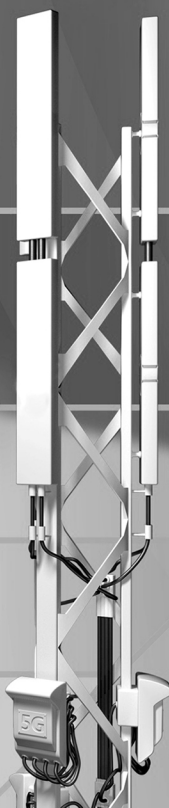




In collaboration with the
Canadian Wireless Telecommunications Association

ACCELERATING 5G IN CANADA

Benefits for Cities
and Rural Communities

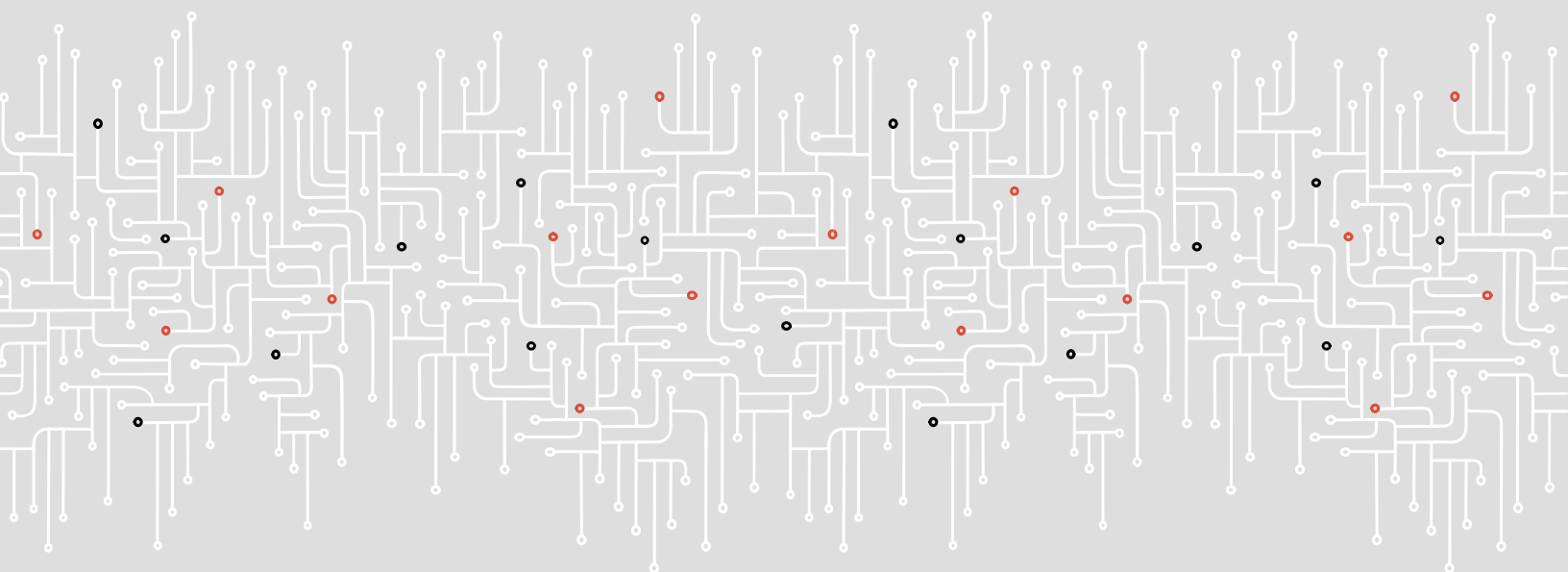


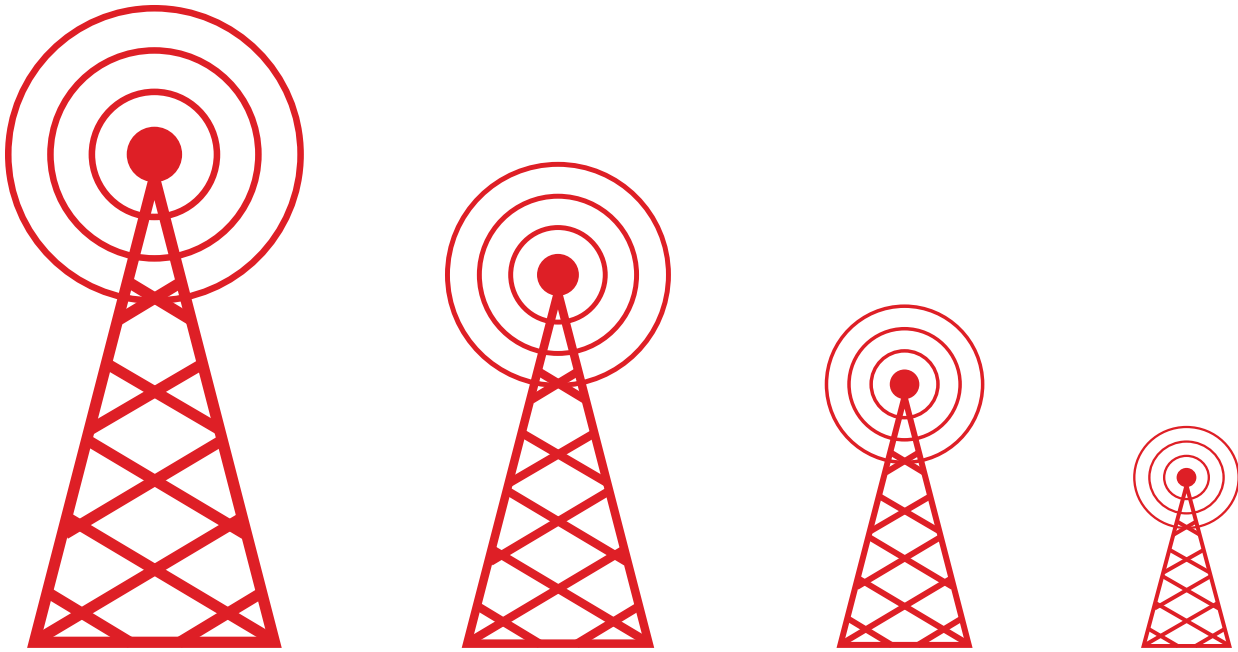
Deployment of 5G will be different than it was for previous generations of wireless technology. Prior to 5G, the primary focus of mobile wireless network operators has been to extend mobile wireless connectivity to an increasing number of Canadians over an expanding geographical footprint. This resulted in 4G/LTE networks being available to 99% of Canadians where they live. However, just like other recent deployments around the world, 5G in Canada will follow a deployment approach and timeline focused on enabling 5G use cases that vary by location – city, urban or rural communities.

Before mass consumer use is fully established, deployment is likely to first target local industries and governments. Local governments are in a unique position to help determine the pace of deployment, and to influence access to the infrastructure that will be required for 5G networks.

In return, it is expected that 5G deployments will benefit local industries, governments and government services, whether it be to meet a government's smart city agenda, to provide coverage for its citizens, or to address use cases for local businesses.

