



**Assessing the efficacy
of instruments for the
delivery of rural
broadband**

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the University of Ottawa**

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The authors wish to recognize the contributions of key informants and experts, including senior federal government officials, academics, and community and industry stakeholders in this work.

This report was prepared at the request of TELUS Communications.

The views expressed here are those of the author and do not necessarily represent the views of TELUS Communications.

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Executive summary

Rural broadband connectivity is a challenge. Nearly 99% of urban households have a 50/10 connection standard, relative to approximately 46% of rural households, with broadband availability at 35% of households on First Nations reserves.¹ Canada is falling short of the goal of a universal service objective.

Canada's rural broadband challenge is fundamentally about connectivity. Connectivity is a matter of 'hard' infrastructure and technology to bring broadband to rural places, but it also requires a digital culture and uptake in a community for sustainability. As the COVID-19 pandemic has underscored, broadband is an essential service and a public utility. From accessing education to supporting agriculture, connectivity is an integral means for participating in the economy and society.

Other countries like the United States, United Kingdom and Australia have also invested in rural broadband and leveraged various instruments to improve connectivity. In the United States, the Federal Communications Commission (FCC) asks the market to dictate the cost of building connectivity in unserved or underserved areas. In the United Kingdom, supplier-targeted subsidies and agreements with suppliers are intended to better align need and public money. While Australia had a vision for state-built fibre capable internet connectivity, its cost and current results suggest that a state-led initiative may not be a desirable approach for connection and risk management.

Abstracting from the reviewed cases, there is clear recognition that a subsidy for rural broadband and multiple technologies (e.g. fibre, wireless, satellite, etc.) are necessary to achieving connectivity. With low population density and variable terrain, costs for building the infrastructure for rural connectivity are higher than in urban areas creating a limited business case for private sector investment. To achieve universal connectivity, public subsidy is required. The public-private investment mix for rural broadband projects, ranges from 2/3 public and 1/3 private to 1/2 public and 1/2 private.

Federally, in Canada, nearly \$8B in expenditures through various programs and the Canada Infrastructure Bank has been allocated to rural connectivity initiatives. While the commitment is significant, only a fraction of that total (\$870M or roughly, 11%) has been reported as expended. Budget 2021 announced an additional \$1B for the Universal Broadband Fund (this and other commitments are subject to parliamentary approval).² The difference between the allocated funding and actual expenditures suggests that there are difficulties in recipients accessing funding and the federal government adjudicating applications.

¹ Canadian Radio-television and Telecommunications Commission (CRTC), "LTE and Broadband Availability," last modified December 10, 2020, <https://crtc.gc.ca/eng/publications/reports/policymonitoring/2020/cmr4.htm>.

² Budget 2021 also proposed amendments to the Telecommunications Act to facilitate broadband delivery, through information sharing and expedited decision-making.

The regulatory and funding environment for rural broadband would benefit from differentiation between practices for rural and urban places, by recognizing that different approaches to spectrum policy, deployment conditions and set asides are needed in different contexts. Canada's rural connectivity challenge is a regulatory and demand issue, not a supply challenge when appropriate resources are allocated to make the buildout viable. Supplying connectivity can be incentivized and industry is more likely to bring connectivity when demand for connectivity is met with resources to offset costs.

Three key messages are highlighted in the analysis of this report, based on lessons from other countries and the perspectives of key informants:

1) **Understand need from the bottom-up.**

All actors in Canada's broadband ecosystem, i.e. federal and provincial governments, industry, communities, need improved data on existing connectivity, user demand and potential to close gaps on a geographic basis.

2) **Leverage a variety of instruments.**

Canada is a large and geographically diverse country with varying levels of community engagement and government intervention on broadband. Using a variety of regulatory and funding instruments, can help to better align public subsidy and policy to need on the ground. A single approach will not be sufficient to achieve the goal of rural connectivity.

Regulatory and funding instruments include:

- a) **Tax credit:** Tax expenditures (tax credits) are used to incentivize behaviours or promote policy outcomes. While an expeditious tool, tax expenditures are also blunt instruments that do not guarantee investment in areas of need or deliver on specific standards (e.g. speed, timely deployment, etc.).
- b) **Grants and contributions (G&Cs):** G&Cs are mechanisms for government to transfer money to another entity to achieve a policy goal. The manner in which the funding is allocated and managed should be reconsidered to include approaches that better respond to policy goals.
- c) **Spectrum allocation:** Spectrum policy allocations and deployment conditions should be differentiated for urban and rural contexts. This means considering realities of geography, density and coverage objectives when allocating spectrum for auction.
- d) **Single door:** Accessing federal funding through a single point of contact would help to promote access. A single-door for programs that can be consolidated now could be explored, with other programs added as their requirements are reviewed and updated.
- e) **Reverse auction:** The reverse auction is an approach to align market forces to public funding. The winning bid meets the coverage and deployment requirements at the most reasonable price.

3) **Both political will and administrative action are necessary for change.**

The instruments reviewed in this report mostly require administrative and policy changes, most feasibly and expeditiously achieved with political direction that supports policy and program changes.

Improving rural broadband connectivity in Canada will be a joint effort between government, industry and communities. Their collaboration and cost-sharing are imperative to achieving the goal of connectivity.

Introduction

The “digital divide” between rural and urban places in Canada has been an ongoing challenge. Political announcements have pledged billions to improve connectivity, especially as differences have only been amplified by the COVID-19 pandemic. In a 2020 report for the Canadian Rural Revitalization Foundation (CRRF), Weeden and Kelly write that:

Rural Canada is not currently realizing its full social and economic potential due to the broad failure of current approaches to broadband investment and policy. Overcoming the digital divide will be essential for supporting Canada’s recovery from the COVID-19 pandemic. Doing so will require rethinking previous approaches to supporting broadband extension and adoption.³

In a post-COVID-19 context, the federal government is spending significantly on infrastructure and related economic programs, this provides an opportunity to revisit and rethink the technologies, regulations and funding that govern subsidies for rural broadband.

The various technologies used to connect rural places are a reflection of the limited business case that exists to fund connectivity in low density and/or hard to reach areas of the country. Building fibre capable infrastructure – while desirable – is not always feasible financially. Using a mix of technologies, including wireless, is a response to a persistent challenge in a timelier fashion, consistent with the practices of the United States, United Kingdom, and Australia.

The regulatory and funding environment for rural broadband would benefit from differentiation between practices for rural and urban places. While current allocations for rural broadband connectivity are significant, there are a range of instruments (both spending and non-spending) that could improve the efficiency and alignment of expenditures to community need. To achieve the goal of universal rural broadband connectivity, a mix of instruments will be needed for reasons of expediency and cost.

This report identifies instruments for rural broadband connectivity, with consideration of public finance, administrative and policy feasibility. The analysis is built on primary data from eleven key informant interviews (with senior public service leadership, academia, and industry), government information and secondary sources.

The report proceeds as follows: Part I sets the context for rural broadband connectivity; Part II reviews the findings from the key informant interviews and the practices of the United Kingdom, United States and Australia in broadband connectivity; Part III identifies instruments to improve Canada’s approach to rural connectivity.

