of the Electronics Watch project which calls for responsible public procurement, employment rights and safety regulations in the electronics industry and in the global ICT supply chain.
- The ***Ontario Smart Grid*** Data Strategy Advisory Council created a Smart Metering Entity: Third Party Access Implementation Plan which recommends the establishment of a Data Access and Ethics Review Committee. This Committee would determine whether uses for smart meter data by third parties are fair and ethical. Although not open data, the

[3] "Barcelona City Council ICT Public Procurement Guide". Open Digitisation Programme from Barcelona City Council's Office for Technology and Digital Innovation.

plan to allow third party access to smart meter data exemplifies an approach for governing data derived from smart technology systems.

- In 2006, The ***City of Chicago*** formed a Mayor's Advisory Council on Closing the Digital Divide to make recommendations to address unequal resident access to the Internet and technology, as is articulated in the City that Networks Report. One of their main recommendations was to create a new nonprofit organization led by philanthropic, municipal, and technology representatives and community leaders to focus on digital inclusion, civic outreach, and digital literacy and skills training.
- The ***City of Barcelona's whistleblowing platform***, ***Bústia Ètica***, enables a secure way for citizens to anonymously report cases of corruption. The platform was born out of the Citizen Advisory Council for the Barcelona City Office for Transparency.

Governance Structures and Participation:

Official or formal participation and resident representation in the governance of smart cities are not yet the norm in Canadian cities, but some cities leaning toward this approach. The following are some examples of where cities have multi-sectoral participation in their governance structures:

- The ***Cities of Guelph*** and ***Edmonton*** aim to have departments and residents representatives on their smart city leadership committees. In ***Edmonton***, branch managers from relevant departments, such as Environmental Strategies, Transit, Information Technology, and Economic Development are represented on the Smart City Steering Committee. In ***Guelph***, representatives from the Geographic Information Systems (GIS), security and physical location security, and digital subcommittees will be included in their IT Governance Committee.
- In addition, ***Ontario's Independent Electricity Systems Operator (IESO)*** has consulted extensively with external experts via their Data Strategy Advisory Council about their plan to enhance the value of and allow third party access to Ontario smart meter data. Outreach includes consultations with information privacy experts (i.e., Privacy Analytics and Information and Privacy Commissioner of Ontario), 73 local distribution companies in Ontario (e.g., Hydro Ottawa and Guelph Hydro), and other industries that have allowed third party access to data, (i.e., Statistics Canada, the Canadian Institute for Health Information, and the Municipal Property Assessment Corporation).

Cooperative and Multi-jurisdictional Governance:

Canada is a federation of 10 provinces and 3 territories and over 3000 cities which are the lowest level of government and are the responsibility of provinces. Across the country there may be any number of other jurisdictional arrangements such as the National Capital Commission in the Outaouais region, regional municipalities, metropolitan areas and etc. Collaboration is an essential component in Canada and especially so in the case for smart cities because different

levels of government have different jurisdictional responsibilities and also different laws, regulation and policies apply depending on where a smart city is deployed.

For example, Canadian utilities such as water, gas, and electricity are not solely governed by cities, but are instead governed by a complex set of multi-jurisdictional and multi-sectoral actors, regulation, laws, and governing entities that are unique to each province and specific to each utility. The following is an example of the smart electricity grid for the Province of Ontario. A city however can develop its own arrangement into the smart grid and generate alternative energy flows as seen in the GridSmartCity cooperative, which the ***City of Guelph*** has considered collaborating with.

- For example, the ***Province of Ontario Smart Grid*** is regulated by the Ministry of Energy while the system is governed and licensed by the Ontario Energy Board (OEB) that delegates authority to 73 local distribution companies (LDCs) that are members of the Electricity Distributors Association (EDA). Data collected by smart meters in homes and businesses are partially anonymized and delivered to the provincial Independent Electricity System Operator (IESO) by the LDCs so that they may be assessed and used for billing. These data are also governed by the Ontario's Freedom of Information and Protection of Personal Information Act (FIPPA).

Accountable Governance:

Digital accountability platforms are beginning to emerges as methods for residents to oversee and present proposals and this Guide will have more on this throughout.

- ***Decidim*** is the ***City of Barcelona***'s participatory democracy platform that allows residents to track City project consultation processes and the status of project proposals. Barcelona promotes it as an open source digital commons that allows citizens, organizations, and public institutions to democratically self-organize by enabling the co-production of strategic planning and participatory budgeting, and to allow for distributed decision-making.
- ***New York City's smart city*** is informed by a ***Digital Playbook*** that includes real case studies with a set of specified principles (e.g., make government simple, welcome all residents, and protect residents' trust). Some of the projects are location based services to find and apply to pre-kindergarten centers around the city and a program called Home-Stat that partners with existing homeless response and prevention programs to introduce new innovations to engage, identify, and transition people experiencing homelessness to services and ultimately permanent housing. This also includes the visualizing of a broad set of data about street homelessness and the City's responses to homelessness.
- While industry driven, the ***City of Montreal*** has a Conseil Avis Développeurs et Novateurs (ADN), an external stakeholder committee to monitor the progress of projects

adopted by the smart and digital city program between 2014-2017. The Conseil was chaired by the Mayor at the time and included representatives from local businesses, consultant firms, academia, and the public sector. Information about the progress of projects was tracked through an online forum called je fais MTL.

Transparent Governance:

The following are examples where the cities have provided the means for residents to find out about decision-making.

