



Community Solutions Toolkit Series

ADVANCING COMMUNITY
RESILIENCE THROUGH
SMART APPROACHES:
**A RESOURCE
FOR CANADIAN
COMMUNITIES**

Ewa Jackson | March 2020



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This toolkit was written by Ewa Jackson, Managing Director of [ICLEI Canada](#). It is an outcome of the lessons learned by Canadian communities that attended the British Columbia Idea Camp in Victoria, British Columbia, on October 30, 2019. It provides guidance and resources to Canadian communities seeking to build resilience through data and connected technology approaches.

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Designed by Jiali Ou.



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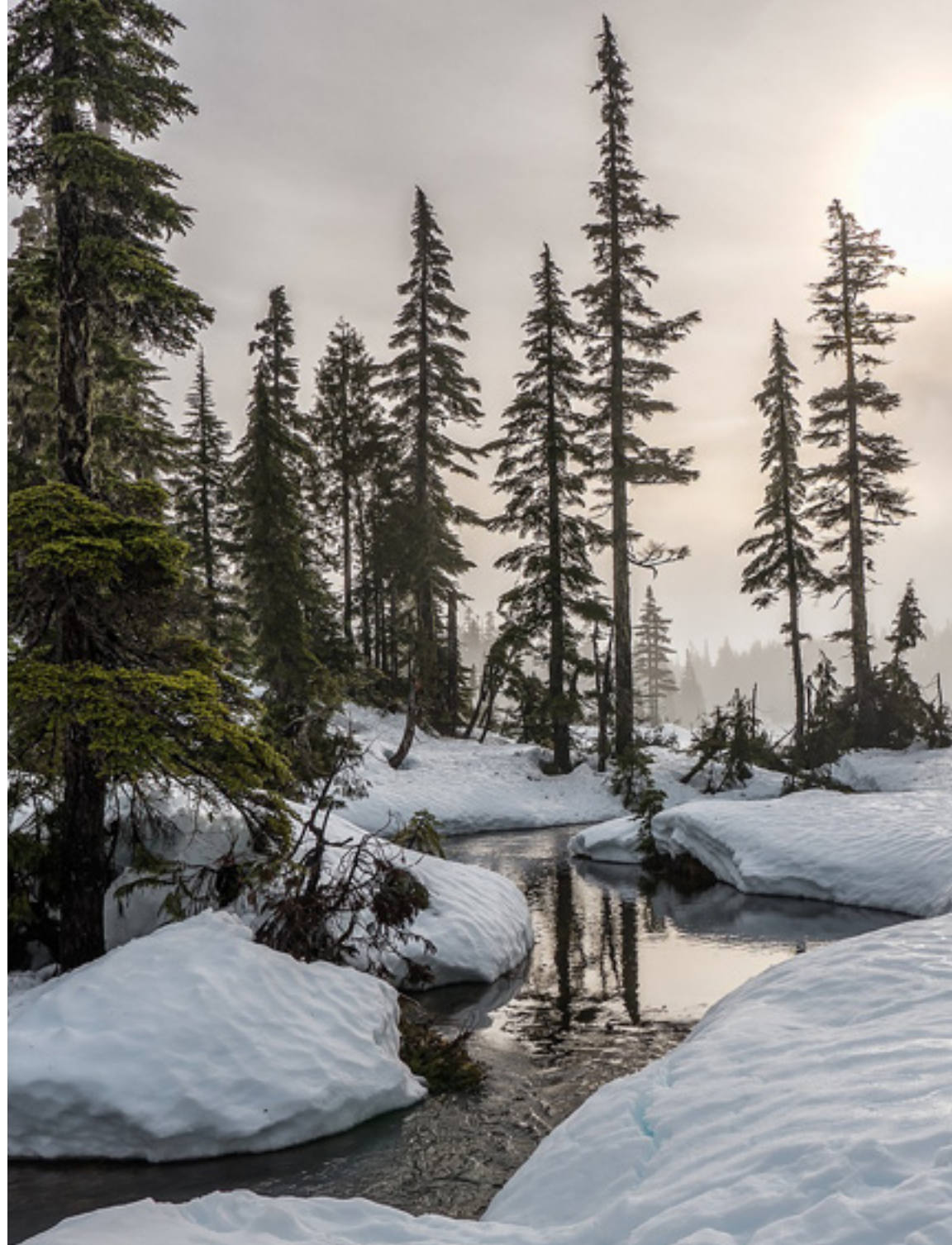
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Preface

