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## Rural Broadband Deployment

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Dillan Theckedath  
Terrence J. Thomas

**Revised by Sarah Lemelin-Bellerose**

Economics, Resources and International Affairs Division  
Parliamentary Information and Research Service

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*Rural Broadband Deployment*  
(In Brief)

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## CONTENTS

1	INTRODUCTION.....	1
2	THE DIGITAL DIVIDE .....	1
3	CANADIAN DEMOGRAPHICS AND BROADBAND ACCESS.....	3
4	FEDERAL GOVERNMENT POLICY.....	4
5	CURRENT TECHNOLOGY.....	5
6	CONCLUSION .....	7
APPENDIX A – POPULATION DENSITIES AND URBANIZATION (SELECTED COUNTRIES)		



# RURAL BROADBAND DEPLOYMENT

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## 1 INTRODUCTION

High-speed Internet (or broadband)<sup>1</sup> is integral to the lives of many Canadians who use it for banking, shopping, education and entertainment. Furthermore, governments at all levels are offering more and more services online. Broadband Internet has an increased importance in rural areas. It makes available a variety of essential services, such as education and medical services, that people living in rural and remote areas would often be unable to access otherwise.

In December 2016, the Canadian Radio-television and Telecommunications Commission (CRTC) declared that broadband Internet access is a basic telecommunications service for all Canadians and set the following targets for the basic services that Canadians need to participate in the digital economy:

- speeds of 50 megabits per second (Mbps) download/10 Mbps upload for fixed broadband Internet access services (often expressed numerically as 50/10 Mbps);
- an unlimited data option for fixed broadband access services; and
- the latest mobile wireless technology available not only in all homes and businesses, but also along major Canadian roads.<sup>2</sup>

Because Canada's population is unevenly distributed over a vast landscape – most Canadians live in cities along the border with the United States – connectivity across the country is unequal. Urban Canadians have access to a wide variety of Internet services, while those living in rural or remote areas have limited or no access to broadband because building broadband networks is extremely expensive. Their cost-effectiveness is highly dependent on the population density of the market. This gulf in connectivity between urban and rural areas, often referred to as the “digital divide,” has become a policy concern for all levels of government.

## 2 THE DIGITAL DIVIDE

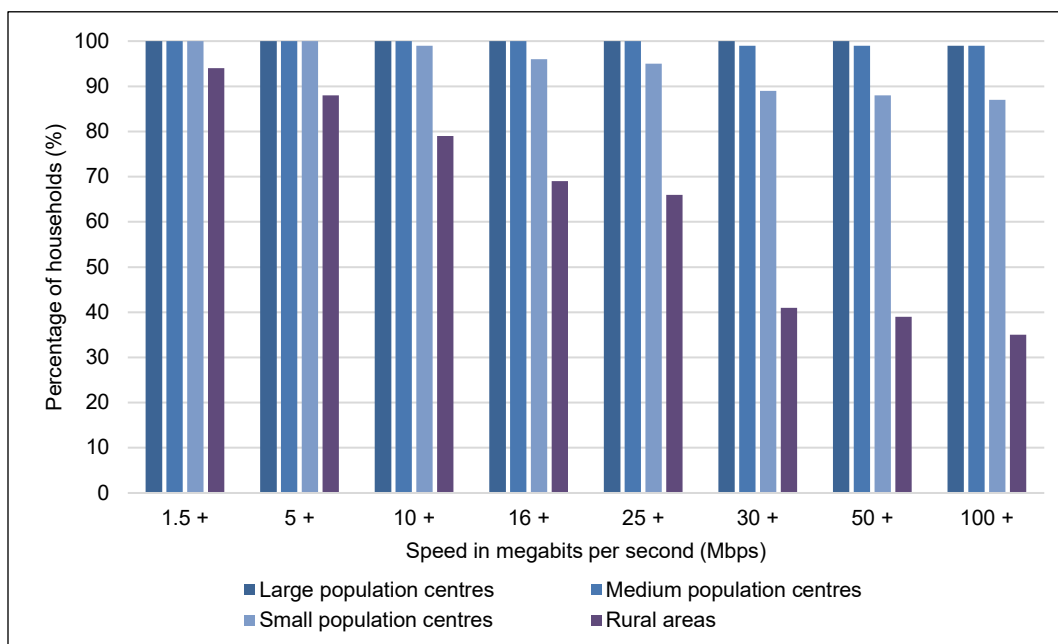
A digital divide separates those who use broadband from those who do not. There are two main categories of digital divide: the technical digital divide and the socio-economic digital divide. The technical digital divide refers to accessibility or the technical ability to have a broadband connection. Although there may be areas in cities (or on the urban-suburban fringe) with no access to broadband, the “technical digital divide” generally refers to the gap between urban and rural or remote areas.