- The ***City of Montreal***'s smart city office, Bureau Ville Intelligente et Numerique (BVIN), oversees the deployment of smart city projects and has documented how resident input informed their smart city strategy focus areas. This includes public input from resident consultations in town halls and public libraries, survey responses, and an analysis of 311 service requests.
- The ***City of Helsinki***'s Open Software Development team published an Application Programming Interface (API) for accessing documentation about city decision-making. This API enables developers to query data on municipal meetings, agendas, and decisions. The API is free to use and modify and is published on the team's GitHub repository.
- The ***City of Montreal*** has adopted the ***Open Contracting Data Standard*** and provides a procurement data visualization tool. This online tool showcases municipal spending on products and services. These "raw" procurement data can also be downloaded and queried with an API.
- Members of the ***Open Government Partnership (OGP)*** are actively engaged in a number of themes related to transparency that include ***wording for commitments***, ***resources*** and ***stories*** which open smart cities proponents can use in their strategies and deployments. ***Some of the related Themes are***: Access to Information, Audits and Controls, Asset Disclosure, Conflict of Interest, and many more.
- The ***Open Contracting Standard Partnership*** is an organization that aims to make governments more transparent by advocating public disclosure of contracts, contracting and procurement. They have developed the ***Open Contracting Data Standard*** that many are adopting including the ***City of Montreal*** just mentioned.

2. An Open Smart City is participatory, collaborative, and responsive. It is a city where government, civil society, the private sector, the media, academia and residents meaningfully participate in the governance of the city and have shared rights and responsibilities. This entails a culture of trust and critical thinking and fair, just, inclusive, and informed approaches.

Cities are the level of government closest to residents and where practices of consultation and participation in governance, urban plans and development projects are most common. Although Canadian cities do not necessarily have open government plans and are not members of the Open Government Partnership (OGP), public engagement is welcomed especially when it comes to open data, digital strategies and advisory committees to council. The following are examples and tools to encourage meaningful participation in Open Smart City governance and the co-creation of smart city policies.

Participation:

- The ***International Association for Public Participation's (IAP2) Public Participation Spectrum*** is a tool to assess public participation. In addition, the AP2 Core Values for Public Participation can be used to help align decisions with the interests of affected people and organizations but also to self assess different forms of engagement. These values are endorsed by the OGP.
- The ***City of Montreal*** smart city office is working with a team dedicated to improving physical accessibility around Montreal. This collaboration entails working on a project to crowdsource data about the accessibility of public facilities and publish these in an online map.
- Residents have much to contribute and should be part of the official governing structures (e.g, city council advisory committees) and engage them in co-creation processes. Some cities, like Guelph and Edmonton, plan to include resident representation in their smart city leadership committees.

Collaboration:

Infrastructure Canada's Smart Cities Challenge called for smart city submissions to include resident engagement in the creation of their proposals and as part of their projects. The following are a examples of forms of smart city collaboration and co-creation.

- In the ***City of Montreal***, close to one thousand residents attended the je vois Montreal event to consult on and suggest smart city projects. Some of these were adopted by the City's smart city office and incorporated into the Smart and Digital City Action Plan.
- The ***City of Guelph*** collected via their Citizen Relationship Manager software requests for projects from residents that have been adapted into City requests for proposals for new technologies.

Responsiveness:

The following are processes to facilitate dialogue and to enlist residents into problem resolution while also being inclusive and responsive to a broad spectrum of needs and abilities.

- The Civic User Test Group is a ***City of Chicago and Cook County,*** Illinois community of residents who are paid to test civic websites and apps. The ***Smart Chicago Collaborative***, is a local organization devoted to making people's lives in the city better through technology have published their user testing methodology to ensure that projects are useable, transparent and scalable.
- Standards for open data are sets of agreed upon specifications for how some kinds of data should be made publicly available. It can be argued that they support the accessibility and interoperability of public information and services (e.g, transit, service requests, and public health inspections). For example, cities across Canada (***Edmonton***, ***Guelph***, ***Montreal***, and ***Ottawa***) use the Open311 specification to collect geo-tagged service request data from residents about non-emergency issues (e.g., potholes, waste collection, and noise complaints). The city responds by addressing cases and updating their information. The Open Data Standards Directory provides a set of metrics for evaluating whether standards like Open311 promote collaborative and accessible approaches for specifying data that are made publicly available.

Critical Thinking:

Critical thinking in an Open Smart City context is about being receptive to challenges and this includes challenging current ways of thinking about partnerships, programs, spending and plans and fostering an environment to welcome feedback that may not always be enthusiastic. This means welcoming critique, argument and debate and possibly pointing out failures and learning from them. This would be from the public but also within city administrations. It may also be the solicitation of academic research and social theory.

- In ***Dublin***, the Programmable City Project actively works with decision makers of its smart city program, ***Smart Dublin***, to translate the research into policy interventions and to affect the thinking and work of public sector officials and bodies.
- **Fairness, Accountability, and Transparency in Machine Learning (FAT/ML)** is an annual event where critical AI scholars publish and share data science and AI papers.

Fair and Just Debate:

Measures to assess how a city is City's doing must include an ***assessment of inequality*** and ***recognize that conflict are inherent characteristics of any city***. Thus, fact-based methods to observe the quality of life and the well-being of inhabitants and their environment should also be supplemented with qualitative indicators.