Now, perhaps more than ever, Canadian communities are being both encouraged (by, for example, the Smart Cities Challenge) and required (due to climate change, urbanization, and other emerging trends threatening to disrupt daily life) to find innovative solutions to the challenges facing their communities. The growing prevalence of “smart” cities reflects this shift. While commonly understood as one that uses data and connected technology to accelerate innovation within local communities,¹ we approach smart cities through a newer concept, called the Open Smart Community.



First developed by OpenNorth in the [Open Smart Cities Guide V1.0](#) and most recently refined in the [State of Open Smart Communities in Canada](#), the Open Smart Community is defined as: “one where all sectors, including residents, collaborate to mobilize data and technologies to develop their community through fair, ethical and transparent government practices that balance economic development, social progress and environmental responsibility.”² Critical to this concept are principles like equity, engagement and transparency. We believe that these elements can help to mitigate the potential risks associated with data and connected technology initiatives, from data privacy, to accessibility, to the risks of outsourcing public services.³

The concept of the Open Smart Community is now being operationalized in the context of the Community Solutions Network through four domains: Data, Governance, Hardware & Software, and People & Engagement.

This resource is an outcome of the British Columbia Idea Camp held in the City of Victoria, British Columbia, on October 30, 2019. Idea Camps are a series of regional events that took place in 5 regions across the country in 2019. Each event brought together mid- and senior-level municipal staff and Indigenous leaders for peer-to-peer exchange and intensive instruction from experts to build capacity in areas related to open data, governance and public engagement.



da·ta

[/'dādə, 'dādə/] *noun*

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.



gov·ern·ance

[/'gəvərnəns/] *noun*

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.



hard·ware & soft·ware

[/'hɑrd,wɛr/ & /'sɒf(t)wɛr/] *noun*

Governance in an Open Smart City is An Open Smart City uses technologies (software and hardware) that are fit for purpose, can be repaired and queried, their source codes are open, adhere to open standards, are interoperable, durable, secure, and where possible, locally procured and scalable



peo·ple & en·gage·ment

[/'pēpəl/ & /in'gəjmənt, en'gəjmənt/] *noun*

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The British Columbia Idea Camp explored the connection between open smart approaches and their ability to support community resilience goals (particularly around climate change) and improve the lives of residents. The event hosted 23 participants representing 13 municipalities and 2 provinces, including Councillors, municipal managers and community planners.

This resource has been developed to assist Canadian municipal and community officials and administrators. It brings together key learnings from communities that are already using open smart approaches to resilience initiatives, as well as resources and guiding principles to help communities identify and implement resilience initiatives and strategies.

This resource includes:

- an overview of the state of climate resilience in Canada, including challenges and opportunities;
- an overview of the connection between climate resilience and open smart approaches;
- a case study of the City of Surrey, BC;
- key considerations for local governments considering and implementing open smart approaches to advance resilience; and
- resources to help communities advance resilience work.

To learn more about Open Smart Communities, go to:

- OpenNorth, [The State of Open Smart Communities in Canada](#)
- OpenNorth, [Open Smart Cities Guide V1.0](#)
- Future Cities Canada, [Getting to the Open Smart City](#)