So just what types of benefits can Canadian communities hope to achieve with 5G adoption?



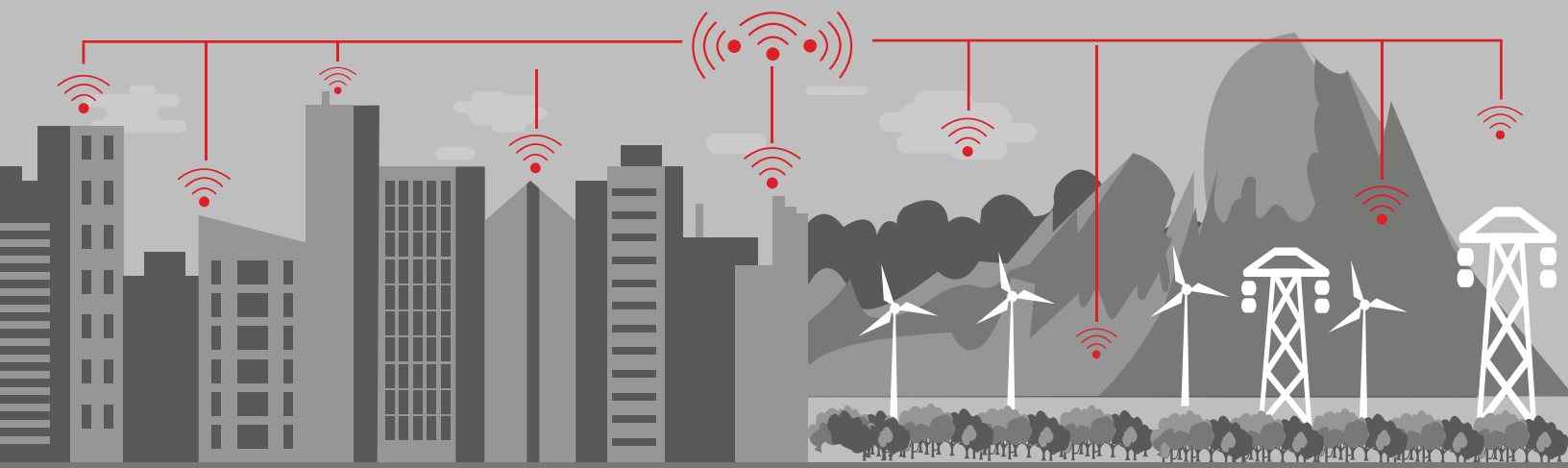


5G: INFRASTRUCTURE FOR INNOVATION

5G is more than the next generation of mobile technology. It will bring entirely new ways of using mobile technology that do not exist today. Much as 4G's speed and capacity propelled us into the app economy and expanded the use of mobile video, 5G will be a platform for entirely new innovations. Imagine what can be done with a 100x increase in traffic capacity and network efficiency, a 10x decrease in end-to-end latency¹, and speeds that are over 600 times faster than the typical 4G speeds on today's mobile phones². 5G's faster, ultra-reliable, low-latency and higher-capacity wireless connectivity, combined with other emerging technologies such as Artificial Intelligence (AI), the Internet of Things (IoT), and Quantum Computing, will enable a whole new world of possibilities.

The reality, however, is that many of these advancements won't directly impact the consumer in the near term. Instead, many of the initial deployments of 5G will be to advance technology adoption for specific industry and government use cases. Local governments in particular will work with operators and network equipment providers to secure access to infrastructure that will drive local benefits, such as smart connected city services or rural high-speed connectivity.

As these deployments scale, and Canada gets closer to national 5G coverage, the estimated economic impact of 5G deployment in Canada will reach \$40B of annual GDP uplift by 2026, with 250K permanent jobs added to the economy in the same timeframe³.



