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**Broadband Access in Rural Canada:
The role of connectivity in building vibrant
communities**



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Federation of Canadian Municipalities

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1. INTRODUCTION

Broadband has the power to transform Rural Canada. Connectivity is now as important as roads and bridges to the sustainability of rural and remote communities, and to the success of rural institutions and organizations. The so-called 'broadband gap' remains a reality throughout Rural Canada, with lower average speeds compared to urban centres, and with limited connectivity in the most remote regions.

In the 2014 federal budget, the Government of Canada announced it would provide "\$305 million over five years to extend and enhance broadband service to a target speed of 5 megabits per second for up to an additional 280,000 Canadian households, which represents near universal access."

In its rationale for this commitment to support rural broadband, the government cited FCM's advocacy work:

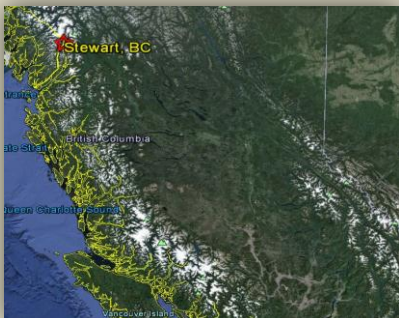
Telecommunications infrastructure is important to Canada's rural, northern and remote communities. Broadband networks contribute to economic growth by improving productivity, providing new products and services, supporting innovation in all sectors of the economy, and improving access to new markets in Canada and abroad. - FCM

The new federal *Connecting Canadians* program, formally launched in July 2014, responds to a critical need to bring basic connectivity to households in the most rural and remote communities, but the broader rural-urban digital divide remains a long-term challenge for the federal government, the private sector and communities themselves.

To support this discussion, FCM contracted Nordicity to research and report on the state of broadband connectivity in rural and remote communities throughout Canada.

Community Snapshot – District of Stewart (British Columbia)

Population: 494 (Census Subdivision), 37,361 (Kitimat-Stikine Region)



Type of Residential Broadband Connectivity: The community is served by at least two internet service providers (ISPs). Onewayout is a community-run ISP using fixed wireless access points. Prices with Onewayout start at \$30 per month (unknown speeds). Xplornet, a satellite-based ISP, offers advertised speeds for satellite service of 3 Mbps, with prices starting around \$68 per month.

Community Website: <http://www.districtofstewart.com/>

2. The current state of residential broadband services available to Canadians

2.1 CANADIAN DATA SETS

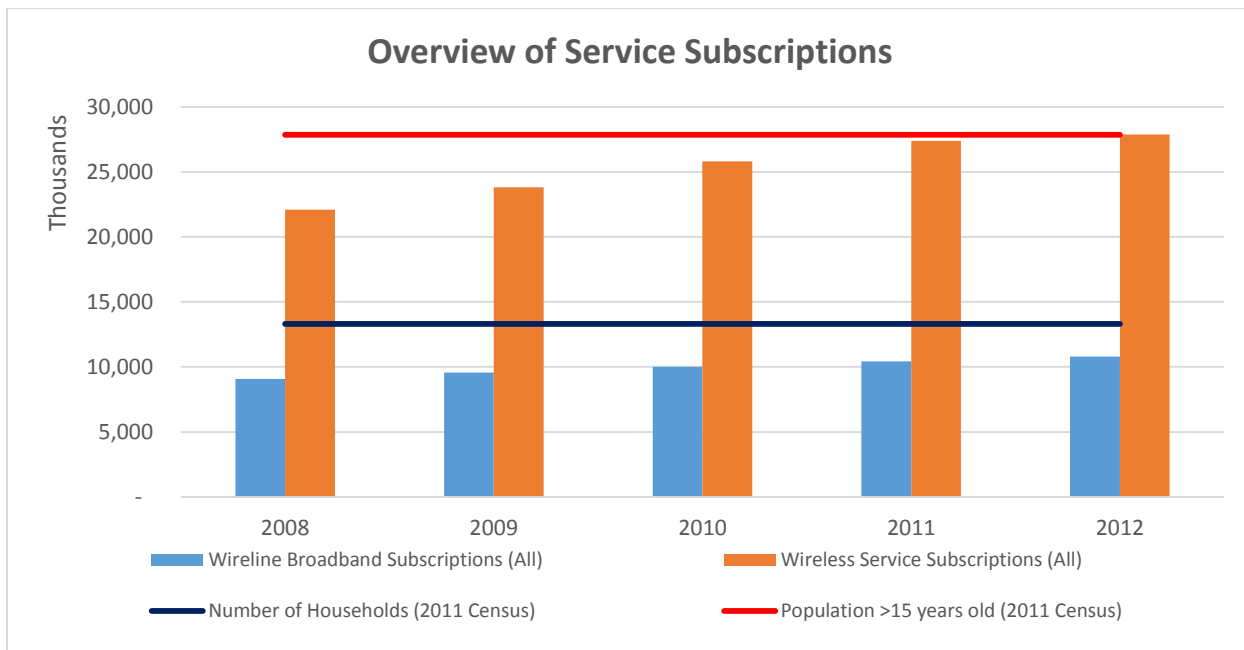
2.1.1 CRTC DATA

The Canadian Radio-Television and Telecommunications Commission (CRTC) maintains the most comprehensive data sets available on a public basis. The CRTC reports on the state of the communications market in the yearly *Communications Monitoring Report*¹. The CRTC uses the definitions provided by Statistics Canada when referring to population centres². Rural areas are communities with less than 1,000 people, or an area with a population less than 400 people per square km.

¹ 2013 Communications Monitoring Report: <http://www.crtc.gc.ca/eng/publications/reports/policyMonitoring/2013/cmr.htm>

² Explanation of statistics Canada population definitions <http://www.statcan.gc.ca/subjects-sujets/standard-norme/sgc-cgt/notice-avis/sgc-cgt-06-eng.htm>

Figure 1 - Overview of Data Subscriptions in Canada



The above figure illustrates the level of penetration of both wireline broadband services and wireless data services in Canada. While wireless subscriptions will more or less track the general population, wireline broadband services will more closely align with the number of households. Based on this logic, the gap between broadband and households is representative of households either not served by wireline broadband *or* those who have chosen not to subscribe to broadband. This is effectively the addressable gap between availability and adoption of broadband services by Canadian households.

The availability of broadband in communities of different sizes provides a more detailed illustration of the digital divide. Since 2011 the CRTC has reported on broadband availability by 'population centres' as defined by statistics Canada. Figure 2 and Figure 3 below show the difference between broadband availability in medium population centres (defined as having populations between 30,000 and 99,999) and rural areas.

