Getting it wrong in "Getting it right: Preparing for 5G deployment in your municipality"

In February 2020, the Federation of Canadian Municipalities (FCM) published Getting it Right: Preparing for 5G deployment in your municipality, a guide designed to help municipalities deal with the practical, policy and logistical implications of 5G technology in local communities.

This FCM document contains several half-truths, mistruths and framing tactics – listed below – which result in a biased, misleading and generally inaccurate guide.

The document did, however, get *some* things right. Part 2 of this summary outlines those points.

Part 1: Getting it Wrong

Misconception 1 **The fifth generation of wireless technology (is) a necessity if Canada is to remain competitive on the world stage**. (p.4)

Fact **The benefits of 5G are dubious at best, and are they worth the costs?**

There has been no cost-benefit analysis of 5G to see if its consequences and risks, including the costs stemming from security and data breaches, environmental damage, liability claims, lost productivity due to radiofrequency radiation-induced illness, and increased healthcare requirements, outweigh its benefits.

Driven by the belief that digital technology is neutral and therefore carries no unintended consequences or risks, politicians, policy makers, and society are ignoring the science-backed evidence that urges us to exercise precaution when investing in infrastructure that is wireless-dependent.

Learn more here:

1. Women's College Hospital, Toronto, Impacts of Wireless Technology on Health: A symposium for Ontario's medical community, 31 May 2019
Video of Presentation by Dr. Magda Havas: Impacts of EMFs on health in the community

2. Schneier, B. (2019, September 25). Essays: Every Part of the Supply Chain Can Be Attacked – Schneier on Security – as published in the New York Times

3. Zarrett, David. (2020, February 19). Threats to security, health, public infrastructure.and other potential costs of Canada's 5G rollout. Macleans

Misconception 2 5G is key to profiting and benefiting from enhanced connectivity and "Smart Cities."

"Connectivity has become essential for any community's economic, cultural and social development." President's Message (p.4)

"For municipal officials, the IoT translates into "smart cities" where countless data points generated by citizens, sensors and assets allow you to monitor traffic and parking, water, wastewater, storm water, bus and rail stops, etc. This would also allow municipalities to make adjustments, or allow systems to make adjustments on their own, as needed." (p.8)

Fact 5G is not the pinnacle of connectivity; wired fiber optic networks are.

From resource and energy monitoring and management to improved emergency, educational and health care services, most of the smart city applications 5G promises can be provided by fiber optic cables connected directly to each premise - without the threats wireless 5G poses to privacy, national security, energy consumption, the environment and public health. A few of 5G's perks - like autonomous vehicles - cannot be delivered by wired fiber networks. However, experts warn that self-driving cars are risk and liability laden, and that 5G will likely not be able to support them.

Learn more here:

1. The Benefits of Wired Smart Cities, Connected Communities

2. Schoechle, Timothy. (2018). Reinventing Wires: The Future of Landlines and Networks. The National Institute of Law and Public Policy

3. Dawson, Doug. (2019). The Myth of 5G and Driverless Cars. CircleID

4. Jones Day law firm. (2017, November). Legal issues Related to the Development of Automated, Autonomous and Connected Cars. A White Paper

Misconception 3 5G is the wireless industry's solution to our ever-increasing wireless data consumption.

"The trend toward greater connectivity will only accelerate. The use of wireless Internet connected devices in our communities is exploding. The advent of fifth generation (5G) wireless networks is the industry's response to this growth and the desire to further leverage the potential of the Internet." (p.6)

Fact **The main industry drivers behind 5G – Huawei, Ericsson and Qualcomm – admit they developed 5G by recognizing trends and opportunities. Consumers would not be consuming more and more data if an endless stream of wireless products were not being marketed and sold. Our growing wireless data consumption has serious environmental implications.**

Which came first – our skyrocketing data usage or industry's plan to sell us a wireless world that is dependent upon us consuming more and more data? Wireless technology uses 10 times more energy than wired technology does. Experts warn our environment cannot support unlimited digital consumption.

Industry is not providing 5G as a public service. When asked about the motivation driving 5G at a December 2016 meeting of *The Institute of Electrical and Electronics Engineers* (IEEE), respected industry expert and Senior Huawei Researcher Dr. H. Anthony Chan stated: "…if technology does not change, the company will die…it is about more jobs…engineering and manufacturing... People must buy a new phone."

Learn more here:

1. A GSA Executive Report from Ericsson, Huawei and Qualcomm. (2015, November). The Road to 5G: Drivers, Applications, Requirements and Technical Development

2. The Shift Project. (2019, March). Lean ICT: Towards "Digital Sobriety": Our New Report on the Environmental Impact of ICT

3. The Shift Project. (2019, July). Climate Crisis: The Unsustainable use of Online Video: Our new Report on the Environmental Impact of ICT

Misconception 4 **5G will bring us the fastest Internet possible**.

"Once fully deployed, 5G technology promises maximum theoretical speeds in the 10 Gbps range, at least 100 times faster than top theoretical speeds for existing 4G technology (up to 1,000 times faster than actual speeds in some circumstances). To get a sense of this change, downloading a two-hour movie will take less than four seconds versus approximately six minutes on existing 4G networks. (Note that consumer technology will also have to catch up as many existing devices are not 5G capable.) (p.7)

Fact **New breakthroughs in fiber optics offers real-time transmission of 200 Gbps. *This is 20 times faster* than the maximum theoretical speed of wireless 5G.**

Learn more here:

Brown, Mike. (2020, January 2). A Fiber Optic Breakthrough Could Beat 5G for Rural Internet Access. Inverse

Misconception 5 **"5G technology will outperform traditional land connections in some cases, making home routers a thing of the past."** (p.7)

Fact **5G may be faster than Internet provided through copper wires or coaxial cable, but it will never be faster than fiber wired directly to the premises.**

Wireless signals can never be as fast as the fiber cables that transport data to antennas.

Learn more here:

Schoechle, Timothy. (2018). Reinventing Wires: The Future of Landlines and Networks. The National Institute of Law and Public Policy

Misconception 6 **"More significantly, 5G networks are key to opening up the potential of the "Internet of Things" (IoT).** (p.7)

Fact **A balanced and informed discussion of the IoT will include its potential, as well as its pitfalls. This discussion would include:**

Privacy and National Security issues related to the IoT:

- Smart devices are easily hacked and controlled,
- They allow for increased surveillance, and potentially nefarious military and paramilitary capabilities such as "swarming" and robotic attack missions,
- They permit our personal data to be tracked and sold.

Environmental and Social Costs of the IoT:

- Powering , manufacturing and storing the data from trillions of sensor-equipped and chipped devices demands huge amounts of energy and resources,
- Massive amounts of e-waste will be generated due to planned obsolescence,
- An increasingly automated world threatens job security and heightens tech addiction,
- Mining for the rare minerals needed to make these devices is causing untold human suffering.

Learn more here:

1. Halpern, Sue. (2019, April 26). The Terrifying Potential of the 5G Network. The New Yorker

2. Congressional Research Service. (2020, May 22). National Security Implications of 5th Generation (5G) Mobile Technologies. A Report from the U.S. Congressional Research Service

3. Bordage, Frederic. (2019, October). The Environmental Footprint of the Digital World Summary. A Report from Green IT.fr

4. McLelland, Callum. (2020, January 15). The Impact of Artificial Intelligence - Widespread Job Losses. Retrieved from IoT for all

5. Annie Kelley. (2019, December 16). Apple and Google named in US lawsuit over Congolese child cobalt mining deaths. The Guardian

Misconception 7 There are no Health Risks associated with 5G.

> **"**Health Canada ensures that 5G installations comply with all existing safety regulations, including Safety Code 6 (SC6), which determines exposure limits for wireless devices and their associated infrastructure. Canada's limits are consistent with the science-based standards used in other countries. Large safety margins have been incorporated into these limits to provide a significant level of protection for the general public and personnel working near radio frequency sources." (p.23)

Fact **There is ample peer-reviewed science linking non-thermal radio frequency radiation (RFR) to biological harm. Countries such as Italy, Switzerland and Russia have radiation exposure limits many times more protective than ours.**

> In 1976, the US Naval Medical Research Institute published a bibliography of 3,700 scientific papers on the thermal and non-thermal biological effects of RFR. The body of scientific evidence on the health implications of the non-thermal effects of RFR has grown exponentially since.
>
> "Health Canada's 2015 guidelines for human exposure to non-ionizing radiation (Safety Code 6) were out of date before they were published, and the review process was flawed," says Dr. Meg Sears, PhD, Chair of Ottawa-based *Prevent Cancer Now*. "Hundreds of peer-reviewed, published studies show that radiofrequency (RF) radiation can cause cancers, damage sperm and DNA, impair reproduction, learning and memory, and more. We should be limiting public exposure, not increasing it."

"We have sufficient data to classify RF radiation as a Group 1, known human carcinogen, along with, for example, asbestos and tobacco smoke," states Dr. Anthony Miller MD, Professor Emeritus of the Dalla Lana School of Public Health, University of Toronto, who worked with the International Agency for Research on Cancer on the 2011 scientific review.

When the U.S. Naval Medical Research Institute identified the risks in 1976, governments should have limited the scope of technological change, and created radiation exposure standards that protected the public from harm. Instead, the evidence was hidden and ignored, and industry-influenced bodies like ICNIRP created the standards that Health Canada still emulates today.