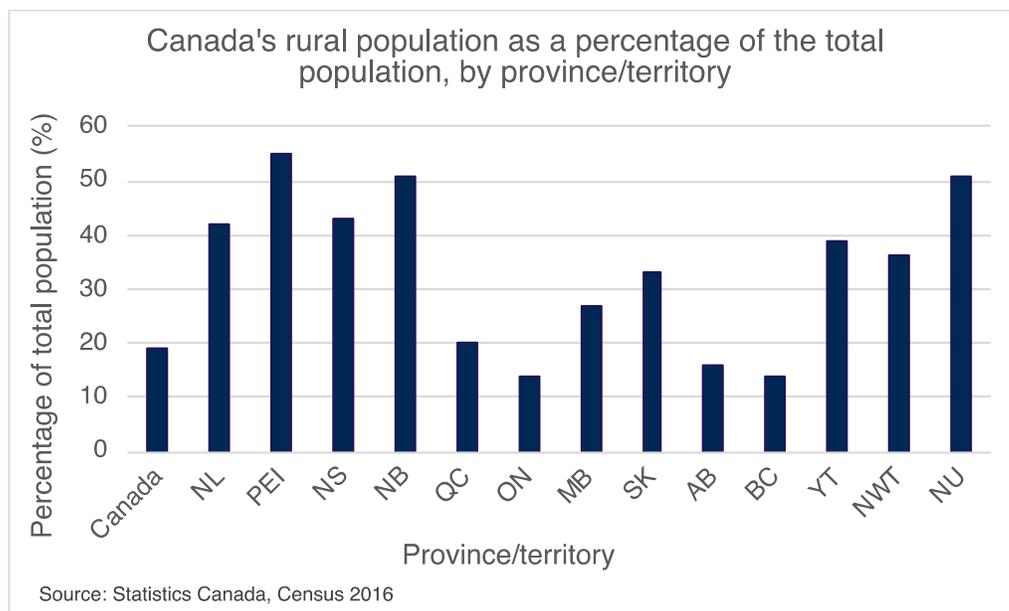
³ S. Ashleigh Weeden and Wayne Kelly for the Canadian Rural Revitalization Foundation, 2020, “Rural Insights Series: COVID-19, 1.5: Addressing the Digital Divide: COVID-19 and the Importance of Connecting Rural Canada,” p. 9.

Part I – Current state

Nearly 20% of Canada’s population lives in a rural context (see

Figure 1).⁴ Rural communities in Canada contribute nearly 30% to the country’s gross domestic product (GDP).⁵ While definitions of what constitutes ‘rural’ vary⁶, most agree that living in a rural place includes population sparsity and distance from an urban centre. Many in rural communities struggle with precarious employment and access to services, including broadband.⁷

Figure 1



⁴ Statistics Canada, “Population and Dwelling Count Highlight Tables, 2016 Census,” last modified February 7, 2018, <https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/hlt-fst/pd-pl/Table.cfm?Lang=Eng&T=703&SR=1&S=87&O=A&RPP=25>.

⁵ Infrastructure Canada, “Rural Opportunity, National Prosperity: An Economic Development Strategy for Rural Canada,” last modified May 27, 2019, <https://www.infrastructure.gc.ca/rural/strat-eng.html>.

⁶ E. Prieto-Lara & R. Ocaña-Riola, “Updating rurality index for small areas in Spain,” *Social Indicators Research*, 95(2): 267–280; B. Reimer & R. D. Bollman, “Understanding rural Canada: Implications for rural development policy and rural planning policy,” in D. Douglas, ed., *Rural Planning and Development in Canada* (Toronto: Nelson Publishing, 2009); P.J. Cloke, “Whither rural studies?” *Journal of Rural Studies*, (1985), 1(1): 1–9.

⁷ See for instance, J. Kolko, “Broadband and local growth,” *Journal of Urban Economics*, (2012): 71, 100–113; L.P. Pant & H.H. Odame, “Broadband for a sustainable digital future of rural communities: A reflexive interactive assessment,” *Journal of Rural Studies*, (2017): 54, 435–450; E. Roberts, D. Beel, L. Philip, and L. Townsend, “Rural resilience in a digital society,” *Journal of Rural Studies*, (2017): 54, 355–359; R. Bollman, “Focus on rural: Non-metro income,” *Rural Ontario Institute* (2015): 3(16); V. Gaspard, “Help wanted: Precarious employment in Ontario – Analysis of key informant interviews,” Guelph, ON: University of Guelph, 2018).

The COVID-19 pandemic has exacerbated disparities in rural contexts, as many services such as education, health and social services transitioned online.⁸ Communities without reliable broadband access have struggled to access services and fully participate in the economy.⁹ Federal and provincial governments have responded with commitments during the pandemic to attempt to address the problem.¹⁰

The challenge of rural broadband is not new. Prior to the pandemic, federal mandate letters (see Appendix A) in 2019 for the Ministers of Infrastructure and Communities (INFC), Innovation, Science and Economic Development (ISED), Indigenous Services Canada (ISC), and Women and Gender Equality and Rural Economic Development included commitments for investing in rural broadband and connecting Canadians. These goals were included in the 2021 supplementary mandate letters but with an added urgency to connect Canadians ‘no matter where they live.’

From an allocative lens, i.e. the alignment of political commitments to expenditures, the federal government has signalled its commitment with nearly \$8B in expenditures through various programs and the Canada Infrastructure Bank (CIB). As business cases for investing and operating broadband connectivity in rural places, public subsidy is a necessary incentive for service providers, both large and small.

The federal government’s total commitment is significant, but the actual expenditures to communities and/or service providers is only a fraction of that total, approximately \$870M. The difference between the allocated funding and actual expenditures suggests that there are difficulties in recipients accessing funding and the federal government adjudicating applications. The challenge appears to be reflected in the CIB, which, until recently had not funded any broadband projects. In late March 2021, the CIB announced that in an agreement in principle, through a 50-50 cost-sharing arrangement it would fund the build-out of a fibre network to connect up to 49,000 households in rural Manitoba at a cost of \$130M (with \$130M from the private sector).¹¹ Recently, Budget 2021 announced an additional \$1B for the Universal Broadband Fund (this and other commitments are subject to parliamentary approval).¹² In many rural places, given the disparate populations and geography, the business case for investment in broadband connectivity is limited or non-existent. This reality could make

⁸ S. Ashleigh Weeden and Wayne Kelly for the Canadian Rural Revitalization Foundation, 2020, “Rural Insights Series: COVID-19, 1.5: Addressing the Digital Divide: COVID-19 and the Importance of Connecting Rural Canada.”

⁹ See for instance, Jenalene Antony, “Coronavirus crisis highlights internet access inequality across Saskatchewan,” *CBC*, May 12, 2020, <https://www.cbc.ca/news/canada/saskatchewan/internet-rural-remote-saskatchewan-covid-19-1.5562476>.

¹⁰ See for instance, *CBC News*, “Ontario to spend \$150M on rural broadband as province reports 338 new COVID-19 cases,” *CBC*, June 3, 2020, <https://www.cbc.ca/news/canada/toronto/ontario-covid-19-june-3-1.5596401>; Infrastructure and Communities Canada, “Supporting Rural Canada during COVID-19,” last modified November 12, 2020, <https://www.infrastructure.gc.ca/rural/covid-19-eng.html>.

¹¹ Bill Curry, “Canada Infrastructure Bank and DIF Capital Partners to expand rural broadband in Manitoba,” *The Globe and Mail*, March 26, 2021, <https://www.theglobeandmail.com/politics/article-canada-infrastructure-bank-and-dif-capital-partners-to-expand-rural/>

¹² Budget 2021 also proposed amendments to the Telecommunications Act to facilitate broadband delivery, through information sharing and expedited decision-making.

the CIB's mandate of 'crowding in' private sector funding a challenge, although the Manitoba case suggests that there is a niche market where this appears feasible.