Figure 2 - Broadband Availability in Medium Population Centres

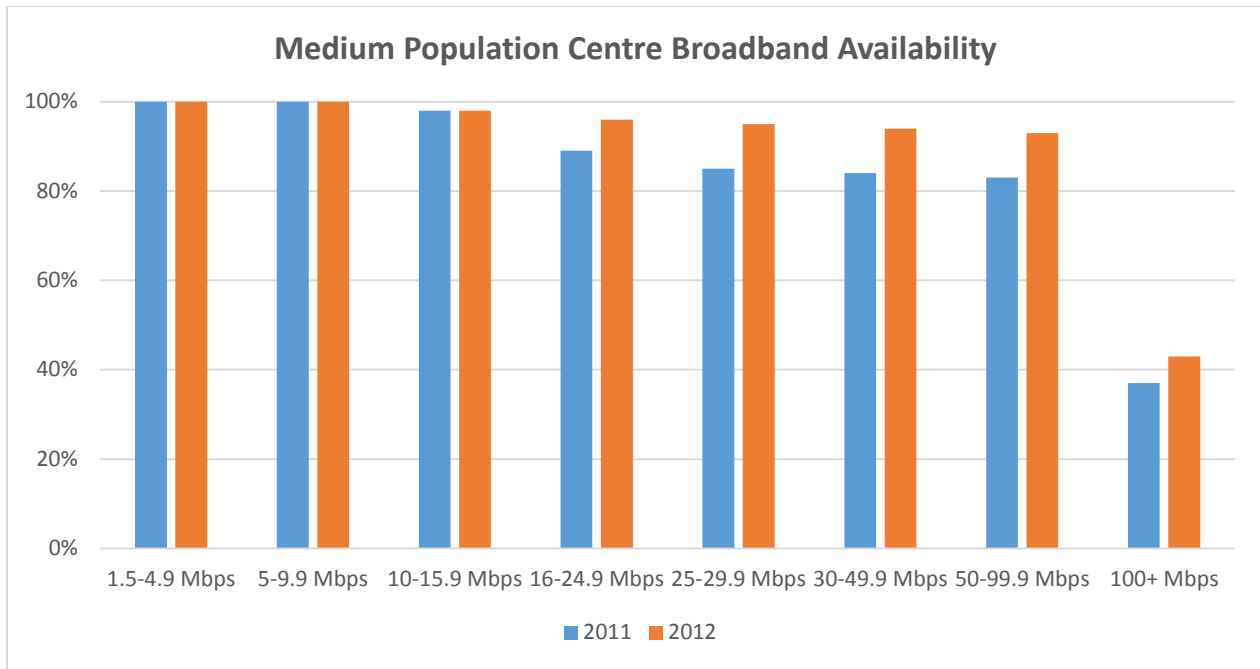
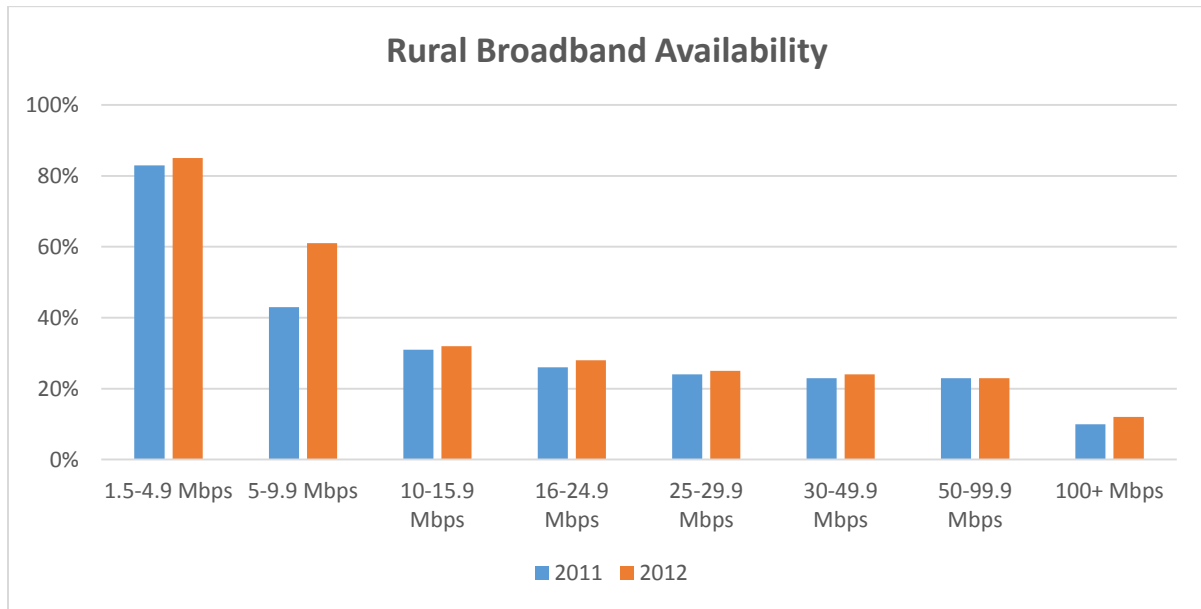


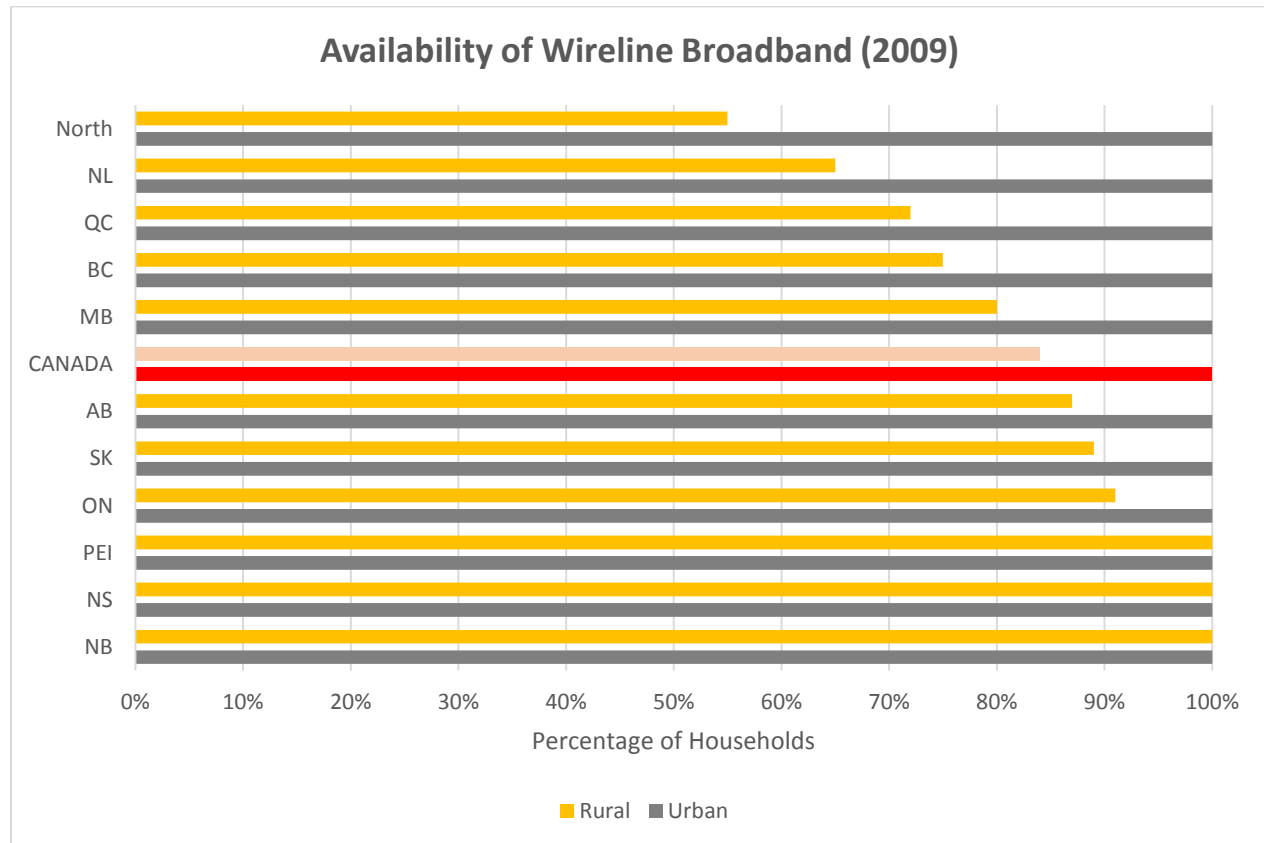
Figure 3 - Broadband Availability in Rural Areas