The socio-economic digital divide focuses on factors independent of where people live, such as age, income, education, language or gender. Bridging the socio-economic digital divide is important in establishing an inclusive digital society; however, this paper focuses on the fundamental issue of bridging the technical divide between urban and rural and remote populations.

Figure 1 shows the urban/rural split for broadband availability in Canada, while Table 1 shows broadband availability in each province and territory.

## RURAL BROADBAND DEPLOYMENT

**Figure 1 – Broadband Availability: Urban Versus Rural Areas, 2017**



Source: Figure prepared by the authors using data obtained from Canadian Radio-television and Telecommunications Commission, [Communications Monitoring Report 2018](#), 2019.

**Table 1 – Broadband Availability, by Speed and Province/Territory, 2017  
(% of households)**

Province/Territory	5+ Mbps	10+ Mbps	16+ Mbps	25+ Mbps	50+ Mbps	50/10 Mbps and unlimited data transfer <sup>a</sup>
British Columbia	97.6	96.7	94.5	94.3	92.8	91.0
Alberta	99.2	98.1	95.9	94.4	82.8	80.3
Saskatchewan	94.6	87.1	77.1	75.3	53.5	45.4
Manitoba	98.0	96.1	94.9	94.6	70.9	69.8
Ontario	98.3	96.4	94.5	93.5	87.4	86.9
Quebec	98.1	96.2	93.3	92.5	88.9	88.5
New Brunswick	94.3	91.9	91.9	91.9	81.2	81.2
Nova Scotia	87.4	83.4	79.1	79.1	78.7	77.8
Prince Edward Island	93.4	87.7	87.7	87.7	59.8	59.8
Newfoundland and Labrador	89.0	80.8	80.7	78.1	70.9	70.9
Yukon	90.5	84.2	60.8	60.8	60.8	0
Northwest Territories	97.7	93.6	53.7	53.7	53.7	0
Nunavut	29.9	0	0	0	0	0
Canada	97.5	95.4	92.8	92.0	85.4	84.1

Note: a. This column presents access to the Canadian Radio-television and Telecommunications Commission (CRTC) target by province and territory.

Source: Table prepared by the authors using data obtained from CRTC, [Communications Monitoring Report 2018](#), 2019.

Canada is not alone in facing the urban/rural technical digital divide. In 2017, for example, the European Commission noted the following situation in its report *Broadband Coverage in Europe, 2017*:

Rural broadband coverage continued to be lower than national coverage across EU Member States. Although 92.4% of rural EU homes were passed by at least one fixed broadband technology in mid-2017, less than 50% (46.9%) had access to high-speed next generation services.<sup>3</sup>

Almost all developed countries have digital or broadband plans that call for universal broadband access.

### 3 CANADIAN DEMOGRAPHICS AND BROADBAND ACCESS

Canada's population distribution and geography are sometimes cited to explain why Canadians receive lower-quality broadband service but pay higher prices for broadband than citizens of other developed countries.<sup>4</sup> In its introduction to the Connect to Innovate program, Innovation, Science and Economic Development Canada (ISED) explained that, in rural and remote communities, "challenging geography and smaller populations present barriers to private sector investment in building, operating and maintaining infrastructure."<sup>5</sup>

Canada is a vast, sparsely populated country, with a population density of 3.6 persons per square kilometre (persons/km<sup>2</sup>), which is low compared to other countries. (For comparison, Appendix A provides data on population density and urbanization for selected countries.) However, this overall average can be misleading, as the population density is not constant across Canada, so the average represents neither the high density in urban areas nor the extremely low density in rural and remote areas.