- In an Open Smart City, ***qualitative and quantitative indicator and assessment approaches*** are recommended as forms of knowledge to assess the success of programs and to identify areas that require further attention. Furthermore, there should be processes in place to not only examine the results, but also to critically assess and discuss with stakeholders if the chosen assessment system is adequate. It is understood that an

indicator system is reliable if it is consistent across time. Here it is suggested that the system should also be flexible and scalable to capture the dynamics of a city, or be what is referred to as living indicators.[4] See the information box below for examples of both living and quantitative indicators.

City Indicator Systems

There are a number of city indicator systems which frame cities as being resilient (e.g., Rockefeller Foundation), sustainable (e.g., UN Millennium and Sustainable Development Goals), and smart (e.g., ITU - KPIs for Smart Sustainable Cities and the ISO 37120 monitored by the World Council on City Data). These are globally recognized indicator systems that aim to offer fact-based evidence, oversight and transparency as it pertains to smart city progress.

Limitations of Quantitative Indicators

While these types of indicators are useful to city managers, they come with numerous limitations:

- ***Indicator systems*** aligned with data and technology driven smart city solutions ***can downplay or obfuscate*** contested and messy institutional, social, and economic processes that are often at the root of urban issues and that are ***hard to measure issues such as: food insecurity, social exclusion*** and ***stigmatization, structural forms of violence, drug addiction*** and ***opioid crisis***, etc.
- Indicator sets and frameworks ***don't typically capture intersectional differences*** of well-being and access to municipal services related to identity such as: ethnicity, gender, religion, and language.
- ***Indicator systems often lack nuance***, for instance, indices for smart sustainable cities do not account for the full production cycle of the deployment of sensor-based technologies that are made of materials that depend on the exploitation of environment (e.g., e-waste and toxic batteries) and labor (e.g., conflict minerals) and that have a high replacement rate. Furthermore, they ***often fail to account for elements of the city that are enjoyable and meant to be experienced, such as urban agriculture or creative architecture***.

The Need for Qualitative Indicators

Overall, most quantifiable and fact-based indices for the smart/resilient/sustainable city typically fail to reflect broader and more complicated notions of fairness, justice, or equality. Broader, more inclusive, and nuanced qualitative processes may need to be

[4] Kaika (2017)

developed to capture complex issues. ***Subjective methods to assess well-being, such as those proposed by the OECD Subjective Measures of Well-Being, are a good start***.

Also, to support critical debate about contested issues, living indicators[5] are recommended especially during the formulation of Open Smart City visions, missions and plans. The engagement of the public in Open Smart City frameworks and visions would include specifying where, how, why, when and by whom a social conflict emerges. Justice and fairness here can be assessed in terms of representation and contestation.

- For example, vocal concerns and misgivings about the National Inquiry into Missing and Murdered Indigenous Women and Girls have openly signaled about the lack of well-being experienced by a group of people. One of the issues raised by the Native Women's Association of Canada has been ***the lack of data about how many indigenous women and girls go missing in Canada each year***.
- Therefore, ***what gets counted and who counts matters***, as is pointed out by Gwen Phillips of the British Columbia First Nations' Data Governance Initiative in Indigenous Data Sovereignty and Reconciliation and by Marilyn Waring in Who's Counting.

Indicators that arise from community-based groups on the front lines of urban crises (e.g., homelessness, opioid addiction, and domestic abuse cases) and resistance to the status quo better capture a city's complexity and should inform the Open Smart City.

Trust:

Transparency, justice, the welcoming of critical debate, and the creation of data and technology literacy programs foster an environment of collaboration, understanding, and trust.

- For **Array of Things** project in the ***City of Chicago***, project administrators meaningfully engaged residents on their plans to install a network of sensors around the city by providing IoT technology literacy and solicited input about how and where to install these sensors. Engagement also included the co-creation of the project's governance and privacy policies.
- The advocacy group ***Tech Reset Canada*** has been active in monitoring plans and activities of Sidewalk Labs in Toronto. Sidewalk Toronto is a joint effort by Waterfront Toronto and Alphabet Inc., the holding company that owns Google, to develop a connected and digitally advanced neighborhood on Toronto's Eastern Waterfront neighborhood. Civic technology advocates have publicly voiced concerns about signs of

[5] Kaika (2017)

mission creep whereby this corporate pilot project may get rolled out across other areas of Toronto and may not be in the public interest.

Inclusive and Informed Approaches:

Inclusiveness entails taking proportionate measures to ensure that access to digital services, skills, and knowledge is equal regardless of gender, physical ability, or level of income. It also ensures that people with relevant skill sets are informing and actively participating in shaping the Open Smart City.

- ***Gender equity*** is a value in the ***City of Barcelona's Digital City Plan*** that aligns with encouraging and supporting women to pursue careers in science and technology. The city emphasizes inclusion of women in their educational and digital skills training initiatives and events focused on gender equity in science and technology (see ***fem.talent***).
- ***Code for Canada*** includes programs for digital literacy and training that are designed to be inclusive to women. Their Ladies Learning to Code program offers workshops, courses and meetups in spaces where women are explicitly welcomed to participate.
- ***Connect Chicago*** is a citywide digital inclusion and literacy initiative focused on increasing access to the Internet and digital learning opportunities. The program consists of a network of over 900 people training others in digital skills, running computer centers throughout the city, and helping residents improve their lives through technology. The program's 25 projects are operationalized by representatives from the public sector, nonprofits, and other entities and governed by the *Connect Chicago Steering Committee* that is made up of representatives from key government agencies, institutional funders, and program partner organizations. The program has also formed a ***meet up group*** to coordinate roundtable discussions of topics related to digital inclusion. The Chicago Smart Health Centers, originally funded by the federal government, is another program that places trained health information specialists, called Health IT Navigators, in clinics in low income areas to assist patients to connect to their own medical records and find reliable health resources online.
- ***Smart Cities for All*** aims to make ICT in smart cities more accessible for people with disabilities and elderly people.The initiative works with expert organizations and companies to create and implement ***their accessibility Toolkit*** and promote strategies to build more inclusive smart cities. Tools included identifying international standards for accessibility such as ETSI EN 301 549, Section 508 of the US Federal Government's Rehabilitation Act, and the World Wide Web Consortium's (W3C) Web Content Accessibility Guidelines (WCAG) 2.0 or ISO/IEC 40500:2012. It is part of a Global Strategy for Digital Inclusion by the ***G3ict which is the Global Initiative for Inclusive ICT***. Their objective is to infuse accessibility into smart city programs to improve human rights, civic engagement, and business outcomes.