To date, there is limited publicly accessible information on the results of the funding that has been expended. Table 1 below highlights that while substantial financial commitments have been made by the federal government, only a subset of the funding has been expended, especially for the newer commitments including the UBF and the CIB. The limited federal data on program expenditures and results, especially with respect to connections to premises has been a consistent challenge for broadband funding.¹³

Table 1

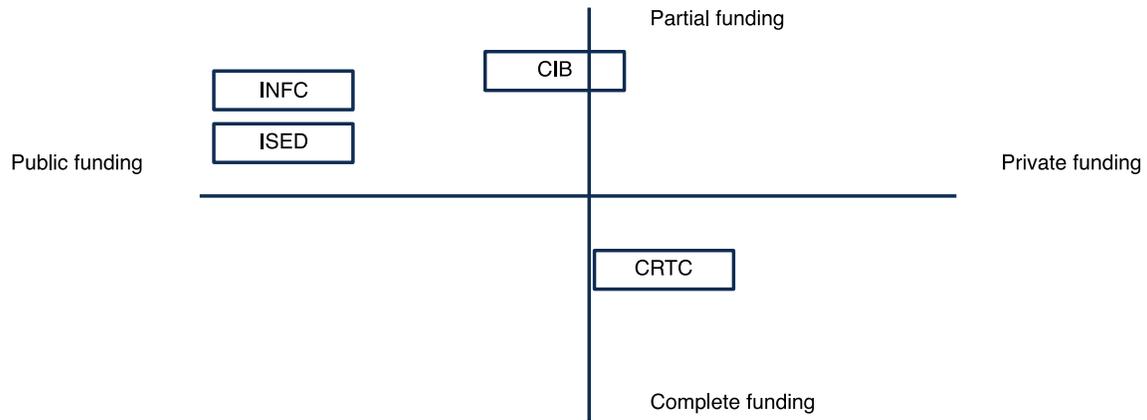
Name	Allocated funding	Approved funding	Application based?	Accountability requirements	Adjudication
Universal Broadband Fund (UBF)	\$ 1,750,000,000	\$ 10,181,597	Yes	Quarterly reports, plus a final report	ISED
Low Earth Orbit (LEO) Satellite Capacity Agreement	\$ 600,000,000	-	-	-	-
Connect to Innovate	\$ 585,000,000	\$ 551,347,000	Yes	-	ISED
Connecting Canadians	\$ 225,000,000	\$ 207,423,850	Yes	-	ISED
CRTC Broadband Fund	\$ 750,000,000	\$ 98,886,000	Yes	-	CRTC
Canada Infrastructure Bank	\$ 2,000,000,000	-	Outreach based	-	CIB
Broadband projects for rural and northern communities	\$ 2,000,000,000	-	To be allocated to provinces and territories on a base plus per capita allocation basis	-	INFC
Accelerated Investment Incentive	Not Applicable	Not Applicable	-	-	CRA
First Nation Infrastructure Fund	Undefined	Undefined	Yes	-	ISC

Various federal departments, the Canadian Radio-television and Telecommunications Commission (CRTC) and the CIB offer funding for rural broadband. These federal stakeholders have slightly different approaches and areas of interest (see

Figure 2) when it comes to the source of funding (public v. private) and the possible applications of funding to cover projects (complete v. partial). ISED's Universal Broadband Fund (UBF) and INFC's funding will use public dollars to cover a proportion of proposals. The CIB is intended to seek out private sources of funds to supplement public investments using market-based loans and other forms of concessions. The CRTC's fund comes from levies on industry and can be used to cover full costs of some projects.

¹³ Michael B. McNally, Dinesh Rathi, Jennifer Evaniew and Yang Wu, "Thematic Analysis of Eight Canadian Federal Broadband Programs from 1994 to 2016," *Journal of Information Policy* (2017), vol. 7: 38-85.

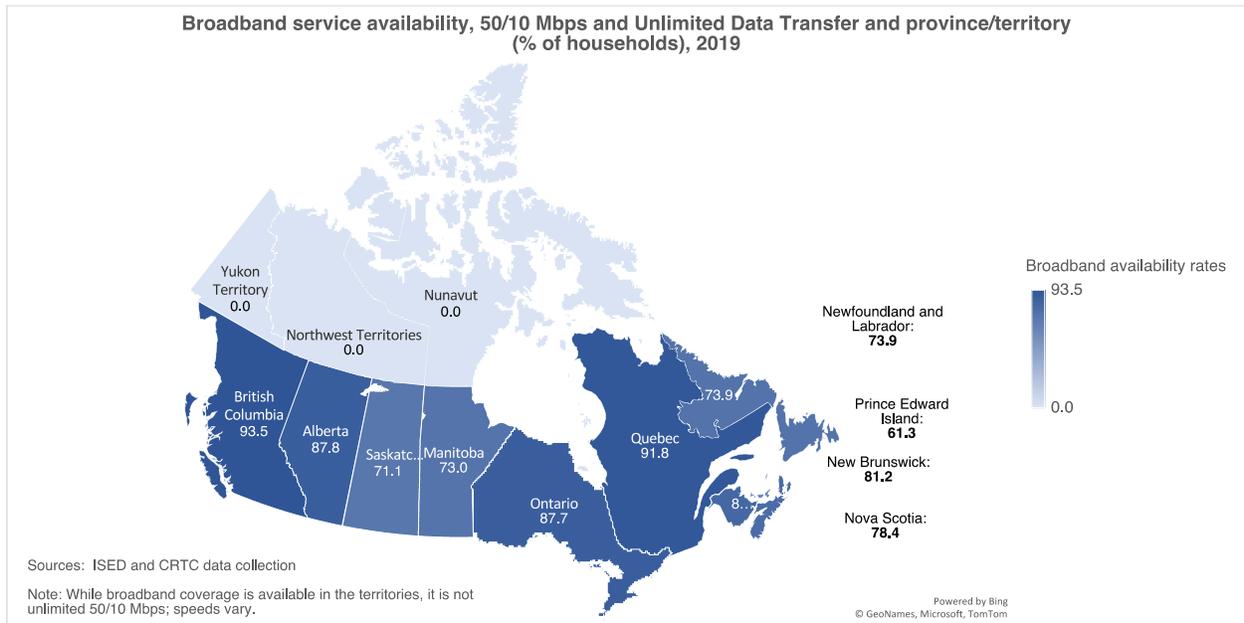
Figure 2



The variability in funding sources has been framed as a challenge by service providers and communities seeking support. Many ‘doors’ exist, but the rules and requirements change, leaving those seeking funding to manage the different processes.

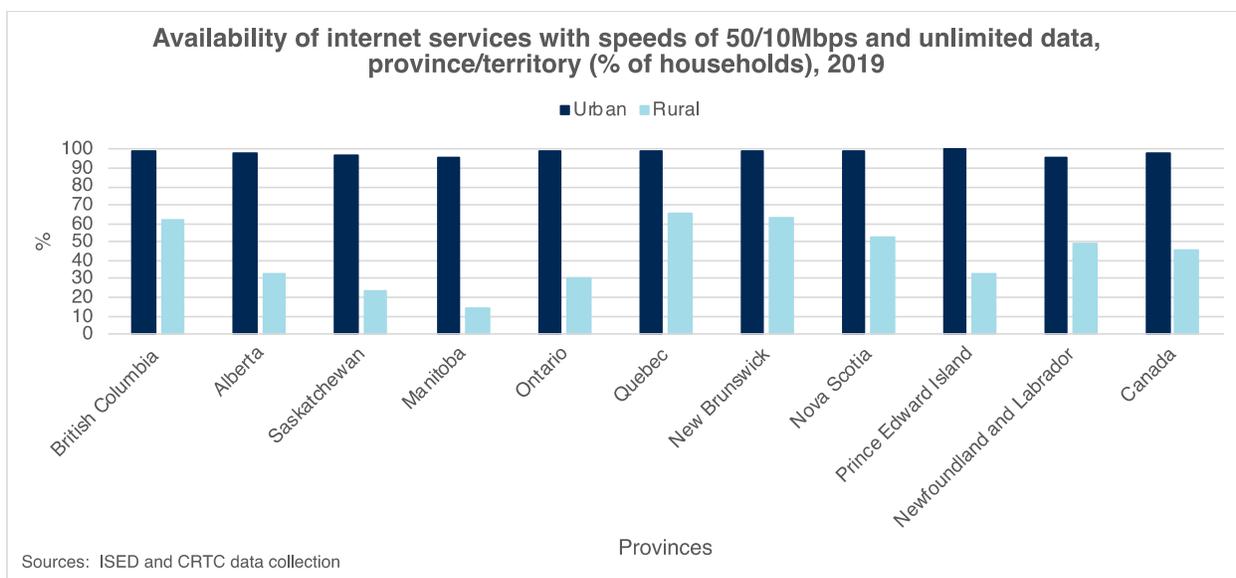
Nationally, roughly 87% of Canadian households are connected at a speed of 50/10 Mbps (Figure 3). British Columbia and Quebec boast the highest overall connectivity rates in the country.

