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Rural Broadband Deployment

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(In Brief)

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RURAL BROADBAND DEPLOYMENT

1 INTRODUCTION

High-speed Internet (or broadband)[1] has become integral to the lives of many Canadians who use it for banking, shopping, education and entertainment. Furthermore, as governments of all levels are increasing the number of services available online, many commentators now argue that broadband should be viewed as an essential service. However, given that building broadband networks is extremely expensive, their cost-effectiveness is highly dependent upon the population density of a given market. The uneven distribution of population over Canada's vast landscape, with most Canadians living in cities along the border with the United States, means that 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. This difference is often referred to as the "digital divide," and it has become a policy concern for all levels of government.

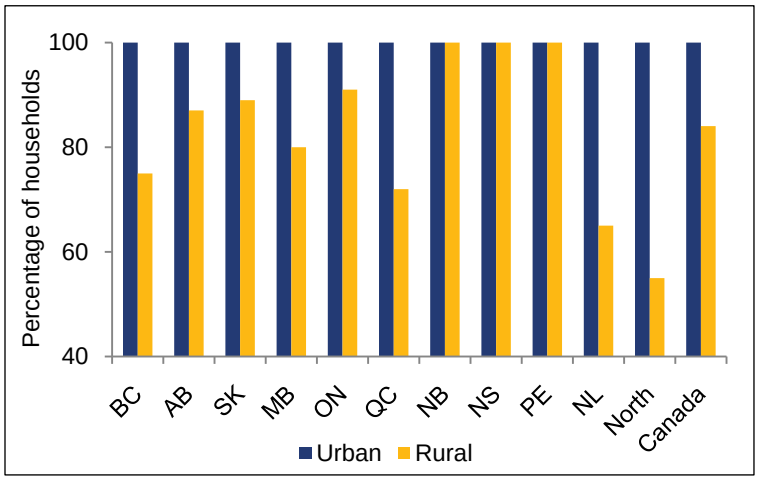
2 DIGITAL DIVIDES

A "digital divide" separates those who use broadband from those who do not. Digital divides can be broadly separated into two categories: 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 divides focus on choice. Those who have access to broadband may choose not to subscribe to it. Such digital divides can be based on age, income, education, language or gender. Overcoming the socio-economic digital divides is important in establishing an inclusive digital society; however, this paper focuses on the fundamental issue of providing the technical access to broadband.

Figure 1 shows the urban/rural split for broadband availability in Canada.

Figure 1 – Broadband Availability in Canada: Urban Versus Rural, 2009



Source: Figure prepared by the authors using data from Canadian Radio-television and Telecommunications Commission, *Communications Monitoring Report*, July 2010.

Canada is not alone in facing the urban/rural digital divide. In 2009, for example, a press release from the European Commission noted:

> While an average 93% of Europeans can enjoy access to a high speed online connection, the figure is only 70% in rural areas, and in some countries (such as Greece, Poland, Slovakia, Bulgaria and Romania) high speed broadband Internet networks cover just 50% or less of the rural population.[2]

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

3 CANADIAN DEMOGRAPHICS AND BROADBAND ACCESS

Canada is a vast, sparsely populated country, with extremes in climate and terrain. Its population density is 3.4 persons per square kilometre (persons/km^2). For comparison, Appendix A provides data on population densities and urbanization for selected countries.

Canada's geography and population distribution are sometimes used to explain why Canadians receive lower quality of service and pay higher prices for broadband than citizens of other developed countries.[3] In 2009, for example, the president of the Canadian Wireless Telecommunications Association stated, "When you consider our sparse population and large geography, Canadians are very well served when it comes to quality of service, speed of network and the handsets they have access to."[4]

The population density of Canada is very low in comparison with most other 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. The North has 41% of Canada's land mass and 0.3% of its population, giving a population density of 0.026 persons/km^2.[5] The five largest CMAs have 0.3% of the country's land mass and 41% of its population, constituting a population density of 547.9 persons/km^2.

Table 1 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 all citizens in the region.

Table 1 – Population Densities, Canada and Selected Census Metropolitan Areas (CMAs), 2006

Region	Area (km^2)	Population (thousands)	Density (persons/km^2)
Toronto	5,904	5,113.1	866.1
Montréal	4,259	3,635.6	853.6
Vancouver	2,877	2,116.6	735.6
Ottawa	5,716	1,130.8	197.8
Calgary	5,107	1,079.3	211.3
Top five CMAs	23,863	13,075.4	547.9

Source: Statistics Canada, *Population and dwelling counts, for census metropolitan areas, 2006 and 2001 censuses*. Data for Montréal and Calgary exclude one or more incompletely enumerated Indian reserves or Indian settlements.

