Stop Wireless 5G

Until Health Canada's Safety Code 6 Is Fixed:

A Guide to Why and How

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Includes link
to C4ST's
FACT-CHECKER
of Government of
Canada Webpages!
see page 112.

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as well as the tireless efforts of scientists and advocates around the world
who give so much of their time to raise awareness of this issue
and who have inspired us.

Despite our best efforts, there may be mistakes in this guide.
All errors are our own.

Disclaimer

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"With EMF, we know that exposure of some kind is
going to have its consequences biologically.
And there will be a segment of the population that will succumb at some level.

**What we have to do is decide, as a society,
what is the level at which we want to set that.
And that's a political decision.**

I think the scientific decision is clear:
that the standards have to be looked at again and have to be reset."

-- Martin Blank, PhD
Former Associate Professor, Columbia University,
Department of Physiology and Cellular Biophysics *(deceased)*
(from an August 2009 lecture entitled Electromagnetic Fields and Health Risk)

Preface

While the world is finally waking up to the reality of climate change, another problem is growing at an alarming rate. And while it has been visible on the radar screens of scientists around the world for some time, our government seems to be on automatic pilot.

It started off gradually. Then, more and more cell towers started popping up, disfiguring the landscape, and creeping closer to homes.

Communities across Canada have been opposing them. At first, for esthetic reasons… then when they search for information on how to stop them, they discover the health risks.
The antennas on these towers give off radiation -- and for the past 20 years, scientists have been warning that this radiation is harmful. Hundreds of high-quality peer-reviewed studies by credible and respected scientists point to cancer, DNA damage, neurodegenerative diseases, infertility, and more… plus serious effects on wildlife, birds, bees and trees.

“Surely our government would not allow this?” “How could this be?” they ask.

Then comes the second awakening; citizens and their municipalities have little say.
It is a federal matter.

As citizens exercise their right to be consulted, they discover that the process favours the telecommunications company. The consultation is simply window-dressing. The only way a tower has been stopped is by local community members organizing a vocal resistance. In some cases a compromise location is found, but only after significant resistance from the community and local politicians.

As municipalities try to exercise their duty to protect the well-being of their citizens, they discover that there is little that they can do.

From Vancouver Island to Newfoundland, so many have gone through this heart-breaking experience and still are. The struggle does not stop at cell towers. RF radiation is the by-product of all wireless devices and antennas. People have been fighting Wi-Fi in schools, the forced installation of “smart” meters, small cell antennas...

What has our government been doing?
Not much. Health Canada’s exposure guidelines (Safety Code 6) are obsolete and do not protect Canadians. Industry Canada’s decisions regarding cell tower siting still do not take into account the outcomes of consultations, i.e., the peoples’ will. And Environment Canada still has no guidelines to protect our flora and fauna from RF radiation. With the challenges already faced by many species in terms of habitat loss, chemical pollution and climate change, how will RF radiation impact them?

For the past 20 years, Health Canada has refused to consider the large body of research that proves that RF radiation has harmful effects at levels far below Safety Code 6.

For the past 20 years, the industry keeps repeating the same mantra: “The jury is still out; more research is needed”. (Remember the tobacco playbook?)

With 5G the situation is about to get a whole lot worse.

The telecom industry is ramping up production in its “race for 5G”, expanding and densifying its infrastructure of towers and small cell antennas, while their competition is launching thousands of low orbiting satellites. Companies are rushing to join the *Internet of Things (IoT)* bandwagon… implanting chips into everything from toothbrushes and diapers, to washing machines and cars.

Slick marketing of gadgets, and some truly useful tools, have ensured a willing, though misinformed, customer base – even though it is clear that the IoT is being driven by the potential to make money rather than by a desire to meet real needs.

Not only are there virtually no government regulations to exercise control over this rollout, our government seems to be leaning towards paving the way by favouring wireless approaches over wired.

There are better alternatives. We can have many of the benefits this technology promises through fiber-optic technology, a much safer, faster, and more secure approach.

This is not about allowing a harmful product that a consenting adult may choose to use, or not, like smoking in your home.

This is about allowing the 24/7 irradiation of all living things
– our families, our children, our pets, wildlife, pollinators, trees and other plants –
whether they consent to it or not,
whether they understand the consequences or not.

Are the benefits worth the risks?
What can we do about it? Is it really too late?
What are other jurisdictions doing about it?

“How far should we go as a society toward locking ourselves into a technological system that risks public health for the sake of a plethora of wireless applications, many of which are amusements, and business models that add risk and instability to the economy?

It seems to be time to address these questions seriously.”

– Timothy Schoechle, PhD, Re-Inventing Wires:
The Future of Landlines and Networks

This is a complex issue to communicate. It’s a story filled with scientific facts on the one hand, and on the other, politics, conflicts of interest, lack of transparency, and a trillion-dollar industry. And caught in the middle are the people and the environment.

This Guide is intended to help you navigate this topic.
We hope it will serve as a reference, a wake-up call, and a call to action.
Our hope is that once Canadians and our Members of Parliament have a better understanding of the risks of wireless technologies to our health, our environment and our security, and of the scope of the rollout of 5G and the Internet of Things, we will all feel compelled to act.

Chapter 12 provides examples of actions you can take. If you take action, please keep us informed at 5Gactions@c4st.org. All suggestions are welcome. Please send them to 5GGuideinput@c4st.org.

1. Executive Summary

1.1. Summary

More than just an upgrade, 5G, the next generation of wireless technologies, is being rolled out rapidly across Canada. While earlier generations focused on cellular communication, the vision for 5G is to connect much more than people and phones. It is centered around the Internet of Things (IoT) – machine-to-machine communication.

5G promises extremely fast data speeds and much lower latencies (network delays) than previous generations. To do this, it will use greater bandwidth and new technologies. Earlier generations of cellular networks in Canada used frequencies below 2.6 GHz. **5G will use those same frequencies** and the recently auctioned 3.5 GHz, **plus it will add the "extremely high frequency" millimetre waves** (mmWaves) at 26 GHz and higher.

To get around the shorter range of the mmWave band, **5G will require a vast additional infrastructure**, including **more towers and hundreds of thousands of small cell antennas located very close to homes and businesses**.[1] Lamp posts, hydro poles, sides of buildings and many other locations are candidates to host small 5G cell antennas.

At the same time, the competition is launching tens of **thousands of low orbit satellites** to provide Internet service **to every inch of the planet**.

Why are we concerned?

There has been **no research on the health effects of long-term exposure to mmWave radiation**. (We are "flying blind," to quote a U.S. senator[2]).

We do have considerable evidence about the harmful effects of the microwaves used in 3G, 4G and LTE (the lower frequency bands **that will also be used in 5G**).

Hundreds of scientists specialized in the field have been warning governments for years that this type of radiation is harmful to humans and the environment. Over the last 20 years, more than 40 appeals and resolutions calling for more protective standards from radiofrequency (RF) radiation have been endorsed by hundreds of EMF researchers and physicians. *See Chapter 4 for a list of these appeals.*

We know from more than 200 scientists representing over 40 countries, who have published more than 2,000 studies in this field, that there is strong evidence of harm to humans and to the environment from exposure to the frequencies used in other generations of wireless technology (2G, 3G, 4G, LTE) that power our commonly used wireless devices such as cell phones, cordless phones and cell antennas.

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[1] There are currently 730,442 transmitters (48,288 towers) in Canada according to the Innovation, Science and Economic Development (ISED) Spectrum Management System database (as of Nov. 2, 2021). 5G network infrastructures will require a much greater cell density. http://sms-sgs.ic.gc.ca/eic/site/sms-sgs-prod.nsf/eng/h_00010.html - https://www.itworldcanada.com/article/everythingyou-need-to-know-about-5g/416498

[2] US Senator Blumenthal Raises Concerns about 5G Wireless Technology Health Risks at Senate Hearing, Feb 6, 2019. https://www.youtube.com/watch?v=ekNC0J3xx1w&feature=youtu.be

The rollout of 5G and the IoT will result in **massive increases of constant exposure** to radiofrequency (RF) radiation – **without the informed consent** of Canadians. There will be no place for people – and wildlife, including pollinators and trees – to escape from this harmful environmental pollutant.

See section 1.2, for our Top Ten Reasons why 5G should be put on hold.

The situation in Canada

The federal Ministry of Innovation Science and Economic Development (ISED) regulates wireless devices, cell antennas and the use of the spectrum in Canada. ISED requires that all wireless devices and antennas comply with Health Canada's Safety Code 6. Public consultation is required for cell towers; however, citizens cannot oppose them on the basis of health concerns. And for towers under 30 metres, the wider community is not notified of the consultation. As for the small cell antennas placed on "non-tower structures" such as lamp posts, hydro poles or on (or in) buildings, public notification is not required at all. Hundreds of thousands of small cell antennas are being installed across Canada, close to people's homes without their knowledge and consent.

Health Canada's *Safety Code 6* is obsolete and does not protect Canadians.
Safety Code 6 guidelines *"establish safety limits for human exposure to radiofrequency (RF) fields".*[3] Since 1979, these guidelines for cell antennas have had only minor changes and are still based on a 1929 assumption[4,5] that thermal effects (heating) are the only "established" adverse effects.[6] A significant amount of peer-reviewed, published, scientific evidence now points to harm from non-thermal effects at well below these limits.[7] Health Canada's track record has been poor in responding in a timely manner to other harmful agents such as asbestos, Bisphenol-A (BPA), cigarette smoking, dioxins, lead, mercury, thalidomide and urea formaldehyde insulation.

Because 5G frequencies fall within Health Canada's Safety Code 6 guidelines, Health Canada has taken the position that the technology is safe for humans, even though there has been no research on the health effects of long-term exposure to mmWaves and the new 5G technologies.

Environment Canada has no guidelines to protect our flora and fauna from RF radiation.

Pervasive conflicts of interest

Health Canada relies on biased organizations when setting its exposure guidelines – in particular the International Commission on Non-Ionizing Radiation Protection (ICNIRP). This organization and several others have come under criticism for biases and conflicts of interest. Chapter 7 delves into some of these.

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[3] https://www.canada.ca/en/health-canada/services/publications/health-risks-safety/limits-human-exposure-radiofrequency-electromagnetic-energy-range-3-300.html
[4] https://www.magdahavas.com/wp-content/uploads/2010/07/Cook_1980_early_research.pdf
[5] www.hc-sc.gc.ca/ewh-semt/consult/_2014/safety_code_6-code_securite_6/final_finale-eng.php. Section 2. MAXIMUM EXPOSURE LIMITS, paragraph 2 - first sentence.
[6] At the lower part of the radiofrequency range, which is not used by everyday wireless devices, Safety Code 6 also considers peripheral nerve stimulation to be an established effect.
[7] See sections 3.1.2, 6.2.1 and 6.2.2 of this guide for references. Here are a just a few: docs.c4st.org/Studies/original-references_of_over_200_scientific_studies_showing_potential_harm_at_levels_below_safety_code_6.pdf; and https://www.saferemr.com/2014/08/why-we-need-stronger-cell-phone_43.html

Do we really need 5G?

In addition to health concerns, experts are challenging the business case of wireless networks**.** As industry continues its race to install the infrastructure for their 5G networks, we believe it is time to stop and consider the costs.

Are the benefits of widespread wireless 5G worth the risk to our health, our environment, our privacy, and our security? According to hundreds of independent scientists, the answer is a clear "no".

As Dr. Martin Blank, a leading expert on the health effects of electromagnetic fields, said:

"With EMF, we know that exposure (...) is going to have its consequences biologically. And there will be a segment of the population that will succumb at some level.

What we have to do is decide, as a society, what is the level at which we want to set that. **And that's a political decision.**

I think the scientific decision is clear:
that the standards have to be looked at again and have to be reset."

Safer alternatives exist

There is a cheaper, faster, greener, more reliable and safer way to provide this next wave of technology, namely fibre-optic technology – fibre to and through the premises (FTTP).

Around the world, people are speaking out.

- ***Some governments are beginning to listen.*** Many jurisdictions are stopping the rollout of 5G technology. Some have passed legislation or taken other actions to protect their citizens' health from exposure to wireless radiation.

- ***Many citizens have turned to the courts.*** And there have been breakthroughs in case law in other countries.

  Of particular note: the recent decision by the US Federal Court that the FCC's decision to retain its 1996 safety limits for human exposure to wireless radiation was "*arbitrary and capricious*" and ordering it to provide "*a reasoned explanation*" for its decisions, and to "*address the impacts of RF radiation*" on people and on the environment. It also stated that the commission cannot rely on agencies like the FDA if the FDA's conclusions are provided without explanation.

  This is significant because Health Canada is guilty of the same: It bases its safety limits on the same obsolete assumption that only heating causes harm, does not provide a reasoned explanation for its decisions, and relies on other organizations that do not provide full, reasoned justifications.

  See the section 10.2 for more on this historic ruling.

- ***The insurance industry is definitely taking no chances***. It has taken steps to protect itself from future claims.

It doesn't have to be this way: Take action

Join *Canadians for Safe Technology.*
Suggested actions you, as a Canadian, can take are included in chapter 12.

It is time for our Government to…

- **update Safety Code 6.** Set up a truly independent panel with appropriate expertise to review the scientific evidence, including non-thermal, biological effects of RF radiation.
- **establish guidelines to protect wildlife and the environment** from RF radiation.
- **protect individual rights,** taking into account sensitive populations (children, pregnant women, immune-compromised, electrosensitive, people who are ill, the elderly, etc.).

In the meantime, **we urge the federal government to take the following actions now, before it is too late**.

- **Stop the rollout of 5G,** especially "small cell" antennas and towers near homes.
- **Stop the auction of the extremely high frequency spectrum** (planned for early 2024).
- **Launch an awareness campaign** so Canadians can take steps to protect themselves and their children from the current levels of radiofrequency/microwave radiation.
- Require that the telecommunications and wireless technology industries prove that their products are safe for Canadians and the environment.
- Complete an economic analysis of the total potential economic burden of 5G.
- Invest in full fibre-optic broadband coverage across Canada (FTTP). Favour wired technologies rather than wireless and satellite options.

We recommend the adoption of the following principles:

- **The Precautionary Principle,** which states that where there are threats of serious or irreversible damage to the environment or to human health, lack of full scientific certainty shall not be used as an excuse for postponing the adoption of measures to prevent such environmental and health degradation.
- **Pollution prevention**, acknowledging that it is less expensive and more effective to prevent damage to the environment and to human health, than to manage or cure this damage.
- **Communities' right to know** about health and environmental risks and **to participate in making decisions that affect their health**.

Indeed, this is the tradition of public health, a tradition which in Canada, through the Supreme Court, has given municipalities the authority to ban pesticides.[8]

In the post-COVID-19 economic recovery plan, let's make sure that decisions put people and our environment first.

[8] Ashbury FD, Sullivan T. Review of Misconceptions about the Causes of Cancer. Chronic Dis Can 2004;25:152-53.

1.2. Top Ten Reasons Why 5G should be put on hold

Please see Chapter 3 for a detailed review of the evidence and supporting references.

1. **There is scientific proof that radiation from wireless technologies will have significant harmful impacts on human health in the long term.**
    a. Hundreds of high-quality peer-reviewed studies show that exposure to radiation from current (pre-5G) wireless technologies causes serious adverse health effects.
    b. 5G will use those same frequencies, plus it will employ new technologies and add the millimetre wave (mmWave) band to the mix. There has been no research on the long-term effects to ensure that 5G technology is safe.
    c. Published evidence demonstrates that RF radiation can cause cancer.
    d. Children and other vulnerable populations are more seriously impacted.
    e. Scientists have been warning our politicians for years.
    f. Health Canada's Safety Code 6 does not protect Canadians.

2. **Some people experience immediate health effects – Electromagnetic Hypersensitivity (EHS): The Canaries in the Coal Mine**
    a. As with other environmental exposures, some people are more susceptible (sensitive or intolerant) and overtly affected by wireless technologies.
    b. Surveys conducted in several countries between 1998 and 2007 estimated that 3%-13% or more of the population experience symptoms of EHS.
    c. Many are being mis- or undiagnosed because the medical community is not well informed about the symptoms and underlying causes, namely overexposure to wireless devices and antennas.

3. **Wireless technologies impact wildlife, including birds and pollinators, and plants.**
    a. Research has demonstrated adverse effects of radiofrequency radiation on the environment including wildlife, such as birds, amphibians, insects, fish, mammals, and plants.
    b. Studies show that RF radiation can impact the navigation abilities of birds and bees; and cause nest and site abandonment, plumage deterioration, locomotion problems, reduced survivorship and death in wild nesting birds.

4. **5G and other wireless networks and technology are major contributors to climate change and pollution, and are not sustainable.**
    a. Wireless technologies consume at least 10 times more power than wired technologies. A 5G base station is expected to consume roughly three times more power than a 4G base station. And 5G will require far more base stations.
    b. 5G will cause a substantial increase of e-waste since devices currently used will become obsolete. Only 20% of e-waste is recycled today.
    c. Most concerning is the exponential growth of the Information and Communication Industry (ICT), and its footprint relative to the total worldwide footprint. *Greenhouse gas emissions from smart phones alone jumped 730% in absolute terms in just 10 years (2010-2020).*
    d. If the wireless industry were a country, it would be the fifth largest consumer of energy in the world.

5. **5G networks will increase the risks to individual and business privacy by transmitting massively more data wirelessly.**
    a. Sensitive information can easily be transferred, leaked or hacked in a wireless network.
    b. 5G networks will allow massive amounts of data to be transmitted wirelessly, providing more opportunities to collect, process, harvest and use it for commercial, or for nefarious, purposes.

6. **There are significant cybersecurity risks with 5G.**
    a. Wireless networks are less secure, more prone to hacking than wired systems.

7. **Basic human rights are being infringed since citizens cannot oppose a cell tower on the basis of health concerns. Small cell antennas do not even require public notification, nor do low earth orbit satellites.**
Hundreds of thousands of 5G small cell antennas are being installed across Canada on lamp posts, hydro poles and other structures close to people's homes and workplaces, without their knowledge and consent.
    a. Public consultation is required for cell towers; however, *citizens cannot oppose them on the basis of health concerns*. And for towers under 30 metres (98 feet), the wider community is not even notified of the consultation, i.e., those living at a distance of more than three times the height of the tower.
    b. Notification is *not* required at all for:
        - *Non-Tower Structures:* antennas on (and in) buildings, water towers, lamp posts, bus shelters, etc. may be installed without notifying or consulting the public, provided that the height of the structure is not increased by more than 25%;
        - *Existing Towers:* modifications may be made to facilitate sharing or the addition of antennas, provided that the total height increase is no greater than 25% of the height of the initial installation.

8. **Scientists have warned that 5G technology will interfere with critical satellite data, resulting in a 30% reduction in weather forecast accuracy, and decreasing the ability to monitor the climate.** NASA and the US National Oceanic and Atmospheric Administration agree. It could also interfere with radar altimeters posing a major **risk to aviation safety**. The deployment of tens of thousands of satellites will cause **unprecedented light pollution, hindering astronomical observation**.

9. **Concerns have been raised about the economic burden** of increased health care costs, lost productivity, financial impacts of security and privacy breaches, damage caused by the degradation of weather forecast accuracy, and environmental damage.

10. **Better alternatives exist. Fibre and wired connections are** . . .
    - safe (do not emit RF radiation)
    - 100 times faster and more reliable
    - far less vulnerable to security and privacy breaches
    - more reliable in a disaster
    - consume 10 times less energy; do not rely on rare minerals.

2. An Overview of 5G

2.1. What is 5G?

5G is the next generation of wireless technologies, the planned successor to the 4G network.

It is being designed to provide **greater capacity** for wireless networks, to deliver **extremely fast** data speeds and **much lower latencies** (network delays) than previous generations. Industry promises to provide us with an entirely new level of connectivity with the *Internet of Things*. From autonomous vehicles to smart cities and so-called fibre-over-the-air, 5G intends to be at the heart of the future of communications.

How will 5G achieve this?

5G will use:

- **greater bandwidth** – a range of frequencies from 600 MHz to 100 GHz – and
- **new technologies**: massive MIMO (massive multiple inputs and outputs), advanced beamforming, higher cell density, higher spectral efficiency, OFDM (orthogonal frequency-division multiplexing), time division duplexing.

While 4G and earlier generations of cellular focused on cellular communication, **the vision for 5G is to connect much more than phones**.

This has become clear in the latest set of 5G standards codified by the 3rd Generation Partnership Project (3GPP), the industry group that establishes the standards for cellular networks.[9] 3GPP finalized ***Release 16*** on July 3, 2020. While earlier releases of the 5G standards focused on the core of 5G as a generation of cellular service, Release 16 laid the groundwork for new services that have never been addressed by cellular before.[10]

For example (excerpt from an article published in IEEE Spectrum in 2020):

- **Sidelinking:** a new technique that will allow 5G-connected vehicles to communicate directly with one another (V2X, short for "Vehicle to Everything"), rather than going through a cell-tower intermediary. This technique can theoretically apply to any two devices that might need to communicate directly rather than go through a base station first. For example: Internet of Things installations, factory robots, etc.
- **Location Services:** In past generations of cellular, three cell towers were required to triangulate where a phone was by measuring the round-trip distance of a signal from each tower. But 5G networks will be able to use the round-trip time from a single tower to locate a device. That's because massive MIMO and beamforming allow 5G antennas to send precise signals directly to devices, and so the network can measure the direction and angle of a beam, along with its distance from the antenna, to locate it.

[9] The 3rd Generation Partnership Project (3GPP) https://www.3gpp.org/about-3gpp/about-3gpp.
The International Telecommunication Union Radiocommunication Sector formally approved the 3GPP 5G technology as International Mobile Telecommunications-2020 (IMT-2020) 5G standard at the ITU-R Working Party 5D #35 meeting, July 9, 2020 https://www.huawei.com/en/news/2020/7/3gpp-itu-imt-2020-5g-standard

[10] Michael Koziol, IEEE Spectrum, "5G Just Got Weird: Industry group 3GPP takes 5G in new directions in latest set of standards", August 7, 2020 – https://spectrum.ieee.org/tech-talk/telecom/standards/5g-release-16

- **Private Networks:** 5G will incorporate millimetre waves, which are higher frequency radiowaves (30 to 300 GHz) that don't travel as far as traditional cell signals.[11] With millimetre waves, it will be possible to build a network just for an office building, factory, or stadium. At those scales, 5G could function like Wi-Fi networks.
- **Unlicensed Spectrum:** Release 16 expands 5G into unlicensed spectrum in the 5 and 6 GHz bands. Unlicensed spectrum could be key for private networks that, similar to Wi-Fi networks, use a specific spectrum without having to go through the process of licensing a frequency band.
- **Release 17 Will "Extend Reality"**: In December 2019, the scope of Release 17 was decided. Among the items to be included: extended reality (alternate reality and virtual reality technologies), and to study the possibility of using frequencies in the 52 to 71 GHz range, far higher than anything used in cellular today. The schedule for Release 17 anticipates completion in **2022**.

For more information on **the technologies**, read this article by Tom Li, IT World Canada "Everything you need to know about 5G", April 11, 2019 -- https://www.itworldcanada.com/article/everything-you-need-to-know-about-5g/416498

Here is a short video from IEEE Spectrum, a magazine edited by the Institute of Electrical and Electronics Engineers: https://www.youtube.com/watch?v=GEx_d0SjvS0

For more information on **the latest release of the 5G Standards**, read this article by Michael Koziol, IEEE Spectrum, "5G Just Got Weird: Industry group 3GPP takes 5G in new directions in latest set of standards", August 7, 2020 – https://spectrum.ieee.org/tech-talk/telecom/standards/5g-release-16

Here is a link to the various releases of **the standards** by 3rd Generation Partnership Project (3GPP) https://www.3gpp.org/DynaReport/FeatureListFrameSet.htm

5G vs 4G

	4G/LTE in Canada*	5G currently in Canada**	5G promises
Download speed (max average)	80 Mbps	112 Mbps	10 Gbps
Latency in milliseconds measured as Round Trip Time (RTT) Note: blink of an eye = 100 to 400 ms	38-41 ms		<1ms
Frequencies used (1 GHz = 1000 MHz)	600 MHz to **2.5 GHZ**	600 MHZ to **6 GHz**	600 MHz to **100 GHz**

* Data rates for 4G: Opensignal. Canada - Mobile Network Experience Report – Feb 2020 https://www.opensignal.com/reports/2020/02/canada/mobile-network-experience

The three large Canadian operators have surpassed the 90% mark in 4G availability.

** Data rates for 5G: Opensignal. Canada - Mobile Network Experience Report - August 2021. https://www.opensignal.com/reports/2021/08/canada/mobile-network-experience

5G users spent 7.2% to 11.1% of time connected to 5G services. Therefore, these rates reflect the overall experience of 5G users including when they switch to 3G or 4G.

To find out what is different about 5G and why it is so concerning, please read sections 2.3 and 2.4.
For the rollout schedule for 5G in Canada, see section 2.7.

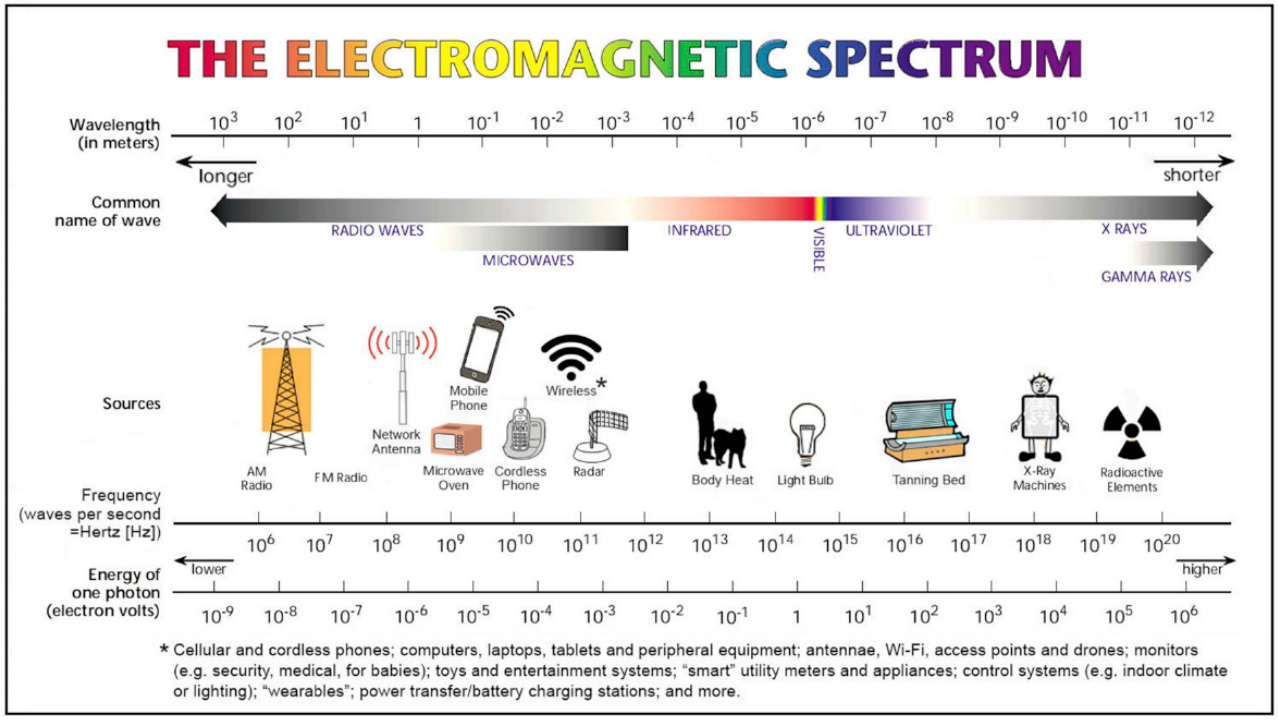
[11] Sperling, Ed. "Millimeter Wave: A Bridge Too Far?" *Semiconductor Engineering*, February 6, 2020. https://semiengineering.com/millimeter-wave-a-bridge-too-far/

2.2. The Electromagnetic Spectrum

Electromagnetic energy travels in waves and spans a broad spectrum from very long radio waves to very short gamma rays.[12]

Ever since the first radio broadcast, humans have been harnessing the electromagnetic spectrum for communications.

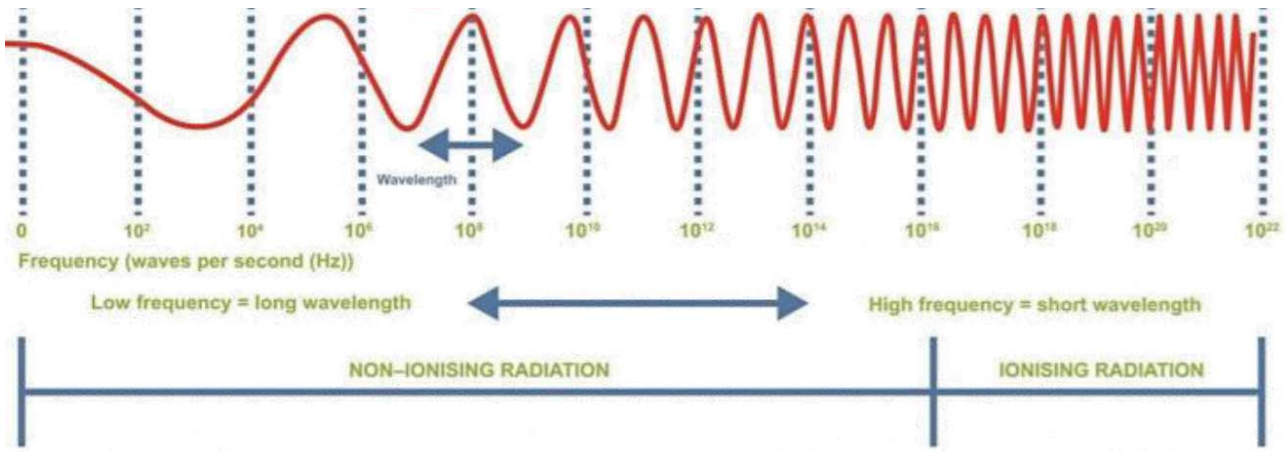
Cellular networks send data through radio waves.



10^8 Hz = 100 MHz; 10^9 Hz = 1 GHz; 10^{10} Hz = 10 GHz; 10^{11} Hz = 100 GHz

(from D. Davis, M. Sears, A. Miller, R. Bray. Microwave/Radiofrequency wireless radiation and human health: clinical management in the digital age, Integrative Environmental Medicine, Oxford University Press (2017), pp. 223-251)[13]

The shorter the wave, the higher the frequency. Frequency is measured in Hertz (Hz).



[12] National Aeronautics and Space Administration, Science Mission Directorate. (2010). Anatomy of an Electromagnetic Wave. Retrieved January 2, 2022, from NASA Science website: http://science.nasa.gov/ems/02_anatomy

[13] https://oxfordmedicine.com/view/10.1093/med/9780190490911.001.0001/med-9780190490911-chapter-10

Radiofrequency (RF) waves occupy the frequency range 3 kHz to 300 GHz.[14]

- **Microwaves** are a specific category of radio waves that cover the frequency range 1 GHz to approximately 100 GHz.[15] Most microwave ovens use 2.4 GHz, which is also the frequency used by many Wi-Fi networks.

- **Millimetre waves** (ultra-short wavelengths, called mmWaves) are a specific category of radio waves that cover the frequency range 30 to 300 GHz. These are designated as "*Extremely high frequency*" or EHF by the International Telecommunication Union.[16] (Some wavelengths in the high 20 GHz are also often referred to as mmWaves.)

Ionizing and Non-ionizing Radiation

- **Radiation that carries enough energy to remove an electron from a molecule causing it to become charged (or ionized) is called ionizing radiation.**[17] Ionizing radiation effectively disrupts molecular bonds. In living organisms, such disruption can cause extensive damage to cells and their genetic material.[18] X-rays and gamma-rays are forms of ionizing radiation.

- **Radiation that does not have enough energy to remove an electron is called non-ionizing radiation.** Radio waves (which include microwaves), infrared radiation, and visible light are all forms of non-ionizing radiation.

Radio frequency (RF) waves used in wireless communication are in the non-ionizing range of the electromagnetic spectrum.

It was once thought that non-ionizing radiation could not damage DNA or cellular tissue.

We now know that it can – just in different ways.

Please see section 3.1 and Appendix 4 for peer-reviewed studies that show harm from non-ionizing radiation.

RF waves are covered by Health Canada's Safety Code 6, the code that serves as the scientific basis for equipment certification and exposure compliance specifications outlined in ISED's regulatory documents governing the use of wireless devices and antennas in Canada. ***For more on Safety Code 6, see chapter 6.***

[14] Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz, see Introduction, page 1. https://www.canada.ca/en/health-canada/services/publications/health-risks-safety/limits-human-exposure-radiofrequency-electromagnetic-energy-range-3-300.html

[15] Different sources define different frequency ranges as microwaves. *Kumar, Sanjay; Shukla, Saurabh (2014). Concepts and Applications of Microwave Engineering. PHI Learning Pvt. Ltd. p. 3. ISBN 978-8120349353.* https://en.wikipedia.org/wiki/Microwave#cite_note-Kumar-2

[16] https://www.itu.int/dms_pubrec/itu-r/rec/v/R-REC-V.431-8-201508-I!!PDF-E.pdf

[17] https://chemed.chem.purdue.edu/genchem/topicreview/bp/ch23/radiation.php

[18] https://www.britannica.com/science/ionizing-radiation

2.3. What is different about 5G?

2.3.1. 5G will be the first cellular network to use millimetre waves (mmWaves)

Before 5G, wireless communication used the frequency bands below 5.2 GHz.
In Canada, cellular networks used frequencies up to 2.6 GHz.

5G will use those same frequencies (and the recently auctioned 3.5 GHz band) **plus**
it intends to add high frequency millimetre waves (mmWaves) to the mix.

Wavelength impacts speed and distance of data transmissions.

Signals sent using higher frequencies have a higher data-carrying capacity, but lower propagation distances, and the opposite for signals sent using lower frequencies; these carry less data but travel much further through the environment.[19]

Higher data-carrying capacity translates into faster transmission speeds. **It is therefore the mmWaves (which are not yet available) that will ensure the super fast speeds promised.**

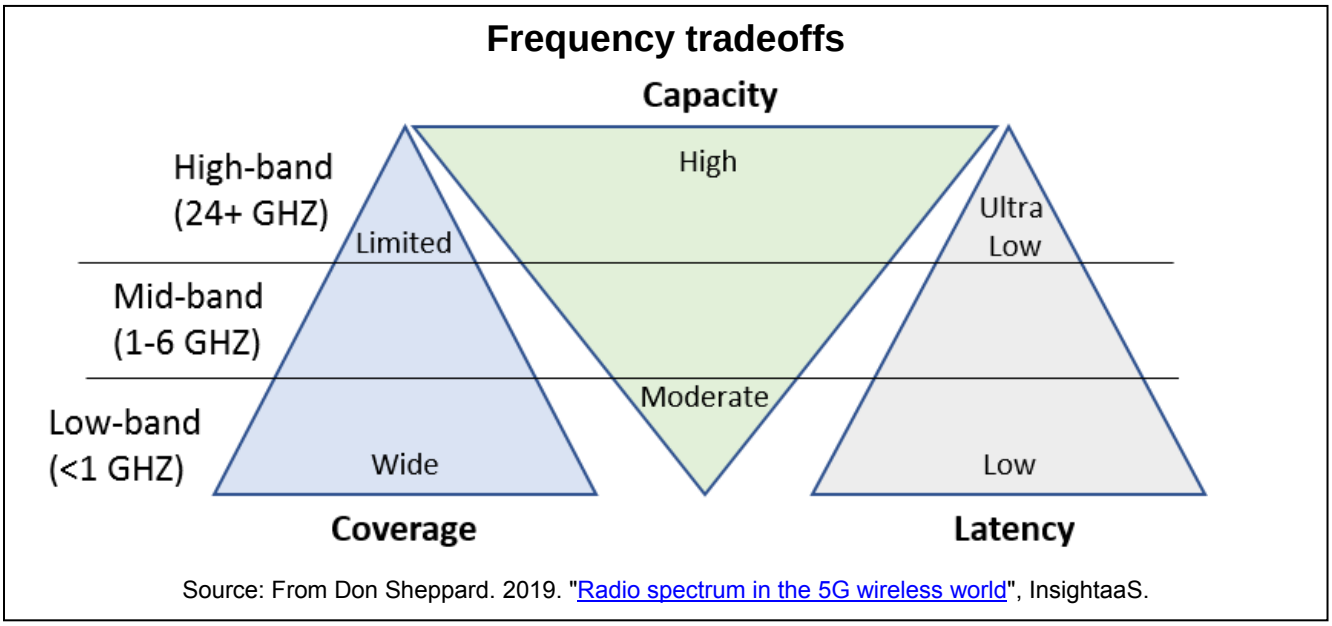
Solution to a Catch-22: Three Frequency Bands

To ensure service, **5G networks will operate on three frequency bands**, each requiring different antennas, and each giving a different tradeoff of download speed vs. service coverage vs. latency.[20] A 5G device will connect to the network through the highest speed antenna within range at its location.[21]

According to the GSMA,[22] the trade body that represents the interests of mobile network operators worldwide, **these are the three bands that 5G will use**:

- **Low-band spectrum: Sub-1 GHz** (600 MHz in Canada)
  for widespread coverage across urban, suburban, and rural areas and to help support the Internet of Things (IoT).
- **Mid-band spectrum: 1 GHz to 6 GHz** (3.5 GHz in Canada)
  is expected to form the basis of many initial 5G services globally.
- **High-band spectrum: 6 GHz to 100 GHz** (26, 28, 37-40 and 64-71 GHz in Canada)
  for the ultra-high broadband speeds. The frequencies to be used in Canada for the high-band (26 GHz and higher) are sometimes called millimetre waves (mmWaves).

[19] Spectrum 101 An Introduction to National Aeronautics and Space Administration Spectrum Management. 2016. page iii. https://www.nasa.gov/sites/default/files/atoms/files/spectrum_101.pdf
[20] Network latency is a term used to describe delays in communication over a network. Latency can either be measured as the Round Trip Time (RTT) or the Time to First Byte (TTFB). According to Verizon, it refers to the time required for a packet of data to travel round trip between two points. https://www.verizon.com/about/our-company/5g/what-network-latency
[21] Horwitz, Jeremy (December 10, 2019). "The definitive guide to 5G low, mid, and high band speeds". VentureBeat online magazine. https://en.wikipedia.org/wiki/5G
[22] 5G Spectrum: GSMA Public Policy Position, March 2020. https://www.gsma.com/spectrum/wp-content/uploads/2020/03/5G-Spectrum-Positions.pdf



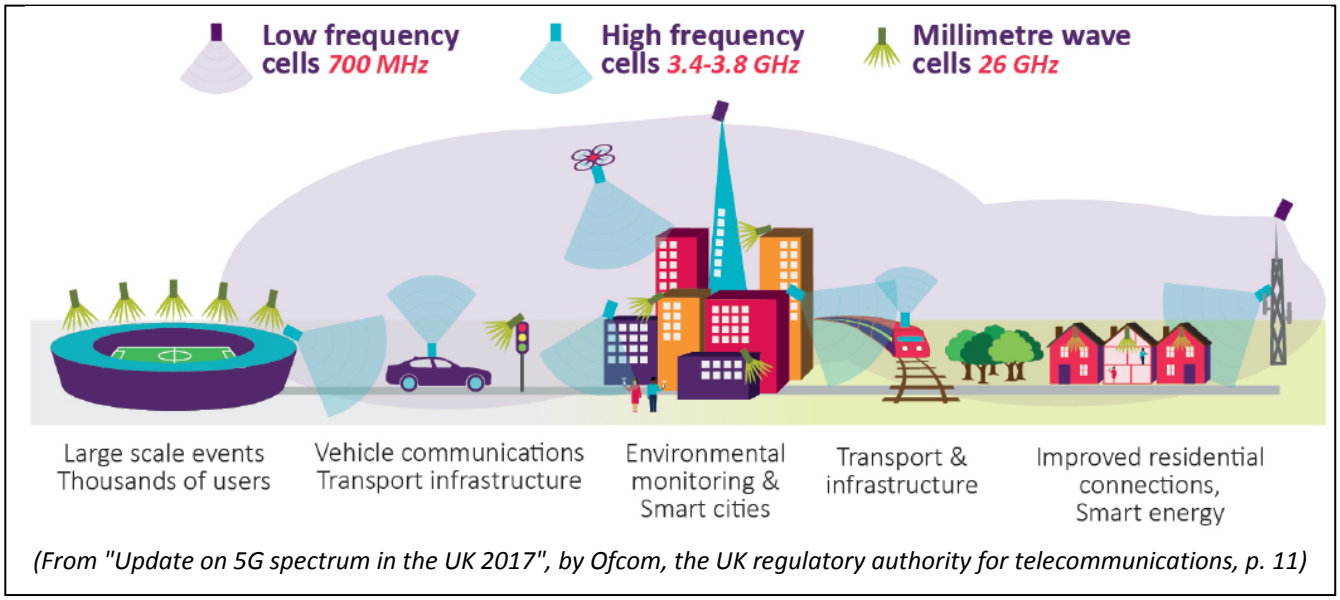
Source: From Don Sheppard. 2019. "Radio spectrum in the 5G wireless world", InsightaaS.

2.3.2. Higher Cell Density: The industry's solution to the short range of mmWaves

To get around the shorter range of the mmWaves (they also have difficulty passing through some types of obstacles), **millimetre wave 5G antennas will be placed much closer to homes and in much greater numbers**.

The industry calls it "**higher cell density**".

These antennas, called "**small cells**" or "**microcells"** (as opposed to the *macro* cells, i.e. on tall cell towers), are being placed on lamp posts, hydro poles, on the sides of buildings, inside malls, conference centres and stadiums, and on other "non-tower" ground level structures.[23] In contrast to current cellular networks requiring one cell tower for every 1-3 km in urban environments, some analyses of 5G networks have concluded that as many as one "small" cell transmitter will be required for every 2-10 houses, in addition to large cell towers.



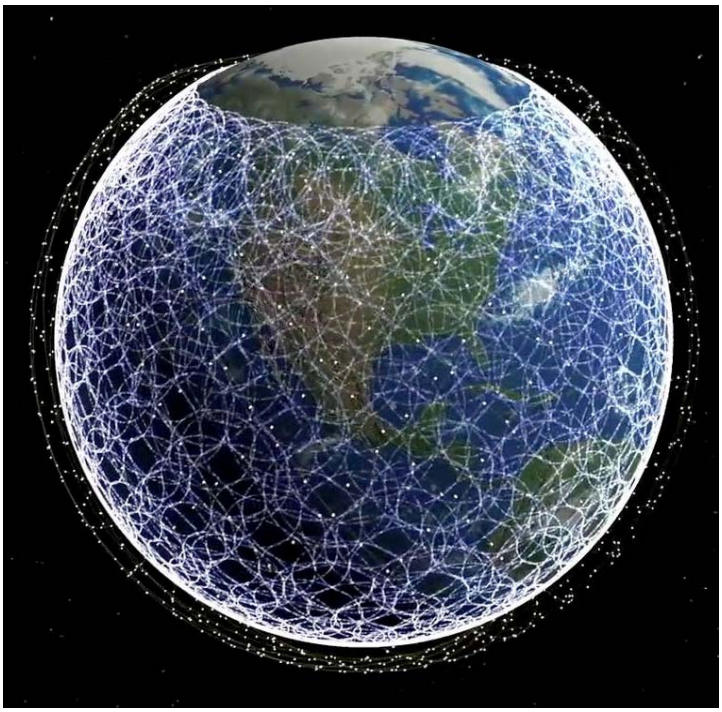
(From "Update on 5G spectrum in the UK 2017", by Ofcom, the UK regulatory authority for telecommunications, p. 11)

[23] Ericsson website. **Invisible Sites: Hiding small cells in not-so-plain site.** https://www.ericsson.com/en/networks/offerings/urban-wireless/invisible-sites

2.3.3. The Competition: Low Earth Orbit Satellites to blanket the country

The Government of Canada is allowing a type of satellite called a non-geostationary satellite orbit (NGSO) satellite, also known as **low earth-orbit satellite** or **LEO** for short, to deliver high-speed Internet to Canadians.[24] These are smaller, brighter, satellites that **travel 18 times closer to Earth** than traditional telecommunications satellites.

Elon Musk's SpaceX is planning to provide Internet service to every inch of the planet



A computer scientist's rendering of SpaceX's constellation of satellites for Starlink. Mark Handley/University College London

- **SpaceX**:
  - has already launched 2,042 satellites (Spacenews.com, January 18, 2022),
  - is launching approximately 60 satellites every two weeks.
  - has the FCC approval to launch 12,000 low-orbit satellites to create a mega-constellation called Starlink (Phys.org, 16 November 2018)
  - is trying to get permission to increase this to 42,000 (Tech Times, Oct 16, 2019).
  - has the FCC approval to deploy 1 million ground antennas for Starlink (CNBC, March 20, 2020)
  - obtained CRTC approval in 2020 to provide low Earth orbit satellite internet to rural Canadians (Canadian Radio-television and Telecommunications Commission).[25]
  - has begun beta tests with households in Canada – see section 2.7.

Others planning to offer satellite Internet service to Canadians include:

- **Project Kuiper, owned by Amazon's Jeff Bezos,** is spending $10 billion US, to launch 3,200 spacecraft into low earth orbit and offer service within one to two years;
- **Telesat** – a Canadian company hopes to launch their service in Canada in late 2022 with 298 LEO satellites.[26] (Canadian Government investing up to $1.44 billion.)

Canadian government actively supporting these satellites

Innovation, Science and Economic Development Canada (ISED) is:

- **streamlining its licensing process** so satellite systems can be approved faster.[27]
- **funding LEO satellites**. In August 2021, ISED entered into an agreement-in-principle with Telesat to invest **$1.44 billion** into its satellite constellation "Telesat Lightspeed" ($790-million repayable loan plus a $650-million equity investment).[28]

[24] https://www.ic.gc.ca/eic/site/139.nsf/eng/00016.html#leo
[25] https://www.cbc.ca/news/canada/new-brunswick/elon-musk-tesla-starlink-low-earth-orbit-high-speed-rural-internet-rockets-satellite-1.5768338
[26] https://www.cbc.ca/news/canada/new-brunswick/broadband-rural-internet-high-speed-access-wireless-technology-fibre-optic-cable-1.5748599
[27] https://www.canada.ca/en/innovation-science-economic-development/news/2017/06/improving_high-speedinternetaccesstoruralandnortherncommunitiest.html

2.4. Why is 5G so concerning?

- **There has been no research on the health effects of long-term exposure to mmWave radiation**. (We are "flying blind," to quote a U.S. senator[29]).
  However, we do have considerable evidence about the harmful effects of the microwaves used in 2G, 3G, 4G and LTE (and therefore some of the lower frequency bands that will also be used in 5G).
- **5G will not replace 4G; it will accompany it.** It will be in addition to current towers. The plan is to install more towers plus thousands of small cell antennas. 5G networks will operate on 3 frequency bands each requiring different antennas. Simultaneous exposure to multiple types of RF radiation will substantially increase our overall risk of harm. [30]
- **5G will require antennas every 100 to 200 metres** (according to some sources, "every few hundred feet"[31]), exposing people to mmWave radiation in their homes whether they use it or not.
- **5G will employ new technologies** (e.g., active antennas capable of beam-forming; phased arrays; massive multiple inputs and outputs, known as massive MIMO), which pose unique challenges for measuring exposures.[32]
- **Citizens are not being consulted.** Canada's regulations require public consultations only for towers (although health concerns are not deemed relevant). Therefore, the telecom industry can legally install small cell antennas on "non-tower" structures, such as lamp poles, hydro poles or buildings, in front of people's houses without any notification. . . and even hide them.
- **Tens of thousands of low Earth orbit satellites are being planned to blanket every inch of the planet with wireless Internet service**, forcing every living thing to be exposed to potentially harmful radiation 24/7.
- **Health Canada's exposure guidelines are obsolete**. – For details, see chapter 6.

There will be no place
for people, wildlife (including pollinators) **and trees**
to escape from this harmful environmental pollutant.

And Canada's regulations ensure that
they have no real say in the matter.

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[28] https://www.canada.ca/en/innovation-science-economic-development/news/2021/08/government-of-canada-announces-144-billion-investment-in-telesat-supporting-the-future-of-connectivity-for-rural-and-remote-communities.html
[29] US Senator Blumenthal Raises Concerns about 5G Wireless Technology Health Risks at Senate Hearing, Feb 6, 2019. https://www.youtube.com/watch?v=ekNC0J3xx1w&feature=youtu.be
[30] Joel M. Moskowitz (University of California, Berkeley). "We Have No Reason to Believe 5G Is Safe", Scientific American, October 17, 2019. https://blogs.scientificamerican.com/observations/we-have-no-reason-to-believe-5g-is-safe/
[31] GlobeNewswire. Recent Verizon/Crown Castle Agreement Bodes Well for Digital Locations", Feb 2, 2021. https://www.theglobeandmail.com/investing/markets/stocks/CCI/pressreleases/1057872/
[32] Moskowitz, op.cit.

2.5. What are the benefits?

Since the first generation of analog cell phones in the 1980's, wireless communication networks have evolved rapidly. Today's 4G/LTE networks provide wireless internet access, email, mobile TV, gaming, movies, navigational maps and more.

5G promises to provide an entirely new level of connectivity; fast, responsive, with very wide coverage.

According to GSMA, the trade body that represents the interests of mobile network operators worldwide, potential 5G benefits can be grouped into three different classes:

- **Enhanced Mobile Broadband** (**faster wireless Internet access**)
  Including peak download speeds of at least 20 Gbps and a reliable 100 Mbps user experience data rate in urban areas. This will better support **increased consumption of video** as well as emerging services like **virtual and augmented reality**.
  *[According to Cisco, by 2022, **65% of all Internet traffic will be wireless video**].*

- **Ultra-Reliable and Low Latency Communications**
  5G networks are being designed to be more reliable and have **very low latencies** (network delays)[33] to support services such as **autonomous vehicles (driverless cars)**, and **mobile healthcare**.

- **Massive Machine Type Communications**
  Including the ability to support at least **one million Internet-of-Things connections per square kilometre** with very long battery life and wide coverage including inside buildings. *[According to Cisco, by 2023, **machine to machine connections** will account for **50% of all Internet traffic**].*

The biggest beneficiaries of 5G will be corporations.

- By facilitating the growth of the Internet-of-Things, 5G will open up **new revenue streams** for corporations **by providing huge amounts of data** (telemetry data, usage data, consumer behaviour analytics, etc.). **Data is the new oil.**[34]
- Also, huge revenues will be generated by the new devices: Qualcomm estimates that 5G will produce up to $12 trillion worth of goods and services.

Note: Problems around data security and privacy will increase given huge amounts of data will be transferred over public networks. See sections 3.5 and 3.6 for more on this.

[33] Network latency is a term used to describe delays in communication over a network. Latency can either be measured as the Round Trip Time (RTT) or the Time to First Byte (TTFB). According to Verizon, it refers to the time required for a packet of data to travel round trip between two points. https://www.verizon.com/about/our-company/5g/what-network-latency

[34] The Economist (May 6, 2017). The world's most valuable resource is no longer oil, but data. https://www.economist.com/leaders/2017/05/06/the-worlds-most-valuable-resource-is-no-longer-oil-but-data
Forbes (Nov 15, 2019). Data Is The New Oil -- And That's A Good Thing. https://www.forbes.com/sites/forbestechcouncil/2019/11/15/data-is-the-new-oil-and-thats-a-good-thing/#9c53bf473045

2.6. The Internet of Things (IoT)

IoT is the generic term used to describe electronic appliances and devices that wirelessly connect to the internet and to each other. Devices are embedded with sensors, software, network connectivity and electronics that enable them to collect and exchange data. For example: your smart refrigerator can alert you when you run low of certain foods; your washing machine can connect directly with the manufacturer for a diagnostic; you can adjust the heat in your house from an app on your mobile phone while you are away.

IoT is already happening on existing networks.
IoT applications presently in use: smart appliances (washer/dryers, ovens, refrigerators), heating, air-conditioning, security systems, wearables (watches, fitness trackers), traffic sensors, connected cars.

With 5G, IoT will no longer be constrained by network resources.
The potential applications: driverless cars, health monitoring of patients, optimisation of street lighting to suit the weather or traffic; environmental monitoring, "smart" agriculture, and "smart" manufacturing. *– Section 3.3.5 has information on the Internet of Underwater Things (IoUT).*

A significant number of these applications can be implemented with a safer, cheaper, greener, and more secure wired solution. *(see section 9.1)*
Unfortunately, little research and development is being invested to find these solutions.