Learn more here:

1. Peer Reviewed Scientific Research on Wireless Health Effects ~ Environmental Health Trust
2. 5G Telecommunications Science - Physicians for Safe Technology
3. Lai, Henry. (2019). Research Summaries of RFR scientific Literature. Retrieved from Bioiniative.org

Misconception 8 Innovation Science and Economic Development Canada (ISED) regularly audits antenna sites to make sure they are safe.

"ISED's regulatory framework, including market surveillance and compliance audits, provides safeguards to protect Canadians against overexposure from wireless devices and antenna installations." (p. 23)

Fact ISED relies on cell tower operators to make sure their sites comply with Safety Code 6. Given how 5G and the IoT work, operators cannot accurately measure citizens radiofrequency radiation exposure.

Much like the fox watching the henhouse, ISED asks cell tower operators to self-monitor how much radiofrequency radiation their antenna sites are emitting. The tests these telecoms do are often software generated, and prone to inaccuracies.

ISED requires operators to "consider, in addition to their own radio system, the contributions of all existing radiocommunication installations within the local radio environment". Given that 5G requires potentially dozens of small cell antennas on one street, and that millimetre wave 5G works "on demand", it is impossible for an operator to take an accurate and consistent field measurement of the RF exposure residents are receiving on a daily basis.

For software-generated audits of 5G RF exposure to be accurate, operators would need to asses an ever-changing IoT "smart" landscape that includes multiple antenna sites owned by multiple operators as well as the RF-emitting smart infrastructure that 5G is purportedly there to support.

For the past six years, academics have been preparing for the increase in radiofrequency radiation exposure inherent to smart cities, and have been developing potential measurement tools. These measurement systems are much more involved and complex than what ISED now requires, and would likely put the onus on municipalities to monitor and regulate emissions and protect residents' health.

Learn more here:

1. ISED. (2015, March 19). TN-261 Safety Code 6 Radio Frequency Exposure Compliance Evaluation Template

2. Diez, L., Aguero, R. and Munoz, L. (2017, June) Electromagnetic Field Assessment as a Smart City Service: The SmartSantander Use-Case. Retrieved from Sensors (Basel). 17(6): 1250

Part 2: Getting it Right

The FCM's "Preparing for 5G deployment in your municipality" outlines several 5G-related planning and regulatory issues that all municipal governments in Canada should be aware of.

Planning Concerns

"Clusters of small cells can be visually unappealing and create unique safety concerns. They can, in particular, detract from the qualities and integrity of areas such as historical or heritage districts as well as some planned urban environments." (p.24)

Regulatory Concerns

"For stand-alone tower structures, regardless of height, the procedure provides for formal consultations with the municipality as the local land-use planning authority. However, 5G small cell installations on existing structures (towers and non-tower structures such as a building or power pole) are excluded from this requirement as long as the height of the structure is not increased by more than 25 percent." (p.14)

"In practical terms, this means that if the power poles are owned by the provincial utility in your jurisdiction, a carrier could enter into an agreement to install 5G small cell antennas on these poles and not even have to notify your municipality (even if the small cell is added at the top of the pole, as long as the addition is less than 25% of the existing height)." (p.14)

"A grey zone exists with respect to pre-emptive pole replacements by utilities. If a utility were to replace a pole with a much taller one, and then add antennas to it, it would likely fall outside the consultation requirements." (p.16)

Liability Concerns

"... a number of municipalities, even those with comprehensive MAAs in place, are reporting the installation of 5G small cell antennas without their knowledge. Even if they are affixed to someone else's asset—like a power pole—if the antenna is located within the ROW space, it could raise issues of interest to the municipality such as safety concerns for the public and municipal workers." (p.14)

Municipal Rights in Jeopardy

Current Rights

"If a carrier has identified municipal assets (light poles, traffic lights, transit shelters, etc.) as one of its preferred options to install small cell antennas, it has to negotiate with the municipality and come to an agreement. As asset owners, municipalities have the right to refuse access." (p.24)

"Municipalities can refuse antennas on their property, but they cannot refuse the installation of equipment required to connect antennas located on other assets. Municipalities cannot charge occupancy fees for the connecting cables and other equipment installed within the ROW, but they can charge market value for an antenna located on their assets." (p.25)

"Some municipalities have been misinformed by carriers into believing that small cells deployment is already covered in MAA's and that, as a result, carriers enjoy the same conditional right of access for antennas as they do for their cables, etc. This is not the case." (p.25)

Potential Loss of Rights

Telecommunications in Canada is currently under two review processes:

1. The Report of the Broadcasting and Telecommunications Legislative Review Panel

In its January 2020 report, the Panel reviewed the governance framework for antennas and the issue of access to municipal infrastructure for network deployment.

2. The CRTC Telecom Notice 2019-57 – Review of Wireless Services

In this national consultation regarding the future of wireless services in Canada, access to municipal infrastructure is an important theme.

How These Two Review Processes May Affect Municipal Governments in Canada:

1) If Recommendations 22, and 34-37 of the Legislative Review Panel's Report are passed:

- Jurisdiction over antenna siting—including small cells for 5G—will be transferred from ISED to the CRTC. (p.11)
- The right of access that carriers currently enjoy within the right-of-way will be extended to encompass all potential support structures. These structures are referred to as "passive infrastructure" in the report, terminology that inaccurately portrays the functionality of a municipality's assets. (p.11)
- Local governments' current ability to refuse telecoms access to municipal assets and property would be lost. (p.11)

2) If the recommendations made by telecommunication carriers to the CRTC Wireless Review are adopted:

- The CRTC will have absolute authority over siting small cells antennas (p.26)
- The CRTC will impose time limits for municipalities to process 5G applications, as well as fee caps, and more. (p.26)

Note on Cost Recovery:

"To date, municipalities have been identifying direct costs (related to the deployment of 5G) such as engineering studies, electricity supply and workforce time, and billing them back to carriers. This seems to be the accepted best practice in Canada for the moment, a practice based in the sound public policy principle that **taxpayers should not be subsidizing the for-profit ventures of the carriers**". (p.23)

Getting it right: Preparing for 5G deployment in your municipality

GUIDE

FCM FEDERATION OF CANADIAN MUNICIPALITIES FÉDÉRATION CANADIENNE DES MUNICIPALITÉS

FCM FEDERATION OF CANADIAN MUNICIPALITIES FÉDÉRATION CANADIENNE DES MUNICIPALITÉS

Disclaimer

This guide has been developed for FCM's municipal members. Information contained within the guide reflects FCM's best understanding and is believed to be accurate at the time of preparation. The material contained in this document is for informational purposes only and is not intended to provide legal advice and should not be relied upon in that regard. Municipalities are encouraged to seek professional legal advice specific to the realities of each municipality. FCM accepts no responsibility for damages, if any, suffered by any party as a result of decisions made or actions based on this document.

Acknowledgements

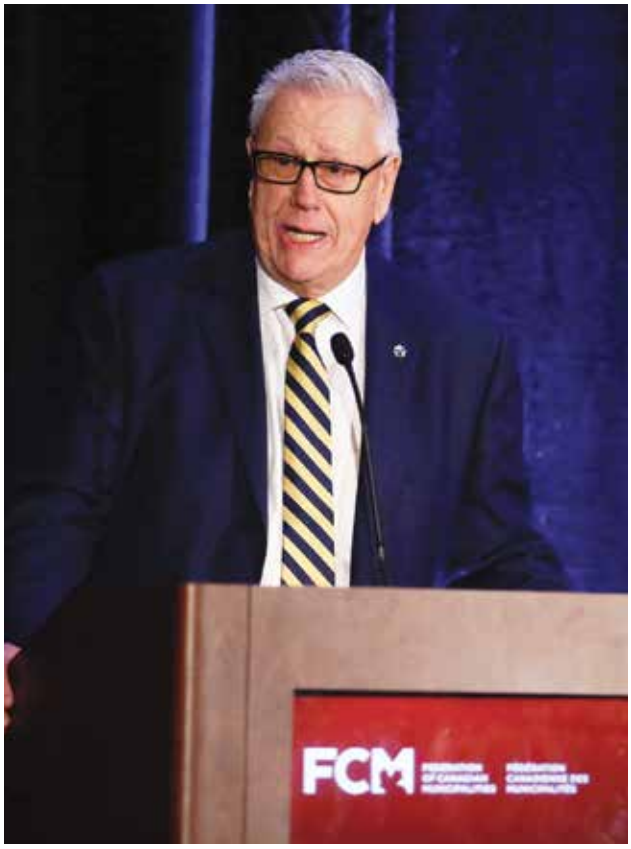
This guide was developed by Professor Stéphane Émard-Chabot, University of Ottawa, under the guidance and review of the FCM Technical Committee on Telecommunications and Rights-of-Way. Review was also provided by the FCM Legal Advisory Committee, and this project was supported by FCM members nationwide through contributions to FCM's Legal Defense Fund.

Federation of Canadian Municipalities
24 Clarence Street Ottawa, Ontario K1N 5P3

An electronic copy of this handbook is available on **fcm.ca**

Contents

President's message



Connectivity has become essential for any community's economic, cultural and social development. Even though important challenges remain in terms of access to basic broadband and wireless services in many smaller and rural municipalities—challenges which FCM continues to address in its work—the next wave of innovation is upon us. Telecommunications carriers, the federal government and the CRTC are gearing up for the deployment of the first components of the fifth generation of wireless technology (or "5G")—a necessity if Canada is to remain competitive on the world stage.