Introduction



The State of Climate Resilience in Canada

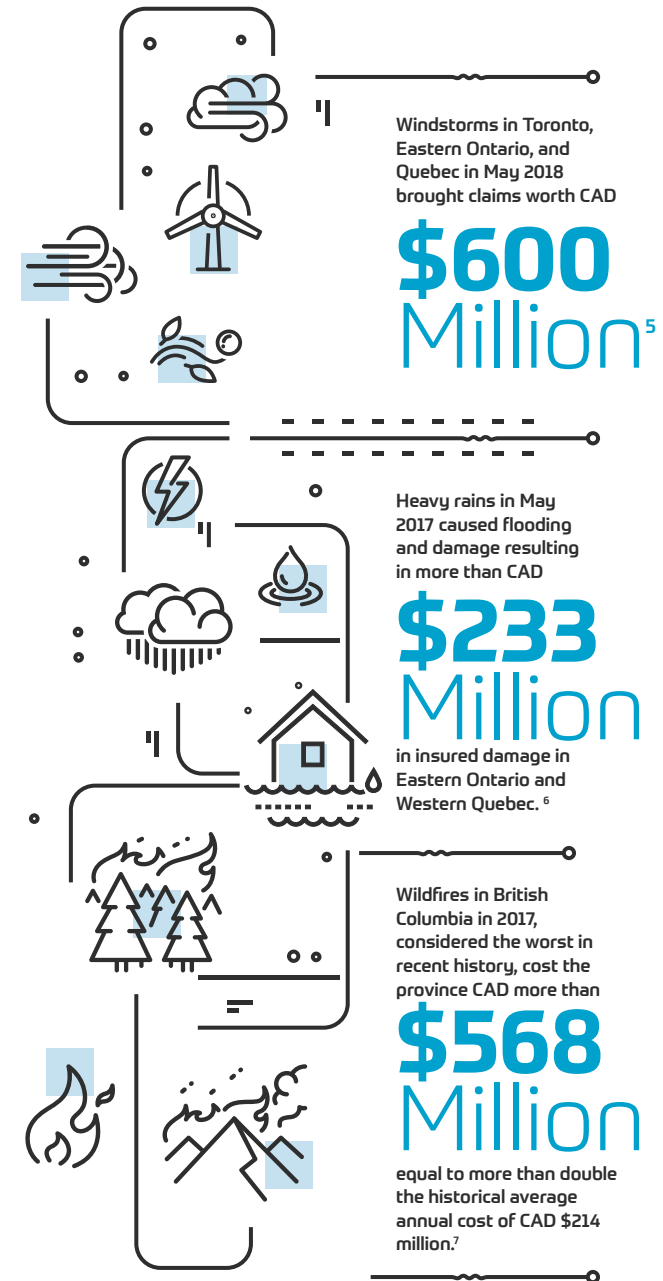
Climate change impacts are being felt across Canada in significant ways. With observed increases in average temperature and precipitation over the last six decades, including especially rapid rates of warming in the North, climate change is already affecting Canada's environment and economy, as well as the safety, physical, mental, cultural, and spiritual health and well-being of Canadians. With these impacts projected to intensify in the coming decades, it is essential that Canadians act now to adapt and build resilience to climate change.

According to the recently released [Canada's Changing Climate Report](#), Canada has been warming over the last six decades, where temperature has increased in all regions of Canada and in the surrounding oceans. Since nation-wide records became available in 1948, Canada's annual average temperature over land has warmed by an estimate of 1.7°C, with higher temperature increases observed in the North, the Prairies, and northern British Columbia. Canada has also generally become wetter over the past several decades, with a shift toward less snowfall and more rainfall. Annual and winter precipitation is projected to increase everywhere in Canada over the 21st century. In the future, a warmer climate will intensify some weather

extremes. Extreme hot temperatures will become more frequent and more intense. This will increase the severity of heatwaves, and contribute to increased drought and wildfire risks. While inland flooding results from multiple factors, more intense rainfalls will increase urban flood risks.⁴

Extreme weather events such as storms, floods, and windstorms are projected to increase in severity and frequency under a future climate scenario. These types of events have already impacted Canadian communities; the costs of recent major Canadian weather events are evidence of the consequences that these types of events can have:

- Windstorms in Toronto, Eastern Ontario, and Quebec in May 2018 brought claims worth CAD \$600 million.⁵
- Heavy rains in May 2017 caused flooding and damage resulting in more than CAD \$233 million in insured damage in Eastern Ontario and Western Quebec.⁶
- Wildfires in British Columbia in 2017, considered the worst in recent history, cost the province CAD \$568 million, equal to more than double the historical average annual cost of CAD \$214 million.⁷