2.7. When will 5G be rolled out in Canada?

5G rollout has begun all across Canada.
"The Big Three" telecommunications giants in Canada who control 90% of the market are Rogers Communications (Rogers Wireless), BCE (Bell Mobility) and Telus (Telus Mobility). They have all begun offering a version of 5G, using the low- and/or mid-band frequencies (below 6 GHz).[35,36]

In order to offer the full 5G, they are waiting for the Canadian government (Ministry of Innovation, Science and Economic Development) to auction the high-band, i.e., the extremely high frequency millimetre waves (mmWaves). The auction of the high frequency bands has been delayed until **the first quarter of 2024**.[37]

Small cell antennas are already being deployed close to homes.

The low- and mid-band frequencies that are being used for the 5G currently being rolled out can travel great distances and can easily penetrate buildings; therefore, they can be transmitted effectively from the large towers. This is why the telecommunications industry has been ramping up its deployment of more and more cell towers during the pandemic.

In addition, in preparation for the high-band frequencies (mmWaves) which cannot travel far nor through obstacles as easily, the telecom industry has been installing thousands of antennas close to homes, and using them to broadcast the mid-range band.

[35] Rogers https://about.rogers.com/news-ideas/canadas-first-and-largest-5g-network-expands-to-over-50-new-cities-and-towns/
[36] Bell https://www.whistleout.ca/CellPhones/Guides/bell-5g
[37] ISED. Decision on the Technical and Policy Framework for the 3650-4200 MHz Band and Changes to the Frequency Allocation of the 3500-3650 MHz Band. Item 345. https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf11699.html

5G Spectrum Auctions – Estimated Schedule

	Band	Auction scheduled for
Low-band spectrum (sub-1GHz) *for outdoor to indoor penetration*	600 MHz	completed Spring 2019 (raised $ 3.5 billion)[38]
Mid-band spectrum (1 to 6 GHz) *for balance between coverage and carrying capacity*	3,500 MHz (3.5 GHz) 3,800 MHz (3.8 GHz)	completed June 2021[39] Early 2023
High-band spectrum (24 to 100 GHz) *for increased data rate*	26 GHz 28 GHz 37-40 GHz 64-71 GHz	Early 2024 (first quarter)
	32 GHz (for backhaul) 70 GHz (for backhaul) 80 GHz (for backhaul)	unknown

Sources: ISED's Spectrum Outlook 2018 to 2022 and "Decision on the Technical and Policy Framework for the 3650-4200 MHz Band and Changes to the Frequency Allocation of the 3500-3650 MHz Band", May 2021, paragraph 345, https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf11699.html

Wireless Internet soon to be deployed over our heads . . . without the consent of Canadians: Go-ahead given to SpaceX to blanket Canada with satellites

Companies planning to offer satellite Internet service to Canadians include:

- **Elon Musk's SpaceX** has begun beta tests on the service with households in Canada, and is currently operating in 14 countries, with license applications pending in others.[40] SpaceX has the FCC approval to launch **12,000 low-orbit satellites** to provide wireless Internet service to every inch of the planet. This mega-constellation of satellites, called Starlink, will orbit 18 times closer to the Earth compared to traditional telecommunications satellites. Its application to provide low Earth orbit satellite internet to rural Canadians was approved in 2020 by the Canadian Radio-television and Telecommunications Commission (CRTC).[41]
- **Project Kuiper, owned by Amazon's Jeff Bezos**, plans to launch 3,200 spacecraft into low earth orbit and offer service **within one to two years**;
- **Telesat,** a Canadian company, hopes to launch its service **in late 2022**[42] with the help of the Canadian Government (agreement-in-principle to invest $1.44 billion).

For more information on these satellites, see section 2.3.3.

[38] https://www.reuters.com/business/media-telecom/canada-launches-long-awaited-auction-5g-spectrum-2021-06-15/
[39] ISED. 3500 MHz auction – Process and results. July 29, 2021 https://www.canada.ca/en/innovation-science-economic-development/news/2021/07/3500-mhz-auction--process-and-results.html
[40] https://www.businessinsider.com/spacex-starlink-dish-terminal-elon-musk-satellite-internet-2021-8
[41] https://www.cbc.ca/news/canada/new-brunswick/elon-musk-tesla-starlink-low-earth-orbit-high-speed-rural-internet-rockets-satellite-1.5768338
[42] https://www.cbc.ca/news/canada/new-brunswick/broadband-rural-internet-high-speed-access-wireless-technology-fibre-optic-cable-1.5748599

3. Why are we concerned?

"In my lifetime our exposure to radiofrequency radiation
has increased by up to a billion billion times.
There is no excuse any more for pretending this is not harmful
– to us and to all life on the planet.
Radiofrequency radiation is the new tobacco.
Anybody sincerely reading the science
should be deeply, deeply concerned."
– Dr. Damien Downing, President,
The British Society for Ecological Medicine

3.1. Health Effects (Long-term)

"Human beings are bioelectrical systems.
Our hearts and brains are regulated by internal bioelectrical signals.
Environmental exposures to artificial EMFs can interact with
fundamental biological processes in the human body.
We have good evidence these exposures can damage our health,
or that of children of the future who will be born
to parents now immersed in wireless exposures."
– The BioInitiative Report 2012

3.1.1. There has been no research on the health effects of long-term exposure to 5G.

Current wireless devices and antennas that use 2G, 3G, 4G and LTE, have serious health consequences associated with them which also apply to 5G which will use many of those same frequencies.

However, in addition to those frequencies, 5G will add millimetre waves to the mix, PLUS it will employ new technologies (see sections 2.1 and 2.4). **There has been no research on the health effects of long-term exposure to radiation from 5G technologies.** Furthermore, we know that no such studies are being planned in the USA[43] and are not aware of any planned for Canada.

3.1.2. Thousands of peer-reviewed studies show serious adverse health effects of current wireless technologies.

The jury is no longer out. There is now more than enough evidence to warrant a precautionary approach which includes putting a stop to wireless 5G.

Hundreds of high-quality peer-reviewed studies have shown that RF radiation affects living organisms at levels well below most international and national guidelines, including Canada's. [44,45,46,47,48,49,50.]

[43] Senate Commerce, Science, and Transportation Committee hearing of the future of 5G wireless technology. February 17, 2019. https://www.blumenthal.senate.gov/newsroom/press/release/at-senate-commerce-hearing-blumenthal-raises-concerns-on-5g-wireless-technologys-potential-health-risks

[44] National Toxicology Program. Cell Phone Radio Frequency Radiation https://ntp.niehs.nih.gov/results/areas/cellphones/index.html

[45] Falcioni, L., et al. (2018). Report of final results regarding brain and heart tumors in Sprague-Dawley rats exposed from prenatal life until natural death to mobile phone radiofrequency field representative of a 1.8 GHz

Proven effects of RF radiation:

- increased cancer risk
- sperm damage
- DNA damage
- neurological disorders
- learning and memory deficits (childhood development)
- cellular stress
- oxydative stress
- increase in harmful free radicals

It would be easy to inundate you with credible studies. Instead we will mention the following and direct you to a few websites if you would like to see more.

- **The BioInitiative 2012 Report,[51] prepared by 29 authors from ten countries, reviewed over 1,800 studies** published in the five preceding years that reported adverse effects at exposure levels ten to hundreds and, some, thousands of times lower than allowed under safety limits in most countries, including Canada.

  Major areas of concern: damage to DNA and genes; carcinogenicity; reduction in free-radical scavengers – particularly melatonin; neurotoxicity in humans and animals; serious impacts on human and animal sperm morphology and function; effects on memory, learning, attention, behaviour, sleep disruption.

- **In 2018**, echoing those concerns, a **Lancet Planetary Health**[52] article reported that, of 2,266 studies evaluated, **1,546 "demonstrated significant biological or health effects associated with exposure"** – both acute and chronic – to anthropogenic EMR, including RFR. **According to the authors, these findings deserve "urgent attention".**

  They pointed to evidence that:

  - The damage goes beyond thermal effects and can alter human brain metabolism, electrical activity in the brain and immune responses;
  - Chronic exposure has been associated with increased oxidative stress, DNA damage and cancer risk;
  - There is an association between neurodevelopmental or behavioural disorders in children and their exposure to wireless devices;
  - Prenatal exposure can cause structural and functional changes in the brain associated with ADHD-like behaviour.

GSM base station environmental emission. Environmental Research. https://doi.org/10.1016/j.envres.2018.01.037

[46] Pall, M. L. (2015). Scientific evidence contradicts findings and assumptions of Canadian Safety Panel 6: microwaves act through voltage-gated calcium channel activation to induce biological impacts at non-thermal levels, supporting a paradigm shift for microwave/lower frequency electromagnetic field action. Reviews on Environmental Health, 30(2), 99–116. https://doi.org/10.1515/reveh-2015-0001

[47] *Canadian scientists urge more research into safety of wireless technology, saying recent report downgrades cancer risk*. The National Post. April 15, 2014. https://nationalpost.com/health/canadian-scientists-urge-more-research-into-safety-of-wireless-technology-saying-recent-report-downgrades-cancer-risk

[48] https://www.powerwatch.org.uk/science/studies.asp

[49] https://bioinitiative.org/conclusions/

[50] https://www.saferemr.com/2014/08/why-we-need-stronger-cell-phone_43.html

[51] https://bioinitiative.org/

[52] Bandara, P. and David O. Carpenter. (2018). Planetary electromagnetic pollution: it is time to assess its impact. https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(18)30221-3/fulltext#articleInformation

- **The $30 million large-scale animal study by the US National Toxicology program (NTP)**, National Institutes of Health (2018) found **"clear evidence" of cancer**.[53]

- **The Italian Ramazzini Institute duplicated the NTP findings**[54] of cancer from exposure to radiofrequency radiation at cell tower emission levels (2018).

- **Miller at al. (2018)**[55] present the science that would justify upgrading RF radiation to a Group 1 "known carcinogen" classification by the WHO's International Agency for Research on Cancer. Asbestos and cigarette smoke are in Group 1. *See 3.1.3 for details.*

- **The Switzerland BERENIS report**[56] has identified the likely mechanism of damage from radiofrequency non-ionizing radiation (at one time it was thought that the energies from non-ionizing radiation could not damage DNA).

2020 CONSENSUS STATEMENT
of UK and International Medical and Scientific Experts and Practitioners
on Health Effects of Non-Ionising Radiation (NIR)

Signed by groups representing more than 3,500 medical doctors

This is an important statement that should be read by all concerned about public health.

https://phiremedical.org/wp-content/uploads/2020/11/Press-Release-2020-Non-Ionising-Radiation-Consensus-Statement-1.pdf

For more information on the 2020 Consensus Statement,[57] **see section 4.3.**

For more peer-reviewed studies, see Appendix 4 and visit these websites:

Physicians for Safe Technology	https://mdsafetech.org/
Canadians for Safe Technology	http://c4st.com/
Environmental Health Trust	https://ehtrust.org/science/top-experimental-epidemiological-studies/
EMR Safety	https://www.saferemr.com
TechSafeSchools	http://techsafeschools.com/

[53] National Toxicology Program. Cell Phone Radio Frequency Radiation https://ntp.niehs.nih.gov/results/areas/cellphones/index.html

[54] Falcioni, L., et al. (2018). Report of final results regarding brain and heart tumors in Sprague-Dawley rats exposed from prenatal life until natural death to mobile phone radiofrequency field representative of a 1.8 GHz GSM base station environmental emission. Environmental Research. https://doi.org/10.1016/j.envres.2018.01.037 https://www.sciencedirect.com/science/article/pii/S0013935118300367?via%3Dihub

[55] Miller, A. B. et al. (2018). **Cancer epidemiology update, following the 2011 IARC evaluation of radiofrequency electromagnetic fields (Monograph 102)**. Environmental Research, 167, 673–683. https://doi.org/10.1016/j.envres.2018.06.043

[56] Federal Office for the Environment (FOEN). (2020). BERENIS - Swiss expert group on electromagnetic fields and non-ionising radiation. Retrieved January 27, 2021, from https://www.bafu.admin.ch/bafu/en/home/themen/thema-elektrosmog/newsletter-beratende-expertengruppe-nis--berenis-/beratende-expertengruppe-nis-berenis.html

[57] 2020 Consensus Statement of UK and International Medical and Scientific Experts and Practitioners on Health Effects of Non-Ionising Radiation (NIR)

3.1.3. A Known Human Carcinogen

Cancer remains the leading cause of death in Canada.
Nearly 1 in 2 Canadians will develop cancer in their lifetime. 1 in 4 will die from cancer.
An estimated 1,000 children (aged 0-14 years) are diagnosed each year.
-- According to the report "Projected estimates of cancer in Canada in 2020" [58]

In 2011, the World Health Organization's **International Agency for Research on Cancer (IARC)** classified RF radiation (RFR) as **"possibly carcinogenic"** (Group 2B – the same category as lead and DDT at the time).

Since then, there has been even more epidemiological evidence as well as animal studies that confirm 'clear evidence' of carcinogenicity – including the two largest investigations ever undertaken globally, from the widely respected National Toxicology Program (USA) and the Ramazzini Institute (Italy). Experts now state unequivocally that RF radiation should urgently be re-classified as a **"*known* human carcinogen"**. [59,60]

Dr. Anthony B. Miller is one of them. A highly respected expert in the field and one of the reviewers for IARC's monograph (volume 102, 2013) that supported the designation of RF radiation as a Group 2B human carcinogen, he has since stated publicly:

"The evidence indicating wireless is carcinogenic
has increased and can no longer be ignored."

-- Dr. Anthony B. Miller, July 31, 2017 lecture in Jackson Hole, Wyoming

He now believes the evidence published since 2011 fulfills the requirements to classify RF radiation as **"carcinogenic to humans" (Group 1)** as are asbestos and cigarette smoking . . . and he should know. *See his biography on next page.*

Here are the **highlights** of what he and his co-authors found in their **2018 review of epidemiology studies published since the IARC 2011 categorization of RFR**[61]:

- Increased risk of brain, vestibular nerve and salivary gland tumors are associated with mobile phone use.
- Nine studies (2011–2017) report increased risk of brain cancer from mobile phone use.
- Four case-control studies report increased risk of vestibular nerve tumors.
- Concern for other cancers: breast (male & female), testis, leukemia, and thyroid.

"When considered with recent animal experimental evidence, the recent epidemiological studies strengthen and support the conclusion that RFR should be categorized as carcinogenic to humans (IARC Group 1)."– excerpt from the abstract of his 2018 review

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[58] Brenner, Darren R., Hannah K. Weir, et al. Projected estimates of cancer in Canada in 2020. CMAJ Mar 2020, 192 (9) E199-E205; DOI: 10.1503/cmaj.191292 https://www.cmaj.ca/content/192/9/E199
[59] Miller, A. B. et al. (2018). **Cancer epidemiology update, following the 2011 IARC evaluation of radiofrequency electromagnetic fields (Monograph 102)**. Environmental Research, 167, 673–683. https://doi.org/10.1016/j.envres.2018.06.043
[60] Hardell, L., & Carlberg, M. (2018). **Comments on the US National Toxicology Program technical reports on toxicology and carcinogenesis study in rats exposed to whole-body radiofrequency radiation at 900 MHz and in mice exposed to whole-body radiofrequency radiation at 1,900 MHz**. International Journal of Oncology. https://doi.org/10.3892/ijo.2018.4606
[61] Miller, A. B. et al. (2018). **Cancer epidemiology update, following the 2011 IARC evaluation of radiofrequency electromagnetic fields (Monograph 102)**. Environmental Research, 167, 673–683. https://doi.org/10.1016/j.envres.2018.06.043

"Based on the evidence reviewed it is our opinion that IARC's current categorization of RFR as a possible human carcinogen (Group 2B) should be upgraded to Carcinogenic to Humans (Group 1)."

Other experts agree.
Researchers Lennart Hardell and Michael Carlberg have published several epidemiological studies that found increased brain cancer associated with long-term cell phone use and conclude that "RF radiation should be regarded as a human carcinogen causing glioma." In addition, published epidemiological research has also found persons diagnosed with brain cancer had decreased survival rates associated with higher wireless phone use.

In 2019, the WHO's International Agency for Research on Cancer (IARC) put RFR on a priority list for re-evaluation of the classification.

Their rationale is that there is "new bioassay and mechanistic evidence".[62]

"based on new evidence, non-ionizing radiation (radiofrequency) **should be a high priority for re-evaluation of the classification**"

– Report of the Advisory Group to Recommend Priorities for the IARC Monographs during 2020–2024[63]

Dr. Anthony B. Miller

- Physician epidemiologist specializing in cancer etiology, prevention and screening
- Professor Emeritus, Dalla Lana School of Public Health, University of Toronto
- Longtime advisor to the World Health Organization (WHO)
- Awarded the Medal of Honour by the WHO's International Agency for Research on Cancer (IARC)
- Member of the Order of Canada (2019)

In the course of his illustrious career, he has served as:

- Senior Epidemiologist, International Agency for Research on Cancer;
- Director, Epidemiology Unit, National Cancer Institute of Canada;
- Chair, Department of Preventive Medicine and Biostatistics, University of Toronto;
- Head, Division of Cancer Epidemiology, German Cancer Research Centre;
- Consultant, Division of Cancer Prevention, U.S. National Cancer Institute.

Dr. Miller has conducted research on electromagnetic fields and cancer, and has served on many committees assessing carcinogenicity of various exposures.
He was visiting Senior Scientist in the IARC Monographs programme as a reviewer to the scientific literature supporting designation of Radiofrequency Electromagnetic Fields as a Group 2B possible human carcinogen in 2011.

He was invited to speak to the House of Commons *Standing Committee on Health* for their report entitled "Radiofrequency Electromagnetic Radiation and the Health of Canadians" *(For more on this Report, see Section 6.3)*

[62] "Advisory Group recommendations on priorities for the IARC Monographs" in *The Lancet Oncology*, Elsevier, June 2019. https://www.thelancet.com/journals/lanonc/article/PIIS1470-2045(19)30246-3/fulltext
[63] https://monographs.iarc.fr/wp-content/uploads/2019/10/IARCMonographs-AGReport-Priorities_2020-2024.pdf

3.1.4. Children and Other Vulnerable Populations

Everyone is at risk for long-term harm from exposure to wireless radiation – even if they cannot feel it. However, the most vulnerable are children, pregnant women, the elderly and those who are ill, in particular the immune compromised.

People who are sensitive to RF radiation, feel immediate effects. These are considered "the canaries in the mine" and the effects that they experience are outlined in section 3.2.

Children are not "Little Adults". They are more susceptible to the harmful effects of RF radiation (RFR) from their early development in the womb until after adolescence.

> *The following is extracted from:* Clegg, F. M., Sears, M., Friesen, M., Scarato, T., Metzinger, R., Russell, C., Stadtner, A., & Miller, A. B. (June 2020). Building science and radiofrequency radiation: What makes smart and healthy buildings, *Building and Environment, 176*(106324), https://doi.org/10.1016/j.buildenv.2019.106324.
>
> **During their rapid development, the embryo, fetus, infant and child are more vulnerable to many environmental insults, and impacts are potentially lifelong.** Various life stages have different vulnerabilities and susceptibilities to RFR.[64,65,66,67] Modeling indicates that children absorb substantially higher RFR doses from cell phones, in deeper brain structures, than do adults (Fig. 2).[68] Research has also found proportionately higher doses to tissues in children compared with adults, from wireless laptops and utility meters.

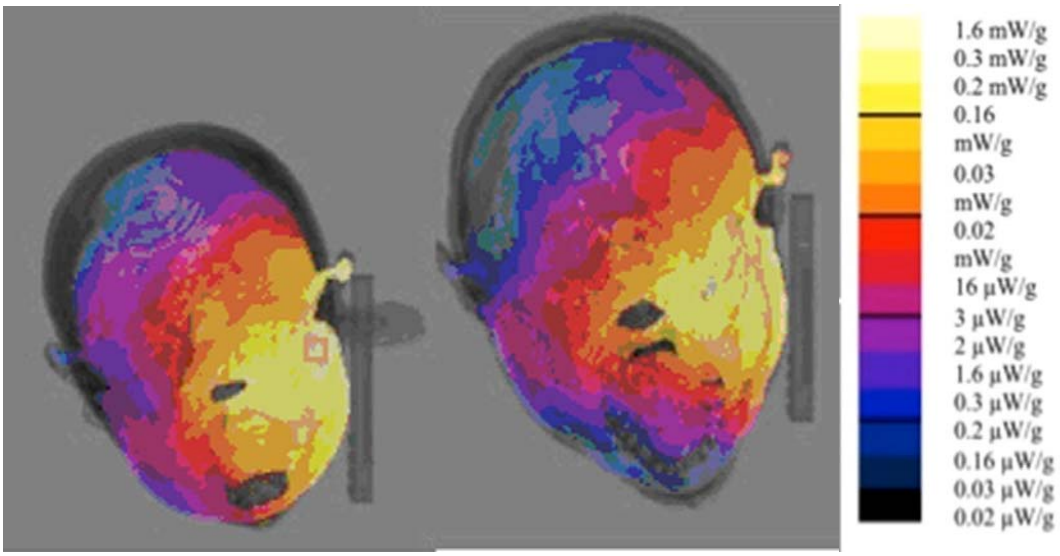

Fig. 2. Specific Absorption Rate (SAR) in adult and child (age 6 years) male heads with phone in talk position. The scale is 50 dB with 0 dB = 1.6 mW/kg. From work of Claudio Férnandez, 2018[69] (used with permission of Environmental Health Trust).

[64] https://www.degruyter.com/view/j/reveh.2015.30.issue-4/reveh-2015-0030/reveh-2015-0030.xml
[65] https://www.ncbi.nlm.nih.gov/pubmed/21999884
[66] https://www.tandfonline.com/doi/full/10.3109/15368378.2011.622827
[67] https://iopscience.iop.org/article/10.1088/0031-9155/55/7/001
[68] https://www.sciencedirect.com/science/article/abs/pii/S0013935118302561?via%3Dihub
[69] https://www.sciencedirect.com/science/article/abs/pii/S0013935118302561?via%3Dihub

Research has linked exposure during pregnancy to adverse effects.
The authors of a case-control study published in 2015 stated, "use of mobile phones can be related to early spontaneous abortions".[70] Maternal mobile phone use during the first trimester of pregnancy may contribute to slowing or halting of embryonic development,[71] possibly due to effects on membrane receptors in human amniotic cells.[72] A 2019 study of over 55,000 pregnant women and infants in four countries (Denmark, the Netherlands, Spain and Korea) linked maternal cell phone use during pregnancy with shorter pregnancy duration and increased risk for preterm birth.[73]

Behavioral problems have been associated with prenatal and postnatal cell phone exposure.
In five cohorts, Birks et al. found cell phone use by a pregnant woman to be associated with an increased risk for behavioral problems, particularly hyperactivity/inattention in her child,[74] and Divan et al. reported behavioral problems in children up to seven years of age.[75,76] Studies of children and adolescents report possible associations of wireless technology use with addictions and depression,[77] fatigue,[78] altered baseline thyroid hormone levels,[79] and poorer well-being.[80,81]
Sage and Burgio discuss the damage from low levels of RFR to genetic material including DNA and nuclear structures in the cell, and potential mechanisms of child neurodevelopmental impairment.[82]
A Yale University study found that when mice were exposed in utero to cell phone radiation, they had impaired memory and increased hyperactivity in adulthood.[83]

Not only can RF radiation act along with carcinogens to promote tumor development,[84] it also may synergize with toxic chemicals in other ways.
For example, in a study of Attention Deficit Hyperactivity Disorder in children, ADHD was associated with mobile phone use for voice calls only in children who were also exposed to relatively high lead levels (lead is an established, potent neurotoxin).[85]

End of excerpt

[70] https://link.springer.com/article/10.1186%2Fs40201-015-0193-z
[71] https://www.ncbi.nlm.nih.gov/pubmed/20568468
[72] https://www.tandfonline.com/doi/full/10.3109/09553002.2011.634882
[73] https://academic.oup.com/aje/article/188/7/1270/5474947
[74] https://www.sciencedirect.com/science/article/pii/S0160412016307383?via%3Dihub
[75] https://journals.lww.com/epidem/Fulltext/2008/07000/Prenatal_and_Postnatal_Exposure_to_Cell_Phone_Use.1.aspx
[76] https://jech.bmj.com/content/66/6/524
[77] https://www.sciencedirect.com/science/article/pii/S0747563215303320
[78] https://bmjopen.bmj.com/content/5/5/e007302
[79] https://www.sciencedirect.com/science/article/pii/S0048969715303946?via%3Dihub
[80] https://ehjournal.biomedcentral.com/articles/10.1186/1476-069X-12-90
[81] https://ehjournal.biomedcentral.com/articles/10.1186/s12940-016-0116-1
[82] https://srcd.onlinelibrary.wiley.com/doi/abs/10.1111/cdev.12824
[83] https://www.nature.com/articles/srep00312
[84] https://www.sciencedirect.com/science/article/abs/pii/S0006291X15003988?via%3Dihub
[85] https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0059742

3.1.5. Canadians are already overexposed to microwave radiation

Children are overexposed in schools and in their homes. Cancer patients are exposed in hospitals. It is impossible to buy a new car – or for that matter a washing machine – that does not expose you to RF radiation. It is impossible to travel without being exposed to microwaves – from Wi-Fi on trains, buses, planes and in hotels, to the Wi-Fi and Bluetooth in your car and the cell towers radiating along the highways. It is difficult to find a restaurant that does not have Wi-Fi . . . not to mention all the people with "smart" devices all around you.

"I have no doubt in my mind that at the present time,
the greatest polluting element in the earth's environment
is the proliferation of electromagnetic fields.
I consider that to be far greater on a global scale, than warming,
and the increase in chemical elements in the environment."[86]

Dr. Robert O. Becker
Twice nominated for a Nobel prize in medicine
State University of New York (deceased)

3.2. Health Effects (More Immediate): Electromagnetic Hypersensitivity – The Canaries in the Coal Mine

The following is extracted from: Clegg, F. M., Sears, M., Friesen, M., Scarato, T., Metzinger, R., Russell, C., Stadtner, A., & Miller, A. B. (June 2020). Building science and radiofrequency radiation: What makes smart and healthy buildings, *Building and Environment, 176*(106324), https://doi.org/10.1016/j.buildenv.2019.106324.

As with other environmental exposures, some people are more susceptible (sensitive or intolerant) and overtly affected by wireless technologies. Electromagnetic hypersensitivity (EHS) is also commonly termed electrical sensitivity, electrohypersensitivity, idiopathic environmental intolerance, or (historically) microwave sickness.

Common symptoms of EHS include[87,88]**:**

- headaches
- cognitive difficulties
- sleep problems
- dizziness
- depression
- fatigue
- skin rashes
- tinnitus
- flu-like symptoms

Adverse reactions to wireless devices range from mild and readily reversible to severe and disabling, and individuals must greatly reduce their exposures to sources of electromagnetic radiation.[89,90,91]

[86] https://www.hindawi.com/journals/ab/2014/198609/
[87] https://www.ncbi.nlm.nih.gov/pubmed/22153604
[88] https://www.ncbi.nlm.nih.gov/pubmed/7881769
[89] https://www.researchgate.net/publication/283718065_The_microwave_syndrome_or_electro-hypersensitivity_historical_background
[90] https://www.ncbi.nlm.nih.gov/pubmed/26372109
[91] https://www.chrc-ccdp.gc.ca/eng/content/medical-perspective-environmental-sensitivities

Surveys conducted in several countries at times ranging from 1998 to 2007 estimated that **approximately three to thirteen percent or more of the population experience symptoms of EHS.**[92,93,94,95]

As well as being difficult to manage in the modern world, EHS is typically unexpected. The theory that EHS is merely a "nocebo" response – that it results from suggestion and worry over possible effects of electronic devices – is the opposite of experience. In a study of 40 people, their EHS was only recognized following a period of illness and self-experimentation.[96]

Further research has confirmed that lived experience is not consistent with the nocebo hypothesis.[97]

EHS is recognized as a disability and is accommodated in the U.S. under the *Americans With Disabilities Act.*[98] Sweden recognizes EHS as a functional impairment.[99] In Canada, the condition is included under environmental sensitivities[100,101] by the Canadian Human Rights Commission. Internationally there are several lawsuits related to cell phones and cancer and disability from EMF exposures. For example, Australian[102] and Spanish[103] courts have awarded disability to workers claiming sensitivity to electromagnetic radiation.

Physicians' organizations' research, experiences, practices and statements over the years were summarized by the European Academy of Environmental Medicine (EUROPAEM) in 2016.[104] Sensitivities vary among individuals, and symptoms may also occur with exposures outside the RFR range.

The consensus of the *EUROPAEM EMF Guideline* is that **the most important action for treatment and management of EHS is reduction and avoidance of pertinent exposures** in locations where significant amounts of time are spent, especially in sleeping areas.

Other recommended measures include a suite of healthy lifestyle measures such as nutrition, stress reduction and measures to avoid toxicants, as well as to reduce levels of toxicants sequestered in the body.[105]

End of excerpt

The Canadian *Guide for Indoor Air Quality* states that people with chemical sensitivities may be more sensitive to other factors in their environment such as radiation from wireless communications and electrical equipment.[106]

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[92] https://www.ncbi.nlm.nih.gov/pubmed
[93] https://iopscience.iop.org/article/10.1088/1755-1315/10/1/012005/meta
[94] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1241215/
[95] https://www.ncbi.nlm.nih.gov/pubmed/21982467
[96] https://www.ncbi.nlm.nih.gov/pubmed/26369906
[97] https://www.ncbi.nlm.nih.gov/pubmed/30920673
[98] https://www.access-board.gov/research/completed-research/indoor-environmental-quality/recommendations-for-accommodations
[99] https://iopscience.iop.org/article/10.1088/1755-1315/10/1/012005/meta
[100] https://www.chrc-ccdp.gc.ca/sites/default/files/envsensitivity_en.pdf
[101] https://www.chrc-ccdp.gc.ca/eng/content/policy-environmental-sensitivities
[102] http://www7.austlii.edu.au/cgi-bin/viewdoc/au/cases/cth/aat/2013/105.html
[103] http://cemical.diba.cat/sentencies/fitxersSTSJ/STSJ_327_2016.pdf
[104] https://www.ncbi.nlm.nih.gov/pubmed/27454111
[105] https://www.ncbi.nlm.nih.gov/pubmed/27454111

3.3. Impacts on Wildlife, Including Birds and Pollinators, and Plants

"Where healthy, breeding bird populations had persisted,
once cell towers were installed and operating,
nest and site abandonment, plumage deterioration, locomotion problems,
reduced survivorship, and death were noted in House Sparrows,
White Storks, Rock Doves, Magpies, Collared Doves, and other species.
This was documentation in the field of some very troubling consequences
of the impacts of cell tower radiation on wildlife".[107]

-- Albert Manville, PhD, retired Senior Wildlife Biologist,
US Fish and Wildlife Service

Damage goes well beyond the human race.
There is growing evidence of harmful effects to both plant and animal life.

The dramatic worldwide decline of populations of birds, insects and other species makes this an urgent issue. According to scientists who specialize in this field, exposure to wireless radiation at ambient levels may well be a co-factor, along with pesticides, habitat loss and climate change.

Electromagnetic interactions are intrinsic in living tissues.

> "Brain waves are electrical, the heartbeat is electrical, the cell membrane has an electric field potential, cell division is electrically influenced, communication between neurons is electrical, and all of the hormonal and enzymatic activities are electrically regulated. Even the chemical-mechanistic model of the human and animal anatomy is essentially an electromagnetic model, because all chemical reactions involve the sharing, trading, or exchange of electrons at the elemental level".-- Albert Manville, PhD

Life on Earth has developed in an environment of fairly static geomagnetic fields and weak natural electromagnetic fields. The cells of all life forms normally communicate within and among themselves with exquisitely low-intensity electromagnetic and chemical signaling. **Over recent decades, man-made electromagnetic fields have significantly altered this natural background.** Ambient levels of EMR in some areas have increased up to a quintillion times the natural background levels (a quintillion is 1 with 18 zeros).

Retired senior wildlife biologist and former lead on telecommunications impacts at the US Fish and Wildlife Service, Dr. Albert Manville has investigated the impacts of radiation on migratory birds and other wildlife since the late 1990s, and has published numerous studies showing harm and testified about the impacts of cell towers on birds. He has stated that[108]:

"The race to implement 5G and the push (…) to approve
the related 5G license frequencies to industry
are very troubling and downright dangerous."

-- Albert Manville, PhD, Retired Senior Wildlife Biologist and
Former Lead on Telecommunications Impacts, US Fish and Wildlife Service

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[106] Canadian Committee on Indoor Air Quality (CCIAQ). Guide for Indoor Air Quality, Modules 13 and 14. https://iaqresource.ca/iaq-guides/

[107] Statement From Dr. Albert Manville On The FDA Report On Cell Phone Radiation. *Environmental Health Trust.* https://ehtrust.org/press-statement-from-dr-albert-manville-on-the-fda-report-on-cell-phone-radiation-2/

3.3.1. What we know: The growing evidence

RF radiation may be contributing to **bird population declines**, **bee colony collapse disorder** and the **dramatic drop in insect numbers** reported recently.


Photo Dreamstime

There is a growing body of peer-reviewed studies reporting that RF radiation can cause:

- harm to the navigational ability of birds and bees
- nest and site abandonment, reduced survivorship and death in nesting birds
- damaged leaves and foliage die-off in trees

A 2013 review of 113 plant and animal studies catalogs those findings and more on the impacts of RFR.[109] Dr. Cindy Russell published an eye-opening article entitled "Wireless Silent Spring"[110] in 2018 which draws parallels between toxic chemicals and RF radiation.

For a list of some of the key studies showing harm to non-human life, see Appendix 5.

The following is modified from Clegg et al. 2019[111]:

> **Biological systems are integrated, complex and operate using minute electrical charges combined with precise chemical signals.** These mediate complex functions such as development, reproduction and cognition.
>
> Recent research has demonstrated adverse effects of radiofrequency radiation (RFR) on environments and wildlife, including birds, amphibians, insects, fish, mammals and plants.[112,113,114] For example, trees near cell towers can become visibly unhealthy on the side facing a cellular antenna, and can die.[115]
>
> A diverse array of species depends upon the Earth's low-level magnetic field to navigate for migration, homing, breeding, foraging and survival. RFR can have significant long-term impacts on the natural environment via disruption of normal positioning and orientation abilities as well as other complex cellular and biologic processes. Incremental effects may be only slowly recognized as species and ecosystems decline.

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[108] Albert Manville. Briefing Comment to the FCC. June 3, 2020. https://www.fcc.gov/ecfs/filing/1060315601199
[109] Cucurachi, S., Tamis, W. L., Vijver, M. G., Peijnenburg, W. J., Bolte, J. F., & de Snoo, G. R. (2013). A review of the ecological effects of radiofrequency electromagnetic fields (RF-EMF). Environment international, 51, 116–140. https://doi.org/10.1016/j.envint.2012.10.009 https://pubmed.ncbi.nlm.nih.gov/23261519/
[110] Russell, Cindy. Wireless Silent Spring. Article published in the October 2018 issue of the Santa Clara County Medical Association Bulletin. https://mdsafetech.files.wordpress.com/2018/11/wireless-silentspring_-sccma-oct-2-2018.pdf
[111] Clegg et al. 2020. https://doi.org/10.1016/j.buildenv.2019.106324
[112] Cucurachi et al. 2012. https://www.ncbi.nlm.nih.gov/pubmed/23261519
[113] Fernie et al. 2000. https://www.ncbi.nlm.nih.gov/pubmed/10685907
[114] Balmori and Hallberg 2007. https://www.tandfonline.com/doi/abs/10.1080/15368370701410558
[115] Waldmann-Selsam et al. 2016. https://www.ncbi.nlm.nih.gov/pubmed/27552133

Birds, Bees, Magnetoreception and Migration

Small deposits of the iron-containing mineral magnetite act as magnetoreceptors in a variety of organisms, including bacteria, insects, fish, birds and mammals[116,117,118] which are used to sense the Earth's magnetic field. Some bird species are strongly influenced by the low intensity magnetic fields of the Earth for directional reference. Newer studies suggest that light-dependent cryptochrome photo receptors in birds' eyes are also sensitive to magnetic forces, and communicate with the brain.[119,120]

RFR can interfere directly with magnetoreception in birds, **disabling their avian magnetic compass**.[121] A series of double-blinded studies replicated over several years demonstrated that migratory European robins lost their ability to orient and navigate in a city with high background "electromagnetic noise" and broadband frequencies.[122] Effects can be complex, as illustrated by findings that some birds can be more sensitive to weak broadband than to stronger fields.[123,124]

Bees use magnetite crystals in their abdomens for navigation.[125] This sensory modality can be disrupted by electromagnetic fields, causing a loss of colony strength.[126,127,128]

Scientists are increasingly concerned about the impacts of wireless radiation on the worldwide decline of domestic bees and colony collapse disorder.[129,130]

Other insects are also adversely affected by RFR.[131,132,133]

Review articles indicate that the weight of evidence is
that **RFR acts as an environmental toxin with ecosystem-wide harm**
from increasing ambient RFR emitted by cell towers and
other RFR infrastructure.

References for the above-mentioned review articles: [134,135,136,137,138,139]

End of Clegg et al. excerpt.

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[116] Cadiou and McNaughton 2010. https://www.ncbi.nlm.nih.gov/pubmed/20106875
[117] Kirschvink, Gould 1981. https://www.ncbi.nlm.nih.gov/pubmed/7213948
[118] Ritz et al. 2004. https://www.ncbi.nlm.nih.gov/pubmed/15141211
[119] Wiltschko and Wiltschko 2014. https://www.ncbi.nlm.nih.gov/pubmed/25587420
[120] Wiltschko et al. 2015. https://www.ncbi.nlm.nih.gov/pubmed/25540238
[121] Keary et al. 2009. https://frontiersinzoology.biomedcentral.com/articles/10.1186/1742-9994-6-25
[122] Engels et al. 2014. https://www.ncbi.nlm.nih.gov/pubmed/24805233
[123] Pakhomov et al. 2017. https://www.ncbi.nlm.nih.gov/pubmed/28794163
[124] Schwarze et al. 2016. https://www.ncbi.nlm.nih.gov/pubmed/27047356
[125] Desoil et al. 2005. https://iopscience.iop.org/article/10.1088/1742-6596/17/1/007
[126] Favre 2017. https://www.jscimedcentral.com/Behavior/behavior-2-1010.php
[127] Lambinet et al. 2017. https://www.ncbi.nlm.nih.gov/pubmed/28330921
[128] Liang et al. 2016. https://www.ncbi.nlm.nih.gov/pubmed/27005398
[129] Expert Committee. Ministry of Environment and Forest. India.2011. http://www.indiaenvironmentportal.org.in/content/341385/report-on-possible-impacts-of-communication-towers-on-wildlife-including-birds-and-bees/
[130] Cammaerts 2017. https://www.jscimedcentral.com/Behavior/behavior-2-1006.php
[131] Cammaerts et al. 2014. https://link.springer.com/article/10.1007/s10905-014-9446-4
[132] Darney et al. 2016. https://link.springer.com/article/10.1007/s13592-015-0421-7
[133] Lázaro et al. 2016. https://link.springer.com/article/10.1007/s10841-016-9868-8
[134] Kumar 2010. https://www.ee.iitb.ac.in/~mwave/GK-cell-tower-rad-report-DOT-Dec2010.pdf
[135] Balmori 2005. https://www.tandfonline.com/doi/abs/10.1080/15368370500205472
[136] Balmori 2015. http://www.sciencedirect.com/science/article/pii/S0048969715002296
[137] Balmori and Hallberg 2007. https://www.ncbi.nlm.nih.gov/pubmed/17613041
[138] Levitt and Lai 2010. https://www.nrcresearchpress.com/doi/pdf/10.1139/A10-018?src=recsys
[139] Sivani and Sudarsanam 2013. https://ecfsapi.fcc.gov/file/7520942058.pdf

3.3.2. Recent Scientific Reviews

There have been several recent reviews that provide a good overview of the scientific evidence of electromagnetic radiation and effects on wildlife.

COMPREHENSIVE REVIEW IN 3 PARTS of the effects of electromagnetic radiation on plants and animals at ambient levels

This authoritative review published in 2021 stated:

> *"Biological effects have been seen broadly across all taxa and frequencies at vanishingly low intensities comparable to today's ambient exposures. Broad wildlife effects have been seen on orientation and migration, food finding, reproduction, mating, nest and den building, territorial maintenance and defense, and longevity and survivorship. Cyto- and geno-toxic effects have been observed."*

1. Levitt, B. B., Lai, H. C., & Manville, A. M. (2021a). Effects of non-ionizing electromagnetic fields on flora and fauna, **Part 1. Rising ambient EMF levels in the environment**. Reviews on Environmental Health. https://doi.org/10.1515/reveh-2021-0026
2. Levitt, B. B., Lai, H. C., & Manville, A. M. (2021b). Effects of non-ionizing electromagnetic fields on flora and fauna, **Part 2 impacts: how species interact with natural and man-made EMF**. Reviews on Environmental Health. https://doi.org/10.1515/reveh-2021-0050
3. Levitt, B. B., Lai, H. C., & Manville, A. M. (2021c). Effects of non-ionizing electromagnetic fields on flora and fauna, **Part 3. Exposure standards, public policy, laws, and future directions**. Reviews on Environmental Health. https://doi.org/10.1515/reveh-2021-0083

THREE RECENT REVIEWS ON INVERTEBRATES including pollinators.
Insect populations of critical importance for a healthy environment are declining dramatically worldwide. These reviews are from Canada, India and Spain.
The authors all conclude that EMR may be a contributing factor.

1. Balmori, A. (2021). Electromagnetic radiation as an emerging driver factor for the decline of insects. Science of The Total Environment, 767, 144913. https://doi.org/10.1016/j.scitotenv.2020.144913 (Spain)
2. Friesen, M., & Havas, M. (2020). Effects of Non-ionizing Electromagnetic Pollution on Invertebrates, Including Pollinators such as Honey Bees: What We Know, What We don't Know, and What We Need to Know. In Working Landscapes. Proceedings of the 12th Prairie Conservation and Endangered Species Conference, Danyluk (ed.). February 2019, Winnipeg, Manitoba. 203 pages. (pp. 127–138). Critical Wildlife Habitat Program, Winnipeg, Manitoba. Retrieved from http://pcesc.ca/media/45404/final-2019-pcesc-proceedings.pdf (Canada)
3. Kumar, S., Singh, V. K., Nath, P., & Joshi, P. C. (2020). An overview of anthropogenic electromagnetic radiations as risk to pollinators and pollination. Journal of Applied and Natural Science, 12(4), 675–681. https://doi.org/10.31018/jans.v12i4.2420 (India)

3.3.3. State of New Hampshire Report

The State of New Hampshire formed a commission to take a deeper look at the potential health risks of 5G. Its ***Commission to Study the Environmental and Health Effects of Evolving 5G Technology*** published its Final Report[140] in November 2020.

The report stated that "No US agency nor international authority with expertise in science, biology or safety has ever acted to review research and set safety limits on these non-human species." and included the following among its 15 recommendations:

> STATE OF NEW HAMPSHIRE
> **Commission to Study the Environmental and Health Effects of Evolving 5G Technology**
>
> RECOMMENDATION 14
>
> The State of New Hampshire should engage agencies with appropriate scientific expertise, including ecological knowledge, to develop RF-radiation safety limits that will protect the trees, plants, birds, insects, and pollinators. (…)
>
> The State of New Hampshire needs to ensure our natural environment and wildlife are protected by effective safety standards. Tree limbs, birds, and pollinators will be closer than humans to 5G cell antennae and associated 4G densified infrastructure. In fact, the wireless radiation from cell antennae is very high in a plume surrounding the antennae. It could exceed FCC limits for several feet in this area, yet this is the exact area where leaves of trees, birds, and pollinators live. Thus, they may have higher exposures being in direct line of sight of wireless RF beams.
>
> When pollinators are impacted so are all forms of vegetation that depend on them for reproduction.

Appendix N of their Report lists studies and reports on the effects of wireless radiation on trees, plants, birds, insects, pollinators, and wildlife. Among them:

- **A letter with background information, written by the US Department of Interior** in 2014 to the National Telecommunications and Information Administration[141] detailing several published studies showing impacts of wireless radiofrequency radiation (RFR) to birds, states that:

  > The placement and operation of communication towers, including un-guyed, unlit, monopole or lattice-designed structures, impact protected migratory birds in two significant ways.
  >
  > The first is by injury, crippling loss, and death from collisions with towers and their supporting guy-wire infrastructure, where present. (Attempts to estimate bird-collision mortality at communication towers in the U.S. resulted in figures of 4-5 million bird deaths per year (Manville 2005, 2009). A meta-review of the published literature now suggests, based on statistically determined parameters, that mortality may be as high as 6.8 million birds per year in Canada and the U.S.)

[140] Abrami et al. 2020. http://www.gencourt.state.nh.us/statstudcomm/committees/1474/reports/5G%20final%20report.pdf
[141] https://ecfsapi.fcc.gov/file/10929811111664/41-Attachment%2041-%20Dept%20of%20Interior%20Original%20Letter.pdf

The second involves impacts from non-ionizing electromagnetic radiation emitted by the communication towers.

> *There is a growing level of anecdotal evidence linking effects of non-thermal, non-ionizing electromagnetic radiation from communication towers on nesting and roosting wild birds and other wildlife in the U.S.*
>
> *Study results have documented nest and site abandonment, plumage deterioration, locomotion problems, reduced survivorship, and death (e.g., Balmori 2005, Balmori and Hallberg 2007, and Everaert and Bauwens 2007). Nesting migratory birds and their offspring have apparently been affected by the radiation from cellular phone towers in the 900 and 1800 MHz frequency ranges (…).*
>
> *In laboratory studies, T. Litovitz (personal communication) and DiCarlo et al. (2002) raised concerns about impacts of low-level, non-thermal electromagnetic radiation from the standard 915 MHz cell phone frequency on domestic chicken embryos- with some lethal results (Manville 2009, 2013a). Radiation at extremely low levels (0.0001 the level emitted by the average digital cellular telephone) caused heart attacks and the deaths of some chicken embryos subjected to hypoxic conditions in the laboratory while controls subjected to hypoxia were unaffected (DiCarlo et al. 2002).*

- **A Briefing Memorandum**: **What We Know, Can Infer, and Don't Yet Know about Impacts from Thermal and Non-thermal Non-ionizing Radiation to Birds and Other Wildlife[142] by Albert M. Manville**, II, Ph.D., C.W.B.; Principal, Wildlife and Habitat Conservation Solutions, LLC; Adjunct Professor, Johns Hopkins University's Krieger School of Arts and Sciences, DC Campus; and former U.S. Fish and Wildlife Service agency lead on avian-structural impacts — including from radiation, 2016.

- **India dropped their RF limits to 1/10th of their previous ICNIRP-based limits after a research review**[143] documented the majority of research studies found adverse effects to wildlife, birds and bees.

- **Regarding bees and pollinators**, the study "Exposure of Insects to Radio-Frequency Electromagnetic Fields from 2 to 120 GHz" published in Scientific Reports found insects, based on insect models (including the Western honeybee) can absorb the higher frequencies that will be used in the 5G with millimetre rollout, with absorbed power increases up to 370%. The researchers warn, "This could lead to changes in insect behaviour, physiology, and morphology over time…." Research also has found impacts to bees from wireless frequencies including inducing artificial worker piping (Favre, 2011), disrupting navigation abilities (Sainudeen, 2011; Kimmel et al., 2007), reducing colony strength (Harst et al., 2006), and impacts to honey bee physiology (Kumar et al., 2011).

[142] Manville, A. (2016). A BRIEFING MEMORANDUM: What We Know, Can Infer, and Don't Yet Know about Impacts from Thermal and Non-thermal Non-ionizing Radiation to Birds and Other Wildlife. https://ecfsapi.fcc.gov/file/12270470130362/Manville%207-14-%202016%20Radiation%20Briefing%20Memo-Public.pdf

[143] Expert Committee. Ministry of Environment and Forest. India.2011. http://www.indiaenvironmentportal.org.in/content/341385/report-on-possible-impacts-of-communication-towers-on-wildlife-including-birds-and-bees/

- **Research on trees has found that trees can be harmed by RFR.** A 9 year field study (Waldmann-Selsam, C., et al 2016) found significant impacts to trees near cell antennas and an investigation of 700 trees found damage starts on the side of the tree with highest RF. A review on impacts to plants entitled, "Weak radiofrequency radiation exposure from mobile phone radiation on plants" concluded, "a substantial amount of the studies on RF-EMFs from mobile phones show physiological and/or morphological effects." A study on aspen seedlings found ambient RF in a Colorado setting were high enough to cause necrotic lesions on the leaves, decrease leader length and leaf area, and suppress fall anthocyanin production (Haggarty, 2010).

- The European Scientific Committee on Health, Environmental and Emerging Risks states, "The lack of clear evidence to inform the development of exposure guidelines to 5G technology leaves open the possibility of unintended biological consequences."

3.3.4. Canada has NO regulations to protect flora and fauna from RF radiation. What are we waiting for?

Wireless radiation "safety" limits for birds, bees, trees, and other wildlife simply do not exist in Canada. Canada's Safety Code 6 limits apply only to human exposures and were not developed to protect our flora or fauna.

And that's not all.

There is no government agency, to our knowledge, researching or monitoring impacts of RFR to birds, bees, trees, and other wildlife.

The Minister of Environment and Climate Change Canada (ECCC), in his response to an Environmental Petition to the Auditor General (October 2021),[144] confirmed that:

> "Environment and Climate Change Canada is not conducting research and monitoring activities on the potential impact of radiofrequency/microwave radiation exposure to biota to inform Health Canada or other regulatory organizations."

It is time to include protection for the environment from RF radiation in the Canadian Environmental Protection Act (CEPA).

For more on this, see the white paper entitled "Protect Birds, Bees and Trees: Include Electromagnetic Radiation in Canadian Environmental Protection Act Amendments". Drafted by Prevent Cancer Now and Canadians for Safe Technology. February 2022."

[144] Petition 456. (2021). **The Government of Canada's rigour and transparency in evaluating the science regarding localized exposures to 5G technologies in its update of Safety Code 6**. https://www.oag-bvg.gc.ca/internet/English/pet_456_e_43873.html; Petition and government responses available at: https://preventcancernow.ca/wp-content/uploads/2022/02/5G-Petition-and-Government-Response.pdf

3.3.5. Meanwhile, plans are underway for the Internet of Underwater Things (IoUT)

The Internet of Underwater Things is defined as a world-wide network of smart interconnected underwater objects that enables the monitoring of vast unexplored water areas. It includes introducing underwater devices that communicate long-distance through impactful acoustic waves — deafening marine life — as well as installing nodes and devices at the ocean floor, scattering numerous underwater vehicles and robots all over the oceans, creating electromagnetic interferences, and much more.[145]

The US Defense Advanced Research Projects Agency (DARPA) has awarded a contract for the next phase of development of its **Ocean of Things (OoT)**, a project to seed the seas with thousands of floating sensors, monitoring everything that passes from aircraft to submarines. The name is a play on the Internet of Things and the aim is to achieve persistent maritime situational awareness over large ocean areas.[146] Data from this floating distributed network will support US Department of Defense missions as well as public oceanographic research and commercial applications.

At a time when so many species are struggling
to survive climate change, habitat loss, pesticides, poaching
and other harms perpetrated by our species,
it is crucial that we learn more
about how wireless technology is impacting them,
and that we apply the brakes before it is too late.

[145] New Threat To Life: The Internet Of Underwater Things. Verve Times, Feb 12, 2022. https://vervetimes.com/new-threat-to-life-the-internet-of-underwater-things/
[146] DARPA Progress With 'Ocean Of Things' All-Seeing Eye On The High Seas. Forbes, Aug 13, 2020. https://www.forbes.com/sites/davidhambling/2020/08/13/darpas-ocean-of-things-is-an-all-seeing-eye-on-the-high-seas/?sh=65491ff3f270

3.4. A Major Contributor to Climate Change and Pollution

*"**The communications industry could use 20% of all the world's electricity by 2025**, hampering attempts to meet climate change targets and straining grids as demand by power-hungry server farms storing digital data from billions of smartphones, tablets and internet-connected devices grows exponentially.*

The industry has long argued that it can considerably reduce carbon emissions by increasing efficiency and reducing waste, but academics are challenging industry assumptions."