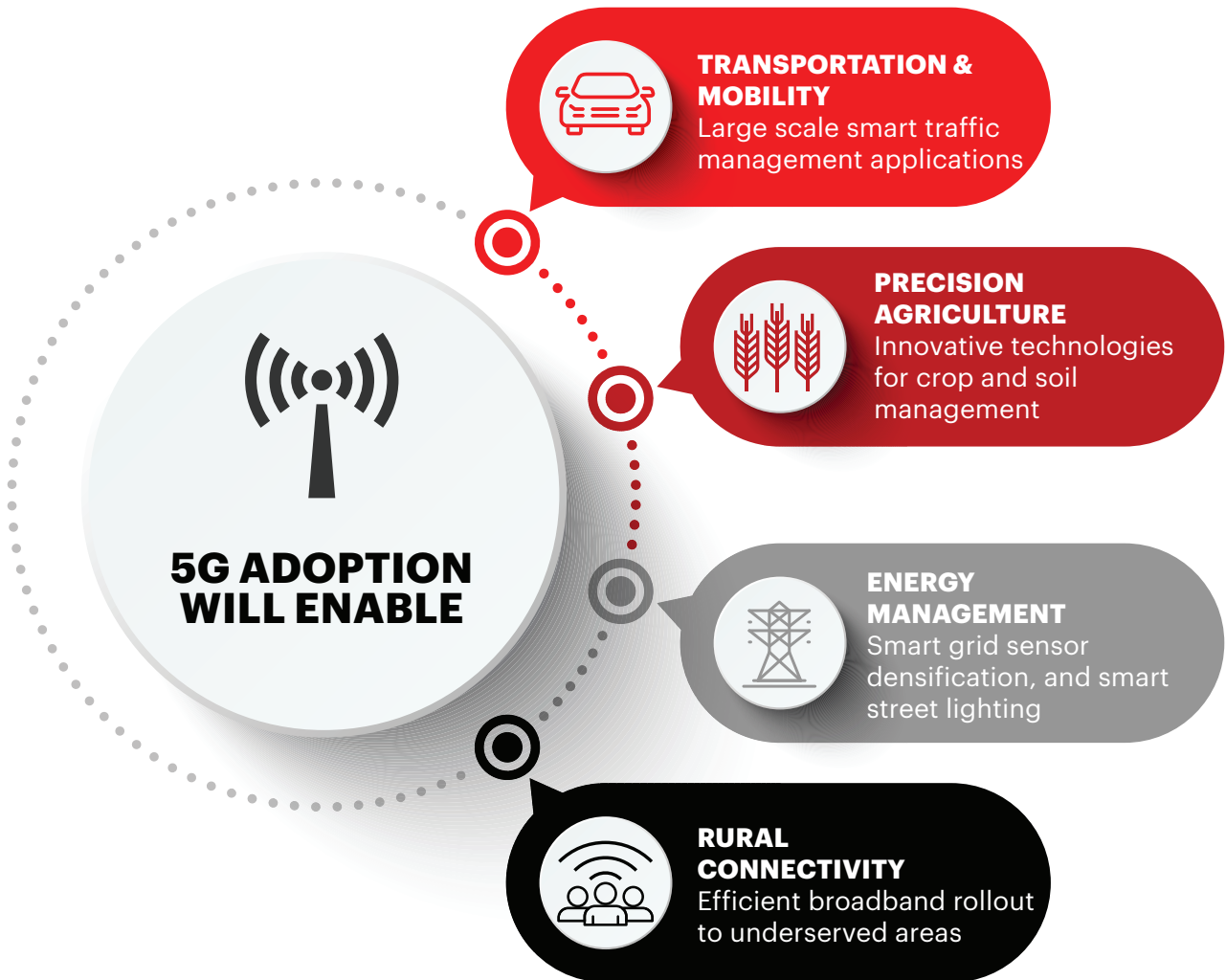
ENABLING A SHIFT TOWARDS SMART CITIES AND RURAL COMMUNITIES

In addition to its significant economic benefits, 5G has the potential to bring quality-of-life benefits to cities and rural communities. Cities are increasingly searching for ways to improve quality-of-life through enabling diverse economic activities, reducing environmental impacts, and providing enhanced services and amenities. Advanced connectivity will spur the technological innovation that enables these objectives by complementing cities' physical infrastructure, providing connectivity to digital infrastructure, and transforming them to "Smart Cities." In addition, 5G opens the door for more cost-effective approaches to extend network connectivity to currently underserved rural communities, which enables a wide range of economic benefits.

The advanced connectivity features of 5G, such as ultra-low latency, high bandwidth, and massive machine-to-machine communication, can play a significant role in enabling a wide range of applications, including:

- **Transportation:** Traffic management, autonomous vehicles, rail/transit maintenance
- **Healthcare:** Connected ambulance, remote care, wearables
- **Agriculture:** Crop and soil management, autonomous vehicles
- **Energy Management:** Smart grid, smart street lighting
- **Water/Waste Management:** Smart metering
- **Municipal Services:** Smart parking meters, garbage collection, snow removal
- **Public Safety:** Smart policing, disaster management
- **Rural Connectivity:** Fixed wireless access

This report explores four main 5G use cases, with a focus on the estimated benefits their adoption will bring in select Canadian cities and rural settings. These four use cases merit special analysis, as they represent solutions that are expected to be adopted in the near future, within the next three to five years, as 5G becomes more widely deployed.

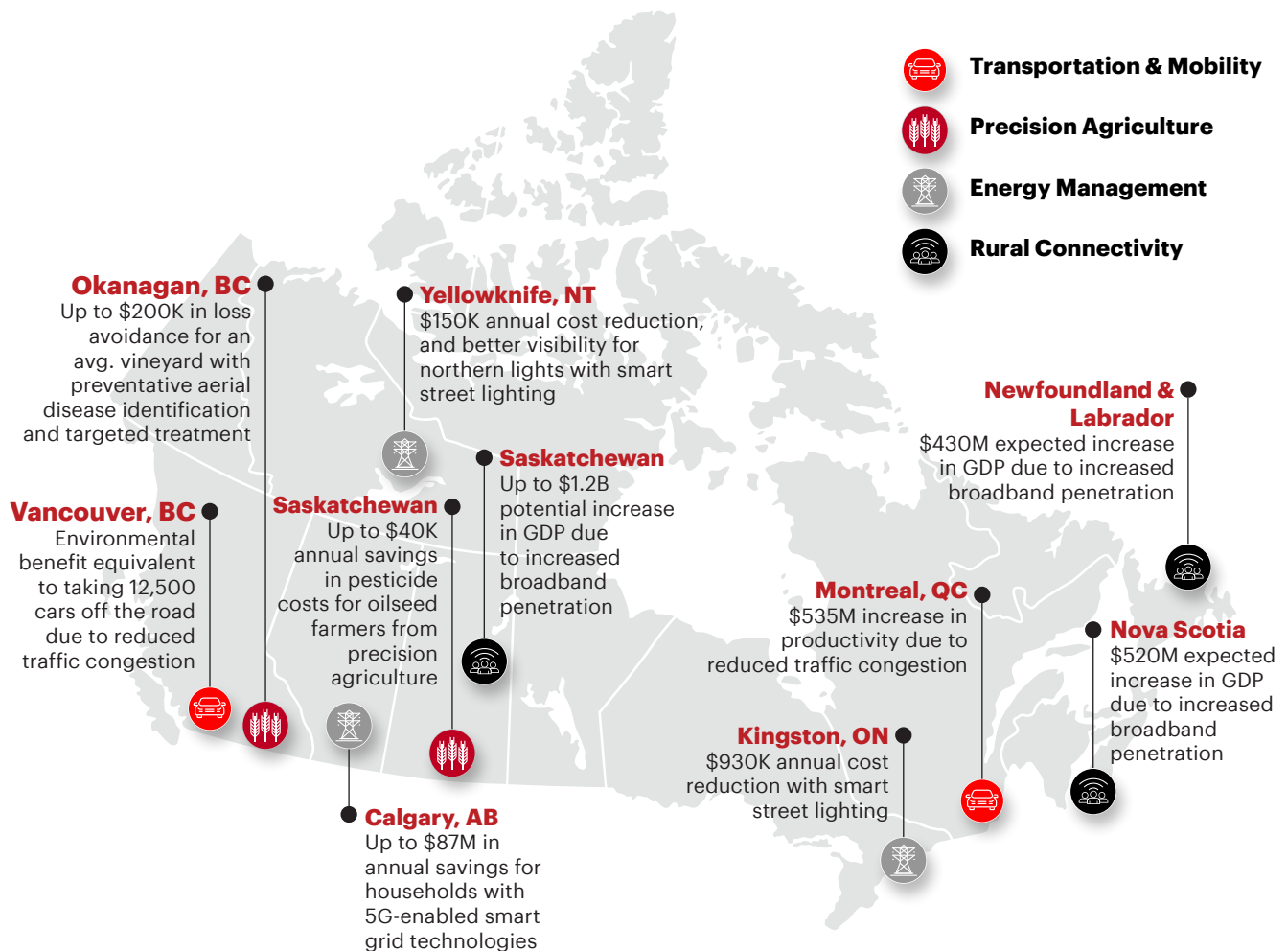


The adoption of 5G-enabled use cases in Canadian cities and rural communities will enable innovations that bring significant benefits to local governments, businesses, and citizens.

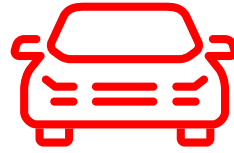
- Local governments can provide greater convenience for their services while realizing economic growth
- Businesses can realize greater efficiencies in production and distribution
- Citizens will benefit from improved products and services provided by their governments and businesses

Benefits to these three primary groups are considered in the selection of use cases across Canada.

Summary of the estimated benefits of select 5G-enabled use cases



TRANSPORTATION & MOBILITY



With more than 10 Canadian cities having a population exceeding 500,000 and an increasing number of citizens commuting to work every day, traffic management is becoming an increasingly important objective for improving quality of life. Commuters in the busiest five Canadian cities lose an average of 127 hours in traffic congestion per year⁴, and cities are continuously looking for ways to ease traffic congestion.