A comparison of the North (Yukon, the Northwest Territories and Nunavut) with Canada's five largest census metropolitan areas (CMAs) shows how a measure using total population and total land area can be misleading. In 2016, the North had 39% of Canada's land mass and 0.3% of its population, giving a population density of 0.013 persons/km<sup>2</sup>.<sup>6</sup> The five largest CMAs had 2.8% of the country's land mass and 43% of its population, constituting a population density of 601.7 persons/km<sup>2</sup>.

Table 2 shows the population densities for the top five CMAs in Canada. Given these densities, private-sector firms can cover costs and make a profit serving the population in these cities and along some of the transportation corridors linking them. Focusing on the densely populated areas in the country appears to be the strategy of most wireless and broadband providers in Canada, in order to make a profit acceptable to their shareholders. For other areas of Canada, public-private partnerships, such as those in Alberta, Saskatchewan and elsewhere, or more direct government involvement is needed to bring broadband to the entire population.

**Table 2 – Population Densities in the  
Top Five Census Metropolitan Areas, 2016**

Census Metropolitan Area	Area (km <sup>2</sup> )	Population	Density (persons/km <sup>2</sup> )
Toronto	5,905.8	5,928,040	1,003.8
Montréal	4,604.2	4,098,927	890.2
Vancouver	2,882.7	2,463,431	854.6
Calgary	5,110.2	1,392,609	272.5
Ottawa–Gatineau	6,767.4	1,323,783	195.6
<i>Total</i>	<i>25,270.3</i>	<i>15,206,790</i>	<i>601.8</i>

Source: Statistics Canada, [“Population and dwelling counts, for census metropolitan areas, 2016 and 2011 censuses,”](#) *Population and Dwelling Count Highlight Tables, 2016 Census*. Data for Montréal and Calgary exclude one or more incompletely enumerated Indian reserves or Indian settlements.

## 4 FEDERAL GOVERNMENT POLICY

In recent years, the federal government has introduced various programs to improve broadband connectivity in rural and remote areas. For example, in 2014, the Government of Canada launched the Connecting Canadians program, which aims to expand and improve broadband Internet access to nearly 300,000 Canadian households. Total funding of \$225 million has been allocated to this program.<sup>7</sup>

In 2016, the Government of Canada announced an investment of up to \$500 million over five years to bring broadband Internet service to 300 rural and remote communities through the Connect to Innovate program.<sup>8</sup> As of 11 July 2019, 147 projects had been announced, for a total of \$468.9 million.<sup>9</sup>

In addition, the CRTC has implemented initiatives to complement ISED programs. For example, in 2016, the CRTC created a \$750 million fund, financed through contributions by major telecommunications service providers, to support projects in areas where the established target of 50/10 Mbps had not yet been met.<sup>10</sup> However, as part of Telecom Regulatory Policy CRTC 2018-377, issued on 27 September 2018, this target was reduced to require that projects aim to provide a minimum speed of 25/5 Mbps instead.<sup>11</sup> Despite some criticism,<sup>12</sup> the CRTC says that this new target will likely result in “projects covering underserved areas that would deliver a broadband Internet access service that the majority of Canadians use today.”<sup>13</sup>

In June 2018, the federal government launched a review of the telecommunications and broadcasting Acts.<sup>14</sup> The public consultations conducted as part of this review identified key themes, including “broadband deployment in rural and remote communities.”<sup>15</sup>

Additional initiatives to support broadband Internet were announced in the two most recent federal budgets. In Budget 2018, \$100 million over five years was announced under the Strategic Innovation Fund to support projects related to Low Earth Orbit satellites and the next generation of broadband service in rural areas.<sup>16</sup>