The Guardian, 2017[147]

3.4.1. 5G is not sustainable – plain and simple

In an article published by the Institute for Electrical and Electronics Engineers (IEEE), researchers from the University of Melbourne stated:

"Wireless technologies will continue to consume at least 10 times more power than wired technologies when providing comparable access rates and traffic volumes."[148]

It was estimated that from 2012-2015, the wireless cloud would increase its carbon footprint by the equivalent of adding 4.9 million cars to the road.[149]

- **One 5G base station is expected to consume roughly <u>three times</u> as much power as a 4G base station.**[150]
- And 5G is expected to require **<u>far more base stations</u>** to deliver service and connect billions of mobile and IoT devices.[151]

The three main ways energy is consumed for Information Communications Technology are:

1) **Embodied energy** (energy associated with the manufacturing of a product, from the extracting and processing of raw materials, to manufacturing, transportation, distribution, assembly and construction)
2) **Data centers**
3) **Obsolescence** of digital technologies, e.g., e-waste

Artificial intelligence with its complex algorithms also adds significantly to the carbon footprint of ICT. "Behind every voice assistant like Amazon's Alexa is a network of algorithms that help the voice assistant understand and interact with us. Behind every voice assistant are also hundreds of thousands of pounds of CO_2 emissions."[152]

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[147] The Guardian (Dec 11, 2017). Tsunami of data' could consume one fifth of global electricity by 2025. https://www.theguardian.com/environment/2017/dec/11/tsunami-of-data-could-consume-fifth-global-electricity-by-2025#:~:text=The%20communications%20industry%20could%20use,internet%2Dconnected%20devices%20grows%20exponentially.

[148] Baliga, J., Ayre, R., Hinton. K., & Tucker, R. (2011). Energy Consumption in Wired and Wireless Access Networks. *IEEE Communications Magazine, June 2011*, p. 76 https://ieeexplore.ieee.org/document/5783987 https://people.eng.unimelb.edu.au/rtucker/publications/files/energy-wired-wireless.pdf

[149] https://ceet.unimelb.edu.au/publications/ceet-white-paper-wireless-cloud.pdf. p. 14

[150] Koziol, Michael. (2019). 5G's Waveform Is a Battery Vampire. *IEEE Spectrum, July 24, 2019* https://spectrum.ieee.org/5gs-waveform-is-a-battery-vampire

[151] Ibid.

[152] https://envirobites.org/2019/09/10/alexa-whats-your-carbon-footprint/

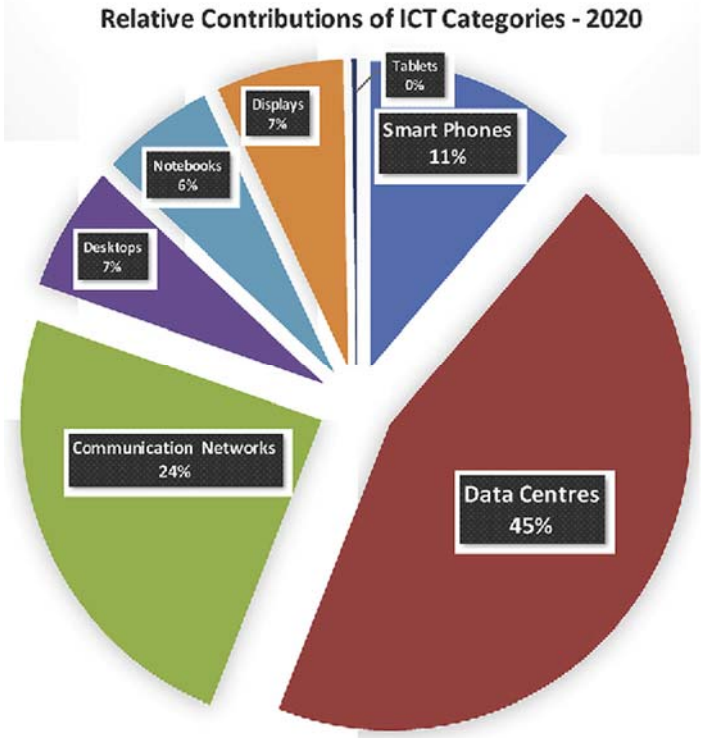
3.4.2. Large consumers of energy – from production to usage

A study from McMaster University published in the *Journal of Cleaner Production*, assessed the global carbon footprint of the Information and Communication Technology Industry (ICT), including the contribution from the main consumer devices, the data centers and communication networks, and compared it with total worldwide global greenhouse gas emissions (GHGE).

They found that the ICT Industry global greenhouse gas emissions are projected to "exceed 14% of the 2016-level worldwide GHGE by 2040, **accounting for more than half of the current relative contribution of the whole transportation sector"**.[153]

Trends suggest that of all devices, smartphones will be the most damaging to the environment.

While they consume little energy to operate, 85% of their emissions impact comes from production. The McMaster study predicted that by 2020 the footprint of smart phones alone would surpass the individual contribution of desktops, laptops and displays. A smartphone's chip and motherboard require the most amount of energy to produce as they are made up of precious metals that are mined at a high cost.



Largest impact comes from the data centres. Among the devices, smartphones expected to be the most damaging
Source: Belkhir, L. & Elmeligi, A. (2018). See footnote below.

> *" **In absolute terms, the GHGE emissions of smart phones grew** from about 17 Mt-CO_2-e in 2010 to 125 Mt-CO_2-e in 2020, **representing a 730% increase in the span of 10 years**. This impact is clearly driven by the fact that the production energy makes up 85-95% of its lifecycle annual foot-print, driven by the short average useful life of smart phones of 2 years, which is driven by the telecom membership business model. Clearly this business model, while highly profitable to the smart phone manufacturers and the telecom industry, is unsustainable and quite detrimental to the global efforts in GHGE reductions.*
>
> —Belkhir and Elmeligi (2018)[154]

[153] Belkhir, L. & Elmeligi, A. (2018). Assessing ICT global emissions footprint: Trends to 2040 & Recommendations. Elsevier, *Journal of Cleaner Production, 177*, 448-463. https://www.sciencedirect.com/science/article/pii/S095965261733233X

[154] Belkhir, L. & Elmeligi, A. (2018). Assessing ICT global emissions footprint: Trends to 2040 & Recommendations. Elsevier, *Journal of Cleaner Production, 177*, 448-463. https://www.sciencedirect.com/science/article/pii/S095965261733233X

Wireless access dominates data centre consumption

"For every text message, for every phone call, every video you upload or download, there's a data center making this happen. Telecommunications networks and data centers consume a lot of energy to serve you and most data centers continue to be powered by electricity generated by fossil fuels. It's the energy consumption we don't see."

-- Lotfi Belkhir, PhD, Faculty of Engineering, McMaster University

Data centres are huge warehouses where thousands of computers are stacked row after row and operate 24/7 to process and store data.

They use massive amounts of electricity to store everything sent through the internet.

They also require cooling to function, which consumes even more electricity.

According to a white paper published by the Centre for energy-efficient telecommunications, Bell Labs and University of Melbourne, "The energy consumption of wireless access dominates data centre consumption by a significant margin."[155]

The McMaster study agrees:

> *"Most of that relative growth comes from the data center industry, which as we move increasingly into a digital age, has become the backbone of both the Internet as well as the telecom industry, and grew its contribution to the overall footprint from 33% in 2010 to 45% in 2020.*
> ***In absolute terms, it shows an almost 3-fold increase** from 159 to 495 Mt-CO_2-eq **in the 10-year span."***

Researchers have been warning us that 5G will force the expansion of the data centre industrial complex.

> "5G will massively increase the amount of new data needing storage, including from thousands of new satellites and the many "smart" devices being sold to the public."[156]

According to the same article, "currently, a new data centre usually uses about 30 megawatts of electricity – enough to power a small city."

---

[155] The Power of the Wireless Cloud: An analysis of the impact on energy consumption of the growing popularity of accessing cloud services via wireless devices. CEET – Centre for energy-efficient telecommunications, Bell Labs and University of Melbourne https://ceet.unimelb.edu.au/publications/ceet-white-paper-wireless-cloud.pdf

[156] Nelson, J.. 5G and the Canadian Data Centre Rush: Between the power needs of 5G itself and the power needed to store vast amounts of new data, will Canadian ratepayers and municipalities be left holding the bag?. *Watershed Sentinel*. October 5, 2021. https://watershedsentinel.ca/articles/the-power-pull-of-5g/

3.4.3. E-Waste will increase substantially with 5G

Only 20% of e-waste is recycled today.[157]

E-waste causes significant environmental harm and will increase substantially with 5G.

5G will require **millions of new cellular antennas** called “small cells” – basically shorter cell towers – close to our homes, as well as more large cell towers. The industry calls this “densification”. These 5G antennas will connect with billions of new wirelessly connected “smart” devices referred to as **the Internet of Things** (IOT). *See section 2.6.*

In addition, there are **no upgrade solutions** that will allow 4G cell phones to work with 5G networks in Canada. Everyone who wants 5G service will need to buy a new phone, and will therefore discard their old ones.

Smartphones have **a short life that drives further production** of new models and an extraordinary amount of waste. The average smartphone life cycle in the United States is now under three years[158] and there are more mobile phone subscriptions and handsets (7.7 billion) globally than there are people on Earth (7.4 billion).[159]

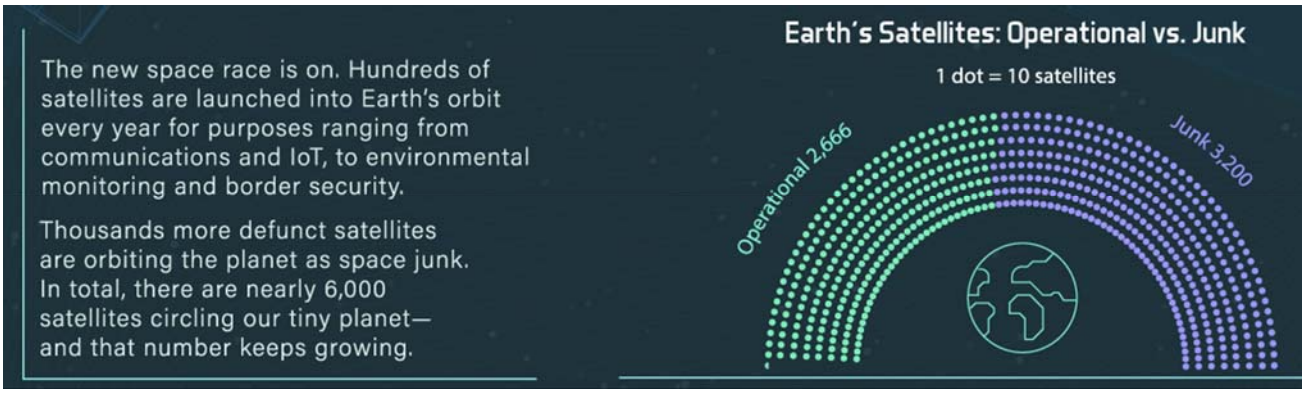
3.4.4. High social and environmental costs

Smartphones can contain as many as 50 different elements, including minerals linked to civil unrest, rare earth metals whose availabilities are dwindling, and various toxic materials that can degrade the natural world and threaten public health.[160] The social and physical costs of cell phones and smart phones is higher than most people realize and higher than many would be willing to pay if they were aware of the real costs.[161]

3.4.5. Space Junk

Of the thousands of satellites currently circling our planet, close to 60% are defunct, i.e., space junk.

As the number of satellites being launched for Internet access and the IoT connectivity skyrockets (see section 2.3.3), so will space debris increase.[162]



Source: Visual Capitalist https://www.visualcapitalist.com/visualizing-all-of-earths-satellites/

[157] https://www.itu.int/en/mediacentre/backgrounders/Pages/e-waste.aspx
[158] https://www.statista.com/statistics/619788/average-smartphone-life/
[159] https://www.telegraph.co.uk/science/2017/12/13/discarded-phones-computers-electronics-behind-worlds-fastest/
[160] https://www.sciencedaily.com/releases/2018/10/181016142434.htm
[161] https://digital.sandiego.edu/cgi/viewcontent.cgi?article=1012&context=honors_theses
[162] https://www.marketwatch.com/story/elon-musk-is-polluting-the-skies-with-spacexs-thousands-of-satellites-2020-05-27

3.5. Risks to Personal and Business Privacy

The Internet of Things (IoT) brings with it grave concerns about privacy.

5G networks will transmit exponentially more data, providing an opportunity to collect, process, harvest and use it for commercial, or for nefarious purposes.

Targeted advertising is only the tip of the iceberg.

Thanks to neural networking and machine learning algorithms, computers now routinely recognize images, parse and respond to human speech, answer questions and make decisions. Companies can work with data derived from GPS sensors, Bluetooth beacons and other sources.

We are constantly and inadvertently providing data whenever we surf the internet, give a voice command to "Alexa", make a credit card purchase, give our email address to a store, or sign up on a website. This information can be shared and compiled to create profiles.

Sensitive information can easily be transferred, leaked, or hacked.

Information such as...

Your health information

Digitized medical records, data obtained in the process of paying for prescriptions, not to mention the information we unthinkingly provide every time we use a search engine to find information about a disease, or post online about an illness or condition, our worries, or our favourite foods, how much we exercise, and much more.

Your movements

Canadians would surely protest if the government ordered every person to carry a tracking device that revealed their location 24 hours a day. Yet, in the past 10 years, app by app, people have been consenting to just such a system run by private companies that are far less accountable than governments.

Companies are collecting precise movements using software on mobile phone apps.[163]

> **Anyone with access to this data can see where you go, with whom you meet, with whom you sleep, where you pray, whether you visit a clinic, a gym, a psychiatrist's office or a massage parlor.**

From this information, evidence can be obtained about health problems, drug addiction, marital problems, visits to psychiatrists; they can learn whether you are religious, whether you participated in a protest, and much more.

The **Electronic Frontier Foundation** (https://www.eff.org/) offers some in-depth analysis of privacy and security issues.[164]

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[163] Zuboff, S. (2014, January). *The Age of Surveillance Capitalism* published by Public Affairs, Hachette Book Group

[164] EFF is an independent non-profit that has been working to protect online privacy for nearly thirty years.

The report from **The New York Times Privacy Project,**[165] demonstrates in an interactive way what they discovered. Click on this link. It is eye-opening.

One Nation, Tracked: An Investigation Into the Smartphone Tracking Industry from Times Opinion

"Every minute of every day, everywhere on the planet, dozens of companies -- largely unregulated, little scrutinized -- are logging the movements of tens of millions of people with mobile phones and storing the information in gigantic data files.

The *Times Privacy Project* obtained one such file, by far the largest and most sensitive ever to be reviewed by journalists. It holds more than 50 billion location pings from the phones of more than 12 million Americans as they moved through several major cities. (...) The sources of the information (employees at a location data company) said they had grown alarmed about how it might be abused and urgently wanted to inform the public and lawmakers.

After spending months sifting through the data, tracking the movements of people across the country and speaking with dozens of data companies, technologists, lawyers and academics who study this field, **we feel the same sense of alarm."**

-- **Twelve Million Phones, One Dataset, Zero Privacy,** By Stuart A. Thompson and Charlie Warzel, The New York Times, Dec. 19, 2019

3.6. Grave Security Risks

5G networks will transmit exponentially more data wirelessly, increasing the risk to personal and business privacy along with broader cybersecurity risks.[166,167]

Wireless networks are less secure, and more prone to hacking than wired systems.[168]

[165] https://www.nytimes.com/interactive/2019/12/19/opinion/location-tracking-cell-phone.html
[166] https://www.eff.org/
[167] N. Patel, "Wait, why the hell is the 'race to 5G' even a race?" in *The Verge*, May 23, 2019. https://www.theverge.com/2019/5/23/18637213/5g-race-us-leadership-china-fcc-lte
[168] Timothy Schoechle, *Re-Inventing Wires: The Future of Landlines and Networks*. Washington, DC: National Institute for Science, Law and Public Policy, 2018. https://electromagnetichealth.org/wp-content/uploads/2018/05/Wires.pdf

The network layer will need to use more complex software and more resources, like cloud services, to function. The number of network antennas will increase by a factor of 20, and with the IoT, many will be **poorly secured 'things'** such as household appliances.

> Click here: https://www.youtube.com/watch?v=ZPsnWKxeyIo&feature=youtu.be
> for a 3-minute video by Oxford Information Labs that explains why 5G networks will be more susceptible to attack than previous mobile networks.

Every part of the supply chain can be attacked.
According to Bruce Schneier, an internationally renowned security technologist, lecturer at Harvard's Kennedy School who has been called a "security guru" by *The Economist*, "Every part of the supply chain can be attacked when it comes to 5G technology; we have to build a trustworthy system out of untrustworthy parts."[169]

"Back doors" can be installed into the product. The computers, devices, smartphones, the chips that are inside them, the engineers who design and program them – come from over a hundred countries. "Thousands of people have the opportunity, acting alone, to slip a back door into the final product." says Schneier. In addition, open-source software packages are increasingly targeted by groups installing back doors.

Attacks can be launched through software distribution systems (fake apps illustrate this); **through update systems** (The NotPetya worm was distributed by a fraudulent update to a popular Ukrainian accounting package); and **through freely available software code libraries** (where malicious code can be inserted, then unintentionally used by programmers around the world).

And while potential nation-state threats like China and Huawei make the news, many of these vulnerabilities are also being exploited by cybercriminals.

The Internet of Things (IoT) will act like an unprotected back door.

- In 2000, Russian anti-virus company Kaspersky Lab warned that in a few years Internet-connected fridges and other household appliances will be targets of net viruses.[170]
- In 2014, the California security firm Proofpoint, Inc. announced that it discovered a large "botnet" which infected an internet-connected refrigerator, as well as other home appliances, and then delivered more than 750,000 malicious emails.[171]
- In 2015, security company Pen Test Partners discovered a vulnerability in the internet-connected refrigerator Samsung model RF28HMELBSR that can be exploited to steal Gmail users' login credentials.[172]

"The world uses one network, and there can only be one answer:
Either everyone gets to spy, or no one gets to spy.
And as these systems become more critical to national security,
a network secure from all eavesdroppers becomes more important."
– Bruce Schneier

[169] Bruce Schneier (2019). Essays: Every Part of the Supply Chain Can Be Attacked - Schneier on Security. *The New York Times,* Sept 25, 2019
https://www.schneier.com/essays/archives/2019/09/every_part_of_the_su.html
[170] Linda Harrison, "Fridges to be hit by Net viruses," in *The Register,* 21 June 2000
[171] "Fridge sends spam emails as attack hits smart gadgets". BBC News. 17 January 2014.
[172] Colin Neagle, "Smart refrigerator hack exposes Gmail account credentials" in *Network World* (26 August 2015). Retrieved 23 October 2016.

3.7. Contravention of Human Rights

People have not given their fully informed consent to the potential risks to their health of exposure to 5G technologies.

Basic human rights are being infringed because

- the general public is generally **not aware** of any of the potential health risks. Making matters worse, Health Canada's website is misinforming Canadians.[173]
- most small cell antennas for the 5G network **will not require public notification**. Small antennas are being placed on lamp posts, hydro poles, on the sides and tops of buildings without notice, public consultation or identifying signage; some are even deliberately hidden.[174]
- the Canadian government (ISED and the CRTC) are **quietly allowing (and funding) companies to blanket Canadians with RF radiation 24/7** from thousands of Low Earth Orbit satellites. *(See 2.3.3)*
- citizens (and their local governments) **cannot prevent the installation of these antennas.**

Public notification (and consultation) are not required for[175]:

- The installation of antennas on "Non-Tower Structures" (buildings, water towers, lamp posts, etc.) provided that the height of the structure is not increased by more than 25%.
- Height increases of up to 25% on existing cell towers.

It should be noted that while a public consultation is required for the installation of all new cell towers, notification of the wider community is only required for towers 30 metres or more in height (see section 5.2).

A Danish attorney, Christian F. Jensen, has examined whether the establishment of a 5G system would be a contravention of human rights and environmental law. The conclusion is that

> ''establishing and activating a 5G-network, as it is currently described, would be in contravention of current human and environmental laws enshrined in the European Convention on Human Rights, the UN Convention on the Rights of the Child, EU regulations, and the Bern- and Bonn-conventions.''[176]

Canada ratified the **UN Convention on Rights of the Child** in 1991.[177] The **Canadian Human Rights Commission (CHRC)** has a policy on Environmental Sensitivities.[178] Although electromagnetic hypersensitivity (EHS, commonly called electrosensitivity) is not specifically mentioned in the policy, it is included in the accompanying CHRC report *Medical Perspective on Environmental Sensitivities*.[179]

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[173] Canadians for Safe Technology (2020). C4ST Fact-checks Government of Canada Webpages Regarding Health Risks and Wireless Technologies, including 5G. docs.c4st.org/C4STdocs/C4ST-Factchecks-GoC-websites.pdf
[174] https://www.ericsson.com/en/networks/offerings/urban-wireless/invisible-sites
[175] https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10840.html Section 2.4
[176] https://mdsafetech.files.wordpress.com/2019/07/5g-danish-legal-opinion-jensen-2019.pdf
[177] https://www.justice.gc.ca/eng/rp-pr/fl-lf/divorce/crc-crde/conv2a.html
[178] https://www.chrc-ccdp.gc.ca/eng/content/policy-environmental-sensitivities
[179] https://www.chrc-ccdp.gc.ca/eng/content/medical-perspective-environmental-sensitivities [accessed 14Feb 2020].

3.8. Decreased Ability to Forecast the Weather and Monitor the Climate, and a Threat to Astronomical Observation

"What if, suddenly, decades of progress in weather prediction was reversed and monster storms that we currently see coming for days were no longer foreseeable? The toll on life, property and the economy would be enormous. Yet the government's science agencies say such a loss in forecast accuracy could happen if the Federal Communications Commission and the U.S. wireless industry get their way."
– Jason Samenow, Washington Post, May 23, 2019.

5G Deployment Could Set Weather Forecasting Back 40 Years.

Scientists have warned that 5G technology could interfere with critical satellite data which could result in a 30% reduction in weather forecast accuracy.[180]

5G intends to use the 24 GHz band which could interfere with the microwave sensors that transmit important water vapor data at a frequency of 23.8 GHz. This valuable data is transmitted from satellites, weather balloons, ocean buoys, weather radars and other technologies that are used by government agencies and the private sector.

The US government's science agencies, National Oceanic and Atmospheric Administration (NOAA) and National Aeronautics and Space Administration (NASA), have expressed serious concerns over this issue. Testifying before the House Science Committee on May 16, 2019, Neil Jacobs, the acting head of the NOAA, told members of Congress that the interference **could result in a 30% reduction in forecast accuracy**. "With this reduced forecast skill, the European model would not have predicted 2012′s Superstorm Sandy hitting the Northeast coast several days in advance", Jacobs said. Lead time to prepare for the storm would have been cut short.

In a memo on March 27, 2019, the US Navy also stated that the data interference would lead to "a probable degradation of weather and ocean models, resulting in increased risk in Safety of Flight and Safety of Navigation, and degraded Battlespace Awareness for tactical / operational advantage."

"NASA took us to the moon, and NOAA helped us explore the depths of the ocean. We rely on these agencies for scientific expertise, and they have warned us about the dire impact of this spectrum sale on weather forecasting capabilities — we should listen."
-- Sen. Maria Cantwell (D-Wash.) in a statement to The Washington Post

Possible Risk to Climate Monitoring

Jacobs added that if the data loss from interference reaches just 2 percent, NOAA would likely have to "stop work" on its $11 billion polar-orbiting satellite program, **important for not just weather forecasting but also for climate monitoring** and many other applications.[181]

[180] https://www.washingtonpost.com/weather/2019/05/23/head-noaa-says-g-deployment-could-set-weather-forecasts-back-years-wireless-industry-denies-it/
[181] https://www.washingtonpost.com/weather/2019/05/23/head-noaa-says-g-deployment-could-set-weather-forecasts-back-years-wireless-industry-denies-it/

The Night Sky and Astronomical Observation Endangered

The deployment of an estimated 42,000 satellites over the next year are not only an unprecedented source of **light pollution**, but also **threaten ground-based astronomy**.[182,183]

They will greatly outnumber the approximately 9,000 stars that are visible to the unaided human eye. This will deprive humanity of an unblemished view of the night sky. Astronomical observations have led to exceptional progress in our understanding of the Laws of Nature, and to scientific advances in industry, aerospace, energy, medicine and more.

See section 2.3.3 for more on these satellites.

As of February 26, 2022, **over 2,000 astronomers had signed an appeal** warning that astronomical observations will be greatly impaired by the deployment of large satellite fleets in preparation for 5G. The Starlink satellite array, unlike previous satellites, is unprecedented. Besides the sheer number, they are much brighter, are configured to be in a series of intersecting trains, and are designed to be in orbits that require constant course-correcting. Under these conditions, the identification and measurement of transient and variable events, such as supernovae, flares, and variable stars, will become impossible. Also, asteroid monitoring to guard the Earth from potential impact events, would be negatively impacted and affect astronomers' ability to warn humankind. *Click here to read the **Astronomers' Appeal**.* (https://astronomersappeal.wordpress.com)

As astronomer Caitlin Casey stated,

> *"The fact that one person, or one company, can take control and completely transform humans' experience of the night sky, and not just humans, but every organism on Earth … that seems profoundly wrong."*

3.9. Major Risk to Aviation Safety

According to a white paper[184,185,186] published in 2020, the RTCA, a private-public aviation partnership that advises the US Federal Aviation Administration, warns that 5G technologies could pose a "**major risk…of harmful interference**" to radar on business jets and other civilian aircraft. If 5G telecommunications systems are permitted to use that frequency band (3.7-3.98 GHz), said the report, "**the risk is widespread** and has the potential for broad impacts to aviation operations in the US, including the **possibility of catastrophic failures leading to multiple fatalities**, in the absence of appropriate mitigations."

Canada will be auctioning that frequency band in early 2023.

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[182] https://www.forbes.com/sites/startswithabang/2020/01/30/dangers-to-astronomy-intensify-with-spacexs-latest-starlink-launch/#6c15e6476a57

[183] https://astronomersappeal.wordpress.com/?fbclid=IwAR0aYFp4cxE1E84zis7Qt4p1kum3qe_EuK43gINN8_ZJbrxkuETlsBvDgWA

[184] News Release: White Paper on 5G Interference Impact on Radar Altimeter Operations, October 8, 2020. https://www.rtca.org/news/rtca-announces-new-white-paper-on-5g-interference-impact-on-radar-altimeter-operations/

[185] Assessment of C-Band Mobile Telecommunications Interference Impact on Low Range Radar Altimeter Operations, White Paper, October 7, 2020. https://www.rtca.org/wp-content/uploads/2020/10/SC-239-5G-Interference-Assessment-Report_274-20-PMC-2073_accepted_changes.pdf

[186] https://robbreport.com/motors/aviation/5g-interfere-airplane-radar-1234580467/?fbclid=IwAR30J-grQkFRot9OW_k9FG7HWcUr3UtFvC8FQL9_CCffMeWCJlfljldgwok

Radar altimeters are the only aircraft sensors that measure the height of the aircraft above the terrain. According to the Flight Safety Foundation, altimeters provide critical information to terrain awareness and warning systems (TAWS), traffic-alert and collision avoidance systems (TCAS), wind shear detection systems, flight control systems and autoland systems. The measurements from radar altimeters are also used by electronic centralized aircraft monitoring (ECAM) systems and engine-indicating and crew alerting systems (EICAS).

UPDATE: The federal government recently announced plans to restrict 5G service near major airports citing concerns about possible interference.[187]

3.10. Increased Economic Burden

The economic burden of wireless technologies has never been evaluated.[188]
While the benefits have been widely discussed, the actual costs have never been assessed to determine if they outweigh the benefits.

- **Canadian doctors raised concerns about the economic burden of increased health care costs.** At a 2019 symposium hosted by the Environmental Health Clinic, Women's College Hospital in Toronto, scientists and physicians stated that 5G rollout will expose Canadians to an unprecedented increase in radiofrequency radiation[189] and expressed concern that our health care costs will rise without our medical professionals' having the necessary information for making adjustments.[190]

- **The costs to our sustainability have never been evaluated.**
  The Minister of Environment and Climate Change Canada (ECCC), in his response to an Environmental Petition to the Auditor General (October 2021), confirmed that: ECCC "is not examining energy and resources implications to sustainability and climate change from the use of various alternative technologies for telecommunications."[191]

All of the risks described in this chapter will translate into tangible costs to society:
- healthcare and lost productivity related to adverse health effects from RF radiation
- costs engendered by security[192] and privacy breaches,[193]
- environmental damage
- the impacts to safety and property from the degradation of weather forecast accuracy and climate monitoring.

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[187] Ottawa stuns telecoms with surprise announcement that Canadians living near airports won't get full 5G service. Toronto Star. Sat., Oct. 9, 2021. https://www.thestar.com/business/2021/10/09/ottawa-stuns-telecoms-with-surprise-announcement-that-canadians-living-near-airports-wont-get-full-5g-service.html
[188] Patel, N. (2019, May 23). Wait, why the hell is the 'race to 5G' even a race? https://www.theverge.com/2019/5/23/18637213/5g-race-us-leadership-china-fcc-lte
[189] Women's College Hospital, Toronto. (31 May2019). Impacts of Wireless Technology on Health: A symposium for Ontario's medical community. https://www.womenscollegehospital.ca/care-programs/environmental-health-clinic/june-2019-conference-videos
[190] Media Release - Ontario Doctors Warn of Rising Health Care Costs after 5G Roll Out https://www.youtube.com/watch?time_continue=4&v=S16QI6-w9I8
[191] Petition 456. (2021). **The Government of Canada's rigour and transparency in evaluating the science regarding localized exposures to 5G technologies in its update of Safety Code 6**. https://www.oag-bvg.gc.ca/internet/English/pet_456_e_43873.html; Petition and government responses available at: https://preventcancernow.ca/wp-content/uploads/2022/02/5G-Petition-and-Government-Response.pdf
[192] Schneier, B. (2019, September 25). Essays: Every Part of the Supply Chain Can Be Attacked - Schneier on Security. https://www.schneier.com/essays/archives/2019/09/every_part_of_the_su.html
[193] The Threat Lab. (2019, June 26). The History of Cellular Network Security Doesn't Bode Well for 5G. https://www.eff.org/deeplinks/2019/06/history-cellular-network-security-doesnt-bode-well-5g

4. Scientists and Doctors Have Been Warning Governments for Years

4.1. The International EMF Scientist Appeal to the UN (ongoing)

> *"Based upon peer-reviewed, published research, we have serious concerns regarding the ubiquitous and increasing exposure to electromagnetic fields generated by electric and wireless devices. These include – but are not limited to – radiofrequency radiation (RFR) emitting devices, such as cellular and cordless phones and their base stations, Wi-Fi, broadcast antennas, smart metres, and baby monitors as well as electric devices and infra-structures used in the delivery of electricity that generate extremely-low frequency electromagnetic field (ELF EMF)."*

World-recognized scientists engaged in the study of biological and health effects of non-ionizing electromagnetic fields (EMF) **are urgently calling upon the United Nations** and its sub-organizations, the **World Health Organization** (WHO) and the **United Nations Environment Programme** (UNEP), **and all UN Member States**, **for more protective standards regarding RF radiation.**[194] These scientists specialize in evaluating the scientific evidence connecting RF radiation and harm to humans.

The original appeal was submitted on May 11, 2015. On July 22, 2019, it was resubmitted to the United Nations Environment Programme (UNEP) Executive Director, Inger Andersen, requesting the UNEP reassess the potential biological impacts of next generation 4G and 5G telecommunication technologies to plants, animals and humans**.**

> As of January 14, 2021: **255 EMF scientists from 44 nations** had signed.
> To read the Appeal: https://www.emfscientist.org/
> *(These scientists have over 2,000 studies on non-ionizing radiation published in the peer-reviewed literature.)*

4.2. Scientists' 5G Appeal to the European Union (ongoing)

> *"We the undersigned, recommend a moratorium on the rollout of the fifth generation, 5G, for telecommunication until potential hazards for human health and the environment have been fully investigated by scientists independent from industry.*
> *5G will substantially increase exposure to radiofrequency electromagnetic fields (RF-EMF) on top of the 2G, 3G, 4G, Wi-Fi, etc. for telecommunications already in place.*
> *RF-EMF has been proven to be harmful for humans and the environment.*"

The 5G Appeal was launched in 2017 by **scientists and doctors who are urgently calling on the European Union to halt the rollout of 5G** due to serious potential health effects from this new technology.[195]

> As of January 24, 2022: **421 scientists** and **medical doctors** from 49 nations had signed.
> To read the Appeal: https://www.5gappeal.eu/the-5g-appeal/

[194] International EMF Scientists Appeal. https://www.emfscientist.org/
[195] 5G Appeal http://www.5gappeal.eu/

4.3. Consensus Statement of UK and International Medical and Scientific Experts and Practitioners on Health Effects of Non-Ionising Radiation (NIR) (ongoing)

"We the undersigned state that the (…) 'Urgent Action Points' must be addressed immediately by the UK Government and other governments internationally, in order to prevent avoidable human injury, disease, deaths and potentially irreversible environmental damage. People must be allowed to retain the right not to be exposed against their will."

Urgent action is required to protect the health of humans and wildlife.

Public Health Crisis:

1. RFR has been proven to damage biological systems at intensities below ICNIRP* guidelines.
2. Public exposure to RFR is already harmful and will rise with the deployment of 5G.
3. Exposure is unavoidable, contravening the Human Rights Act for those who do not consent.
4. Multiple international governmental health advisory groups are biased by conflicts of interest.

*ICNIRP: International Commission on Non-Ionising Radiation Protection

Required Urgent Actions:

1. Immediate moratorium on 5G, wireless smart metering and any other new RF emissions.
2. Establishment of public safety limits to be biologically protective against adverse health effects.
3. Withdrawal of Wi-fi, wireless phone and other RFR emissions from within / near all schools.
4. Designation of low EMR* areas to protect those who are unwell or do not consent to exposure.
5. Education programmes to inform medical professionals on EMR related illnesses / effects.
6. A zero tolerance approach to industrial influence on public health policy and assured exclusion of those with conflicts of interest from official advisory bodies.

*EMR: Electromagnetic Radiation

Launched in 2020, this 12-page document declares current safety levels to be inadequate and highlights some of the disease processes linked with NIR exposure in peer-reviewed publications; it points out the vulnerabilities of children and other hypersensitive groups; it also highlights the contravention of Human Rights and Equalities acts and requests urgent responses from governments and health authorities to halt further deployment of emitting technology and address current public health failures.[196]

To read the Statement: https://phiremedical.org/wp-content/uploads/2020/11/Press-Release-2020-Non-Ionising-Radiation-Consensus-Statement-1.pdf

Endorsed so far by the following groups representing **over 3,500 medical doctors**, including experienced clinicians and widely-published experts in this field

• Physicians' Health Initiative for Radiation and Environment • British Society for Ecological Medicine • Alborada Foundation (Spain) • American Academy of Environmental Medicine • Australian College of Nutritional and Environmental Medicine • European Academy for Environmental Medicine • Italian Association of Doctors for the Environment	• National Association of Environmental Medicine (USA) • Ralf Meyer Akademie für Komplementärmedizin • Kompentenzinitiative (Germany) • EM Radiation Research Trust • Environmental Health Trust • International EMF Alliance • International Guidelines on Non-Ionising Radiation • Oceania Radiofrequency Scientific Advisory Association

[196] 2020 Consensus Statement of UK and International Medical and Scientific Experts and Practitioners on Health Effects of Non-Ionising Radiation (NIR)

4.4. International Appeal to Stop 5G on Earth and in Space (ongoing)

"We the undersigned scientists, doctors, environmental organizations and citizens from __ countries, urgently call for a halt to the deployment of the 5G (fifth generation) wireless network, including 5G from space satellites. 5G will massively increase exposure to radio frequency (RF) radiation on top of the 2G, 3G and 4G networks for telecommunications already in place. RF radiation has been proven harmful for humans and the environment. The deployment of 5G constitutes an experiment on humanity and the environment that is defined as a crime under international law."

This appeal, addressed to the **United Nations**, the **World Health Organization**, the **European Union**, the **Council of Europe**, and **governments of all nations**, and signed by **scientists, doctors, environmental organizations and citizens, urgently calls for a halt to the deployment of the 5G** (fifth generation) wireless network, **including 5G from space satellites.**

As of February 26, 2022: **300,675 signatories** from **215** nations and territories, including 4,388 medical doctors
To read the Appeal: https://www.5gspaceappeal.org/the-appeal

4.5. United States of America National 5G Resolution

"We join with the thousands of doctors, scientists and health care providers worldwide who have recently issued appeals for urgent action on 5G to protect public health and call for a moratorium on 5G and any further wireless antenna densification ***until potential hazards for human health and the environment have been fully investigated by scientists independent from the wireless industry****."*

"The children are our future. The scientific evidence has been clear for decades and now America has an opportunity to lead the way," said Toril H. Jelter, MD, a pediatrician who presented at the EMF Conference with case studies on children she has treated who have dramatically improved after reducing wireless exposures. "It is my impression that health effects of wireless radiation go misdiagnosed and underdiagnosed for years. Parents, teachers and physicians need to know that hardwiring internet, phone and tv is a healthier option for our children."

This letter to President Trump signed by American scientists, doctors and healthcare practitioners, urgently calls for a moratorium on the rollout of 5G until potential hazards for human health and the environment have been fully investigated by scientists independent from the industry. The letter references the published scientific studies demonstrating harm to human health, bees, trees and the environment from current wireless technology and posits that 5G will both increase exposure and add in new technology never safety tested for long-term exposure.

(*Developed during the first three-day US medical conference fully dedicated to this topic,* Electromagnetic Fields Conference on Diagnosis and Treatment*, which convened in Scotts Valley, California in September 2019.)*

As of December 2019: **113 doctors and health practitioners** had signed
To read the Appeal: https://www.globalresearch.ca/dozens-us-doctors-healthcare-practitioners-send-letter-president-trump-calling-moratorium-5g-press-release/5698191

4.6. Appeals Between 1998 and 2014

The recent appeals are nothing new. For over 20 years, scientists and doctors have been warning governments around the world. Each of these appeals, resolutions and statements were endorsed by a group of experts.

- Doctors' Declaration to Health Canada 2014[197]
- Scientists' Declaration to Health Canada 2014[198]
- Potenza Picena Resolution (Italy) 2013
- International Doctors' Appeal 2012
- The Karolinska Institute, Stockholm, Sweden, 2011 (Press release: "Scientists Urge Halt of Wireless Rollout and Call for New Safety Standards: Warning Issued on Risks to Children and Pregnant Women"[199])
- Seletun Consensus Statement 2011 (Panel of international scientists (Norway, Israel, USA, Sweden, Russia & Greece)[200]
- International Appeal of Würzburg 2010
- Copenhagen Resolution 2010
- Paris Appeal 2009 (Déclaration du 23 mars 2009: Champs électromagnétiques et santé)
- Porto Alegre Resolution 2009
- Dutch Appeal 2009
- Venice Resolution 2008
- Berlin Appeal 2008
- London Resolution 2007
- Schlüchterner Appeal, Germany 2007 (39 MDs)
- Brussels Appeal 2007
- Benevento Resolution 2006
- Allgäuer Appeal 2006
- WiMax Appeal 2006
- Coburger Appeal 2005
- Oberammergauer Appeal 2005
- Haibacher Appeal 2005
- Pfarrkirchener Appeal 2005
- Freienbach Appeal 2005
- Lichtenfels Appeal 2005
- Hofer Appeal 2005
- Helsinki Appeal 2005
- Parish Kirchner Appeal 2005
- Saarlander Appeal 2005
- Stockacher Appeal 2005
- Bamberger Appeal 2004
- Maintaler Appeal 2004
- Declaration of Alcalá 2002
- Catania Resolution 2002
- Freiburger Appeal 2002 (1000+physicians)
- Salzburg Resolution 2000
- The Stewart Report (2000) Health Protection Agency of the UK[201]
- Vienna Resolution 1998

[197] http://www.c4st.org/images/documents/hc-resolutions/medical-doctors-submission-to-health-canada-english.pdf
[198] http://www.c4st.org/images/documents/hc-resolutions/scientific-declaration-to-health-canada-english.pdf
[199] https://ecfsapi.fcc.gov/file/7520942052.pdf
[200] https://www.ncbi.nlm.nih.gov/pubmed/21268443
[201] https://webarchive.nationalarchives.gov.uk/20100910162959/http://www.iegmp.org.uk/report/text.htm

5. Who regulates wireless devices, cell antennas, and the use of the Spectrum in Canada?

In Canada, telecommunications fall under **federal jurisdiction**. The law that governs them is called the ***Radiocommunication Act.***[202]

Innovation, Science and Economic Development Canada (ISED) regulates the use of the radiofrequency spectrum, all antenna siting, and all wireless communication devices and equipment.

Among a long list of the Minister's powers, Section 5 of the *Radiocommunication Act* states that "the Minister may, taking into account all matters that the Minister considers relevant for ensuring the orderly development and efficient operation of radiocommunication in Canada,

> (i.1) issue spectrum licences in respect of the utilization of specified radio frequencies;
> (f) approve each site on which radio apparatus, including antenna systems, may be located, and approve the erection of all masts, towers and other antenna-supporting structures."

5.1. The Spectrum Auctions – Is the Government in a Conflict of Interest?

Since 1999, the Canadian government has relied on auctions to allocate wireless spectrum licences used to deliver high-speed internet services.

The Canadian treasury makes billions of dollars from auctioning spectrum licences to Canada's wireless network companies. According to an ISED news release (June 5, 2019), **5G wireless technologies could add up to $40 billion annually** to the Canadian economy by 2026.

> In 2019, ISED auctioned off the 600 MHz spectrum, raising $3.47 billion. In June-July 2021, the 3500 MHz band was auctioned, raising $8.91 billion on this one frequency band.[203] Canada plans to auction its extremely high frequency millimetre wave (mmWave) spectrum that is the basis of the fastest 5G in 2024. And there is a proposal to release the 3800 MHz spectrum in 2022. (*See section 2.7 for the auction schedule for 5G).*

Do these auctions put the Federal government in a position of conflict of interest?

Canada's new Digital Charter clearly favours the development of 5G, prioritizing access and connectivity to the digital world. (from the ISED news release, June 5, 2019)

In the above-mentioned press release, the Government of Canada announced that it is **investing $199 million over five years to modernize spectrum equipment and processes** required to ensure favorable, interference-free spectrum conditions to support world-class networks.

This same government develops our exposure guidelines.

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[202] https://laws-lois.justice.gc.ca/eng/acts/R-2/page-2.html#h-423843
[203] ISED. 3500 MHz auction – Process and results. July 29, 2021 https://www.canada.ca/en/innovation-science-economic-development/news/2021/07/3500-mhz-auction--process-and-results.html

5.2. Antenna Siting and Public Consultation – Is this Canadian democracy?

"It made you feel like the municipalities sit at the kids' table and Bell and the federal government are at the adults' table."

-- Outgoing Mayor Joan Westland Eby (East Bolton, Québec), commenting on her feeling of powerlessness in trying to negotiate with the telecommunications giant and the federal government regarding a proposed cell tower that was the object of citizen protests over two years. The project went ahead despite objections from residents and council members.
(Brome County News, July 27, 2021)

All companies planning to install or modify an antenna system in Canada must respect ISED's antenna siting procedures document, CPC-2-0-03 — ***Radiocommunication and Broadcasting Antenna Systems***.

To build a new cell tower, companies must:

- submit their plan to the local municipality (or land use authority) and get their agreement in writing (letter of concurrence or equivalent);
- notify residents within an area 3× the height of the proposed tower;
- carry out a public consultation.
  Note: the wider community is only informed of the consultation for towers 30 metres (98 feet) or more in height; for these tall towers only, the companies must place a notice in a local community newspaper to inform the public of the consultation.

  This consultation:
  - is carried out by the company itself and not by an independent third party;
  - health concerns are excluded, deferring to Safety Code 6;
  - the results are not made available to the public;
  - and no matter what the results are, the Minister of ISED can disregard them.

If the Municipality does not give permission, or the citizens are strongly against the tower, the Minister of ISED has the final say regarding whether antenna systems and towers may be installed.

No public consultation required for:

- **Existing Towers:** modifications may be made, or the tower may be replaced, to facilitate sharing or the addition of antennas, provided that the total height increase is no greater than 25% of the height of the initial antenna system installation.
- **Non-Tower Structures:** "antennas on buildings, water towers, lamp posts, etc. may be excluded from consultation provided that the height above ground of the non-tower structure, exclusive of appurtenances, is not increased by more than 25%."[204]

Extremely high frequency emitting 5G antennas are being placed lower to the ground, on existing telephone, street light and hydro poles and on (and in) buildings, and therefore **do not require public notification**. These will begin emitting as soon as the high frequency bands are auctioned (early 2024) – *see section 2.7 for details*. Existing macro towers will be retrofitted to accommodate mid-band 5G antennas -- again without public consultation.

[204] https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10840.html

5.3. Antennas must comply with environmental legislation. . . but there are no guidelines to protect our natural environment from RF radiation

ISED requires that the installation and modification of antenna systems be done in a manner that complies with environmental legislation. This includes the *Canadian Environmental Assessment Act, 2012* (CEAA 2012), recently renamed "*Impact Assessment Act*", where the antenna system is incidental to a physical activity or project designated under CEAA 2012, or is located on federal lands.

The companies are also responsible to ensure that antenna systems are installed and operated in a manner **that respects the local environment and that complies with other statutory requirements**, as applicable, such as: *Canadian Environmental Protection Act, 1999; Migratory Birds Convention Act, 1994; Species at Risk Act.*

The problem is that none of the above Acts address the effects of RF radiation used in telecommunications.

Not only do Canada's RF radiation exposure guidelines not protect humans effectively, **they do not even consider other mammals, birds, insects, vegetation and natural processes.**

5.4. For health concerns, ISED defers to Health Canada's Safety Code 6

All antenna towers and wireless devices must comply with Health Canada's Safety Code 6 and its newly developed localized limits for 6 GHz to 300 GHz.[205]

> "Current exposure limits found in Safety Code 6 cover the frequency ranges that will be used by devices and antenna installations using 5G mmWave technology."
>
> – ISED's *Decision on Releasing Millimetre Wave Spectrum to Support 5G* (SLPB-003-19, June 2019, chapter 10)

However, Health Canada **only recommends**:

> "While Safety Code 6 recommends limits for safe human exposure, Health Canada does not regulate the general public's exposure to electromagnetic RF energy. **Industry Canada is the regulator** of radiocommunication and broadcasting installations and apparatus in Canada."
>
> – Andrew Adams, Director General, Environmental and Radiation Health Sciences Directorate, Department of Health (HESA Hearing, March 24, 2015)

Note: There is another law governing radiation emitting devices – The *Radiation Emitting Devices Act*[206] and regulations[207]. However, they do not mention radiofrequency radiation or telecommunications devices.

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[205] January 2021. Notice: Localized human exposure limits for radiofrequency fields in the range of 6 GHz to 300 GHz https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/types-sources/radiofrequency-fields/notice-localized-human-exposure-limits-range-6-ghz-300-ghz.html

[206] Government of Canada. ***Radiation Emitting Devices Act***: https://lois-laws.justice.gc.ca/eng/acts/R-1/ and **Radiation Emitting Devices Regulations** https://lois-laws.justice.gc.ca/eng/regulations/C.R.C.,_c._1370/FullText.html

5.5. Does anyone monitor the RF radiation emitted by the installations?

In ISED's siting procedures, it says that **it is the responsibility of the companies to ensure that their installations comply**, including the consideration of combined effects of nearby installations.

How does ISED monitor installations?

According to the Spectrum Management Operations Branch, there are two tools used by ISED to ensure that antenna installations are compliant with Safety Code 6.

- The first one is a **Safety Code 6 report** that ISED can request the owner of the antenna installation to provide. It normally includes a theoretical modelling of the RF fields around the installation to ensure that limits are respected. In the case of more powerful transmitters, it is normally mandatory to provide such a report at the beginning of the licence and periodically after that.

- The second one is **RF fields measurements** done by ISED inspectors at some chosen antenna installations each year. The purpose is to validate theoretical models and to verify that RF fields limits from Safety Code 6 are respected. The stations that are more powerful or that are near the Safety Code 6 limits are visited more often.

Results of the monitoring are not normally made available to the public.

ISED claims that it "routinely audits the radio frequency energy at tower sites".[208]

However, it is not clear how it does this, since they do not seem to have much control or knowledge about what installations exist at a given time.

Database anomalies:

The list of all antennas in Canada is kept in The Spectrum Licences Site Data[209] and is updated monthly.

A C4ST volunteer has been tracking it since 2016. Since that time, we have discovered hundreds of thousands of exact duplicate records, and hundreds of thousands of duplicate records where the only difference between the two were the update date.

When anomalies are pointed out to ISED's Spectrum Management Operations Branch by C4ST's volunteer, the errors are eventually corrected. However, the Spectrum Management Officer reminded the volunteer that:

> "The Spectrum Licence Site Data is built upon the data that spectrum licensees upload. ISED regulates them, but **the companies are responsible for updating the data**."
>
> -- Spectrum Management Operations Branch,
> emails July 9 and Oct 24, 2019

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[207] Government of Canada. **Radiocommunication Regulations**. https://laws-lois.justice.gc.ca/eng/regulations/sor-96-484/index.html

[208] https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/h_sf11435.html

[209] http://sms-sgs.ic.gc.ca/eic/site/sms-sgs-prod.nsf/eng/h_00010.html

Highlights:

Date of data	Number of transmitters	Action taken
June 1, 2020	979,880	On July 3, 2020, C4ST volunteer informed ISED that there were more than 200,000 exact duplicates. On July 29, 2020, ISED replied that they would "attempt to remove duplicate entries".
Aug. 4, 2020	dropped to 763,632	Duplicate entries removed.
Oct. 2, 2020	jumped to 950,426	On Oct 6, 2020, C4ST volunteer wrote to ISED: "The October data file now has 250,000 new entries, and no duplicates. I don't understand what is going on. Is it possible that 250,000 new transmitters were installed in one month? Or were the duplicates just place holders for these new transmitters? I really would like to know who is in charge of this file.
Nov. 2, 2020	dropped to 773,737	The data in the left-hand column shows wild fluctuations. We have not been able to obtain answers for these fluctuations. **We have asked staff at ISED's Spectrum Management Operations Branch on numerous occasions who is ultimately responsible for this database, and have never received an answer to this question.**
Dec. 1, 2020	back up to 987,215	
Feb. 1, 2021	dropped to 785,749	
April 8, 2021	back up to 984,873	
May 4, 2021	dropped to 793,459	
Sept. 2, 2021	back up to 975,254 (then changed to 873,109)	
Oct. 5, 2021	896,505	
Nov. 2, 2021	873,109	
Dec. 2, 2021	**major drop to 618,477**	C4ST volunteer noticed that small cell antennas that had previously been in the database were no longer listed.
Jan. 25, 2022	619,900	On January 29, 2022, our volunteer asked ISED for an explanation for this drop and asked if the small cell antennas were no longer to be tracked in the database. As of February 26, 2022, no reply had been received.

We do not know how the "combined effects" are measured.

6. Surely Health Canada has safety guidelines to protect its citizens?

In principle yes… in reality NO.

Sadly, this is not an area where Canada is a leader.

> "*As the former President of Microsoft Canada,*
> *I have witnessed the incredible benefits technology can provide.*
> *I also have seen the harm caused when technology is not implemented correctly.*
>
> *After extensively studying the harmful effects of wireless radiation for the last nine years and personally meeting with over a dozen international experts,*
> ***it is clear to me that Canada's policies***
> ***on the use of wireless technology are not safe**.*
>
> *With the imminent expansion of 5G infrastructure throughout our country,*
> ***it should be an imperative to ensure the health of Canadians is protected now***
> ***by updating Canadian standards based on the latest scientific evidence."***
>
> – Frank Clegg, former President of Microsoft Canada

6.1. Safety Code 6 – Health Canada's Exposure Guidelines

Health Canada's exposure guidelines for radiation from devices and antennas are known as **Safety Code 6 – *Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 kHz to 300 GHz.***[210]

Three Types of Exposure Limits

Safety Code 6 has **three types** of exposure limits for RF radiation, depending on their distance and their operating frequency. They are calculated based on a **6-minute** reference period.