Figure 3



Canada’s broadband access weakens considerably in rural communities. Nearly 99% of urban households have a 50/10 connection standard, relative to approximately 46% of rural households, with broadband availability at 35% of households on First Nations reserves.¹⁴ The disparities between rural and urban broadband connectivity vary considerably on a provincial basis (Figure 4). Manitoba, Saskatchewan, Alberta, Ontario and Prince Edward Island have the lowest connectivity rates in rural areas, relative to those in other provinces. Comparatively, British Columbia, Quebec and New Brunswick lead in rural connectivity rates. In the cases of British Columbia and Quebec, the higher rates of rural connectivity are attributable to the tripartite partnerships (federal-provincial/municipal-industry) that incentivized service through shared funding arrangements.¹⁵

Figure 4



In most provinces, rural customers pay slightly more than their urban counterparts (with exception to British Columbia and Alberta) (Figure 5).¹⁶ The average monthly price for broadband in rural places in Canada is roughly \$76 compared to \$70 in urban areas. Saskatchewan has the greatest variability in price with rural customers paying an average of \$115 per month, relative to \$78 for urban customers.

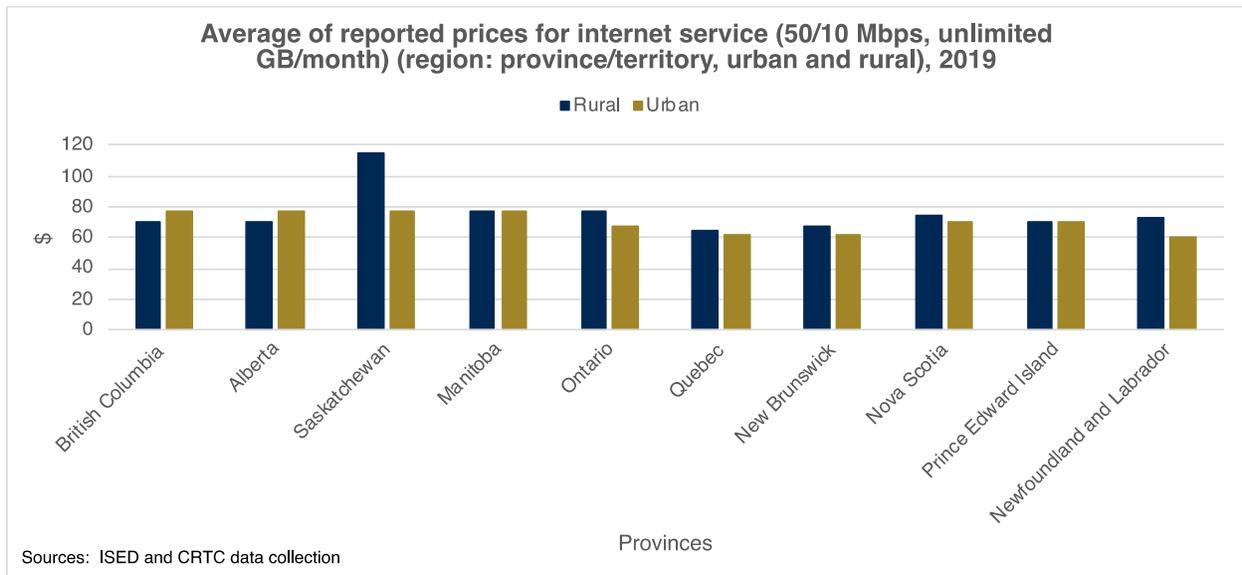
¹⁴ Canadian Radio-television and Telecommunications Commission (CRTC), “LTE and Broadband Availability,” last modified December 10, 2020,

<https://crtc.gc.ca/eng/publications/reports/policymonitoring/2020/cmr4.htm>

¹⁵ See for instance, TELUS Communications, “Cracking the rural broadband challenge,” 2020.

¹⁶ Note that price comparisons do not reflect technical and other differences.

Figure 5



It is more expensive to build and operate services in rural places. TELUS estimates that installation and building costs in rural places cost on average 2.5 times more than urban places, with limited revenue recovery from service provision.¹⁷ In 2018, the Office of the Auditor General of Canada (OAG) reported that ISED “did not have a plan to bring high-quality Internet services to Canadians in rural and remote areas.”¹⁸ At the time, the OAG reported departmental estimates between \$40B-\$50B to connect all Canadians through fibre. If a multi-modal approach was leveraged where various technologies including satellite, were used the cost for connectivity at a speed of 50/10 Mbps was estimated at \$6.5B for the entire country.¹⁹ Using data from the CRTC, TELUS estimates that it would cost between \$6B-\$10B to provide 50/10 Mbps service to the 14% of Canadian households currently without access.²⁰ These estimates are within range of current federal allocations for connectivity, when all sources of funds are combined.

There is a trade-off between cost, network speed and expeditious access. It would be less costly and faster to leverage a variety of technologies to provide speed of at least 50/10 Mbps across the country, although the useful life of the technologies may be shorter for some technologies. If fibre connectivity were pursued, the useable life of the

¹⁷ TELUS Communications, “Cracking the rural broadband challenge,” 2020.

¹⁸ Office of the Auditor General of Canada, 2018, “Fall Reports of the Auditor General of Canada to the Parliament of Canada: Report 1 – Connectivity in Rural and Remote Areas,” above par. 1.20, https://www.oag-bvg.gc.ca/internet/English/parl_oag_201811_01_e_43199.html#hd3b.

¹⁹ Office of the Auditor General of Canada, 2018, “Fall Reports of the Auditor General of Canada to the Parliament of Canada: Report 1 – Connectivity in Rural and Remote Areas,” see par. 1.36, https://www.oag-bvg.gc.ca/internet/English/parl_oag_201811_01_e_43199.html - hd3b.

²⁰ TELUS Communications, “Cracking the rural broadband challenge,” 2020.

asset would be extended because of the potential for upgrades, but the initial build-out would be costly and could take years. A multi-modal approach that includes wireless could be built with greater expediency and at a lower cost by leveraging existing infrastructure, e.g. towers, and still achieve the 50/10 connectivity standard.

Canada's rural broadband challenge is a matter of connectivity, not speed, especially, when compared to international peers (Table 2). Connectivity speeds in Canada are better than those in more densely populated places, although the breadth of coverage in other countries is more extensive. For instance, the United States, United Kingdom and Australia all report over 70% rural connectivity with however, considerable variability in speed. The United States leads in connectivity on the bases of breadth of coverage (74% of rural places) and speed (50/10). When it comes to connecting rural places, the Federal Communications Commission (FCC) has incentivized connectivity through rural-focused auctions and special funding. The reverse auction instrument is reviewed later in this paper.

Table 2

Country	Rural population, % ²¹	National connectivity standard (download/upload Mbps)	Connectivity rates by region (household access, rounded %)
Canada	19%	50/10 (2019) ²²	50/10 (2019) National: 87% Urban: 99% Rural: 46% First Nations reserves: 35% ²³
United States	18%	25/3 (2017) ²⁴	50/10 (2019) National: 94% Urban: 98% Rural: 74% Tribal regions: 68% ²⁵
United Kingdom	16%	“Decent” broadband service, 10/1 (2018) ²⁶	Download speed of at least 30 Mbps (2019) Urban: 97% Rural: 79% ²⁷
Australia	14%	25Mbps/1 (to all premises) and 50Mbps to 90% of fixed line premises ²⁸	“Internet access” (2020) National: 76% Capitals: 78% Rural: 73% ²⁹

²¹ The World Bank, “Rural population (% total population),” accessed on February 23, 2021, <https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS>.