While communities across Canada prepare strategies and implement actions to prepare for climate risks, they are, at the same time, embracing data and connected technology approaches in an effort to lower operating costs, enhance public services, and improve the quality of life of residents. Examples can be identified in transportation, where data from public transportation fare cards pinpoint commuter hotspots and determine bus fleet needs, where bike sharing programs with self-service bike stations are promoting active transportation for residents, and where street light management is enabling the accommodation of real-time traffic conditions. In the realm of health and wellness, the availability of telemedicine to account for increasing demands for healthcare services in underserved communities and populations is being increasingly explored, piloted and implemented.

Similarly, communities are exploring how smart approaches link to climate resilience. This resource emerged from the discussions held at the British Columbia Idea Camp that explored how communities can and are advancing resilience strategies, and how open smart approaches to data and technologies can be leveraged to help address resilience challenges.

Making the Connection: Climate Resilience and Open Smart Approaches

Impacts of a changing climate are already being felt in towns and cities across Canada. Municipalities are becoming increasingly vulnerable to a variety of impacts, including increased incidences of extreme weather events, sea level rise, increasing temperatures, and changes in precipitation. Indeed, there is a growing acknowledgement that it is now adaptation and resiliency strategies at the local level that are essential to support infrastructure building and maintenance, land use planning, and the broad range of services provided by local governments.

While climate change adaptation has received increasing attention over the past several years, the focus has largely been on the planning process (e.g. conducting vulnerability and risk assessments, developing different types of asset management plans, storm water management plans, community adaptation plans, etc.) and less on tangible on-the-ground actions. Adaptation planning is a process that is often capable of delivering positive outcomes, however it must be supplemented with action; otherwise, vulnerability is not reduced and a community is still exposed to climate risk. For many communities bridging this gap between planning and implementation is an ongoing barrier towards becoming more resilient.

Through enhanced connectivity and the proliferation of mobile technology, people living in vulnerable areas can use mobile phones to participate in collective mapping exercises, and help identify local priorities for action.



The connection between open smart approaches and local government action to reduce climate impacts are increasingly being considered and explored, but it is a newly emerging practice across Canada. At this intersection, for example, geographic information systems (GIS) can be used in local hazard mapping and analysis to help identify evacuation routes and locate vulnerable housing. Through enhanced connectivity and the proliferation of mobile technology, people living in vulnerable areas can use mobile phones to participate in collective mapping exercises, and help identify local priorities for action. They can also provide ongoing feedback on the effectiveness of risk-reduction initiatives that have been deployed in their communities. Many of the methods for reducing climate impacts rely on sensors either to record and relay real-time consumption information or to detect the activities of residents.⁸ In many parts of Canada, fixed and mobile telecommunications networks are ideally suited for a lot of these tasks. The detection and collection of key data, when used appropriately, can help local governments make informed decisions that contribute to climate reduction.

To date, much of the work on resilience and smart cities has been siloed; the two initiatives are not frequently thought of as mutually beneficial and complimentary, or even as existing within the purview of local government.

Instead, smart cities approaches have typically come from outside of local government. In order for the two concepts to be mainstreamed, local governments will also need to co-create solutions from within, working with residents, entrepreneurs, academics, not-for-profits and others to develop innovative prevention and risk reduction tools that help to address identified community challenges and needs.

Some examples of the nexus between resilience and smart approaches are:

- The role of big data in climate resilience, where anonymized cell-phone use records can be made available to track movements during extreme weather events. In work done by Professor James Ford (McGill University and University of Leeds), big data can also be used to georeference data around vulnerability of high risk groups – such as household income, demographics, housing characteristics – data which is often non-existent, outdated or unreliable.⁹
- The creation of warning systems that incorporate social media data to trigger emergency response measures (e.g., heat or flood alert systems). In this way, smartphones could be equipped with sensors that allow for the monitoring of human movement before, during, and after an extreme event to aid with disaster response.¹⁰

Integrating detailed considerations on data, technology and connectivity into the planning process for climate change strategies (alongside the people who will be responsible for their implementation) can be one of the ingredients for success in moving forward with open smart approaches.