1) Specific Absorption Rate (SAR) limits ("localized exposure" limits) – for wireless devices used close to the body, operating at frequencies between 100 kHz and 6 GHz

SAR is a measure of the rate at which RF energy is absorbed in the body (in a volume of tissue), and is expressed in units of watts per kilogram (**W/kg**). The current SAR limit in Canada is **1.6 W/kg** *(peak spatially-averaged SAR for the head, neck and trunk, averaged over any 1 g of tissue).*

The SAR is calculated **based on a mannequin**.[211] Scientists have protested that the method for determining SAR is inadequate for several reasons including that the mannequin does not represent the majority of the population and does not capture the complex characteristics and interactions of living tissues.[212,213]

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[210] https://www.canada.ca/en/health-canada/services/publications/health-risks-safety/limits-human-exposure-radiofrequency-electromagnetic-energy-range-3-300.html

[211] CBC Marketplace. (2017). **The Secret Inside Your Cellphone.** https://www.cbc.ca/marketplace/m_episodes/2016-2017/the-secret-inside-your-phone

[212] Environmental Health Trust. (2017). Why do scientists state that SAR is inadequate to protect cell phone users? https://ehtrust.org/sar-test-inadequate/

ISED requires manufacturers of wireless devices to provide information to users on the minimum compliance distance to maintain between the product and the user.

> To find out the SAR value for your device: see your user manual or device settings or visit ISED's Radio Equipment Search site.

2) Field Strength Limits – for devices operating at frequencies below 10 MHz

Electric and magnetic field strength limits are intended to prevent the occurrence of nerve stimulation from devices that operate at low frequencies (below 10 MHz).

3) Power Density limits ("whole body exposure") – for all other devices & antennas

Also called ***Whole Body Limits*** by Health Canada because these sources are generally found at a distance from a person's body, which results in the entire body being exposed, they are currently set at **10 W/m^2** for the general public**.** ***See update in green box below.***[214]

Power density is the amount of electromagnetic energy in a given area, typically expressed in watts per square metre (**W/m^2** or W/cm^2) or as volts per square metre (V/m^2), and can be measured with an RF meter. *See the Safe Living Technologies website for a convenient conversion table.*[215]

UPDATE: The new 5G devices held **close to the body** will have **many antennas operating at frequencies below 6 GHz** (must respect SAR limits) **AND above 6 GHz** (must respect power density limits)**.**
Health Canada's solution? Follow ICNIRP's advice.
Double the power density limit to 20 W/m^2.

Which limit applies to which device?

Type of wireless device	*Such as…*	*Must comply with*
Devices at frequencies **below 10 MHz**	Wireless charging devices, metal detectors, electronic cards, tag readers and anti-shoplifting detector panels installed at doors of stores, etc.	Field strength limits
Devices **used close to the body*** operating at frequencies **between 100 kHz and 6 GHz**	Cell phones, tablets and wearables	SAR limit -- 1.6 W/kg (peak spatially-averaged for the head, neck and trunk, over any 1 g of tissue)
Devices **used close to the body*** at frequencies **above 6 GHz**	**Cell phones, tablets and wearables once 5G is fully deployed**	Power density limit **(doubled to 20 W/m^2** for general public in Jan. 2021 **without** public **consultation)**
Devices used **further from the body****	Wi-Fi routers, baby monitors, smart meters, home monitoring systems, etc.	Power density limit (approximately 2 to 10 W/m^2 for general public)
Antennas	on cell towers and small cells (on lamp posts, utility poles, buildings, etc.)	Power density limit (approximately 2 to 10 W/m^2 for general public)

* less than 20 cm / 8 inches from the body ** more than 20 cm / 8 inches from the body

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[213] Clegg, F. M., Sears, M., Friesen, M., Scarato, T., Metzinger, R., Russell, C., Stadtner, A., & Miller, A. B. (June 2020). Building science and radiofrequency radiation: What makes smart and healthy buildings, *Building and Environment, 176*(106324), https://doi.org/10.1016/j.buildenv.2019.106324.
[214] https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/types-sources/radiofrequency-fields/notice-localized-human-exposure-limits-range-6-ghz-300-ghz.html
[215] Conversion tables: https://slt.co/Downloads/Education/RFConversionTable.pdf

6.2. Is Health Canada fulfilling its mandate?

Health Canada's mandate includes preventing and reducing risks to individual health and the overall environment, and providing health information to help Canadians make informed decisions.

Regarding RF/EMF radiation, according to the Government's website,[216] Health Canada is responsible for:

- **carrying out research** into possible health effects of human exposure to radiofrequency electromagnetic radiation from wireless devices;
- **monitoring the scientific literature** related to such possible effects; and
- **developing exposure guidelines** (safety limits) to protect Canadians.

However, Health Canada:

- **has not carried out ANY** recent **research** on the subject;
- deliberately **ignores a large number of peer-reviewed studies**;
- has made **no major revision to its exposure guidelines since 1979** (when they were first established) to incorporate non-heating biological effects.

In addition, **there has been no research on long-term exposures to radiation from the new 5G technologies.** We know that no such studies are being planned in the USA and are not aware of any planned for Canada or elsewhere.

> ***"So there really is no research ongoing.***
>
> ***We're kind of flying blind here,***
> ***as far as health and safety is concerned."***
>
> -- US Senator Richard Blumenthal
> US Senate Hearing on the Future of 5G Wireless Technology, Feb 6, 2019

Click here to see 5 minute video of this US Senate Hearing on the Future of 5G Wireless Technology.

[216] First sentence in the "Background" to *2015 Revisions to Safety Code 6: Summary of Consultation Feedback*. https://www.canada.ca/en/health-canada/services/environmental-workplace-health/consultations/2015-revisions-safety-code-6-summary-consultation-feedback.html

6.2.1. Health Canada's guidelines for RF radiation, based on thermal effects, are obsolete

"Existing guidelines for RF safety only look at thermal tissue damage and are obsolete, since many modern studies show metabolic and genomic damage from exposures below the level of intensity which heats tissues."

-- American Academy of Environmental Medicine

"I think it's **irresponsible to just set standards using a thermal effect**. If you just set it based on a thermal effect, you're neglecting a large amount of data."

– Dr. Henry Lai, Bioelectromagnetics Research Laboratory, Department of Bioengineering, University of Washington

Health Canada's exposure guidelines – Safety Code 6 – **are based on a 1929 assumption that tissue must be heated to be harmed.**[217,218]

This assumption was also used by ICNIRP when it developed its guidelines in 1998, and has been nurtured ever since. ICNIRP has come under criticism for biases and conflicts of interest. *See chapter 7 – Pervasive Conflicts of Interest.*

There is substantial peer-reviewed evidence that this assumption is wrong. It neglects the non-thermal biological effects that occur at exposure levels far lower than those at which tissue is heated.

Safety Code 6 has not undergone any major revisions since being established in 1979. There were only minor revisions in 1991, 1993, 1999, 2009 and 2015. Canada's exposure guidelines continue to be based on the "thermal argument".

An article published in the highly respected medical journal, The Lancet, in 2018[219] questions the validity of this assumption.

The report points to research suggesting the damage goes beyond these thermal effects and might alter human brain metabolism, electrical activity in the brain and immune responses. In addition, chronic exposure has been associated with increased oxidative stress and DNA damage, and cancer risk. There also appears to be evidence for an association between neurodevelopmental or behavioural disorders in children and exposure to wireless devices. Prenatal exposure might cause structural and functional changes in the brain associated with ADHD-like behaviour.

According to the authors these findings deserve "urgent attention".

And they are not alone.

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[217] https://www.magdahavas.com/wp-content/uploads/2010/07/Cook_1980_early_research.pdf

[218] www.hc-sc.gc.ca/ewh-semt/consult/_2014/safety_code_6-code_securite_6/final_finale-eng.php See Section 2. MAXIMUM EXPOSURE LIMITS, paragraph 2 - first sentence

[219] Planetary electromagnetic pollution: it is time to assess its impact - The Lancet Planetary Health, Volume 2, Issue 12, Pe512-E514, December 1, 2018, https://doi.org/10.1016/S2542-5196(18)30221-3

6.2.2. Safety Code 6 does not protect Canadians' health.

Over 200 high quality peer-reviewed studies have been published showing that radiofrequency radiation is harmful to human health below Safety Code 6 limits.[220,221]

Section 3.1 of this Guide describes the long-term adverse health effects.

Section 3.2 describes the more immediate effects experienced by many Canadians.

Appendix 4 lists some of the studies showing evidence of brain cancer, impacts on children, DNA and sperm damage, and oxidative stress which can lead to cancer, Alzheimer's and Parkinson's diseases.

Here are a **few peer-reviewed studies published since the last revision of Safety Code 6** (2015), that show links to cancer, sperm damage, DNA damage, neurodegenerative conditions and childhood development from radiofrequency (RF) radiation.[222]

- **$30 million U.S. National Toxicology Program** study results[223] provide "**clear evidence of cancer**" and "**strong evidence for the genotoxicity** of cell phone radiation" and "should put to rest the old argument that RF radiation cannot cause DNA damage" -- Ron Melnick (led the team that designed the study)[224]

- Confirmed by the **Ramazzini Institute Study**[225]

- Experts published peer-reviewed papers providing **scientific evidence** that radiofrequency radiation should be **reclassified as a *known* human carcinogen** (as are asbestos and cigarette smoking).[226,227] *See Section 3.1.3 for more information.*

- Belpomme, D., et al. **Thermal and non-thermal health effects of low intensity non-ionizing radiation**[228]

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[220] See: Marketplace, March 2017 – Wendy Mesley. "*The Secret Inside Your Phone*". Has over 2.7 million views. https://www.youtube.com/watch?v=Wm69ik_Qdb8

[221] 200 Scientific Studies Reporting Potential Harm at Non-Thermal Levels Below Safety Code 6 Exposure Limits http://c4st.org/?s=200+studies

[222] Smith-Roe, S. L., et al. (2019). **Evaluation of the genotoxicity of cell phone radiofrequency radiation in male and female rats and mice following subchronic exposure.** *Environmental and Molecular Mutagenesis*. https://doi.org/10.1002/em.22343 https://www.ncbi.nlm.nih.gov/pubmed/31633839

[223] National Toxicology Program. Cell Phone Radio Frequency Radiation https://ntp.niehs.nih.gov/results/areas/cellphones/index.html

[224] https://microwavenews.com/news-center/ntp-comet-assay

[225] Falcioni, L., et al. (2018). Report of final results regarding brain and heart tumors in Sprague-Dawley rats exposed from prenatal life until natural death to mobile phone radiofrequency field representative of a 1.8 GHz GSM base station environmental emission. Environmental Research. https://doi.org/10.1016/j.envres.2018.01.037 https://www.sciencedirect.com/science/article/pii/S0013935118300367?via%3Dihub

[226] Miller, A. B. et al. (2018). Cancer epidemiology update, following the 2011 IARC evaluation of radiofrequency electromagnetic fields (Monograph 102). Environmental Research, 167, 673–683. https://doi.org/10.1016/j.envres.2018.06.043 and https://www.ncbi.nlm.nih.gov/pubmed/30196934

[227] Hardell, L., & Carlberg, M. (2018). Comments on the US National Toxicology Program technical reports on toxicology and carcinogenesis study in rats exposed to whole-body radiofrequency radiation at 900 MHz and in mice exposed to whole-body radiofrequency radiation at 1,900 MHz. International Journal of Oncology. https://doi.org/10.3892/ijo.2018.4606 https://www.ncbi.nlm.nih.gov/pubmed/30365129

[228] Belpomme, D., et al. (2018). Thermal and non-thermal health effects of low intensity non-ionizing radiation: An international perspective. Environmental Pollution, 242, 643–658. https://doi.org/10.1016/j.envpol.2018.07.019 https://www.ncbi.nlm.nih.gov/pubmed/30025338

Hundreds of world-recognized international scientists have maintained that this type of radiation has been proven to be harmful to humans and the environment.

In fact, over the last 20 years, more than 40 appeals, position papers and resolutions regarding EMF and health have been adopted by EMF researchers and physicians, calling for more protective standards from radiofrequency radiation.

See Chapter 4 for a list of these appeals.

Most recently:

- 255 EMF scientists from 44 nations appealed to the World Health Organization, the United Nations Environment Programme and all member states.[229]
- 417 scientists who focus on evaluating the scientific evidence connecting RF radiation and harm to humans, have signed a 5G Appeal to the European Union.[230]
- 15 organizations representing over 3500 medical doctors issued a Consensus Statement in 2020 calling on all governments to take urgent action to protect humans and wildlife.[231]

6.2.3. Health Canada has never completed a proper review.

Health Canada has **never completed a proper systematic review** of the scientific evidence for the radiofrequencies currently used for telecommunications, i.e., a review that meets **international standards**,[232] nor has it published any of its analyses.

This requires rigorous scientific methods, transparency, full public consultation from initial scoping throughout the process, and health-protective precautionary interpretation of findings. According to the Health Sciences Library of Columbia University:

> "Systematic Reviews are comprehensive, in-depth analyses of research conducted on a particular question designed to inform clinical practice and policy decisions. The review should be a planned, methodical project that aims to uncover all relevant research via a systematic search, analysis and synthesis of results.
>
> In order to adhere to a strict methodology, a protocol should be created to serve as a plan for the review. Protocols include the research question, team members, search strategy, databases to search, inclusion and exclusion criteria, quality assessment tool, data extraction template, software and more. (...)
>
> It is best practice to create and register a protocol (...). If you create a protocol and stick to it, your review will be of higher quality and have less risk for reporting bias."[233]

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[229] International EMF Scientists Appeal. https://www.emfscientist.org/
[230] 5G Appeal http://www.5gappeal.eu/
[231] https://phiremedical.org/wp-content/uploads/2020/11/Press-Release-2020-Non-Ionising-Radiation-Consensus-Statement-1.pdf
[232] Rooney, A. A., et al.(2014). *Systematic Review and Evidence Integration for Literature-Based Environmental Health Science Assessments*. Environmental Health Perspectives. https://doi.org/10.1289/ehp.1307972 https://ehp.niehs.nih.gov/doi/10.1289/ehp.1307972 Abstract: https://www.ncbi.nlm.nih.gov/pubmed/24755067
[233] https://library.cumc.columbia.edu/insight/prospero-registry-systematic-review-protocols

If Health Canada had conducted a proper review, its protocol would be published on the PROSPERO website.

> PROSPERO is an international database of prospective registered systematic reviews with a health related outcome.
> https://www.crd.york.ac.uk/prospero/#aboutpage

In fact, to the best of our knowledge, **Health Canada still does not use appropriate systematic reviewing software tools** to catalogue research, extract data and compile relevant data in order to perform proper analyses. If it did, then why do we not see this information on Health Canada websites?

There is one arguable exception.

> Recently, Health Canada stated that it did a systematic review of the literature on studies of RF radiation at frequencies from 6 to 300 GHz in anticipation of the widespread deployment of these higher frequencies which include millimetre waves.
>
> In April 2021, it published an executive summary of its findings on its website.[234]
>
> - The full report was not provided. However, C4ST requested a copy and Health Canada provided it. It is available here on the C4ST website.
> - Health Canada's protocol for the systematic review is not to be found in the PROSPERO database.
> - Canadians were not consulted.
>
> - Again, only temperature was considered (as well as a pain threshold).
> - All tissue and cell studies were excluded.
> - The report states that there are no human studies that assessed the outcomes.
> - The animal studies identified were all short term studies – though many of these did find adverse effects.

Yet, Health Canada decided it was safe to double the exposure limit
to 20 W/m^2 for devices used close to the body at frequencies above 6 GHz, such as cell phones, tablets and wearables once 5G is fully deployed, i.e., using millimetre waves.

255 world-recognized scientists have appealed to the World Health Organization and the United Nations for standards that are more protective regarding RF radiation. These scientists have published more than 2,000 studies on electromagnetic fields, including RF radiation, in the peer-reviewed literature.

Health Canada's lack of systematic review and research capacity
—the ability to thoroughly monitor and update research syntheses—
results in it being a laggard rather than a leader in public health.

[234] Analysis of recommended localized human exposure limits for radiofrequency fields in the frequency range from 6 GHz to 300 GHz https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/types-sources/radiofrequency-fields/notice-localized-human-exposure-limits-range-6-ghz-300-ghz/executive-summary.html

6.2.4. Health Canada's decisions are not based on all of the current scientific evidence.

When new information becomes available, the proper scientific approach is to study and analyze the results to ensure a current premise is still correct. Health Canada appears to do the opposite and look for ways to dismiss any new evidence that challenges its assumptions.

For example,

- In its last review of Safety Code 6 (2015), rather than embracing new scientific evidence as is the proper practice, Health Canada disregarded studies that did not conform to its 1929 assumption that tissue must be heated to be harmed.[235]
- Health Canada shows complete disregard for the **$30 million US National Toxicology Program study** involving over 3,000 rodents over 10 years that provided **clear evidence of cancer and DNA damage**—despite the fact that this study passed through peer-review three times before publication. Health Canada's statement "The RF exposure levels tested in the study were 19 to 75 times higher than the human exposure limits established internationally and within Canada for whole body exposure for humans" has been refuted by Dr. Ron Melnick in a Jan. 4, 2018 email to The Honourable Ginette Petitpas Taylor, Minister of Health. Dr. Melnick was the lead scientist for the design of the NTP study and was also a member of the WHO's IARC panel in 2011 that classified RF EMF as possibly carcinogenic to humans.
- 255 world-recognized scientists from 44 nations have appealed to the World Health Organization and the United Nations for more protective standards from RF radiation.[236] There is also a 5G Appeal by scientists who focus on evaluating the scientific evidence connecting RF radiation and harm to humans. [237]

6.2.5. Health Canada relies on biased organizations when setting its exposure guidelines.

Health Canada relies on the following organizations when establishing its guidelines:

- **World Health Organization's International EMF-Project (WHO-EMF Project)**

  The WHO states that "there are no adverse short- or long-term health effects" from exposure to wireless networks,[238] completely disregarding its own **International Agency for Research on Cancer (IARC)** which in 2011 classified RF radiation as a **possible human carcinogen** (Group 2B – same category as lead and DDT at the time). In fact, in 2019, IARC decided that: "based on new evidence, non-ionizing radiation (radiofrequency) **should be a high priority for re-evaluation of the classification**" (*Report of the Advisory Group to Recommend Priorities for the IARC Monographs during 2020–2024)*[239]

[235] www.hc-sc.gc.ca/ewh-semt/consult/_2014/safety_code_6-code_securite_6/final_finale-eng.php See Section 2. MAXIMUM EXPOSURE LIMITS, paragraph 2 - first sentence
[236] International EMF Scientists Appeal. https://www.emfscientist.org/
[237] 5G Appeal http://www.5gappeal.eu/
[238] https://www.who.int/teams/environment-climate-change-and-health/radiation-and-health/bstations-wirelesstech
[239] https://monographs.iarc.fr/wp-content/uploads/2019/10/IARCMonographs-AGReport-Priorities_2020-2024.pdf

The WHO-EMF Project is “industry-friendly” and heavily influenced by the *International Commission for Non-Ionizing Radiation Protection (ICNIRP)* when making its recommendations.

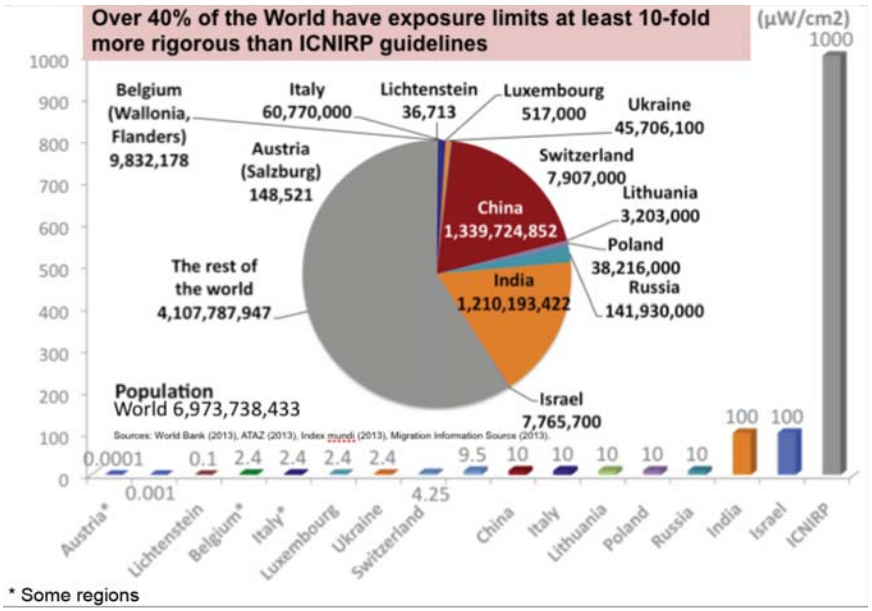
- **International Commission for Non-Ionizing Radiation Protection (ICNIRP)**

ICNIRP is a private self-appointed non-governmental group, consisting mainly of engineers with ties to the telecommunications industry and the US military.[240]

Its exposure limit guidelines influence many countries, **including Canada**.

Its power density limits are based on the 1929 assumption that tissue must be heated to be harmed. *See section 6.2.1 for more on this obsolete assumption.*

40% of the world’s population has exposure limits at least 10-fold lower than ICNIRP’s.



Source: Dr. Isaac Jamieson[241]

- **the IEEE (formerly known as Institute of Electrical and Electronics Engineers)**
IEEE is the world's most powerful federation of engineers. The members are or have been employed in companies or organizations that are producers or users of technologies that depend on radiation frequencies, such as power companies, the telecom and the military industry. IEEE has prioritized international lobbying efforts for decades especially aimed at the WHO.

- **the United States**
In a report published by Harvard University Press *Captured Agency - How the Federal Communications Commission Is Dominated by the Industries It Presumably Regulates*, Norm Alster outlines how the inordinate influence of corporate interests led to errors of commission and omission at the FCC.

These organizations have come under criticism for biases and conflicts of interest.[242,243,244,245,246]
See Chapter 7 "Pervasive Conflicts of Interest" for more on the WHO and ICNIRP.

[240] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5504984/
[241] RF/Microwave Radiation and Risk Awareness • EMF: AV_RM0140721 https://www.eesc.europa.eu/resources/docs/emf_report_-provided-by-dr-jamieson.pdf
[242] https://www.spandidos-publications.com/10.3892/ijo.2017.4046
[243] https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2902287
[244] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5504984/
[245] https://www.ncbi.nlm.nih.gov/pubmed/26688202
[246] https://www.ncbi.nlm.nih.gov/pubmed/27902455

In December 2020, the Washington Spectator published **a major exposé by investigative journalist Barbara Koeppel on industry influence into the science and policy of 5G and wireless radiation**. She details industry ties between the ICNIRP, the Food and Drug Administration, The Center for Disease Control and Prevention, The New York Times, the American Cancer Society, and scientists professing that 5G is safe.[247]

Now that there are close to 2,000 studies showing serious biological effects (such as cancer) **at levels far lower** than what ICNIRP deems safe, and hundreds of these are of very high quality, **many are wondering why ICNIRP and the WHO continue to ignore these studies**.

Why is Health Canada relying on others instead of doing its own homework?

BREAKING NEWS: TWO WRONGS DO NOT MAKE A RIGHT:
US Court states that the FCC cannot rely on other agencies like the FDA if the FDA's conclusions are provided without explanation.

On August 13, 2021, **the United States Court of Appeals** for the District of Columbia Circuit **ordered the FCC to explain why it ignored scientific evidence showing harm** from wireless radiation, stating that the decision by the FCC to retain its 1996 safety limits for human exposure to wireless radiation was "**arbitrary and capricious**."

The FCC, when justifying its safety limits, points to the Food and Drug Administration (FDA) who do not provide any explanation as to why they persist in retaining their 1996 limits, ignoring the scientific evidence that shows harm.

In response to this, the US Court of Appeals wrote that the commission cannot rely on agencies like the Food and Drug Administration (FDA) if the FDA's conclusions are provided without explanation.

> "While imitation may be the highest form of flattery, it does not meet even the low threshold of reasoned analysis required by the APA under the deferential standard of review that governs here. One agency's unexplained adoption of an unreasoned analysis just compounds rather than vitiates the analytical void. Said another way, **two wrongs do not make a right**," the court wrote.

The same is happening here in Canada.

ISED defers to Health Canada which does not provide a full justification for excluding evidence for non-thermal effects when setting its limits and instead refers to the WHO-EMF Project and ICNIRP, which also do not provide full justifications for exclusion.

For more information on this historic ruling, see section 10.2.

Whatever the reason, Health Canada continues to mislead Canadians, stating that there is currently no published evidence showing a link to adverse health effects at the levels permitted by Safety Code 6, including exposure from equipment that uses 5G technology, despite ample evidence to the contrary.[248]

[247] The Washington Spectator. (2020). **Wireless Hazards.** https://washingtonspectator.org/wireless-hazards/
[248] https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/occupational-exposure-regulations/safety-code-6-radiofrequency-exposure-guidelines.html#How_Safety_Code_2

6.2.6. Health Canada's process to update Safety Code 6 is deeply flawed.

For the most recent review of Safety Code 6 – in 2015 – Health Canada contracted with the Royal Society of Canada (RSC). The RSC convened a panel of eight experts to evaluate the research and produce a report on Safety Code 6. Their report was released in 2014.

A few months later, the **Canadian Medical Association Journal (CMAJ)** reported concerns that were raised by two respected scientists who had been invited to peer-review the Report.[249]

In an interview with the CMAJ, Dr. Anthony Miller suggested that instead of outsourcing the safety review to an organization that is not subject to government accountability and transparency rules, Health Canada should conduct the safety review internally, using traditional expert advisory panel review procedures, which are more accountable.

Panel Riddled with Conflicts of Interest and Lack of Expertise

> "The panel included members with major links to the telecommunications industry. This is a conflicted panel, with insufficient expertise in epidemiology. It ignored recent evidence that wireless radiation is a probable carcinogen."
>
> – Dr. Anthony B. Miller, professor emeritus, University of Toronto's Dalla Lana School of Public Health and Medal of Honour recipient from the World Health Organization's International Agency for Research on Cancer,

The peer-reviewers flagged their concerns about major conflicts of interest as well as lack of expertise within the eight-member panel. The chair had an undisclosed conflict of interest and was replaced. And two other members stepped down... While a fourth with suspected links to the telecommunications industry remained on the panel. Finally, one of the vacant seats was filled by an ICNIRP member. According to the peer-reviewers, these changes were unsatisfactory.

Vital Evidence Omitted[250]

> "The RSC's eight-member panel actively blinded themselves to vital evidence. The panel's position on maintaining the current standards is so fixed that it leads them to conclusions one would never expect from policy officials in the field of health.
>
> I am almost certain that the reluctance of the panel to be guided by biological evidence reflects a lack of expertise in cell biology"
>
> – Dr. Martin Blank, expert on the effects of electromagnetic radiation and special lecturer at the Columbia University Medical Center, New York (now deceased)

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[249] Webster, P. C. (2014). Federal Wi-Fi safety report is deeply flawed, say experts. *CMAJ: Canadian Medical Association Journal*, 186(9), E300. https://doi.org/10.1503/cmaj.109-4785

[250] *Canadian scientists urge more research into safety of wireless technology, saying recent report downgrades cancer risk*. The National Post. April 15, 2014. https://nationalpost.com/health/canadian-scientists-urge-more-research-into-safety-of-wireless-technology-saying-recent-report-downgrades-cancer-risk

When Safety Code 6 was being revised in 2014 . . .

- **Health Canada ignored 140 peer-reviewed studies showing harm at levels at, or below Safety Code 6**

  As part of a public consultation in 2014 regarding the review of Safety Code 6, Canadians for Safe Technology (C4ST) submitted to Health Canada a list of 140 peer-reviewed studies showing harm at levels at, or below Safety Code 6, that the Royal Society's panel omitted in its review.[251]

  Health Canada ignored all of this evidence-based information when setting Safety Code 6 limits although it did admit that 36 of the studies met its criteria as being "in scope" for risk assessment, and were considered in their weight-of-evidence analysis. Twenty-six were at or below Safety Code 6 limits. (*See Appendix 7 for the list of studies that Health Canada deemed were "in scope for risk assessment", and its two-page analysis which does not explain why they were rejected*).

  No weight-of-evidence analysis was provided. When inquiries were made about the reasons for excluding this evidence, Health Canada provided an unpublished discussion paper "Safety Code 6 (2015) – Rationale"[252] that has no rationale for excluding these and other non-thermal studies. Instead it cites other authorities. Bias and conflict of interest of some of these authorities has been outlined in a number of papers.[253] *See chapter 7 for more information on these biased organizations.*

- **Health Canada ignored requests** in 2014 **by over 100 Canadian medical doctors[254] and international scientists**[255] to set more protective safety guidelines**.** The scientists signed Declarations urgently calling on Health Canada to:
  - intervene in what they view as an **emerging public health crisis**;
  - establish guidelines based on the best available scientific data; and
  - advise Canadians to limit their exposure and especially the exposure of children.

  They said that "Canada's Safety Code 6 Guideline is **fundamentally flawed**."

  > "It is based on an obsolete account and analysis of the research and has disregarded or minimized certain recent studies, such as cancer, DNA damage, protein synthesis, stress response, and detrimental biological and health effects in humans that occur at RFR intensities below the existing Code 6 Guideline."

[251] Canadians for Safe Technology. (2014). Relevant scientific studies (140) omitted by Health Canada in its scientific review of draft Safety Code 6 (2014), Canada's safety guidelines for safe exposure to radiofrequency/microwave radiation. Submission to the Federal Minister of Health Canada, Honourable Rona Ambrose 15 July 2014, 213 pages. docs.c4st.org/Studies/140_studies_omitted_by_Health_Canada.pdf
[252] Health Canada. (2015). Safety Code 6 (2015) – Rationale. Unpublished Discussion Paper, 62 pages. docs.c4st.org/GovRelations/Fed/Health-Canada/Health-Canada-Safety-Code-6-2015-Rationale_62-pages_Unpublished-discussion-paper.pdf
[253] Clegg et al. 2019 https://www.sciencedirect.com/science/article/pii/S0360132319305347
[254] Declaration: Doctors Call for Protection from Radiofrequency Radiation Exposure. (2014, September 28). Retrieved July 13, 2014. http://www.c4st.org/images/documents/hc-resolutions/medical-doctors-submission-to-health-canada-english.pdf
[255] Declaration: Scientists call for Protection from Radiofrequency Radiation Exposure. (2014, July 9). Retrieved July 13, 2014. http://www.c4st.org/images/documents/hc-resolutions/scientific-declaration-to-health-canada-english.pdf

6.2.7. Health Canada's guidelines are behind other countries

While it may be true that many countries follow ICNIRP and base their guidelines only on the thermal effects of RF radiation, there are many countries, states, and cities around the world that are doing a lot more to protect their citizens.

Canada should be among them.

- China, Russia, Italy, Switzerland, India, Israel, Chile, Poland, Lithuania, Slovenia, and parts of Belgium, have power density **guidelines that are between 5 and 100 times safer** than Canada's.
- Parts of Italy, Switzerland, Ireland and the UK, have **put a halt to the rollout of 5G** until more is known about possible adverse effects.[256]
- **France adopted a comprehensive law** in 2015 that protects the public from excessive exposure to RF radiation.[257]

  Among its articles:

  - Wi-Fi is banned in nurseries for children under the age of 3;
  - Wi-Fi in primary schools (under age 11) is enabled *only when used for lessons*.
  - *Signage is required* to inform the public when Wi-Fi is offered in a public place.
  - At the point of sale of mobile phones, the SAR value must be clearly shown.
  - In the future, all mobile phone advertisements must include recommendations on how users can reduce RF radiation exposure to the head such as the use of headsets.
  - Data on local EMF exposure levels shall be made more easily accessible to the general public, among others, through country-wide transmitter maps.

See Chapter 10 for more on what others are doing to protect their citizens and themselves.

[256] Environmental Health Trust. *International Actions to Halt* 5G. https://ehtrust.org/international-actions-to-halt-and-delay-5g/
[257] https://www.legifrance.gouv.fr/loda/id/JORFTEXT000030212642/

Canada's RF Exposure Guidelines Compared to Others	Intensity (mW/m^2)
CANADA	
– for devices used close to the body (6 GHz to 300 GHz), i.e., cell phones, tablets and wearables once 5G is fully deployed [258]	**20,000**
– for 6 GHz to 150 GHz *	**10,000**
– for 5 GHz Wi-Fi networks ****	**8,830**
– for 2.4 GHz Wi-Fi networks and cordless phones ****	**5,350**
– for 2.1 GHz LTE cellular networks ****	**4,880**
– for 900 MHz – for example wireless "smart" meters ****	**2,740**
COMPARED TO. . .	
Russia, Slovenia (2100 MHz) †	1,000
Israel, India, Lithuania (1800 MHz) †	900
Brussels Capital Region ††	560
Israel, India, Lithuania (900 MHz) †	450
Slovenia (900 MHz) †	450
China †	400
Italy † *near homes, schools, places where people stay more than 4 hours*	100
Poland †	100
Chile † *near schools, kindergartens, hospitals, care homes*	100
Switzerland (1800 MHz), Lichtenstein, Luxembourg ***	95.5
Switzerland (900 MHz) ***	42.5
Belgium's Wallonia and Flanders ****	24
Austrian Antenna System Siting Guideline (2012, updated 2015) ****	1
Parliamentary Assembly of Council of Europe ****	1
EUROPAEM (MDs) - daytime**	0.1
EUROPAEM (MDs) - nightime**	0.01
BioInitiative 2012[259]	0.006
EUROPAEM (MDs) - sensitive populations**	0.001
Natural background level (all RF frequencies)***	0.000000001
Cosmic background ***	0.00000000000001

SOURCES: * Safety Code 6; ** Belyaev, et al. (2016). European Academy for Environmental Medicine (EUROPAEM) EMF Guideline 2016 for the prevention, diagnosis and treatment of EMF-related health problems and illnesses. Reviews on Environmental Health, 31(3). https://doi.org/10.1515/reveh-2016-0011;
*** https://www.powerwatch.org.uk/science/intguidance.asp; **** KatharinaConsulting.com (2018)
† WHO https://www.who.int/data/gho/data/themes/topics/indicator-groups/indicator-group-details/GHO/exposure-limits-for-radio-frequency-fields-(public) - *updated 2017*
†† July 2021: Brussels increased their limit by a factor of 5: https://stop5g.be/fr/lettre/CP/20210901.htm#_edn1

[258] Health Canada (Jan 2021). Notice: Localized human exposure limits for radiofrequency fields in the range of 6 GHz to 300 GHz https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/types-sources/radiofrequency-fields/notice-localized-human-exposure-limits-range-6-ghz-300-ghz.html

[259] BioInitiative Working Group, Sage C, Carpenter DO, editors. BioInitiative Report: A Rationale for a Biologically-based Public Exposure Standard for Electromagnetic Radiation at www.bioinitiative.org, December 31, 2012.

6.3. Report of the House of Commons Standing Committee on Health (HESA) Ignored

In 2015, the House of Commons Standing Committee on Health (HESA) held hearings that included invited testimony and briefs from Canadian and international experts.

Its report entitled **"Radiofrequency Electromagnetic Radiation and the Health of Canadians**" which included 12 recommendations,[260] concluded that:

"the potential risks of exposure to RF fields are a serious public health issue that needs to be brought to the attention of Canadians".

THE 12 RECOMMENDATIONS*

https://www.ourcommons.ca/Content/Committee/412/HESA/Reports/RP8041315/hesarp13/hesarp13-e.pdf

1.	That the Government of Canada, in collaboration with the health departments of the provinces and territories, examine existing cancer data collection methods to **improve the collection of information relating to wireless device use and cancer.**
2.	That **Statistics Canada** consider **including questions related to electromagnetic hypersensitivity** in the Canadian Community Health Survey.
3.	That the Government of Canada, through the Canadian Institutes of Health Research, consider **funding research into electromagnetic hypersensitivity testing, diagnosis and treatment, and its possible impacts on health in the workplace**.
4.	That the Canadian Medical Association, the Royal College of Physicians and Surgeons, the College of Family Physicians of Canada and the World Health Organization consider updating their guidelines and continuing education materials regarding the diagnosis and treatment of electromagnetic hypersensitivity to ensure they are based on the latest scientific evidence and reflect the symptoms of affected Canadians.
5.	That the Government of Canada continue to provide **reasonable accommodations for environmental sensitivities, including electromagnetic hypersensitivity**, as required under the Canadian Human Rights Act.
6.	That Health Canada ensure the **openness and transparency of its processes for the review of Safety Code 6**, so that all Canadians have an opportunity to be informed about the evidence considered or excluded in such reviews, that outside experts are provided full information when doing independent reviews, and that the scientific rationale for any change is clearly communicated.
7.	That the Government of Canada establish **a system for Canadians to report potential adverse reactions** to radiofrequency fields.
8.	That an **independent scientific body** recognized by Health Canada **examine whether measures taken and guidelines provided in other countries**, such as France and Israel, to limit the exposure of vulnerable populations, including infants, and young children in the school environment, to radiofrequencies **should be adopted in Canada**.
9.	That the Government of Canada develop an **awareness campaign relating to the safe use of wireless technologies**, such as cell phones and Wi-Fi, in key environments such as the school and home to ensure that Canadian families and children are reducing risks related to radiofrequency exposure.
10.	That **Health Canada conduct a comprehensive review of all existing literature relating to radiofrequency fields and carcinogenicity based on international best practices**.

[260] https://www.ourcommons.ca/DocumentViewer/en/41-2/HESA/report-13/

11.	That the Government of Canada, through the Canadian Institutes of Health Research, consider **funding research into the link between radiofrequency fields and potential health effects** such as cancer, genetic damage, infertility, impairment to development and behaviour, harmful effects to eyes and on the brain, cardiovascular, biological and biochemical effects.
12.	That the Government of Canada and manufacturers consider **policy measures regarding the marketing of radiation emitting devices to children under the age of 14**, in order to ensure they are aware of the health risks and how they can be avoided.

* [Bolding added for scannability]

What happened to this Report?

- **June 17, 2015:** presented to the House of Commons (Conservative Government)
  - **Shelved** because of the Federal election in October 2015.

- **June 15, 2016:** re-adopted after the election by the new HESA Committee, and presented once again to the House of Commons. (Liberal Government)
  - **No action was taken.** Response from The Honourable Jane Philpott, Minister of Health at the time, dismissed the committee's recommendations.[261] In her response, she stated that "Health Canada uses a "weight of evidence" approach in evaluating scientific studies". Despite numerous requests, and in contrast to standard scientific procedure, Health Canada has never published its weight of evidence criteria or analyses.

6.4. Why is Health Canada not acting?

6.4.1. Not one of the recommendations made by the House of Commons Standing Committee on Health (HESA) in 2015 has been fully implemented.

Despite the HESA Committee's conclusion that "the potential risks of exposure to RF fields are **a serious public health issue that needs to be brought to the attention of Canadians**" and its 12 recommendations made to the House of Commons in 2015, and despite it being re-adopted and presented for a second time – this time to the 42nd Parliament (Liberal Government) in 2016, **this Report** (see previous section) **has fallen on deaf ears.**

C4ST replied to then Health Minister Jane Philpott's dismissive response in 2016, outlining concerns that Health Canada was not protecting Canadians[262] by:

- Neglecting to run awareness campaigns to inform Canadians on how to use their wireless devices more safely;
- Allowing the wireless industry to bury their safety warnings in their manuals;
- Misrepresenting Canada's safety guidelines compared to other countries;
- Refusing to invest the resources to understand electromagnetic hypersensitivity (EHS) better. It is estimated that at least 3% of the population suffers from EHS.
- Failing to meet the international scientific standards for systematic literature review;
- Dismissing the large body of credible evidence that there are harmful biological effects below Safety Code 6 limits.

[261] https://www.ourcommons.ca/DocumentViewer/en/42-1/HESA/report-2/response-8512-421-78
[262] http://c4st.org/minister-health-response-hesa-recommendations/

6.4.2. How much more evidence does Health Canada need?

- **Well over 200 peer-reviewed studies have been published since the last revision of Safety Code 6 (2015), showing that radiofrequency radiation has potentially harmful biological effects below Safety Code 6 limits.**[263,264]

  See Appendix 4 for a few of the studies showing evidence of brain cancer, impact on children, DNA and sperm damage, and oxidative stress which can lead to cancer, Alzheimer's and Parkinson's diseases.

- At a 2019 symposium hosted by the Environmental Health Clinic, Women's College Hospital in Toronto, Canadian scientists and physicians publicly stated that full 5G rollout will expose Canadians to an unprecedented increase in radiofrequency radiation.[265] They expressed concern that our health care costs will rise without our medical professionals understanding why, and not having the necessary information for making adjustments accordingly.[266]

- **Physician accrediting bodies are accrediting medical conferences.**
  The accrediting bodies that offer Continuing Medical Education (CME) have approved conferences on this topic aimed at educating family physicians and specialists. For example:

  All-Day Symposium for Ontario's medical community: Impacts of Wireless Technology on Health – May 31st, 2019[267]
  Hosted by Environmental Health Clinic, Women's College Hospital, Toronto

  Approved by the CPD Department of the Faculty of Medicine, University of Toronto, for:
  6 MOC Section 1 Credits (Royal College of Physicians and Surgeons of Canada)
  6 Mainpro+ and CERT+ credits (College of Family Physicians of Canada)

  EMF Medical Conference – January 28-31, 2021 – 600 attendees
  4-day virtual conference organized jointly by US-based CME provider AKH Inc., Advancing Knowledge in Healthcare and The Electromagnetic Safety Alliance, Inc.

  Approved for **20.5 AMA PRA Category 1 Credits**
  Through an agreement between the **Royal College of Physicians and Surgeons of Canada** and the **American Medical Association**, physicians may convert AMA PRA Category 1 Credits™ to Royal College MOC credits.

[263] See: Marketplace, March 2017 – Wendy Mesley. "*The Secret Inside Your Phone*". Has over 2.7 million views. https://www.youtube.com/watch?v=Wm69ik_Qdb8
[264] 200 Scientific Studies Reporting Potential Harm at Non-Thermal Levels Below Safety Code 6 Exposure Limits http://c4st.org/?s=200+studies
[265] **Impacts of Wireless Technology on Health: A symposium for Ontario's medical community**. https://www.womenscollegehospital.ca/care-programs/environmental-health-clinic/june-2019-conference-videos
[266] Media Release - **Ontario Doctors Warn of Rising Health Care Costs after 5G Roll Out** https://www.youtube.com/watch?time_continue=4&v=S16QI6-w9I8
[267] https://www.womenscollegehospital.ca/care-programs/environmental-health-clinic/electromagnetic-field-hypersensitivity-(ehs)

6.4.3. Health Canada's track record has been poor in responding to other harmful agents.

Health Canada has a dismal track record in responding in a timely manner to harmful agents. Think asbestos, Bisphenol-A (BPA), cigarette smoking, dioxins, flame retardants, lead, mercury, thalidomide and urea formaldehyde insulation.

Here are a few examples.

- **Cigarettes** were causing cancer; studies proved it; our government waited another **40 years** before passing legislation to require warning labels on packages.[268]
- Since the early 1900s, health authorities have known that **asbestos** causes mesothelioma, a deadly form of lung cancer.
    - By 2005 it was banned throughout the European Union.
    - Canada waited another 14 years to ban it (until 2019 -- **100 years** after it discovered the serious health risk it posed).
    - Canada has one of the highest rates of mesothelioma in the world.
    - Asbestos-related deaths are on the rise because of the latency period (it takes years to die from asbestos).
- **Glyphosate** (a dangerous pesticide) is **still allowed** in Canada, while 21 countries in the rest of the world are banning or restricting it.[269,270] In fact, Health Canada is considering loosening restrictions.[271]
- Regarding **BPA**, Health Canada's website states: "Health Canada's Food Directorate has concluded that the current dietary exposure to BPA through food packaging uses is not expected to pose a health risk to the general population including newborns and infants".[272]
- In 1959, the Government of Canada allowed samples of **thalidomide** to be distributed to patients by "qualified investigators", and on April 1, 1961, it officially authorized distribution of thalidomide in Canada. At the time, the US Food and Drug Administration had refused to approve it because of a lack of sufficient research. On March 2, 1962, Canadian authorities finally withdrew the drug from the market (**a full three months after it was taken off the market in its own country of origin)** after several doctors brought up concerns that it appeared to be responsible for severe birth defects when taken by pregnant women.[273] It took over 50 years for the Government of Canada to launch a proper financial compensation program for survivors.[274] To this day, the Government of Canada has never formally acknowledged its share of responsibility for this tragedy.

The wireless industry is growing rapidly. Our government is not keeping up.
For the past 20 years, Health Canada has refused to consider the large body of evidence that proves that RF radiation has harmful effects at levels far below Safety Code 6.

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[268] http://www.smoke-free.ca/pdf_1/2009/History%20of%20tobacco%20control%20in%20Canada.pdf
[269] https://www.canada.ca/en/health-canada/news/2019/01/statement-from-health-canada-on-glyphosate.html
[270] https://sustainablepulse.com/2019/05/28/glyphosate-herbicides-now-banned-or-restricted-in-17-countries-worldwide-sustainable-pulse-research/#.X3Teoj-Slpg
[271] https://montreal.ctvnews.ca/higher-concentrations-of-controversial-herbicide-glyphosate-may-soon-be-on-your-plate-here-s-why-1.5515198
[272] https://www.canada.ca/en/health-canada/services/food-nutrition/food-safety/packaging-materials/bisphenol.html
[273] https://thalidomide.ca/en/the-canadian-tragedy/
[274] https://www.canada.ca/en/health-canada/services/thalidomide-survivors-contribution-program.html

7. Pervasive Conflicts of Interest

7.1. International Commission for Non-Ionizing Radiation Protection

The exposure guidelines set by Health Canada as well as many other agencies worldwide are based on the recommendations of biased organizations – in particular the **International Commission on Non-Ionizing Radiation Protection (ICNIRP)**. This organization and several others have come under criticism for biases and conflicts of interest.

ICNIRP is a private, self-appointed non-governmental group, consisting mainly of engineers with ties to the telecommunications industry and the US military.[275]

ICNIRP's guidelines were established in 1998 and are **based only on short-term thermal (heating) effects** from RF radiation, neglecting all non-thermal biological effects.[276]

> The heating effects arise when radiation is so high that it warms up the whole body by 1°C or more after 30 min exposure at 4 W/kg specific absorption rate.[277]

The document *Differences between the ICNIRP (2020)*[278] *and Previous Guidelines*[279] confirms that **ICNIRP has not deviated from this misleading stance**. They state that "… the main ICNIRP (1998) restrictions currently remain protective, and have been mostly retained in the new guidelines."

In June 2020, two **Members of the European Parliament** – Michèle Rivasi (Europe Écologie) and Klaus Buchner (Ökologisch-Demokratische Partei), commissioned and published a report entitled "*International Commission on Non-Ionizing Radiation Protection: Conflicts of interest, corporate interests and the push for 5G".*[280] It was financed by the Greens/EfA group in the European Parliament.

It concluded that "**For really independent scientific advice, we cannot rely on ICNIRP."**

The following reasons are explained in detail:

- **The composition of ICNIRP is very one sided.** There is only one medically-qualified person (who is not an expert in wireless radiation) out of a total of 14 scientists.
- Even after much criticism from members of the global scientific community, ICNIRP **still adheres to the paradigm that the only proven effects (on health) are thermal**. It seems that "a closed circle of like-minded scientists" has turned ICNIRP into a self-indulgent science club, with a lack of bio-medical expertise.

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[275] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5504984/
[276] International Commission on Non-Ionizing Radiation Protection Guidelines for limiting exposure to time-varying electric, magnetic, and electromagnetic fields (up to 300 GHz) Health Phys. 1998; 74:494–522. https://pubmed.ncbi.nlm.nih.gov/9525427/
[277] Hardell L. (2017). https://doi.org/10.3892/ijo.2017.4046
[278] https://www.icnirp.org/cms/upload/publications/ICNIRPrfgdl2020.pdf
[279] https://www.icnirp.org/en/differences.html#:~:text=The%20International%20Commission%20on%20Non-Ionizing%20Radiation%20Protection%20(ICNIRP),to%20Electromagnetic%20Fields%20(100%20kHz%20to%20300%20GHz).
[280] The International Commission on Non-Ionizing Radiation Protection: Conflicts of interest, corporate interests and the push for 5G. Report commissioned, coordinated and published by Members of the European Parliament – Michèle Rivasi (Europe Écologie) and Klaus Buchner (Ökologisch-Demokratische Partei), and financed by the Greens/EfA group in the European Parliament. Brussels, June 2020. https://www.michele-rivasi.eu/wp-content/uploads/2020/06/ICNIRP-report-FINAL-JUNE-2020_EN.pdf

- The majority of ICNIRP scientists **have done, or are doing, research partly funded by industry**. Source of funding has an impact on study results.[281]
- The norms ICNIRP proposes are the **"harmonised limits" that the European Telecommunications Networks Operators' Association welcomes**.
- It is clear from ICES minutes[282] that ICNIRP worked very closely with the International Committee on Electromagnetic Safety (ICES) of the IEEE on the creation of ICNIRP's new RF safety guidelines that were published in 2020. **And this implies that large telecom-companies as well as US military had a direct influence on the ICNIRP guidelines.**
- The European Commission and national governments (…) should stop funding ICNIRP.

According to Lennart Hardell, a Swedish oncologist known for his research into environmental cancer-causing agents:

"Being a member of ICNIRP is a conflict of interest
in the scientific evaluation of health hazards from RF radiation
through ties to military and industry."[283]

In an article published in the European Journal of Risk Regulation (Cambridge University Press), "*Not Entirely Reliable: Private Scientific Organizations and Risk Regulation – The Case of Electromagnetic Fields*",[284] **Dr. G. D. Pascual, Professor of Administrative Law** at University of Valencia, explains that:

"There are several good reasons for governments not to uncritically follow the recommendations made by private scientific organisations such as the ICNIRP in order to regulate some risks."

He states:

- **Such organizations do not have the right incentives** to make the decisions – or, eventually, the recommendations – that maximize social welfare, not even the welfare of most citizens.
- Private scientific organizations such as the ICNIRP often have an **excessively homogeneous composition**. That lack of plurality tends to reduce both the quantity and the quality of the available information that serves the basis of their judgments, to stifle critical dialogue, to exacerbate the common biases and positions of their members and to produce extreme outcomes, polarized in the direction of those biases and points of view.
- Even though **new empirical evidence contrary to a mainstream scientific theory** might not eventually constitute a sufficient reason to abandon such a theory at the purely scientific level, **it may justify a change in the legal rules grounded in that theory.**

---

[281] Huss A, Egger M, Hug K, Huwiler-Müntener K, Röösli M. Source of funding and results of studies of health effects of mobile phone use: systematic review of experimental studies. Environmental Health Perspectives. 2007 Jan;115(1):1-4. DOI: 10.1289/ehp.9149. https://europepmc.org/article/PMC/1797826; and
[282] https://www.ices-emfsafety.org/wp-content/uploads/2017/08/TC95-Minutes-SC3-SC4-January-2017.pdf
[283] Hardell, Lennart. "World Health Organization, radiofrequency radiation and health - a hard nut to crack (Review)." International journal of oncology, vol. 51, 2 (2017): 405-413. doi:10.3892/ijo.2017.4046 https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5504984/
[284] Pascual, Gabriel Doménech. "Not Entirely Reliable: Private Scientific Organizations and Risk Regulation – The Case of Electromagnetic Fields." European Journal of Risk Regulation (Cambridge University Press), Volume 4, Issue 1 (2013): 29-42. https://www.uv.es/gadopas/2013.Not.Entirely.Reliable.pdf

Dariusz Leszczynski, PhD, has 20 years of experimental work on EMF and health. His expert roles have included:

- Parliament of Canada: expert in hearing on cell phone radiation and health; Safety Code 6, in 2015;
- International Agency for Research on Cancer: Invited Expert to Working Group on Non-Ionizing Radiation (RF fields). Lyon, France, May 2011;
- US Senate: expert in hearing on "The Health Effects of Cell Phone Use". Washington, DC, USA, September 14th, 2009.

From his science blog post on September 8, 2020[285]:

> "There is something utterly wrong with how science is evaluated and understood by ICNIRP scientists."

In another post "*Is ICNIRP reliable enough to dictate meaning of science to the governmental risk regulators?"*[286]:

> "In my opinion the major problems of ICNIRP are:
>
> - it is a "private club" where members elect new members without need to justify selection
> - lack of accountability before anyone
> - lack of transparency of their activities
> - complete lack of supervision of its activities
> - skewed science evaluation because of the close similarity of the opinions of all members of the Main Commission and all of the other scientists selected as advisors to the Main Commission."

