



UNIVERSITY OF ALBERTA
ALBERTA CENTRE FOR SUSTAINABLE
RURAL COMMUNITIES

Rural Broadband

POLICY RECOMMENDATIONS FOR IMPROVING BROADBAND ACCESS
& ADOPTION IN RURAL ALBERTA

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Executive Summary

The provincial and federal governments have made efforts to ensure equitable access to broadband technology and services for all Canadians. From 2011 to 2015, the CRTC's Broadband Expansion Fund allocated funds upwards of \$350 million dollars to broadband expansion (CRTC, 2009). In 2005, the Government of Alberta had invested \$193 million into the Alberta SuperNet, a large-scale broadband network (Cybera, 2016). More recently, the government-funded, non-profit organization Cybera has connected educational institutions and businesses across the province to encourage innovative research and development.

Although Alberta's coverage exceeds the national average, approximately 80,000 Albertans remain underserved (Cybera, 2016). A small number of Internet service providers monopolize the broadband market, which has led to stagnant development in rural areas. The Alberta SuperNet has improved communications and sparked entrepreneurial attitudes, but it is underutilized outside of government services (Middleton & Given, 2010).

Accessible high-speed broadband is no longer a luxury, but a basic requirement for everyday economic, social, and cultural activities. Effective implementation can result in new and improved online services, including commerce, government, health and education. Broadband service development can in turn benefit a community's economy, workforce, governance structure, and natural environment. Public policy can help address low adoption rates and stimulate a healthy, competitive broadband market by:

- Focusing on supporting equitable access initiatives over forefront broadband technologies.
- Addressing the shortage of demand-oriented broadband policies and strategies by creating locally relevant broadband content and services.
- Supporting collaborative efforts, including public sector investment, in broadband initiatives.
- Establishing pricing benchmarks for broadband services to prevent high costs from discouraging adoption.
- Incentivizing broadband adoption, especially for the purposes of entrepreneurship, research and development.
- Improving digital literacy and user-interface experiences, especially amongst non-user and marginalized groups.

The Methodology

This literature review cross references sources based on the determinants of broadband adoption that it addresses and the way in which it addresses them (interventions).

Functionally, this creates loose categories within the ‘determinants of broadband’ section such as ‘developed vs. developing vs. northern/aboriginal communities’, “rural vs. urban”, and ‘social determinants of broadband (gender, race, socioeconomic status, and individual factors)’.

Generally, the interventions can be divided into supply-side and demand-side interventions with further subcategories. Demand-side subcategories include education, wealth, the demand gap and social capital. Supply-side subcategories include public-private partnerships, taxation, incentives, municipal broadband, loop unbundling, and regulation.

This approach is valuable because it systematically sorts the literature in a way that makes specific policy suggestions easily found – simply cross reference the intervention used with the determinant (e.g. literature focusing on public-private partnerships in rural areas is found by cross referencing public-private partnerships and rural areas).

Rural Broadband: An Overview

Access to high-speed broadband is no longer a luxury, but a basic requirement for everyday economic, social, and cultural activities. Average broadband availability and penetration rates in Alberta are greater than overall Canadian rates. However, approximately 80,000 Albertans pay for download speeds of less than 5 Mbps, compared to the national average of 14.8 Mbps in rural and 19.8 Mbps in urban areas (Cybera, 2016). Minimal broadband market competition has led to stagnant development in rural areas. The Alberta SuperNet has improved communications and sparked entrepreneurial attitudes, but it remains underutilized outside of government services (Middleton & Given, 2010). To help address the issues of low quality service and low adoption rates in Alberta’s rural areas, public policy can formally acknowledge the importance of broadband as a driver of growth, create locally relevant broadband content, provide technical and financial support for broadband research and development, and ensure Alberta’s citizens are digitally literate.

Reframing Rural Broadband Adoption Issues

Rather than being seen as an issue of demography or interest, LaRose (2007) implores policymakers to view the ‘broadband gap’ as a “problem in diffusion of innovations, “The process in which an innovation is communicated through certain channels over time among the members of a social system”” (LaRose, 2007, quoting Rogers (2003, p. 5)). LaRose suggests combining this framework with a social cognitive theory framework to address the human factors that cause broadband service internet adoption in rural communities. This alternative understanding allows for policymakers to address aspects of the ‘demand gap’ (in which individuals choose not to uptake broadband services that are available to them). While this is just one method of reframing the issue of rural broadband, it points to a larger problem in the way in which broadband issues are framed. Through a “build it and they will come” approach, Alberta has limited itself and its understanding not only of the issues surrounding rural broadband, but of rural Albertans themselves. Therefore, a shift in framing is essential to tackling broadband issues holistically and thoroughly.