Everyone has heard of 5G, but it is important for municipal officials to grasp and prepare for its practical, policy and logistical implications. From a practical perspective, this technology will revolutionize the place of the Internet in our professional and personal lives, including how municipalities provide services to the public.

5G will also pose challenges in that the infrastructure required is different from anything currently on the ground. In order to achieve its full potential, 5G will rely on vast numbers of small antennas—hundreds of thousands of them—that will become ubiquitous in our environment, each antenna requiring its own power and broadband connections. Furthermore, under the current legislative framework, the antenna and wireline components fall under different regulatory schemes, although this could evolve in the coming years.

Carriers have already stated that, for 5G to be fully deployed, they will require access to various municipal assets: traffic lights, light posts, bus shelters, etc. As with previous waves of communications innovation, municipalities will therefore be key in managing and supporting this deployment for the benefit of their residents and businesses. And FCM will play a leading role in advocating for the municipal sector and assisting municipalities in developing best practices.

This guide is the first practical tool developed by FCM to assist municipal officials as they prepare for 5G deployment in their communities. I wish to thank those who have contributed to this project, in particular the volunteer members of the Technical Committee on Rights-of-Way and the Small Cell Working Group.

As with other FCM resources, this guide provides members with a thorough overview of the information they need and the concrete steps they can take to adapt their individual relationships with carriers, as well as their own internal processes, in order to meet the challenge of 5G. FCM will continue to update this resource as the collective experience and the regulatory framework evolves.

Bill Karsten
FCM President and Councillor,
Halifax Regional Municipality

Connectivity: a new challenge

Connectivity is a crucial factor in ensuring a community's development and prosperity. For this reason, FCM has played a leading role in developing policies, programs, and tools that advocate for universal connectivity. Municipal officials also need help to protect their communities' interest while ensuring the efficient and timely deployment of technology within their jurisdiction. Thanks to the work of its Technical Committee on Rights-of-Way and, more recently, the work of the Small Cell Working Group, FCM has been instrumental in shaping best practices and defending municipal interests.

The trend toward greater connectivity will only accelerate. The use of wireless Internet-connected devices in our communities is exploding. Research shows that our current wireless data consumption has reached approximately 1.8 exabytes (one exabyte is one quintillion bytes) per month in North America alone, and this number is projected to grow six-fold by 2022. The advent of fifth generation (5G) wireless networks is the industry's response to this growth and the desire to further leverage the potential of the Internet. The Government of Canada is also encouraging the deployment of telecommunications infrastructure to meet its broadband and broader connectivity targets, both in urban settings and in rural areas.

5G technology requires entirely new networks comprised of great numbers of small, short-range antennas—"small cells"—to be deployed in order to provide effective coverage. Unless incentives (or even restrictions) to share infrastructure are put in place federally, each carrier will want to deploy its own network of small cells, which means that in some neighbourhoods there will be one small cell per carrier company every few hundred metres. Multiply this by the number of carriers operating in that neighbourhood and you get a sense of the magnitude of the undertaking. Estimates for 5G coverage in Canada set the number of installations at over 275,000 small cells.

The scope of this next wave of technological evolution makes it necessary for both the public and private sector to work closely together to ensure that the benefits of 5G technology become available to residents and businesses in a timely and cost-effective way. As the owners and managers of the right-of-way (ROW) space, as well as many other types of municipal or utility infrastructure (such as elevated tanks, buildings, posts and other possible supporting structures) where carriers want to install their 5G infrastructure, municipalities will have a pivotal role to play in balancing the need to provide connectivity to their communities with the protection of legitimate municipal interests such as safety and cost-recovery.

To assist municipal officials in their work and in tackling the new challenges posed by 5G, this guide seeks to provide readers with a basic understanding of 5G technology, of the current regulatory framework within which the deployment of the new networks will take place, as well as key considerations and emerging best practices municipal officials can take into account in preparing locally.

What is 5G?

5G, quite simply, refers to the "fifth-generation" of industry standards for wireless technology, the next wave in the evolution of mobile networks. While current 4G/LTE (fourth-generation/Long Term Evolution) technology revolutionized the capabilities of mobile handsets and other devices through faster connectivity and enhanced data capability, 5G will take wireless possibilities to a whole new level.

Once fully deployed, 5G technology promises maximum theoretical speeds in the 10 Gbps range, at least 100 times faster than top theoretical speeds for existing 4G technology (up to 1,000 times faster than actual speeds in some circumstances). To get a sense of this change, downloading a two-hour movie will take less than four seconds versus approximately six minutes on existing 4G networks. (Note that consumer technology will also have to catch up as many existing devices are not 5G capable.)

However, 5G is about much more than boosting speeds on your mobile phone. It is ultimately about enabling faster Internet connectivity everywhere and for everyone. In terms of coverage, 5G technology will outperform traditional land connections in some cases, making home routers a thing of the past. More significantly, 5G networks are key to opening up the potential of the "Internet of Things" (IoT), another popular term.

At the moment, most of the data that circulates on the Internet comes from human beings. In order for a news story, a research article, or a photo to find its way onto the web, someone has to create that content and upload it. To make a piece of data available on the Internet, by and large a person has to collect that data, then enter it into a computer. The IoT would allow countless devices, objects and even living beings—people, plants and animals—to be connected and provide accessible data in real time without the need for a human intermediary.

Imagine you own a dairy farm. You currently monitor the health of your cows by observing them and if you feel there is problem, by making certain tests. Now imagine if each cow

had a medical implant wirelessly connected to the Internet. You could consult, in real time on your mobile phone, any number of vital signs for each cow in your herd over the life of each animal. Each component in your car could report its own status, allowing you to make repairs before any real harm is done. Or imagine an implant monitoring your blood-sugar levels and informing you when you actually need a dose of insulin, as well as the size of the dose. Or a chip warning you that the blood markers of an imminent heart attack are present before you notice any symptoms. Smart home devices already on the market are just the tip of this technological iceberg and its potential.

For municipal officials, the IoT translates into "smart cities" where countless data points generated by citizens, sensors and assets allow you to monitor traffic and parking, water, wastewater, storm water, bus and rail stops, etc. This would also allow municipalities to make adjustments, or allow systems to make adjustments on their own, as needed. There are currently pilot projects across the country testing Smart City implementation and how to make use of the data that will flow from 5G to increase the efficiency and effectiveness of services and to respond to emerging needs.

Transportation and computer industry experts suggest the 5G deployments may also be crucial to the eventual use of autonomous vehicles or semi-autonomous driving. New pilot projects on provincial highways are exploring this possibility now.

In short, 5G opens the door to giving more and more things an IP address and connecting them to the Internet using some sort of sensor, allowing them to communicate with us and with each other, without the need for human interaction. This technology will bring new commercial opportunities, new services to residents, and open the door to innovation in the way municipal services are provided and managed.

How does 5G work?

In order to deliver on its promise to connect millions of densely packed devices and sensors, 5G relies on new technical standards as well as new infrastructure.

Without getting into too many technical details, 5G standards rely on a few key changes to achieve the new network's full potential:

- **Greater bandwidth:** the ability to flow more data faster.
- **A different band of the radio spectrum:** different frequencies from current 4G networks.
- **Reduced latency:** the time it takes a device to connect to the network (measured in milliseconds).
- **Full duplex capabilities:** the ability to transmit and receive at the same time, instead of doing one, then the other, sequentially.
- **The ability to "speak" to large numbers of devices at the same time**, instead of switching very quickly between devices as is currently the case.

Of central importance to municipal officials is the fact that these new standards cannot be delivered with existing 4G wireless infrastructure. The larger antennas now found in most neighbourhoods do not operate in the right frequency range. 5G will therefore require an entirely new network of its own, gradually replacing existing mobile networks. The most significant change within the municipal realm is the advent of small cell installations. Although this equipment is relatively small, its range is also limited.

A study by Accenture estimates that achieving the full deployment of 5G in Canada will require the installation of somewhere in the order of 275,000 of these devices and, as you might expect, carriers will want to install these on any number of public assets. Developing business processes and technical parameters for the installation of thousands of these devices within your jurisdiction poses a challenge for municipalities and carriers alike.

The deployment of 5G networks will also require a number of new cell towers ("macro towers"), but the extent of that deployment is not known at this time, nor whether existing sites can accommodate these structures.

What are small cells?

Small cells are low-powered antennas (or "wireless base stations", to use industry language) that function like cells in existing mobile wireless networks, typically covering targeted indoor or localized outdoor areas. It is essential to remember that "wireless" communications are only wireless for the end user. Small cells rely on a number of physical connections to function. In order for the data to flow into or from the Internet, each small cell antenna must be hard-wired into the carrier's underground fibre-optic network. Each antenna is also accompanied by various support or control equipment and requires its own power source. Therefore a fiber optic cable conduit and a power supply conduit might need to be constructed where the cables are located underground.

There are various types of small cells: their size, shape, weight, the way in which they are attached as well as their individual ranges all vary. The smallest are for indoor use, operating on power levels similar to Wi-Fi routers. The largest are for outdoor use and typically consist of a small equipment cabinet (pedestal) and antennas. The antennas are small, mostly smaller than a briefcase, while the pedestals can be as large as fridge-sized cabinets. The larger small cells are often located on existing assets like traffic lights, street lights, crosswalk arms, power utility poles and buildings. Some can be incorporated into LRT or subway platforms, bus shelters, or placed underground, while others are installed in municipal buildings (city hall, libraries, arenas, recreation centres, police and fire stations, etc.).