Making matters worse, ICNIRP members are regularly invited to sit on other advisory committees evaluating the harmful effects of RF Radiation. Health Canada's committee report to the Royal Society[287] and the advisory panel[288] to Bermuda's Regulatory Authority are two examples.

Overwhelming power of ICNIRP opinions through backing from GSMA, MWF & telecoms: **WHO and governmental agencies meekly follow and disseminate misinformation** on 5G millimeter-waves' safety research

-- Dariusz Leszczynski, PhD

Source: Title of Dr. Leszczynski's science blog post, March 22, 2021[289]

[285] "There is something utterly wrong with the ICNIRP membership", Between a Rock and a Hard Place, Science Blog on Mobile Phone Radiation and Health by Dariusz Leszczynski. September 8, 2020. https://betweenrockandhardplace.wordpress.com/2020/09/08/leszczynski-there-is-something-utterly-wrong-with-the-icnirp-membership/

[286] "Is ICNIRP reliable enough to dictate meaning of science to the governmental risk regulators?", Between a Rock and a Hard Place, Science Blog on Mobile Phone Radiation and Health by Dariusz Leszczynski. April 8, 2016. https://betweenrockandhardplace.wordpress.com/2016/04/08/is-icnirp-reliable-enough-to-dictate-meaning-of-science-to-the-governmental-risk-regulators/

[287] Rianne Stam was a panel member of ICNRP's Progress report: ICNIRP Statement on non-ionizing radiation for cosmetic purposes https://ieeexplore.ieee.org/document/8526071

[288] Rodney Croft is chairman of the International Commission on Non-Ionizing Radiation Protection https://www.royalgazette.com/technology/business/article/20201112/concerns-raised-about-5g-advisory-panel/

[289] "Overwhelming power of ICNIRP opinions through backing from GSMA, MWF & telecoms: WHO and governmental agencies, like ARPANSA, BfS, TNO, STUK et al., meekly follow and disseminate misinformation

The editor of Microwave News, an independent publication that has been covering non-ionizing radiation issues for 40 years, recently called for ICNIRP to be disbanded, saying it is "time to clean house".[290]

> This cannot go on. **The first step is for ICNIRP (…) to be disbanded.** The Swedish panel should also be dissolved and reconstituted with a more balanced membership. Indeed, all expert committees should be broadened to include those who allow that more than RF tissue heating may be at work.
>
> **But most important: The lies and distortions must stop.** Otherwise, confusion and conspiracy theories will continue to run rampant. The net result is that the entire RF research enterprise will lack credibility, which, unfortunately, is the objective of many of the leading players.
>
> -- Louis Slesin, PhD, Microwave News, April 9, 2020

7.2. World Health Organization (WHO) and its EMF Project

Many concerns have been raised about the influence ICNIRP (see 7.1) has on the WHO and the WHO's International EMF-Project.[291] ICNIRP prepares guidelines that are recommended for implementation around the world by the WHO EMF Project.

The WHO states that "there are no adverse short- or long-term health effects" from exposure to wireless networks,[292] completely disregarding its own **International Agency for Research on Cancer** (IARC) which in 2011 classified RF radiation as a **possible human carcinogen** (Group 2B – same category as lead and DDT at the time), and which in 2019 concluded that:

> "based on new evidence, non-ionizing radiation (radiofrequency) **should be a high priority for re-evaluation of the classification**"
>
> *– Report of the Advisory Group to Recommend Priorities for the IARC Monographs during 2020–2024*[293]

The WHO-EMF Project is heavily influenced by **ICNIRP** and reports from the Scientific Committee on Emerging and Newly Identified Health Risks and Advisory Group on Non-ionising Radiation, when making its recommendations.
These reports and organizations, especially ICNIRP, have come under criticism for biases and conflicts of interest.[294,295,296,297,298]

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on 5G millimeter-waves' safety research", Between a Rock and a Hard Place, Science Blog on Mobile Phone Radiation and Health by Dariusz Leszczynski. March 22, 2021. https://betweenrockandhardplace.wordpress.com/2021/03/22/overwhelming-power-of-icnirp-opinions-through-backing-from-gsma-mwf-telecoms-who-and-governmental-agencies-like-arpansa-bfs-tno-stuk-et-al-meekly-follow-and-disseminate-misinformation-on/

[290] "The Lies Must Stop: Disband ICNIRP -- Facts Matter, Now More Than Ever", Microwave News, April 9, 2020. https://microwavenews.com/news-center/time-clean-house

[291] https://betweenrockandhardplace.wordpress.com/2014/12/05/epidemiology-icnirp-hijacked-who-emf-project/

[292] https://www.who.int/teams/environment-climate-change-and-health/radiation-and-health/bstations-wirelesstech

[293] https://monographs.iarc.fr/wp-content/uploads/2019/10/IARCMonographs-AGReport-Priorities_2020-2024.pdf

[294] https://www.spandidos-publications.com/10.3892/ijo.2017.4046

[295] https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2902287

[296] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5504984/

[297] https://www.ncbi.nlm.nih.gov/pubmed/26688202

Louis Slesin, founder of Microwave News, has been reporting on the health and environmental impacts of electromagnetic fields (EMFs) and other types of non-ionizing radiation since 1981.

He raises concerns about the WHO's announcement that it is reopening its review of the health effects of RF radiation for a summary report. This report will have world-wide effects since it will serve as a benchmark for its more than 150 member countries. The report may also be used to respond to widespread concerns over the new world of 5G.

Slesin raises concerns that key international experts were not included in the invitations to participate, the timeline for response was very short and the lack of funding for reviewers all favour ICNIRP members who have all recently finished their own literature reviews to update ICNIRP's exposure guidelines.[299]

7.3. Industry Influence

In December 2020, the Washington Spectator published **a major exposé by investigative journalist Barbara Koeppel on industry influence into the science and policy of 5G and wireless radiation**. Koeppel's investigation follows the money. She details industry ties between the International Commission on Non-Ionizing Radiation Protection (ICNIRP), the Food and Drug Administration (FDA), The Center for Disease Control and Prevention (CDC), The New York Times, the American Cancer Society, and scientists professing that 5G is safe.[300]

On the Science

The **Environmental Health Trust** has an informative page on its website that contains an ongoing list of published **studies and reports on industry involvement in the science of EMFs.** Visit: https://ehtrust.org/science/research-industry-influence-emfs/

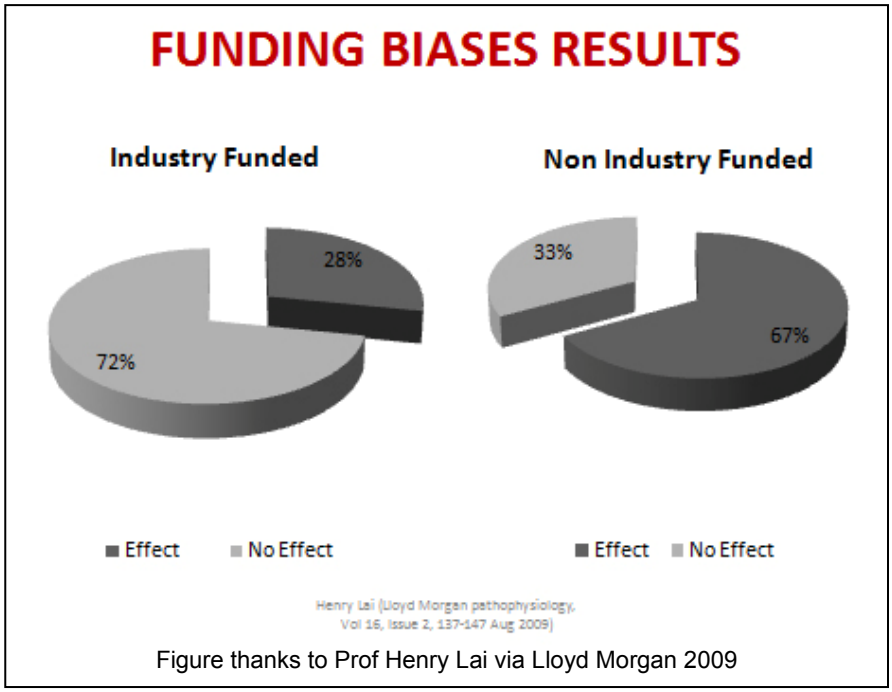


Figure thanks to Prof Henry Lai via Lloyd Morgan 2009

[298] https://www.ncbi.nlm.nih.gov/pubmed/27902455
[299] https://microwavenews.com/news-center/can-who-kick-icnirp-habit
[300] The Washington Spectator. (2020). **Wireless Hazards.** https://washingtonspectator.org/wireless-hazards/

On Government

In the US:
According to a recent joint study by Common Cause and the Communications Workers of America (CWA) union, big internet service providers in the US over the last few years have **eliminated most FCC oversight of broadband providers**, derailed efforts to pass meaningful privacy rules, and thwarted a wide variety of proposals designed to deliver faster, cheaper fiber broadband competition. The study found that the telecom industry spent $234 million on lobbying during the 116th Congress alone, or nearly **$320,000 a day**.[301]

In Canada:
According to an article in the Huffington Post in February 2021,[302] **federal government officials met with lobbyists for Canada's big telecom firms** "**an average of twice every business day**" over the past year. The article quoted TekSavvy, an independent internet provider who had analyzed entries in the federal lobbyist registry in the 12 months prior to February 2021 and found 577 meetings between officials and the three big telcos — Bell, Rogers and Telus — as well as three regional players — Shaw, Quebecor and Cogeco — and the Canadian Wireless Telecommunications Association.

The Ontario-based company argued that **Canada is on the verge of "regulatory capture" in its telecom industry** — a situation where regulators "come to be dominated by the industries or interests they are charged with regulating."

> ""A single meeting doesn't automatically translate into the lobbyist's desired action, but such results are likelier when policy makers are primarily getting messaging from proponents **of only one side of an issue**," Nowak wrote.
>
> "**The problem can be compounded when policy makers themselves have ties to the companies.**" He noted that Deputy Finance Minister Michael Sabia served as CEO of Bell Canada parent company BCE from 2002 to 2008, while the CRTC's Scott is a former Telus lobbyist."

7.4. Media Coverage

There is a dramatic disconnect between concerns of scientists who are independent of industry and public awareness.

The media has a role to play in covering this issue in a balanced fashion.

In an article entitled "Is Wireless Technology an Environmental Health Risk?", published on January 6, 2021 by the Society of Environmental Journalists,[303] award-winning journalist Katie Alvord, recipient of the 2007 American Association for the Advancement of Science "Science Journalism Award for Excellence in Online Reporting", highlights a number of issues about the rollout of 5G that need to be thoroughly investigated by the media. She also describes the science and the well funded attempts by industry to prevent the conversation from entering the mainstream.

---

[301] Broadband Gatekeepers. How ISP Lobbying and Political Influence Shapes the Digital Divide. July 2021. https://www.commoncause.org/wp-content/uploads/2021/07/CCBroadbandGatekeepers_WEB1.pdf
[302] "Big Telecom Lobbied Trudeau Government 577 Times In Past Year, TekSavvy Says", Huffington Post, Feb.13, 2021 https://www.huffingtonpost.ca/entry/telecom-lobbying-ottawa_ca_60280096c5b680717ee8175a
[303] https://www.sej.org/publications/features/wireless-technology-environmental-health-risk?fbclid=IwAR0LDG7pp_zpV8ga2l9DnqBC3EQJWM4-rPgHghBHzVY9LvDzgpq32CozEXc

8. Do we really need 5G NOW?

8.1. Why the rush?

An artificial sense of urgency has been created.

The wireless industry declared itself to be in a race to deploy 5G.
Then politicians and major media joined the bandwagon, framing the building of next-generation 5G networks as a "race" that MUST be won.

> "The stakes of this supposed race are wholly unclear. What happens if we win, besides telecom execs getting slightly richer? More importantly, what are the drawbacks to coming in second, or even third? Where is the list of specific negative outcomes of China building a 5G network a month, a year, or even five years before the United States? I've never seen it, and I keep asking about it. […]
>
> The more I hear about the race, the more I don't buy it. **I think the "race" framing is there to make some big decisions seem urgent and important — to make it appear as though some serious trade-offs are worth it in order to "win."**
>
> And those trade-offs are indeed serious: 5G networks will require a serious rethinking of how we use wireless spectrum. There are incredible privacy implications around putting millions of IoT devices in a "smart city" on 5G. Investment dollars will naturally flow toward building 5G networks in cities instead of expanding our networks to rural areas, exacerbating the digital divide."
>
> (Extract from "Wait, why the hell is the 'race to 5G' even a race?, *No one seems to have a good answer to this question"* By Nilay Patel, The Verge, May 23, 2019)

With <u>current</u> networks, latency is 50 milliseconds, about **half the time it takes to blink an eye**. 5G technology will reduce that time to one millisecond.

Do we need this imperceptible increase in speed <u>so badly</u> that it is worth rushing into it despite all of the warnings?

> … ***warnings by hundreds of credible scientists and doctors*** of serious harm to our health, and to our environment.
>
> … ***warnings by security experts*** of the threat to our privacy and national security.
>
> … ***the refusal of insurance companies*** (such as Lloyds and Swiss Re) ***to provide coverage*** for injuries caused by non-ionizing radiation exposure.
>
> … ***warnings by experts*** of the immense strain it will bring to bear on the fight against ***climate change*** – its global emissions are projected to surpass aviation and shipping.[304]

[304] https://www.theguardian.com/environment/2017/dec/11/tsunami-of-data-could-consume-fifth-global-electricity-by-2025

8.2. The Scientific Decision Is Clear

The Precautionary Principle

> "When an activity raises threats of harm to human health or the environment, precautionary measures should be taken even if some cause and effect relationships are not fully established scientifically."[305]

As Dr. Martin Blank, a leading expert on the health effects of electromagnetic fields (EMF), said:

> "It is easier to understand it in terms of automobile speed.
> If we travel at 50 mph, we'll have a certain number of fatalities,
> if we raise it to 60 mph, we'll obviously have more fatalities.
> The question is: **How many fatalities is our society willing to live with?**
>
> With EMF, we know that exposure of some kind is going to have its consequences biologically. And there will be a segment of the population that will succumb at some level. **What we have to do is decide, as a society, what is the level at which we want to set that.**
>
> **And that's a political decision.**
>
> **I think the scientific decision is clear:**
> that the standards have to be looked at again and have to be reset."
>
> -- Professor Martin Blank, PhD
>
> https://www.youtube.com/watch?v=a6wLFeIrCtU
> -- Listen to the last minute.

Remember, estimates are:

- **Machine to machine connections** will account for **50% of all Internet traffic** by 2023. This means that **the biggest beneficiaries** of 5G **will be the companies that collect the data about you** from these machines so that they can resell it.

- **65% of all Internet traffic by 2022** will be for **wireless video**.
  "70% of North American internet traffic in peak evening hours comes from streaming video and audio sites like Netflix and YouTube" according to research from broadband services company Sandvine.[306]

This means that the next biggest beneficiary will be the entertainment industry.

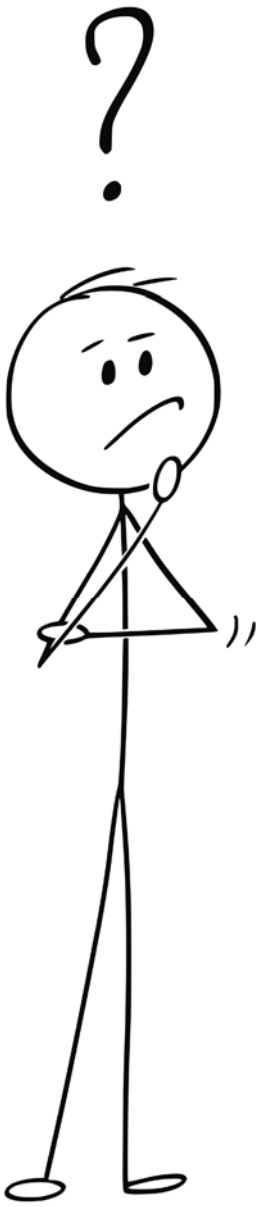
Most of the wonders being touted by the wireless industry are things that can be done better and more securely with wired connections, or things that we can easily live without
. . . at least until a safer alternative is found.

[305] Wingspread Conference on the Precautionary Principle, Jan 1998, Racine, Wisconsin, https://www.healthandenvironment.org/environmental-health/social-context/history/precautionary-principle-the-wingspread-statement
[306] "Sandvine: Over 70% of North American traffic is now streaming video and audio", Sandvine press release, Dec 07, 2015. https://www.newswire.ca/news-releases/sandvine-over-70-of-north-american-traffic-is-now-streaming-video-and-audio-560769981.html

The Benefits of 5G

- **Faster wireless Internet***
  mainly to support consumption of wireless video
  [According to Cisco, by 2022 65% of Internet traffic will be wireless video]
  Biggest beneficiary:
  Entertainment industry
  (Netflix, YouTube, etc.)
  [According to Sandvine, 70% of North American internet traffic in peak hours comes from streaming video and audio sites like Netflix and YouTube.]
- **Lower Latency**
  important for some services such as driverless cars and mobile healthcare (wireless)
- **Revenues from sales of new devices**
  (estimated at $12 trillion)
  Beneficiary: Wireless Industry
- **The Internet of Things**
  [According to Cisco, by 2023, machine-to-machine connections will account for 50% of all Internet traffic]
  Beneficiary: Corporations
  Data is the new oil. Companies collect data about you from machines and sell it.
- **Revenues from sales of the spectrum**
  Beneficiary: Government

* Note that even the fastest 5G wireless will never surpass fibre optics when it comes to speed.



The Costs

- **Long-term adverse health effects**
  - Increased cancer risk
  - Sperm damage
  - DNA damage
  - Neurological disorders
  - Learning and memory deficits
  - Increase in harmful free radicals, cellular and oxidative stress
- **Short-term adverse health effects**
  electrosensitivity, sleep problems, headaches, dizziness, fatigue, etc.
- **Harm to wildlife, including birds and pollinators**
- **Damage to trees and other plants**
- **Security risks**
- **Privacy Risks**
- **Major contributor to climate change**
- **Contravention of human rights**
- **Impact on aviation safety**
- **Degradation of weather forecast accuracy**
- **Decreased ability to monitor climate change**
- **Threat to astronomical observation**

9. Safer Alternatives Exist: Wired Is Better.

Much is written about the benefits of 5G. Unfortunately, next to no discussion includes the use of wired solutions. In most cases, **a wired solution will provide all the benefits more economically, efficiently and securely, and without harmful side effects.**

9.1. Wired vs Wireless

Wired connections provide the benefits of 5G but are FASTER, SAFER, CHEAPER and GREENER. And Fibre is best.

IN A NUTSHELL...

FIBRE BROADBAND (*compared to wireless*)**. . .**

- Consumes up to 10 times less energy[307]
- At least 100 times faster[308, 309]
- More reliable and resilient[310]
- Far more protective of privacy[311,312]
- Far more secure, less vulnerable to hacking[313,314]
- Does not rely on rare minerals[315]
- Safe; It does not expose people, wildlife, and trees to wireless radiation.

"Wireless communication can never approach the speed and reliability of wired networks."
-- Timothy Schoechle, Re-Inventing Wires[316]

[307] Baliga, J., Ayre, R., Hinton. K., & Tucker, R. (2011). "Energy consumption in wired and wireless access networks," in IEEE Communications Magazine, vol. 49, no. 6, pp. 70-77, June 2011. https://ieeexplore.ieee.org/document/5783987

[308] Noam, E. (2011). Let them eat cellphones: why mobile wireless is no solution for broadband. In Journal of *Information Policy*, Vol. 1 (2011), pp. 470-485 (pp. 470–485). Penn State University Press. Retrieved from https://www.jstor.org/stable/pdf/10.5325/jinfopoli.1.2011.0470.pdf

[309] Schoechle, Timothy. (2018). Re-Inventing Wires: The Future of Landlines and Networks. *National Institute for Science, Law & Public Policy Washington*, DC, 156. https://bit.ly/3crWnfV

[310] Wired phones work during a power outage hence are more reliable. Wireless cell networks are constantly upgraded whereas cable or fibre is laid once.

[311] Warzel, Charlie, & Thompson, Stuart A. (2019, December 19). Twelve Million Americans Were Tracked Through Their Phones. *New York Times*. Retrieved from https://www.nytimes.com/2019/12/19/opinion/tracking-phone-data.html

[312] Zuboff, S. (2014, January). *The Age of Surveillance Capitalism* published by Public Affairs, Hachette Book Group https://en.wikipedia.org/wiki/The_Age_of_Surveillance_Capitalism - https://youtu.be/hIXhnWUmMvw

[313] Schoechle, T. (2018). Re-Inventing Wires: The Future of Landlines and Networks. https://bit.ly/3crWnfV

[314] Bruce Schneier (2019). Essays: Every Part of the Supply Chain Can Be Attacked - Schneier on Security. *The New York Times,* Sept 25, 2019 https://www.schneier.com/essays/archives/2019/09/every_part_of_the_su.html

[315] https://www.newswire.ca/news-releases/canada-and-u-s-finalize-joint-action-plan-on-critical-minerals-collaboration-829031955.html; https://www.cnet.com/news/digging-for-rare-earths-the-mines-where-iphones-are-born/ ; https://cacm.acm.org/magazines/2019/3/234917-electronics-need-rare-earths/fulltext

[316] Schoechle, Timothy. (2018). Re-Inventing Wires: The Future of Landlines and Networks. *National Institute for Science, Law & Public Policy Washington*, DC, 156. https://bit.ly/3crWnfV

Wireless networks are not sustainable.

- According to the IEEE, wireless technologies "**consume at least 10 times more power** than wired technologies."[317]
- **A 5G base station** is expected to consume roughly **three times as much power** as a 4G base station.[318] 5G will require **far more base stations**. (Koziol, 2019)
- Greenpeace reports, If the "cloud" were a country, it would be the fifth largest consumer of energy in the world.[319]

Wireless networks cause interference.

- 5G technology is expected to interfere with critical satellite data which could result in a 30% reduction in weather forecast accuracy according to the NOAA and NASA.[320]

- 5G wireless networks are expected to interfere with radar altimeters which will greatly impact aviation operations, including the "possibility of catastrophic failures leading to multiple fatalities".[321]

Wireless radiation can harm our health and the environment.

Fibre Broadband – the Superior Choice!

- Industry is implementing fibre solutions in arctic conditions in Alaska and Nunavik.[322]
- Former FCC Chair Tom Wheeler is now backing fiber to the premises.[323]
- AT&T is already moving there.[324]
- In July, California passed legislation for fiber to the premises.[325]
- In Switzerland, the Romande energy company and the Swiss4net telecom company have already formed a new alliance for Fiber-to-the-Home as they call it.[326]
- Fiber to the premises solves the broadband equity issues, closing the digital divide.
- The cost is not prohibitive; wherever we run electricity lines, we can insert fiber-optics. Fibre is laid once, unlike wireless cell networks that are constantly upgraded.
- Once fibre is installed to and through the premises, and the public is educated to minimize wireless connections, the capacity demands for wireless diminish and there is ample capacity for cell phone calls.

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[317] Ferreira, J. B., Almeida de Salles, Á. A., & Fernández-Rodriguez, C. E. (2015). SAR simulations of EMF exposure due to tablet operation close to the user's body. In *2015 SBMO/IEEE MTT-S International Microwave and Optoelectronics Conference (IMOC)* (pp. 1–5). https://doi.org/10.1109/IMOC.2015.7369205

[318] Koziol, Michael. (2019). 5G's Waveform Is a Battery Vampire. IEEE Spectrum, July 24, 2019. https://spectrum.ieee.org/5gs-waveform-is-a-battery-vampire

[319] https://www.greenpeace.org/static/planet4-international-stateless/2012/04/e7c8ff21-howcleanisyourcloud.pdf

[320] https://www.washingtonpost.com/weather/2019/05/23/head-noaa-says-g-deployment-could-set-weather-forecasts-back-years-wireless-industry-denies-it/

[321] Assessment of C-Band Mobile Telecommunications Interference Impact on Low Range Radar Altimeter Operations, White Paper, October 7, 2020. https://www.rtca.org/wp-content/uploads/2020/10/SC-239-5G-Interference-Assessment-Report_274-20-PMC-2073_accepted_changes.pdf

[322] CanArctic Inuit Networks' SednaLink Fibre to eliminate Nunavut and Nunatsiavut Connectivity Crisis by November 2022 - SubTel Forum

[323] Tom Wheeler Before the Congress of the United States, House of Representatives Committee on Energy & Commerce, LIFT America: Revitalizing our Nation's Infrastructure and Economy, March 22, 2021

[324] https://about.att.com/aboutus/pressrelease/2022/fastest-major-internet-provider.html

[325] https://arstechnica.com/tech-policy/2021/07/california-passes-historic-plan-for-statewide-open-access-fiber-network/

[326] https://www.morges4net.ch/en/

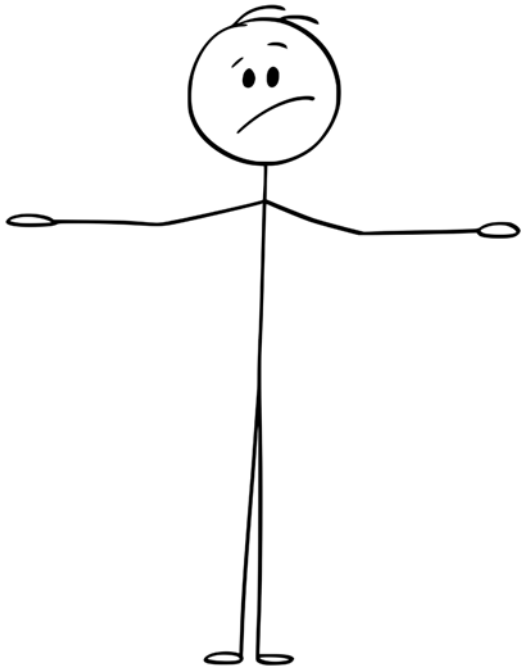
The Wire behind Wireless: The cables are already there!

Fibre-optic cable is used to connect more and more cell towers. This connection is called "backhaul." 5G macro and small cells require fibre-optic backhaul.

> "Most bandwidth consumed over mobile network airwaves is related to video-centric content flowing from a distant data center located across a city, a country, or even an ocean. (...) The only transport media capable of scaling to these demands is fiber meaning it'll have to be available everywhere, particularly in the RAN to the hundreds of thousands of small and macro cells deployed worldwide."[327]

WIRED networks

- **100 times faster**
- **reliable**
- **affordable**
- **10 times more energy efficient**
- **secure**
- **safe for all living beings**
- **resilient in extreme weather events –** telephone landlines function during power failures
- **future-proof**
- **A SOLID BASIS FOR ECONOMIC GROWTH**



WIRELESS networks

- **100 times slower**
- **unstable** (constant upgrades)
- **more costly**
- **consume 10 times more energy**
- **vulnerable to privacy and security breaches**
- **harmful to health** (human, animal, insect and plant)
- **not reliable in a crisis** – mobile networks require electricity, can be knocked out by increased call volume
- **economic burden to be determined**
- **UNSUSTAINABLE**

Wireless should be used only for things that move.

[327] https://www.ciena.com/insights/articles/5G-wireless-needs-fiber-and-lots-of-it_prx.html

Many of the Benefits Touted for 5G Can Be Achieved with Wired Systems

In their "race to 5G",[328] the technology and telecommunications industries have been implementing a "wireless first" strategy with limited consideration of wired alternatives. And they have been successful in tying the benefits of access to the Internet to wireless.

However, in very few cases is a wireless connection necessary.

Wireless is only necessary for mobile access.
Most devices planned to be connected to the IoT are not mobile.

Here are just a few examples of wired solutions that can provide the best of both worlds -- access to the information and tools needed to gain the benefits, but using resilient infrastructure, and without exposure to the harmful radiation from wireless devices and antennas.

- For the deployment of **smart street lighting, traffic lights, roadway signage** alerts, the electrical wiring connecting each fixture can be utilized for a wired solution.
- **Smart utility metre networks** and AMR meters can be connected through a wired system that can transmit information back to the utility through a dedicated phone line, fibre optics or other wired system once a day rather than with a constant Wi-Fi-like grid that exposes people and the environment to unnecessary radiation 24/7.
- **Smart building systems** in schools, homes and other buildings should use wired communication networks. Heating, ventilation, air conditioning and security systems and appliances are not mobile.[329] Pre-existing cables and wires can be rejuvenated.
- In the example of **drone-flight and video analysis in precision agriculture**, high resolution information may be captured on the device and then uploaded through a wired connection for further analysis. What consideration has been given to the harmful effects to birds, bees and other pollinators due to their constant exposure to radiation 24/7? *[330,331]*
- For education or entertainment, files should be **downloaded in advance and viewed offline**, or a wired connection should be used.[332]

For those who are willing to risk their health, <u>private</u> 5G networks can be set up.

A private 5G network could function like a Wi-Fi network for a building, factory or stadium. In fact, a 5G private network can be set up without even obtaining a license by using "unlicensed spectrum". *(See section 2.1 "Private Networks" and "Unlicensed Spectrum")*

[328] Wait, why the hell is the 'race to 5G' even a race? https://www.theverge.com/2019/5/23/18637213/5g-race-us-leadership-china-fcc-lte
[329] https://www.sciencedirect.com/science/article/pii/S0360132319305347?via%3Dihub#!
[330] https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(18)30221-3/fulltext
[331] https://www.researchgate.net/publication/301647025_Electromagnetic_radiation_of_mobile_telecommunication_antennas_affects_the_abundance_and_composition_of_wild_pollinators
[332] US-CHPS__Criteria_2014-2021_v1.2.pdf

9.2. Do We Need Wireless for 911?

We constantly hear that better cell phone reception is required for public safety.

However, rarely does the other side of the coin get mentioned: that **for every life potentially saved in an emergency, countless others will succumb to cancer and other life-threatening conditions** caused by their constant exposure to the radiation from the numerous antennas being installed – not to mention those who experience immediate and debilitating effects.

Cell phones cannot be relied upon. Rogers's recent mass outage caused by a "software update" is a prime example.[333]

> This website explains some of the other reasons you cannot rely only on cell phones in emergencies: https://www.kingsiii.com/help-phone-blog/you-should-know-about-the-cons-of-cell-phone-use-for-emergencies/

More importantly, **mobile network infrastructure** (cell towers, antennas) **needs electricity**.

In natural disasters when the power grid is down, such as the recent wildfires,[334] the floods in Europe,[335] the winter storm in Texas,[336] the big ice storm in Eastern Canada, mobile networks were the first to collapse. People needed help but had no electricity and no cell phone, and no Internet.

Even if there is electricity, mobile networks **can be knocked out by increased call volume** during a natural disaster (even if they usually have sufficient bandwidth).[337]

The safest option is to keep a landline.


Cellular networks vulnerable to wildfires across U.S.

October 27, 2020 | By Chris Barncard

The threat to cell towers will only grow as climate change makes many areas more fire prone, and as more Americans make their homes near the cusp of both wilderness and civilization.


Unprecedented Winter Storm Causes Cellular Outages Across All Major Carriers in Texas

verizon

AT&T

T-Mobile

[333] https://globalnews.ca/news/7768754/rogers-outage-canada-customers-internet-phone/
[334] https://news.wisc.edu/cellular-networks-vulnerable-to-wildfires-across-u-s/
[335] "Mobile networks have collapsed in some flood regions.". Global News (Reuters), July 16, 2021 https://www.reuters.com/world/europe/floods-germany-claim-81-victims-more-than-1000-missing-2021-07-16/
[336] https://www.idropnews.com/news/fast-tech/unprecedented-winter-storm-causes-cellular-outages-across-all-major-carriers-in-texas/152415/
[337] https://www.fastcompany.com/3008458/why-your-phone-doesnt-work-during-disasters-and-how-fix-it

9.3. Fibre Optics to the Premises (FTTP) for All Canadians

Canada allocated $1.7 billion in the 2019 budget to support high-speed internet including the new Universal Broadband Fund to set up fibre, fixed wireless and low-orbit satellites to "connect communities that need it most". In his recent throne speech, Prime Minister Justin Trudeau said he plans to accelerate the project and make it more ambitious. https://nowtoronto.com/news/digital-divide-toronto-vulnerable-residents-left-disconnected

The time is now to get the federal government to favour wired rather than wireless.

Wired connections, especially fibre-optic cable, are faster, cheaper, greener, more secure, more resilient, AND SAFE for people and the environment!

"When it comes to delivering the bits, copper wire and fiber access networks are superior to wireless in cost and performance. Fiber offers the most stable and future-proof long-term solution. On the other hand, wireless offers mobility that wired cannot. If wired service is made more available, the consumer will have the option to use it and to be less dependent on wireless."[338]

The goal should be to bring fibre as close to the user as possible, to use a copper tail for short distances where necessary, and to resort to wireless technology as a last resort.

Fibre to Every Farm

Members of the *Agricultural Producers Association of Saskatchewan* task force who studied internet speed, funding, and other factors found that **fibre-optic technology is still best**. The Rural Connectivity Task Force produced their report in March 2021 and are calling for a "master plan" to eliminate the bureaucracy that is preventing rural Saskatchewan from being fully connected. In their words: "the long-term infrastructure and investment needs to come in the form of fibre."

Among their suggestions:

- **a dig once policy** for the province's crown corporations. If SaskPower, for example, is installing an underground power line, then a fibre optic line should go in as well, the task force said. Jeremy Welter, task force chair, said putting those lines in is the largest cost, not the fibre itself. He described fibre as the "true solution to connectivity."
- **use SaskTel dividends for infrastructure** rather than move it into general government revenue.

https://www.producer.com/news/fibre-optics-seen-as-solution-to-rural-internet-problems/

> **The public interest lies in the establishment of stable long-term physical infrastructure, not in the ephemeral wireless *app du jour* (latest application) or *gen du jour* (latest generation) that are so often associated with wireless systems.**
>
> – Timothy Schoechle, Re-Inventing Wires

[338] Timothy Schoechle, *Re-Inventing Wires: The Future of Landlines and Networks*. Washington, DC: National Institute for Science, Law and Public Policy, 2018. https://electromagnetichealth.org/wp-content/uploads/2018/05/Wires.pdf

9.4. Remote Areas Do Not Have to Settle for Satellite Broadband

An Inuit-led company unveiled plans in January 2021 to bring fibre-optic internet to Iqaluit, Nunavut, by November 2022. **CanArctic Inuit Networks** will construct a sub-sea fibre-optic line more than 2,000 kilometres long between Clarenville, NL, and Iqaluit, NU.[339]

The project, pegged to cost $107 million and called SednaLink, will ensure cheaper and more reliable connectivity for Nunavut and Nunatsiavut.

In Alaska, the private sector's successful construction of a subsea fibre network resulted in bandwidth charges being reduced by more than 60% over a three-year period. CanArctic Inuit Networks anticipates achieving similar results for SednaLink – with no requirement for Government of Nunavut capital investment.

This historic initiative to bridge the Arctic digital divide will save Nunavut and Nunatsiavut residents, businesses and governments millions of dollars in internet charges and increase productivity.

https://www.ctvnews.ca/business/company-plans-to-build-107m-fibre-optic-cable-from-newfoundland-to-nunavut-1.5243445

If fibre-optic cable can be brought to Alaska and Canada's far north, it can be made available to Canadians everywhere.
The economic and health benefits will more than make up for the investment.

9.5. Taking Control: Some Communities Are Building Their Own Fibre Infrastructure

Publicly-owned and -controlled wired infrastructure is inherently more future-proof, more reliable, more sustainable, more energy efficient, safer, and more essential to many other services, according to Timothy Schoechle, communications technology expert, international consultant in computer engineering and standardization, and Senior Research Fellow at the National Institute for Science, Law & Public Policy.

Stating that **"The benefits of community-owned and -controlled fiber networks as basic infrastructure are well established,"** he recommends that municipalities and communities build their own fibre optic infrastructure to serve the health and welfare of the people and fuel their social and economic growth.

Locally built and financed networks that provide optical fibre-based Internet access to the premises, both metropolitan and rural, are indeed achievable.

Fibre to the Home (FTTH) is the first preference, and the goals should be to:

1. Bring the fiber as close to the user as possible.
2. Use a copper tail (new or old) for short distances where necessary.
3. Use wireless technology only as a last resort or an ancillary service.

[339] https://subtelforum.com/fibre-optic-network-between-iqaluit-nu-and-clarenville-nl-which-will-dramatically-improve-connectivity-in-to-inuit-nunangat-by-november-2022/

Many communities in North America and elsewhere have done just that.

Once communities get their own networks in place, they can actually be a source of tremendous revenue. Dr. Schoechle provides examples of wireline municipal broadband services currently operating that show the **monumental economic benefits of high-speed wired systems that can pay for themselves** and bring tremendous economic growth to the community.

- in Chattanooga, Tennessee, a $220 million investment has yielded $865 million in economic growth for the city.
- in Longmont, Colorado, a new municipal broadband system there (NextLight™) provides access to fast, inexpensive $49/month 1 Gigabit service, at a fraction of the cost others pay in many other cities today, an extremely attractive offering to businesses and residents alike.

Cedar Falls, Iowa, was one of the first U.S. cities to offer fiber connections to businesses. **In 20 years, the number of businesses in the town increased sixfold.**

Source: Broadband Communities, November/December 2016[340]

This map shows community-owned networks in the U.S.:
https://muninetworks.org/communitymap

There are two business models that communities can follow:

- cooperatives/social enterprises
- public-private (not recommended)

The cooperative model is recommended for the following reasons:

- allows the community to be truly self-supporting. Once the cost of installation is paid off, providing Internet, phone & TV services becomes profitable.
- allows the community to be truly in control. Many local governments do not understand wireless harm or the need to implement with the best equipment possible to limit possible dirty electricity on home wiring. When the private party is a small ISP, it is at a risk of being bought out by Big Telecom. The social enterprise-cooperative model ensures that the network is owned by the community, and the ISP is only a contractor.

Underserved areas have access to federal and provincial funding, as long as the applicant is an Internet Service Provider, a government body or in some cases a non-profit organization. Looking at funding through social enterprise based loans from credit unions as well as asking members to buy shares may be a safer way to go in the long run than relying on government funds, unless control can be kept out of government hands.

[340] Economic Development Is The Killer App For Local Fiber. Broadband Communities, November/December 2016. Networkshttps://www.westminstermd.gov/DocumentCenter/View/1738/BBC_Nov16_KillerApp?bidId=

Salt Spring Island, BC, is working on obtaining the funding for their project and have generously shared their proposal and a “How-to” document.

Salt Spring How to Document:
https://connected-communities.ca/wp-content/uploads/2021/08/How-to-Adapt-SSI-Fiber-Proposal-to-other-Communities.pdf

Salt Spring Proposal:
https://connected-communities.ca/wp-content/uploads/2021/07/Saltspring-Island-Community-Fiber-Project-Proposal.pdf

Canadian examples of public-private partnerships who have built or are working on building a fiber network:

- Olds, Alberta: The first to offer gigabit Internet
- Stratford, ON: Ontario’s technological innovation hub
- Coquitlam, British Columbia: BC’s trail blazer
- Eastern Ontario: A real, rural network
- Quadra & Cortes islands, British Columbia
- Haida Gwaii, British Columbia
- Hornby and Denman Islands, British Columbia, have obtained the provincial funding needed for their fibre to the home network in collaboration with the Connected Coast sub-sea fiber project, which is run by a regional government that has now incorporated the project, and CitiWest, the small ISP that is owned by the City of Prince Rupert and that appears to have in place all the funding for bringing fibre to these coastal communities.
  For more about the Connected Coast: Connected Coast | Bringing High-Speed Internet To Coastal BC

There are several success stories in Québec based on the Coop model.

- A great example is the MRC of Antoine Labelle. See https://ctal.ca/en/

  This MRC (a county-like political entity in Québec) is the owner of its own FTTH (fibre to the home) optical fibre network. To fund this project, grants from the federal and provincial governments are being used. A small tax is added per residence and each citizen can become a member of the CTAL at low cost. By Sept 30, 2022, optical fibre will be present in almost all the homes of this MRC. 75% of the project has been completed. Customers have the choice between WIFI or wired technologies if they pay the difference for the wiring.

Similar projects are also springing up elsewhere in the world.

10. Actions Taken by Others Around the World

In addition to scientists and doctors, citizens around the world are protesting . . . and some governments are beginning to listen. To find out the next Global Protest Day Against 5G go to: https://safetechinternational.org/

10.1. Government Actions

Many jurisdictions around the world have adopted the precautionary principle due to health concerns. Below are a few examples.

Prescient Government Actions prior to 5G [341]

- **France:** adopted a comprehensive law in 2015 that protects the public from excessive exposure to RF radiation. Among its articles:
  - *Wi-Fi banned in nurseries* for children under the age of 3;
  - Wi-Fi in primary schools (under age 11) enabled *only when used for lessons*.
  - *Signage required* to inform the public when Wi-Fi is offered in a public place.
  - At the point of sale of mobile phones, the SAR value must be clearly shown.
  - In the future, all mobile phone advertisements must include recommendations on how users can reduce RF radiation exposure to the head such as the use of headsets.
  - Data on local EMF exposure levels shall be made more easily accessible to the general public, among others, through country-wide transmitter maps.
- **Switzerland, Italy, China, and Poland:** have stricter guidelines than Canada and the US -- guidelines that are not solely based on heating of the body, but consider non-thermal (non-heating) biological effects.
- **Switzerland, France, Germany, and other European countries**: have banned or severely restricted Wi-Fi in schools.
- **Sweden:** officially recognizes EHS as a functional disability (i.e., caused by environmental factors; not a disease). This recognition provides people with this impairment a maximal legal protection; gives them the right to get accessibility measures for free, government subsidies and municipal economic support; special Ombudsmen (at the municipal, the EU, and the UN level); the right and economic means to form disability organizations and to be part of national and international counterparts, all with the aim of allowing these persons to live an equal life in a society based on equality.[342]
- **Council of Europe:** In 2011, the Council of Europe's 47 member states adopted Resolution 1815[343] which **recommends a precautionary approach** regarding electromagnetic fields. Among the 23 recommendations to their member states: that they "reconsider the scientific basis for the present standards on exposure to electromagnetic fields set by the International Commission on Non-Ionizing Radiation Protection (ICNIRP), which have serious limitations, and apply ALARA principles,[344]

[341] https://ehtrust.org/policy/international-policy-actions-on-wireless/
[342] Johansson O. (2006). Electrohypersensitivity: state-of-the-art of a functional impairment. Electromagnetic biology and medicine;25(4):245-58. https://pubmed.ncbi.nlm.nih.gov/17178584/#:~:text=In%20Sweden%2C%20electrohypersensitivity%20(EHS),electromagnetic%20field%20(EMF)%20sources.
[343] Resolution 1815 (2011) of the Council of Europe. "The potential dangers of electromagnetic fields and their effect on the environment". https://assembly.coe.int/nw/xml/XRef/Xref-XML2HTML-en.asp?fileid=17994
[344] ALARA: As Low As Reasonably Achievable

covering both thermal effects and the athermic or biological effects of electromagnetic emissions or radiation."

The resolution also stated: "The Assembly regrets that, despite calls for the respect of the precautionary principle and despite all the recommendations, declarations and a number of statutory and legislative advances, there is still a lack of reaction to known or emerging environmental and health risks and virtually systematic delays in adopting and implementing effective preventive measures. Waiting for high levels of scientific and clinical proof before taking action to prevent well-known risks can lead to very high health and economic costs, as was the case with asbestos, leaded petrol and tobacco."

- **European Parliament EMF Resolution 2009**[345] (566 votes in favour):
  In 2009, the European Parliament adopted a resolution entitled "Health concerns associated with electromagnetic fields (EMF)". Among its 29 points, it urged the European Commission to **review the scientific basis and adequacy of the EMF limits** laid down in Recommendation 1999/519/EC. The Parliament also called on Member States to follow the example of Sweden and recognize persons suffering from electrohypersensitivity as disabled so as to grant them adequate protection and equal opportunities.

Countries Banning 5G (moratorium)

Italy

15 municipalities have halted deployment of 5G.[346]

Switzerland

will monitor radiation levels amidst 5G rollout[347]. Several Swiss cantons, including Geneva and Vaud have put a freeze on issuing the permits required to erect new antenna.[348]

Belgium

In 2019, Brussels halted 5G deployment due to radiation concerns.[349]

"I cannot welcome such technology if the radiation standards, which must protect the citizen, are not respected, 5G or not," Environment Minister Céline Fremault said, as reported in The Brussels Times. "The people of Brussels are not guinea pigs whose health I can sell at a profit. We cannot leave anything to doubt. "https://www.fiercewireless.com/5g/brussels-halts-5g-plans-over-radiation-rules *(In 2021, the new government decided to increase exposure limits to make way for 5G.)*

Ireland

County Clare[350] and Laois County[351] halted 5G due to adverse health effects.

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[345] https://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//TEXT+TA+P6-TA-2009-0216+0+DOC+XML+V0//EN

[346] https://oasisana.com/2019/06/24/esclusivo-sindaci-stop-5g-ecco-la-prima-ordinanza-ditalia-di-sospensione-e-la-lista-delle-13-delibere-di-giunta-e-mozioni-comunali-per-la-precauzione/?fbclid=IwAR38YOvu-PkPfgmhsu5k8Bnerz6aoI3SB5sExYpqAL9PH56mFw3YkFss8Y8

[347] https://www.reuters.com/article/us-swiss-5g/switzerland-to-monitor-potential-health-risks-posed-by-5g-networks-idUSKCN1RT159

[348] https://lenews.ch/2019/09/27/thousands-protest-against-5g-mobile-rollout-in-swiss-capital/

[349] [2]https://www.hln.be/in-de-buurt/brussel/brusselse-regering-weigert-5g-brusselaars-zijn-geen-proefkonijnen~a92c8130/?referer=https%3A%2F%2Fwww.google.com%2F&referer=https%3A%2F%2Fehtrust.org%2Finternational-actions-to-halt-and-delay-5g%2F

[350] http://www.clare.fm/news/clare-county-council/motion-oppose-5g-rollout-clare-receives-council-backing/

UK

Glastonbury,[352] Frome[353] and Shepton Mallet[354] Town Councils have halted 5G due to adverse health effects.

Countries Commissioning Urgent Studies of Health Effects of 5G

Austria

Parliament has commissioned a study on 5G health effects.[355]

USA

State of New Hampshire House Bill 522 (July 2019) established a Commission to Study the Environmental and Health Effects of Evolving 5G Technology[356,357] The Commission issued its **final report**[358] to New Hampshire Governor Chris Sununu on November 1, 2020, concluding that safety assurances for 5G have "come into question because of the thousands of peer-reviewed studies documenting deleterious health effects associated with cellphone radiation exposure." The report included 15 recommendations to address inadequate federal protections, educate the public on risk management, engage the medical community, install safe hard-wired technology and monitor and map radiation exposures.

On January 5, 2022, New Hampshire House Bill 1644[359] was introduced to begin acting on those recommendations. (Relative to the placement of telecommunication antennae and establishing a registry for residents who are experiencing biological symptoms from wireless radiation exposure)

- Dr. Kent Chamberlin, who served on the Commission, explains the reasons for the setback and the registry in this 20-minute video.
- View the Jan. 18, 2022 New Hampshire HB1644 Hearing with House Science, Technology and Energy Committee: Wireless Setback and State-wide Registry of Harm: https://www.youtube.com/watch?v=TnFBpyh0OCo&t=325s

The **Louisiana House passed Resolution 145** (May 2019) which has the Louisiana Department of Environmental Quality and the Department of Health study the effects of 5G technology on the environment and public health.[360]

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[351] https://smombiegate.org/laois-county-ireland-to-suspend-5g-due-to-health-concerns-non-coverage-by-insurance/
[352] https://www.somersetlive.co.uk/news/local-news/glastonbury-council-opposes-5g-roll-2998413
[353] https://www.frometowncouncil.gov.uk/frome-town-council-discuss-5g/?fbclid=IwAR38rd9uzzYe1JEyH-wRpOQCnyLTSUSUVLRJFSxuMptAHlJkrcPn0avqwD0
[354] https://www.somersetlive.co.uk/news/local-news/somerset-council-blocks-5g-roll-3420355?fbclid=IwAR2-wHQHZsYqRhgSH1EUSuUiMuWfA-WqojOQuQufMZcx3Odfyir46XwRIys
[355] https://ehtrust.org/austrian-parliament-commissions-study-on-5g-health-effects/
[356] http://gencourt.state.nh.us/bill_status/bill_status.aspx?lsr=0261&sy=2019&txtsessionyear=2019&txtbillnumber=hb522&sortoption=&q=1
[357] http://www.gencourt.state.nh.us/statstudcomm/committees/1474/documents.html
[358] http://www.gencourt.state.nh.us/statstudcomm/committees/1474/reports/5G%20final%20report.pdf
[359] http://www.gencourt.state.nh.us/bill_status/billinfo.aspx?id=1725&inflect=2
[360] https://www.wakingtimes.com/2019/06/07/louisiana-becomes-first-state-to-call-for-study-on-health-impacts-of-5g/?utm_campaign=meetedgar&utm_medium=social&utm_source=meetedgar.com&fbclid=IwAR3XaFFnTMlNXvUQKR9G_Qs44Who7etn7QPYIkgLyvoe39Flm66AHK7OfIg

10.2. Legal Action

In view of the lack of protective measures taken by their governments, many have turned to the courts. Over the past 20 years, there have been hundreds of such cases.

Below are some of the most significant decisions.

- **USA: Historic Decision: Federal Court Orders FCC to Explain Why It Ignored Scientific Evidence Showing Harm from Wireless Radiation**

  In January 2020, a legal action was filed against the Federal Communications Commission (FCC) by a group of scientists, consumer health nonprofits, and citizens, for its refusal to update its 24-year-old cell phone and wireless radiofrequency (RF) radiation guidelines. They contended the FCC's action is "arbitrary, capricious, an abuse of discretion" and "not in accordance with the law" as the FCC has violated the Administrative Procedure Act and the National Environmental Policy Act by failing to adequately review the hundreds of relevant scientific submissions finding harmful effects from wireless technologies.[361]

  The appeal was filed in the United States Court of Appeals for the District of Columbia Circuit by the Law Office of Edward B. Myers on behalf of Environmental Health Trust, Children's Health Defence, Consumers for Safe Cell Phones, and several individuals. *(Myers was part of the recent winning litigation against the FCC, along with the Natural Resources Defense Council and 19 tribal groups, which overturned FCC regulations that would have exempted small cell facilities from environmental review and compliance under the National Environmental Policy Act)*.

  The Court ruled on August 13, 2021, that the decision by the FCC to retain its 1996 safety limits for human exposure to wireless radiation was **"arbitrary and capricious."**

  The court held that

  - the FCC failed to respond to "record evidence that exposure to RF radiation at levels below the Commission's current limits may cause negative health effects unrelated to cancer."
  - demonstrated "a complete failure to respond to comments concerning environmental harm caused by RF radiation."
  - In overturning the FCC determination for its lack of reasoned decision making, the court wrote that the commission cannot rely on agencies like the Food and Drug Administration (FDA) if the FDA's conclusions are provided without explanation.

    "While imitation may be the highest form of flattery, it does not meet even the low threshold of reasoned analysis required by the APA under the deferential standard of review that governs here. One agency's unexplained adoption of an unreasoned analysis just compounds rather than vitiates the analytical void. Said another way, **two wrongs do not make a right**," the court wrote.
  - the FCC failed to respond to approximately 200 comments on the record by people who experienced illness or injury from electromagnetic radiation sickness.

[361] Historic Legal Action Against the FCC on Cell Phone and Wireless Health Effects. 2020. https://ehtrust.org/ehtlegalaction-againstfcconhealtheffectsofcellphones/

The court ordered the FCC to:

- provide a reasoned explanation for its decision to retain its testing procedures for determining whether cell phones and other portable electronic devices comply with its guidelines,
- address the impacts of RF radiation on children, the health implications of long-term exposure to RF radiation, the ubiquity of wireless devices, and other technological developments that have occurred since the Commission last updated its guidelines,
- address the impacts of RF radiation on the environment.