3. An Open Smart City uses data and technologies that are fit for purpose, can be repaired and queried, their source code are open, adhere to open standards, are interoperable, durable, secure, and where possible locally procured and scalable. Data and technology are used and acquired in such a way as to reduce harm and bias, increase sustainability and enhance flexibility. An Open Smart City may defer when warranted to automated decision-making and therefore designs these systems to be legible, responsive, adaptive and accountable.

Open smart cities enable ethical, transparent, accountable, and cooperative models of governance and meaningful civic engagement and some of these properties can be embodied in the design of technologies, processes and data practices. The following are examples of how these are applied in real terms.

Fit for Purpose:

Technologies that are fit for purpose are appropriate (comply to a standard) as per its intended use. For example a smart lamp post should not also be a surveillance instrument, the quality of the data collected for a device should meet standards and only the necessary data should be collected.

- Smart cities deploy IoT technologies and require special considerations and standards related to privacy & transparency, infrastructure, security, and operations & sustainability. The ***City of New York*** ***NYC guidelines on IoT deployment*** provides a set of guidelines for each of these areas.
- ***3Gict*** is working toward developing standards, technologies and policies to ensure that the smart city is accessible with their ***Smart City and Digital Inclusion*** programs and resources.
- Some cities have their own units devoted to data analytics, open software, and cybersecurity. Examples of these include the ***City of Helsinki***'s Open Software Development team, ***The City of Chicago***'s Information Security Office, and ***Edmonton***'s Analytics Center of Excellence and Spatial Center of Excellence (SPACE). These units reflect a commitment to internally fostering digital skill sets of city personnel.

Repaired and Queried:

Technologies that can be repaired and queried provide users access to the tools, diagnostics, documentation, and software that are required to repair devices and to see into the often black boxed data, AI, software and code.

- The ***Right to Repair Association*** advocate for state governments in the US to adopt right to repair legislation. The association wants vendors to allow end users of their technology to access diagnostic tools and manuals and ask that suppliers make these easily available.
- The ***City of Helsinki***'s open APIs ecosystem, ***CitySDK***, ensures that data about public information (e.g., service requests, mobility and transport, access to public facilities, and events) are open and can be queried and repurposed into scalable applications with via automatic processes. The API ecosystem was formulated by Helsinki's smart city office, Forum Virium Helsinki, and is accompanied by a Harmonized Smart City APIs "Cookbook" to help smart city representatives and software developers know what cities use APIs and how to scale them to their city. The first recommendation of this Cookbook is that APIs for public information should always respond to an articulated public need and be designed to match that intended purpose and make the API easy to use. This is also an example of technology that is fit for purpose.

Open Source:

Open source refers to computer software with source code that is made available under an open source license and can be modified and repurposed with no or minimal restrictions (such as specifying attribution, reuse of copyleft, etc.). Open source software is mostly made available free of charge. Open source is different than software that is free to use whereby there is no cost but the source code is not transparent and there are restrictions in terms of the modification or repurposing of that source code.

- The ***UK Government***'s Digital Service Standard specifies that new source code be open source. To aid in the procurement of open source technologies, the UK government has published a guide and an Open Source Procurement Toolkit.[6] The City of Guelph has cited the Toolkit in the open source procurement section of their Open Government Action Plan Initiative Interim Report.
- The ***Canadian Internet Policy and Public Interest Clinic*** (CIPPIC) has published a Frequently Asked Questions (FAQ) webpage about differences between open source and proprietary software and the types of open licenses for software.
- ***New York City's Mayor's Office of Data Analytics*** has released a beta version of their Open Analytics Library, a project to showcase and educate the public about how city agencies are using data and open source software to understand and address urban issues. This project not only posts the source code to GitHub, but also explains the methodology (i.e., scoping, data, analysis, pilot, and handoff) for each project in a way that is human readable and relatively easy to understand.
- The ***City of Chicago***'s smart data platform, which can link to and apply situationally aware analytics to city data, is built on an open source base and has a public facing

[6] UK Cabinet Office (2012)

component called ***OpenGrid*** which is hosted online and allows anyone to visualize and apply analytical functions to geo-tagged open data.

- The ***ThingsNetwork*** is an open source and decentralized approach to building an IoT network. Member communities of the network can contribute source code, place a gateway on the console, and plug and play with their applications.

Open Standards:

Open Smart City standards are considered to have properties that embody the public good. The defining characteristics of open standards are: (1) they use well-defined procedures that guarantee public participation in their creation and (2) they have liberal terms of access that allow public use of standardized technologies.[7] Open standards are typically vendor-neutral, flexible/repurposable, and enable decentralized data interoperability and portability across discrete systems and applications.