²² ISED, “High-Speed Access For All: Canada’s Connectivity Strategy,” last updated July 16, 2019, https://www.ic.gc.ca/eic/site/139.nsf/eng/h_00002.html.

²³ CRTC, “Communications Monitoring Report, 2019,” last modified December 10, 2020, <https://crtc.gc.ca/eng/publications/reports/policyMonitoring/2020/cmr4.htm#a2.3>.

²⁴ Congressional Research Service, “Broadband Internet Access and the Digital Divide: Federal Assistance Programs,” (October 25, 2019): 3, <https://fas.org/sqp/crs/misc/RL30719.pdf>.

²⁵ Congressional Research Service, “Broadband Internet Access and the Digital Divide: Federal Assistance Programs,” (October 25, 2019): 3, <https://fas.org/sqp/crs/misc/RL30719.pdf>. (Note: 73.6% rounded to 74% and 67.9% rounded to 68%).

²⁶ Ofcom, “Connect Nations 2019: UK report,” (March 18, 2020):10, https://www.ofcom.org.uk/data/assets/pdf_file/0023/186413/Connected-Nations-2019-UK-final.pdf.

²⁷ Ofcom, “Connect Nations 2019: UK report,” (March 18, 2020):3, https://www.ofcom.org.uk/data/assets/pdf_file/0023/186413/Connected-Nations-2019-UK-final.pdf.

²⁸ NBN Co., “Statement of Expectations,” August 24, 2016, <https://www.nbnco.com.au/content/dam/nbnco2/2018/documents/Policies/soe-shareholder-minister-letter.pdf>

²⁹ J. Thomas, et al., “Measuring Australia’s Digital Divide: The Australian Digital Inclusion Index 2020,” RMIT and Swinburne University of Technology, Melbourne, for Telstra, p. 16, https://digitalinclusionindex.org.au/wp-content/uploads/2020/10/TLS_ADII_Report-2020_WebU.pdf. (Note: 77.5% rounded to 78%).

Canada's existing approach to spectrum allocation and connectivity funding helps to foster competition but does not adequately promote connectivity in rural places.³⁰ From the perspective of wireless or multi-modal broadband connectivity, Canada's model of set-asides and deployment requirements promote competition from a variety of carriers, both large and small. The incumbent telecommunications providers, i.e. TELUS, Bell and Rogers, do have the advantage of scale to finance major capital outlays. Smaller service providers tend not to have the same capacity for major investments.

Canada's rural connectivity challenge is a regulatory and demand issue, not a supply challenge when appropriate resources are allocated to make the buildout viable. Supplying connectivity can be incentivized and industry is more likely to bring connectivity when demand for connectivity is met with resources to offset costs. For instance, it was recently announced that Rogers would invest \$150M to improve connectivity in Eastern Ontario by building or upgrading towers. That capital investment was matched with roughly \$140M from the federal and provincial governments and \$10M from local partners. This public-private partnership appears to be a 50-50 cost share.³¹ When it comes to rural broadband, the cost sharing metrics range from 2/3 public and 1/3 private to a 1/2 public and 1/2 public cost sharing arrangement.³²

Improving the alignment of resources to connectivity needs requires a needs-based bottom-up mapping on a community basis. From such an information base, gaps in coverage can be identified and linked to community connectivity requirements. These two pieces of information can help to better define instrument choice to incentivize connectivity with public funding.

Part II – Findings

A mix of industry, academic and senior federal government officials were consulted as key informants for this analysis. Eleven interviews (with supplementary follow-ups) were undertaken, and all findings are reported without attribution (following the Chatham House Rule). Findings from the key informant interviews converged on common issues in problem definition, instruments for connectivity and principal conclusions. These findings are consistent with existing research and the C.D. Howe Institute Telecommunications Policy Working Group's Communiqué #2.³³

³⁰ See for instance, Robert Crandall, "Draft: The Government's Spectrum Policy Will Reduce the Quality of Wireless Services for Rural Canadians," October 6, 2020; TELUS Communications, "Cracking the rural broadband challenge," 2020; McNally et al., 2017; Michael B. McNally, Dinesh Rathi, Kris Joseph, Jennifer Evaniew and Amy Adkisson, "Ongoing Policy, Regulatory, and Competitive Challenges Facing Canada's Small Internet Service Providers," *Journal of Information Policy*, 2018, Vol. 8 (2018): 167-198.

³¹ Alexandra Posadski, "Rogers lands contract to build hundreds of cell towers to expand wireless service in Eastern Ontario," *Globe and Mail*, March 19, 2021, <https://www.theglobeandmail.com/business/article-rogers-lands-contract-to-build-hundreds-of-cell-towers-to-expand/>.

³² See for instance, SWIFT, "Frequently Asked Questions," accessed March 30, 2021, <https://swiftruralbroadband.ca/resources/service-provider-toolkit/>

³³ C.D. Howe Institute Telecommunications Policy Working Group, "Communiqué #2 Governments Must Cut Through Their Red Tape to Build 5G," March 9, 2021, <https://www.cdhowe.org/council-reports/governments-must-cut-red-tape-build-5g-telecommunications-working-group>.

*Problem definition*³⁴

Canada's rural broadband challenge is fundamentally about connectivity. Connectivity is a matter of 'hard' infrastructure and technology to bring broadband to rural places, but it also requires a digital culture and uptake in a community for sustainability. As the COVID-19 pandemic has underscored, broadband is an essential service and a public utility. From accessing education to supporting agriculture, connectivity is an integral means for participating in the economy and society.

Discussion of the problem definition was focused on three issues: 1) public subsidy to build rural broadband; 2) spectrum policy; 3) the differentiated points of departure of communities.

Key informants reiterated the need for a long-term approach to rural connectivity. Short-term investments without a clear strategy to foster ongoing connectivity and uptake can have limited sustainability and capacity to change as technologies shift. A long-term strategy for connectivity would take the form of a multi-part and multi-stakeholder approach that considers technology, community needs and capacity, and a recognition that there will be differentiated approaches to connectivity.

Public subsidy: The private sector has limited incentive to invest in rural places alone. Incumbent telecommunications highlight a required rate of return tied to a 10-year payback period on capital investments. The payback period for industry is very long (if it even exists) in a rural context. Amortization over several years is not viable for for-profit entities. Some co-ops, e.g. Quadro³⁵, exist and are willing to participate with a model with incentives other than profit, as do municipal governments and some community-based providers. While they can be effective, they do not exist in most rural places. This reality requires that risk and rewards for rural broadband connectivity be managed and shared between private and public sectors.

As public subsidy is required for rural connectivity, how the public subsidy is accessed and delivered influences expediency in investment and build-out. The majority of interlocutors noted the misalignment of federal funding programs and private sector planning cycles. Most of the private sector's planning tends to happen in Q4 (at the end of their fiscal year), whereas the federal government's timeline and fiscal years may not match these cycles. The time required for federal decision-making can outrun the private sector's planning timelines.

Accessing funding for rural broadband connectivity could be improved by streamlining federal points of access for support programs. Inviting applications through a single 'door' would then enable internal federal arrangements to triage the proposal and adjudicate accordingly. The work of having to align the access to the appropriate

³⁴ The discussion in sub-sections, Problem definition and Potential solutions, comes from the key informant interviews. To maintain the Chatham House Rule and no attribution to key informants, there will be no citations in these sections. The information reviewed – unless otherwise indicated – comes from the eleven key informant interviews.