One of the main advantages of 5G wireless technologies is enabling a very large-scale network of connected IoT/sensor devices. These advanced IoT networks will have the capability to transmit data with widely varying bandwidth requirements, ranging from simple readings of road conditions and vehicle information to high-definition, real-time video from thousands of monitoring devices. Having access to this massive amount of data will enable smart-city traffic management solutions to reduce congestion with capabilities that were not available when using previous wireless network technologies.

Research has shown that implementing 5G technologies has the potential of reducing traffic congestion by 10%⁵. While this benefit may seem minor on an individual scale, it is a step towards improving quality of life for citizens and achieving significant collective productivity gains for businesses. In addition, smart cities can expect significant environmental benefits as a result of reduced idle time for vehicles on the road.

Two major Canadian cities, Montreal and Vancouver, are advancing their efforts to tackle mobility challenges for citizens. As part of its Smart Cities Challenge proposal, the city of Montreal is focusing on adopting technologies to provide efficient and sustainable transportation alternatives. The city of Vancouver, on the other hand, is partnering with the city of Surrey to explore the implementation of a collision-free, multi-modal transportation corridor leveraging innovations in autonomous vehicles and data analytics⁶.

As both cities continue to focus on easing mobility challenges, 5G technologies are expected to help progress towards this objective. 5G-enabled smart traffic management solutions in the cities of Montreal and Vancouver can be expected to further the prosperity of citizens and businesses in these cities, with a potential annual increase in productivity of \$535M and \$270M respectively⁷. In addition, the expected environmental benefits include reduction of CO2 emissions of 130K tonnes and 55K tonnes respectively⁸. To put this in perspective, this reduction in CO2 emissions is equivalent to taking 29,000 cars off the road in Montreal, and 12,500 cars off the road in Vancouver⁹.



Smart traffic management can reduce time stuck in traffic by **10%**
This can lead to Annual productivity gain of up to

\$535M In Montreal

\$270M In Vancouver

PRECISION AGRICULTURE



With lots of digital innovation in agriculture, 5G can support such improvement by enabling “precision agriculture,” a farming management technique that aims to micro-optimize agricultural processes and practices through the massive collection, analysis and utilization of data about soil, crops, labor, weather, pesticides and much more. Although some of the technologies associated with precision agriculture are already commonplace in many large-scale farming operations across Canada, 5G’s promise of enhanced mobile broadband, greater throughput and proliferation of sensors will enable the scaling of current use cases to capture significant additional benefits.

A major example of 5G’s potential benefit is canola, one of Canada’s most prominent crops, of which 90% is exported to markets around the world. In 2018, Saskatchewan alone harvested over 12M acres of canola, with a total production of over 10.9M tonnes¹⁰.

Of particular focus in the Canadian agricultural industry (and the canola industry specifically) is the use of fertilizers and pesticides on cropland to promote the growth and yield of successful crops while fighting invasive plants, harmful insects, and disease. Large operations typically use several tractors over multiple days, or even manned aircraft, to spray canola fields at scale with fertilizers and pesticides. This can often result in over- or under-spraying certain areas, putting at risk not only the crops but human health and the greater environment.

Minimizing the use of pesticides is becoming top of mind for farm operators, not only to comply with Canadian government oversight and regulations, but also to meet international requirements for the food safety of exported products.

Recent Transport Canada regulations have reduced the paperwork and overhead associated with operating unmanned aerial vehicles, or drones, for aerial video and photography. While 4G networks can support current connectivity needs, the evolution and increasing demand for IoT devices’ bandwidth and speed requirements, such as real-time video analysis, will drive need for higher speeds/capacity of 5G networks. The ability to isolate problem areas on a large farm through massive penetration of large-scale IoT sensor networks, aerial scanning and detection, and autonomous, targeted (reduced) application of pesticides, has the potential to save farmers a significant amount of money and to protect the fragile ecosystem. A study conducted by the European Parliamentary Research Service found that early, accurate detection and localized pest and disease treatment has the potential to reduce pesticide costs by up to 85%¹¹.

For the canola industry in Saskatchewan, this is the equivalent of up to \$360M¹² in savings annually, in addition to improving overall yield through targeted application and the added health and environmental benefits of reduced pesticide use. The average Saskatchewan oilseed farmer can expect to see upwards of \$40,000¹³ in savings annually, once 5G networks are established and further regulations are put in place to allow for precision agriculture technologies to take off in Canada.



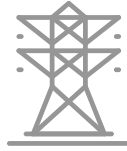
**Precision Agriculture technologies can reduce the use
of pesticides by **85%****

This can lead to up to **\$40,000 in annual cost savings
for an average Oilseed farm in Saskatchewan**

Precision agriculture enabled by aerial drones has also taken off in viticulture, where careful, often low-touch maintenance is required to ensure proper development and fruit production. The need for targeted identification, isolation and timely treatment of infected or at-risk vines calls for a more frequent, automated approach to vineyard analysis than would traditionally be conducted on foot.

Companies such as Halifax-based VineView aim to address these challenges, as demonstrated in a recent “Digital Vineyard of the Future” pilot project, partnering with Global UAV Technologies to fly a 4G-enabled drone over a Nova Scotia winery in order to conduct real-time analysis of vineyard health¹⁴. VineView’s aerial disease detection capabilities can help identify and isolate Grapevine Leafroll Disease, one of the most common viruses impacting vineyards globally. For an average 50-acre Okanagan vineyard, this virus could impact yield by as much as 30%¹⁵. If left undetected and untreated in a timely manner via targeted roguing (vine replacement), this would result in an economic loss on average of \$18,000 annually¹⁶, or up to \$200,000 over the vineyard’s lifespan¹⁷. Under Canada’s current regulations, the average vineyard owner could own and operate their own unmanned aerial vehicle to perform the reconnaissance, while a 5G-enabled communications network enables increased volumes of data and imagery to be transmitted in real time for farmers to take action quickly to improve their crop yields.

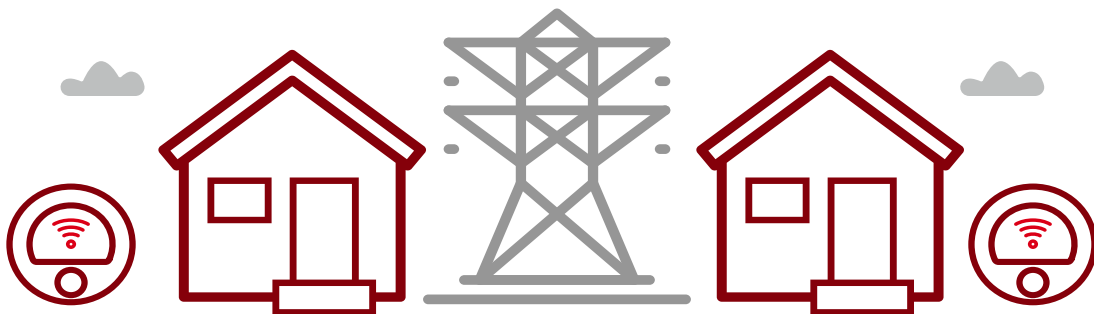
ENERGY MANAGEMENT



According to the latest statistics, energy consumption in Canada has increased by 2.2% year-over-year, with this increase led by the industrial sector (4%) and the residential sector (3.4%)¹⁸. Seven out of the 10 Canadian provinces saw an increase in energy consumption, ranging from 0.5% in Ontario to 6.9% in Alberta¹⁹.