- December 18, 2020: **Breakthrough in case law on radiation risks: Dutch Court declares resident's appeal against the placement of a 5G antenna well-founded.**

  Arnhem District Court declares appeal by resident from Haarlo (Municipality of Berkelland) against placement of 5G antenna well-founded. In the opinion of the court, considering all arguments, with reference to scientific literature, "it cannot be ruled out that there are increased health risks even at a field strength lower than 1 V / m, and thus also in the plaintiff's case". The court therefore considers the claimant to be an interested party and declares the appeal well-founded.[362,363] "The court ruled that the health interests of residents who are sensitive to radiation must be included in the balancing of interests. In Dutch case law, it is the first time that the exposure limits are no longer leading due to advancing scientific understanding."[364]

- January 13, 2020: **The Court of Appeal of Turin confirms link between a head tumour and mobile phone use** https://www.phonegatealert.org/en/the-court-of-appeal-of-turin-confirms-the-link-between-a-head-tumour-and-mobile-phone-use

- 2019: **Italian court orders the government to launch a campaign to advise the public of the health risks** from mobile and cordless phones.[365]

- 2017: **Italy's highest court recognizes a causal link between development of a brain tumor and cell phone use**, and awarded social security payments.[366]

- **Australian[367] and Spanish[368] courts award disability to workers** claiming sensitivity to electromagnetic radiation.

For more court cases, visit the Environmental Health Trust website:

- For Lawsuits on 5G, Wi-Fi , Wireless Radiation and Health Effects: https://ehtrust.org/lawsuits-on-5g-wi-fi-wireless-radiation-and-health-effects/
- For Brain Tumor Litigation: https://ehtrust.org/key-issues/cell-phone-radiation-litigation/

[362] https://linkeddata.overheid.nl/front/portal/document-viewer?ext-id=ECLI:NL:RBGEL:2020:6699
[363] https://ehtrust.org/dutch-court-health-impact-of-cell-tower-cannot-be-excluded/
[364] https://letstalkabouttech.nl/2021/01/nederlandse-rechter-mogelijk-verhoogde-gezondheidsrisicos-zendmast/
[365] https://www.giustizia-amministrativa.it/cdsintra/cdsintra/AmministrazionePortale/DocumentViewer/index.html?ddocname=4JM4PKAARND2ZYHVSOSK2FIQIQ&q
[366] https://www.courthousenews.com/italian-court-finds-link-cell-phone-use-tumor/
[367] http://www8.austlii.edu.au/cgi-bin/viewdoc/au/cases/cth/AATA/2013/105.html
[368] http://cemical.diba.cat/sentencies/fitxersSTSJ/STSJ_327_2016.pdf

10.3. The Insurance Industry Protects Itself from Claims

Since 2007, there have been reports about insurance companies excluding risks associated with electromagnetic radiation.[369] Indeed, leading insurers, including Lloyd's syndicates, treat electromagnetic fields as a real health risk.[370]

Insurance Authorities Warn Their Peers

- **Lloyd's** is the world's leading insurance and reinsurance market.
  In 2010, the Emerging Risk Team of Lloyd's issued a white paper[371] which compared **the potential risks to insurers from health damage claims associated with cell phones and wireless radiation to those posed by asbestos.**

  The 2013 **Lloyd's Risk Index** lists "harmful effects of new technology" as an increasing environmental risk.[372]

- **Swiss Re** is the world's second largest reinsurance company, based in Zürich, Switzerland. Its 2013 report "Emerging Risks Insights" listed the "unforeseen consequences of electromagnetic fields" as potentially having a **high risk impact** for the insurance industry.[373]

  In their 2019 Report, they added "Current concerns regarding **potential negative health effects from electromagnetic fields are likely to increase**. Hackers can also exploit 5G speed and volume to acquire (or steal) more data faster. Major concerns are possible privacy and security breaches, and espionage."[374]

- **AM Best**, the leading insurance rating agency published a report in 2013 stating that it had been determined that in the US about 250,000 cell phone antenna workers per year who are in close contact with cell phone antennas are at high risk of thermal effects from RF radiation including eye damage, infertility and cognitive impairments. Note their analysis did not even consider the non-thermal effects, which would have made this report even more ominous for the industry.[375]

Electromagnetic Fields "Exclusion" Becoming a Standard

Electromagnetic fields exclusions are becoming a standard across the insurance industry. Insurers often exclude the risk from commercial general liability policies, and strictly limit the coverage or avoid policyholders in the wireless industry.[376, 377] This exclusion serves to exclude coverage for injury or property damages from electromagnetic fields, including illnesses caused by long-term EMF (non-ionizing radiation) exposure.

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[369] https://www.businessinsurance.com/article/20070603/STORY/100022051/Insurers-exclude-risks-associated-with-electromagnetic-radiation
[370] "Lavayen,Carolina. "Insurance Companies Keep Quiet About EMF Exclusion Clause" in 5G Technology News. May 11, 2020. https://5gtechnologynews.com/insurance-companies-keep-quiet-about-emf-exclusion-clause/
[371] https://www.lloyds.com/news-and-risk-insight/risk-reports/library/technology/emf
[372] https://ehtrust.org/wp-content/uploads/Lloyds-Risk-Index-2013report100713.pdf
[373] http://nebula.wsimg.com/3ef9a4d9a5a32e5aeaf9226b982e9fb3?AccessKeyId=045114F8E0676B9465FB&disposition=0&alloworigin=1
[374] https://www.swissre.com/dam/jcr:5916802c-cf6b-4c67-9d42-39cf80c4b00d/sonar-publication-2019.pdf
[375] http://www.ambest.com/directories/bestconnect/EmergingRisks.pdf
[376] https://completemarkets.com/Electromagnetic-Fields-Utilities-Liability-Insurance/Storefronts/
[377] https://www.businessinsurance.com/article/20070603/ISSUE03/100022051/insurers-exclude-risks-associated-with-electromagnetic-radiation

Here are a few examples:

- **ProSurance Architects & Engineers Policy** (Canadian version) lists "Electromagnetic fields" on the same footing as "Asbestos" in the "General Exclusions": a total exclusion on liability for all EMF radiation.[378]
- **CFC Underwriting**, a Lloyd's-backed insurance company, updated its insurance policy in 2015. The new policy excludes compensation for claims regarding electromagnetic fields, specifically "directly or indirectly arising out of, resulting from or contributed to by electromagnetic fields, electromagnetic radiation, electromagnetism, radio waves or noise". CFC Underwriting went on to say in a clarification sent to one policy holder:

> "The Electromagnetic Fields Exclusion (Exclusion 32) is a General Insurance Exclusion and is **applied across the market as standard**. The purpose of the exclusion is to exclude cover for illnesses caused by continuous long-term non-ionising radiation exposure, i.e. through mobile phone usage."

Wireless Radiation Classified as a Pollutant

Insurance company policies often define electromagnetic radiation as a "pollutant." Policy enhancements can be purchased to cover environmental pollutants which include EMFs.[379, 380] According to Verizon's 2019 Mobile Insurance policy, "Pollutants means any solid, liquid, gaseous, or thermal irritant or contaminant including (…) artificially produced electric fields, magnetic field, electromagnetic field, sounds waves, microwaves, all artificially produced ionizing or non-ionizing radiation and/or waste."[381, 382]

In other words, insurers are already enforcing their version of the precautionary principle. . . to protect themselves.

[378] Insurance for Architects & Engineers, ProSurance A&E Policy Document. https://www.jrseco.com/wp-content/uploads/Insurance-AE-CFC-Underwriting-Limited-Lloyds-Latest-Version-February-7th-2015.pdf
[379] Beacon Hill Associates, Environmental Insurance News blog, May 2, 2016. https://b-h-a.com/blog/the-gl-form-and-pollution-exclusions/
[380] Halprin, P. "The Broadening Scope of Pollution Legal Liability Insurance" in *Risk Management*. Aug 25, 2015. http://www.rmmagazine.com/2015/08/25/the-broadening-scope-of-pollution-legal-liability-insurance/
[381] https://scache.vzw.com/dam/support/pdf/ASVZW-710_TMP_WebReady_NextGen_18.pdf. The "Pollution" definition, which is an exclusion, is paragraph B 16 on page 7.
[382] https://www.phoneclaim.com/verizon/pdf/ASVZW-713_TMP_WebReady_NW-FL.pdf

10.4. The Telecom Industry is aware of the risks

Wireless device manufacturers are protected from future claims.

Manufacturers of wireless devices are required to provide information to users on the minimum compliance distance to maintain between the product and the user. Although the information is generally hidden deep within the user manual or the device itself, it is there for those who seek it. This warning protects the manufacturer from future claims since most people hold their devices closer to their bodies than is indicated in the instructions.

To read the warnings on an i-Phone for example, go to: SETTINGS, ABOUT, GENERAL, LEGAL, RF EXPOSURE. (Try to enlarge the text, many models do not allow this feature)

Wireless telecommunications industry warns its stockholders, but not its clients.

Wireless device manufacturers and providers of the infrastructure are aware that the radiation from their products could be risky and warn their shareholders.

In fact, the US Securities and Exchange Commission (SEC) and its Canadian equivalent, the Canadian Securities Administrators (CSA), require companies to report any foreseeable risks to investors.

- In the US, they provide these corporate company investor warnings on Form 10-K (or Form 20-F or 40-F). Here is an example of such a warning:

  "We may incur significant expenses defending such suits or government charges and may be required to pay amounts or otherwise change our operations in ways that could materially adversely affect our operations or financial results."

- In Canada, companies' reports can be found in the CSA's SEDAR database, on their Annual Information Form (AIF), or on their Management Discussion and Analysis Form (MD&A). To access this database: https://www.sedar.com/search/search_form_pc_en.htm

The Environmental Health Trust has compiled a list of excerpts of such statements that show these companies are informing their shareholders that they may incur significant financial losses related to electromagnetic fields.

Click here to read these statements: https://ehtrust.org/key-issues/corporate-company-investor-warnings-annual-reports-10k-filings-cell-phone-radiation-risks/

Companies are already working on future technologies to reduce the risks.

This excerpt, from a Patent Application in 2004 by Swisscom, a major telecommunications provider in Switzerland, shows that they know that this technology can be harmful. This company is working on a method to reduce the electrosmog in wireless local networks and mobile networks.[383]

> "The influence of electrosmog on the human body is **a known problem**. (…) When human blood cells are irradiated with electromagnetic fields, **clear damage to hereditary material has been demonstrated** and there have been indications of an

[383] https://patents.google.com/patent/WO2004075583A1/en

> **increased cancer risk**. (…) Thus, it has been possible to show that mobile radio radiation can cause damage to genetic material, in particular in human white blood cells, whereby both the DNA itself is damaged and the number of chromosomes changed. This mutation can consequently lead to increased cancer risk. In particular, it could also be shown that **this destruction is not dependent upon temperature increases, i.e. is non-thermal**."

It is likely that other companies are doing the same, knowing that the day will come, as it did for tobacco, when the public will become fully aware of the risks, and governments will begin legislating to protect its citizens and the environment.

Currently there is little incentive to develop safer devices.
The telecommunications and technology industries are accountable to their shareholders, who expect growth in earnings and profits. The key method for growth is the continued purchase of new devices and data plans which are all dependent on wireless devices and communications.

It is time for strong protective regulations.

Regulations combined with appropriate incentives can act as a catalyst for innovation and new market opportunities.

According to a Harvard Business Review article,[384]

> "Our research on competitiveness highlights the role that outside pressure plays in motivating companies to innovate."
>
> One of the reasons regulation is needed, according to the authors, is "to level the playing field during the transition period to innovation-based environmental solutions, ensuring that one company cannot gain position by avoiding environmental investments."

Proper incentives could foster a new "race": the race to come up with safer solutions.

Safe tech is good business!

[384] Michael E. Porter and Claas van der Linde. Sustainable Business Practices. Green and Competitive: Ending the Stalemate, Harvard Business Review, Sept–Oct 1995. https://hbr.org/1995/09/green-and-competitive-ending-the-stalemate

11. Conclusion

Given the rapid deployment of wireless 5G underway in Canada, the hundreds of thousands of small cell antennas that are required and their planned proximity to homes, schools and offices, the complete lack of understanding of the risks and the actual costs involved, and the lack of any meaningful investigation into alternatives that are faster, safer, more secure and more environmentally sustainable, **we urge the federal government to take the following actions now, before it is too late**.

- **Stop the rollout of 5G,** especially “small cell” antennas and macro towers near homes, hospitals, schools, public buildings and wildlife habitats, until safety guidelines have been appropriately revised and implemented, and until the total economic implications are understood.
- **Stop the auction of the extremely high frequency spectrum** until 5G is proven to be safe.
- **Revise Safety Code 6.** A truly independent panel with appropriate expertise must systematically review the scientific evidence of the effects of RF radiation, including non-thermal, biological effects. This requires rigorous scientific methods, transparency, full public consultation from initial scoping throughout the process, and health-protective precautionary interpretation of findings.
- **Establish binding guidelines to protect the environment, including wildlife,** from harm from exposure to RF radiation.
- **Create legislation to protect individual rights**, especially those of children, pregnant women, the elderly, people who are ill, and people who are electrosensitive.
- **Launch an awareness campaign** so Canadians can take steps to protect themselves and their children from the current levels of RF radiation they are exposed to through 2G, 3G, 4G/LTE.
- **Shift the burden of proof to the telecommunications and wireless technology industries.** Require that they prove that the RF radiation from their products and equipment is safe for Canadians and the environment – as the automotive, chemical and pharmaceutical industries must do.
- **Complete an economic analysis, by the end of 2023**, of the incremental revenue from 5G versus the total potential economic burden. This would include, but not be limited to: increased healthcare costs; lost productivity arising from adverse health effects; security and privacy breaches; damage to the environment; escalating costs of energy consumption and risks to safety and property including those resulting from degraded weather forecast accuracy.
- **Invest in full fibre-optic broadband coverage across Canada to the premises (FTTP) .** Favour wired technologies over wireless and satellite options.

We recommend the adoption of the following principles:

- **The Precautionary Principle**, which states that where there are threats of serious or irreversible damage to the environment or to human health, lack of full scientific certainty shall not be used as an excuse for postponing the adoption of measures to prevent such environmental and health degradation.
- **Pollution prevention**, acknowledging that it is less expensive and more effective to prevent damage to the environment and to human health, than to manage or cure this damage.
- **Communities' right to know** about health and environmental risks and **to be consulted and participate in making decisions that affect their health, especially regarding the placement of cell towers and antennas**.

Indeed, this is the tradition of public health, a tradition which in Canada, through the Supreme Court, has given municipalities the authority to ban pesticides.[385]

The current health crisis has highlighted our broken systems which too often put the economy and private interests before all else.

In the post-COVID-19 economic recovery plan,
let's make sure that decisions put people and our environment first.

Invest in full fibre-optic broadband coverage
to the premises (FTTP) across Canada.

Favour wired technologies over wireless and satellite options.

"**Waiting** for high levels of scientific and clinical proof
before taking action to prevent well-known risks
can lead to very high health and economic costs,
as was the case with asbestos, leaded petrol and tobacco."

– The Council of Europe (2011), Resolution 1815[386]

[385] Ashbury FD, Sullivan T. Review of Misconceptions about the Causes of Cancer. Chronic Dis Can 2004;25:152-53.
[386] Resolution 1815 (2011) of the Council of Europe. "The potential dangers of electromagnetic fields and their effect on the environment". https://assembly.coe.int/nw/xml/XRef/Xref-XML2HTML-en.asp?fileid=17994

12. It Doesn't Have to Be This Way: Take Action

12.1. Introduction (or to recap)

For decades, scientists have been sounding the alarm that RF radiation from wireless technologies has serious harmful effects on people, plants, insects and wildlife... in other words, on all living things.

But these warnings have fallen on deaf ears.

Until now, industry has had virtually free rein to bring these products to market. There has been no industry accountability for the damage from their products. Our government's safety guidelines do not protect us, and there are no guidelines to protect wildlife, including pollinators, and plants.

And it's about to get worse!

- There has been **no testing and no research to ensure that 5G technology is safe** in the long term for humans and the environment. 5G will use the same microwave frequencies that 4G uses that have been proven to cause serious harm. But in addition, it will use "Extremely high frequency" millimetre waves (mmWaves) and different technology.
- mmWaves cannot travel as far as 3G and 4G frequencies. As a result, the industry will be putting up **hundreds of thousands of small cells very close to where we live and work** (by close, we mean on the telephone or hydro or lamp pole close to your house). Each small cell contains several antennas radiating a mix of frequencies, including the ones that are installed on the large cell towers.
- The 5G rollout will also require **more large (macro) cell towers**. And while these may require public consultation, the process is undemocratic and favours the industry.
- On top of that (literally), Elon Musk and others have plans to blanket the planet with **tens of thousands of low orbit satellites** (18 times closer than regular satellites) for Internet service. SpaceX has already launched over two thousand. The public knows little about how much RF will radiate from these and the hundreds of ground stations required.
- Small cell antennas that are added to existing poles or buildings, and antennas that will radiate from low orbit satellites, **do not require public notification, nor consultation**!

Around the world, citizens have been speaking out and some governments have started to listen. Many, including the Canadian government, have not.

It is time for the truth to come out here too.

People need to know the risks.
Not just to their health, but also to the environment, privacy, security, safety, night skies, not to mention the effects it will have on climate change.

Our government needs to:
- put a stop to the frantic rollout of wireless technology;
- ensure that all Canadians have access to fibre-optic cable for their Internet needs;
- set real guidelines and legislation to protect people and the environment.

Only then will the telecommunications industry and device manufacturers come up with safer technologies.

12.2. What We Need

We need technology. . . but health and safety must come first!

COVID-19 has been a wake-up call that has shaken every pillar of our society. And while it exposed some of the flaws in our systems and how vulnerable we all are, it has also shown that when the government wants to, it can act swiftly. As Canada works towards economic recovery, **this is our chance to reimagine everything.**

We need a MORATORIUM on the rollout of 5G until the Canadian Government properly updates *Safety Code 6* (its exposure limits for RF radiation) to incorporate the non-thermal effects of RF radiation on the health of Canadians and our environment, and until it adopts a truly democratic process for the placement of cell towers, small cell antennas, and low earth orbit satellites, one that includes Land Use Authorities (such as municipalities) AND citizens.

Our ultimate goals:

- **Health Canada's Safety Code 6 must be properly revised** based on international standards of scientific review.
- **Environment and Climate Change Canada must develop regulations to protect Canada's biota.**
- **We need legislation regarding the placement of cell towers and antennas** to protect our right to a safe environment.

Right now, we need to:

- Stop the installation of small cell antennas and cell towers near where people spend much of their time: homes, schools, hospitals and work places.
- Halt the auction of 5G spectrum.
- Raise awareness of the health and other risks to humans and the environment, so that people can begin to reduce exposures.
- Push for a review of the process to approve low earth orbit satellites (LEOs) over Canadian territory to take into account our health, the environment and every Canadian's right to see the night sky.
- Ensure that non-ionizing electromagnetic radiation is included in the amended Canadian Environmental Protection Act (CEPA) as a pollutant that can have toxic effects on human and environmental health.

If you agree, please take action.

C4ST along with other non-profit organizations, medical professionals and international scientific experts, have worked for nearly a decade to get Safety Code 6 revised based on evidence from independent researchers... but without success.

It has become clear that the push must come from the grassroots level.

THAT'S YOU!

If you decide to take action, please keep us informed by emailing 5Gactions@c4st.org

What You Can Do

1) **Sign the "Suspend 5G Canada Appeal"** https://www.appel5gappeal.ca/.
   If you have already signed it, please share it with friends, family members and co-workers and ask them to sign.

2) **Tell your Federal Member of Parliament how you feel about this.**
   Ask him/her to push the federal government to protect its citizens. Telecommunications fall under federal jurisdiction; **Health Canada** develops the safety guidelines; and **Innovation, Science and Economic Development Canada** (ISED) regulates the radiofrequency spectrum, satellite licensing, all antenna siting and all wireless communication devices and equipment. Anyone who has fought to stop a cell tower knows that there is only so much a municipality can do. It always falls back to ISED and Health Canada's safety guidelines. *See section 12.6*

Also

- **Protect yourself and your loved ones**. *See section 12.3*
- **Raise awareness**, start talking about it. *See section 12.4*
- **Stand up against the installation of antennas in your neighbourhood**. *See section 12.5*

Become Better Informed

Be wary of misinformation.
Our MPs often rely on the government websites (Health Canada and Innovation, Science and Economic Development) for their information. These websites contain inaccurate and misleading information which you can point out to them. For more information, see:

- **C4ST Fact-checks Government of Canada Webpages Regarding Health Risks and Wireless Technologies, including 5G**
  – Click here to read our Fact-Checker.

Read what independent scientists are saying, and what governments elsewhere are doing, and why. While it is important to know what the positions of the Canadian government and the World Health Organization are on this subject, it is crucial to go beyond those sources.

- **This Guide** provides a good introduction to the problem.
- **The appendices** provide links to a wealth of resources and sources of information.

  In particular:
  - Appendix 2: sources of information (websites to consult, books to read, videos and films to watch, blogs and newsletters to sign up for)
  - Appendix 8: for useful tools (sample letters, petitions, handouts, posters, and links to other groups' toolkits)

Also, we recommend this excellent website:

- **Environmental Health Trust** – ***Educate Yourself***
  https://ehtrust.org/take-action/educate-yourself/

Change Is Possible

"Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it's the only thing that ever has."
– Margaret Mead

You may feel powerless to change things, but you CAN make a difference.

We have heard all kinds of reasons for not acting. Here are a few of them and our answers.

Excuse for not acting	Our reply
"That ship has sailed. Wireless devices are everywhere. People are dependent on them."	Yes, wireless devices are everywhere, and with 5G and the Internet of Things, it will become much worse. **All the more reason to act <u>swiftly,</u> and turn that ship around!** At the moment, there are virtually no rules. It is like the Wild West. The wireless industry is taking advantage of this. Who can blame them? There is no incentive to develop safer devices. **It is time for strong protective regulations.** This would place all companies on a level playing field. They would rush to come up with safer solutions instead of rushing to win the "race" for 5G. **People need to know the risks** a) so that they can take steps to at least <u>reduce their exposure</u>, and b) so that they will <u>add their voices</u> and demand that the Federal government protect its citizens before it is too late. Remember: The effects are cumulative. The more devices and antennas you are exposed to, the higher your risks. There is no protection from a 4G or 5G small cell antenna or tower placed near from your home, school or workplace.
"Everything causes cancer. It doesn't matter what we do."	True, we are exposed to many carcinogens. But we have a right to a safe environment and a right to know when we are being exposed to a carcinogen so that we can take steps to avoid it. It took 30 years for the government to ban cigarettes in public places, and over 100 years to ban asbestos. Microwave radiation is a class 2B carcinogen (a classification that reputable scientists and experts argue should be upgraded to a class 1 known human carcinogen. Cigarette smoke and asbestos are class 1). We have a choice to use or not use a cellphone, but cell towers, small cell antennas, and wi-fi in public places radiate 24/7. It is wrong (some may say criminal) to force this radiation on non-consenting people, pets and wildlife.
"We need high speed Internet."	Yes, we do! And the best high speed internet is by fibre-optic cable. It is 100 times faster, more secure, more environmentally sustainable AND MUCH SAFER. Most of what we do on the Internet can be done while connected with a wire. Even tablets (like i-Pads) can be connected by a cable when not on the move.

"We need cell phones for 911."	Yes, they can save a life. However, **they cannot be relied upon.** Rogers's recent mass outage caused by a software update is a prime example. More importantly, **mobile network infrastructure** (cell towers, antennas) **and internet service need electricity**. **In natural disasters** when the power grid is down, such as the recent wildfires, floods in Europe, the winter storm in Texas, the ice storm in Eastern Canada, mobile networks are the first to collapse. People need help but have no electricity and no cell phone, and no Internet. Even if there is electricity, mobile networks can be knocked out by increased call volume during a natural disaster (even if they usually have sufficient bandwidth). **The safest is to keep a landline.**
"All politicians are the same. They won't do anything about it."	Yes, politicians do tend to wait until a problem is huge before acting . . . or until they hear from a lot of people. We cannot afford to wait. There is no better time to speak up than now. The pandemic has proven that when the government wants to do something, it can act quickly. **And with the ongoing possibility of another election, they should be more receptive.**
"The telecommunications industry is too powerful. They even own the media. We can't win. What's the point?"	The industry is taking advantage of lax government regulations. They see an opportunity to make big profits. That is what they do. We need to work on the federal government to develop "real" safety guidelines, a democratic process for the placement of antennas, and guidelines to protect flora and fauna. While we are working on getting the government to act in our best interests, remember this: the telecom companies are businesses. . . and we are their customers. We need to hold them accountable. Public pressure, the threat of reputational damage, demands for proof of liability insurance, lawsuits, not to mention dialogue, and showing widespread support when positive change begins to happen . . . these are all things that need to happen. We know that change will not happen overnight. But momentum is building. See Section 10. As we saw the shift regarding climate change, organizations are now being held accountable for the impact of their products on our environment. The transportation, pharmaceutical and chemical industries must prove their products are safe before they are introduced in the market. We need to hold the telecom and technology industries to the same standards.

12.3. Protect Yourself and Your Family

There are 2 main strategies to follow in protecting yourself and your family.

Distance is your friend

All wireless devices carry a manufacturer's warning on the minimum distance the device should be held from the human body in order to meet Health Canada's and ISED's guidelines.[387] For cell phones, it ranges from 5 mm to 15 mm (about a quarter to a half inch). Baby monitors are in the range of 20 cm (8 inches). Samsung states "to ensure compliance with RF exposure guidelines the Notebook PC must be used with a minimum of 20.8 cm (8 inches) antenna separation from the body".[388] Keep devices in airplane mode with Wi-Fi off as much as possible. Download content and watch off-line as much as possible. For smart watches, use a device that allows you to turn off all communications when wearing and download the information through a hard wired connection.

Create a safe haven in your home

We are bombarded by many sources of RF radiation as soon as we leave our home. Our bodies, especially children's bodies, have an incredible ability to heal and repair. You can reduce RF sources within your home so that when your family is at home, this rest, repair and healing cycle will be maximized. Remove all devices and Wi-Fi as much as possible from areas of sleep or high activity, especially the home office and bedroom. Make it a practice to use devices in a wired fashion. Connectors are available for your cell phone to connect to a wired line.[389]

C4ST's Safety Tips (http://c4st.org/wp-content/uploads/2016/05/Wireless-Safety-Tips-English.pdf)

- Don't sleep with an active cell phone near you.
  Turn to airplane mode with Wi-Fi off. Better yet, turn it off.
- Keep cell phones and tablets away from small children.
- Replace a wireless baby monitor with a wired monitor.
- Remove all cordless phones, and replace with wired ones.
- Opt out of any smart meters. If possible, keep your analog utility meter or request its return.
- Mothers to be: keep all wireless devices away from your abdomen.
- Keep cell phones away from your head (use the speaker or air tube earbuds; not Bluetooth) and out of your pocket, bra, etc.
- Do not use "wearable" wireless devices.
  If you must, then keep their use to a bare minimum.
- Replace Wi-Fi with wired options.
  If impossible, put the router on a timer to turn off at night.
  Remove from high-use and sleeping areas.

[387] https://ehtrust.org/fine-print-manufacturer-radio-frequency-radiation-warnings/
[388] http://downloadcenter.samsung.com/content/UM/201202/20120201090611529/3G_Connection_Guide_UK.pdf page 8.
[389] https://www.amazon.ca/Ethernet-Network-Adapter-Charging-Support/dp/B07PY3KM76/ref=asc_df_B07PY3KM76/?tag=googleshopc0c-20&linkCode=df0&hvadid=335055404543&hvpos=1o2&hvnetw=g&hvrand=2408420440972172802&hvpone=&hvptwo=&hvqmt=&hvdev=c&hvdvcmdl=&hvlocint=&hvlocphy=9000834&hvtargid=pla-818054391267&psc=1

Some wireless devices are more harmful than others.

There is some confusion about which wireless devices are the most harmful, and for good reason.

According to Health Canada's flawed Safety Code 6, heating is the only factor at low intensity exposures, and guidelines are based on power density (averaged) and amount of energy absorbed (Specific Absorption Rate- SAR).

However, many other factors must be considered, such as:

- wavelengths/frequencies, their peak levels, polarization and modulation
- how different wavelengths interact in different environments
- whether the emissions are continuous waves or **pulsed** waves.[390] (Pulsed radiofrequency radiation is generally thought to be more biologically active.[391, 392] Most wireless devices transmit using pulsed waves.[393])
- whether the environment they are in is **reflective.** (The more reflective the environment, i.e., metal surfaces, the more the waves bounce around. For example, using your phone while sitting in a car, or riding in an elevator.)
- whether they **emit constantly.** (The most harmful devices emit radiation constantly such as cordless phones. Some devices such as garage door openers and most TV remotes do not emit wireless radiation until a button is pressed.)

Some of the most harmful devices – ones that emit pulsed radiation constantly:

- Cordless phones* (both the cordless handset and the base station, even when not in use)
- Cell phones (when they are turned on)
- Wi-Fi
- Most smart meters**
- Most wireless keyboards and mice use Bluetooth technology that constantly emits radiation. There are older models that use infrared that emit less radiation.
- Cell tower and small cell antennas.

The further from the device, the better. And the shorter the exposure, the better.

* Cordless phones (also called DECT phones) and their base units (the cradle) transmit 24-7 even when you are not making a call – regardless of whether you have an older version where the base is plugged in and uses your landline or you have the newer version where both the base and the phone are wireless. The base, in both cases, transmits at full power 24-7. It is like having a small cell tower inside your home. They emit as much radiation, if not more, than cell phones. Manufacturers have the capability of producing devices that only emit when a call is being made.[394] However, most do not, and those that do, do not offer them in Canada.

** Smart meters such as those in British Columbia and Québec utilize a system that requires constant communication from the smart meter. In Ontario, of the 80 or so utilities providing electrical power, approximately 40% utilize a system that requires communication from the smart meter only several times per day. All utilities should ensure that their meters transmit as infrequently as possible.

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[390] https://www.britannica.com/science/electromagnetic-radiation/Radio-waves

[391] Sage C, Burgio E. Electromagnetic fields, pulsed radiofrequency radiation, and epigenetics: how wireless technologies may affect childhood development. Child Dev. (2018) 89:129–36. https://pubmed.ncbi.nlm.nih.gov/28504324/

[392] Huber R, Treyer V, Schuderer J, Berthold T, Buck A, Kuster N, et al. . Exposure to pulse-modulated radio frequency electromagnetic fields affects regional cerebral blood flow. *Eur J Neurosci.* (2005) 21:1000–6. https://pubmed.ncbi.nlm.nih.gov/15787706/

[393] https://news.berkeley.edu/2021/07/01/health-risks-of-cell-phone-radiation/

[394] https://www.powerwatch.org.uk/library/downloads/dect-phones-2018-10.pdf

12.4. Raise Awareness

You don't have to be an expert to raise awareness.

Talk to your neighbours and co-workers, email your friends and family, write to your local media, call your local elected officials. Just share what you have learned and be honest when you do not know the answer to a question. C4ST is here for you if you cannot find the answer to a question.

Ask questions: Have you heard that there will be small cell antennas installed close to our homes? In front of our children's schools? Why is there no public consultation?

Some people will be receptive, others not. Don't be discouraged by skeptics. They will be your best allies once they find out the real story.

"We so wish we had begun raising awareness in our community before that cell tower project fell in our laps. It wouldn't have been such an uphill battle."
– Carol and Fred Dowe, Qualicum Beach, BC

There are many ways to raise awareness.

1. Show movies or videos. *(see appendix 2 for suggestions)*
2. Email links to some of the great videos on the subject *(see Appendix 2)* along with a personal message from you
3. Hold a community meeting (virtual or other). Share what you know, invite speakers and have discussions. (A representative from C4ST will present if invited.)
4. Write letters to the editor, op-eds, or articles for local newspapers and newsletters.
5. Use social media - start a Facebook page, Twitter or whatever you are familiar with.
6. Write a letter to your neighbours and mail it along with a flyer (ask your post office for the price to send unaddressed direct mail to your community; you can decide by postal code or even target a single street).
7. Put up posters, distribute flyers, start a petition . . .
8. Encourage people to sign the "Suspend 5G Canada Appeal" https://www.appel5gappeal.ca/

Form a Group and Raise Awareness (or join one if it already exists)

The most effective way of getting results is to form a group. More and more local groups in Canada are being formed to voice their opposition against 5G. And they are happy to network with each other to share ideas. *(See Appendix 3 for a list of such groups)*

It starts with one concerned citizen. Get together with like-minded individuals. If you are alone, talk to your neighbours, invite them to an informal meeting and provide them with information. Show a video. Get them concerned and engaged. *(See Appendix 2)*

Increase your numbers. Put up posters, distribute flyers, show films, hold information sessions (with or without guest speakers), write Op-Eds and letters to the Editor for your local media. In other words, reach out to others, let them know how you feel about the issue. As you spread the word to others, collect their contact information – name, phone number, email address, skill set. These will come in handy when you decide to take action.

Appendix 2 contains sources of information to point people to (books, movies, videos, websites, blogs, etc.)

Appendix 8 contains links to many useful action tools: Flyers; petitions and PowerPoint presentations that you can use as models for your own, and much more.

Start Taking Action Now!

12.5. Stand Up Against the Installation of Antennas in Your Neighbourhood

Click here for the C4ST Toolkit: "How to Stop a Cell Tower in Canada".

Find Out What Is Happening in Your Neighbourhood

Find out if you have antennas (small or large) near you. *Check out the cell tower maps in Appendix 1.*

Ask your municipality if a telecommunications company has been in touch with them about the installation of a cell tower or small cell antennas in the neighbourhood.

Ask them what policy is in place for the installation of cell antennas. Do they have their own protocol for antenna siting? Find out everything that you can about their stance on cell antennas. These questions should be asked of both staff and your local municipal councilor or representative.

A telecommunications carrier needs to lease or buy land for cell towers.
If all landowners refuse to lease or sell their land (and this includes municipalities), the carrier cannot proceed. (Note: this may change but for now that is the rule.)

If someone has accepted to lease their land, the telecom carrier still has to carry out a public consultation.

The more your community is aware of the risks, the easier it will be for you to get them to speak out against the project.

* No consultation (nor notification) required for:
- modifications to existing towers, provided that the total height increase is no greater than 25%;
- non-tower structures, such as antennas on buildings, water towers, lamp posts, etc., provided that the height above ground of the non-tower structure is not increased by more than 25%.

Once you decide on your plan of action, seek the support of others.
Start a petition, or a letter-writing campaign.

Ask Your Municipal Council (or Land Use Authority) to Protect Its Citizens

Your municipal council is not completely powerless.
Many elected representatives are neither aware of the extent of 5G installations nor of the health issues. They do generally know that the final word rests with the federal government. Therefore, they often believe that there is nothing that they can do.

> There are no requirements for Canadians to be consulted when cell antennas are added to existing structures (towers, buildings, lamp posts or hydro poles close to our homes); and municipalities do not have to be notified unless the municipality owns the structure.
>
> As for new towers, the public and the municipality must be consulted; however, the public consultation is carried out by the telecommunication company and is inadequate. If a municipality is opposed to the installation of a cell tower, the federal government can legally override that refusal.
> *(See 5.2 for more on Antenna Siting and Consultations)*

That said, a municipal council CAN influence whether a cell tower is accepted or where it is positioned, and it can definitely refuse antennas on municipal property and on the structures that the municipality owns.

By simply delaying the installation of a tower or antenna through public opposition and the municipality's efforts to negotiate a better solution, a more suitable location can sometimes be found.

In fact, in many cases, tower projects have been dropped by the telecommunications company when they encountered too much opposition from both the citizens and their municipality.

A Good Place to Start: Ask Questions

1. Contact your elected officials and start with simple questions as to what they know about the local 5G rollout. By email (good because you have a record) or by other means, ask your municipality (staff and elected officials) what they know about any plans for small antennas or about any 5G infrastructure that is being considered.
2. Ask if your local government has entered into any legal agreements with telecommunications companies.
3. If there are legal agreements, is there any reference to liability issues?
4. Watch for agenda items as they become available to the public as well as media articles. Whenever there is an opportunity, give a presentation, or at least voice your opposition/concerns.
5. Ask if your Mayor or local Councillor will be a sponsor to get the item on the Agenda.

Take every opportunity to state your objections/concerns and keep asking questions. Any actions that slow the installation of cell antennas can lead to discussions involving compromise.

See Appendix 8 for examples of presentations to a City council or committee, and for tips for grassroots organizers.

Potential Liability to Council and Municipality

In addition to the health and safety concerns, more attention is being given to the potential liability to Council and the Town. Insurers often exclude or limit coverage for the risk from electromagnetic fields (EMFs) in commercial general liability policies, decline policyholders in the wireless industry, and only provide coverage via pollution liability policy enhancements.

For more on the insurance industry's stance on RF radiation, see section 10.3.

SPEAKING POINTS WHEN ENGAGING THE MAYOR AND COUNCIL

C4ST has been working for several years to understand how to safeguard health, and working towards solutions. Please review www.c4st.org to ensure all of your actions are supported.

Here are a few speaking notes to consider:

- **Thank Council** for taking the time to investigate this issue. Many councils do not.
- Councils have many items on their agendas. If you are given time to speak, **honour the time commitments** and **respect the process** they ask you to follow.
- **Recognize that there is very little authority the local council has at this time, but their pressure on Innovation, Science and Economic Development, and Health Canada, will support our efforts to change this:**
  - Decision on placement lies with the Federal Government.
  - Currently Municipalities can only comment to ISED, but are usually overturned.
- **Acknowledge that the major change has to come from the federal government**:
  - *Health Canada* sets the guidelines for exposure in a document called Safety Code 6.
  - *Innovation, Science and Economic Development* licenses the towers that must be in compliance with the guidelines of Safety Code 6.
- **Point out that there are actions Council can take.** See next page for examples.
- We realize this can become a very emotional topic; energy and passion is high. **Keep all your comments respectful and based on the facts.**
- Talk about what you are doing at the federal level to raise this issue.

If asked why you feel so strongly and yet still carry a cell phone…

We are Canadians for **Safe** Technology, not **no** technology. We support the use of cell phones if safe procedures are followed. Talk about C4ST's safety tips.

Here are some of the things that your Town Council (Land Use Authority) can do, i.e., requests that you can make of them:

- **Educate itself** about the potential health effects of wireless telecommunications and **the potential liability risks** to its community and council members**.**
- **Provide public education** on the risks related to the use of wireless devices and safer options. (for example, host a one-day session or an open forum debate)
- **Purchase a radiofrequency meter** and make it available for citizens to borrow from the local library.
- **Request the provincial Public Health authority** to start monitoring and reporting on the exposure to and related health effects of RF radiation.
- **Place a moratorium on the installation of antennas on city owned property** until Safety Code 6 is properly updated using international standards of scientific review.

  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, utility pole, etc.), they negotiate an occupancy agreement with the owner, which usually includes some form of rent. **For now, any owner is free to refuse – and this includes municipal land and structures.**

The 2020 report of the Broadcasting and Telecommunications Legislative Review Panel is recommending giving the federal government even greater control over where antennas are placed in Canada, including on private property, and municipal and provincial property.

(Yale, J. et al. (2020). Final Report. *Canada's Communication Future: Time to Act*. https://www.ic.gc.ca/eic/site/110.nsf/vwapj/BTLR_Eng-V3.pdf/$file/BTLR_Eng-V3.pdf)

This is why it is so important for municipalities to speak out now. The symbolic resolutions are important in this process. (See below)

- **Pass a symbolic resolution calling on the Federal Government to** properly revise Safety Code 6, implement the recommendations of the 2015 HESA Report, and in the interim, to stop 5G, and to put a hold on the auctions of the spectrum.

  Around the world, municipalities have been doing this. In Canada, the town of Sutton, Québec was the first to do so. They adopted a resolution calling on the federal government to institute a moratorium on the deployment of 5G "until the various studies reach a consensus on the absence of risks and impacts of 5G cellular technology on health and the environment".

  To consult the French wording of the resolution adopted by the Sutton municipal council: http://www.cqlpe.ca/pdf/ResolutionMoratoire5GSutton.pdf?fbclid=IwAR129pCakaSn75L4PgFl6kNEUQDNmdDk7cVOTqIk44LKsS0tDUq_B90qrZA

  For more on this: https://www.stopponsla5g.ca/post/première-résolution-au-canada-réclamant-un-moratoire-sur-la-5g (scroll down to get to the English)

- **Develop its own protocol/policy for antenna siting.** If there is no local policy, then the process defaults to the federal policy. Encourage your municipality to create its own customized protocol for the siting of Antenna Systems.

  The following template was developed jointly by the Federation of Canadian Municipalities and the Canadian Wireless Telecommunications Association in 2013, (revised in 2014), and is consistent with Innovation, Science and Economic Development (formerly Industry Canada) rules on Antenna System consultations.

  Antenna System Siting Protocol Template:
  https://fcm.ca/en/resources/antenna-system-siting-protocol-template

  While it is a good starting point, **it does not go far enough.**
  However, it does encourage the development of local protocol guidelines that fully express the Municipality's preferences.

  Ask your council to develop **stricter guidelines to protect you and the Municipality.** For example, add the following:

  - No antennas on municipal land or structures;
  - Require public consultation for all cellular antennas (not just for towers).
  - Require notification of the wider community (with multiple notices in a local community newspaper and on its website) for all cellular antennas (not just for towers over 30 metres).
  - Require that the proponent provide proof of liability insurance covering injury and property damages from electromagnetic fields, including illnesses caused by long-term EMF (non-ionizing radiation) exposure.

  The City of Toronto adopted a "Prudent Avoidance Policy". See the box below.

City of Toronto Prudent Avoidance (PA) Policy

In 2008, following a recommendation from its Board of Health, Toronto's City Council adopted a Prudent Avoidance (PA) policy related to radiofrequencies (RFs) emitted from cell towers. Under the policy, Toronto Public Health (TPH) reviews the predicted RF values provided by companies applying to install new cell towers in Toronto and requests that providers keep RF emission levels **100 times below Safety Code 6 limits**, Health Canada's public exposure guideline. Compliance with the PA policy is voluntary as the authority to regulate cell towers rests with the federal government.

In a 2013 report, it was stated that "Since 2008, 33 applications for towers have been assessed by TPH and compliance with the PA policy has been high."

In that same year, a meeting was held to discuss whether the PA policy should be discontinued. Here is that report:
https://www.toronto.ca/legdocs/mmis/2013/hl/bgrd/backgroundfile-62787.pdf
(Recommendation 1 recommended discontinuing the PA policy.)

The meeting minutes show that Recommendation 1 was defeated:
http://app.toronto.ca/tmmis/viewAgendaItemHistory.do?item=2013.HL25.5

12.6. The Single Most Important Thing That You Can Do: Push the Federal Government to Protect Its Citizens

The only way to effect meaningful change is to demand that the federal government do its job and protect Canadians.

It's all laid out in the "*Urgent Appeal to the Government of Canada to Suspend the 5G Rollout and to Choose Safe and Reliable Fibre Connections*" https://www.appel5gappeal.ca/ which was developed by a coalition of advocates and scientists from across Canada.

We need Members of Parliament across the country taking action and talking to party leaders about Canada's response to 5G.

But here's the thing: They won't act unless they hear from you first.

This is why we are calling on all Canadians to step up.

We urge you to go beyond your normal comfort zone, embrace your power as a citizen. Encourage your Member of Parliament to take a stand.
If we don't act, then we will all have to live with the consequences.

Use your postal code to find your MP: https://www.ourcommons.ca/Members/en

12.6.1. What We Want Our Member of Parliament (MP) to Do

1. **Support the requests in the Suspend 5G Appeal.**

   "Urgent Appeal to the Government of Canada to Suspend the 5G Rollout and to Choose Safe and Reliable Fibre Connections"
   https://www.appel5gappeal.ca/

   The main requests are:

   - **Immediately suspend the auctioning of spectrum licences, the licensing of low earth orbit satellites for broadband service, and the installation of new antennas** near homes, hospitals, schools, public buildings and sensitive wildlife habitats, until safety guidelines have been appropriately revised, and until the total economic implications are understood.
   - **Protect Canadians' health and the environment before further rollout of wireless infrastructure, including 5G** (properly revise Health Canada's Safety Code 6, implement the 12 recommendations in the HESA 2015 report *Radiofrequency Electromagnetic Radiation and the Health of Canadians;* and establish binding guidelines to protect wildlife and the environment from RF radiation (provisions in the amended Canadian Environmental Protection Act would be a good start);
   - **Provide a meaningful, transparent process for municipalities and their citizens to have a decisive say** over whether and where cellular network antennas are installed – including small antennas on non-tower structures.
   - **Ensure all Canadians can have Internet access that is safe, fast, reliable, resilient, secure, affordable and, in the long term, the most environmentally and economically sound for Canada** (in other words, **fibre optic and wired technologies** instead of wireless and satellite).

2. **Facilitate communications with one of the following Cabinet Ministers:**
   Listed below are 7 key Ministers and the 5G Canada Appeal statements that pertain to their field of responsibility.
   - Minister of Health – 2a, 2b, 2d
   - Minister of Innovation, Science and Industry – 1a, 1b, 1c, 1d, 1e, 2a, 2d, 2e, 3a
   - Minister of Environment and Climate Change – 2c, 2e
   - Minister of Finance – 1b, 1c, 1d, 1e, 2d
   - Minister of Digital Government – 1a, 1b, 2e
   - Minister of Public Services and Procurement – 1a, 1b, 2e,
   - Minister of Infrastructure and Communities – 1a, 1b, 2e

   by choosing one of the Ministers above and. . .
   a. Agreeing to sponsor a meeting between C4ST and the Minister
   b. Submitting questions to the Minister regarding the Suspend 5G Appeal
   c. Speaking to/writing a letter of support of the Suspend 5G Appeal to the Minister

3. **Meet with you.**

4. **Sponsor an e-petition.**

5. **Raise the issue in caucus or with the health or industry standing committees.**

6. **Ask questions in the House of Commons.**

7. **Attend the *Why Care?* Webinar on Wireless Technologies and Superior Alternatives** in September 2022 (details to be announced)

12.6.2. Steps You Can Take to Get Your MP to Act

1) **Sign the Appeal,** and encourage your family, friends, and co-workers to do so as well. Canadians of all ages can sign.

   https://www.appel5gappeal.ca/

   When you sign, click on the button that tells us that you want an email sent to your MP on your behalf to let him/her know that you signed the Appeal.
   Also check the box to receive updates on the Appeal.

2) **Follow up with your MP.**

   If he/she responds to the email, **write back.**
   Most MPs have been sending standard responses quoting the Health Canada and ISED (Innovation, Science and Economic Development Canada) websites which contain a lot of misinformation.

   We have drafted for you responses to these typical MP statements and provided evidence-based science to back up our replies. They can be accessed here: https://docs.c4st.org/PubEngage/Take-Action-Tools/Engaging-MPs-about-5G.pdf.

If you do not get a satisfactory reply (or any reply), call or email him/her and request a meeting. ***If you go as a group, you will have an even larger impact.*** See Section 12.4 on suggestions to build awareness in your community.
(If you do not feel comfortable meeting with your MP on your own, a member of C4ST will be glad to join you by telephone or videoconference (Zoom, for example).

Connect with the C4ST Riding Representative in your riding:
Contact Shelley (shelleyw@c4st.org) to see if there is a C4ST Riding Representative (RR) in your riding.

Become a C4ST Community Member and network with like-minded Canadians:
C4ST Community Members receive occasional newsletters and calls to action, and are invited to a monthly zoom meeting covering a range of topics relating to wireless radiation. Email Shelley to join: shelleyw@c4st.org.

12.6.3. Meeting with Your MP

Be prepared

- ☐ Know your MP – you can find background information about your MP on the government website. www.parl.gc.ca . Is he or she a minister, or sits on a committee? If you can, learn about your MP's record on the issue. What awareness does your MP have of this issue (the MP's assistant may be able to help here)? We can let you know how many emails your MP has received regarding the Appeal.
- ☐ Read over the key messages in the **Suspend 5G Appeal**. Know the facts and tell your personal story – "Why is this important to you – and what you want the government of Canada to do".
- ☐ Be prepared to answer opposing arguments, or to say you will get back to them with an answer. (C4ST is there to support you.)

Arrange the meeting

- ☐ If you do not represent an organization, form your own delegation of concerned citizens. (If you cannot go as a group, go on your own. Your voice matters!)
- ☐ Call your MP's local constituency office and make an appointment. Before you call find out when the MP will be in the constituency office (www.parl.gc.ca).
- ☐ Talk to the MP's assistant – they are a key resource person. Provide the assistant with a brief summary about why you are calling so he/she can brief the MP.
- ☐ Use the 4 page (double sided) Suspend 5G Appeal from the website https://www.appel5gappeal.ca/ as a starting point and inform your MP about the goals of the Appeal. There is also a "Supplemental Materials" document available there with more of the scientific evidence to back up your concerns.
- ☐ Confirm the time and place of your meeting in a follow-up letter or email which also clearly states your purpose of the meeting. Also include who will be attending the meeting.

Getting ready for the meeting

- ☐ Prepare an agenda. Have group members address specific areas of expertise, e.g., health, the environment, security, privacy. Be sure to leave time for a discussion.
- ☐ Prepare your presentation. Keep it brief and to the point. Plan for a 15-minute meeting or whatever time you have. See Appendix 8 for a sample presentation.
  - Know your "ask" and be clear about what you want.
  - Focus on solutions, specifically on the benefits of safe, fast, reliable, wired fibre-to-and-through-the-premises (FTTP).
- ☐ Identify what the MP can do to help – raise the issue in caucus or with the health or industry committees, speak to or write a letter of support to the relevant Ministers, ask questions in the house.
- ☐ Prepare an information package to leave behind, and most importantly a one-page summary of your main points. And your contact information.

At the meeting

- ☐ Introduce yourself, your organization, and C4ST, but keep it brief.
- ☐ Ask your MP how familiar they are with small cell antennas (microcells) and 5G.
- ☐ Explain the goals and objectives for your meeting – what you want to achieve.
- ☐ Provide your MP with your one-page summary of your main points.
- ☐ Introduce and explain the issues you want to discuss: the need to suspend the rollout of 5G and the consequences of not acting NOW.
- ☐ Answer any questions you can, but don't be afraid to say, "I don't know but I'll get back to you". Never state things that you are not sure are accurate.
- ☐ Be sincere and passionate – share your personal story.
- ☐ Take notes.

Follow-up

- ☐ Write a thank you letter to your MP.
- ☐ Call and thank the MP's assistant.
- ☐ Keep in touch with your MP – add to your mailing list and follow-up on issues discussed at the first meeting.
- ☐ Let C4ST know about the meeting and its results by sending an email to – shelleyw@c4st.org

Use the Media

- ☐ A key access point to your MP is your local newspaper/media.
- ☐ It is important to look for ways to educate the media, your MP and the public about the Suspend 5G Appeal and the reasons behind it, as well as about C4ST and your group or organization (if you represent one).

12.6.4. Other Federal Elected Officials to Write to

(These can change. Make sure to visit the government website to see who the current minister is.)

- **The Right Honourable Justin Trudeau**
  Prime Minister of Canada
  Office of the Prime Minister of Canada
  80 Wellington Street
  Ottawa, ON K1A 0A2
  Tel: 613-992-4211 Fax: 613-941-6900
  Email: pm@pm.gc.ca

- **The Honourable Jean-Yves Duclos**
  Minister of Health
  Health Canada
  70 Colombine Driveway, Tunney's Pasture
  Address Locator 0900C2
  Ottawa, ON, K1A 0K9 Canada
  Tel: 613-957-0200
  Email: hcminister.ministresc@hc-sc.gc.ca

- **The Honourable François-Phillippe Champagne**
  Minister of Innovation, Science and Industry
  C.D. Howe Building
  235 Queen Street
  Ottawa, Ontario K1A 0H5
  Tel: 343-291-2500 Fax: 343-291-2511
  Email: ministerofisi-ministredeisi@ised-isde.gc.ca

- **The Honourable Steven Guilbeault**
  Minister of Environment and Climate Change
  Fontaine Building 12th floor
  200 Sacré-Coeur Blvd
  Gatineau QC K1A 0H3
  Tel: 819-938-3813
  Email: ministre-minister@ec.gc.ca

  Dr. Mona Nemer, C.M., C.Q., FRSC, FCIC
  Chief Science Advisor of Canada
  160 Elgin Street, 11th Floor
  Ottawa, ON K1A 0W9
  Tel: 613-943-0689
  Email: science@canada.ca

Handwritten letters can be very effective, and no postage stamp is needed if addressed to the Ottawa Address:

[Name of Member of Parliament]
House of Commons
Ottawa, Ontario
Canada K1A 0A6

https://www.ourcommons.ca/en/contact-us

12.7. Ask Your Provincial Representative to Protect Its Citizens

Provinces have responsibility for schools and universities.