The Demand Gap

It is largely conceded that the digital divide is no longer an issue of availability. While there are areas that remain underserved, the general consensus is that broadband services are available for adoption; the larger (and oft ignored) issues are equity of access and quality and the ‘demand gap’. The demand gap consists of those who chose not to adopt broadband services that are available to them. The most effective ways of closing the demand gap are ensuring equitable and affordable broadband access, creating digital literacy programs, and having access to both devices and broadband service itself made publicly available (through public portals such as schools and libraries).

Approaches to Rural Broadband Development

Studying broadband adoption patterns in rural areas can provide information on gaps in services and technologies, and help to inform future integration plans. In Oklahoma, increased availability of broadband, cable and DSL infrastructure has minimal impact on broadband adoption (Whitacre, 2008). Researchers often instead focus on studying individual factors that may influence the choice to utilize broadband. Prior experience, knowledge of potential benefits, age, and income all significantly affect whether a person will utilize innovative broadband technologies and services, income being a key determinant (LaRose et al., 2007; Saleminck et al., 2015). The potentially high cost of broadband adoption acts as a short-term challenge for rural residents and SMEs looking to innovate and expand their systems (Galloway, 2007).

The “last mile” approach to broadband development denotes rural and remote areas as the last leg of broadband connectivity. A more recent “first mile” approach views broadband

expansion as beginning in a rural community, giving rural areas a more active role and increased ownership over their broadband development (Ashton & Girard, 2012). An action framework for broadband integration in Manitoba's rural communities has adopted this "first mile" approach, calling for collaboration between public and private business sectors, youth, and community members. A number of First Nations communities across Canada have also excelled in establishing and maintaining locally owned and operated broadband networks that are relevant to local needs (McMahon et al., 2014; Whiteduck et al., 2012). Their initiatives often succeed due to efficient resource and knowledge sharing, as well as allowing each region to have control over its digital development (Fisher et al., 2006). Positive outcomes for Ontarian First Nations communities include job creation, updated technology, increased communication between parents and children away at school, and the establishment of youth technology camps and digital literacy programs for adults (McMahon et al., 2014). Adequate funding also means the regional service network, known as KO-KNET, runs as a non-profit.

Rural Broadband Benefits

Effective broadband implementation can result in new and improved online services, including commerce, government, health or education. Broadband service development can in turn benefit a community's economy, workforce, governance structure, and natural environment.

Broadband produces mixed economic effects in rural areas. In the United States, increased broadband availability raises property values and creates a larger tax base (Kolko, 2012), but at the individual level, increased availability alone has no impact on employment rates or average income, only actual adoption (i.e., use beyond basic information gathering and email) (Whitacre, Gallardo, & Strover, 2014). A recent cross-Canadian broadband study found rural service industries, especially those with high digital usage, experienced significant employment and wage growth after broadband implementation (Ivus & Boland, 2015). Broadband can also encourage entrepreneurship, market diversification, and boosted firm productivity (Atkinson & McKay, 2008; Grimes, Ren & Stevens, 2012). These types of effects tend to be less significant for rural small and medium-sized enterprises (SMEs) that rely minimally on broadband services (Galloway, 2007).

Beyond employment rates and average income, broadband can also play an important role in workforce preparation. Access to high-speed broadband has become a basic requirement for many public education institutions; students without access are at a disadvantage when it comes to completing homework (Meyer, 2016). Online education and training programs enable rural residents of all ages to develop an advanced career without having to migrate to an urban centre. Increased broadband connectivity has been shown to improve rural population retention (Fuhr & Pociask, 2007; Irshad, 2010; Stolarick et al., 2010).

Less direct, but measured spillover effects of broadband implementation include changes in: (1) social behaviours; and (2) the natural environment. Broadband access enables individuals to have greater control over their daily activities, which can have both positive and negative consequences (Asgarkhani, 2005). Negatives may include increased illegal online activity or cyber-bullying. Positive impacts have been measured with respect to democratic functions; access to broadband technologies can increase exposure to political information, changing civic engagement and voting behaviours. As for spillover effects in the natural environment, broadband integration often correlates with a reduction in worksite energy consumption. Broadband technologies decrease human error, paper use, and transportation costs (Atkinson & McKay, 2008; Fuhr & Pociask, 2007; Havyatt et al., 2010). However, context must be considered (i.e., resource prices, building characteristics) when determining whether the benefits of a broadband strategy outweigh the costs of its infrastructure and implementation. For example, teleworking can cut down on transportation costs, but individual teleworkers' household costs often rise (Havyatt et al., 2010).