These two images illustrate the disparity in service available to urban and rural Canadians. Over time, it is expected that these two figures will begin to converge, but for now, they clearly indicate the lesser service available to Canadians in rural areas.

Although the release of province-specific statistics by the CRTC stopped with the 2010 Monitoring Report³, Figure 4 illustrates the variation in broadband availability between rural and urban populations by province, as of 2009.

Figure 4 - Rural and Urban Broadband Availability by Province



2.1.2 Service provider data

Another source of information on the state of broadband deployment and adoption is the service providers themselves. As the principal providers of connectivity, they undoubtedly have very detailed information on exactly where they provide service, and at what speed. Unfortunately, this data is commercially sensitive and is not reported publicly. However, some information on new projects and improvements to service delivery is available from providers’ public announcements of new projects and improvements to service delivery.

SaskTel recently announced additional roll-outs of high-speed broadband in a number of rural areas in Saskatchewan, including the towns of Bruno (pop. 574), Anaheim (pop. 219), Elbow and Middle Lake⁴ (pop. 242). SaskTel indicated that

⁴ Source: <http://www.sasktel.com/about-us/news/2014-news-releases/sasktel-brings-high-speed-internet-to-four-sk-communities.html>

these communities would be able to get speeds of up to 5 Mbps. As illustrated, these communities have fairly small populations, well within our understanding of a 'rural' area.

Community Snapshot – Yellowhead County (Alberta)

Population: 10,469 (Census Subdivision), 28,584 (Regional Area)



Type of Residential Broadband Connectivity: The community is served by at least two traditional ISPs. TELUS provides DSL-based services, but only in select locations. Prices with TELUS are unknown, and likely start at 1.5Mbps. Xplornet, provides satellite-based and fixed wireless services. Typical advertised speeds for satellite service range from 1.5-10Mbps, with prices starting around \$45 per month. Bell, Rogers, and TELUS also offer mobile wireless services.

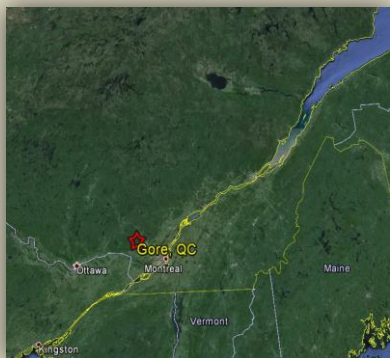
Community Website: <http://www.yellowheadcounty.ab.ca/>

In contrast, SaskTel also announced it was bringing its 'infiNET' product to Prince Albert in 2014⁵. This service promises speeds of up to 260 Mbps. The population of Prince Albert is 35,129, making it an urban centre. SaskTel also stated that this service would be brought to the nine largest urban centres in the province. This example of differences between rural and urban deployments is not unique to SaskTel, as there are economic challenges to bringing the same level of service to all communities.

⁵ Source: <http://www.sasktel.com/about-us/news/2014-news-releases/prince-albert-to-receive-sasktel-infinet-in-2014.html>

Community Snapshot – Canton de Gore (Quebec)

Population: 1,775 (Census Subdivision), 32,117 (Regional Area of Argenteuil)



Type of Residential Broadband Connectivity:

The community is served by one ISP, and has mobile wireless coverage. Xplornet, offering satellite and fixed wireless based services, is the main ISP in the region, offering advertised speeds for satellite service of 1.5-10 Mbps, with prices starting around \$45 per month. Bell, TELUS, and Rogers all offer mobile wireless services in the region.

Community Website: <http://www.cantondegore.qc.ca/>

Another example of technology roll out comes from Bell Aliant, which operates in the Atlantic Provinces, and the more rural parts of Quebec and Ontario. In late 2013, Bell Aliant announced that it would be bringing their 'FibreOP' services to Sturgeon Falls, Ontario⁶. Once fully deployed, this community of 6,672 will have access to Internet speeds of up to 250Mbps. According to the press release, this service is also available in the town of Cobalt, Ontario, an area with a population of only 1,133.

Xplornet Communications Inc., a leading rural broadband service provider, also announced in July 2014 that it intends to provide an enhanced broadband offering with 25 Mbps download speeds to "100% of the rural population" by 2017⁷. Xplornet is deploying next-generation satellites and Long Term Evolution (LTE) fixed wireless in order to provide this level of service.

Decisions on where to provide higher-speed services often depend on the geographic proximity of small communities. For example, the communities of Cobalt and Sturgeon Falls likely fall on the route of major telecommunications

⁶ Source: http://www.bellaliant.ca/english/news/view_art.asp?id=2257

⁷ Source: <http://www.xplornet.com/about-us/news-releases/2014/xplornet-announces-plan-to-deliver-25-mbps-broadband-internet-to-100-of-rural-canadians>

service lines between the larger centres of Timmins, Sudbury, and North Bay. As such, the cost to connect these communities is far less than if the main lines had to be connected *into* those communities.

The challenges that are faced by building expensive networks into rural and remote areas appears to result in more remote communities being left behind as the technology and infrastructure improves in other areas. Communities such as Elbow Lake and Bruno, which are receiving improved services over time, are less likely to have the top-tier Internet access services available to them. The intention of the foregoing is not to place blame on any service providers, but to comment on the state of network technologies available in different parts of the country.

2.2 Misleading data?

Impeding an assessment of the state of broadband in Canada is the lack of complete data. Anecdotally, we often hear messages regarding the poor state of Internet access in Canada, particularly in rural and remote areas, while simultaneously being told that network operators are pouring billions of dollars into network improvements. Detailed information is a closely guarded secret and, the information that is publicly available is often not completely representative of the situation.

In recognition of this data challenge, the balance of this report examines the impacts and results of less connectivity. It is easy to find a community with little or limited broadband Internet access, but more challenging to articulate how that community is specifically being impacted.

3. The Need for Speed

There is no consensus on an appropriate or necessary speed for broadband connectivity in order to fully realize the benefits of a connected world. Regulators and governments worldwide have set a wide range of target speeds summarized in the following table⁸.