Unlike traditional cellular equipment, which is placed high up on single cell towers or buildings, small cell technology requires the density of multiple equipment installations clustered closely together, located in proximity to the end user and closer to the ground. While technical needs will vary according to the location and specific device used, providing full 5G coverage

can require small cells as close to each other as every 250 metres. For these reasons, coupled with the high cost of installing dedicated monopoles and the resulting public discontent that sometimes occurs in residential neighbourhoods due to tower proliferation, by installing small cells on existing municipal infrastructure, carriers can also reduce their costs. The collection of photographs at *Appendix A* provides you with a good overview of the variety of small cell installations that are commonly found.

How is the deployment of small cells regulated in Canada?

An evolving landscape

Having a basic understanding of how federal regulations are structured is important for municipal officials dealing with telecommunications issues. This section sets out the fundamentals of these rules. However, the legislative and regulatory landscape for small cells in Canada is currently the subject of two in-depth reviews that could bring about significant changes to this framework.

The first review was undertaken by the federal government. It appointed the *Broadcasting and Telecommunications Legislative Review Panel* to recommend revisions to the statutes that govern all aspects of communications in Canada. The Panel examined issues such as telecommunications, Canadian content creation, net neutrality, cultural diversity, and how to strengthen Canadian media. Of significance to municipalities, the Panel reviewed the governance framework for antennas and the issue of access to municipal infrastructure for network deployment.

The Panel issued its final report in January 2020 (**Full Text**). A number of recommendations (namely 22, and 34 to 37) involve municipalities directly. The Panel proposes transferring jurisdiction over antenna siting—including small cells for 5G—from ISED to the CRTC. The Panel further recommends that the right of access that carriers currently enjoy within the right-of-way be extended to encompass all potential support structures. These structures are referred to as "passive infrastructure", terminology that inaccurately portrays the functionality of a municipality's assets.

Although this is not stated explicitly, there seems to be an assumption on the part of the Panel that municipal consent will be required as per existing requirements under the *Telecommunications Act*—but the ability to refuse access to municipal assets outright would be lost if the Panel's recommendations are adopted. Other recommendations, and several segments of the Panel's "rationale", on the other hand, are supportive of the municipal role and perspective as guardians of the right-of-way.

A summary of FCM's submission to the Panel is set out at Appendix C. At the time of publication, FCM was in the process of determining its official response to the recommendations. The federal government was also still studying the report. FCM will remain engaged in this issue and will update this guide as required.

In a parallel proceeding, the CRTC has embarked on a national consultation regarding the future of wireless services in Canada (**Telecom Notice 2019-57**). FCM is also actively engaged in representing the municipal sector in this process during which access to municipal infrastructure has become an important theme. The consultation phase of this process is expected to wrap up in March 2020 with no definite timeline for a decision from the CRTC. (To access copies of FCM's submissions to the CRTC, follow the links in *Appendix C*.)

In the meantime, please consider the present guide as a living document, which will grow alongside the legislative and regulatory landscape as it evolves.

The current legislative backdrop

All matters pertaining to interprovincial communications fall under federal jurisdiction. As it stands, the federal framework relating to telecommunications in Canada is set out in three key statutes:

- **Telecommunications Act:** The oldest of the statutes, this Act was initially meant to regulate telegraphs. Today, the Act essentially covers all modes of communication that involve a cable or wire. Significantly for municipalities, this Act gives carriers (the word used to designate telecommunications service providers) a right to use municipal ROWs to install, maintain and operate telecommunications infrastructure, subject to municipal consent. The Act is administered by the Canadian Radio-television and Telecommunications Commission (CRTC).
- **Radiocommunication Act:** This statute deals with the technical aspects of communications through transmitted signals: radio, television, cell phones, and the emerging 5G technology. The statute is administered by Industry, Science and Economic Development Canada (ISED), formerly known as Industry Canada. The placement of any towers for transmission antennas, for any consumer or commercial application, must be approved by ISED and the approval process is set out in the Antenna Tower Siting Procedure. Contrary to the *Telecommunications Act*, carriers do not enjoy any rights of access to install transmission antennas, including small cells, and must negotiate access on a case-by-case basis.
- **Broadcasting Act:** Much less relevant to the municipal sector, this statute deals with the management of frequencies, sets out policies regarding such things as Canadian content, and establishes the CBC/Radio-Canada. Most matters under this Act are administered by the CRTC.

When these laws were put in place, telling "telecommunications" and "radiocommunications" apart was simple: a telephone relied on a wire, while watching television or listening to the radio depended on your proximity to an antenna. However, as we all know from our daily lives, this dividing line has become blurred more than ever. Technically, our telephones now rely on transmission antennas, not cables, to function. And we consume most of our content through means, such as fibre-optic cables, that do not involve traditional broadcasters or antennas. We also tend to purchase all our communications services from a single carrier. These dramatic changes are undoubtedly why legislative and regulatory reviews are underway.

For municipal officials, understanding the different set of rules, and how they are applied, is essential to develop bylaws, agreements and practices that protect their municipality's interests while ensuring the latest telecommunications services are available to businesses and residents. Being well versed in how these rules interact will take on even greater importance with the impending deployment of 5G technology.

Wires, cables, and municipal rights of way

If you have limited experience with the carriers operating within your ROW, understanding the rules regarding wireline infrastructure (such as fibre-optic cables) is important in the 5G context since—as we have seen—each small cell antenna has to be connected to the carrier's wire network, typically located within the ROW —usually underground.

When it enacted the *Telecommunications Act*, Parliament did two things. First, it used its jurisdiction to grant carriers a right to access municipal ROW and "other public places" to deploy their networks. Second, Parliament also expressly curtailed the carriers' rights. Under the Act, carriers can only access ROW and other public places with the consent of the municipality. Municipalities are prevented from refusing access to carriers, but they can dictate reasonable terms of access to their ROW through the conditions of their consent.

The conditions you set and the actual tool you decide to use to grant your municipality's "consent" to a carrier's work depends on your municipality's circumstances. FCM's updated handbook *Telecommunications and Rights-of-Way* explores in great detail the best practices that have developed over the last two decades in this field. The Small Cell Guide builds on that expertise, but only provides a cursory overview. You are therefore invited to consult the telecommunications handbook if you are not familiar with this topic.

In essence, there are three options available to you to grant consent for work within the ROW (or in other public places):

- **Ad hoc or individual permits:** If you only receive the occasional request from a carrier to perform work within your municipality's ROW (typical in less densely-populated areas), you might decide to deal with the occasional request from a carrier through ad hoc or individual permits, attaching specific conditions to each permit. Individual agreements can also be used if the carrier is seeking access to public property, other than a ROW, that has unique characteristics such as a park.
- **Municipal access agreements:** The most widely used way of granting blanket consent and setting the terms of access to municipal ROWs is through the negotiation of a mutually-acceptable, comprehensive Municipal Access Agreement (or MAA). MAAs typically cover a host of issues to protect local taxpayers by ensuring direct and indirect costs are not transferred to the municipality (e.g. reinstatement costs, pavement degradation, relocation for municipal works, liabilities, etc.). Please note that site-specific access agreements are also used when dealing with unique properties or assets.
- **Municipal access bylaws:** The Telecommunications Act does not set out the form that municipal consent must take. Theoretically, therefore, consent and terms of access can take the form of a bylaw. A handful of municipalities have opted for this approach and, in some cases, the bylaws have worked well for some time. However, in other municipalities, the carriers have reacted by challenging the bylaws in

court. At the time of publication, cases involving Calgary, Alberta and Gatineau, Quebec are proceeding through the courts so the judicial response to this approach— the definitive interpretation of the word "consent" under the Telecommunications Act— is still unknown.

Regardless of the method used to grant municipal consent, both parties, the municipality as well as the carrier, can turn to the CRTC to resolve disagreements regarding the conditions of access to municipal ROWs. The CRTC has the authority to dictate the specific terms of carrier's access and their decisions can be appealed to the Federal Court of Appeal, with the Court's permission.

One of the central elements of the CRTC's approach has been the principle of cost-neutrality. Under this principle, the CRTC has clearly set out how municipalities can recover all cost elements attributable to the work and presence of telecommunications infrastructure within the ROW. The only cost element the CRTC has consistently rejected is an occupancy fee. Municipalities are not allowed to charge occupancy fees or rent to carriers for the space (even if they do so for other ROW users).

Transmission antennas: towers and small cells

The legal framework for antennas is completely different and is set out under the *Radiocommunication Act*. Contrary to wires and cables, carriers do not have any rights to access property for the purposes of installing transmission antennas. Carriers must negotiate on an equal footing with the owners of the assets where they wish to install an antenna. Typically, carriers purchase or lease the land to install large towers or, if they wish to attach a smaller antenna to an existing structure (rooftop, building wall, utility pole, etc.), they negotiate an occupancy agreement with the owner, which usually includes some form of rent. Of course, any owner is free to refuse.

Once they have secured a location for an antenna, carriers must apply to Innovation, Science and Economic Development Canada (ISED) for technical approval. ISED will assess each application based on the Antenna Systems Procedure (**Client Procedures Circular CPC-2-0-03**). For stand-alone tower structures, regardless of height, the procedure provides for formal consultations with the municipality as the local land-use planning authority. However, 5G small cell installations on existing structures (towers and non-tower structures such as a building or power pole) are excluded from this requirement as long as the height of the structure is not increased by more than 25 percent.