The Existing Policy

Current Policy

The Alberta provincial government invested an initial \$193 million into the Alberta SuperNet, with an additional \$102 million provided by Bell Canada. The SuperNet is a large-scale broadband network that provides communication, education, and healthcare services for the province's residents. The goal of the SuperNet was to provide equitable broadband access for all Albertan residents while supporting a competitive broadband market. Internet service providers that purchase SuperNet bandwidth are responsible for then connecting their clients to the network (i.e., using wireless, DSL, fibre)(Bakardjieva & Williams, 2010). SuperNet ISPs also choose the speeds and rates they offer to customers. The initiative has been effective in expanding and centralizing government services across the province, with SuperNet now integrated into 429 communities across Alberta (Adria & Brown, 2012; Alberta SuperNet Overview, 2016).

Cybera, a non-profit organization funded by the provincial and federal governments, connects users to the CyberaNet, an ultra-high-speed network. Cybera promotes research and innovative digital development in educational institutions, businesses, and governments that will contribute to the provincial economy (Cybera, 2016a). The organization aggregates user traffic to reduce bandwidth costs, meaning they can offer their services at competitive rates. Cybera has participated in projects such as the Rapid Access Cloud, an initiative to bring SMEs into the world of online commerce.

The Regional Economic Development Alliances (REDAs) have made significant contributions to broadband development in Alberta. The northern REDAs and the Ministry of Economic Development and Trade are currently collaborating on the Northern Alberta Broadband Preparedness Project led by the Northern Alberta Development Council (NADC). The project spans 150 communities with the purpose of planning effective broadband strategies. Other efforts are being made at the federal level to enhance the broadband environment in all Canadian communities. The federal Canadian Radio-television and Telecommunications Commission (CRTC) has stimulated competition within the broadband services market by allowing third party network access, giving smaller ISPs a chance to offer reasonably priced services (OECD, 2008). From 2011 to 2015, the CRTC's Broadband Expansion Fund allocated funds upwards of \$350 million dollars to broadband expansion (CRTC, 2009). Other recent rural broadband initiatives have included Broadband Canada: Connecting Rural Canadians (2009-2012) and Broadband Canada's significant contributions to Canada's Economic Action Plan (2009-2011). The current Connecting Canadians program is contributing \$3.6 million to two ISPs with the purpose of establishing broadband service (5+ Mbps) to 6,000 rural households in northern Alberta (Roberts, 2015).

Shortcomings and Opportunities

Although broadband participation levels have reached near-saturation in rural areas, adoption levels remain low (i.e., innovative uses beyond emailing and basic information gathering). Alberta's rural residents are hesitant to adopt broadband for a number of reasons, whether it be expensive subscriptions, irrelevant services (Middleton & Given, 2010), or insufficient digital support and education (Hauge & Prieger, 2010; Moll & Shade, 2011). The Alberta SuperNet's "build it and they will come" approach has, in some ways, failed to engage potential users. The Alberta SuperNet places the province at a significant advantage in terms of broadband infrastructure, with higher coverage in Alberta than most other areas of Canada (McNally, 2016). However, effective broadband integration also requires leaders to create, distribute and manage relevant broadband content. Current SuperNet policies are becoming outdated as digital technology and user demands rapidly evolve. After expiring in 2018, these policies will need to be revised to accommodate the dynamic nature of individual community digital needs. The federal government, in its business-case approach, has encouraged and incentivized private sector investment in the broadband market. Despite the CRTC's regulatory efforts, the market has become essentially monopolized by a small number of ISPs for which rural connectivity is often an issue of little importance (Rajabiun & Middleton, 2013; Roberts, 2015). Rural residents without sufficient access to affordable broadband are placed at an economic and social disadvantage. As Internet-use becomes more commonplace in all areas of life, with Canadian data usage expected to triple from 2015 – 2020, the rural-urban divide may close but the access-gap between socioeconomically advantaged and disadvantaged groups is at risk of widening (Cybera, 2016). Spillover or unexpected effects are gaining recognition as

an important element in broadband integration, but are not yet explicitly addressed in public policy. Evidence for governance or environmental benefits of broadband technologies may be used to inform new incentive programs for increasing adoption rates.