Smart grid technologies are considered an important enabler for dealing with the increasing demand for electricity, especially given the complexity of the electricity infrastructure. 5G technologies will be able to unlock further efficiencies in smart grids by supporting large numbers of low-cost, low-power sensors that extend monitoring for many of the grids' unconnected areas. The densified coverage of 5G-enabled sensors will allow unprecedented visibility for demand-side management that helps better forecast energy requirements, reduce electricity peaks, and ultimately reduce costs. In addition, the data collected can be integrated into consumer-facing systems to allow better visibility into residential energy use, enabling households to take more proactive roles in managing consumption. Densifying smart grids with 5G sensors will also enable the self-healing capabilities of future smart grids that can diagnose maintenance issues in real time, and automatically react to avoid outages.

It has been estimated that 5G-connected smart grids can enable a wide range of applications that can help reduce household energy consumption by up to 12%²⁰. Provinces like Alberta stand to benefit from a shift to smart grids and cleaner energy production, especially with government investments like the Smart Grid Program²¹. If a city like Calgary realized the household energy consumption savings from smart grids, this could mean \$87M in annual savings for household spending on energy²².



**5G-enabled smart grids can reduce household
energy consumption by up to **12%****

Cities can also utilize 5G networks in the deployment of smart street lighting, especially as more vendors start to integrate 5G and advanced sensors into new lighting poles. Smart lighting systems consume 50% to 60% less energy than traditional lamps, due to the use of LED and the increased capability to adjust brightness. Connectivity also unlocks further cost savings of up to 80% by providing more visibility into maintenance operations²³.

An increasing number of Canadian cities are building public-private partnerships focusing on smart city applications for energy management. The city of Kingston, Ontario has recently established a partnership to deploy smart energy management applications²⁴. The city may see an annual cost reduction benefit of up to \$930K from smart street lighting alone. In addition to annual cost savings of about \$150K, a city such as Yellowknife, Northwest Territories, can see additional benefits from automatic adjustment of smart street lighting²⁵, which can reduce light pollution and increase the visibility of the Northern Lights, contributing to the city's tourism industry²⁶.



**Smart Street Lighting Systems can lead to
annual costs savings of up to...**

\$930K In Kingston

\$150K In Yellowknife

RURAL CONNECTIVITY



The most recent Internet Factbook of the Canadian Internet Registration Authority (CIRA) mentions that 86% of Canadians have access to broadband internet²⁷. Most of those who don't have such access live in rural and remote areas that are underserved by traditional network infrastructure²⁸. However, the government of Canada, through Budget 2019, has set a target of achieving 95% broadband coverage for homes across the country by 2026, and 100% by 2030. To achieve this target, the government is formulating coordinated plans to provide \$5B to \$6B in public and private sector investment to connect underserved communities over the next 10 years²⁹. In addition, Canada's first Minister of Rural Economic Development recently announced a national connectivity strategy called "High-Speed Access for All: Canada's Connectivity Strategy." The new strategy elaborates how the government plans to meet the established connectivity targets and builds on existing investment and funding vehicles³⁰.

Although the value case for traditional last-mile network infrastructure is often hard to prove for rural connectivity, 5G fixed wireless access technologies will provide a cost-efficient way to improve rural connectivity, at up to 40% less cost than Fibre-to-the-Premise (FTTP) deployment³¹. Some Canadian operators are already providing rural connectivity through fixed wireless technologies, and 5G will enable the expansion of these services, utilizing technologies such as MIMO and the additional mid-band spectrum that will become available through the upcoming 3.5GHz auction in 2020.

As network operators evaluate how to extend and enhance coverage to rural areas, there will be increasing benefits to deploy 5G as new spectrum and equipment becomes available. Operators may choose to go directly to 5G (vs. 4G) to future-proof the network investment. This strategy would take advantage of new spectrum bands coming for auction, like 3.5GHz to improve range, and new operational efficiencies, like Virtualization, Mesh networks, and Mobile-Edge-Computing to bring down the costs of operations, traffic, and infrastructure deployment. For the time being, we have estimated the benefits based on closing the broadband connectivity gap. While this benefit materializes no matter which technology is deployed for high-speed broadband access, 5G can help close the gap and may be the preferred choice of operators in many regions.

Broadband internet can bring significant economic benefits. High-speed internet enables businesses to access national and global labour markets to harness efficiencies and skills. It also enables citizens in rural areas to participate in the labour force remotely. Surveys have shown that 20% of Canadians with reliable home internet very often work from home³². In addition, high-speed internet improves access to services associated with greater economic prosperity, such as e-commerce, e-learning, and better infrastructure and access for educational services. 5G in particular can make job types and functional roles, such as machine control, available remotely³³.

Studies have shown that a 10% increase in broadband penetration can achieve a 0.9% to 1.5% increase in GDP growth³⁴. Applying these figures to Canadian rural regions shows significant economic benefits. In Saskatchewan, a province with 296 rural municipalities³⁵ and 33% of the population living in rural regions³⁶, only 75% of households have access to broadband services³⁷. In a scenario where the province achieves the Canadian government target of 95% broadband service availability, Saskatchewan can expect a potential increase in GDP of up to \$1.2B³⁸. Similarly, Nova Scotia and Newfoundland and Labrador have a 43% and a 42% rural population respectively³⁹. Elevating broadband service availability in Nova Scotia and Newfoundland and Labrador from the current levels (79% and 78% respectively)⁴⁰ to government targets can result in a potential increase in GDP of up to \$520M and \$430M respectively⁴¹.



5G can help extend broadband coverage to rural Canada through Fixed Wireless Access Which can lead to potential GDP increases of