In practical terms, this means that if the power poles are owned by the provincial utility in your jurisdiction, a carrier could enter into an agreement to install 5G small cell antennas on these poles and not even have to notify your municipality (even if the small cell is added at the top of the pole, as long as the addition is less than 25% of the existing height). When the carrier undertakes work within the ROW to connect these antennas to their fibre network, they might approach you for a permit for that part of the process. However, a number of municipalities , even those with comprehensive MAAs in place, are reporting the installation of 5G small cell antennas without their knowledge. Even if they are affixed to someone else's asset—like a power pole—if the antenna is located within the ROW space, it could raise issues of interest to the municipality such as safety concerns for the public and municipal workers. These aspects will be explored in the *Key considerations and emerging best practices* section of this guide.

5G deployment: where wirelines and antennas meet

As explained earlier in this guide, to provide connectivity, 5G networks rely on large numbers of small, short-range antennas. To properly cover a large urban area, several hundred antennas (if not thousands) must be installed throughout the service area. These might be "wireless" as far as the end user is concerned, but for the technology to function, each small cell antenna requires a power source and must usually be physically connected, by a cable, to the rest of the carrier's Internet network.

What this combination means is that 5G deployment simultaneously engages both sets of rules—the antenna regulations and the wireline regulations—and it does so on a very large scale. From a legal and a practical ROW point of view, the deployment of 5G networks potentially engages your municipality in at least six different ways:

1. **Municipality as an asset owner:** Carriers must obtain the consent of any property owner in order to place an antenna. Therefore, if a carrier wishes to install an antenna on a municipal asset, it cannot proceed without the full agreement of the municipality. Conditions of access to a supporting structure for each small cell antenna (traffic light, bus shelter, light standard, hydro pole, etc.) will have to be negotiated between the carrier and the owner of the structure. As we will explore further below, conditions typically include assigning liability, accessing a power source, maintenance, occupancy fees, worker safety, etc. In negotiating access, a municipality should feel free to impose any reasonable conditions to safeguard its interests. Like other private property owners, municipalities typically receive rent from carriers for any antennas installed on their property.

2. **Municipality as the ROW owner/custodian:** Each small cell will have to be connected to the 5G network through cables to transmit the data captured by the small cells or to deliver data to the wireless users and devices. This wire connection component of a carrier's 5G network will likely be located within your ROW and could require the installation of pedestals or cabinets at grade. As per the rules applicable to wire-line infrastructure, carriers have a right to use the ROW space for these installations but, as we have seen, this right is subject to the terms of your municipality's consent. Disagreements on the terms of access can be brought to the CRTC by either party for resolution.

3. **Municipality as land use planning authority:** In 2014, the FCM was successful in advocating for regulatory amendments to the federal government's Antenna Siting Procedure that previously exempted smaller supporting structures (notably towers under 15 metres in height) from the public consultation requirements. The updated federal procedure requires consultation with the municipality and the public for all tower installations, regardless of height. In the 5G context, in the absence of a readily-available supporting structure, carriers might ask to place their own dedicated poles (or "mono-poles," in 5G parlance—see *Appendix A* for images) within the ROW or elsewhere, to support a small cell antenna. Officially, the request to install a supporting structure would trigger the formal public consultation requirements with the land use planning authority, set out in ISED's procedure. Practically, since the carrier would have to seek permission from the municipality as the owner of the land on which the monopole is to be installed, both processes would likely unfold simultaneously.

   Installations to existing towers or other existing structures such as power poles or buildings do not trigger the formal consultation requirement set out in CPC-2-0-03 unless the installation would result in an increase in height, of the existing structure, of more than 25 percent. A grey zone exists with respect to pre-emptive pole replacements by utilities. If a utility were to replace a pole with a much taller one, and then add antennas to it, it would likely fall outside the consultation requirements.

   (Please note that, in addition to the changes to the federal framework, FCM negotiated a comprehensive Antenna System Siting Protocol Template with the Canadian Wireless Telecommunications Association. This template is not mandatory and has no legal force unless it is used by a municipality and a carrier to enter into an agreement that complements the federal consultation requirements and reflects local considerations.)

4. **Municipality as building code enforcement authority:** If a carrier wishes to attach a transmission antenna to an existing privately-owned building or structure, municipalities should feel free to require a building permit application if they have any concerns regarding the effects of the installation on the structure. The rationale for this requirement is the same as for any other change to an existing structure and FCM is of the view that this approach is legally and constitutionally sound.

5. **Municipality as utility:** Each small cell installation requires a dedicated power supply (although battery back-ups are being reviewed by some manufacturers). If your municipality also owns the local power utility, or acts as the utility itself, it will also have to consider the technical requirements for these power connections, as well as determine how to metre and bill for each antenna's electricity usage. There is no expectation that the utility will simply allow carriers to plug in to their power source and use electricity without paying for it. Some municipalities have calculated an annual rate for non-metered power connections as the power utility, or with the agreement of the power provider.

6. **Municipality as legislator:** Municipalities also enjoy a number of lawmaking powers through the adoption of bylaws. However, municipal officials should keep in mind that, in the context of telecommunications, these powers are greatly limited by the federal government's exclusive jurisdiction in this field. As the Supreme Court of Canada's decision in *Rogers Communications Inc. v. Châteauguay (City)*, (**2016 SCC 23**) clearly sets out, municipalities cannot use their powers to establish mandatory rules regarding antenna placement. A bylaw establishing a minimum separation distance between a dwelling and a small cell, for example, would be unconstitutional.

Key considerations and emerging best practices

As with any change of this magnitude, it is difficult to anticipate all the legal and operational issues that will arise. Looking back to the impacts of the deregulation of the telecommunications industry in 1993—and the immediacy with which issues arose on the ground—we know that such changes can create significant challenges for individual municipalities and for the municipal sector as a whole.

FCM's goal through this guide and the ongoing work of the Technical Committee, particularly its Small Cell Working Group, is to support information sharing and the development of best practices with respect to 5G technology, and to do so as proactively as possible. Although 5G deployment is barely starting in Canada, we already know from Canadian municipalities at the forefront of this work and from experience elsewhere, that there are certain steps municipalities can take right away in order to protect municipal interests while make the deployment of 5G networks on their territory as smooth as possible.

GETTING STARTED
Administrative and stakeholder considerations

Internal engagement: Depending on your municipality's size and its approach and experience in processing applications from carriers for traditional ROW work, your internal structures and/or resources may or may not be adequate to deal with 5G issues comprehensively. In some municipalities, the division of responsibilities between various administrative units (engineering, public works, water, legal, transit, etc.) might not lend itself to handling the various aspects of 5G deployment naturally. There might not even be any obvious coordination point for this work.

Coming together internally to figure out the basic "who does what," including designating a 5G function within your structure, is often a necessary and worthwhile first step, even before the carriers come knocking. Some municipalities have used the opportunity to coordinate or centralize the technical 5G work with initiatives such as smart-city opportunities and connectivity strategic plans for their communities.

Engaging carriers: Being able to anticipate and plan for the arrival of 5G with the carriers is certainly the preferred approach. This might be a slightly utopian objective as deployment is largely market-driven, with carriers going first where they can make the most money. This can make it challenging to obtain detailed plans in advance. Carriers want to protect their competitive advantages and may be reluctant to share too much information. Furthermore, experience has shown that plans can change suddenly as carriers review their commercial priorities. Nonetheless, engaging carriers as early as possible remains a preferred approach.

Obtaining information on planned service areas, deployment timelines, preferred support structures, the types of small cells that will likely be used, the requirements for power and cable connections, etc., will allow you to assess what measures are required to ensure that the framework is in place to manage the arrival of 5G technology in your municipality.

Conversely, regular meetings with carriers will allow you to test out ideas on how your municipality is proposing to deal with these issues. For example, experience has shown that carriers can have difficulty understanding how power connections and fibre-optic feeds can be best installed to avoid safety risks and planning concerns. A healthy dialogue is often the most efficient way of resolving these issues.

Lastly, a proactive approach is also helpful in developing a healthy collaborative relationship with carriers for the long term. By and large, municipalities at the forefront of 5G deployment in Canada have reported good success with most carriers in jointly developing the parameters for a successful 5G introduction on their territory.

Business processes: The information gathered in the first two steps above will assist you in adapting or developing business processes and corresponding staffing needs to manage the influx of 5G small cell installation requests. Municipalities are free to develop and use whatever process is convenient and logical in their jurisdiction but, at this point in time, it seems that the type of installation has been guiding the comprehensiveness of permitting process used:

A. **Attachment to an asset owned by a third party (like a power pole) within the ROW:** In these cases, the relationship is mainly between the carrier and the third-party owner. The power supply may or may not involve municipal interests while the wire connection might only require minor work within the ROW. In such cases, the governing ROW processes might be sufficient, along with a new "notification" requirement that allows you to know that there is a small cell at this location, the type and strength of the device, etc. This information would be useful to ensure a complete shutdown of the antenna if municipal employees must work in close proximity (more on this in the *Technical and engineering considerations* below). Some municipalities are going a bit further and treating the presence of this type of small cell installation within the ROW under their general ROW occupancy bylaws and requesting an occupancy fee for the small cell as well as an indemnity agreement with the carrier for civil liability and the cost of any future relocation at the municipality's request.

B. **Attachments to private property outside the ROW:** In such cases, you might consider that being notified is sufficient, depending on how much work needs to take place within the ROW to connect the antenna to the carrier's wireline network.