The Next Step: Recommendations

The “build it and they will come” approach to broadband development has been generally ineffective in Alberta’s rural areas, and so new policy can aim to increase adoption rates by supporting the creation of locally relevant broadband infrastructure and content for all user groups, including individuals, businesses and communities (Ramirez, 2007). Partnerships between community organizations, non-profits, and service providers to establish locally owned broadband initiatives can benefit the local economy and reduce costs for users (Adria & Brown, 2012; Bertot et al., 2013). Many researchers recommend that public sector supporters such as hospitals, schools, judicial courts, and lottery corporations be included in policy decision-making (Ashton & Girard, 2012; Marle, 2015; McMahon et al., 2014); a diverse group of stakeholders will be more likely to take comprehensive action. Public institutions can also act as an “anchor” – their high data demand provides sufficient revenues to attract private sector investment in underserved communities (Nordicity, 2014). However, maintaining public ownership ensures fair competition and generates revenue for the municipality.

If the goal is to promote locally owned and managed broadband networks, then broadband public policy should be adaptable to meet the needs of individual communities. Individuals who live in rural and remote areas and rely on broadband technologies for education or training have expressed the desire for increased flexibility of offerings to reduce disruption to their regular schedule, as well as for equitable access to the same materials as traditional learners (i.e., affordable bandwidth to participate in peer and tutor videoconferencing)(Butcher & Rose-Adams, 2015). Social media tools can also be customized to support innovation within agriculture and other rural sectors (Chowdhury & Odame, 2016). The government should ensure rural users are aware of how to update their cybersecurity measures when adopting new broadband technologies (Cybera, 2016; Sutherland, 2016). On a broader scale, small communities may benefit from receiving support to update their local websites and online recruitment methods (Nene, Johnson, Burkhartkriesel, & Cantrell, 2009). Along with creating relevant broadband services, stakeholders should ensure their target population is adequately prepared to take advantage of the service’s benefits. Digital literacy is essential for successful broadband integration (Irshad, 2010; SRDC, 2010).

The government can further support local initiatives by placing certain regulations on the broadband market, including price controls of business data services in areas of market power, preventing high costs from discouraging public institution adoption (SHLB, 2016).

However, over-regulation of the online market should be avoided; protecting the offline private sector can harm existing online businesses (Atkinson & McKay, 2008). More specifically, the Alberta government can stimulate a competitive broadband service market and support Alberta's small IT firms by modifying the roles of the Government of Alberta's Chief Information Security Officer and ministerial security officers (Cybera, 2016). The government can also provide direct financial assistance, tax credits, and other incentives for those looking to innovate and/or expand their broadband systems (Atkinson & McKay, 2008; Copps, 2009; Zaremohzzabieh et al., 2015).

To realize the SuperNet's maximum potential, Service Alberta must ensure that the upcoming 2018 Alberta SuperNet agreements align with the goal of Alberta becoming a broadband leader (Cybera, 2016). Service Alberta has explicitly stated their intention to "advance the strategic vision and direction for SuperNet," enhancing the delivery of broadband services to hospitals, schools, and other public facilities (Service Alberta, 2016). Recent internal recommendations also include an independent audit of the current SuperNet operator and establishing a "fairness monitor for the provincial broadband service procurement process."

Plans for broadband developments should also include the intention to evaluate their short- and long-term outcomes, so that ineffective strategies are realized in a timely manner and unnecessary expenditure is avoided (Epstein & Yuthas, 2007; Taylor & Schejter, 2013). Stakeholders should be encouraged to carry out reflexive, interactive assessments of their digital systems across a time span of at least two decades to fully understand the systems' impacts (Pant & Hambly-Odame, 2016).

The economic, social and environmental spillover effects of broadband are under-recognized in current public policy, likely because they arose unexpected from development initiatives. As researchers further develop methods to accurately measure spillover effects, their beneficial nature can be used to guide new broadband policy (Kelly et al., 2009). Workshops hosted by the ACSRC on the issues surrounding rural broadband have come to several conclusions regarding stakeholder and citizen priorities. Stakeholder priorities vary widely, with the bottom line being issues of affordable, high quality and informed access. There is a distinct lack of policy directed at ensuring, from a demand perspective, that the needs of rural citizens are met in this regard. In areas dubbed 'rural-rural' by their citizens, such as Parkland County, broadband speeds remain insufficient for citizens to take online education courses. The 'build it and they will come' approach has clearly failed this section of the population. Demand-oriented approaches to broadband policy are underutilized and potentially very valuable tools to overcome the problems associated with broadband in rural and 'rural-rural' areas.