\$1.2B

In Saskatchewan

\$520M

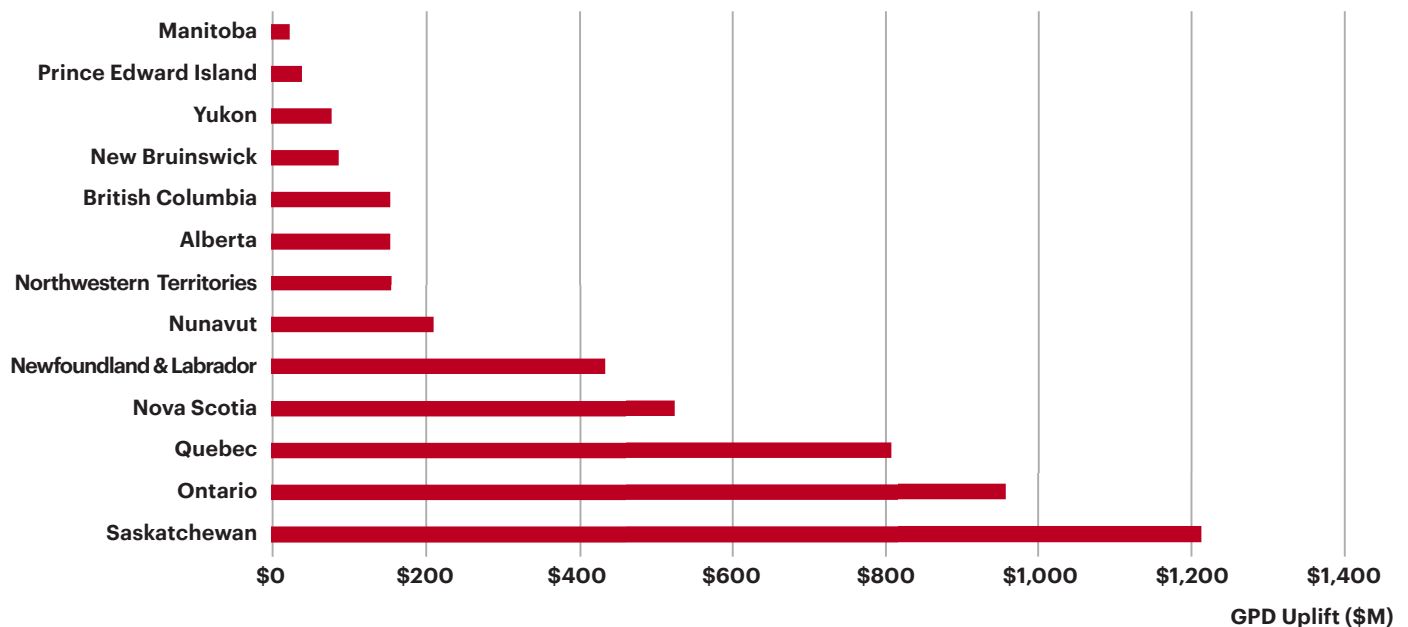
In Nova Scotia

\$430M

**In Newfoundland
& Labrador**

As economic benefits from increased broadband penetration are not limited to rural regions, all Canadian provinces and territories can expect significant GDP impacts as 5G technologies provide new avenues for achieving higher broadband service availability. In a scenario in which the government's broadband availability target of 95% is achieved across all Canadian provinces and territories, significant GDP impacts can be realized as shown below. Impacts on provincial GDP vary depending on current broadband service availability and current GDP of different Canadian provinces and territories⁴².

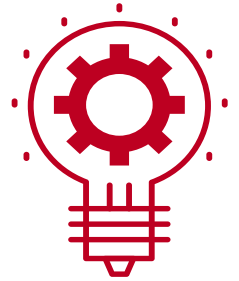
Expected GDP uplift from achieving government broadband penetration targets in every province/territory



PATH TOWARDS THE FUTURE

Accelerating the deployment and adoption of 5G use cases in Canadian cities and rural communities will rely on three key actions: encouraging innovation in advanced technologies, encouraging investments in wireless infrastructure, and enabling ecosystems to collaborate in deploying innovative use cases.

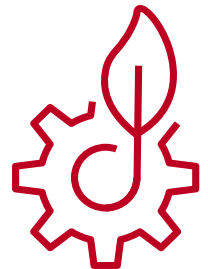
1. Encouraging Innovation



2. Encouraging Investment



3. Ecosystem Enablement



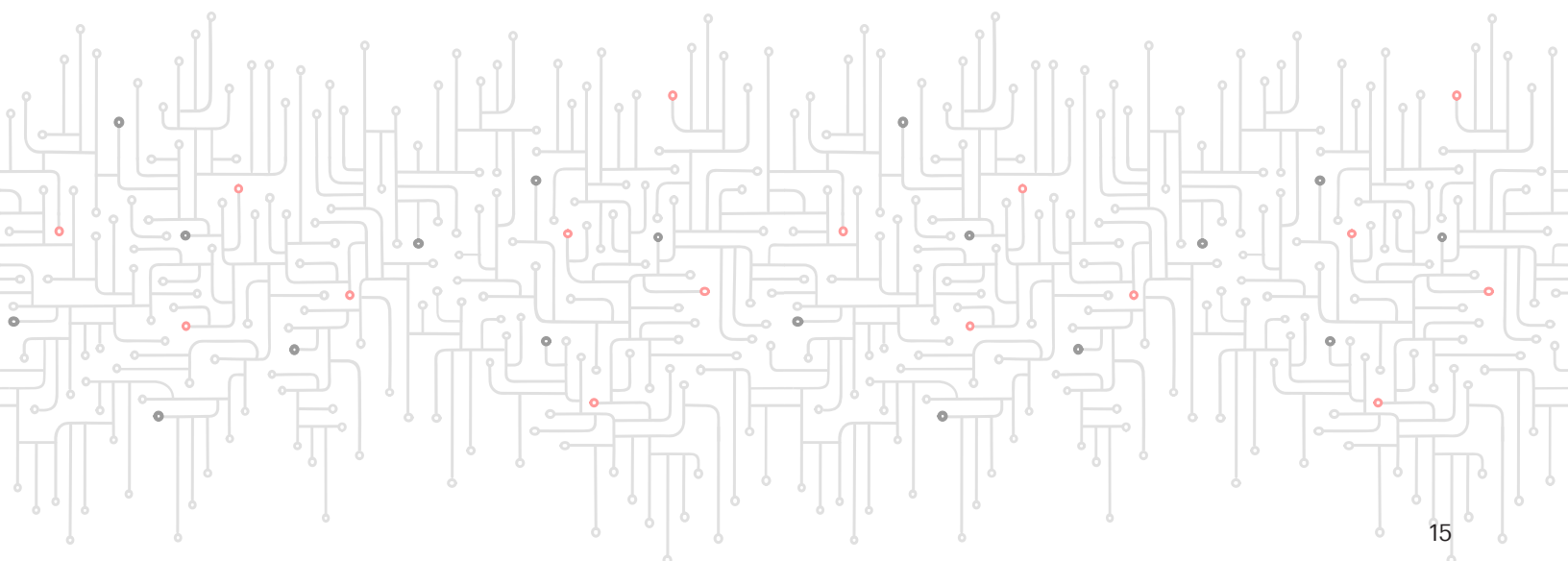
ENCOURAGING INNOVATION



Canadian government agencies are using targeted programs to encourage innovation in technological solutions that benefit cities and rural communities.

For example, to encourage innovation in 5G mobile urban applications, Innovation, Science, and Economic Development (ISED) published a request for proposal for a millimeter wave (wireless spectrum used for 5G) testbed focusing on demonstrating 5G capabilities and deployment in challenging locations⁴³. In addition, in 2018, the government of Canada launched the Smart Cities Challenge, an initiative to encourage communities across the country to develop innovative solutions leveraging technology and connectivity advancements to improve the lives of citizens. Such an initiative, which attracted over 200 communities, not only enables winning solutions with government grants, but also pushes communities to think about major challenges in technology adoption, connectivity, partnership development, and funding.

Initiatives such as these play an important role in encouraging the innovation and adoption of advanced technology that are necessary to realize the full potential of 5G. To realize the benefits for Canadian cities and rural communities, governments at all levels should continue to play this role.