Table 1- Global Broadband Targets

Country	Download Target	Coverage Target	Timeframe
United States	2 Mbps	100%	2015
	4 Mbps	100%	2020
	50 Mbps	100 Million homes	2015
	100 Mbps	100 Million homes	2020
Australia	100 Mbps	90%	2016
	12 Mbps	Universal	Near-Term
Finland	100 Mbps	Close to all homes	2015
Germany	50 Mbps	75%	2014
Japan	100 Mbps	Ubiquitous	2015
South Korea	50 Mbps	95%	2013
Sweden	100 Mbps	40%	2015
	100 Mbps	90%	2020
United Kingdom	2 Mbps	100%	2015
New Zealand	20 Mbps	80% Urban	2015
	5 Mbps	80% Rural	2015
Argentina	10 Mbps	100%	2015
Colombia	1 Mbps	100%	2014
China	20 Mbps	Urban	2015
	4 Mbps	Rural	2015
EU Guidance	512 kbps - 4 Mbps	Universal	2013
	30 Mbps	Universal	2020
	100 Mbps	50% of Households	2020
Egypt	2 Mbps	75% of households	2015
	25 Mbps	90% of households	2021
Israel	100 Mbps	10% of country	2013
	100 Mbps	66% of country	2019

⁸ Many of these targets were taken from this source: https://blogs.akamai.com/Akamai_NBP_Infographic_V6.pdf Another source of targets is the FCC National Broadband Plan, chapter 8: <http://www.broadband.gov/plan/8-availability/>.

Generally, these targets were chosen based on a variety of factors, including the perceived need for certain speeds, the challenges associated with deploying certain technologies in each country, the current state of connectivity, etc. Governments are often cautious to state any targets that they may feel are not realistic.

Unlike other countries and regions that have set long-term speed targets, the Government of Canada and the CRTC have tended to focus on extending minimum levels of broadband access to rural and remote regions within the medium-term.

In 2009, the CRTC announced a non-binding, aspirational speed target of 5 Mbps download speeds by 2015 that it hoped would be achieved through a combination of private investment and government support:

In CRTC 2009-657, the CRTC established a notional broadband speed target of 5 Mbps for downloads and 1 Mbps for uploads. They noted that this speed should be available to all Canadians, regardless of geographic location by 2015.

In 2014, the federal government adopted the same 5 Mbps speed target as part of its *Digital Economy 150* strategy⁹, and as part of the new *Connecting Canadians* program announced in the 2014 federal budget¹⁰: This program is expected to bring 5 Mbps speeds to 98 per cent of Canadian households.

“To keep pace with the needs of Canadians in rural and Northern communities, Economic Action Plan 2014 proposes to provide \$305 million over five years to extend and enhance broadband service to a target speed of 5 megabits per second for up to an additional 280,000 Canadian households, which represents near universal access.” – Budget 2014

While the 5 Mbps target speed is relatively low compared to other jurisdictions, and will be achieved several years later than the initial CRTC target date, *Connecting Canadians* has been designed to focus on very remote regions that currently do not have access to these speeds. These remote regions will be identified through a mapping exercise conducted by Industry Canada, after which project proponents will be invited to submit proposals on how to maximize the number of households benefitting from the program in each geographic area. In most cases, these are likely to be multi-stakeholder projects involving some form of public/private partnerships.

⁹ Digital Economy 150, Industry Canada: <http://www.ic.gc.ca/eic/site/028.nsf/eng/home>.

¹⁰ Connecting Canadians program, Industry Canada: http://www.ic.gc.ca/eic/site/028.nsf/eng/h_00587.html.

Connecting Canadians also includes an envelope focused on satellite-dependent communities in the North. This envelope will bring a minimum of 3 Mbps speeds to Nunavut and the Nunavik region in northern Quebec, where current federal funding was set to expire in 2016.

Community Snapshot – Village of Webb (Saskatchewan)

Population: 58 (Village Census Subdivision), 29,962 (Regional Area)



Type of Residential Broadband Connectivity: The community is served by at least two ISPs. YourLink is an ISP using fixed wireless access points. Prices start at \$34 per month, with speeds ranging from 256 kbps to 5 Mbps (limited availability). Xplornet, a satellite-based ISP, offers advertised speeds for satellite service of 1.5-10 Mbps, with prices starting around \$45 per month. Owing to its proximity to the highway, mobile wireless services are also available.

Community Website: n/a

3.1 Government involvement

Federal, provincial, territorial and municipal governments have undertaken numerous initiatives over the years to ensure Canadians have access to high-speed broadband Internet services. The end goal has always been to ensure that all Canadians can make use of enhanced connectivity.

3.1.1 Funding mechanisms

One of the fundamental public policy questions related to increasing connectivity is who should fund such projects. Over the years, the cause has been picked up by various government agencies at both the federal and provincial/territorial level. The table below lists some of these initiatives, the amount of funding and type of program.

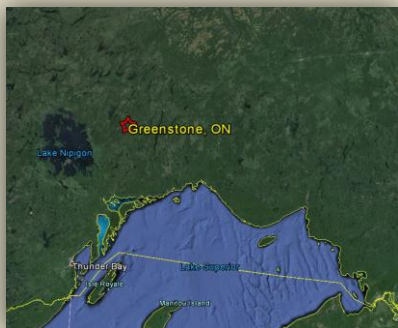
Table 2- Dedicated Broadband Funding Programs across Canada, 2002-2013

Funding Program	Sponsor	Amount	Timing	Nature of Program
Broadband for Rural and Northern Development (BRAND)	Federal (Industry Canada)	\$105 M	2002-2007	Improve service to unserved communities; priority for First Nations, rural and remote, etc.
Connecting Citizen Grant Program	BC Gov't	\$5.2 M	2008-2011	Funding assistance to assist BC Communities with their requirements for 'last mile' access
Broadband Canada: Connecting Rural Canadians	Federal (Industry Canada)	\$225 M	2010-2013	Matching funds on Capital Costs
Deferral Account Funding	Federal (CRTC)	\$600M	2011-	Providing fibre and services to underserved regions
Communautés rurales branchées	Provincial (Quebec)	\$24 M	2009	Funding for rural areas
Building Broadband in Rural and Northern Ontario	Provincial (Ontario)	\$32.75 M	2002	Co-investment (up to 1/3) as part of BRAND program
Saskatchewan	Provincial (Saskatchewan)	\$90 M	2008	Investment to SaskTel to move towards 100% availability
Rural Connections: Community Broadband Infrastructure	Provincial (Alberta)	\$9 M	2009	Help economically vulnerable rural communities to get connected
Rural Connections / Northern Ontario Broadband Initiative	Provincial (Ontario)	\$70 M	2007	Funding to assist rural regions, and northern Ontario regions particularly, to improve broadband connectivity
Infrastructure Fund / Connectivity	Federal (Indian and Northern Affairs Canada)	\$140 M	2009	Program total covers several categories, including connectivity
Broadband for Rural Nova Scotia	Provincial (Nova Scotia)	\$19.5 M	2007	Program cost shared between federal, provincial, and private partners
Broadband Access Project	Provincial (New Brunswick)	\$12.5 M	2003	Program cost shared between federal, provincial, and private partners

As seen in the table above, funding projects are structured in several different ways. These can range from straight capital investments by the funding program, to multi-party partnerships that help offset the costs. They can also be focused on last-mile connectivity (i.e. connecting individual homes to existing networks) or improving backbone connectivity (i.e. the main “trunk” connections of the Internet).