C. **Attachments to municipally-owned assets:** In these cases, municipalities are generally requiring a full permit application process to make sure that municipal interests are protected, both as the asset owner and as the manager of the space. The complexity of the process will depend on whether the installation type has already been reviewed for technical and engineering purposes. If the application is for the same type of small cell antenna on the same type of municipal asset, for example, application processes are typically simplified and bulk applications are often considered. Applications for new antenna-asset combinations, on the other hand, typically require a closer examination (see *Technical and engineering considerations*).

D. **In-building installations:** Requests for small cell installations inside municipal buildings are not frequent yet but will be coming. These will obviously require individual consideration as each building will present different challenges. However, a standard set of conditions can be developed in advance to govern general legal and operational issues associated with the presence of the antenna within a municipal building.

   As with most approval processes, in developing any 5G-specific business process, you can set out the different goals that you wish to achieve: data collection on 5G infrastructure in your municipality, cost-recovery, protection for potential liabilities, public consultation or notification, etc.

E. **Pilot projects and soft launches:** In the Canadian municipalities where 5G deployment has progressed the most, municipal official and carriers have tended to work together in order to proceed incrementally and learn and develop best practices collectively. This has been achieved through limited pilot projects (installing a few small cells in different environments to identify practical issues that need to be resolved) or through soft launches of comprehensive business processes. In these cases, a permitting process and basic legal framework are put in place, a number of installations take place, and the lessons learned from this initial phase are used to inform the final versions of the permit process and master agreement between the carriers and the municipality.

Technical and engineering considerations

Civil or structural engineering: In many cases, attaching a small cell antenna to an existing asset will require a review by a civil engineer. Some poles might quite readily accommodate the added weight of the antenna, its control box and its power supply. But the added wind load on the pole (depending on the location of the device, its shape, and size) can become a problem that needs to be addressed through modifications to the pole or an outright replacement with a stronger structure. The great variety of small cell devices, multiplied with the various types of assets to which a carrier might want to attach an antenna, will mean that each antenna-structure configuration will need to be assessed to ensure public safety. On the positive side, once this work is done for a specific antenna-structure combination, approvals can proceed much more quickly, streamlining business processes over time. To that end, some municipalities are creating tables of each type of antenna coupled with each type of support structure with carriers and integrating them into their legal agreements.

Electrical engineering and power supply: How each small cell is powered is an important consideration in establishing approval parameters in your jurisdiction. This aspect will have to be examined closely as carriers often assume that a power source is readily available when, in fact, it is not. For example, in many municipalities, street lights are not powered at all during the day, requiring significant reconfiguration of lighting circuits in order to provide the 24-hour power required for the operation of the small cells. Provincial electrical codes also vary, which means that a solution in one location might not work in another province. Lastly, metering power usage is an important part in ensuring full cost-recovery for taxpayers. Emerging practices currently vary according to the location and type of small cell, from individual smart meters attached to each cell, to a flat fee per cell negotiated with the local utility.

How an electrical feed is introduced in the pole is also another issue of contention. Where an external power feed is needed to feed a small cell antenna on an existing pole, the underground feed from the meter or the pedestal may be required, but supplying that feed through the existing streetlight's base can be problematic. Some carriers and municipalities have agreed to a shroud to cover the external cable routing on the outside of the base to the bottom of the pole itself, but it has been found to either be aesthetically undesirable or the shroud gets deformed or broken by snow clearing or by pedestrian traffic. A better practice is to allow for conduit paths in new streetlight bases/piles to allow an eventual power and/or fibre-optic feed through the base into the pole.

Access to municipal assets: In some municipalities, once the installation request has been reviewed, the carrier will be allowed to simply proceed with the work, from installing the small cell to connecting it to its power supply and to the underground fibre network. However, in other municipalities, work on municipal assets such as traffic lights and street lights can only be performed by municipal employees because of collective agreements. In some cases, this restriction might not apply to the installation of the antenna itself, as it is owned by the carrier. But the connection to the power supply within a pole might have to be done by

municipal workers. In other jurisdictions, work on municipal assets can only be performed by designated contractors. These are important considerations that will have to be examined in your own context.

It is worth noting that some municipalities have opted, with the concurrence of carriers, to undertake the work of connecting the antenna to a designated location where the carrier brings its fibre-optic. In other words, the carrier installs the antenna but the municipality does the rest of the work on (or inside) the pole. This includes hooking up the power supply and the fibre-optic cable to a designated and municipally-provided junction cabinet at grade, where the carrier then connects the antenna to its underground network. This ensures that any work affecting the integrity of the municipal asset is directly under municipal control. Furthermore, by providing common cabinets for all 5G antennas, the goal is to limit proliferation of at-grade infrastructure.

Abandoned assets: 5G will only increase demand for congested spaces. Ensuring that carriers remove infrastructure that is no longer useful will be important in many locations. By and large, carriers resist incurring these costs however, municipalities might have to become more demanding on this point as time goes one to ensure that the space available is used efficiently.

Density and antenna-sharing: The concern of demand for 5G locations outstripping the supply, particularly in dense urban areas, has been identified openly by some carriers. Municipalities should also bear this in mind as they move forward with 5G approvals. If five different carriers each want to install their own 5G small cell networks, will there be enough room on available structures? Will the resulting visual clutter be tolerated by officials or residents? This is still an unknown variable, but an important one to keep in mind.

Shutdown and employee/contractor safety: Municipal employees might need to work in close proximity to small cells (to install street signage, decorative banners, or flowerpots, for example), while those working on streetlight luminaires would have to pass the cells' radiation zone. First responders arriving at the scene of an accident where a pole has been knocked down and a small cell is lying on the roadway will be placed in a similar situation of being in close proximity to the radiation emitted by the small cell. While some provincial safety associations and industry groups are examining the potential impacts of this kind of deployment, mechanisms and protocols to ensure the complete shutoff of individual small cells in such circumstances should form part of any technical parameters developed with the carriers.

Interference with existing wireless assets: There is a small risk that 5G small cells might interfere with existing wireless infrastructure. For example, if your municipality already uses wireless devices to control traffic flows or street lights, advanced testing of the carriers' preferred antenna models would be a worthwhile exercise to avoid any surprises.

Ground-mounted installations: On this point, it is sufficient to remember that all small cells have to be connected to a carrier's fibre network in order to function. How this is managed at grade is another logistical challenge, particularly in congested urban areas. Municipalities will likely want to ensure some level of coordination—or control—to avoid the proliferation of cabinets at grade.

Financial considerations

Cost recovery: With respect to traditional telecommunications infrastructure within the ROW, the CRTC has long supported full recovery of "causal costs"—cost elements associated with the work and presence of telecommunications infrastructure. Municipalities have been approaching the deployment of 5G technology with the same principle in mind: ensuring that the taxpayer is made whole. Municipalities have been identifying direct costs such as engineering studies, electricity supply and workforce time, and billing them back to carriers. This seems to be the accepted best practice in Canada for the moment, a practice based in the sound public policy principle that taxpayers should not be subsidizing the for-profit ventures of the carriers.

Permit fees: Municipal law parameters are well-established when it comes to what a municipality can charge to process permit applications. These fees must bear a direct relationship to the service provided. To charge less than the cost of processing permit applications would be problematic as carriers would be treated differently from other utilities that provide services that are also of vital importance locally and nationally. It would also amount to a *de facto* subsidy to carriers that could be challenged by others.

Occupancy fees: Although the CRTC has long held that municipalities cannot charge occupancy fees or rent for the use of the ROW space by telecommunications equipment, with respect to antennas, carriers have to negotiate access to the supporting structure and typically pay rent to the owner of that structure. This is certainly the case for current 4G antennas found on many buildings. In places where initial 5G installations and testing has begun, agreements with carriers do include occupancy fees or rent for access to the municipality's structure. These typically include a fixed annual fee for the location as well as a per-meter annual fee for the underground conduits where these are provided by the municipality. In some cases, in-kind contributions are also being considered, such as free access within municipal buildings, as part of the fees package.

Lastly, municipal officials should also keep in mind any developments with respect to access to hydro poles in their jurisdiction. Even in Ontario, where the Ontario Energy Board (OEB) has set a tariff for wireline attachments on hydro poles, the OEB declined to regulate fees for small cells. Carriers must therefore pay market rates for these attachments. These developments can have an effect on municipalities' bargaining position.

Public opinion considerations

Health concerns: Health Canada ensures that 5G installations comply with all existing safety regulations, including Safety Code 6 (SC6), which determines exposure limits for wireless devices and their associated infrastructure. Canada's limits are consistent with the science-based standards used in other countries. Large safety margins have been incorporated into these limits to provide a significant level of protection for the general public and personnel working near radio frequency sources. ISED's regulatory framework, including market surveillance and compliance audits, provides safeguards to protect Canadians against overexposure from wireless devices and antenna installations.

To this effect, ISED requires that all wireless equipment sold in Canada, including consumer devices such as cell phones, tablets and Wi-Fi routers comply with SC6. Carriers are obligated to comply with these regulations. In cases where residents express concern about this technology and health risks, carriers and Health Canada should be equipped to address the issue.

Planning concerns: Proper municipal oversight should help address the most obvious planning concerns such as sight lines and the effective management of the public realm by avoiding duplication, ensuring proper positioning, etc. However, clusters of small cells can be visually unappealing and create unique safety concerns. They can, in particular, detract from the qualities and integrity of areas such as historical or heritage districts as well as some planned urban environments. Products and techniques are available to camouflage and mask antennas, and municipalities can also facilitate placement in less visible locations.