ENCOURAGING INVESTMENT



The Canadian government helps create a regulatory framework that encourages investments in advancing the Canadian network infrastructure. This framework is becoming of increasing importance, as building the nation's 5G network will require significant investments from facilities-based wireless providers – investments estimated at close to \$26B⁴⁴.

As one measure to encourage investments, the federal government in 2018 increased the capital cost allowance through the Accelerated Investment Initiative. Increasing the capital cost allowance will impact how quickly companies can write down investment in longer-term equipment, including 5G network infrastructure, making it easier for Canadian facilities-based wireless providers to make such significant investments. The federal government expects this initiative to help accelerate the deployment of 5G and the expansion of network coverage to underserved areas⁴⁵.

However, timely and efficient use of this investment can benefit from modernization and streamlining of relevant administrative processes for 5G deployment. This includes shorter approval timelines, appropriate exemptions, and reasonable and non-discriminatory fees for accessing and using government infrastructure⁴⁶.

The government's ability to encourage investment in wireless infrastructure will continue to be a key success factor enabling Canadian cities and rural communities alike to realize the expected benefits of 5G.

ECOSYSTEM ENABLEMENT



Leveraging 5G to enable innovative use cases will often require coordination between several partners that bring complementary methodologies to address solution outcomes and ROI targets. For example, implementing a smart traffic management system will require coordination among city and provincial governments, telecom operators, equipment manufacturers, software platform developers, system integrators and several other entities. With the benefits of such an application spanning financial, societal, and environmental impacts, establishing value cases to ensure sufficient return on investment for ecosystem partners becomes a lengthy and complex process. Encouraging a robust ecosystem enablement and management framework is therefore a major success factor.

Such a framework should rely on several key enablers. Long-term strategic planning should consider holistic city needs, focus on adoption of technologies enabling a wide range of use cases, and continuously gather feedback from ecosystem partners as well as public constituents. In addition, sustainable financing programs should be established with committed funding partners, in alignment with technology adoption and scalable solution roadmaps. Finally, governance models should be in place to streamline decision making and ensure alignment among ecosystem partners.

A recent example of ecosystem collaboration is the Ottawa L5 testing facility for connected and autonomous vehicles. In this facility, several ecosystem partners spanning technology development, connectivity infrastructure, research institutions, and local government are collaborating to provide a reliable and safe testing facility for automation and artificial intelligence applications contributing to the development of autonomous vehicles⁴⁷.

5G is a core part of the infrastructure deployed for this test site in Ottawa. Delivering the solutions developed at Ottawa L5 facility at scale to realize benefits across Canada will require this infrastructure to be deployed in one city and one rural community at a time.



About this Research

This study was commissioned by the Canadian Wireless Telecommunications Association (CWTA) and conducted by Accenture Strategy, Accenture Network and Communications Industry Practice with support from Accenture Research. Benefits were estimated for select 5G use cases applicable to select cities and rural communities across Canada. Benefits were calculated based on identified data points through research, in most cases referencing examples of technology benefits that have been realized pre-5G, where the technology deployment is more likely to scale when 5G becomes available in a particular region.

NOTES

- ¹ Qualcomm – 5G FAQ
URL: <https://www.qualcomm.com/invention/5g/what-is-5g>
- ² Wired – The Wired Guide to 5G
URL: <https://www.wired.com/story/wired-guide-5g/>
- ³ Accenture Strategy – Fuel for Innovation: Canada's Path in the Race to 5G
URL: <https://www.5gcc.ca/resources/>
- ⁴ INRIX Global Traffic Scorecard
URL: <http://inrix.com/scorecard/>
- ⁵ European Commission - Identification and Quantification of Key Socio-economic Data to Support Strategic Planning for the Introduction of 5G in Europe
URL: https://connectcentre.ie/wp-content/uploads/2016/10/EC-Study_5G-in-Europe.pdf
- ⁶ Infrastructure Canada – Smart Cities Challenge
URL: <https://www.infrastructure.gc.ca/cities-villes/profiles-profil-eng.html>
- ⁷ Accenture Analysis
- ⁸ Ibid
- ⁹ Ibid
- ¹⁰ Canola Council of Canada – Markets & Stats URL: <https://www.canolacouncil.org/markets-stats/statistics>
- ¹¹ European Parliament - Precision Agriculture and the Future of Farming in Europe URL: [http://www.europarl.europa.eu/RegData/etudes/STUD/2016/581892/EPRS_STU\(2016\)581892_EN.pdf](http://www.europarl.europa.eu/RegData/etudes/STUD/2016/581892/EPRS_STU(2016)581892_EN.pdf)
- ¹² Accenture Analysis
- ¹³ Ibid
- ¹⁴ UAS Weekly, Oct 24, 2018 - Global UAV, Major Telecom and VineView Perform 4G Supported Agriculture Survey at Jöst Vineyards
URL: <https://uasweekly.com/2018/10/24/global-uav-major-telecom-and-vineview-perform-4g-supported-agriculture-survey-at-jost-vineyards/>
- ¹⁵ Agriculture and Agri-Food Canada - Demystifying the Status of Grapevine Viruses in British Columbia
URL: <https://brocku.ca/ccovi/wp-content/uploads/sites/125/2016-03-02.-CCOVI-Lecture-Series.-Urbez-Torres-Grapevine-viruses-in-BC.pdf>
- ¹⁶ Accenture Analysis
- ¹⁷ Shady S. Atallah, et al - Economic Impact of Grapevine Leafroll Disease on Vitis vinifera cv. Cabernet franc in Finger Lakes Vineyards of New York
URL: <https://www.ajevonline.org/content/63/1/73>
- ¹⁸ Statistics Canada – Energy Supply and Demand 2017
URL: <https://www150.statcan.gc.ca/n1/daily-quotidien/181220/dq181220e-eng.htm>
- ¹⁹ Ibid
- ²⁰ O2 – The value of 5G for cities and communities URL: <http://www.mobileuk.org/cms-assets/O2%20Smart%20Cities.pdf>
- ²¹ EnergyRates.ca
URL: <https://energyrates.ca/the-main-electricity-sources-in-canada-by-province/>
- ²² Accenture Analysis on: BNN Bloomberg - Toronto electricity bills highest in Canada, study finds
URL: <https://www.bnnbloomberg.ca/toronto-electricity-bills-highest-in-canada-study-finds-1.809441>
Statistics Canada - Census 2016
URL: <https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/index-eng.cfm>
- ²³ LEDs Magazine, April 11th, 2018 - Toronto Town Settles on Smart Lights for Now
URL: <https://www.ledsmagazine.com/articles/2018/04/toronto-town-settles-on-smart-lights-for-now.html>
- ²⁴ CISION, Feb 7th, 2018 - Bell and City of Kingston Partner for Smart City Program
URL: <https://www.newswire.ca/news-releases/bell-and-city-of-kingston-partner-for-smart-city-program-673114793.html>
- ²⁵ Accenture Analysis
- ²⁶ Infrastructure Canada, Smart Cities Challenge – City of Yellowknife
URL: <https://www.infrastructure.gc.ca/cities-villes/videos/yellowknife-eng.html>
- ²⁷ Cira – Canada Internet Factbook 2019
URL: <https://cira.ca/factbook/canada%E2%80%99s-internet-factbook-2018>
- ²⁸ Canada House of Commons - Broadband Connectivity in Rural Canada: Overcoming the Digital Divide
URL: <http://www.ourcommons.ca/Content/Committee/421/INDU/Reports/RP9711342/indurp11/indurp11-e.pdf>