Community Snapshot – Municipality of Greenstone (Ontario)

Population: 4,724 (Census Subdivision), 146,057 (Regional Area - Thunder Bay)



Type of Residential Broadband Connectivity:

The community is served by at least two ISPs. TbayTel is the regional telecommunications provider, offering services using both fixed wireless and DSL. Speeds and prices are dependent on locations, and not listed. Xplornet a satellite-based ISP, offers advertised speeds for satellite service of 3 Mbps, with prices starting around \$68 per month. Bell and TELUS both offer mobile wireless services in the region.

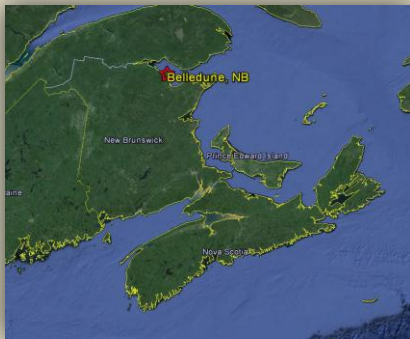
Community Website: <http://www.greenstone.ca/>

3.1.2 Major infrastructure projects

In addition to broadband-specific funding programs, various governments and agencies have undertaken major infrastructure projects to bridge the connectivity gap. These projects have either made use of the funding mechanisms discussed above, or are completely independent projects to address the needs of specific areas. In some cases, municipalities, completely of their own volition, have undertaken to improve their community’s connectivity options.

Community Snapshot – Village of Belledune (New Brunswick)

Population: 1,548 (Census Subdivision), 32,594 (Regional Area of Restigouche)



Type of Residential Broadband Connectivity: The community is served by at least three ISPs. Bell Aliant offers services using DSL technology. Speeds range from 1.5-7 Mbps with prices starting at \$62. Rogers offers services via cable internet at speeds starting at 6Mbps and prices of \$45. Xplornet, a satellite-based ISP, offers advertised speeds for satellite service of 1.5-10 Mbps, with prices starting around \$45 per month. Bell, TELUS, and Rogers all offer mobile wireless services in the region.

Community Website: <http://www.belledune.com/>

Alberta

One recent example of a municipality deciding to undertake their own facility project is the town of Olds, Alberta, population 8,200. In July, 2013, Olds announced that it plans to build its own fibre-optic based network, and start its own ISP to deliver 1 Gbps Internet access services to its residents for as little as \$57 / month¹¹.

Community Snapshot – Valley–Goose Bay (Newfoundland/Labrador)

Population: 7,552 (Census Subdivision), 24,111 (Regional Area)



Type of Residential Broadband Connectivity: The community is served by at least one ISP, and has mobile wireless coverage. Xplornet, offering satellite-based services, is the main ISP in the region, offering advertised speeds for satellite service of 1-2 Mbps, with prices starting around \$65 per month. Bell Aliant offers dial-up Internet access services in the area. Bell and TELUS each offer mobile wireless services in the region.

Community Website: <http://www.happyvalley-goosebay.com/>

Another infrastructure example from the same region is the Alberta SuperNet¹². This initiative, announced in 2001, was an effort by the Alberta government to bring high-speed fibre optic and wireless links to a large portion of the rural Alberta communities. Rather than focusing on the last mile, the SuperNet was built as a backbone network, allowing any service providers to use this backbone on a neutral basis to provide services to the communities. Prior to the SuperNet being in place, there were only seven service providers operating outside of major urban centres. According to recent estimates, there are now over 81 service providers making use

¹¹ CBC article on the initiative here: <http://www.cbc.ca/news/technology/small-alberta-town-gets-massive-1-000-mbps-broadband-boost-1.1382428> Website associated with the O-Net ISP created in Olds: <http://www.o-net.ca/manage/>

¹² Main Alberta SuperNet website: <http://www.thealbertasupernet.com/>

of the infrastructure. Many have cited the SuperNet as a prime example of the benefits of a neutrally-built and operated infrastructure can boost connectivity. While Bell Canada owns a portion of the network the majority is owned by the Government of Alberta and operated by a company known as Axia SuperNet.

Ontario

The Eastern Ontario Regional Network (EORN¹³) was created by the Eastern Ontario Wardens' Caucus to provide higher speeds and bandwidth to at least 95 per cent of homes and businesses in Eastern Ontario. It is a partnership between various levels of government and the private sector, with the federal government contributing \$55 million through the Building Canada Fund – Major Infrastructure Component.¹⁴ The network is currently under construction, and will feature a 5,500-km network of fibre optic cable, with 160 new access points for ISPs. Another stated goal of EORN is to increase coverage area, bandwidth and speed, while bridging the urban-rural price gap.

New Building Canada Fund

Connectivity and broadband is among the project categories eligible for funding under the federal government's major infrastructure fund, the 10-year *New Building Canada Fund*¹⁵. Broadband is eligible for funding under both the \$9 billion *Provincial and Territorial Infrastructure Component – National and Regional Projects* and the \$1 billion, municipally-dedicated *Small Communities Fund*. The actual amount of funding allocated to broadband projects will depend on the level of project applications and Infrastructure Canada's final decision on funding priorities.

3.2 Impacts of technology

An important aspect of broadband connectivity is the role and impact that technology shifts will have on peoples' expectations and service delivery. These shifts change the way services are delivered and put increasing pressure on existing networks.

¹³ Main EORN website: <http://www.eorn.ca/>

¹⁴ August BCF EORN announcement: <http://www.eorn.ca/assets/Uploads/20140806ENHaliburton-launch-Press-Release-Aug-6-2014-EN-2.pdf>

¹⁵ NBCF website: <http://www.infrastructure.gc.ca/plan/nbcf-nfcc-eng.html>

Table 3 - Comparison of Internet Access Technologies

Technology Type	Speed Capabilities	Most Common Usage	Trend
DSL	1.5 – 25 Mbps	Lower speeds in rural areas due to long copper loops, higher speeds in urban due to fibre	Speeds increasing in urban areas, but not being matched in rural settings
Fibre to the Home	25 – 1,000 Mbps	Used to offer bundles of TV and high-speed Internet access	Most deployments in urban areas and new developments
Cable (DOCSIS)	6 – 250 Mbps	Used to offer bundles of TV and high-speed Internet access	Speeds typically increasing throughout service areas
Fixed Wireless	<1 – 150 Mbps	Used in rural areas where there are some facilities to carry traffic	Although high speeds theoretically possible, most residential offerings are 5 Mbps and below
Mobile Wireless	<1 – 150 Mbps	Used either with smartphones and tablets, or for home access in some areas	Speed varies greatly by location, and depends on number of users; highest speeds in urban areas
Satellite	<1 – 10 Mbps	Used mainly in regions that do not have reliable alternative options, or as backup	Speeds increasing due to new satellite technology (up to 25 Mbps), but still lag behind more advanced options

3.2.1 Brave New Wireless World

Perhaps the greatest strides in capability and usage have come from the increased adoption and usage of wireless services. There are two primary types of wireless networks. The first is mobile wireless (or cellular) networks, which are ubiquitous in both presence and usage throughout Canada, albeit with different capabilities in speed. With high growth in adoption and usage of devices such as smart phones and tablets, Canadians increasingly rely heavily on data connectivity.