Framework and legal considerations

Reviewing your Municipal Access Agreement: The current dual governance structure, coupled with the relatively low number of antennas required for traditional cell phone technology, means that wireless connections are not often addressed explicitly in traditional MAAs. You should review any agreements in place to determine whether they capture items such as power feeds and fiber optic connections to the small cell attachments from a vault or pedestal. For example, what is the definition of "works" or similar word in your agreement? What is its scope? Obtaining legal advice on this point in advance is recommended as it will allow you to know what position to take in future negotiations. You might consider proposing changes to your MAAs to explicitly cover any unique elements flowing from 5G deployment.

Prepare to negotiate a lease for supporting structures: If a carrier has identified municipal assets (light poles, traffic lights, transit shelters, etc.) as one of its preferred options to install small cell antennas, it has to negotiate with the municipality and come to an agreement. As asset owners, municipalities have the right to refuse access. In this light, municipalities would do well to give some thought to their needs in this regard beforehand. For example, are there locations or asset types for which your municipality is not prepared to grant access? There is currently no preferred model to govern access to municipal infrastructure, but basic parameters will undoubtedly evolve over time.

Combining legal agreements: You may find this more efficient, instead of entering into two distinct agreements to negotiate a comprehensive document to manage 5G deployments alongside traditional telecommunications infrastructure in your municipality. There is certainly nothing preventing a municipality from proceeding this way. However, it is worth repeating the fundamental point that antennas and their connecting infrastructure are subject to two different sets of rules. Municipalities can refuse antennas on their property, but they cannot refuse the installation of equipment required to connect antennas located on other assets. Municipalities cannot charge occupancy fees for the connecting cables and other equipment installed within the ROW, but they can charge market value for an antenna located on their assets.

Some municipalities have been misinformed by carriers into believing that small cells deployment is already covered in MAA's and that, as a result, carriers enjoy the same conditional right of access for antennas as they do for their cables, etc. This is not the case.

Prepare for litigation: While FCM's goal is to be a constructive partner in the deployment of 5G technology, there will inevitably be a few cases where it will be necessary to turn to regulatory bodies or the Courts to clarify jurisdictional grey zones. FCM, through its Legal Defense Fund, can intervene in key cases. However, experience in the telecommunications realm over the last 25 years has clearly shown that, in order to help regulators and the courts gain a better understanding of municipal needs, the presentation of strong, objective evidence, collected by individual municipalities, is crucial. By preparing reliable data on contentious legal and operational issues, individual municipalities will be able to demonstrate the legitimacy of their arguments and positions, not just for themselves but also for the municipal sector as a whole.

The future

There is still a fair amount of uncertainty with respect to how both the legislative framework and the range of technical challenges for 5G deployment will be managed. How will the federal government respond to the Report of the Broadcasting and Telecommunications Legislative Review Panel? If the Panel's recommended changes to the regulatory framework for antennas and wireline infrastructure are adopted, this would certainly upend existing practices. Changes of that magnitude would not only take time to make their way through Parliament, they would also generate inevitable legal questions that might require final determination by the courts.

From a technical point of view, the review of mobile wireless services undertaken by the CRTC in Telecom Notice 2019–57 is another source of uncertainty. As part of this process, some carriers have urged the CRTC to adopt an expansive interpretation of its authority in order to take over the authority over small cells antennas. Others argue that the CRTC should impose measures similar to those enacted by the Federal Communications Commission in the United States: time limits for municipalities to process 5G applications, fee caps, etc.

In its various submissions (see Appendix C for the complete documents), FCM has argued strenuously that the CRTC does not have the same authority as the FCC, and that the conditions in the U.S. that led to the imposition of measures simply do not exist in Canada. FCM's central position is that, in fact, the real impediments to timely and efficient deployment of 5G are technical—not legal—and the focus of all stakeholders' efforts should be on coming together to define and resolve these issues of common interest.

To that end, FCM has supported the proposals made by certain carriers who have opted for a more collaborative tone. For example, a proposal for the creation of a national 5G working group to work through common technical issues with municipalities and other stakeholders holds tremendous potential to make sure 5G deployment is done properly. Another suggestion from a number of stakeholders was the need for a faster dispute-resolution process to facilitate 5G implementation, an idea also endorsed by FCM.

During FCM's presentation at the CRTC hearings, the Commission seemed to express a good level of interest in this collaborative approach. The CRTC also seemed receptive to the various examples provided by FCM with respect to the nature of the challenges on the ground—congestion, power supply to small cells, backhaul connections, etc—and the fact that these challenges require a technical solution, not a regulatory one. The CRTC's process is expected to wrap-up at the end of March 2020 with a final round of written submissions but a timeline on the publication of the CRTC's preferred approach was not known at the time of publication.

In short, municipal officials should continue to monitor closely developments on these fronts, as well as FCM communications on these issues.

APPENDIX A:
Photos

Example 1 of 13-metre tall streetlight antenna pole with connection cabinet at grade

Close-up of connection cabinet

Example 2 of 13-metre tall streetlight antenna pole with cabinet.

Close-up of connection cabinet

Small cell attachments to decorative street lights
(the white vertical element is the light)

Small cell attachments to decorative street lights
(the white vertical element is the light)

APPENDIX B:
The U.S. context

The deployment of 5G is a bit more advanced in the U.S., so there is more collective experience from which to learn. However, it should be noted that the unique political dynamics at play in the US also affect the scope of municipal authority with the FCC and several states specifically curtailing local ability to manage 5G installations.

Recent U.Ss federal and state legislation (presently in 21 states) concerning the deployment of small cell technology may prevent cities from addressing aesthetic or safety concerns, and severely limits what cities may charge for private sector use of public streets as well as imposing new unfunded mandates on municipalities in the form of radically shortened application timelines.

The following areas have been the focus for legislative interest in the U.S.:

- Streamlining processing times for applications and permits.
- Capping and lowering collocation, application, and ROW fees.
- Limiting municipalities' design aesthetics jurisdictions.
- Limiting municipalities' control over denying applications for reasons other than required by legislation.

The Federal Communications Commission (FCC), the U.S. regulator, believes that municipal governments are overcharging wireless carriers to access public ROW. As an example of recent action, the FCC issued a Notice of Proposed Rulemaking (NPRM) on the topic of Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment.

This NPRM suggests stripping local governments of siting authority by significantly shortening permitting "shot clocks" and eliminating cities' ability to temporarily freeze complicated siting applications. It also limits annual lease rates to $270 per small cell, significantly lower than the present market rate in most communities. The RVA LLC/Next Century Cities found that among municipal governments surveyed, the average annual lease rate was US$1,438 per attachment and the median annual lease rate per pole was US$1,200.

Interestingly, the RVA LLC/Next Century Cities report also found that municipalities are indeed concerned about maintaining local control and input. For example, over half of respondents (59% of 176 surveys returned) reported being greatly concerned about state laws and 52% are concerned about federal regulations that are passed without municipal input. A full 84% of respondents believe that state laws presently under consideration related to pole use for small cells will have negative impacts for their community.

In the U.S., market value rates are being calculated by comparison for fees charged for installation of a monopole or lattice tower on municipal ROW or titled lands. For example, based on the current rates for monopoles—which can be anywhere from US $20,000 to US$27,000 per year—with the standard range of 1.3 km and the stated range of various wireless units of about 180 meters, the annual rate per pole could be anywhere from US$2,769 to US$3,738. The fee could be applied for multiple attachments, or per attachment. Some cities charge different fees depending on the number of poles attached (e.g. in increments such as 1-25, 26-50, 51-100, 100-200, and over 201). For example, the rate in Long Beach, CA is US$1,500 per pole per year, whereas in Buffalo, NY, it is US$2,000 per pole per year with an automatic 3% annual increase.

A 2018 study by RVA LLC/Next Century Cities that was implemented to help determine the current deployment status of, and community attitudes toward Smart City and small cell deployment, found that the appearance of the equipment was the most common complaint about small cells. Fifty-eight percent of 176 municipal respondents reported complaints from citizens about deployment aesthetics. In Boston, the city worked with carriers and community members to come to agreement on how to ensure the equipment blended in more naturally with the cityscape.

Huntington Beach, California

Huntington Beach had great success in balancing carriers' interests with maintaining local control and community values. They found that bringing as many stakeholders as possible to the table and collaboration was important at every turn.

They were able to leverage already available assets, by acquiring 11,000 street lights from Southern California Edison. As well, Philips approached Huntington Beach to offer a deal to deploy 200 Smart Fusion Poles, making them the first city in the country to have this technology. The poles include integrated stealth antennas that can support service from several carriers at each location. So far, agreements have been made with Verizon, AT&T, and Mobilitie, creating another source of revenue for the city.

They first created a broadband strategic plan and then based on that wider plan, a specific plan with carriers to deploy small cell technology. They also made use of public-private partnerships, where this made sense, in the deployment of small cells.

They created an internal (municipal) telecommunications committee to evaluate all permitting processes. At the start, internal permitting processes didn't include any protocol for wireless siting in the public ROW, so a new process for permitting of wireless facilities through the public works department was created. They also amended the zoning code to permit small cells that meet pre-approved design standards within the public ROW. The committee created a forum that encouraged participation from all city departments, including fire and police, to work together to create policies that worked for everyone.