- ***UK Government's Digital Service Standard***, in addition to their principle of open source, also specifies the use of open standards and common platforms for public services. To help public services achieve the open standards requirement, the UK Government has published an open standards principles guide about working with open standards, which includes ensuring that technical standards are maximally adhered to as possible.
- A policy guideline in the ***City of Montreal***'s Smart and Digital City Strategy is an open, interoperable, and technological architecture. Accordingly, this is a part of the City's smart city procurement. Specifically, the smart city office in Montreal specifies openness in their request for proposals to pilot APIs.
- The ***City of Helsinki's*** 3D semantic model uses open standards, open data, and open source to query, link and visualize geospatial information about the City. These data have been applied to planning the installation of solar panels, flood simulation, and informed programs that seek to reduce greenhouse gas emissions.
- The ***Open and Agile Cities Initiative*** is a city-driven, non-profit organization working to provide data interoperability and portability across and within multiple cities. The approach uses the following open components in its design: an open API (FI-WARE NGSI Specification), a set of data models (citySDK), and an open source and open data platform (CKAN).

Cybersecurity and Data Security:

Open Smart Cities ensure that smart city technologies and infrastructures are protected from being hacked via a cyberattack and that data are protected from improper access and for privacy. There are a number of cybersecurity standards and frameworks for system components, architectures, and operations and research on data protection. Cities can enlist public confidence

[7] Russell (2014)

by ensuring that personal information is secured and especially so when they are transparent about their cybersecurity and data security policies and practices.

- ***Getting Smarter about Smart Cities: Improving data privacy and data security*** is a report published by the Government of Ireland Data Forum, a panel of experts from across industry, civil society, academia, and the public sector, about privacy and security implications for smart cities and how to address them. The report includes recommendations for public agencies that deploy technologies for data driven and networked urbanism to better mitigate potential privacy and security risks and harms. Recommendations include more transparency about data protection and privacy policies (e.g., Transport for London and the City of Chicago's Department of Innovation and Technology) as well as market; technology; policy, regulatory, and legal; and governance and management solutions. Observable examples of harms related to security and privacy for smart cities, as well as their solutions, are framed in a multi-faceted and comprehensive manner.
- ***The Citizen Lab*** is an interdisciplinary laboratory based at the Munk School of Global Affairs at the University of Toronto. Its focus is research development, high level strategic policy and legal engagement related to the intersection of Information Communication Technologies (ICT) with human rights and global security. The Lab has a number of useful resources on its website.
- The ***Canadian Multistakeholder Process: Enhancing IoT Security*** is a collaborative endeavour to develop secure the IoT in Canada and abroad. It is led by the following core team actors Internet Society (ISOC), Innovation, Science and Economic Development (ISED), the Canadian Internet Policy and Public Interest Clinic (CIPPIC), and the Canadian Internet Registration Authority (CIRA). There are a number of ***very useful resources related to vulnerabilities, standards, policies,*** and etc. for the proponents of open smart cities to consider when developing their road maps and deploying technologies.

Reduction of Harm and Bias:

Reducing harm and bias means that ***algorithms and automated processes do not unjustly or exploitatively target services, police, or penalize persons***. The following are examples and resources ***to make automated process more accountable, responsive, and legible***:

- ***New York City***'s Council has passed a bill to establish a task force to make recommendations on how to share more information about the software the City uses and how municipal agencies may ***address instances where people are harmed by automated decision-making***. The original bill specified an initiative to create an inventory of software that City agencies use and allow citizens to directly audit software. City officials cited issues with the bill in its original form, and these included "legal and practical constraints" such as IP restrictions by proprietary software vendors, ability to accurately

identify the valid source code of many older systems, and concerns about cybersecurity and personal privacy breaches. These concerns raised by City officials in front of NYC Committee of Technology suggest that transparency and accountability are at risk of being impeded by broad assertions of corporate secrecy about technology. Nonetheless, the creation of a task force demonstrates a discussion about ensuring automated decision-making among local public agencies are fair and accountable to their affected residents.

- In Europe, the ***EU General Data Protection Regulation (GDPR)*** ***right to explanation*** will soon come into force and will legislate a right to explanation to improve transparency about decision-making, access, and algorithms. It has been argued that a subject-centric approach to the explanation of automated processes that focuses on particular regions of automated models related to a query is promising as a method to reveal how algorithms work and to ensure that their makers are responsible, and that processes are explicable, and human centered.[8]
- ***Community Control Over Police Surveillance*** (COPS) is a civil liberties partnership that aims to ensure that a regulated process is in place to examine automated programs that target and police people. To date, 20 cities across the United States have been working to pass COPS legislation that would "***ensure residents, through local city councils are empowered to decide if and how surveillance technologies are used, through a process that maximizes the public's influence over those decisions***."[9]
- ***Fairness, Accountability, and Transparency in Machine Learning (FAT/ML)***, as was referenced earlier, is an annual event to discuss and recognize challenges for ensuring non-discrimination, due process, and understandability in decision-making raised by machine learning. The organization that coordinates the event publishes ***principles for accountable algorithms and a social impact statement for algorithms***.

Local and Sustainable Procurement:

Locally procured refers to the procurement, adoption and use of technologies created by local small and medium enterprises wherever possible. Locally procured technologies may be strategically linked with initiatives by the public sector to shape and direct grassroots types of innovation and this type of procurement strategies ensure that large multinational monopolies are not the only game in town. This may require the scaling down of projects to enable companies to bid on smaller parts of Open Smart City projects and later help them scale up should the project be successful.