The second is fixed wireless networks, most commonly found in rural areas, where coverage challenges for cellular networks and wired technologies are an oft-cited problem to getting Internet access. In areas with even greater connectivity challenges, satellite technologies are used to stay connected. Improvements in both satellite and wireless technologies have been heralded as the key to ensuring rural and remote communities can be served with high-speed Internet services.

Wireless network providers, and indeed, the federal government itself, often speak about the importance of wireless connectivity in helping rural communities be part of the digital economy¹⁶. Although great progress has been made in the deployment of wireless networks, there are still large portions of the country that are without high-speed wireless connectivity. For an idea on coverage challenges, one simply needs to look at the maps provided by wireless carriers on their own websites¹⁷.

Satellite services, for their part, have also improved in the past five years with the introduction of newer satellites referred to as high-throughput satellites (HTS). Each generation of satellite technologies improves over the previous. Accordingly, these new satellites are able to deliver greater speeds to end users, but with the limitation that the coverage of these satellites is limited to 'spot beams'¹⁸, which provide greater capacity to only targeted areas. In areas not covered by these spot beams, services that are offered in most cases are provided on older satellite platforms. The net result is that although there may be 100 per cent satellite coverage from coast to coast to coast, the speeds and pricing available are not universal.

Wireless and satellite networks are unlikely to reach the same level of robustness and reliability as traditional wired networks. However, the speeds now being achieved exceed that of first generation wired technologies used in telco and cable company broadband Internet offerings (which ranged from 256 kbps to 1.5 Mbps).

¹⁶ Government of Canada site dedicated to wireless network promotion: <http://www.canada.gc.ca/morechoices>

¹⁷ Sites such as <http://www.comparecellular.com/coverage-maps/> enable comparison of various providers.

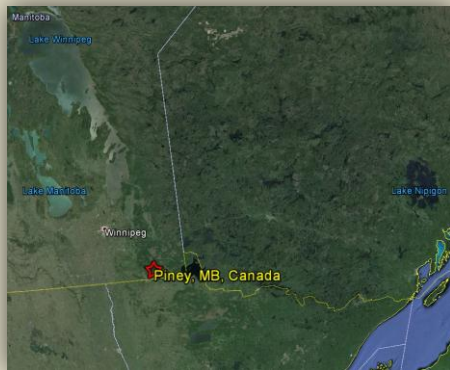
¹⁸ For an image illustrating these 'spot beams' see this page on the Xplornet website, one provider of such services: <http://www.xplornet.com/how-it-works/national-4g-satellite-coverage/>

3.2.2 Fibre-rich and fibre-starved

In spite of the growth of wireless and satellite technologies, there is still a dependence on wired network connections to form the 'backbone'. Nowadays, the fundamental building block is fibre-optic equipment. In order to handle the volumes of traffic that are being created by all the users, network operators need vast networks. A single strand of fibre optic cable, using the latest technologies, has nearly limitless capacity, and can be upgraded over time. In the past, these connections were for the most part handled by physical copper connections and wires.

Community Snapshot – Rural Municipality of Piney (Manitoba)

Population: 1,720 (Census Subdivision), 17,331 (Regional Area)



Type of Residential Broadband Connectivity:

The community is served by at least two ISPs, and has mobile wireless coverage. WiBand is an ISP using fixed wireless access points. Prices and speeds are unknown, (WiBand focuses on business market). Xplornet, a satellite-based ISP, offers advertised speeds for satellite service of 1.5-10 Mbps, with prices starting around \$45 per month. MTS Allstream may also offer DSL services in some communities, at lower range speeds.

Community Website: <http://rmofpiney.mb.ca/>

In an ideal situation, every community and business would be linked to the Internet and all other networks via fibre-optic connections. Given the geography, topology, and vastness of Canada, achieving that goal poses an economic challenge.

In spite of this, communities *are* being connected with new technologies. Decreased operational and maintenance costs arising from new technologies are an incentive for service providers to upgrade. Once larger population centres are connected, neighbouring regions may benefit from this connectivity as part of a natural

progression of network upgrades. However, remote communities can be so far away from these areas, and have such low population densities, that it is less likely they would see this level of connectivity. In those areas, they continue to rely on technologies like fixed wireless or microwave-based links to provide the capacity. As a result, some regions of the country are fibre-rich, and others are fibre-starved.

The U.S. broadband plan released in 2010, had as one of its six objectives that all 'anchor institutions' should have access to a minimum speed of 1 Gbps by the year 2020¹⁹. Progress has steadily been made towards those goals, and communities are seeing the benefits of this enhanced connectivity.

"GOAL No. 4: Every American community should have affordable access to at least 1 gigabit per second broadband service to anchor institutions such as schools, hospitals and government buildings.

Schools, libraries and health care facilities must all have the connectivity they need to achieve their purposes. This connectivity can unleash innovation that improves the way we learn, stay healthy and interact with government." U.S. Broadband Plan

Setting such goals motivates action to achieve them. As will be explored below, in conversations with select rural communities across Canada, it is obvious that there is a real desire to see some of the benefits that come with improved connectivity. Once high-capacity links to anchor institutions are in place, there are technologies to help distribute this connectivity throughout a community. In other words, if you start with a strong backbone, it is much easier to reach the outer edges.

3.2.3 Rise of the apps

Recent trends towards smaller, more powerful devices, with greater portability are increasing the possibilities of, and demand for, broadband connectivity.

Imagine a user in downtown Toronto at a local electronics store. They know they can buy any device and use it to its fullest potential in their downtown condo which is well connected. Now, imagine a rural or remote user, at their nearest electronics store, which will sell all the same devices. However, once at home, they realize that they are severely limited in what they can do with it as a result of low or no cellular connectivity, coupled with poor Internet access in homes and other community areas.

Now imagine a child, well connected at their local school, then told to finish their homework later, carrying out research online. However, when the students get

¹⁹ Full details of the U.S. broadband plan can be found here: <http://www.broadband.gov/plan/>

home, they are unable to complete homework as a result of poor connectivity. This can lead to great frustration for parents and educators alike.

3.3 Comment on rural and remote challenges

As the previous sections have illustrated, there are real challenges facing rural and remote communities in terms of providing broadband connectivity. The actual needs of these communities are the same as other, larger population centres, but the economics and geography often pose substantial challenges.

In spite of these challenges, improvements have been made, through a combination of newer technologies, and targeted programs in the form of public funding and/or private/public partnerships. The next section explores specific stories from different user groups in rural and remote communities.