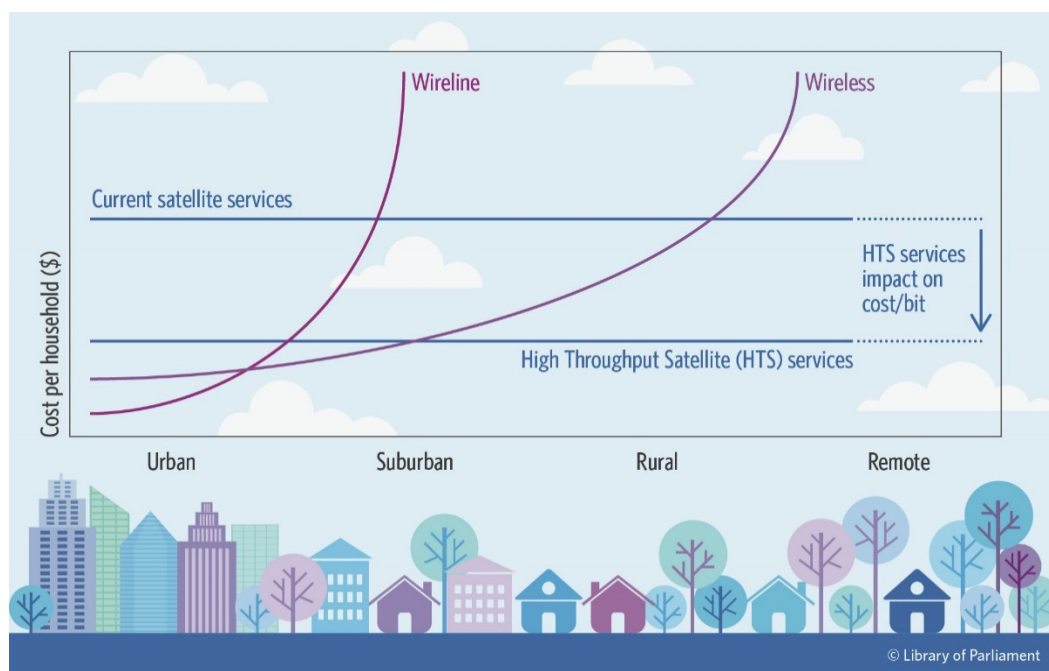
In addition, in Budget 2019, the Government of Canada committed to ensuring that 95% of Canadians have access to Internet speeds corresponding to CRTC targets by 2026 and that 100% of Canadians have access to them by 2030. To achieve its objectives, the government proposed various initiatives, including these:

- Universal Broadband Fund: Up to \$1.7 billion over 13 years, starting in 2019–2020, to establish a national broadband Internet program. This funding will build on initiatives under the Connect to Innovate program and aim to increase Low Earth Orbit satellite capacity.
- Statistics Canada targeted surveys: Up to \$11.5 million over five years, starting in 2019–2020, for two surveys to measure household access to and use of the Internet and to measure business online behaviour.<sup>17</sup>

## 5 CURRENT TECHNOLOGY

The cost-effectiveness of various broadband delivery systems is highly influenced by the population densities of the targeted regions. Figure 2 shows how declining population densities lead to higher capital costs for households with wireless or wireline broadband (wire or fibre); satellites, because of their vast coverage, do not show the same rising costs, although their technical characteristics make them a choice for only sparsely populated areas.

**Figure 2 – Cost-Effectiveness of Technologies by Population Density**



Source: Figure prepared by the Library of Parliament using data obtained from Brightstar Canada, [Nova Scotia Department of Business Last Mile Strategy](#), May 2018.

The following technologies are examples of cost-effective solutions for providing high-speed Internet access to vast, sparsely populated regions.