³⁵ Quadro, "Internet," accessed March 30, 2021, <https://www.quadro.net/internet/>.

funding source can be an internal management issue, rather than one that various external stakeholders attempt to address. The Treasury Board of Canada Secretariat's *Guide to Departments on the Management and Reporting of Horizontal Initiatives*³⁶ can serve as a point of departure for this revised organizational approach. The document provides instructions on how departments collaborate and report on initiatives that cut across multiple departments.

There are multiple sources of federal funding (as reviewed in Part I of this note), that can pose a challenge for those seeking federal support. Even though funding is available, knowing what should be included in the application and knowing to which source of funds to apply requires insight and resources. Especially from the perspective of rural communities, the multiple funding doors can be a challenge. Many of these communities are small and do not have the resource base to maintain a diversity of expertise, notably those required for rural broadband funding and development.

Spectrum policy: The existing approach to spectrum allocation in Canada is designed to foster competition among service providers. Set-asides for smaller ISPs and a single approach to spectrum (irrespective of the location it will cover) do not address the challenges of rural connectivity. The current approach assumes service demands and user uptake for cost recovery and incentive for private sector investment. In urban contexts, this approach makes sense. The critical mass of potential end-users provides demand that in turn incents the investment of ISPs (both small and large) to compete for customers.

By contrast, that density does not exist in rural contexts. The lower density requires an increase in public subsidy to incent connectivity, because there is a limited opportunity to generate returns from end-user service provision. The goal of rural broadband coverage is in tension with existing spectrum policy. Spectrum set-asides in rural contexts may disincentivize building infrastructure and thus, restrict operating opportunities. Spectrum in rural areas is also under deployed by some purchasers who may not be able to afford the initial capital outlay required to build infrastructure.

When spectrum is auctioned in the current state, there is no differentiation between rural and urban contexts. Rural and urban places have different densities, different levels of existing infrastructure, and ultimately, different value propositions for the private sector. These differentiated points of departure should be reflected in spectrum allocation because a different mix of inputs, e.g. financial, infrastructure, etc., will be required to build the bases for connectivity.

When it comes to spectrum allocation policy, if the goal is competition, then the current system makes sense in urban areas. Fostering competition with set-asides can make sense because providers are likely to deploy spectrum and offer services due to

³⁶ Treasury Board of Canada Secretariat, "Guide to Departments on the Management and Reporting of Horizontal Initiatives," last modified May 17, 2018, <https://www.canada.ca/en/government/system/finances/horizontal-initiatives-database/guide-departments-management-reporting-horizontal-initiatives.html>

density. If the goal is trying to connect people, especially, in rural places, spectrum should be allocated on a community basis to ensure there are incentives (financial and other) in place to encourage connectivity.

Differentiated points of departure of communities: Rural communities in Canada have differences in size, capacity and digital culture. Often times, in rural places, there is limited understanding and accessibility of how to work with an ISP and/or the federal government to access funding (i.e. I don't know how to get connectivity or how to ask for it). Without existing knowledge of connectivity technology and the resource base to seek out solutions (as communities are busy dealing with various municipal services), broadband access can be challenging for rural communities.

Education and communication with communities matters. This must go beyond the offer of webinars and a call centre for accessing the UBF through the pathfinder service. Community support is needed to navigate available programs for funding and to determine the suitability for residents. A passive exercise in funding allocation is impractical and insufficient for rural communities; policies and programs need to be readjusted to provide capacity and support to communities who wish to build connectivity.

There are rural communities that have successfully built broadband connectivity, such as O-Net that was built in Olds, Alberta.³⁷ Smaller providers are at times the sole providers in rural and small communities. Even though they may be best placed to serve them, they cannot compete in several funding programs. The unprofitability of connectivity in some areas, leaves gaps in coverage.

Takeaways from findings

There are three conclusions to highlight that help to orient approaches to improving rural broadband connectivity:

- 1) Community focus: Understanding community capacity and need and aggregating it to a higher geographic level is a crucial step in addressing rural broadband connectivity. In the current state, there is clear commitment to rural connectivity. There is less clarity around alignment of need and geography. **A detailed mapping is necessary to determine which communities are connected, where gaps exist, where nodes are available, and how to link the resources.**
- 2) Urban-rural differentiation: Urban and rural places are different by virtue of density, geography and need. There is consensus that a subsidy is necessary for rural broadband connectivity. To make that subsidy effective and efficient, **spectrum policy should be differentiated to accommodate rural realities.** In the current state, spectrum policy promotes competition for service delivery to the end user by requiring capital outlays. In rural circumstances, there is a limited customer base from which to generate returns through service provision. Instead of competing spectrum on the bases of both capital and services, spectrum

³⁷ O-Net is fibre-based connectivity and wholly owned by a not-for-profit to serve the town of Olds, Alberta. See <https://o-net.ca/about-o-net/>.

should be managed to align to geographies (where service is required). With this approach, resources can be aligned to solve a problem on a geographic basis, rather than one based on population density (i.e. opportunity to provide services).

- 3) Improved coordination between stakeholders: To promote broadband connectivity and the efficient use of public resources, **community need should be aligned to funding**. This requires coordination among stakeholders, i.e. federal, provincial and municipal governments, communities and industry, in order to understand the problem, propose solutions, and build digital culture for sustainability.

Building rural broadband connectivity requires a clear definition of the problem to be solved and consideration of instruments for its achievement. The stakeholder interviews were helpful in identifying current challenges and potential solutions (reviewed in Part III) to better achieve the goal of rural connectivity.

With the broadband imperative for economic and social participation, countries have approached the connectivity challenge with different instruments. For context, the approaches and instruments of three other jurisdictions are reviewed: the United Kingdom (UK), the United States (US) and Australia. These three countries were selected as they share one or more relevant characteristics with Canada. The UK is a Westminster-style government with devolved regions, the US and Australia are federal states with variable geographies.

United Kingdom

The UK announced its commitment to rural connectivity (voice and broadband) in 2020. The National Infrastructure Strategy committed to a collaboration with the telecommunications industry to target 85% gigabit capable coverage of the UK by 2025. Government estimates suggested that the private sector would cover 80% of the commercially viable portions of the country by 2025.

To connect those harder-to-reach areas, “Project Gigabit” was established with a 5B GBP allocation to support infrastructure investment and development of gigabit capable technology. In areas where private investment was not viable, state-led subsidies would be awarded through competitive procurements for suppliers to cover these areas. The UK stated its desire not to overbuild using public money where there are existing private sector plans. Mapping and consideration of anticipated commercial deployment plans will be used to guide areas of where public intervention and subsidy will be applied.³⁸

From the government’s perspective, the initiative is working. In over one year, gigabit capable broadband coverage increased in the UK from 9% to 39% through industry with support from the national government, local authorities and Ofcom (the UK’s

³⁸ Department for Digital, Culture, Media and Sport, United Kingdom, “Project Gigabit: Phase 1 Delivery Plan,” March 19, 2021, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/971903/Project_Gigabit_PHASE_ONE_DELIVERY_PLAN_v3.pdf

telecommunications regulator).³⁹ The UK government consulted with industry, local and devolved government how they thought the subsidies from Project Gigabit could be best used for connectivity in December 2020. The results were communicated in a guidance document on the Phase 1 strategy.⁴⁰ In the initial phase of the Project Gigabit rollout, the UK is focusing on setting up procurements for the harder-to-reach parts of the country.⁴¹

There are other schemes in the UK to support gigabit broadband connectivity. A voucher scheme for connectivity was developed and a new round of financing will be launched in April 2021. Supplier-led, micro-grants are provided to the supplier to defray connectivity costs. Any supplier who wishes to participate in the scheme must be able to supply gigabit capable connectivity (other terms and conditions for suppliers are also defined). Once a supplier is registered and approved, customers can request a subsidy, valued at 1,500 GBP for a home and 3,500 GBP for a business. Once the request and connection are confirmed, the subsidy is paid to the supplier.