[8] Edwards and Veale (2017)

[9] https://www.aclu.org/issues/privacy-technology/surveillance-technologies/community-control-over-police-surveillance

- While procurement laws may limit a City's ability to locally procure, there are tools and advice available to help them consider local technological solutions for their smart city. ***The Forum for the Future's Sustainable Procurement Tool***, ***discussed in more detail below***, ***describes strategies to support local procurement***. These include specifying minimum response times for suppliers and improving local outreach and training, as well as local advertising.
- The ***City of Montreal***'s Smart and Digital City Strategy includes as a goal the growth of a localized economic technology cluster. The creation of ***InnoCité MTL***, ***Canada's first smart city accelerator***, and of the strategic funding of venture capital firms, such as ***Capital Intelligent MTL***, has actively supported the City's strategic goal of supporting innovative startups in Montreal create technologies for improving urban issues.
- ***Guelph***'s ***Civic Accelerator Program*** is another example in Canada of reaching out to local suppliers for innovative solutions to address city's business needs. The program implements a collaborative and transparent approach to pilot new technologies with small and medium enterprises that address various business needs.
- One approach of note for forming public and private partnerships to pilot smart city technologies is the Open Innovation Platform (OIP), strategically implemented by the ***City of Helsinki***.[10] The aim of the OIP is to build platform management and develop competences and foster the growth and internationalization of small and medium enterprises. If it succeeds, the platform will enable new tools for managing platforms that are shaking up the information economy (e.g., Airbnb and Uber). Furthermore, it will strategically specify a neutral environment in which actors enter into public-private-people partnerships to share spaces to pilot technologies.

Balancing Sustainability:

Openness for smart cities entails balancing sustainability by also mitigating the contamination of the environment via e-waste and unsustainable labor practices via procurement processes and innovative initiatives to promote the reuse of materials.

- The ***Forum for the Future's Sustainable Procurement Tool*** considers the full life cycle cost of Information Technologies (IT). The toolkit includes a tender review spreadsheet and challenges rogue spending and consumption (i.e., spending that is unnecessary or unjustified). It also includes a spreadsheet to assess sustainability impacts related to promoting fair working conditions; reducing soil, water, and air pollution; reducing energy consumption and causes of climate change; and reducing consumption of materials, packaging and water. Furthermore, it encourages creating specifications to design-in sustainability, such as requiring information about whether the product is upgradeable/reparable, its minimum usage life/service intervals, maximum recycled

[10] Raunio et al. (2016)

content, maximum hazardous materials content, and renewable energy. Finally, the whole Life Cost Tool automatically evaluates in Excel lower operating and disposal costs of products that are relatively more sustainable. The Toolkit also provides an opportunity to support localized services and products by specifying shorter response times (only where relevant).

- The ***City of Seoul Sharing City*** initiative aims to promote platforms for sharing that benefit a sense of community well-being and increase sustainability through reusing material resources. The Seoul Sharing Promotion Committee acts as the public-private governance mechanism for the initiative and is comprised of representatives from academia, legal circles, the press, businesses, nonprofits, and research institutes, as well as the directors and general officials who are responsible for economic, welfare, transportation, and innovation affairs.

4. In an Open Smart City, data management is the norm and custody and control over data generated by smart technologies is held and exercised in the public interest. Data governance includes sovereignty, residency, open by default, security, individual and social privacy, and grants people authority over their personal data.

Data Management:

Data management considers the ***full lifecycle management of data*** from collection to preservation and this includes technologies, source code, sensors, etc.

- There are a number of well-established institutions such as the Center for Open Science and Spatial Data Infrastructures that have mature multi- stakeholder, -jurisdictional and -sectoral policies, principles, governance structures and practices for the deployment of sensors and the management, access, and visualization of data that are geospatial, big and small. The geomatics community and scientists (i.e. meteorologists, transportation, hydrographers etc.) have been using remote and sensor-based technologies, situationally aware analytics, augmented reality and 3D visualization and algorithms to model urban and environmental systems and complexity for decades but are largely absent from smart city discussions. For additional resources on the management of complex and large datasets, see the GeoConnections Operational Policies documents on data preservation, licenses, sensitive data, etc.
- The research community in Canada will soon be mandated by the Tri-Agency (i.e., Canadian Institutes of Health Research (CIHR), the Natural Sciences and Engineering Research Council of Canada (NSERC), and the Social Sciences and Humanities Research Council of Canada (SSHRC)) to develop ***research management plans*** and to deposit

their data into trusted digital repositories. Organizations such as the Portage Network, CASRAI and Research Data Canada are key resources in this area.

- These institutions have great insights into best data management practices related to archiving, interoperability, theory informed statistical modeling, data accuracy and precision, and avoidance of bias from aggregated spatial data (modifiable areal unit problem (MAUP), boundary effects, etc.). The following are examples of documents and organizations that exemplify best practices in these domains:
    - Arctic Spatial Data Infrastructure Strategic Documents
    - Open Science: org + (i.e. Ocean Network Canada)
    - Open Geospatial Consortium (see their Smart Cities Spatial Information Framework and Future City Pilot Phase 1)

Data Custody and Residency:

Custody of data in this context refers to ensuring that data are transported safely, are stored where national jurisdiction can reach, and that business rules are in place for proper data management and protection. Data residency is a critically important consideration for Open Smart Cities because many firms that provide cloud computing for smart cities (Google, Microsoft, etc.) store their data in servers outside of Canada, such as in the United States where there are limited protections against snooping and surveillance by government and where Canadian law does not apply. The following resources explain why this might cause issues, and how some Cities have innovatively retained control of sensitive and crucial data stored abroad.