**Fixed wireless:** Fixed wireless systems use digital radio transmitters placed on any elevated location (e.g., rooftop or tower) and achieve point-to-point signal transmission via a microwave platform.<sup>18</sup> In 2017, 26% of rural households relied solely on this technology for broadband access.<sup>19</sup>

**Satellite:** Although costlier than fixed-line service, satellite delivery of broadband provides access to multiple remote users from one delivery point. Emerging technology in ultra-high-throughput-capacity satellites, such as ViaSat-2 (launched in June 2017), will provide greater economies of scale for broadband providers, which should make satellite service more affordable.<sup>20</sup>

**Small-cell infrastructure:** Small-cell infrastructure includes a variety of operator-controlled radio-communications equipment that provides mobile and Internet services within localized areas. The term “small cell” covers femtocells, picocells, microcells and metrocalls. These cells typically have a range of from 10 to several hundred metres.<sup>21</sup> This type of infrastructure is already used in some rural areas, as in Saskatchewan.<sup>22</sup>

**Rural Remote Broadband Systems (RRBS):** This technology, used only in Canada, allows for broadband Internet transmission over unused analog television channels in the 512–698 megahertz (MHz) spectrum (channels 21–51). Use of this technology is declining (52 stations were in operation in 2015 compared with 555 stations in 2011). The receivers required to use this technology are not produced in sufficient quantities to make them affordable for the average consumer, and RRBS operators will have to move their services since the 600 MHz band was auctioned in spring 2019 and can therefore no longer be used for this purpose.<sup>23</sup>

**WiMAX:** Using a powerful base station, WiMAX can provide wireless broadband access for up to 50 km for fixed stations and 5 to 15 km for mobile stations. WiMAX may be useful in underserved areas that are just beyond traditional urban limits.<sup>24</sup>

To offer wireless Internet technologies (including WiMAX and fixed wireless), often used in rural areas in particular, Internet service providers (ISPs) must have access to quality spectra, which can sometimes be difficult. In Canada, ISED manages the use of the various spectrum frequency bands and distributes them through auctions.<sup>25</sup> Some stakeholders, particularly in rural areas, have said that various issues – including the size and cost of spectrum licences – hinder the access to the spectrum that would allow them to deliver Internet in their regions. They say that this situation favours ISPs that wish to serve primarily major urban centres.<sup>26</sup>

In addition, a recent issue in rural spectrum management is the potential reallocation of the 3500 MHz band. Currently, this band is often used for fixed wireless services, particularly in rural areas, but it is now coveted for fifth generation (commonly referred to as “5G”) deployment. ISED is consulting stakeholders on this subject and announced on 5 June 2019 that it will hold public consultations on the auction operations for the 3500 MHz band spectrum.<sup>27</sup> At the same time, ISED announced a decision paper outlining changes to the 3500 MHz band leading up to an auction in 2020.

## 6 CONCLUSION

For a truly inclusive digital society, all Canadians must have access to broadband service. As noted above, the CRTC has set broadband targets to be met for all Canadians by 2030. With the aid of private investment, government policies, technological advances and public-private partnerships, the technical digital divide may be bridged. The government may then address the socio-economic digital divide to allow all Canadians – regardless of their circumstances – to take full advantage of the 21<sup>st</sup> century digital society.

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## NOTES

1. The Canadian Radio-television and Telecommunications Commission [CRTC] defines “broadband” as “any service with a 1.5 Mbps download speed or greater.” See CRTC, [Communications Monitoring Report](#), October 2015, p. 189.
2. Government of Canada, “[CRTC establishes fund to attain new high-speed Internet targets](#),” News release, 21 December 2016.
3. European Commission, “[Executive Summary](#),” *Broadband Coverage in Europe 2017*, p. 4.
4. Organisation for Economic Co-operation and Development [OECD], “[Prices and mobile termination rates: 4.4. OECD mobile broadband basket, medium user, May 2017](#),” *Broadband Portal*; and OECD, “[Prices and mobile termination rates: 4.10. OECD fixed broadband basket, high user, June 2017](#),” *Broadband Portal*.  
  