Importantly, the municipality worked with carriers to develop four pre-approved small cell design standards. Input from carriers on design was incorporated into the final permitting process, so if carriers' deployments fit one of the four standards, they are free to follow a streamlined, over-the-counter application process for permits. Collaborating with carriers to develop these designs was integral to ensuring the permitting process would work for both the city and the carriers. They also worked with other municipalities in Orange County to develop best practices in wireless siting. As a group, the cities worked through similar questions together to problem-solve and create shared resources and tools.

Denver, Colorado

Denver is currently exploring its policies and ordinances for Small Cell infrastructure and reviewing all new pole applications, within the parameters of federal and state law as well as Denver rules and ordinances. Under current law, it is not clear how the city can restrict height, design, or location (unless conflicting) of Small Cell infrastructure. The city is having success in coordinating expectations and recommendations through enhanced communication efforts at the outset of each carrier's program. So far each carrier has been receptive to:

- Considering standardizing pole design elements, colour, location, etc. to meet intent and character of existing infrastructure in the public ROW.
- Limiting pole heights to match existing street lighting and other poles in the public ROW.
- Generally avoiding placing poles adjacent to parks and historical places.
- Encouraging pole and equipment designs that enclose as much equipment as possible to minimize visual impact.

- Co-locating equipment onto existing infrastructure wherever feasible.
- Installing consistent infrastructure that does not discriminate based on neighbourhood type, demographic, or character.
- Exploring new concepts in combining equipment from multiple companies into single poles.

Public Works currently performs careful consultation with top executive and program management staff from each wireless carrier about proposed infrastructure programs before the carrier is allowed to submit any applications for approval. This ensures that each carrier approaches the city in a consistent manner, and that the city's current policies and permitting procedures are well known at the outset.

Per state law, the city must allow each company to propose their infrastructure in the public ROW. Additionally, the city must offer permitting procedures that can process "bulk" Small Cell programs in batches, in 90 days or less, rather than requiring individual permits for each pole or antenna. In response to these requirements, Public Works has established a plan review and permitting program that combines existing utility plan review and encroachment permitting into one contiguous process. Each applicant may submit batches of 10 or fewer unique poles or pieces of ground-mounted equipment per application. Each application will result in a revocable encroachment permit.

APPENDIX C:
FCM submissions

Broadcasting and telecommunications legislative review process

January 2019 – Recommendations (excerpt from the full submission which can be found here: https://www.ic.gc.ca/eic/site/110.nsf/vwapj/908_FederationofCanadianMunicipalities_10_EN_CA.pdf/$FILE/908_FederationofCanadianMunicipalities_10_EN_CA.pdf)

As stated, municipalities are crucial partners in the timely and cost-effective deployment of communications infrastructure in Canada. Therefore, in their submission to the Broadcasting and Telecommunications Legislative Review, (January 2019) FCM made clear their recommendations involving municipal ROW management related to access and consent, including:

- Develop a national broadband strategy, with elements that enhance accountability, transparency and cooperation between federal agencies, orders of government and with industry to improve broadband service across the country, as well as better ensure universal access to emerging technologies at affordable rates for consumers.
- Maintain municipalities' legislated role in managing public space for the benefit of all users. Achieving national connectivity objectives must build on and enhance the long-standing partnership with municipalities.
- Maintain the integrity of the local taxpayer without transferring costs onto the municipal tax base.
- Maintain the wording of sections 43 and 44 of the *Telecommunications Act*.
- Maintain the jurisdiction between the CRTC and ISED in the governance of small cells.
- Clarify the responsibilities of ISED and the CRTC over broadband in order to facilitate the implementation of a national broadband strategy.

FCM continues to focus on ensuring that municipalities maintain their rights around managing ROW issues and assisting with informational tools and strategies to improve the operational deployment of emerging technologies.

CRTC Telecom Notice 2019-57 – Review of Wireless Services

Initial submission dated May 15, 2019 – **https://services.crtc.gc.ca/pub/DocWebBroker/OpenDocument.aspx?DMID=3646824**

Response to the CRTC's "Request for Information" (RFI), a series of targeted questions, dated September 2019 **https://data.fcm.ca/documents/tools/guides/crtc-telecom-notice-2019-57-fcm-responses-to-questions.pdf**

Further comments, as per CRTC procedures, in response to all submissions and responses to RFIs submitted by all parties, dated November 23, 2019 **https://services.crtc.gc.ca/pub/DocWebBroker/OpenDocument.aspx?DMID=3756327**

FCM presentation slides for the CRTC hearings on February 21, 2020 – **https://data.fcm.ca/documents/members_only/board_march/2020/FCM-CRTC-Telecom-Notice-2019-57-Presentation-en.pptx**

Video recording of FCM's presentation at the CRTC hearings on February 21, 2020 – **https://www.cpac.ca/en/programs/crtc-hearings/episodes/66152116/**

APPENDIX D:
Canadian case study

Edmonton, Alberta

The City of Edmonton proceeded using a clear and precise order in finding solutions to small cell deployment issues. Public consultation was an important piece and the technical review of the technology was extensive. The telecom carriers had input, and they indicated that they thought the process made sense. Edmonton has developed ROW consent and access agreements that are separate from MAAs and has developed a streamlined permitting process along with clear policies for permit review. The following is a brief selection and summary of agreement provisions and requirements.

- The annual fee for an attachment is $500 plus GST per attachment, as approved by city council.
- The cabinets associated with the antenna are not to be attached to the pole, contractor cabinet bases will not be allowed.
- For large cabinetry, there is no objection to the unit being wrapped or painted with a mural or other artwork approved by the City.
- Any proposal to install an attachment in an area serviced with decorative poles must be designed to match, as much as possible, the design used in that neighbourhood.
- If multiple attachments are proposed in a given area, it is the city's preference that the poles are fed from a central location (e.g. three or four poles with a fibre-optic feed from a central vault).
- Installations will be permitted at any time (subject to co-ordination with other construction work and/or events.
- "Mid-span" stand-alone poles will only be allowed in areas where there are no existing street lights or poles. Should an area become serviced by standard street lighting, any stand-alone pole may need to be removed at the telecommunication company's expense.

- Red light camera poles and/or CCTV poles are not available for attachments.
- The companies shall be responsible for all electrical permits, installation of the power feed, meter installation, and associated power consumption bills from the power carrier.

The city will review and, where appropriate, approve the installation of attachments. Once a pole has been determined to be useable, the applicant shall apply for a Utility Line Assignment (ULA) permit for the underground connections to the pole. All fees associated with the ULA permit process, pavement degradation fees, and lost productivity costs shall be charged as per the applicable agreement with the company (usually the ROW Consent and Access Agreement).

For the installation of pole attachments on public road ROW, there will be a pre-consultation site investigation meeting with the city to:

- Determine if a specific pole can accommodate an attachment.
- Identify preliminary issues of concern.
- Identify requirement for public consultation.
- Guide the content of the proposal submission.

Once the meeting has taken place, Edmonton's City Operations will give the applicant an information package that includes requirements for public consultation, installation and design and a list of plans and studies that may be required as well as any additional approvals and/or studies that the City has identified as being required. If the proposal is found to be technically possible, City Operations will forward an agreement to the applicant, advise if any additional approvals are required and require the applicant to engage in public consultation similar to the consultation required under City of Edmonton Policy C471C "Policy for Siting Telecommunications Facilities."

APPENDIX E: **References for further reading**

Models and Challenges for the Deployment of Next-Generation Telecom Systems in Cities, report commissioned by the City of Montreal, June 2018 (English version)

https://res.cloudinary.com/villemontreal/image/upload/v1573053761/portail/nitmhkpzlhc1yi00poxi.pdf

Background of Small Cell Technology. SmartWorks Partners. December 18, 2018

https://www.smartworkspartners.com/small-cell-overview

Becoming Broadband Ready: A Toolkit for Communities. Next Century Cities. January 2019

https://nextcenturycities.org/becoming-broadband-ready/

Broadband Strategy, City of San José CA

https://www.sanjoseca.gov/your-government/department-directory/office-of-the-city-manager/civic-innovation/broadband-strategy-and-small-cell-deployment-5147

Broadband Strategic Plan. Huntington Beach, CA

https://nextcenturycities.org/guest-blog-bridging-the-digital-divide-in-huntington-beach/

New Guide: How to Plan for Small Cell Wireless Infrastructure. National League of Cities (NLC). August 27, 2018

https://www.nlc.org/article/new-guide-how-to-plan-for-small-cell-wireless-infrastructure accessed March 4, 2019

Next Century Cities' 5G and Small Cell Resources. June 28, 2018

https://nextcenturycities.org/next-century-cities-5g-resources/

Status of U.S. Small Cell Wireless/ 5G & Smart City Applications from The Community Perspective. RVA LLC/Next Century Cities. March 2018

https://nextcenturycities.org/wp-content/uploads/5Gresearch.pdf

Summary of Final FCC Small Cell Order Accelerating Wireless Broadband Deployment by Removing Barriers to Infrastructure Investment. Declaratory Ruling and Third Report and Order; WT Docket No. 17-79; WC Docket No. 17-84. December 20, 2018
https://nextcenturycities.org/wp-content/uploads/Guide-to-FCC-Small-Cell-Order.pdf

fcm.ca

FCM FEDERATION OF CANADIAN MUNICIPALITIES FÉDÉRATION CANADIENNE DES MUNICIPALITÉS