4. Letters from Canadians

One of the primary sources of information for this reports' conclusions were people living in rural and remote communities. This section examines what they said about community connectivity in focus group interviews.

4.1 Chosen communities and methodology

To get a representative picture of what is happening in rural communities, interview focus groups were held with participants from eight communities across Canada (shown in Figure 5). Each group had representatives from various occupations. The intention was to better understand the common issues present across the country. Community size was determined by using the latest census data available²⁰. To determine current connectivity in those communities, a tool offered by Industry Canada²¹ provided initial data, which was then verified through a review of company websites.

Figure 5 - Selected Communities for Focus Groups



4.2 What was said

The interviews focused on the impacts connectivity needs of different user groups within the communities: enterprises, health care sector users, educators, and municipal governments.

Table 4 below summarizes the main concerns regarding the importance of connectivity to the respondent groups indicated.

Table 4- Summary of Connectivity Concerns

Group	Primary Concern
Small to Medium Enterprises	Connectivity is one of the first things businesses consider when deciding to set up shop in any community. As such, low quality and high cost connectivity can be immensely prohibitive for economic development in rural and remote regions.
Healthcare & First Responders	Full-time and volunteer first responders are often scattered across large distances in rural municipalities. It becomes difficult to notify everyone of emergencies, as Internet connectivity is not uniformly available across all residential areas. Many rely solely on the Internet connection at their workplace(s) for reliable connectivity.
Educators	The traditional classroom has changed; curricula are now heavily reliant on connectivity reflecting the skills required to live and work in today's world. In connectivity-reduced communities where students often do not have a connection at home, Internet usage is limited to completing assignments when at school. This cuts into time learning in the classroom.
Municipal Governments	Connectivity for municipal governments is really about building and maintaining community capacity with a view to fostering sustainable relationships between residents, businesses and other groups. What was once known as a 'digital divide' is now more like a 'community divide' – the disruptive effect of low connectivity on resident out-migration as well as employee/business retention further lowers the feasibility of enhancing connectivity in a region.

Small to Medium Enterprises (SMEs)

SME concerns centered on the business aspects of connectivity. Not only is connectivity one of the more important factors businesses consider when locating in a certain area, it is also an important consideration in how the business will operate. In cases where a business has to bring in specialized talent (such as geologists or heavy equipment mechanics) from urban regions, these prospective employees often find it uncomfortable to be without the 'always on' and 'always available' level of connectivity available to them in larger centers. As such, companies experience high turnover rates that result in higher operation costs, as increasingly higher salaries become required in order to attract the needed talent to these areas. This makes it difficult for businesses to expand and grow.

Some comments:

- Employee training is complicated in the absence of connectivity; online courses and seminars are commonplace, but with poor connectivity, employees must travel to receive training, costing SMEs time and money.
- Lack of reliable connectivity at employees' homes hinders the ability to grow and attract workers, as there are no telecommuting options.
- While quality of life attracts many people to certain rural or remote regions, the tendency will be to seek a community with superior connectivity so that they can enjoy both quality of life and the ability to work.

Healthcare/First responders

Communication is a critical tool for health care professionals and first responders. Transferring patient data, such as MRI and CT scans, over the Internet is mainstream and many hospitals have mandated access to high-speed connections. In rural and remote areas however, there are a lot of gaps in connectivity across a given region that is to be served by a hospital or first responder detachment. This becomes a very serious issue in emergency situations as the availability of connectivity that doctors, nurses or first responders have at their homes differs from what is available at their workplace, and in an emergency, people are not going to be located at one central location. In areas with more reliable connectivity, technologies such as instant messaging, text messages, or other type of services can be used.

However, absent strong mobile wireless networks or connectivity options, alternatives need to be employed. As such, some participants offered that the use of 'phone trees'²² is still a common practice in rural and remote areas. With the many challenges and opportunities currently facing healthcare professionals and first responders in rural municipalities, improvements in connectivity would put

²² A phone tree is a network of people organized in such a way that they can quickly and easily spread information amongst each other using regular phones. It works on the principal that each person contacted in turn is designated to contact additional people.

them into a more cost-effective situation overall, resulting in less of a cost to municipalities to operate these vital services.

Some comments:

- There is pent-up demand in this field for tele-health and online training; tele-health would enable hospitals to expand the number of consultations they could perform and open access to healthcare in more remote areas

- Travel costs associated with health care could be reduced by improved connectivity. In poorly-connected regions, assessments and consultations via videoconferencing is not possible. As such, the only way to see a specialist is to physically travel there, incurring travel, food and even lodging costs online training for first responders and health professionals could cut down on costs and time lost due to travel or training out of region, leading to better service delivery.

Educators

For educators, one of the major challenges in rural/remote areas is ensuring students have the same opportunities as their urban counterparts. There is a growing emphasis in Canadian curricula to provide students with STEM (Science, Technology, Engineering and Math) skills, which today is increasingly reliant on using the Internet for research and assignments. However, while schools themselves may enjoy a certain level of connectivity, allowing students to be productive, this doesn't extend to the homes.

As discussed in the technology section, regardless of location, people are adopting tools like laptops and tablets. Participants from the education community shared that these connected devices have vastly increased the quality of education available to students with learning disabilities in particular, but only if adequate connectivity can be achieved. With the rapid pace that desktop computers in computer labs in schools become outdated, there is even a push for BYOD (Bring Your Own Device) policies in schools, which will necessitate greater levels of connectivity as these policies are brought into place in rural and remote regions. Reduced connectivity in comparison to the standards available in urban areas constitutes a significant disadvantage for rural students. Adequate connectivity in the classroom and for students is one of the best ways to shore up the disparity between rural and urban students.

Some comments:

- Students unable to complete homework assignments due to poor connectivity, having a negative impact on some students' performance and interest in school.
- E-readers and e-books have made it more affordable for students to acquire textbooks. However, where Wi-Fi is available at schools, teachers are often the only ones who have access, as there is limited capacity on the network. Teachers have to coordinate usage so as not to affect students using it while in the library or in computer labs.
- Rural students are having difficulties competing with their urban counterparts when applying for jobs or higher education as they are not as 'digitally literate'. This is particularly pronounced in rural/remote areas where it is more common for students to have a very limited Internet connection at home and sometimes none at all.
- In rural areas with adequate access, use of tools such as e-learning and co-teaching sessions (e.g. via video conferencing) have inspired students to

continue with their education.

Municipal Governments

For municipal governments, the primary concern is building and maintaining a sustainable community. Dwindling development and population levels are major issues facing rural communities and the level and availability of connectivity plays an important role in these issues. One of the most common questions prospective businesses ask community development officers in these regions is “Will we have reliable Internet?” Reliable and adequate connectivity has become one of the most crucial issues when assessing the viability of a new business venture or expanding an existing one. As such, much of the development of broadband infrastructure begins with meeting the needs of vital community services (such as justice, education, and health services), and then moves on to meeting the needs of businesses and residents. The ability to offer reliable connectivity is important for maintaining the competitiveness of communities.