It is at this level that the decision has been made to accept Safety Code 6 guidelines when installing Wi-Fi. Voice your concern about Wi-Fi in schools to your provincial ministers of health and education. Any province can decide to implement stricter guidelines than Safety Code 6 if they so choose. Let them know what other countries are doing to protect children in schools and daycares. (see Section 10.1)

The province may have jurisdiction over the utilities and rights-of-way.

Telecommunications carriers purchase or lease the land to install large towers or, if they wish to attach a smaller antenna to an existing structure (rooftop, utility pole, etc.), they negotiate an occupancy agreement with the owner. For now, any owner is free to refuse.

For example, in Winnipeg, Manitoba Hydro “owns” the hydro poles and must enter into agreements with the cell antenna companies. Concern can be raised with the utility company responsible and to the provincial minister responsible for the utility.

Land use planning is under provincial jurisdiction, and is coordinated between the province and its municipalities.

For example, the Québec government has a zoning law (Loi sur la protection des terres agricoles, or Law for the Protection of Agricultural Lands). Many groups fighting the installation of cell towers in rural Québec have appealed to the Commission de protection du territoire agricole du Québec (the Commission for the Protection of Agricultural Lands in Quebec, or CPTAQ) when a municipality considered rezoning a "green zone" (protected forest or agricultural land) to allow the installation of a cell tower. British Columbia is the only other province with a similar commission.

13. Who We Are

Canadians for Safe Technology (C4ST)

is a national, non-profit, non-partisan, volunteer coalition of parents, scientists and citizens who are concerned about the health risks of wireless technology.

Founded in 2012, C4ST is led by Frank Clegg, former President of Microsoft Canada.

Our Mission:

- to educate and inform Canadians, and policy makers, about the dangers of exposure to unsafe levels of radiofrequency/microwave radiation from wireless devices and cellular antennas.
- to provide recommendations on how to use wireless technology more safely.
- to work with all levels of government to create healthier communities for children and families, and to protect our environment, from coast to coast to coast.

Guiding Principles:

- C4ST is not opposed to technology. We want safe technology.
- C4ST does not support any theories connecting 5G with Covid-19.
- C4ST condemns acts of violence such as burning antenna towers.

Canadians for Safe Technology
PO Box 33
Maple Grove Village Postal Outlet
Oakville, ON
Canada L6J 7P5
https://c4st.org/

Network with like-minded Canadians – Become a C4ST Community Member:
Community Members receive occasional newsletters and calls to action, and are invited to a monthly Zoom meeting covering a range of topics relating to wireless radiation.
Email Shelley to join: shelleyw@c4st.org

To find out if there is a C4ST Riding Representative in your riding:
Email shelleyw@c4st.org

If you take action, please keep us informed:
5Gactions@c4st.org

Comments or suggestions for the next edition of this Guide?
Please email: 5GGuideinput@c4st.org

APPENDICES

APPENDIX 1 – Cellular Antennas in Canada

CANADIAN CELLULAR TOWERS MAP

http://www.ertyu.org/steven_nikkel/cancellsites.html

This site provides an interactive map of all the cell towers/transmitters in Canada.

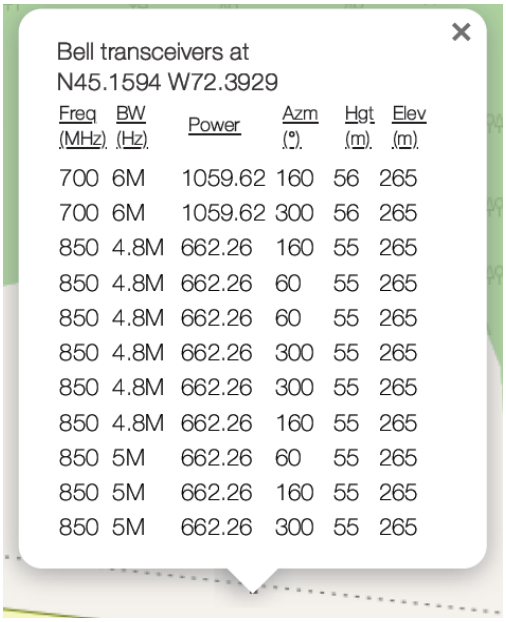
You can zoom in wherever you choose.

The towers/microcells are colour-coded by company.

You can click on an individual tower and get the details on that tower. On the example here, the tower had 21 transmitters – to see them all you have to scroll.

This document only shows screen shots of the site. We encourage you to visit it and share the link.

Also see: **EMR Health Alliance BC**
https://emrabc.ca/?page_id=7536



CANADIAN TOOL TO SEE HOW MANY TRANSMITTERS ARE NEAR YOU

https://www.thecelltowers.org/antennas

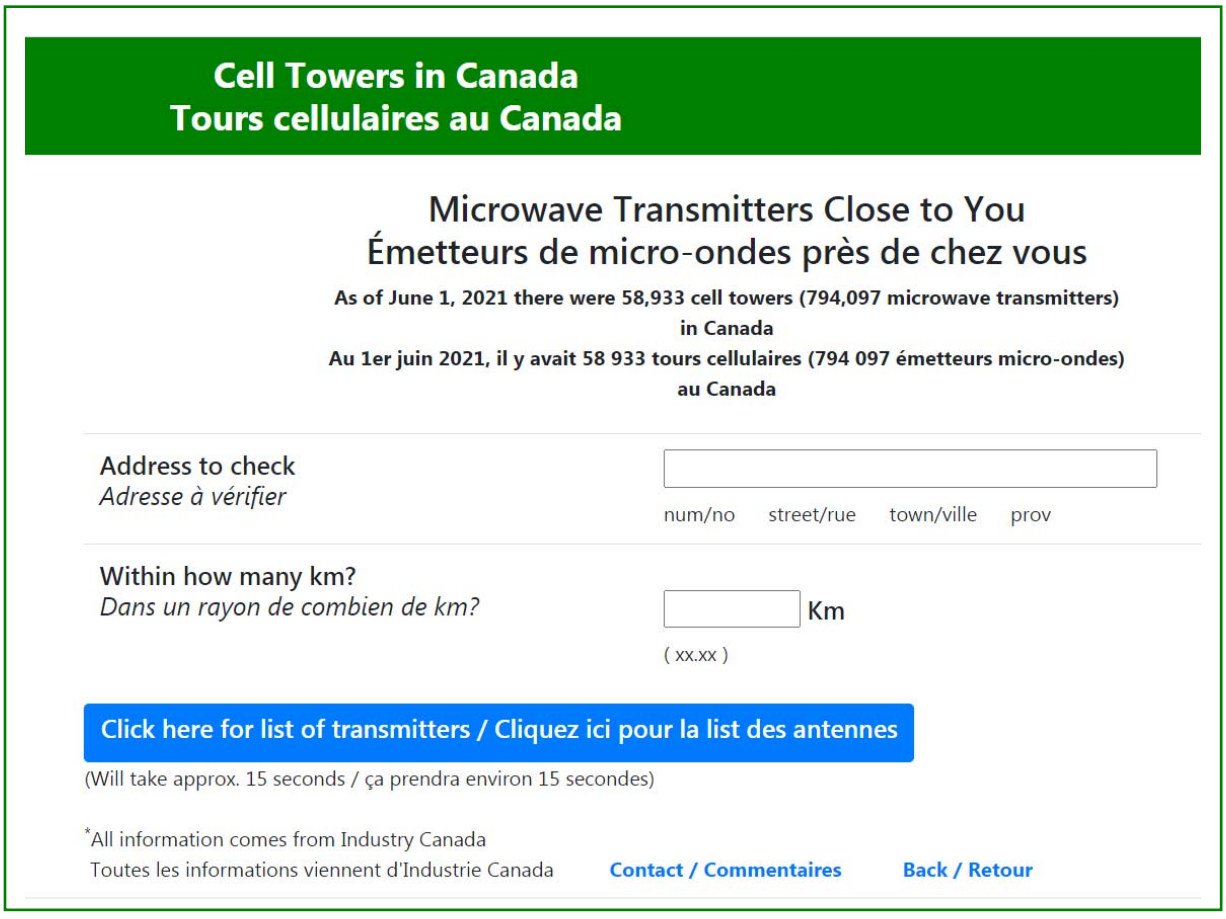
On this site, you can enter a **Canadian address**, and **a radius** (number of km from that address), to find out how many microwave **transmitters** are within that radius.

The results will provide much detail:

- company name
- address
- location (map coordinates)
- type of transmitter (service), power, frequency, height
- click for more info (where you can a lot of technical details on each transmitter, including the license number)

You can also click on the map to see the precise location. The number of transmitters will appear in a circle at that location. You can change the view to satellite view to better see the location.

This programme, created and maintained by *Citizens Against the Proliferation of Cell Antennas in the Eastern Townships* in Québec, uses the data from ISED's Spectrum Management System and is updated monthly.



APPENDIX 2 – Sources of Information

Websites

Canadians for Safe Technology (C4ST)
http://c4st.org/

C4ST is a volunteer coalition of parents, scientists and citizens whose mission is to educate Canadians and policy makers about the dangers of exposures to unsafe levels of radiofrequency/ microwave radiation from commonly used wireless devices and cellular antennas and to provide recommendations on how to use wireless technology more safely. C4ST works with all levels of government to create healthier communities for children and families from coast to coast to coast.

Environmental Health Trust (EHT)
https://ehtrust.org/

The only nonprofit organization in the world that carries out cutting edge research on environmental health hazards and also works directly with communities, health and education professionals, and policymakers to understand and mitigate these hazards -- Their vision: A thriving world where technology is both state-of-the-art and safe for all.

Electromagnetic Radiation Safety
https://www.saferemr.com

Joel M. Moskowitz, PhD, Director, Center for Family and Community Health, School of Public Health, University of California, Berkeley

Scientific and policy developments regarding the health effects of electromagnetic radiation exposure from cell phones, cell towers, Wi-Fi, Smart Meters, and other wireless technology.

Powerwatch
https://www.powerwatch.org.uk/

A non-profit independent organisation in the UK that promotes policies for a safer environment. Have been researching EMF effects on health for over 20 years, and provide information to help people understand these complex issues.

Zone'In Programs Inc.
"Ten Reasons Why Handheld Devices Should be Banned for Children Under the Age of 12."
http://archive.constantcontact.com/fs193/1101930228564/archive/1118195733831.html

Microwave News
https://microwavenews.com/

Louis Slesin, PhD, Editor & Publisher
Independent and not aligned with any industry or government agency.

Has been reporting since 1981 on the potential health and environmental impacts of electromagnetic fields and radiation. Widely recognized as a fair and objective source of information on this controversial subject.

Physicians for Safe Technology
https://mdsafetech.org/

Group of physicians and health professionals whose aim is to prevent acute and chronic diseases by encouraging understanding of the connection between the public, psychosocial and environmental health effects of using modern technology. They help translate science regarding health and environmental impacts of wireless and digital technologies and provide recommendations for health professionals, policymakers and the public.

Dr. Magda Havas – Ph.D. Professor Emeritus, Trent University
https://magdahavas.com/

Early research pioneer whose work was instrumental leading to the Acid Rain agreements involving Ontario and the States around the Great Lakes.

BioInitiative 2012 Report
https://bioinitiative.org/

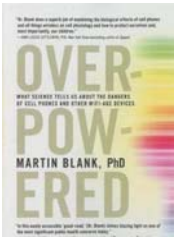
650+ page report prepared by 29 authors from 10 countries, including three former presidents of the Bioelectromagnetics Society, the Chair of the Russian National Committee on Non-Ionizing Radiation, and a Senior Advisor to the European Environmental Agency. The report covers over 1800 studies reporting bioeffects and adverse health effects of electromagnetic fields and wireless technologies

Call to Action to Limit Microcells (CALM)
https://thecalm.ca/

Grassroots Environmental Education
http://grassrootsinfo.org/matwireless.php

Books

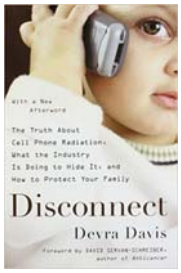
OVERPOWERED:
What Science Tells Us About the Dangers of Cell Phones and Other Wifi-Age Devices
Martin Blank, PhD
(2014) New York, NY: Seven Stories Press



With a PhD in physical chemistry (Columbia University) and one in colloid science (University of Cambridge), Dr. Blank was an expert on the health-related effects of electromagnetic radiation, who focused in particular on the effects on cells and reactions with DNA, as in the cellular stress response. An associate professor at Columbia University, he published over 200 papers and reviews on the subject, and served as an invited expert regarding EMF safety for the Canadian Parliament, the Vermont House Committee on Natural Resources and Energy, and Brazil's Supreme Federal Court.

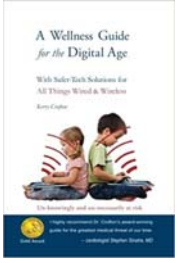
"Martin Blank deals with a difficult subject in a scientifically accurate but easily readable fashion. (…) In this great scientist, we have an unlikely activist and truth teller." -- David O. Carpenter, M.D., Director, Institute for Health and the Environment, University at Albany

DISCONNECT: The Truth About Cell Phone Radiation, What the Industry Has Done to Hide It, and How to Protect Your Family
Devra Davis, PhD, MPH
(2010) Dutton Adult; (2011) paperback, Plume; (2013) Environmental Health Trust



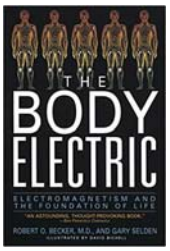
A leading researcher on environmental causes of cancer and chronic disease, Dr. Davis was co-scientific writer of Al Gore's Nobel Winning team, founding director of the Board on Environmental Studies and Toxicology of the US National Research Council, National Academy of Sciences, and is the founder and president of Environmental Health Trust. Selected by TIME magazine as a top pick, *Disconnect* provides shocking detail about cell phone radiation and our health.

A Wellness Guide for the Digital Age: With Safer-Tech Solutions for All Things Wired & Wireless – for brains worth saving
Kerry Crofton, PhD
(2013) Global Wellbeing Books



This health educator collaborated with respected scientists, physicians and environmental health experts, to present an overview of the evidence and recommendations for safer solutions.

The Body Electric: Electromagnetism and the Foundation of Life
Robert O. Becker, MD, and Gary Selden. (1985). New York, NY: Morrow



The father of electrotherapy and electrochemically induced cellular regeneration tells the fascinating story of our bioelectric selves.

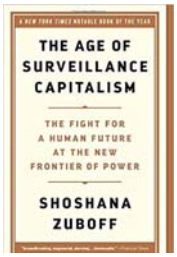
An Electronic Silent Spring: Facing the Dangers and Creating Safe Limits
Katie Singer. (2014). Hudson, NY: SteinerBooks

This book by a medical journalist who works on public policy with the Electromagnetic Radiation Policy Institute, offers an extensive section for policy makers, telecom and utility companies, schools, civic groups and individuals who want EMF solutions and protection.

Re-Inventing Wires: The Future of Landlines and Networks
Timothy Schoechle, PhD. (2018). Washington, DC: National Institute for Science, Law & Public Policy
https://electromagnetichealth.org/wp-content/uploads/2018/05/Wires.pdf

This 156 page report outlines why wired solutions are 100 times faster, safer, more secure, more cost effective, more reliable, protect privacy better and are more energy efficient than wireless solutions. Dr. Schoechle is a communications technology expert, international consultant in computer engineering and standardization, and former faculty member of the University of Colorado, College of Engineering and Applied Science.

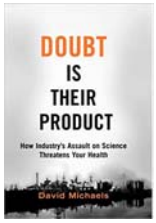
The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power
Shoshana Zuboff, PhD
(2019). New York, NY: Public Affairs, Hachette Book Group



The first detailed examination of the challenges to humanity posed by the digital future: the unprecedented form of power called "surveillance capitalism," and the quest by powerful corporations to predict and control our behavior. What began as advertising is now a threat to freedom and democracy, argues Prof. Zuboff, Professor Emerita at Harvard Business School.

A "masterwork of original thinking and research" -- The Financial Times

Doubt Is Their Product: How Industry's Assault on Science Threatens Your Health
David Michaels, PhD
(2008). New York, NY: Oxford University Press



"Doubt is our product," a cigarette executive once observed, "since it is the best means of competing with the "body of fact" that exists in the minds of the general public. It is also the means of establishing a controversy." In this eye-opening expose, David Michaels, scientist and former government regulator, reveals how the tobacco industry's duplicitous tactics spawned a multimillion dollar industry that is dismantling public health safeguards. David Michaels is currently Research Professor and Associate Chairman of the Department of Environmental and Occupational Health at The George Washington University School of Public Health and Health Services and Professor, Albert Einstein School of Medicine, Mount Sinai School of Medicine.

Videos

Less than 5 minutes:
Dr. Anthony Miller:
Radio Frequency Radiation, Cancer and Cell Towers Statement to School District.
Statement that wireless radiation should be classified as a Class 1 *known* carcinogen.
https://www.youtube.com/watch?v=LPs6PAG1H6c

22 minutes:
CBC Marketplace. (2017). The Secret Inside Your Cellphone.
with Wendy Mesley, March 24, 2017
https://www.youtube.com/watch?v=Wm69ik_Qdb8

About 1 hour:
Devra Davis, PhD, MPH:
The truth about mobile phone and wireless radiation (2015)
Dean's Lecture at University of Melbourne, School of Engineering
https://ehtrust.org/science/key-scientific-lectures/dr-davis-dilvered-the-deans-lecture-at-melbourne-school-of-engineering/

Less than 5 minutes:
US Senator Blumenthal Raises Concerns about 5G Wireless Technology Health Risks at Senate Hearing
https://www.youtube.com/watch?v=ekNC0J3xx1w&feature=youtu.be

8:42 minutes:
Frank Clegg, CEO, Canadians for Safe Technology;
former President of Microsoft Canada
5G Wireless Technology and Safety
https://youtu.be/xW7BbztmuYg

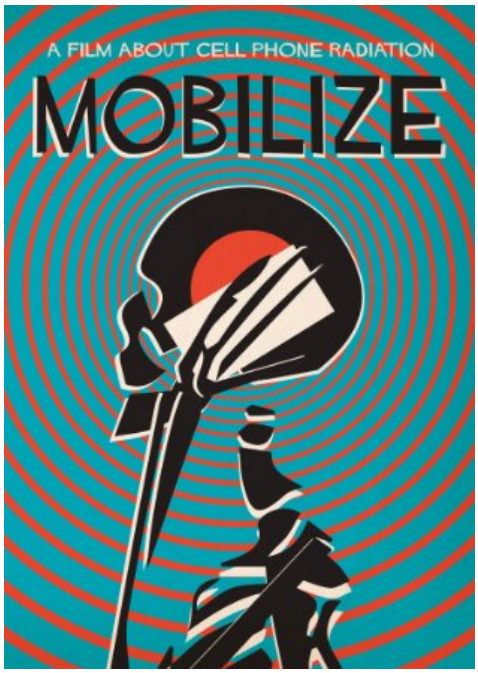
14 presentations (approx 30 minutes each):
Symposium for Ontario's medical community
Hosted by Environmental Health Clinic at Women's College Hospital, Toronto
May 31st, 2019
Impacts of Wireless Technology on Health
Link to the 14 presentations.
https://www.womenscollegehospital.ca/care-programs/environmental-health-clinic/electromagnetic-field-hypersensitivity-(ehs)

20 short videos (5 to 12 minutes each):
Wireless Technology Forum, held in Lansing, Mi.
Speakers included:
Dr. A. B. Miller, World Health Organization advisor, Dr. Devra Davis, co-scientific writer of Al Gore's Nobel Winning team, Dr. Ron Melnick, lead scientist for the design of the NTP study and member of the WHO's IARC panel in 2011 that classified RF EMF as 2B, possibly carcinogenic to humans.
https://www.youtube.com/playlist?list=PLzxSfWG1ZjiB71mHLQQDUQbE8jjQtiZj0

22 minutes:
Interview on Counterpoint of Frank Clegg, former President of Microsoft Canada, and CEO of Canadians for Safe Technology, by host Tanya Granic Allen, Sept. 16, 2020
https://www.newsforum.tv/videos/cp024

34 minutes:
5G Risk Discussion:
Former President of Microsoft Canada, Frank Clegg & Former Michigan State Senator Pat Colbeck, Oct. 28, 2020
https://www.youtube.com/watch?v=DkYvYF8U3JM&feature=youtu.be

Movies



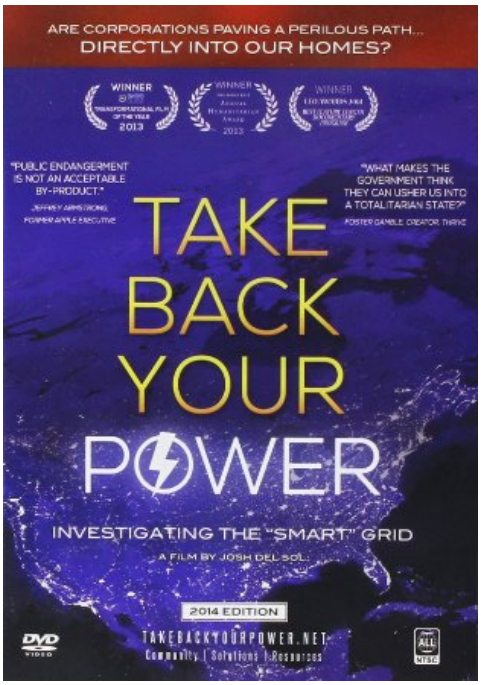
Mobilize

http://www.mobilizemovie.com/
Documentary, October 14, 2014
Director: Kevin Kunze / Producers: Ellie Marks, Joel Moskowitz and Devra Davis
Language: English
Run Time: 84 minutes

Mobilize is an investigative documentary that explores the potential long-term health effects from cell phone radiation including cancer and infertility. Examining the most recent scientific research and legislative efforts, *Mobilize* illuminates how finance corrupts public health. The film features interviews with numerous doctors, politicians, cancer patients, technology experts, major telecommunication associates, and prominent politicians.

Filmed over three years and edited together from over 2,000 hours of footage, *Mobilize* includes accounts from individuals at the following organizations and universities: Apple Inc., the World Health Organization, the International Agency for Research on Cancer, the National Cancer Institute, the Cellular Telecommunications Internet Association, Yale University, Harvard University, USC, UCSF, UC Berkeley, and Virgin Mobile.

Awarded Best Documentary in California Independent Film Festival 2014



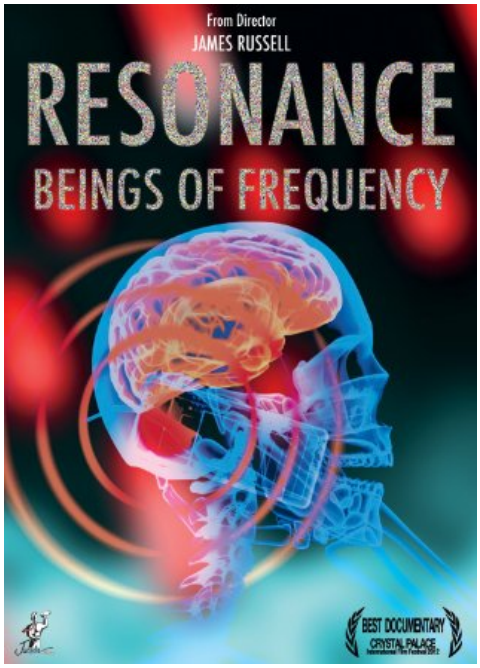
Take Back Your Power

https://www.youtube.com/user/ThePowerFilm
Original edition (Director's cut, 102 mins) released worldwide on Sept 5, 2013
2014 Edition (final cut, 88 mins) released in June 2014 – with new scenes, a shorter running time of 88 minutes, and Spanish, French and English subtitles.

Josh del Sol's award winning documentary investigates so-called "smart" utility meters, uncovering shocking evidence of in-home privacy invasions, increased utility bills, health & environmental harm, fires and unprecedented hacking vulnerability… and lights the path toward solutions.

With compelling insight from whistleblowers, government agents, lawyers, doctors, researchers and environmentalists, Take Back Your Power investigates the claimed benefits and emerging risks of a profit-based global initiative that seeks to change the way we live. What you'll discover will surprise, unsettle and ultimately empower you.

Winner, Leo Award, Best Feature Length Documentary Program (2014)
Winner, AwareGuide, Transformational Film of the Year (2013)
Winner, IndieFest, Annual Humanitarian Award (2013)



Resonance — Beings of Frequency

https://tubitv.com/movies/507919/resonance-beings-of-frequency
2013
Producer: James Russell
Directors: John K. Webster James Russell
Run Time: 1:28:22
Language: English

An eye-opening documentary which reveals the immeasurable harm we are causing ourselves by living in an ocean of man made wireless frequencies. The film journeys through 60 years of independent scientific research to uncover for the very first time, the mechanisms by which this technology is causing a variety of life threatening diseases. The film ultimately reveals how every single one of us is reacting to the biggest change in environment this planet has ever seen.

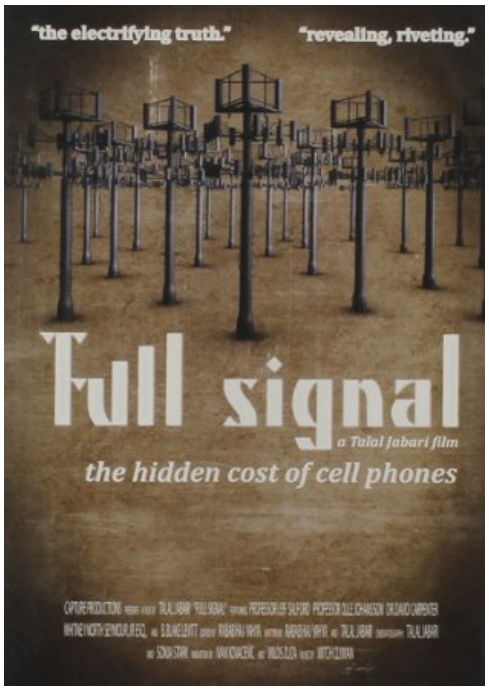
Generation Zapped

https://generationzapped.com/#gen-trailer
2017
Producer: Sabine El Gemayel
Director: Sabine El Gemayel
Run Time: 74 minutes
Language: English

Multiple award-winning documentary, GENERATION ZAPPED investigates the potential dangers of prolonged exposure to Radio Frequencies (RF) from wireless technology; its effects on our health and well-being, as well as the health and development of our children. From its links to breast and brain cancer, to its associations with increased infertility and genetic mutations related to autism and ADHD, to newly developed illnesses, such as Electrical Hyper-Sensitivity (EHS).

Today we encounter a hundred thousand times the level of radiation from wireless technologies than we did decades ago. Yet the safety standards set by federal regulatory agencies are outdated. New wireless devices such as smart phones, tablets and baby monitors to the latest “Internet of Things” continue to enter the market without any proper pre-market testing or post-market monitoring. Too little is done to ensure public safety and awareness.

So how can we uncover the facts and reduce our exposure to limit the associated health risks during this technological revolution? GENERATION ZAPPED attempts to do just that.



Full Signal (Available also with French subtitles)

http://fullsignalmovie.com/trailer-credits.html
Documentary, 61 minutes, 2010

Since 1997 and the onset of GSM telephony, more and more cellular antennas have been popping up in neighborhoods all around the world to support an ever-growing number of cell phone users.
In fact they have become so prolific in some parts of the world that they disappear into the landscape with the same subtlety as cars on the street. And those that don't 'disappear' are cleverly disguised as chimneys, flagpoles, or water towers.

Full Signal talks to scientists around the world who are researching the health effects related to cellular technology; to veteran journalists who have called attention to the issue for decades; to activists who are fighting to regulate the placement of antennas; and to lawyers and law makers who represent the people wanting those antennas regulated.

Filmed in ten countries and six US states, *Full Signal* examines the contradiction between health and finance, one of the many ironies of the fight to regulate antenna placement.

The Social Dilemma

https://www.thesocialdilemma.com/
2020
Director: Jeff Orlowski
Producer: Larissa Rhodes
Run Time: 89 minutes
Language: English

This docudrama directed by Jeff Orlowski explores the rise of social media and the damage it has caused to society, focusing on its exploitation of its users for financial gain through surveillance capitalism and data mining, how its design is meant to nurture an addiction, its use in politics, its effect on mental health (including the mental health of adolescents and rising teen suicide rates), and its role in spreading conspiracy theories.

The film features interviews with former Google design ethicist and Center for Humane Technology co-founder Tristan Harris, his fellow Center for Humane Technology co-founder Aza Raskin, Asana co-founder and Facebook like button co-creator Justin Rosenstein, Harvard University professor Shoshana Zuboff, former Pinterest president Tim Kendall, AI Now director of policy research Rashida Richardson, Yonder director of research Renee DiResta, Stanford University Addiction Medicine Fellowship program director Anna Lembke, and virtual reality pioneer Jaron Lanier. The interviews are cut together with dramatizations starring actors Skyler Gisondo, Kara Hayward, and Vincent Kartheiser, which tell the story of a teenager's social media addiction.

The Social Dilemma premiered at the 2020 Sundance Film Festival and was released on Netflix on September 9, 2020.

Blogs & Newsletters

Environmental Health Trust (EHT)
https://ehtrust.org/?s=blogs

Joel M. Moskowitz, Ph.D., Director, Center for Family and Community Health
School of Public Health, University of California, Berkeley
https://www.saferemr.com/

Dariusz Leszczynski, Ph.D. – Science blog: Between a Rock and a Hard Place
https://betweenrockandhardplace.wordpress.com/

Louis Slesin, Ph.D. – Microwave News
https://microwavenews.com/

Lennart Hardell, MD **–** Swedish brain cancer epidemiologist
https://lennarthardellenglish.wordpress.com/

Sharon Noble – e-newsletter update sent almost daily
Email Sharon citizensforsafertech@shaw.ca
See older updates at : http://www.stopsmartmetersbc.com/newsletters/

Magda Havas PhD. Professor Emerita, University of Trent
– Global EMF Project : BRAG. More than 400 volunteers taking RF measurements.
https://globalemf.net/

Radiofrequency Meters & Protective Shielding

Safe Living Technologies Inc.
https://safelivingtechnologies.com/

Shield Your Body
https://www.shieldyourbody.com/

The following video from *Kingstonians for Safe Technology*, shows readings from a radiofrequency meter of the radiation levels emitted from a small cell antenna in Kingston, Ontario -- https://www.youtube.com/watch?v=UZVGPZph2hU

APPENDIX 3 – Canadian Advocacy Groups

NATIONAL

Canadians for Safe Technology (C4ST)
www.c4st.org

Electromagnetic Pollution Illnesses Canada Foundation (EPIC)
https://iexistworld.org/

Electrosensitive Society
www.electrosensitivesociety.com

The Canadian Initiative to Stop Wireless Electrical and Electromagnetic Pollution (WEEP)
www.weepinitiative.org

BRITISH COLUMBIA

Call to Action to Limit Microcells (CALM)
thecalm.ca

Coalition to Reduce Electropollution (CORE)
Email: hansk@telus.net

Coalition to Stop Smart Meters
www.stopsmartmetersbc.com

Connected Communities, BC
connected-communities.ca

Let's Connect Salt Spring
www.facebook.com/pages/category/Community/Lets-Connect-Salt-Spring-298947187698017/

Parents for Safe Schools
https://www.facebook.com/Parents-for-Safe-Schools-428808610553840/

parentsforasafeschool.blogspot.com/2020

ALBERTA

Albertans for Safe Technology
Email: lorilcurran@gmail.com

SASKATCHEWAN

MANITOBA

Manitobans for Safe Technology
m4st.ca

5G Winnipeg Awareness
5gwinnipegawareness.ca

ONTARIO

Kingstonians for Safe Technology
k4st.ca

Ontario for Safe Technology (O4ST)
www.o4st.ca

Stop 5G Hamilton
https://www.facebook.com/groups/595380718064024

QUÉBEC

Campagne Stoppons la 5G -- Vivons sans danG
www.stopponsla5g.ca

Citizens Against the Proliferation of Cell Antennas in the Eastern Townships
http://www.thecelltowers.org/

Rassemblement ÉlectroSensibilité Québec (RESQ)
www.electrosensibilitequebec.com

ATLANTIC CANADA

Atlantic Canada 4 Safe Technology - No 5G
Email: No5GDan@tuta.io

APPENDIX 4 – Scientific Evidence for Harm to Health

The following represent **a small portion** of peer-reviewed papers published since the last revision of Canada's Safety Code 6 in 2014/2015 (up to 2019).

CANCER – Evidence to support a Group 1 *Known Human Carcinogen* classification (World Health Organization, International Agency for Research on Cancer (WHO-IARC)

- Miller, A. B.[1], Morgan, L. L., Udasin, I., & Davis, D. L. (2018). **Cancer epidemiology update, following the 2011 IARC evaluation of radiofrequency electromagnetic fields (Monograph 102)**. *Environmental Research*, *167*, 673–683. https://doi.org/10.1016/j.envres.2018.06.043 https://www.ncbi.nlm.nih.gov/pubmed/30196934
- Hardell, L.,[2] & Carlberg, M. (2018). **Comments on the US National Toxicology Program technical reports on toxicology and carcinogenesis study in rats exposed to whole-body radiofrequency radiation at 900 MHz and in mice exposed to whole-body radiofrequency radiation at 1,900 MHz**. *International Journal of Oncology*. https://doi.org/10.3892/ijo.2018.4606 https://www.ncbi.nlm.nih.gov/pubmed/30365129

CANADIAN BRAIN CANCER DATA – 2x risk of gliomas with >558 hours of cell phone use

- Momoli, F., Siemiatycki, J., McBride, M. L., Parent, M.-É., Richardson, L., Bedard, D., … Krewski, D. (2017). **Probabilistic Multiple-Bias Modeling Applied to the Canadian Data From the Interphone Study of Mobile Phone Use and Risk of Glioma, Meningioma, Acoustic Neuroma, and Parotid Gland Tumors**. *American Journal of Epidemiology*, *186*(7), 885–893. https://doi.org/10.1093/aje/kwx157 https://www.ncbi.nlm.nih.gov/pubmed/28535174

CANADIAN COLORECTAL CANCER – Increases in adults younger (less than 50 years in age) but not older adults (over 50 years in age)

- Brenner, D. R., Heer, E., Sutherland, R. L., Ruan, Y., Tinmouth, J., Heitman, S. J., & Hilsden, R. J. (2019). **National Trends in Colorectal Cancer Incidence Among Older and Younger Adults in Canada**. *JAMA Network Open*, *2*(7), e198090–e198090. https://doi.org/10.1001/jamanetworkopen.2019.8090

BRAIN CANCER INCIDENCE IN ENGLAND

- Philips, Alisdair, Henshaw, Denis L., Lamburn, Graham, & O'Carroll, Michael. (2018). **Brain tumours: rise in Glioblastoma Muliforme incidence in England 1995-2015 suggests an adverse environmental or lifestyle factor**. *Journal of Environmental and Public Health*, 20. https://www.hindawi.com/journals/jeph/2018/7910754/

INCREASED ABSORPTION OF RADIOFREQUENCY ENERGY IN CHILDREN

- Fernández, C., de Salles, A. A., Sears, M. E., Morris, R. D., & Davis, D. L. (2018). **Absorption of wireless radiation in the child versus adult brain and eye from cell phone conversation or virtual reality**. *Environmental Research*, *167*, 694–699. https://doi.org/10.1016/j.envres.2018.05.013 https://www.sciencedirect.com/science/article/pii/S0013935118302561

[1] Anthony B. Miller, MD, FRCP, FRCP(C), FFPH, FACE. Professor Emeritus, Dalla Lana School of Public Health, University of Toronto. Dr. Miller has acted as adviser to the International Agency for Research on Cancer (IARC), from which he has also received a Medal of Honour.

[2] Dr. Hardell's research was part of the main evidence used by IARC in the 2011 classification of radiofrequency radiation as a *possible* carcinogen.

PUBLIC HEALTH RISKS – Both Miller and Russell are medical doctors

- Miller, A. B., Sears, M. E., Morgan, L. L., Davis, D. L., Hardell, L., Oremus, M., & Soskolne, C. L. (2019). **Risks to Health and Well-Being From Radio-Frequency Radiation Emitted by Cell Phones and Other Wireless Devices**. *Frontiers in Public Health*, *7*. https://doi.org/10.3389/fpubh.2019.00223 https://www.frontiersin.org/articles/10.3389/fpubh.2019.00223/full
- Russell, C. L. (2018). **5 G wireless telecommunications expansion: Public health and environmental implications.** Environmental Research, 165, 484–495. https://doi.org/10.1016/j.envres.2018.01.016 Website: Physicians for Safe Technology - https://mdsafetech.org/

BEHAVOURAL PROBLEMS IN CHILDREN

- Birks, L., Guxens, M., Papadopoulou, E., Alexander, J., Ballester, F., Estarlich, M., … Vrijheid, M. (2017). **Maternal cell phone use during pregnancy and child behavioral problems in five birth cohorts**. *Environment International*, *104*, 122–131. https://doi.org/10.1016/j.envint.2017.03.024 https://www.ncbi.nlm.nih.gov/pubmed/28392066

ADVERSE EFFECTS ON SPERM QUALITY – One of several reviews with similar conclusions

- Houston, B. J., Nixon, B., King, B. V., De Iuliis, G. N., & Aitken, R. J. (2016). **The effects of radiofrequency electromagnetic radiation on sperm function**. *Reproduction (Cambridge, England)*, *152*(6), R263–R276. https://doi.org/10.1530/REP-16-0126 https://www.ncbi.nlm.nih.gov/pubmed/27601711

DNA DAMAGE – More than 30 studies showing damage at under safety level exposures

- Panagopoulos, D. J. (2019). **Comparing DNA damage induced by mobile telephony and other types of man-made electromagnetic fields**. *Mutation Research/Reviews in Mutation Research*, *781*, 53–62. https://doi.org/10.1016/j.mrrev.2019.03.003 https://www.sciencedirect.com/science/article/pii/S1383574218300991

OXIDATIVE STRESS – Can lead to many health conditions including Cancer, Alzheimer's and Parkinson's Disease

- Yakymenko, I., Tsybulin, O., Sidorik, E., Henshel, D., Kyrylenko, O., & Kyrylenko, S. (2016). **Oxidative mechanisms of biological activity of low-intensity radiofrequency radiation**. *Electromagnetic Biology and Medicine*, *35*(2), 186–202. https://doi.org/10.3109/15368378.2015.1043557 https://www.ncbi.nlm.nih.gov/pubmed/26151230

ELECTROHYPERSENSITIVITY (EHS): Symptoms include headaches, sleep disturbances, memory problems, tinnitus (ringing in the ears), heart problems

- Belyaev, I., Dean, A., Eger, H., Hubmann, G., Jandrisovits, R., Kern, M., … Thill, R. (2016). **EUROPAEM EMF Guideline 2016 for the prevention, diagnosis and treatment of EMF-related health problems and illnesses**. *Reviews on Environmental Health, 31(3)*. https://doi.org/10.1515/reveh-2016-0011
- Havas, M. (2019). **Electrohypersensitivity (EHS) is an Environmentally-Induced Disability that Requires Immediate Attention**. *J. Sci. Discov., 3(1),* 20. https://doi.org/jsd18020

CELL TOWER EXPOSURE STUDY – DNA damage, oxidative stress

- Zothansiama, Zosangzuali, M., Lalramdinpuii, M., & Jagetia, G. C. (2017). **Impact of radiofrequency radiation on DNA damage and antioxidants in peripheral blood lymphocytes of humans residing in the vicinity of mobile phone base stations**. *Electromagnetic Biology and Medicine*, 1–11. https://doi.org/10.1080/15368378.2017.1350584 https://www.ncbi.nlm.nih.gov/pubmed/28777669

APPENDIX 5 – Scientific Evidence for Harm to Non-Human Life (Wildlife including Birds, Insects, Pollinators, Trees and Plants)

Canada's Safety Code 6 limits were not developed to protect our flora or fauna. Wireless radiation “safety” limits for trees, plants, birds, insects, pollinators, and other wildlife simply do not exist in Canadian federal law.

Here are just a few studies showing harm from RF Radiation.

RESEARCH STUDIES

- **On Flora and Fauna (in general)**
  Literature reviews warning that non-ionizing EMFs are an “emerging threat” to wildlife.

Levitt, B. B., Lai, H. C., & Manville, A. M. (2021a). Effects of non-ionizing electromagnetic fields on flora and fauna, **Part 1. Rising ambient EMF levels in the environment**. Reviews on Environmental Health. https://doi.org/10.1515/reveh-2021-0026

Levitt, B. B., Lai, H. C., & Manville, A. M. (2021b). Effects of non-ionizing electromagnetic fields on flora and fauna, **Part 2 impacts: how species interact with natural and man-made EMF**. Reviews on Environmental Health. https://doi.org/10.1515/reveh-2021-0050

Levitt, B. B., Lai, H. C., & Manville, A. M. (2021c). Effects of non-ionizing electromagnetic fields on flora and fauna, **Part 3. Exposure standards, public policy, laws, and future directions**. Reviews on Environmental Health. https://doi.org/10.1515/reveh-2021-0083

Balmori, A. (2015). Anthropogenic radiofrequency electromagnetic fields as an emerging threat to wildlife orientation. *Science of The Total Environment*, Volumes 518–519, 2015, Pages 58-60, ISSN 0048-9697, https://doi.org/10.1016/j.scitotenv.2015.02.077. (https://www.sciencedirect.com/science/article/pii/S0048969715002296)

Cucurachi, S., Tamis, W. L., Vijver, M. G., Peijnenburg, W. J., Bolte, J. F., & de Snoo, G. R. (2013). A review of the ecological effects of radiofrequency electromagnetic fields (RF-EMF). *Environment international*, *51*, 116–140. https://doi.org/10.1016/j.envint.2012.10.009 https://pubmed.ncbi.nlm.nih.gov/23261519/

Levitt BB, Lai HC, Manville AM. (2021). Effects of non-ionizing electromagnetic fields on flora and fauna, Part 2 impacts: how species interact with natural and man-made EMF. *Reviews on Environmental Health*. 2021 Jul 8. doi: 10.1515/reveh-2021-0050. Epub ahead of print. PMID: 34243228. https://pubmed.ncbi.nlm.nih.gov/34243228/

Manville, Albert. former senior biologist of the US Fish and Wildlife Service. (2014). “A BRIEFING MEMORANDUM: What We Know, Can Infer, and Don’t Yet Know about Impacts from Thermal and Non-thermal Non-ionizing Radiation to Birds and Other Wildlife” published in *Wildlife and Habitat Conservation Solutions*, 2014 on the impacts of RFR to birds and bees. https://ecfsapi.fcc.gov/file/12270470130362/Manville%207-14-%202016%20Radiation%20Briefing%20Memo-Public.pdf

Sivani, S., Sudarsanam, D. (2012). “Impacts of radio-frequency electromagnetic field (RFEMF) from cell phone towers and wireless devices on biosystem and ecosystem - a review.” *Biology and Medicine,* Volume 4, Issue 4, Pages 202–216. https://biolmedonline.com/Articles/Vol4_4_2012/Vol4_4_202-216_BM-8.pdf

- **On Birds**

  "Study results have documented nest and site abandonment, plumage deterioration, locomotion problems, reduced survivorship, and death (e.g., Balmori 2005, Balmori and Hallberg 2007, and Everaert and Bauwens 2007). Nesting migratory birds and their offspring have apparently been affected by the radiation from cellular phone towers in the 900 and 1800 MHz frequency ranges- 915 MHz is the standard cellular phone frequency used in the United States.

  Laboratory studies: T. Litovitz (personal communication) and DiCarlo et al. (2002) raised concerns about impacts of low-level, non-thermal electromagnetic radiation from the standard 915 MHz cell phone frequency on domestic chicken embryos- with some lethal results (Manville 2009, 2013a). Radiation at extremely low levels (0.0001 the level emitted by the average digital cellular telephone) caused heart attacks and the deaths of some chicken embryos subjected to hypoxic conditions while controls subjected to hypoxia were unaffected (DiCarlo et al. 2002)."[3]

  Balmori A. "Possible Effects of Electromagnetic Fields from Phone Masts on a Population of White Stork (Ciconia ciconia)." *Electromagnetic Biology and Medicine*, vol. 24, no. 2, 2005, pp. 109-19.

  Balmori, Alfonso. "Anthropogenic radiofrequency electromagnetic fields as an emerging threat to wildlife orientation." *Science of The Total Environment* 518–519 (2015): 58–60.

  Engels, S. et al. "Anthropogenic electromagnetic noise disrupts magnetic compass orientation in a migratory bird." *Nature*, vol. 509, 2014, pp. 353–6.

  "Briefing Paper on the Need for Research into the Cumulative Impacts of Communication Towers on Migratory Birds and Other Wildlife in the United States." Division of Migratory Bird Management (DMBM), U.S. Fish & Wildlife Service, 2009.

- **On Bees and Other Insects**

  Regarding bees and pollinators, the study "Exposure of Insects to Radio-Frequency Electromagnetic Fields from 2 to 120 GHz" published in Scientific Reports found insects (including the Western honeybee) may potentially absorb the higher frequencies that will be used in the 4G/5G rollout, with absorbed power increases up to 370%. The researchers warn, "This could lead to changes in insect behaviour, physiology, and morphology over time…."

  Research also found impacts to bees from wireless frequencies including inducing artificial worker piping (Favre, 2011), disrupting navigation abilities (Sainudeen, 2011; Kimmel et al., 2007), reducing colony strength (Harst et al., 2006), and impacts to honey bee physiology (Kumar et al., 2011).

  Balmori, A. (2021). Electromagnetic radiation as an emerging driver factor for the decline of insects. Science of The Total Environment, 767, 144913. https://doi.org/10.1016/j.scitotenv.2020.144913 (Spain)

  Friesen, M., & Havas, M. (2020). Effects of Non-ionizing Electromagnetic Pollution on Invertebrates, Including Pollinators such as Honey Bees: What We Know, What We don't Know, and What We Need to Know. In Working Landscapes. Proceedings of the 12th Prairie Conservation and Endangered Species Conference, Danyluk (ed.). February 2019, Winnipeg, Manitoba. 203 pages. (pp. 127–138). Critical Wildlife Habitat Program, Winnipeg, Manitoba. Retrieved from http://pcesc.ca/media/45404/final-2019-pcesc-proceedings.pdf (Canada)

[3] Excerpt from enclosure A of letter sent by the Director of the Office of Environmental Policy and Compliance of the United States Department of the Interior, to the National Telecommunications and Information Administration in the Department of Commerce (Feb 7, 2014)

Kumar, S., Singh, V. K., Nath, P., & Joshi, P. C. (2020). An overview of anthropogenic electromagnetic radiations as risk to pollinators and pollination. Journal of Applied and Natural Science, 12(4), 675–681. https://doi.org/10.31018/jans.v12i4.2420 (India)

European Parliament, Directorate-General for Parliamentary Research Services, Thielens, Arno (2021). "Environmental Impacts of 5G. A Literature Review of Effects of Radio-Frequency Electromagnetic Field Exposure of Non-Human Vertebrates, Invertebrates and Plants." https://doi.org/10.2861/318352.

Thielens, Arno, Duncan Bell, David B. Mortimore, Mark K. Greco, Luc Martens, and Wout Joseph. "Exposure of Insects to Radio-Frequency Electromagnetic Fields from 2 to 120 GHz." *Scientific Reports* 8. 1. 3924. https://www.nature.com/articles/s41598-018-22271–3 (March 2, 2018). https://doi.org/10.1038/s41598-018-22271-3.

Shepherd et al. "Increased aggression and reduced aversive learning in honey bees exposed to extremely low frequency electromagnetic fields." *PLoS One*, 2019 Oct 10.

Kumar, Neelima R., Sonika Sangwan, and Pooja Badotra. "Exposure to cell phone radiations produces biochemical changes in worker honey bees." *Toxicology International*, 18, no. 1, 2011, pp. 70–2.

Favre, Daniel. "Mobile phone-induced honeybee worker piping." *Apidologie*, vol. 42, 2011, pp. 270-9. https://link.springer.com/article/10.1007/s13592-011-0016-x

Sahib, Sainudeen. (2011). Impact of mobile phones on the density of honeybees. Public Administration and Policy Research. 3. https://www.researchgate.net/publication/268298822_Impact_of_mobile_phones_on_the_density_of_honeybees

Kimmel, Stefan et al. (2007). Electromagnetic Radiation: Influences on Honeybees (Apis mellifera). University of Koblenz-Landau/Campus Landau, Germany

- **On Wildlife and Other Animals**

Balmori, A. "Electrosmog and species conservation." *Science of the Total Environment*, vol. 496, 2014, pp. 314-6.

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"The potential dangers of electromagnetic fields and their effect on the environment." Council of Europe Parliamentary Assembly, Resolution 1815, 2011.

Halgamuge MN, Skafidas E, Davis D. "A meta-analysis of in vitro exposures to weak radiofrequency radiation exposure from mobile phones (1990-2015)". *Environmental Research*. 2020 May;184:109227. doi: 10.1016/j.envres.2020.109227. https://www.sciencedirect.com/science/article/abs/pii/S0013935120301195?via%3Dihub

- **On Amphibians**

Balmori, A. "Mobile phone mast effects on common frog (Rana temporaria) tadpoles." *Electromagnetic Biology and Medicine*, vol. 29, no. 1-2, 2010, pp. 31-5.

- **On Trees and Plants**

  Research on trees has found that trees are harmed by RFR. A 9 year field study (Waldmann-Selsam, C., et al 2016) found significant impacts to trees near cell antennas and an investigation of 700 trees found damage starts on the side of the tree with highest RF. A review on impacts to plants entitled, "Weak radiofrequency radiation exposure from mobile phone radiation on plants" concluded, "a substantial amount of the studies on RF-EMFs from mobile phones show physiological and/or morphological effects." A study on aspen seedings found ambient RF in a Colorado setting were high enough to cause necrotic lesions on the leaves, decrease leader length and leaf area, and suppress fall anthocyanin production (Haggarty, 2010).

Waldmann-Selsam, C., et al. "Radiofrequency radiation injures trees around mobile phone base stations." *Science of the Total Environment* 572 (2016): 554-69. https://pubmed.ncbi.nlm.nih.gov/27552133/

Breunig, Helmut. "Tree Damage Caused By Mobile Phone Base Stations An Observation Guide" (2017). https://kompetenzinitiative.com/wp-content/uploads/2019/08/2017_Observation_Guide_ENG_FINAL_RED.pdf

Gustavino, B., et al. "Exposure to 915 MHz radiation induces micronuclei in Vicia faba root tips." *Mutagenesis* 31.2 (2016): 187-92.

Haggerty, Katie. "Adverse Influence of Radio Frequency Background on Trembling Aspen Seedlings." *International Journal of Forestry Research,* 2010.836278 (2010). https://www.hindawi.com/journals/ijfr/2010/836278/

Halgamuge, M. "Weak radiofrequency radiation exposure from mobile phone radiation on plants." *Electromagnetic Biology and Medicine*, vol. 36, no. 2, 2017, pp. 213-235.

Halgamuge, M., Davis, D. "Lessons learned from the application of machine learning to studies on plant response to radio-frequency." *Environmental Research*, 2019. doi:10.1016/j.envres.2019.108634

Halgamuge, Malka N., See Kye Yak, and Jacob L. Eberhardt. "Reduced growth of soybean seedlings after exposure to weak microwave radiation from GSM 900 mobile phone and base station." *Bioelectromagnetics* 36.2 (2015): 87-95. 114

Pall, Martin. "Electromagnetic Fields Act Similarly in Plants as in Animals: Probable Activation of Calcium Channels via Their Voltage Sensor." *Current Chemical Biology*, Volume 10, Issue 1, 2016.

Schorpp, Volker. "Tree Damage from Chronic High Frequency Exposure Mobile Telecommunications, Wi-Fi, Radar, Radio Relay Systems, Terrestrial Radio, TV etc" (2011).

Shikha Chandel, et al. "Exposure to 2100 MHz electromagnetic field radiations induces reactive oxygen species generation in Allium cepa roots." *Journal of Microscopy and Ultrastructure,* 5.4 (2017): 225-229.

APPENDIX 6 – Publications on Energy Consumption Related to Information and Communications Technology

Key articles appear in shaded areas.