- The report, **Seeing Through the Cloud: National Jurisdiction and Location of Data, Server, and Networks Still Matters in a Digitally Interconnected World**, explains why national jurisdiction matters when outsourcing eCommunications and how it could affect which third parties can legally access data, and on what terms. The report includes recommendations to Canadian organizations as they decide whether to outsource their eCommunications.
- Sensitive and crucial data processed by the ***Government of Estonia***'s digital services platform are copied to servers in Luxembourg. These servers are located within a "**Data Embassy**", and their governance is granted the same protections afforded by a diplomatic mission. The Data Embassy makes it possible for critical services to resume even if local data centers are stopped or disturbed for any reason. However, its unique legal set up makes it distinct from a typical disaster recovery center.

Open by Default:

Open Knowledge International's definition of open data and content states that these should be freely used, modified, and shared by anyone for any purpose. Open by default is a principle of the International Open Data Charter that is endorsed by the OGP whereby governments must make the data they produce accessible to the public by default while also adhering to relevant

policy, legislation and leading practices related to the privacy and security of personal information. Many cities have open data programs but that does not mean that smart city data are open. It is suggested here that Open Smart City' data be open by default.

- In Canada, governments at multiple levels have officially adopted the ***International Open Data Charter***, and these include the ***City of Edmonton***, ***Government of Ontario***, and ***Government of Canada***. OpenNorth, one of the Charter's international stewards, is actively working to map principles laid out by the Open Data Charter onto smart cities.
- In the ***City of Montreal***, some of the data from the metropolitan area's central mobility center is pushed to the open data portal. These data include information about how the system standardizes the transportation data so it may be repurposed by anyone. Many cities in Canada also publish real-time transit data via the GTFS-RT open data format.
- The ***City of Helsinki*** is a pioneer in deploying IoT projects that support the reuse of open data and it is main strategic consideration for Finland's ***Six City Strategy*** for smart cities.
- In the ***City of Chicago***, real time and geo-tagged 'raw' data collected from Chicago's Array of Things urban sensing project are published as open data on the City of Chicago's open data platform and Plenario, a web-based portal for searching and downloading open data.
- Organizations that work to help governments uphold the principle of open by default include OpenNorth, the Open Data Institute, Powered by Data, and Open Knowledge International.

Privacy:

Privacy refers to the power to selectively reveal oneself to the world.[11] There is an array of types of privacy to consider, such as identity, bodily, locational, and communications.[12] Advocates for a National Data Strategy for Canada note that more needs to be done to implement laws for data protection and privacy that are adapted to cases where data is treated as an economic asset. The following provide techniques and resources about privacy concerns and legal and regulatory gaps raised by smart cities:

- The implementation plan to allow third party access to smart meter data in Ontario uses privacy by design as a core guiding principle for both enhancing the data's value by geocoding the data and allowing third party access to these data. Privacy by design entails deploying industry best practices to de-identify data and conducting multiple re-identification risk assessments throughout the piloting stage and after.
- The ***Future of Privacy Forum*** provides a central repository for privacy related guidance documents, best practices, reports, codes of conduct, and other resources that can help local policymakers, technologists, and citizens navigate issues and concerns raised by

[11] https://www.activism.net/cypherpunk/manifesto.html and cited in Kitchin (2016)
[12] https://pdfs.semanticscholar.org/5b12/95fd31bdc3598bcc8142f1b8d63acd1ee96b.pdf and cited in Kitchin (2016)

smart cities. It also provides a webpage that identifies actors and technologies that make up smart cities and what they mean for privacy.

- The ***Surveillance Studies Centre*** is a Social Sciences and Humanities Research Council (SSHRC) of Canada funded research initiative with a mandate to advance the surveillance studies field through collaboration via workshops, lectures and seminars, empirical work, a visiting scholar program, publishing, community outreach, liaising with policy and activist groups, and student training.
- Federal, provincial, and territorial privacy protection authorities urged the Minister of Infrastructure and Communities in a public letter to take steps to ensure the privacy and security of personal information are considered in the selection, design, and implementation of the winning proposals in the federal government's Smart Cities Challenge. The letter refers to privacy risks and lists important privacy and security measures that should be built into proposals, such as data-minimization, de-identification, data governance and privacy management program, privacy impact assessments and threat risk assessments, community engagement and project transparency, and consent. Furthermore, the Office of the Information and Privacy Commissioner of Ontario (IPC) has developed a fact sheet to help the public understand smart cities and how they can impact an individual's privacy. This fact sheet asserts that, "municipalities need to take steps to ensure that the non-personal information collected by their private sector partners is available as a public resource."

Personal Data Management:

Control of data refers to the ability to influence how and for what purpose data are used. It is often defined by the agreements governments enter into with technology vendors. Infrastructures and models exist that emphasize that people are able to access and exert authority over their personal data.