According to the OECD data, Canada ranks 29<sup>th</sup> out of 35 countries in average monthly subscription prices for medium users of broadband and 32<sup>nd</sup> out of 35 countries for average monthly subscription prices for high users of broadband.
5. Innovation, Science and Economic Development Canada [ISED], [Connect to Innovate](#).
6. This population density represents about one person per 79 km<sup>2</sup>, which is the equivalent of 75 people inhabiting the entire Toronto census metropolitan area.
7. In fact, Budget 2014 allocated \$290 million in grants and contributions to the Connecting Canadians program. Of that amount, \$65 million was transferred to the Connect to Innovate program in 2016. See Government of Canada, “[About Connecting Canadians](#),” *Digital Canada 150: FAQs*.
8. ISED, *Connect to Innovate*.
9. ISED, [Announced Connect to Innovate projects](#), Database, accessed 11 July 2019.
10. CRTC, [Broadband Fund: About the Fund](#).
11. CRTC, [Telecom Regulatory Policy CRTC 2018-377](#), 27 September 2018.
12. See Open Media, [Advocates stunned by CRTC’s decision to cut its own Internet speed targets in half for new Broadband Fund](#), 27 September 2018; and *ibid*.
13. CRTC (2018), para. 104.
14. Canadian Heritage, “[Government of Canada launches review of Telecommunications and Broadcasting Acts](#),” News release, 5 June 2018.
15. Government of Canada, Broadcasting and Telecommunications Legislative Review Panel, [What We Heard Report](#), June 2019, p. 9.

16. Department of Finance Canada, [\*Equality + Growth: A Strong Middle Class\*](#), Budget 2018, 27 February 2018, p. 120.
17. Department of Finance Canada, [\*Investing in the Middle Class: Budget 2019\*](#), 19 March 2019, p. 97.
18. CRTC, [“Fixed wireless,”](#) *Glossary*.
19. CRTC, [“Retail Fixed Internet Sector and Broadband Availability,”](#) *Communications Monitoring Report 2018*, 2019.
20. Viasat, [\*High-Capacity Satellite System: Transforming Satellite Communications\*](#).
21. GSMA, “What is a small cell?,” [\*Improving wireless connectivity through small cell deployment\*](#), p. 5.
22. SaskTel, [“SaskTel Bringing Improved Wireless Service to 41 more Rural Communities,”](#) News release, 26 November 2018.
23. Gregory Taylor, [“Remote Rural Broadband Systems in Canada,”](#) *Telecommunications Policy*, Vol. 42, Issue 9, October 2018.
24. WiMAX Forum, [Frequently Asked Questions](#).
25. Government of Canada, [Spectrum auctions](#).
26. House of Commons, Standing Committee on Industry, Science and Technology [INDU], [Broadband Connectivity in Rural Canada: Overcoming the Digital Divide](#), Eleventh Report, 1<sup>st</sup> Session, 42<sup>nd</sup> Parliament, April 2018; and INDU, [Rural Wireless Digital Infrastructure: A Critical Role](#), Eighteenth Report, 1<sup>st</sup> Session, 42<sup>nd</sup> Parliament, June 2019.
27. Government of Canada, [Consultation on a Policy and Licensing Framework for Spectrum in the 3500 MHz Band](#), June 2019.

## APPENDIX A – POPULATION DENSITIES AND URBANIZATION (SELECTED COUNTRIES)

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**Table A.1 – Population Densities and Urbanization  
(Selected Countries)**

Country	Area (km <sup>2</sup> )	Population (millions)	Density (persons/km <sup>2</sup> )	Urbanization (%)
Canada	9,984,670	35.8	3.6	81
United States	9,833,517	329.2	3.5	82
Australia	7,741,220	23.4	3.0	86
France	643,801	67.3	104.5	80
Japan	377,915	126.1	333.7	92
Finland	338,145	5.5	16.3	85
United Kingdom	243,610	65.1	267.2	83
South Korea	99,720	51.4	515.4	82
Belgium	30,528	11.5	376.7	98
Hong Kong	1,108	7.2	6,498.2	100
Singapore	719	5.9	8,203.6	100

Source: Table prepared by the authors using data obtained from Central Intelligence Agency, [The World Factbook](#). Population is a July 2018 estimate; urbanization, which is the percentage of the total population living in urban areas, as defined by the country, is for 2018. Density calculated from *The World Factbook* data.