Amazon Employees for Climate Justice. (2019, September 20). **Amazon employees are joining the Global Climate Walkout, 9/20**. *Medium*. Retrieved from https://medium.com/@amazonemployeesclimatejustice/amazon-employees-are-joining-the-global-climate-walkout-9-20-9bfa4cbb1ce3

Andrae, A. S. G., & Edler, T. (2015). **On Global Electricity Usage of Communication Technology: Trends to 2030**. *Challenges*, *6*(1), 117–157. https://doi.org/10.3390/challe6010117

Andrae, Anders. (2019). **Prediction Studies of Electricity Use of Global Computing in 2030**. *International Journal of Science Engineering Investigations*, *8*(86). Retrieved from https://www.researchgate.net/publication/332111132_Prediction_Studies_of_Electricity_Use_of_Global_Computing_in_2030

Anonymous, K. (2019, December 2). **Why aren't more climate change activists fighting 5G?** *Stop Smart Meters Australia*. Retrieved from https://stopsmartmeters.com.au/2019/12/02/why-arent-more-climate-change-activists-fighting-5g/

Barger, S. (2019, November 8). **The gathering storm: Computing's climate change problem**. *TechTalks*. Retrieved from https://bdtechtalks.com/2019/11/08/global-warming-shared-computing/

Belkhir, L. (2018, March 25). **How smartphones are heating up the planet**. *The Conversation*. Retrieved from http://theconversation.com/how-smartphones-are-heating-up-the-planet-92793

Belkhir, L., & Elmeligi, A. (2018). **Assessing ICT global emissions footprint: Trends to 2040 & recommendations**. *Journal of Cleaner Production*, *177*, 448–463. https://doi.org/10.1016/j.jclepro.2017.12.239

Belkhir, Lotfi. (2018, March 25). **Study shows smartphones harm the environment | Faculty of Engineering**. Retrieved from https://www.eng.mcmaster.ca/news/study-shows-smartphones-harm-environment

CEET - Centre for Energy-effecient telecommunication.. (2013). ***The Power of Wireless Cloud*** (p. 22). BELL Labs and University of Melbourne. Retrieved from [[e.

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Conger, K., Fausset, R., & Kovaleski, S. F. (2019, May 14). **San Francisco Bans Facial Recognition Technology**. *The New York Times*. Retrieved from https://www.nytimes.com/2019/05/14/us/facial-recognition-ban-san-francisco.html

Cook, G. (2017). ***Clicking Clean: who is winning the race to build a green Internet?Greenpeace Report. 2017*** (p. 102). Greenpeace. Retrieved from https://www.ong2zero.org/blog/clicking-clean-who-is-winning-the-race-to-build-a-green-internet-greenpeace-report/

Daigle, T. (2020, January 2). **"Completely unsustainable": How streaming and other data demands take a toll on the environment.** *CBC News*, *https://www.cbc.ca/news/technology/data-centres-energy-consumption-1.5391269*. Retrieved from https://www.cbc.ca/news/technology/data-centres-energy-consumption-1.5391269

Darby, S. J. (2018). **Smart technology in the home: time for more clarity**. *Building Research & Information*, *46*(1), 140–147. https://doi.org/10.1080/09613218.2017.1301707

De Decker, K. (n.d.). **The monster footprint of digital technology**. *LOW-TECH MAGAZINE*. Retrieved from https://www.lowtechmagazine.com/2009/06/embodied-energy-of-digital-technology.html

Elegant, Naomi Xu. (2019). **The Internet Cloud's Dirty Secret: It Consumes Tons of Energy, Has Large Carbon Footprint**. *Fortune*. Retrieved from https://fortune.com/2019/09/18/internet-cloud-server-data-center-energy-consumption-renewable-coal/

Elliot, John, & et al. (2017). **Energy consumption in smartphones: an investigation of battery and energy consumption of media related applications on android smartphones**. Retrieved from http://eprints.leedsbeckett.ac.uk/4703/1/SEEDS%20FINAL%20Paper%202017%20150%20Fehmi.pdf

Greenpeace International. (2012). How Clean Is Your Cloud? According to this report, if the wireless industry were a country, it would be the fifth largest consumer of energy in the world. https://www.greenpeace.org/static/planet4-international-stateless/2012/04/e7c8ff21-howcleanisyourcloud.pdf

Hussain, S.M. Suhail, Nadeem, Furquan, Aftab, Mohd Asim, Ali, Ikbal, & Ustun, Taha Selim. (2019). **The Emerging Energy Internet: Architecture, Benefits, Challenges, and Future Prospects**. *Electronics*, *8*, 1037. https://doi.org/10.3390/electronics8091037

International Environmental Technology. (2019, April 29). **How Does Smart Home Automation Affect the Environment?** *Envirotech Online*. Retrieved from https://www.envirotech-online.com/news/environmental-laboratory/7/breaking-news/how-does-smart-home-automation-affect-the-environment/45838

Kommenda, N. (2019, July 19). **How your flight emits as much CO2 as many people do in a year**. *The Guardian*. Retrieved from http://www.theguardian.com/environment/ng-interactive/2019/jul/19/carbon-calculator-how-taking-one-flight-emits-as-much-as-many-people-do-in-a-year

LaMonica, M. (2014, September 10). **The spiralling energy consumption behind your smart phone**. *The Guardian*. Retrieved from https://www.theguardian.com/sustainable-business/2014/sep/10/energy-consumption-behind-smart-phone

Lewis, Andrew. (2019). **GeSI facilitates real world solutions to real world issues within the ICT industry and the greater sustainability community.** *GeSI Facilitates Real World Solutions to Real World Issues within the ICT Industry and the Greater Sustainability Community.* Retrieved from http://gesi.org/team/andrew-lewis-9

Loken, Andrea. (2019, October 17). **From climate to health, spread of 5G networks poses multiple risks**. *Rabble.Ca*. Retrieved from https://rabble.ca/blogs/bloggers/views-expressed/2019/10/climate-health-spread-5g-networks-poses-multiple-risks

Louis, J.-N., Calo, A., Leiviskä, K., & Pongrácz, E. (2015). **Environmental Impacts and Benefits of Smart Home Automation: Life Cycle Assessment of Home Energy Management System**. *IFAC-PapersOnLine*, *48*(1), 880–885. https://doi.org/10.1016/j.ifacol.2015.05.158

Matsakis, L. (2019, September 28). **Thousands of Tech Workers Join Global Climate Change Strike**. *Wired*. Retrieved from https://www.wired.com/story/tech-workers-global-climate-change-strike/

Mills, Mark P. (2013). **The cloud begins with coal**. *Digital Power Company*, 45.

Noble, D. F. (1995). ***Progress Without People: New Technology, Unemployment, and the Message of Resistance***. Between The Lines.

Pärssinen, M., Kotila, M., Cuevas, R., Phansalkar, A., & Manner, J. (2018). **Environmental impact assessment of online advertising**. *Environmental Impact Assessment Review*, *73*, 177–200. https://doi.org/10.1016/j.eiar.2018.08.004

Paul, K. (2019, May 23). **Amazon workers demand Bezos act on climate crisis**. *The Guardian*. Retrieved from https://www.theguardian.com/technology/2019/may/22/amazon-workers-climate-crisis-board-jeff-bezos

Raghaven, Barath. (2011). **The energy and emergy of the Internet**. *TCSI and UC Berkely. Hotnets '11*, *https://raghavan.usc.edu/papers/emergy-hotnets11.pdf*. Retrieved from https://raghavan.usc.edu/papers/emergy-hotnets11.pdf

Schoechle, Timothy. (2018). **Re-Inventing Wires: The Future of Landlines and Networks**. *National Institute for Science, Law & Public Policy Washington, DC*, 156.

Schwartz, R., Dodge, J., Smith, N. A., & Etzioni, O. (2019). **Green AI**. *ArXiv:1907.10597 [Cs, Stat]*. Retrieved from http://arxiv.org/abs/1907.10597

Shehabi, A., Smith, S. J., Masanet, E., & Koomey, J. (2018). **Data center growth in the United States: decoupling the demand for services from electricity use**. *Environmental Research Letters*, *13*(12), 124030. https://doi.org/10.1088/1748-9326/aaec9c

Strubell, E., Ganesh, A., & McCallum, A. (2019). **Energy and Policy Considerations for Deep Learning in NLP**. *ArXiv:1906.02243 [Cs]*. Retrieved from http://arxiv.org/abs/1906.02243

Tarnoff, B. (2019, September 18). **To decarbonize we must decomputerize: why we need a Luddite revolution**. *The Guardian*. Retrieved from https://www.theguardian.com/technology/2019/sep/17/tech-climate-change-luddites-data

The Shift Project. (2019, February). **Lean ICT report - The Shift Project - full report.pdf**. *Google Docs*, 90.

Trueman, C. (2019, August 9). **What impact are data centres having on climate change?** *Computerworld*. Retrieved from https://www.computerworld.com/article/3431148/why-data-centres-are-the-new-frontier-in-the-fight-against-climate-change.html

Walsh, B. (2013, August 14). **The Surprisingly Large Energy Footprint of the Digital Economy [UPDATE]**. *Time*. Retrieved from http://science.time.com/2013/08/14/power-drain-the-digital-cloud-is-using-more-energy-than-you-think/

APPENDIX 7 – Evidence Ignored by Health Canada

Health Canada's analysis of 140 studies showing harm at or below Safety Code 6 that were omitted during the last revision of Safety Code 6 (2015)

During the public comment period of the last "revision" of Safety Code 6, C4ST submitted 140 studies showing harm at or below Safety Code 6 that had been omitted by Health Canada and the Royal Society of Canada. Below is the entire analysis of these 140 studies as provided by Health Canada. **Note: they state that 36 of these studies meet quality standards for risk assessment but do not provide their specific rationale for excluding them. See next page.**

Total # Papers Submitted by C4ST (140 without duplicates)

By C4ST Category	# submitted by C4ST	# (in scope)	# with sufficient quality for inclusion in RA	
Cancer	9	6	6	
Generic Damage	14	13	2	
Infertility	14	13	1	
Dev./Learn./Behavior	30	24	7	*one paper excluded, not English/French
Brain/Nervous System	44	42	13	*one paper excluded, not English/French
Eye	6	5	2	
Cardiovascular	4	4	2	
EHS	8	3	1	
Biochemical	65	58	16	*two papers excluded, not English/French
	194	168	50	(See Note 1)

Note 1: many papers listed in the categories above are duplicates and appear in more than one category.

Total # of unique (in-scope, sufficient quality) technical references submitted by C4ST, with duplicates removed = 36.
Health Canada has evaluated these studies and does not consider them to impact on the previously identified thresholds for established adverse health effects, basic restrictions or derived reference levels in SC6 (2015).

List of "in-scope" technical references submitted by C4ST that meet quality standards for RA

Year	Authors
2010	Ammari, M., Gamez, C., Lecomte, A., Sakly, M., Abdelmelek, H. & De Seze, R.
2010	Augner, C., Hacker, G.W., Oberfeld, G., Florian, M., Hitzl, W., Hutter, J. & Pauser, G.
2009	Bas, O., Odaci, E., Kaplan, S., Acer, N., Ucok, K. & Colakoglu, S.
2010	Belyaev I, Markova E, Malmgren L.
2012	Bouji, M., Lecomte, A., Hode, Y., de Seze, R. & Villégier, A.S.
2013	Byun, Y.H., Ha, M., Kwon, H.J., Hong, Y.C., Leem, J.H., Sakong, J., Kim, S.Y., Lee, C.G., Kang, D., et al.
2011	Carballo-Quintás, M., Martínez-Silva, I., Cadarso-Suárez, C., Alvarez-Figueiras, M. et al.
2013	Cervellati, F., Valacchi, G., Lunghi, L., Fabbri, E., Valbonesi, P., Marci, R., Biondi, C. & Vesce, F.
2010	Céspedes, O., Inomoto, O., Kai, S., Nibu, Y., Yamaguchi, T., Sakamoto, N., Akune, T., Inoue, M., et al.
2014	Coureau, G., Bouvier, G., Lebailly, P., Fabbro-Peray, P., Gruber, A., Leffondre, K. et al.
2009	Dahmen, N., Ghezel-Ahmadi, D. & Engel, A.
2013	Deshmukh, P.S., Megha, K., Banerjee, B.D., Ahmed, R.S., Chandna, S., Abegaonkar, M.P. et al.
2010	Divan, H.A., Kheifets, L., Obel, C. & Olsen, J.
2011	Esmekaya, M.A., Ozer, C. & Seyhan, N.
2014	Furtado-Filho, O.V., Borba, J.B., Dallegrave, A., Pizzolato, T.M., Henriques, J.A. et al.
2010	Grigoriev, Y.G., Grigoriev, O.A., Ivanov, A.A., Lyaginskaya, A.M., Merkulov, A.V., Shagina, N.B., et al.
2011	Hardell, L., Carlberg, M. & Mild, K.H.
2013	Hardell, L. & Carlberg, M.
2013	Hardell, L., Carlberg, M., Soderqvist, F. & Mild, K.H.
2014	Liu, K., Li, Y., Zhang, G., Liu, J., Cao, J., Ao, L. & Zhang, S.
2013	Loos, N., Thuróczy, G., Ghosn, R., Brenet-Dufour, V., Liabeuf, S., Selmaoui, B., Libert, J.P. et al.
2012	Lu, Y., Xu, S., He, M., Chen, C., Zhang, L., Liu, C., Chu, F., Yu, Z., Zhou, Z. & Zhong, M.
2014	Lv, B., Chen, Z., Wu, T., Shao, Q., Yan, D., Ma, L., Lu. K. & Xie, Y.
2010	Lyaqinskaja, A.M., Grigoriev, Y.G., Osipov, V.A., Grigoriev, O.A. & Shafirkin, A.V.
2014	Maaroufi, K., Had-Aissouni, L., Melon, C., Sakly, M., Abdelmelek, H., Poucet, B. & Save, E.
2014	Maskey, D. & Kim, M.J.
2012	Megha, K., Deshmukh, P.S., Banerjee, B.D., Tripathi, A.K. & Abegaonkar, M.P.
2012	Misa Agustiño, M.J., Leiro, J.M., Jorge Mora, M.T., Rodríguez-González, J.A., Jorge Barreiro, F.J., et al.
2013	Moretti, D., Garenne, A., Haro, E., Poulletier de Gannes, F., Lagroye, I., Lévêque, P. et al.
2012	Nazıroğlu, M., Çelik, Ö., Özgül, C., Çiğ, B., Doğan, S., Bal, R., Gümral, N., et al.
2013	Ni, S., Yu, Y., Zhang, Y., Wu, W., Lai, K. & Yao, K.
2010	Sonmez, O.F., Odaci, E., Bas, O. & Kaplan, S.
2014	Souza, Lda C., Cerqueira, Ede M. & Meireles, J.R.
2013	West JG, Kapoor NS, Liao S-Y, Chen JW, Bailey L, Nagourney RA.
2014	Valbonesi, P., Franzellitti, S., Bersani, F., Contin, A. & Fabbri, E.
2013	Zhang, Y., Yao, K., Yu, Y., Ni, S., Zhang, L., Wang, W. & Lai, K.

Summary of the harmful effects documented in 36 studies deemed by Health Canada to be "in scope" for Safety Code 6 Risk Assessment

– see minutes of House of Commons, Standing Committee on Health (HESA, 54, 2nd Session, 41st Parliament, 24 March 2015)

These studies were among the "140 omitted studies" submitted by C4ST to Health Canada in July 2014. None are mentioned in the Safety Code 6 Rationale (2015), nor in the Royal Society of Canada's Expert Panel report (2014), nor in any of their "Authoritative Reviews".

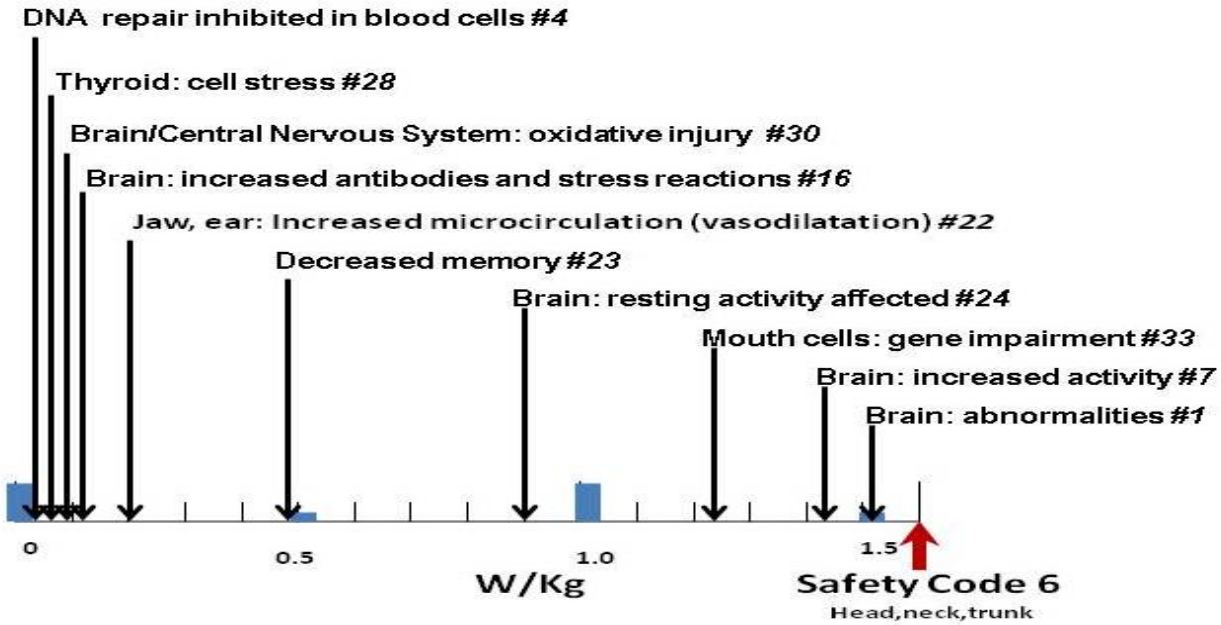
All are in the cell/mobile phone frequency range of 900 MHz to 2450 MHz, except for some in group IV (Other Studies) in the table below. Specific Absorption Rate (SAR) levels were taken from the original papers and from EMF Portal http://www.emf-portal.de/

 # indicates the number of the reference on the next page.

I. Epidemiological-type studies (6), Case report (1), Literature review (1), Laboratory tests (1)	
CONDITION	**FINDINGS**
Brain cancer: #17,18 Swedish case-control studies [note: Hardell et al. recently published a further study]	Dr. Hardell now recommends a World Health Organization, International Agency on Cancer Research (WHO/IARC) Group 1, ***known*** carcinogen classification [along with asbestos and cigarette smoke]. Dr. Hardell's work was used by the WHO/IARC to reach a near unanimous Group 2b, ***possible*** carcinogen classification in 2011.
Brain cancer: French case-control study #10	Higher cancer incidence among earliest and heaviest mobile phone users; findings are consistent with Hardell's group's work
Breast cancer: #35	USA case report of four (4) young women with no familial history of breast cancer in the precise location where they tucked their cell phones in their bras
Acoustic Neuroma: #19 Benign tumour on 8th cranial nerve	Confirmation of previous studies of an association with mobile/cordless phone use
Infertility: #21	Review found adverse effects. Conclusion: "... men should not keep mobile phone in their trouser pockets or near testicles to avoid potential harmful effect..."
Children: Attention Hyperactivity Deficit Disorder (ADHD) #6	Association with mobile phone use among children with higher lead levels
Children: 7 years in age #13	Behavioural problems associated with prenatal exposure
Electrohypersensitivity (EHS):#11	Laboratory tests: thyroid and liver dysfunction, chronic inflammation

II Biological effects below Safety Code 6 SAR for the head, neck and trunk (1.6 W/kg)

Human, animal and cell culture studies



III Biological effects below Safety Code 6 SAR for whole body (0.08) W/kg

Human, animal and cell culture studies

%SC6	BIOLOGICAL EFFECTS	%SC6	BIOLOGICAL EFFECTS
1%	Brain: single strand DNA breaks #12	21%	Thyroid: cell stress #28
1%	Brain: oxidative stress, cognitive impairment, inflammation #27	38%	New born decreased body weight, effects on biochemistry #15
20%	Brain nerve development: increase in damaged cells #3	63%	Brain: dopamine and serotonin changes, impaired behaviour # 25
20%	Brain: cell loss, decrease in Purkinje cells #32	75%	Liver: DNA strand breaks #15

IV Other studies

Other studies (n=10): All >SC6. All showed effects. #5, 8, 9, 14, 20, 26, 29, 31, 34, 36.

References for the thirty-six (36) studies considered by Health Canada to be "in-scope" for Safety Code 6 Risk Assessment

(See previous page for a summary of the potentially harmful effects reported in these studies.)

Health Canada ignored all of this evidence-based information although it admitted that these studies met their criteria for risk assessment. No weight-of-evidence analysis was provided; it is unknown why they were rejected for inclusion in the last revision of Safety Code 6 (2015).

Name of first author, title, journal and country of first author (in brackets).

1. Ammari (2010). **GFAP [Glial Fibrillary Acidic Protein] expression in the rat brain following sub-chronic exposure to a 900 MHz electromagnetic field signal.** *International Journal of Radiation Biology*, (**France**)
2. Augner (2010). **Effects of Exposure to GSM Mobile Phone Base Station Signals on Salivary Cortisol, Alpha-Amylase, and Immunoglobulin A.** *Biomedical and Environmental Sciences.* (**Austria**)
3. Bas (2009) **900 MHz electromagnetic field exposure affects qualitative and quantitative features of hippocampal pyramidal cells in the adult female rat**. *Brain Research.* (**Turkey**)
4. Belyaev (2009). **Microwaves from Mobile Phones Inhibit 53BP1 Focus Formation in Human Stem Cells Stronger than in Differentiated Cells: Possible Mechanistic Link to Cancer Risk**. *Environmental Health Perspectives*. (**Sweden**)
5. Bouj (2012). **Effects of 900 MHz radiofrequency on corticosterone, emotional memory and neuroinflammation in middle-aged rats.** *Experimental Gerontology*, *47*(6). (**France**)
6. Byun (2013**). Mobile phone use, blood lead levels, and attention deficit hyperactivity symptoms in children: a longitudinal study**. *PloS One*. (**Korea**)
7. Carballo-Quintás (2011). **A study of neurotoxic biomarkers, c-fos and GFAP after acute exposure to GSM radiation at 900 MHz in the picrotoxin model of rat brains.** *Neurotoxicology.* (**Spain**)
8. Cervellati (2013). **17-β-estradiol counteracts the effects of high frequency electromagnetic fields on trophoblastic connexins and integrins.** *Oxidative Medicine and Cellular Longevity.* (**Italy**)
9. Céspedes (2010). **Radio frequency magnetic field effects on molecular dynamics and iron uptake in cage proteins.** *Bioelectromagnetics*, (**Japan**)
10. Coureau (2014). Mobile **phone use and brain tumours in the CERENAT case-control study**. *Occupational and Environmental Medicine* (**France**)
11. Dahmen, (2009). **Blood laboratory findings in patients suffering from self-perceived electromagnetic hypersensitivity (EHS).** *Bioelectromagnetics.* (**Germany**)
12. Deshmukh (2013**). Detection of Low Level Microwave Radiation Induced Deoxyribonucleic Acid Damage Vis-à-vis Genotoxicity in Brain of Fischer Rats**. *Toxicology International* (**India**)
13. Divan (2010). **Cell phone use and behavioural problems in young children.** *Journal of Epidemiology & Community Health***. (USA-Denmark data**)
14. Esmekaya (2011). 900 **MHz pulse-modulated radiofrequency radiation induces oxidative stress on heart, lung, testis and liver tissues**. *General Physiology and Biophysics*. (**Turkey**)
15. Furtado-Filho (2014). **Effect of 950 MHz UHF electromagnetic radiation on biomarkers of oxidative damage, metabolism of UFA and antioxidants in the livers of young rats of different ages**. *International Journal of Radiation Biology* (**Brazil**)
16. Grigoriev (2010). **Confirmation studies of Soviet research on immunological effects of microwaves: Russian immunology results**. *Bioelectromagnetics.* (**Russia**)
17. Hardell (2013a). **Using the Hill viewpoints from 1965 for evaluating strengths of evidence of the risk for brain tumors associated with use of mobile and cordless phones**. *Reviews on Environmental Health*. (**Sweden**)

18. Hardell (2011). **Re-analysis of risk for glioma in relation to mobile telephone use: comparison with the results of the Interphone international case-control study**. *International Journal of Epidemiology.* (**Sweden**)

19. Hardell (2013). **Pooled analysis of case-control studies on acoustic neuroma diagnosed 1997-2003 and 2007-2009 and use of mobile and cordless phones**. *International Journal of Oncology.* (**Sweden**)

20. Liaginskaia. (2010). **[Autoimmune processes after long-term low-level exposure to electromagnetic fields (the results of an experiment). Part 5. Impact of the blood serum from rats exposed to low-level electromagnetic fields on pregnancy, foetus and offspring development of intact female rats**]. *Radiatsionnaia biologiia, radioecologiia / Rossiĭskaia akademiia nauk* (**Russia**)

21. Liu (2014) **Association between mobile phone use and semen quality: a systemic review and meta-analysis**. *Andrology*. (**China**)

22. Loos (2013). **Is the effect of mobile phone radiofrequency waves on human skin perfusion non-thermal?** *Microcirculation* (**France**)

23. Lu (2012). **Glucose administration attenuates spatial memory deficits induced by chronic low-power-density microwave exposure**. *Physiology & Behavior.* (**China**)

24. Lv (2013). **The alteration of spontaneous low frequency oscillations caused by acute electromagnetic fields exposure**. *Clinical Neurophysiology: Official Journal of the International Federation of Clinical Neurophysiology*. (**China**)

25. Maaroufi (2013). **Spatial learning, monoamines and oxidative stress in rats exposed to 900MHz electromagnetic field in combination with iron overload**. *Behavioural Brain Research.* (**France**)

26. Maskey (2010). **Effect of 835 MHz radiofrequency radiation exposure on calcium binding proteins in the hippocampus of the mouse brain**. *Brain Research.* (**South Korea**)

27. Megha (2012**). Microwave radiation induced oxidative stress, cognitive impairment and inflammation in brain of Fischer rats**. *Indian Journal of Experimental Biology.* (**India**)

28. Misa Agustiño (2012). **Electromagnetic fields at 2.45 GHz trigger changes in heat shock proteins 90 and 70 without altering apoptotic activity in rat thyroid gland**. *Biology Open* (**Spain**)

29. Moretti (2013). **In-vitro exposure of neuronal networks to the GSM-1800 signal.** *Bioelectromagnetics* (**France**)

30. Nazıroğlu (2012). **Melatonin modulates wireless (2.45 GHz)-induced oxidative injury through TRPM2 and voltage gated Ca(2+) channels in brain and dorsal root ganglion in rat**. *Physiology & Behavior.* (**Turkey**)

31. Ni (2013). **Study of oxidative stress in human lens epithelial cells exposed to 1.8 GHz radiofrequency fields.** *PloS On* (**China**)

32. Sonmez (2010). **Purkinje cell number decreases in the adult female rat cerebellum following exposure to 900 MHz electromagnetic field.** *Brain Research.* (**Turkey**)

33. Souza (2014). **Assessment of nuclear abnormalities in exfoliated cells from the oral epithelium of mobile phone users.** *Electromagnetic Biology and Medicine.* (**Brazil**)

34. Valbonesi (2014). **Effects of the exposure to intermittent 1.8 GHz radio frequency electromagnetic fields on HSP70 expression and MAPK signaling pathways in PC12 cells**. *International Journal of Radiation Biology* (**Italy**)

35. West (2013). **Multifocal breast cancer in young women with prolonged contact between** their breasts and their cellular phones. *Case Reports in Medicine*. (**USA**)

36. Zhang (2013). **Effects of 1.8 GHz radiofrequency radiation on protein expression in human lens epithelial cells.** *Human & Experimental Toxicology.* (**China**)

APPENDIX 8 – Action Tools

Below are tools to help you take action.

The Suspend 5G Appeal

One of the most important tools to bring about positive actions from the Canadian government is the *Suspend 5G Appeal*. It contains our "demands" (or, as we prefer to say as polite Canadians, "our requests") as well as references to back up what we are saying.

> **Urgent Appeal to the Government of Canada to Suspend the 5G Rollout and to Choose Safe and Reliable Fibre Connections**
> https://www.appel5gappeal.ca/

MATERIALS DEVELOPED BY C4ST

The documents listed in this section are currently being developed by C4ST. We plan to have the links become live by June 1, 2022.

- **Key Messages** to rally our forces around
  https://docs.c4st.org/PubEngage/Take-Action-Tools/C4ST-Key-Messages-2022.pdf

TO RAISE AWARENESS IN YOUR COMMUNITY (with the general public)

- sample flyer
  https://docs.c4st.org/PubEngage/Take-Action-Tools/Sample-flyer.pdf
- sample email message or letter
  https://docs.c4st.org/PubEngage/Take-Action-Tools/Sample-email-to-your-community.doc
- sample PPT presentation
  https://docs.c4st.org/PubEngage/Take-Action-Tools/Sample-PPT-for-community.ppt

TO ENGAGE YOUR MEMBER OF PARLIAMENT

- one-page summary of main points to make to your MP
  https://docs.c4st.org/PubEngage/Take-Action-Tools/Main-points-to-make-to-MP.pdf
- list of things that he/she can do
  https://docs.c4st.org/PubEngage/Take-Action-Tools/Suggested-actions-for-MP.pdf
- sample letter to your MP
  https://docs.c4st.org/PubEngage/Take-Action-Tools/Sample-letter-to-MP.docx
- sample PPT presentation *(coming soon)*
  https://docs.c4st.org/PubEngage/Take-Action-Tools/Sample-PPT-for-MP.ppt

MATERIALS DEVELOPED BY C4ST (CONTINUED)

TO ENGAGE YOUR LOCAL TOWN COUNCIL

- one-page summary of main points to make to your town council https://docs.c4st.org/PubEngage/Take-Action-Tools/Main-points-to-make-to-Council.pdf
- list of things that they can do https://docs.c4st.org/PubEngage/Take-Action-Tools/Suggested-actions-for-Council.pdf
- sample letter to your town council https://docs.c4st.org/PubEngage/Take-Action-Tools/Sample-letter-to-Council.docx
- sample PPT presentation https://docs.c4st.org/PubEngage/Take-Action-Tools/Sample-PPT-for-Council.ppt

TO APPROACH TELECOMMUNICATIONS COMPANIES

- Sample letter of non-consent with questions https://docs.c4st.org/PubEngage/Take-Action-Tools/Sample-letter-non-consent.docx

MATERIALS DEVELOPED BY OTHERS

PRESENTATIONS

Presentations made by others to their community.

- **5G Cell "Towers" in Winnipeg Neighbourhoods. Health Risks and Science Overview:** https://www.youtube.com/watch?v=Z9JQyemPsHo

- **The Right to a Healthy Environment: RF Radiation Exposure from Cell Towers:** Presentation to Healthy Saanich Advisory Committee by Katharina Gustavs on behalf of concerned citizens of Cadboro Bay – May 20, 2015 https://segex.ca/wp-content/uploads/2020/03/GUSTAVS-Katharina-2015MAY20_Saanich_Microcell_Antenna_Presentation_2.pdf

Presentations to Politicians

- City of Winnipeg, Standing Committee - Property Development, Heritage and Downtown Development – Item 22. Review of the Winnipeg Antenna Siting Policy – 5G Network: Margaret Friesen at 2:54 hours http://clkapps.winnipeg.ca/dmis/ShowVideo.asp?DocId=19038

- City of Winnipeg - Standing Policy Committee on Innovation and Economic Development Video. February 10, 2020 - Regular Meeting. Item 2: Review of the Winnipeg Antenna Siting Policy – 5G Network:
Margaret Friesen: Lyle Barkman followed by questions of Councillors to City staff. http://clkapps.winnipeg.ca/dmis/ShowVideo.asp?DocId=19278

MATERIALS DEVELOPED BY OTHERS (CONTINUED)

OP-EDS / LETTERS TO THE EDITOR

Op-Eds / Letters to the Editor written by others to their local media.

- **"Winnipeg should be cautious of 5G antennas":**
  https://www.winnipegfreepress.com/opinion/analysis/winnipeg-should-be-cautious-about-5g-antennas-564489772.html

- **"Open letter to Valérie Plante: Acting as a Caring Mayor"**
  Written by Pascal Gélinas, documentary filmmaker and longtime producer of two popular Radio-Canada television series on science (Science-Réalité, Découverte), this open letter was addressed to Valérie Plante, Mayor of Montréal, during the November 2021 municipal election. It was published in 6 French Québec newspapers during the election campaign.

  Original French version as published in one of the papers:
  https://www.lesoleil.com/opinions/lettre-ouverte-a-valerie-plante-agir-en-bonne-maire-de-famille-7abb0dac408993bd0054975df9da0cb3

  English translation:
  http://www.cqlpe.ca/pdf/OpenLetterPlante.pdf?fbclid=IwAR1lIDf57EPo6fj5S9XMcg5GIf55-LXuxPNpZilqbrRkPo-pZTZyyGSAjwE

PETITIONS

Examples of petitions that you can use as models for your own.
(Oh, and do sign them while you are there!)

- **Kingston**
  Online: https://www.change.org/p/city-of-kingston-stop-5g-small-cells-in-kingston?recruiter=965464622&utm_source=share_petition&utm_medium=copylink

  Hard copy: https://img1.wsimg.com/blobby/go/d2d6c20a-fd5c-49d9-a244-07815c43f87c/downloads/Stop%205G%20petition%20-%20Kingston%20-%20Sept%209-19.pdf?ver=1579063674621

- **Montréal --** 5G IN MONTREAL: ONE G TOO MANY!
  https://www.change.org/p/5g-in-montreal-one-g-too-many

- **Winnipeg:**
  Online: https://5gwinnipegawareness.ca/
  Hard copy: https://img1.wsimg.com/blobby/go/14b5189a-1884-439c-92a5-c3f96dc79377/downloads/v35Wpg%20FINAL%205G%20PETITION%20WINNIPEG%203DEC2019.pdf?ver=1579298777332

OTHER

Call to Action to Limit Microcells (British Columbia) has put together a Tool Kit for Activists which contains a plethora of useful templates for letters, petitions and more:
https://thecalm.ca/tool-kit/spread-the-word/letters/letter-templates

USEFUL DOCUMENTS

C4ST Publications

C4ST Fact-checks Government of Canada Webpages Regarding Health Risks and Wireless Technologies, including 5G
Online Fact-Checker: https://www.appel5gappeal.ca/eng/fact-checker.php
Full document as a pdf: docs.c4st.org/C4STdocs/C4ST-Factchecks-GoC-websites.pdf

Engaging Your Member of Parliament (MP) about 5G. C4ST's Suggestions & Facts You Can Use to Reply to Your MP Regarding the Suspend 5G Canada Appeal.
docs.c4st.org/PubEngage/Take-Action-Tools/Engaging-MPs-about-5G.pdf

C4ST Wireless Safety Tips
docs.c4st.org/PubEngage/Take-Action-Tools/Wireless-Safety-Tips-English.pdf

How to Stop a Cell Tower in Canada. A Toolkit. DRAFT 1.
https://c4st.org/wp-content/uploads/docs/C4STdocs/How-To-Stop-A-Cell-Tower-In-Canada-Toolkit-2021-10-17_Draft1.pdf

Auditor General Environmental Petitions and Government of Canada Replies regarding Radiofrequency/microwave Radiation Related to Health Canada's Safety Code 6
https://docs.c4st.org/C4STdocs/C4ST-Compendium-22-Auditor-General-Env-Petitions-Government-of-Canada-Replies-RF-MW-SC6-651-pages.pdf

Auditor General Environmental Petition #456.
Title on the Auditor General Environmental Petition website:
"The Government of Canada's rigour and transparency in evaluating the science regarding localized exposures to 5G technologies in its update of Safety Code 6"

Original title as submitted: "Concerns regarding the Government of Canada rigour and transparency in evaluation of the science in its update of Safety Code 6 for the range of 6 GHz to 300 GHz, regarding localized exposures to 5G technologies"
https://c4st.org/wp-content/uploads/docs/GovRelations/Fed/Health-Canada/5G_Petition_and_Government_Response.pdf

C4ST Videos

Frank Clegg, CEO of Canadians for Safe Technology (C4ST), introducing the Appeal to the Government of Canada to suspend the 5G rollout and to choose safe and reliable fibre connections: https://www.youtube.com/watch?v=xW7BbztmuYg

Frank Clegg, CEO, C4ST, interviewed by veteran Canadian journalist Rodney Palmer, former CTV foreign correspondent and CBC investigative reporter:
https://youtu.be/4LLXdryhW30

Federal Government Publications

Government of Canada, Industry Canada. (2014). CPC-2-0-03 — Radiocommunication and Broadcasting Antenna Systems https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf08777.html#sec4.1.

Government of Canada, Industry Canada. (2014, June 26). DGSO-002-14 — Decision on Amendments to Industry Canada's Antenna Tower Siting Procedures [Consultation Reports]. https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10840.html

Government of Canada, Industry Canada. (2014). Guide to Assist Land-use Authorities in Developing Antenna System Siting Protocols. *Spectrum Management and Telecommunications*, (2), 10. https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf10860.html.

Health Canada. "Limits of Human Exposure to Radiofrequency Electromagnetic Energy in the Frequency Range from 3 KHz to 300 GHz. Safety Code 6 (2015). https://www.canada.ca/en/health-canada/services/publications/health-risks-safety/limits-human-exposure-radiofrequency-electromagnetic-energy-range-3-300.html

Health Canada, Complement to Safety Code 6 (2015). "Notice: Localized Human Exposure Limits for Radiofrequency Fields in the Range of 6 GHz to 300 GHz." February 1, 2021. https://www.canada.ca/en/health-canada/services/health-risks-safety/radiation/types-sources/radiofrequency-fields/notice-localized-human-exposure-limits-range-6-ghz-300-ghz.html

Relating to Canadian Municipal Situations

Antenna System Siting Protocol Template:
https://thecalm.ca/ufaqs/creating-protective-antenna-siting-protocols

CRTC: Telecom Decision CRTC 2019-316. Ottawa, 6 September 2019
Public record: 8690-V81-201703231
City of Gatineau – Terms and conditions of a municipal access agreement with certain carriers
https://crtc.gc.ca/eng/archive/2019/2019-316.htm

APPENDIX 9

URGENT APPEAL TO THE GOVERNMENT OF CANADA TO SUSPEND THE 5G ROLLOUT AND TO CHOOSE SAFE AND RELIABLE FIBRE CONNECTIONS

MAY 14, 2020

If recent events have shown us anything, it is that our health is what matters most,
late responses to early warnings of potential harm are costly ...
and we need the Internet!

The telecommunications industry is rushing to deploy 5G across Canada,
with no prior health and environmental impact assessment,
without fully understanding the economic consequences,
and without informed consent.

Full 5G rollout will require the installation of hundreds of thousands[1]
of new antennas throughout the country on cell towers, hydro poles, lamp posts,
buildings and other structures, often within a few metres of where we live and work.

Canadians are largely unaware of the risks of chronic exposure to
radiofrequency (RF) radiation emitted by cell tower antennas, small cell antennas,
cellphones[2], cordless phones, and Wi-Fi and Bluetooth devices such as tablets, laptops,
baby monitors, wireless printers/keyboards/mice, gaming consoles, virtual reality
headsets, wearables, "smart" appliances, and utility meters.

RF radiation is scientifically demonstrated to cause or contribute to
numerous health effects, including cancers, sperm damage, reproductive harms,
learning and memory deficits, and neurodegenerative, cellular and genetic damage.

We rely on the government to ensure our safety.
To date, Health Canada and other Ministries have let us down.

We urge Canadians to appeal to the Government of Canada to "look before we leap,"
to immediately suspend any further 5G rollout, and
to press for a safer, more cost-effective and secure alternative —
namely fibre optic and wired connections to every home and business.

SIGN THE APPEAL at appel5Gappeal.ca

This Appeal is available online in English and in French at c4st.org/5Gappeal.
La version française de cet Appel est disponible à www.stopponsla5G.ca/appel.

URGENT APPEAL TO THE GOVERNMENT OF CANADA

TO SUSPEND THE 5G ROLLOUT AND TO CHOOSE SAFE AND RELIABLE FIBRE CONNECTIONS

This Appeal was jointly developed by the following Canadian organizations:

C4ST
CANADIANS FOR SAFE TECHNOLOGY
CANADIENS POUR UNE TECHNOLOGIE SÉCURITAIRE

PREVENT CANCER NOW

Stoppons la 5G
Vivons sans danG

(((5G))) Winnipeg Awareness!

EPIC electromagnetic pollution illnesses Canada foundation

CALM 5G or safeG? The Choice is Yours Call to Action to Limit Microcells

electrosensitive society

coalition TO STOP "SMART" METERS
www.stopsmartmetersbc.ca

Canadian organizations supporting this Appeal at launch (May 14, 2020):

5G Winnipeg Awareness [MB]
Albertans for Safe Technology [AB]
CALM - Call to Action to Limit Microcells [Canada-wide]
Canadians for Safe Technology / Canadiens pour une technologie sécuritaire (C4ST)
Canadians for Safe Technology (C4ST) Youth Riding Reps [ON]
Citizens Against the Proliferation of Cell Antennas in the Eastern Townships [QC]
Coalition to Reduce Electropollution (CORE) [BC]
Coalition to Stop Smart Meters [BC]
Electrosensitive Society [Canada-wide]
Environmental Health Association of Manitoba [MB]
EPIC - Electromagnetic Pollution Illnesses Canada Foundation
Kingstonians for Safe Technology [ON]
Let's Connect Salt Spring [BC]
Let's Stop 5G – Let's Live Safely campaign / Campagne Stoppons la 5G – Vivons sans danG [QC]
Parents for Safe Schools [BC]
Prevent Cancer Now (PCN) [Canada-wide]
Rassemblement ÉlectroSensibilité Québec (RESQ) [QC]
Stop 5G Magog-Sherbrooke [QC]
Stop 5G Montréal [QC]
Stop 5G Rimouski [QC]
Stop 5G Sutton [QC]
Stop 5G Val-David [QC]
Transition Wolfville Area [NS]
WEEP - The Canadian Initiative to Stop Wireless Electrical and Electromagnetic Pollution

WHEREAS:

1. All Canadians need safe, fast, reliable, energy-efficient, secure and affordable Internet access.

a. **Connectivity with wires, and in particular fibre optic cable (fibre), is the best means to fulfill this need.** Fibre does not emit radiofrequency (RF) radiation that is harmful; fibre is at least 100 times faster,[3] more reliable, secure and resilient[4] and is far more protective of privacy[5,6] than wireless connectivity;[7]

b. **Wireless technologies emit harmful RF radiation, have a much larger carbon footprint than wired technologies**, rely on rare minerals,[8] and the Institute of Electrical and Electronics Engineers (IEEE) published that, "Wireless technologies will continue to consume at least 10 times more power than wired technologies";[9]

c. **The economic burden of wireless technologies has never been evaluated.**[10] While the benefits have been widely discussed, the actual costs – increasing healthcare costs,[11] lost productivity related to adverse health effects from RF radiation exposure, costs engendered by security[12] and privacy breaches,[13] environmental damage,[14,15] and the foreseeable impacts to safety and property from the degradation of weather forecast accuracy[16] – have never been assessed to determine if they outweigh the benefits.[17]

2. Canadians expect their government to protect their health and the environment.

a. **There has been no testing to ensure that 5G technology is safe for humans and the environment;**[18,19]

b. **Health Canada's *Safety Code 6*,**[20] **the exposure guidelines for human exposure to RF radiation, does not protect Canadians' health,**[21,22,23,24] **nor does it address environmental safety.** Canada's guidelines lag behind those of many other countries.[25] Health Canada's process to update *Safety Code 6* (in 2015) was deeply flawed,[26,27] and exposure limits are based on the outdated premise that RF radiation causes harm only at exposure levels that produce excessive heat.[28,29,30] Hundreds of peer-reviewed scientific publications describe biological effects and harms with exposures far below Canada's limits, in humans, plants, laboratory animals and wildlife such as birds and pollinators;[31,32,33,34]

c. **Wireless transmitters emit RF radiation, which is scientifically demonstrated to cause or contribute to numerous health effects** including cancers,[35,36] sperm damage,[37] reproductive harms,[38] learning and memory deficits,[39] and neurodegenerative, cellular and genetic damage.[40,41,42] A growing number of Canadians also experience immediate and debilitating health problems (that could be prevented) such as headaches, irregular heartbeats, cognitive difficulties and insomnia, resulting in poor quality of life.[43] All Canadians are susceptible to developing such health issues, unless their ever-increasing exposure to RF radiation is curtailed;

d. **Scientists report environmental harms to birds,**[44,45] **pollinators,**[46] **trees**[47] **and other species;**[48,49] however, there are no environmental guidelines for RF radiation;[50]

e. **The default in Canada is for most of our wireless devices and antennas to be "always on," i.e., transmitting;**

f. **In 2015, the House of Commons Standing Committee on Health (HESA) published a report** entitled *Radiofrequency Electromagnetic Radiation and the Health of Canadians.*[51] Its 12 recommendations (listed on page 8 of this Appeal) addressed several of the issues mentioned above, and included a national awareness campaign about the harmful effects of wireless technologies and how to reduce risks. The report received all-party support and was tabled by the Conservative (2015) and Liberal (2016) majority governments. In 2010, a similar report was published.[52] None of the recommendations have been implemented.[53,54]

3. Canadians expect and deserve a transparent public consultation process to choose telecommunications infrastructure.

a. **There are no requirements for Canadians to be consulted**[55] when cell antennas are added to existing structures (towers, buildings, lamp posts or hydro poles close to our homes); and municipalities do not have to be notified unless the municipality owns the structure. As for new towers, the public and the municipality must be consulted; however, the public consultation is carried out by the telecommunication company and is inadequate. Telecommunication companies, regarding health and radiofrequency emissions, say that they comply with *Safety Code 6*. Further, if a municipality is opposed to the installation of a cell tower, the federal government can legally override that refusal.[56] Recently, the 2020 report of the Broadcasting and Telecommunications Legislative Review Panel recommends giving the federal government even greater control over where antennas are placed in Canada;[57]

WE, THE CITIZENS AND RESIDENTS OF CANADA, URGENTLY APPEAL TO THE GOVERNMENT OF CANADA TO:

1. Ensure all Canadians can have Internet access that is safe, fast, reliable, resilient, secure, affordable and, in the long term, the most environmentally and economically sound for Canada:

a. **Require all telecommunications providers to provide fibre to the premises (FTTP)** that can connect to wireline equipment in the premises, and to not replace existing wired telephone and Internet services with wireless;

b. **Invest in wired technologies, instead of wireless and satellite options,** to expand high-speed Internet in communities underserved by the private sector across Canada;

c. **Complete an economic analysis, by the end of 2021, of the incremental revenue from 5G versus the total potential economic burden.** This would include, but not be limited to: increased healthcare costs; lost productivity arising from adverse health effects; security and privacy breaches; damage to the environment; and risks to safety and property including those resulting from degraded weather forecast accuracy;

d. **Immediately suspend the installation of new antennas**, especially "small cell" antennas near homes, hospitals, schools, public buildings and sensitive wildlife habitats, until safety guidelines have been appropriately revised and implemented, and until the total economic implications are understood;

e. **Immediately suspend the auctioning and transferring of all spectrum licences**, until safety guidelines have been appropriately revised and implemented, and until the total economic implications are understood;

2. Protect Canadians' health and the environment *before further rollout of wireless infrastructure*, including 5G:

a. **Implement the 12 recommendations** (listed on page 8 of this Appeal) in the House of Commons Standing Committee on Health (HESA) 2015 report *Radiofrequency Electromagnetic Radiation and the Health of Canadians*;

b. **Revise Health Canada's *Safety Code 6***. A truly independent panel with appropriate expertise must systematically review the scientific evidence of the effects of RF radiation. This requires rigorous scientific methods, transparency, full public consultation from initial scoping throughout the process, and health-protective precautionary interpretation of findings;

c. **Establish binding guidelines to protect wildlife and the environment from RF radiation using a similar process;**

d. Building on the regulation of chemicals, **shift the burden of proof to the telecommunications and wireless technology industries**, and require that they prove that their products are not harmful to Canadians or to the environment;

e. **Ensure Canadians' indoor and outdoor exposure to RF radiation from wireless technologies is kept as low as possible** (ALARA or "as low as reasonably achievable") through proper regulation, monitoring, enforcement and ongoing public education and technical device management. One of many examples would be to require that all wireless devices and antennas not transmit (i.e., not emit radiation) when not in use.

3. Provide a meaningful, transparent process for municipalities and their citizens to have a decisive say over the installation of cellular network antennas.

a. **Provide a meaningful, transparent process for municipalities and their citizens to have a decisive say over whether and where cellular network antennas are installed,** on either towers or non-tower structures (e.g., lamp posts, hydro poles and buildings). Informed public participatory consultation and local decision-making regarding current and future antenna siting would replace the broad powers currently resting with the Minister of Innovation, Science and Economic Development Canada (ISED).

Endnotes begin on the next page, followed by the 12 recommendations in the House of Commons Standing Committee on Health (HESA) 2015 report "Radiofrequency Electromagnetic Radiation and the Health of Canadians."

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Endnotes

[1] There are currently 764,581 transmitters in Canada according to the Innovation, Science and Economic Development (ISED) Spectrum Management System database (as of April 3, 2020). 5G network infrastructures will require a much greater cell density. http://sms-sgs.ic.gc.ca/eic/site/sms-sgs-prod.nsf/eng/h_00010.html - https://www.itworldcanada.com/article/everything-you-need-to-know-about-5g/416498

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THE 12 RECOMMENDATIONS*

in the House of Commons Standing Committee on Health (HESA) 2015 report "Radiofrequency Electromagnetic Radiation and the Health of Canadians"

https://www.ourcommons.ca/Content/Committee/412/HESA/Reports/RP8041315/hesarp13/hesarp13-e.pdf

1.	That the Government of Canada, in collaboration with the health departments of the provinces and territories, examine existing cancer data collection methods to improve the collection of information relating to wireless device use and cancer.
2.	That Statistics Canada consider including questions related to electromagnetic hypersensitivity in the Canadian Community Health Survey.
3.	That the Government of Canada, through the Canadian Institutes of Health Research, consider funding research into electromagnetic hypersensitivity testing, diagnosis and treatment, and its possible impacts on health in the workplace.
4.	That the Canadian Medical Association, the Royal College of Physicians and Surgeons, the College of Family Physicians of Canada and the World Health Organization consider updating their guidelines and continuing education materials regarding the diagnosis and treatment of electromagnetic hypersensitivity to ensure they are based on the latest scientific evidence and reflect the symptoms of affected Canadians.
5.	That the Government of Canada continue to provide reasonable accommodations for environmental sensitivities, including electromagnetic hypersensitivity, as required under the Canadian Human Rights Act.
6.	That Health Canada ensure the openness and transparency of its processes for the review of Safety Code 6, so that all Canadians have an opportunity to be informed about the evidence considered or excluded in such reviews, that outside experts are provided full information when doing independent reviews, and that the scientific rationale for any change is clearly communicated.
7.	That the Government of Canada establish a system for Canadians to report potential adverse reactions to radiofrequency fields.
8.	That an independent scientific body recognized by Health Canada examine whether measures taken and guidelines provided in other countries, such as France and Israel, to limit the exposure of vulnerable populations, including infants, and young children in the school environment, to radiofrequencies should be adopted in Canada.
9.	That the Government of Canada develop an awareness campaign relating to the safe use of wireless technologies, such as cell phones and Wi-Fi, in key environments such as the school and home to ensure that Canadian families and children are reducing risks related to radiofrequency exposure.
10.	That Health Canada conduct a comprehensive review of all existing literature relating to radiofrequency fields and carcinogenicity based on international best practices.
11.	That the Government of Canada, through the Canadian Institutes of Health Research, consider funding research into the link between radiofrequency fields and potential health effects such as cancer, genetic damage, infertility, impairment to development and behaviour, harmful effects to eyes and on the brain, cardiovascular, biological and biochemical effects.
12.	That the Government of Canada and manufacturers consider policy measures regarding the marketing of radiation emitting devices to children under the age of 14, in order to ensure they are aware of the health risks and how they can be avoided.

* In 2015, the House of Commons Standing Committee on Health (HESA) held hearings that included invited testimony and briefs from Canadian and international experts. In its report, HESA made these important recommendations that still await action.