- ***Finland***'s human centric approach to personal data management and processing is called ***MyData***. This approach uses open infrastructures that allow individuals to change services and avoid proprietary lock-ins (i.e., data portability articulated in the EU GDPR) and provides the means to consent as to how and with whom personal data are shared. The model assumes a right for individuals to obtain their personal information and use it freely and emphasizes that sectors cooperate with one another to ensure that individuals may access their data across all areas of life (public health, taxes, education, etc.). The model was created by Open Knowledge Finland and a paper about technical, legal, and business implications of the model was commissioned by Finland's Ministry of Transport and Communications.
- **e-Estonia** is the national platform to streamline a range of public services across sectors for both Estonians and Non-Estonians. Services offered by the platform are i-Voting, e-Tax, e-Business, e-Banking, e-Ticket, e-School, e-Residency. Estonia's X-Road, the

open source interoperability infrastructure for exchanging data across services, can transmit large datasets and perform searches across multiple datasets incorporated in e-Estonia. e-Estonia ***ensures security and integrity of personal data by utilizing blockchain technologies and encrypting and digitally signing all outgoing data***. An individual may access all data that E-Estonia contains about them and any queries to their data are logged.

- ***Finland*** has combined their ***National Data Exchange Layer*** with ***Estonia***'s X-Road interoperability layer. In Finland, the exchange layer will enable an interface (i.e., Soumi.fi) that will provide a view of what the government knows about an individual citizen. In addition, the infrastructure will allow third parties to pool and repurpose data for applications related to a specific sector, but also reinforce Finland's human-centric and consent driven model for personal data management, myData . In 2017, a law was passed to mandate that Finnish public services connect to it. Notably, X-Road is the first data exchange platform to automatically exchange data between two countries (Estonia and Finland).
- The ***Green Button Initiative***, originally developed by the United States Department of Energy, was ***adopted by Ontario's Ministry of Energy*** to enable consumers of energy access to their energy use data via an open data format and an open API. The latter allows customers to actively grant and revoke access by third parties to their energy use data at anytime. The open API furthermore ensures data portability so that consumers may choose from multiple applications and services based on their specific needs.

5. In an Open Smart City, it is recognized that data and technology are not always the solution to many of the systemic issues cities face, nor are there always quick fixes. These problems require innovative, sometimes long term, social, organizational, economic, and political processes and solutions.

It is the idea that it is "*not just a 'right to use technology', which is precisely where many smart city initiatives stop, but rather the right to shape the city using human initiative and technology for social purposes to make cities better.*"
- Hollands (2014).

This **Open Smart City Guide V1.0** recognizes that open smart cities are socio-technological systems and that technology combined with human initiative and vision should benefit and empower people and social movements. These initiatives are propelled by human values and principles of accountability, transparency, ethics, equity, openness, human rights, and inclusivity. Thus, we emphasize that efficiency and progress should not be the key drivers for the

deployment of smart city technology. Our fifth characteristic of an Open Smart City would also recognize the right to disconnect and the right to be anonymous in a connected city.

Concluding Remarks: Limitations & Strengths

In this **Open Smart City Guide V1.0** we explain the difference between an Open Smart City and the contemporary manifestations of the data and networked version of smart cities. We covered quite a bit of ground, and we are also acutely aware that much is missing from this guide. For example, we could have developed the guide to align with the best practices pertaining to typical components of a smart city as described in our smart city environmental-scan (E-Scan) (e.g., smart buildings, smart energy, and smart mobility). We could have developed principles and guidelines related to a specific field of technology, such as the autonomous car and robotics. We could also have approached the structure of this report according to a software stack or an IoT service and delivery model. Finally, we could have developed it with much broader consultation, and each of the 5 characteristics could be research agendas in and of themselves. Thus, we could have sent the guide for consultation with legal, privacy and civil liberties associations, or to software engineers, IoT specialists, cybersecurity experts, platform architects, database modelers and data scientists, convened with industry associations, standards bodies, alliances and think tanks, or met with community developers, digital rights advocates and a host of makers and civic technology groups.

All of that was unfortunately out of project scope, but none are beyond the realm of future possibilities. We did however set a baseline for Open Smart Cities and accomplished the following:

1. We studied smart cities and conducted ***a smart city E-Scan*** and shared the results in our first international webinar. We also amassed a large quantity of research literature that will be deposited in a digital repository for future examination.
2. We then dove deeper and created an ***Assessment Report*** that included case studies for ***four Canadian cities*** and the ***Ontario Smart Grid***. We also gained knowledge about a selection of ***International Best Practices*** and shared these findings in our second webinar.
3. Thirdly, we collaborated with the Canadian Internet Policy and Public Interest Clinic (CIPPIC) on the creation of an **Open Smart Cities Frequently Asked Questions (FAQ).** This FAQ seeks to answer common legal and regulatory questions about smart city technologies.
4. In addition, two masters students participated in this research and have gone on to pursue their own smart city research agendas.
5. Finally, we defined what an Open Smart City might be, which was reviewed among a selection of smart city experts, and we test drove the ideas at a few events and feedback

informed this Open Smart Cities Guide and we disseminated those findings in our third and last webinar.

We view this **Open Smart City Guide V1.0 as a starter kit** for Open Smart City actors. We are creating this as a living document that will dynamically grow as more resources become available, and as we receive additional input from stakeholders and experts. This guide could be useful for stakeholders currently shaping the Sidewalk Labs project in Toronto, and we look forward to the submissions for Infrastructure Canada's Smart Cities Challenge where we may see some Open Smart City examples.

We would love to hear your thoughts, critiques and/or be pointed to people, projects, practices and additional resources. Please feel free to email info@opennorth.ca for more information or to provide input.

Check out the links below for more outputs from *Open Smart Cities in Canada*.

- *Open Smart Cities in Canada: Assessment Report*
- *Open Smart Cities in Canada: Executive Summary of Environmental Scan and Case Studies*
- Open Smart Cities FAQ
- Webinar 1
- Webinar 2
- Webinar 3

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