Some recent examples of how Canadian cities are using data and connected technology as part of their climate adaptation strategies include:

- The City of Windsor used thermal imaging to understand how increased temperatures were affecting playgrounds in the city. Through imaging, the City found that temperatures on surfaces below certain play structures ranged from 50-70°C.
- Libraries of Things: The concept of borrowing a neighbour's drill, lawnmower, or tent is not new. However, increasing rates of social isolation have virtually eliminated this practice. In response, Libraries of Things have emerged to not only help neighbors interact, but also to address the consumption of resources (a significant contributor to climate change). Libraries of Things, enabled by software platforms, have become community hubs which increase entrepreneurship, social innovation and local economic development.
- Many cities are adopting technology-based water monitoring systems that not only broadcast risk alerts, but also help to control and record behaviours in maintaining a satisfactory water flow (see the [River Watch mobile app](#), developed by Civic Tech Fredericton and now serving all New Brunswickers). Such early flood detection and warning systems are reliable and have stable structures in terms of communications and accuracy.

As a result of the British Columbia Idea camp, three key opportunities were identified for connecting smart approaches to resilience action:



Raising awareness among Canadian communities around smart approaches as a tangible and locally relevant response to resilience and climate change challenges.



Knowledge exchange and sharing around smart approaches – digitization, data integration, connected technology – that can be applied in remote or rural, small- to medium- sized communities.



Building relationships across a network of communities and innovation partners centred around collaboratively advancing smart approaches as solutions to local resilience challenges.

CASE STUDY

The City of Surrey, BC

Presented at the British
Columbia Idea Camp

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The City of Surrey is located in the Metro Vancouver region of British Columbia. The City has been a leader on a variety of sustainability initiatives for decades and has been working on climate change since 2010, with their [Community Climate Action Strategy](#) being endorsed by Council in 2013. Likewise, it has been working on advancing smart approaches through a variety of initiatives under the banner of the City's strategy [Smart Surrey: Leading Through Innovation](#). The City began by creating a local definition: "A 'Smart' City creates sustainable economic development and high quality of life by considering innovation and technological advancements as a key ingredient in its decision making and strategy development."¹¹

There are several examples of initiatives that highlight how the City has operationalized Smart Surrey: Leading Through Innovation. These include:

1. Surrey mobile apps

An example of a citizen information system, providing access to a variety of mobile apps developed by the City to help residents access the following City of Surrey services:

- [Building Inspection Request App](#)
- [MySurrey App](#)
- [Surrey Libraries App](#)
- [Surrey RCMP App](#)

2. Data Driven Decision Making (D3M)

The City's D3M process launched in 2018 in partnership with the consulting company, CGI. Through this process, 80 different technologies were identified as being used by City departments. Staff were asked to work through problem statements to get to a common "wish list," that included:

- Reducing data lags and "Self-service" access to data
- Effective forecasting
- Data catalogue
- More public-facing data

The City's focus on creating and improving city information systems, while at the same time moving towards more integrated data-driven decision making is helping to build resilience in Surrey, both within their corporate operations as well as in the broader community. The variety of mobile apps that are offered and downloaded by residents are vital communications platforms that can be used before, during, or after an emergency event to communicate vital information regarding the level of risk and where residents can turn for help. Advancing D3M is an important process for city staff to use to design better, more targeted, and equitable resilient actions and solutions.

KEY CONSIDERATIONS FOR **LOCAL GOVERNMENTS**

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A number of lessons learned emerged from the City of Surrey case study and the broader discussions held at the British Columbia Idea Camp. These lessons provide insight around some guiding elements that local governments can keep in mind when considering and/or moving forward with the implementation of open smart approaches to help address climate resilience challenges:



Early capacity building and knowledge sharing: Staff knowledge and capacity must be developed early on in order to reduce reliance on external organizations and providers.