Further, the growing issue of the 'demand gap' is shown to undercut the broadband adoption rates. Again, demand-oriented policies are valuable to overcome the demand gap,

particularly in the areas of education and skill-building for those who lack experience with digital devices and the internet.

The larger issues for rural Albertan ISPs (particularly smaller firms) include access to Alberta's SuperNet infrastructure and other infrastructure built by incumbent operators, and lax regulations around broadband spectrum use. Implementing regulations for loop unbundling and allowing easier access to already-built infrastructure to smaller ISPs and community and municipal broadband initiatives will result in greater competition and subsequently high quality broadband at lower prices for users. The next step that Albertan policymakers take is essential in making or breaking broadband opportunities for rural residents and bringing rural broadband into the future. Targetting issues of innovation and adoption over issues of availability is paramount in creating a sustainable broadband future in rural Alberta.

Conclusions

The following is a summary of our recommendations for improving adoption rates and stimulating a healthy, competitive broadband market:

- **Shift focus to demand-oriented policies** rather than universal availability. Broadband adoption determines impact, not availability (Whitacre, Gallardo, & Stover, 2014).
- **Encourage locally owned broadband initiatives**, which contribute to the local economy and reduce costs for users (Bertot et al., 2013; Whiteduck et al., 2012). Look to First Nations' decentralized approach as a successful model when planning broadband integration (Fisher, Clement, & Walmark 2006; McMahon et al., 2014; Stratigea 2011).
- **Increase policy surrounding broadband outcome evaluation** to prevent expenditure of resources on ineffective strategies (Epstein & Yuthas, 2007; Taylor & Schejter, 2013).
- **Support Alberta's small IT firms** by modifying the roles of the Government of Alberta's Chief Information Security Officer and ministerial security officers (Cybera, 2016).
- **Establish pricing benchmarks for broadband services** to prevent high costs from discouraging adoption (SHLB, 2016).
- **Support digital literacy initiatives** and highlight the personal benefits of broadband (Irshad, 2010; LaRose et al., 2007; Moll & Shade, 2011; SRDC, 2010).
- **Incentivize ICT and broadband adoption** for the purposes of entrepreneurship and research and development (Zaremozzabieh et al., 2015). Incentives can include tax credits and reduced tariffs on ICT imports (Atkinson & McKay, 2008).
- **Target non-user and marginalized groups** when attempting to improve broadband integration (Howick & Whalley, 2007).

- **Consider effects of capital-labour substitution** on job retention (Katz & Suter, 2009). Include job retention plans in broadband strategies.
- **Consider the environmental, social, cultural and ethical implications** of broadband integration (Asgarkhani, 2005).

Rather than a business opportunity, broadband should be considered a priority for community development and an important space for interaction and innovation. Rural residents desire broadband that is accessible, affordable, and relevant. What is relevant for one community may not be true for another, and so a need for differentiated broadband solutions exists in rural Alberta. New and modified policies should be responsive and customizable to individual community needs as those needs evolve over time. By taking on a more demand-oriented approach, the Albertan government will likely see significant progress in rural broadband development.

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About the ACSRC

The ACSRC fills the gap for research and policy in rural areas by fostering constructive dialogue, promoting interdisciplinary and collaborative research, and developing partnerships between the University of Alberta and rural communities.

Mission

The mission of the ACSRC is to link the research, outreach and educational capacity of the University of Alberta with students, researchers, rural communities, rural community organizations and policy makers at multiple levels across the province, nationally, and internationally in order to support the improved sustainability of rural communities and populations.

General information

The vision of the ACSRC is of resilient rural communities across Canada linked closely to the discovery, dissemination, and application of new knowledge at the University of Alberta through teaching and learning, research and creative activity, community involvement, and partnerships. Such resilient rural communities will hinge on informed citizens actively participating in community governance and development in order to support and sustain the people, livelihoods, regional and local capital, economic development and long-term social viability of rural communities as a key element of the Canadian economy, the natural environment and as home to many Canadians.

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