- Some comments: Rural economies may be reliant on revenues generated by tourists; reduced connectivity carries an impact, as they expect ubiquitous broadband access as a default.
- Out-migration from rural municipalities is commonly seen, due to the connectivity gap. Over time, it will be harder and harder to close the gap and attract families, students, residents, and businesses back.
- Enhancements in connectivity are crucial for maintaining the competitiveness of port cities, which ensures tax revenue is generated in Canada and reduces the costs of imported goods for Canadian consumers.
- Deploying their own communications infrastructure is not feasible for most communities. With respect to any future funding programs (such as the recently-announced \$305M initiative by the government), it was suggested that municipalities themselves should be more involved in determining how funds are used, as they are in the best position to understand local needs.

Community Resilience and Innovation

One trait evident amongst all the groups in rural municipalities was their resilience. Faced with the situation of lower levels of connectivity for residents, businesses and other community service groups, they employ workarounds to make up for the lack of adequate connectivity.

Examples of this resilience and innovation include:

- Use telephone trees to relay important messages to everyone in the community.
- Copying data to CDs and DVDs for physical delivery of information between computers as a common practice for transferring data across far distances in lieu of robust upload speeds and suitable data caps.
- Faced with cost increases, many residents indicated that they would simply absorb these costs rather than give up connectivity (especially if it meant improvements).

One final aspect of rural connectivity mentioned repeatedly was of the importance of reliable mobile wireless networks. While the primary focus was to assess the impact of the lack of higher-speed connectivity using traditional ISPs, focus group participants nonetheless expressed concerns with mobile wireless services. In regions with few ISP options, but having cellular service, many people are relying on the mobile data services offered by network operators for their primary connectivity needs. Due to significant investments in recent years, in many cases, the cellular network is more reliable than other options in rural and remote regions. However, stories abound about dead zones and issues with remaining connected while moving between locations. Many participants shared that they would be happy to see increased mobile wireless connectivity over other forms of network building, if for no other reason than there already seems to be a base to work from, and the fact that people are quite familiar with the technologies, and the use of their mobile phones, tablets, and laptops.

5. Findings and Conclusions

The need for broadband connectivity is becoming a necessity for citizens, businesses, and governments alike. While the 'digital divide' in Canada has been acknowledged, moving from recognition to action is a slow process, with most investments focused on providing minimum levels connectivity to the most remote regions. The stories of the communities we spoke to as part of this report would likely resonate with other rural regions that are dealing with the limitations of low connectivity and will require more robust broadband connections in the future.

5.1 Residential vs. institutional requirements

Our conversations with rural and remote communities pointed out how strongly needs for home connectivity are tied to connectivity in businesses, schools, and other institutions. Participants shared that having good connectivity in one location merely highlights the problems of not having good connectivity in the other. A good example was from the educators citing students unable to complete homework at home, but having access to great resources while at school.

This linkage leads to one of the first challenges facing broadband connectivity, which is to identify what constitutes adequate connectivity in homes, as well as in other sectors. While a universal speed of 5 Mbps has been proposed by the CRTC,

and is the current focus of the federal government, there are reasons to believe this may not be adequate now, let alone in the near future. A recent report prepared by Nordicity, and delivered to the governments of the three northern territories concluded that there should actually be different speed requirements based on particular user groups²³. For example, speeds of 9 Mbps were suggested for residential use, 11 Mbps for educational use, and 16 Mbps for healthcare applications. All of these speeds were identified as being required today. The determination of these speeds was based on a detailed needs-based analysis. Different user groups have unique needs, which place different demands on the networks.

As a closing thought, caution needs to be exercised with respect to determining what minimum speeds should be delivered to communities. The reality is that in northern communities, needs may actually exceed those that seem reasonable on a national basis, precisely because of the remoteness and increased reliance on communications links.

5.2 Progress has been made, but continual improvement is needed

In this report, we have looked at a number of factors that make up the notion of 'being connected', including examining technologies and the ways they are being used by people. We have also examined some of the programs and initiatives that have been put in place to address the connectivity gap that exists for rural and remote Canadians.

As the evidence shows, significant funds have been allocated to help solve this problem, and progress is being made. The tide of technological change has also contributed to a net benefit in all communities over time. The critical point however, is that this change is continual, and if one area is perpetually 'behind' in terms of technology, the perceptions will always be that people are being 'left behind'. The positive news is that for the most part, communities are in a better position than ever before. The rollout of mobile wireless networks has been a catalyst for improved services, but has shone a light to continued connectivity gaps.

The stories from all communities have shown that even when communities are seemingly well-connected, there are still 'outliers to connectivity'. For that reason, continual improvement is essential when it comes to public policies and programs on connectivity and broadband. One of the primary challenges moving forward may lie in collecting the right data and mapping the exact gaps that exist. Industry Canada's mapping exercise for the *Connecting Canadians* program may very well make an important contribution in this area.

²³ To review the full report, please refer to: <http://northernconnectivity.ca/>

5.3 Final thoughts

To close, we acknowledge the assistance and participation of the selected communities in gathering input about the impacts of reduced connectivity. Participants were very forthcoming about the challenges that were posed. These same participants were equally quick to point out the solutions they are coming up with to deal with these challenges. Their resourcefulness is a clear illustration of the vibrancy of Canada's rural and remote communities.

However, it is important to note that some of the solutions that are being employed are not sustainable in the long run. The data demands of new technologies that pervade everyday lives in urban centers continues to increase along with demands for lower access costs, greater availability, coverage, greater speeds and higher data caps. However, rural consumers, by virtue of their small numbers and the technical challenges in delivering these same advancements, make the investment case for any operator very difficult without government support.

The success of rural and remote communities in 'closing the gap' on connectivity disparity will depend on novel approaches to the existing policies and investment strategies directed at improving connectivity. To close, we would like to reproduce text from a 2011 report by General Electric (GE) on Shaping Economic Growth in Remote Communities²⁴. For their study, roundtables consisting of participants from remote communities were utilized. In the closing thoughts of that report, it was reiterated that participants stressed the need for, among other things:

- An attitude that looks at spending in remote communities not as a subsidy, but as strategic investment for the country as a whole
- Embracing new technology solutions to help bridge infrastructure gaps, in areas such as energy, water, telecommunications, transport, health and education

Furthermore, the report stated:

"Now is the time to look at Canada's remote communities with a new perspective. One that will shape economic potential, encourage innovation and the application of new technology, as well as supporting new models of partnership while respecting our natural resources and contributing to growing healthy communities.

No matter where we live in Canada, now is the time for all of us to work together to drive forward a vision for growth and opportunity in Canada's remote communities."

While the GE report was focused on the case for investment in rural and remote communities generally, rather than specifically on communication needs, the sentiments are applicable. Rural and remote communities are the very fabric of Canada. Attention and focus needs to remain on addressing the connectivity issues

²⁴ The full report can be found here: http://ctcg.org/wp-content/uploads/2013/03/ge_canada-full_report-remote_communities-en.pdf

facing Canadians from coast to coast to coast. This will require all stakeholders to roll up their sleeves and pitch in. Only in acting as a true 'national' community will the "digital divide" continue to be addressed.