4 FEDERAL GOVERNMENT POLICY

In 2000, the federal government set the goal of ensuring that broadband would be available in every Canadian community. The National Broadband Task Force was established in 2001 to recommend how this goal could be reached.[6]

In 2002, the federal government launched the Rural and Remote Broadband Access program whose goal was to support research and development of cost-effective technologies for bringing broadband services to Canada's rural and remote communities. This program ended in 2007.[7] Also in 2002, the federal government initiated Broadband for Rural and Northern Development as a three-year, $105-million, cost-matching program, to help address the lack of broadband access in "First Nations, Inuit and Métis, northern, rural and remote communities."[8] In 2004, the Treasury Board approved the extension of the program to 2007.[9] In 2003, the government launched the National Satellite Initiative, a $155-million program to lower the cost of bringing broadband to the Far and mid-North by purchasing the needed satellite capacity.

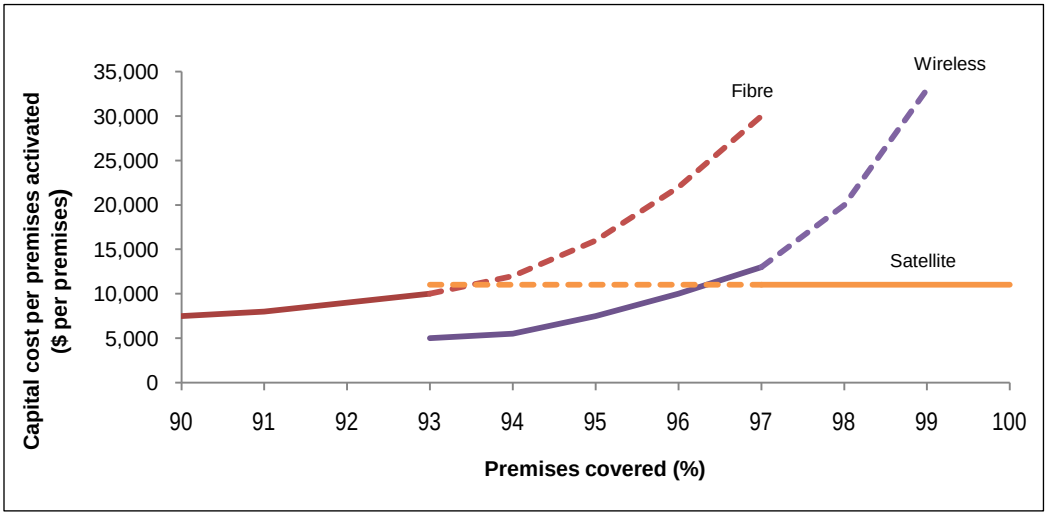
In 2009, Industry Canada conducted a comprehensive study to identify areas in Canada where broadband Internet was unavailable, or not easily available. Through *Budget 2009: Canada's Economic Action Plan*, Industry Canada was allotted $225 million over three years to develop public–private initiatives for extending broadband to these areas.[10] *Broadband Canada: Connecting Rural Canadians* is the government's primary policy tool for meeting this objective. As of February 2011, the program has approved 91 projects in eight provinces and territories, which would provide broadband availability to approximately 230,000 households.[11]

On 3 May 2011, the Canadian Radio-television and Telecommunications Commission (CRTC) set the following broadband targets: by 2015, all Canadians should have access to broadband at certain minimum speeds – at least 5 megabits per second for downloads and 1 megabit per second for uploads. The CRTC suggests that the target will be reached by "a combination of private investments, targeted government funding and public–private partnerships."[12]

5 CURRENT TECHNOLOGY

The cost-effectiveness of various broadband delivery systems is highly influenced by the population densities of the regions targeted. Figure 2 shows how declining population densities lead to higher capital costs per household served with fibre or wireless broadband; 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. The data used in Figure 2 are based on the distribution of population in Australia, which is similar to that in Canada.

Figure 2 – Technologies and Costs by Broadband Coverage



Note: The dollar amounts are in Australian dollars (in April 2011, A$1 = C$1.01). The solid lines show the economically efficient technology as more premises receive access to broadband.

Source: Adapted from Australia, "Introduction to the Implementation Study." *National Broadband Network Implementation Study, 6 May 2010*. The range of "premises covered" refers to non-urban premises in Australia.