- ²⁹ Government of Canada – Budget 2019 URL: <https://www.budget.gc.ca/2019/docs/nrc/infrastructure-infrastructures-internet-en.html>
- ³⁰ Infrastructure Canada - Address by Bernadette Jordan Minister of Rural Economic Development at the Launch of the Rural Economic Development and Connectivity Strategies URL: <https://www.canada.ca/en/office-infrastructure/news/2019/06/addressbybernadette-jordanminister-of-rural-economic-development-at-the-launch-of-the-rural-economic-development-and-connectivity-strategies.html>
- ³¹ SNS Telecom & IT - 5G for FWA (Fixed Wireless Access): Opportunities, Challenges, Strategies & Forecasts URL: <http://www.snstelecom.com/5gfw>
- ³² Cira – Canada Internet Factbook 2019 URL: <https://cira.ca/factbook/canada%E2%80%99s-internet-factbook-2018>
- ³³ <https://qz.com/work/1707685/how-5g-will-transform-our-ability-to-work-from-home/>
- ³⁴ ITU – Impact of Broadband on the Economy URL: https://www.itu.int/ITU-D/treg/broadband/ITU-BB-Reports_Impact-of-Broadband-on-the-Economy.pdf
- ³⁵ State of Rural Canada – Saskatchewan URL: <http://sorc.crrf.ca/saskatchewan/>
- ³⁶ Statistics Canada – 2016 Census, Population and Dwelling Count Highlight Tables URL: <https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/hlt-fst/pd-pl/Table.cfm?Lang=Eng&T=703&SR=1&S=87&O=A&RPP=25>
- ³⁷ CRTC – Communications Monitoring Report 2018 URL: <https://crtc.gc.ca/eng/publications/reports/policymonitoring/2018/cmr3c.htm> *Service availability figures for 25Mbps broadband are used in this analysis*
- ³⁸ Accenture Analysis on: CRTC – Communications Monitoring Report 2018 URL: <https://crtc.gc.ca/eng/publications/reports/policymonitoring/2018/cmr3c.htm> Statistics Canada - GDP, expenditure-based, provincial and territorial, annual URL: <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3610022201> *The broadband availability targets highlighted in Budget 2019 are focused on 50/10 Mbps broadband services. However, the analysis focused on achieving 95% service availability for the current high-speed standard of 25Mbps to quantify economic benefits, as several provinces are still underserved with respect to 25Mbps broadband, especially the ones with higher percentages of rural population.*
- ³⁹ Statistics Canada – 2016 Census, Population and Dwelling Count Highlight Tables URL: <https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/hlt-fst/pd-pl/Table.cfm?Lang=Eng&T=703&SR=1&S=87&O=A&RPP=25>
- ⁴⁰ CRTC – Communications Monitoring Report 2018 URL: <https://crtc.gc.ca/eng/publications/reports/policymonitoring/2018/cmr3c.htm> *Service availability figures for 25Mbps broadband are used in this analysis*
- ⁴¹ Accenture Analysis on: CRTC – Communications Monitoring Report 2018 URL: <https://crtc.gc.ca/eng/publications/reports/policymonitoring/2018/cmr3c.htm> Statistics Canada - GDP, expenditure-based, provincial and territorial, annual URL: <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3610022201>
- ⁴² Accenture Analysis on: CRTC – Communications Monitoring Report 2018 URL: <https://crtc.gc.ca/eng/publications/reports/policymonitoring/2018/cmr3c.htm> Statistics Canada - GDP, expenditure-based, provincial and territorial, annual URL: <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=3610022201> *The broadband availability targets highlighted in Budget 2019 are focused on 50/10 Mbps broadband services. However, the analysis focused on achieving 95% service availability for the current high-speed standard of 25Mbps to quantify economic benefits, as several provinces are still underserved with respect to 25Mbps broadband*
- ⁴³ 5G Canada Council – 5G Canada Review URL: https://www.5gcc.ca/?mailpoet_router&end-point=view_in_browser&action=view&data=WzA-slmNmMjFkZDFjZmUxNCIsMCwwLDE2LDFd
- ⁴⁴ Accenture Strategy – Fuel for Innovation: Canada's Path in the Race to 5G URL: <https://www.5gcc.ca/resources/>
- ⁴⁵ Government of Canada – Budget 2019 URL: <https://www.budget.gc.ca/2019/docs/plan/chap-02-en.html>
- ⁴⁶ Accenture Strategy – Fuel for Innovation: Canada's Path in the Race to 5G URL: <https://www.5gcc.ca/resources/>
- ⁴⁷ Invest Ottawa – Ottawa L5 Testing Facilities URL: <https://www.investottawa.ca/ottawal5-about/>

JOIN THE CONVERSATION



@AccentureStrat
@accenturecomms



[www.linkedin.com/company/
accenture-strategy](http://www.linkedin.com/company/accenture-strategy)

CONTACT THE AUTHORS

EXECUTIVE OVERSIGHT:

Tejas Rao

tejas.rao@accenture.com

Peters Suh

peters.suh@accenture.com

Jefferson Wang

jefferson.e.wang@accenture.com

Hillol Roy

hillol.g.roy@accenture.com

Majed Al Amine

majed.al.amine@accenture.com

LEAD AUTHORS:

David Safer

Accenture Strategy, Communication, Media & Technology

david.m.safer@accenture.com

Mourad Soliman

Accenture Strategy, Communication, Media & Technology

mourad.soliman@accenture.com

Alex Alexa

Accenture Strategy, Communication, Media & Technology

alexandru.alex@accenture.com

ABOUT ACCENTURE

Accenture is a leading global professional services company, providing a broad range of services and solutions in strategy, consulting, digital, technology and operations. Combining unmatched experience and specialized skills across more than 40 industries and all business functions—underpinned by the world’s largest delivery network—Accenture works at the intersection of business and technology to help clients improve their performance and create sustainable value for their stakeholders. With 482,000 people serving clients in more than 120 countries, Accenture drives innovation to improve the way the world works and lives. Visit us at www.accenture.com.

ABOUT ACCENTURE STRATEGY

Accenture Strategy combines deep industry expertise, advanced analytics capabilities and human-led design methodologies that enable clients to act with speed and confidence. By identifying clear, actionable paths to accelerate competitive agility, Accenture Strategy helps leaders in the C-suite envision and execute strategies that drive growth in the face of digital transformation. For more information, follow @AccentureStrat or visit www.accenture.com/strategy.

ABOUT ACCENTURE NETWORK

Accenture’s Network practice provides consulting and technology services to help telecommunications operators accelerate the deployment of next generation networks, launch digital services and optimize network operations. Please visit www.accenture.com/network.