Aligning around a shared vision: Changing the way we make decisions around resilience and technology will take time. Establishing the trust needed for collaborative decision-making can help to leverage the potential in communities and advance a collective vision for an equitable and resilient community. Aligning around a shared vision of what a resilient community looks like, and the role of technology in it, will lead to long-term progress and shared ownership for implementation.



Meaningful public and stakeholder engagement is crucial: Ensuring comprehensive and meaningful public and stakeholder engagement is key to building and maintaining trust with residents, and opens the door for co-creation. The shared vision of your resilient community should drive your engagement strategy and process. By making decisions and developing policies collaboratively, and ensuring ongoing transparency and accountability, the foundation will be laid for meaningful and long-term change.



Quality of life > technology for innovation's sake: It is easy to be swept up in the promises of new technologies and the benefits and solutions they claim to enable. Understanding the needs and wants of your residents and maintaining focus on improving their quality of life can help you to avoid the potential pitfalls of prioritizing innovation and newness. A few questions to ask are: What problem are we trying to solve with this technology? How certain are we that the problem will be solved by this technology?



Time and resources are real constraints: Many communities lack dedicated resources to take on new data and technology initiatives (few Canadian communities have a dedicated smart city or open data branch or department). In most cases, data and connected technology initiatives are undertaken by existing departments that are already limited in resources.



Understand the risks: While smart approaches promise many benefits, they also have the potential to pose significant threats to individual rights. From invasion of privacy due to increasing and new forms of surveillance, to the ability of data or connected technology initiatives to reflect or even exacerbate existing social and economic inequalities, there is reason for exercising caution. This is particularly significant when approaching resilience initiatives; resilience, at its core, is meant to promote equity and social connectedness. Understanding the risks associated with a certain intervention and the purpose behind it, is a crucial early step.

Discussions at the British Columbia Idea Camp also triggered important questions for local governments to consider when applying data and technology approaches to climate resilience:

Do you have reliable and consistent access to broadband internet?

Generally, smart approaches to data and technology rely on continuous and reliable broadband internet and connectivity. Many parts of Canada, especially in Northern, rural, and remote areas, struggle with connectivity issues and do not have adequate or consistent access to broadband internet. To meet this need, governments at all levels have acknowledged this as a fundamental challenge and are taking action to close the digital divide by creating funding mechanisms and infrastructure to provide reliable internet access for all Canadians.

For more information, go to:

- [Government of Canada Universal Broadband Fund](#)
- [Internet speed test with Canadian Internet Registration Authority \(CIRA\)](#)
- [Conference Board of Canada Progress Report on Connectivity](#)

Do you have a comprehensive community and stakeholder engagement strategy?

When considering the application of data and connected technology to advance resilience, it is important to engage with communities and stakeholders more broadly. Better engagement helps to identify resident needs and how open smart approaches can help to meet those needs. When building these relationships, it is important to identify all stakeholders: governments, utilities, IT, finance, private businesses, etc. Additionally, it is important to identify opportunities for a variety of partnerships, both public/public and public/private as prospects for funding. Models to help connect innovators with practitioners and funders (e.g. the Innovate BC model, which connects innovators with funding, tools, resources, etc.) should be pursued when considering open smart approaches.

For more information, go to:

- [Innovate BC](#)
- [Future Cities Canada: Getting to the Open Smart City](#)
- [Municipal World: Smart\(er\) cities focus on open data and community engagement](#)



We need to make sure that open smart approaches are people-centred (and equitable) by ensuring that all are included or considered in conversations on data and technology.



Do you understand the unique needs and challenges of your community's equity-seeking communities? Have you addressed them in your approach to resilience?

Climate change impacts are disproportionately impacting Indigenous people, low income families, and people of colour. Climate change worsens gaps that historically (and presently) prevent inclusion of whole communities in building resilience. We need to make sure that open smart approaches are people-centred (and equitable) by ensuring that all are included or considered in conversations on data and technology. Likewise, technological responses must be catered to a perceived and/or identified local need or gap and implemented actions must reflect people and place. Fundamentally, communities need to make sure that solutions include (or at a minimum do not discriminate) against those for whom technology and connectivity are not as readily available.