For those in the UK without access to any broadband, the Broadband Universal Service, managed by Ofcom may apply. In the UK, “every home and business...has the legal right to request a decent, affordable broadband connection.”⁴² An upgrade can be requested if speeds of 10 Mbits/s download and 1 Mbits/s upload do not exist. The client calls BT or KCOM for an estimate. If they are eligible and no other current or coming UK program can support the connection, they can receive up to 3,400 GBP to defray the cost of connectivity. Any costs above that threshold are covered by the client.⁴³

The UK’s approach appears to have multiple input sources that supports infrastructure development for broadband (whether in rural or urban places). Using a voucher system, citizens and small businesses can apply for a subsidy to help to defray the cost of broadband connectivity. For the roll-out of the 5B GBP fund, the UK consulted with

³⁹ Department for Digital, Culture, Media and Sport, United Kingdom, “Project Gigabit: Phase 1 Delivery Plan,” March 19, 2021,

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/971903/Project_Gigabit_PHASE_ONE_DELIVERY_PLAN_v3.pdf

⁴⁰ Department for Digital, Culture, Media and Sport, United Kingdom, “Project Gigabit: Phase 1 Delivery Plan,” March 19, 2021,

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/971903/Project_Gigabit_PHASE_ONE_DELIVERY_PLAN_v3.pdf

⁴¹ Department for Digital, Culture, Media and Sport, United Kingdom, “Project Gigabit: Phase 1 Delivery Plan,” March 19, 2021,

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/971903/Project_Gigabit_PHASE_ONE_DELIVERY_PLAN_v3.pdf

⁴² Ofcom, “Your right to request a decent broadband service: What you need to know,” March 20, 2020, <https://www.ofcom.org.uk/phones-telecoms-and-internet/advice-for-consumers/broadband-uso-need-to-know>

⁴³ Ofcom, “Your right to request a decent broadband service: What you need to know,” March 20, 2020, <https://www.ofcom.org.uk/phones-telecoms-and-internet/advice-for-consumers/broadband-uso-need-to-know>

industry, local and devolved governments before money was released. The UK appears to build its initiatives based on demand and declared need.

The UK has a clear focus on gigabit capable technology and subsidizing the costs of infrastructure for connectivity. In its most recent budget, the UK announced a tax credit (ending in March 2023) that would reduce by 25p every 1 GBP invested in “qualifying new plant and machinery assets [...]”. This tax credit is intended to incentive companies to make investments, including telecommunications firms investing in building gigabit capable networks.⁴⁴

For Canada, the lessons from the UK are to focus on a goal with a plan and integrating bottom-up considerations of demand (when feasible). With a clearer sense of need, funding instruments can be better aligned to deliver on connectivity goals based on consumer need. The UK’s model emphasizes infrastructure development and individual/localized subsidies to promote connectivity. There are however, no deployment requirements associated to the build-out of the gigabit capable pipe. The UK is much smaller geographically than Canada and is a unitary state making direct interventions more practical and manageable.

When it comes to mobile coverage in the UK, the Shared Rural Network was struck as an agreement between the Government of the UK and the country’s four main operators (EE, Telefónica UK (O2), Three and Vodafone). These are the only providers with physical networks in the UK (any other service providers use their networks).⁴⁵ The goal was to provide 88% coverage of the UK’s landmass by 2024 and 90% by 2026⁴⁶ (more recently, the service coverage⁴⁷ goal has been defined as 95% of the UK by 2025).⁴⁸

The Shared Rural Network agreement would provide grant funding to deliver the defined voice and broadband connection requirements. Each provider submitted their plan for consideration to Ofcom. Ofcom confirmed all industry proposals by November 2020, considering them aligned to the defined coverage goals. Connectivity targets

⁴⁴ Department for Digital, Culture, Media and Sport, United Kingdom, “Government launches new £5bn ‘Project Gigabit,’” March 19, 2021, <https://www.gov.uk/government/news/government-launches-new-5bn-project-gigabit>; HM Revenue and Customs, United Kingdom, “Policy paper: New temporary tax reliefs on qualifying capital asset investments from 1 April 2021,” March 3, 2021, <https://www.gov.uk/government/publications/new-temporary-tax-reliefs-on-qualifying-capital-asset-investments-from-1-april-2021/new-temporary-tax-reliefs-on-qualifying-capital-asset-investments-from-1-april-2021>

⁴⁵ Shared Rural Network, “Frequently Asked Questions,” accessed on March 30, 2021, <https://srn.org.uk/faqs/>

⁴⁶ Ofcom, “Mobile coverage obligations,” November 17, 2020, <https://www.ofcom.org.uk/spectrum/information/cellular-coverage>

⁴⁷ Ofcom (the UK’s telecommunications regulator) defined the signal strength baseline for 4G coverage as a 95% probability for a 90 second phone call and a 95% probability of a 2 Mbit/second download speed. Department for Digital, Culture, Media and Sport, United Kingdom, “Shared Rural Network: £1bn deal to end poor rural mobile coverage agreed,” March 9, 2020, <https://www.gov.uk/government/news/shared-rural-network>.

⁴⁸ Digital Mobile Spectrum Limited, “Rural mobile coverage,” accessed March 30, 2021, <https://dmsluk.com/our-work/our-work-srn/>

were technology neutral with coverage requirements defined by geography. Initial expectations included connecting an additional 280,000 premises, improving coverage on 16,000 km of road and enhancing connectivity in national parks and other such spaces.⁴⁹

The four providers are expected to focus on improvements to their existing networks and collaborate on shared infrastructure and the building of new sites. Funding from the Department for Digital, Culture, Media and Sport will be used to subsidize infrastructure where none currently exists. Approximately 9% of the UK is not currently covered by a mobile provider. For those that do have coverage, the Shared Rural Network is intended to increase consumer choice from 66% to 84% in some parts of the UK.⁵⁰

Digital Mobile Spectrum Limited (DSML) (established in 2012 by the four main providers) runs and manages the Shared Rural Network program and provides reporting and tracking to industry and government.⁵¹ The 1B GBP funding to focus on mobile coverage was a mix of approximately 50% private (532M GBP) and 50% public (500M GBP).⁵² All providers had legally binding contracts that committed them to these investments.

Compliance to coverage requirements and timelines will be monitored through reporting and overseen by Ofcom. Such requirements include required coverage by geography over four-and six-year periods (the 2020 Coverage Obligations – Notice of compliance verification methodology⁵³ cover the requirements and approach). Should there be contract violations, i.e. targets are not met, Ofcom is empowered to issue fines of up to 10% of an operators gross revenue.⁵⁴

The Shared Rural Network is expected to generate meaningful returns for consumers and industry. A 2021 report commissioned by O2 from Development Economics suggested that the UK's GDP stood to gain roughly \$59M GBP annually from improved wireless connectivity. When considered through a regional lens, rural Scotland was expected to enjoy most of the benefits. From an industry perspective, the hospitality

⁴⁹ Shared Rural Network, "About the Shared Rural Network," last accessed March 30, 2021, <https://srn.org.uk/about/>.

⁵⁰ Shared Rural Network, "Frequently Asked Questions," accessed on March 30, 2021, <https://srn.org.uk/faqs/>.

⁵¹ Digital Mobile Spectrum Limited, "Rural mobile coverage," accessed March 30, 2021, <https://dmsluk.com/our-work/our-work-srn/>

⁵² Department for Digital, Culture, Media and Sport, United Kingdom, "Shared Rural Network: £1bn deal to end poor rural mobile coverage agreed," March 9, 2020, <https://www.gov.uk/government/news/shared-rural-network>.