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

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-1 will provide much improved scale economies for broadband providers, which should make satellite service more affordable.[13]

WiMAX: Using a powerful base station, WiMAX can provide wireless broadband access up to 50 kilometres for fixed stations and 5 to 15 kilometres for mobile stations. WiMAX may be useful in underserved areas that are just past traditional urban limits.[14] Canada is a world leader in developing this technology.[15]

Compressed Transmission Systems (CTS): CTS technology, such as Alcatel-Lucent's lightRadio™, replaces large cellular transmission base stations with small devices (fits in the palm of the hand) that can be mounted to existing elevated structures. Moreover, such systems require less electricity and have much higher throughput capacity.[16]

Rural and Remote Broadband Systems (RRBS): This technology allows for broadband Internet transmission over unused analog television channels in the 512–698 megahertz spectrum (local channels 21–51). RRBS technology has an operating range of up to 30 kilometres. However, the receivers required to use this technology are not yet produced in sufficient quantities to make them affordable for the average consumer.[17]

Currently, satellite and WiMAX systems are used in Canada to provide broadband access to underserved areas, whereas CTS and RRBS applications may provide future solutions for bridging the digital divide. The planned launch of new satellites along with recent advances in wireless telecommunications capability may affect the choice of technology selected by service providers, for any given population density.

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 2015. With the aid of private investment, government policies, technological advances and public-private partnerships, the technical digital divide may be eliminated. The government may then address the socio-economic digital divides to allow all Canadians – not just those in urban areas – to take full advantage of the 21st century digital society.

NOTES

1. Industry Canada, "About the Program," *Broadband Canada: Connecting Rural Canadians*. Industry Canada defines broadband Internet as having a speed of at least 1.5 megabits per second.
2. European Commission, "Better high-speed Internet access needed to revitalise Europe's rural regions, says Commission," News release, 3 March 2009.
3. Organisation for Economic Co-operation and Development (OECD), "Average broadband monthly subscription price, by country, USD PPP," *OECD Broadband Portal*, October 2009. According to OECD data, Canada ranks 22nd out of 30 countries in average monthly subscription prices for broadband access.
4. Tamara Gignac, "Canada's cellphone market is 'hypercompetitive,'" *Calgary Herald*, 22 November 2009, p. B1.
5. This population density represents about one person per 38 square kilometres, which is the equivalent of the entire Toronto CMA being inhabited by 155 people.
6. Industry Canada, *Telecommunications Policy Review Panel, Final Report, 2006*, Ottawa, March 2006, p. 8-3.
7. Telephone interview with an official from Communications Research Centre Canada, 24 May 2011.
8. Industry Canada, "Formative Evaluation of the Broadband for Rural & Northern Development Pilot – Final Report," *Audits and Evaluations*.
9. Ibid.

10. Industry Canada, "Government of Canada Announces Third Round of Broadband Canada Funding," News release, 6 November 2010.
11. For a list of approved projects, please consult "List of Projects by Province," *Broadband Canada: Connecting Rural Canadians*.
12. Canadian Radio-television and Telecommunications Commission (CRTC), "CRTC sets speed target for broadband Internet and maintains obligation to provide basic home telephone service," News release, 3 May 2011.
13. ViaSat, "Transforming Satellite Broadband," *ViaSat-1*.
14. Ibid.
15. Communications Research Centre Canada, *WiMAX Activity in Canada*. WiMAX stands for "Worldwide Interoperability for Microwave Access."
16. Alcatel-Lucent, "Welcome to the future of Wireless Broadband: Introducing the lightRadio™ Portfolio," *lightRadio™: Evolve your wireless broadband network for the new generation of applicants and users*.
17. Telephone interview with official from Communications Research Centre Canada, 24 May 2011.

APPENDIX A – POPULATION DENSITIES AND URBANIZATION

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

Country	Area (km^2)	Population (millions)	Density (persons/km^2)	Urbanization (%)
Canada	9,984,670	33.5	3.4	80
United States	9,826,675	307.2	31.3	82
Australia	7,741,220	21.3	2.8	89
United Kingdom	243,610	61.1	250.8	90
France	643,427	62.2	96.7	77
Belgium	30,528	10.4	340.7	97
Finland	338,145	5.3	15.7	63
South Korea	99,720	48.5	486.4	81
Singapore	697	4.7	6,743.2	100
Hong Kong	1,104	7.1	6,431.2	100
Japan	377,915	127.1	336.3	66

Source: CIA, *World Fact Book*. Population is a July 2009 estimate; urbanization, which is the percentage of the total population living in urban areas, as defined by the country, is for 2008. Density calculated from the *World Fact Book* data.