For more information, go to:

- [City of Calgary Resilience Strategy](#)

Are you aware of and considering the differences for large versus small communities?

In large communities it can be hard to “act locally” due to large bureaucracy, and many pre-identified and competing priorities. In small communities, however, municipal staff may not necessarily see open smart technologies as a priority area and also may not have the resources to take on something new. To overcome these considerations, smart city approaches need to be framed as a solution to resilience challenges (in any type of community) leading to better uptake and long-term implementation.

For more information, go to:

- [Do not forget about Smart Towns](#)

Conclusion

Communities across Canada are actively working on resilience – from vulnerability and risk assessments, to creating resilience strategies/plans, to implementing resilience interventions. In most cases these initiatives are not being approached through a data and connected technology lens; digitization, data-driven decision making, automation, and technological innovation are often not central components of resilience strategies and plans. In many cases, we are relying on the ways we have always planned cities to plan for a new and uncertain future.

Planning for this uncertain future requires a paradigm shift in the way communities are planned and designed. Innovative and sustainable approaches to many aspects of community life, such as public transportation, urban agriculture, construction, housing and smart building technologies can advance resilience, create jobs, and help communities stand up to a changing climate. Open smart approaches can have a role to play in advancing these future-ready solutions. By better integrating principled data and connected technology approaches into resilience strategies in a manner that is equitable, transparent and participatory, we can ensure our communities are taking long-term action that is inclusive and responds to local risks and stressors.

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References

1. Sodhi, Z., Flatt, J., & Landry, J.N. (2018). Getting to the Open Smart City. Future Cities Canada. Retrieved from https://futurecitiescanada.ca/downloads/2018/Getting_to_Open_Smart_City.pdf
2. Pemberton, C., et al. (2019). The State of Open Smart Communities in Canada. OpenNorth. Retrieved from <https://www.opennorth.ca/publications/#the-state-of-open-smart-communities-2019>
3. Sodhi, Z., Flatt, J., & Landry, J.N. (2018). Getting to the Open Smart City. Future Cities Canada. Retrieved from https://futurecitiescanada.ca/downloads/2018/Getting_to_Open_Smart_City.pdf
4. Bush, E. & Flato, G. (2019): Executive Summary, in Canada's Changing Climate Report, (ed.) E. Bush and D.S. Lemmen; Government of Canada, Ottawa, Ontario, p. 7–23.
5. Gambrell, D. (2019). Why the Global Protection Gap is the Lowest it's Been in 14 years. Canadian Underwriter, January 2019. Retrieved from www.canadianunderwriter.ca/insurance/why-the-global-protection-gap-is-the-lowest-its-been-in-14-years-1004151048
6. Insurance Bureau of Canada. (2017). Spring Flooding in Ontario and Quebec caused more than 223 million in Insured Damage. Retrieved from <http://www.ibc.ca/on/resources/media-centre/media-releases/spring-flooding-in-ontario-and-quebec-caused-more-than-223-million-in-insured-damage>
7. Lindsay, B. (2018) How British Columbia Budgets for Wildfire: Choose an Arbitrary Number, Put it in the Books. CBC News, August 2018. Retrieved from <https://www.cbc.ca/news/canada/british-columbia/how-b-c-budgets-for-wild%EF%AC%81res-choose-an-arbitrary-number-put-it-in-the-books-1.4793981>
8. Ovington, T. (2020, 03 01). How Smart Cities Can Help Tackle Climate Change. Retrieved from Frontier Economics: <http://www.frontier-economics.com/uk/en/news-and-articles/articles/article-i4604-how-smart-cities-can-help-tackle-climate-change/>
9. Ford J.D., et al. (2016). Opinion: Big Data Has Big Potential for Applications to Climate Change Adaptation. PNAS, 113(39):10729–10732. doi:10.1073/pnas.1614023113
10. Ibid
11. City of Surrey. (2020). Smart Surrey Strategy. Retrieved from <https://www.surrey.ca/files/SmartSurreyStrategy.pdf>