⁵³ Ofcom, "2020 Coverage Obligations - Notice of compliance verification methodology," last accessed March 30, 2021, https://www.ofcom.org.uk/data/assets/pdf_file/0031/192919/notice-of-compliance-verification-methodology.pdf

⁵⁴ Department for Digital, Culture, Media and Sport, United Kingdom, "Shared Rural Network: £1bn deal to end poor rural mobile coverage agreed," March 9, 2020, <https://www.gov.uk/government/news/shared-rural-network>.

industry is expected to benefit most from increases “in turnover,” thanks to the improved coverage.⁵⁵

When the UK’s approach to developing rural connectivity is considered, the focus on subsidizing infrastructure funding (the most expensive outlay) with deployment and coverage requirements on a geographic basis is evident. By collaborating with industry, the government came to an agreement on a useful level of public subsidy relative to industry’s opportunity for cost recovery through service delivery. Working with the country’s largest providers (for mobile coverage), there was a clear signal that improvements to competition for consumers required better infrastructure (and infrastructure where none before existed). Other providers leverage the physical network infrastructure of the four main providers. The Shared Rural Network investments recognize the need to incentivize ongoing development and maintenance of wireless infrastructure.

*United States*⁵⁶

The Federal Communications Commission (FCC) is the independent government agency (overseen by Congress) that regulates telecommunications in the US. Since its establishment in 1934, the FCC has had a mandate focused on universal connectivity in the technology of the time from phone to broadband.⁵⁷ During the pandemic response stimulus packages passed by Congress, there was funding for the FCC to subsidize connectivity for those who could not afford it, with other initiatives, such as school device connectivity (with the Biden administration).

The US government funds connectivity programs through departments such as Agriculture (ReConnect Loan and Grant Program). To ensure efforts are not being duplicated and infrastructure not being over built, the FCC regularly coordinates with other federal departments providing connectivity funding. The agency has legislation that directs such coordination with information-sharing requirements. The coordination requirements, are not however, a panacea as recipients are still confused about which source of funding to access. State and other entities will still check with the FCC to ensure that activities with other funding sources will not prejudice funding from the agency. Ad-hoc briefings and consultations are commonplace for managing broadband funding.

In competitions for rural broadband funding, it is the position of the FCC that resources should only be deployed where none currently exist. More than half of US states have established their own broadband subsidy programs and there were concerns that accessing these programs would preclude companies from FCC RDOF funding. In a March 2020 letter to the Chairman of the FCC, US Senators raised concerns that

⁵⁵ Joe O’Halloran, “First phase of Shared Rural Network set to bring £187m boost to UK rural businesses,” *ComputerWeekly.com*, February 10, 2021, <https://www.computerweekly.com/news/252496168/First-Phase-of-Shared-Rural-Network-set-to-bring-187m-boost-to-UK-rural-businesses>

⁵⁶ A meeting with FCC officials helped to provide additional context on the FCC’s approach.

⁵⁷ Federal Communications Commission (FCC), “Universal Service,” last updated March 26, 2021, <https://www.fcc.gov/general/universal-service>

restricting federal funding may deter states from establishing their own broadband subsidy programs. In response, the Chairman of the FCC wrote:

With regard to state programs, the Commission continues to support state efforts to connect more Americans to broadband and welcomes the opportunity to partner with states (as it has with states like New York) to align their funding streams with ours so as to stretch our funding as far as possible. In response to your questions, if a state hasn't already issued a formal funding commitment, that area will not be excluded from the Rural Digital Opportunities Fund Phase I Auction. In a similar vein, a "broadband subsidy program from 12 years ago" would have no bearing on our inquiry, nor would a future program that "ha[s] not yet awarded funding." I should also note that our goal is to not duplicate funding targeted to a particular area. This means—consistent with the principle I outlined above—if a service provider has state-based funding and a commitment to deploy 25/3 Mbps or better service in one area, it cannot receive FCC funding to deliver similar service to that same area. But it would still be eligible to participate in the Rural Digital Opportunity Fund in other areas in the state that are unserved and not covered by a funding commitment.⁵⁸

The FCC's focus on not duplicating subsidies is consistent with its emphasis on competition and restricted use of public subsidy to achieve results in a market-based system.

To deliver on its mandate of broadband connectivity in areas of the country with no, limited or challenges connecting, the FCC has four main programs: 1) Connect America Fund (formerly, the High-Cost Program); 2) Lifeline (subsidies for low-income consumers); 3) Schools and Libraries (E-Rate); 4) Rural Health Care.⁵⁹ All four programs are funded through the Universal Service Fund (USF). The USF is governed by the independent not-for-profit Universal Service Administrative Company, which allocates funding to the four programs based on guidance from the FCC.⁶⁰

Contributions exclusively from telecom carriers (a cost levied from consumers and through assessments on interstate and international revenues) is the sole source of funding for the USF. By endowing the fund from private sector subsidies, it can remain insulated from political whims and is a permanent income stream for the FCC's universal service obligations. Any revenues generated from the FCC's spectrum auctions are destined for the US Treasury and do not remain within the agency.

⁵⁸ Congressional Research Service, "Rural Digital Opportunity Fund: Requirements and Selected Policy Issues," August 28, 2020, <https://fas.org/sgp/crs/misc/R46501.pdf>, p. 7-8, referencing footnote 42.

⁵⁹ FCC, "Universal Service," last updated March 26, 2021, <https://www.fcc.gov/general/universal-service>

⁶⁰ Universal Service Administrative Co., "About USAC," accessed March 30, 2021, <https://www.usac.org/about/>

Table 3

Program/fund	Available funding	Duration (YYYY-YYYY)	Eligibility / Distribution
Universal Service Fund	Approximately \$10B in annual funding	Indefinitely	Connect America Fund Lifeline Rural Health Schools and Libraries (E-Rate)
Connect America Fund	\$1.6 billion (\$115 million for Phase 1, \$1.5 Billion for Phase 2)	2012 - 2020	Census blocks were grouped into Census Block Groups (CBG). An eligible CBG contains at least one census block that had following characteristics: It is High, or Extremely-high, cost for an ISP to build there due to its geography or population density; and it did not have a wireline internet service as of 2016.
Rural Digital Opportunities Fund	\$20.4 Billion (\$16 billion for Phase 1, and \$4.4 billion for Phase 2)	2020 - 2030	Phase 1: Census blocks with no service Phase 2: Census blocks that are underserved, or were not selected for phase 1 funding.

With the purpose of building and maintaining networks (in low service areas or areas without connectivity), the reverse auction instrument used in the Phase II Connect America Fund (CAF) and the subsequent Rural Digital Opportunities Fund (RDOF) will be the focus of this analysis (see Table 3).⁶¹

The reverse auction instrument applied by the FCC is now its principal tool for funding rural connectivity. This approach demonstrates the importance and value of good data and analysis by government and other actors. Designed to let the market determine what subsidy is necessary to incent industry to build, the FCC asks the market, tell us how much support (public subsidy) you need to serve particular areas. The FCC subsidizes within a certain range for each area, based on its own model. Working with their economists, the FCC spends time building models that are specific to scale, geography, soil type, etc. The models define reasonable offers to be made to incent industry to take the subsidy and provide coverage.

The FCC’s model presupposes that industry owns spectrum for which it is seeking subsidy (buying access to spectrum is a condition required to participate in the reverse auction). Spectrum auctions and subsidy auctions remain separate. Buying access to spectrum does not guarantee the awarding of a subsidy.

The FCC also does its due diligence to understand the areas in which industry may want to build, i.e. industry may already be present in area and realize they can bid in

⁶¹ To be considered for High-Cost FCC funding programs, i.e. CAF and RDOF, a vendor must be an Eligible Telecommunications Carrier (ETC). There are federal-state guidelines that determine ETCs, based on a set of federal principles, e.g. five-year plan on how subsidies would improve coverage, ability to maintain functionality in an emergency, etc. Considerations of security and domestic industrial protection appear to be managed through the criteria. It is unclear if dumping from resourced providers is an issue for the existing programs. The FCC’s auctions appear to incentivize providers with existing presence in subsidy-focused areas to build-out their coverage. See for instance, FCC, “FCC Adopts Additional Requirements for Eligible Telecommunications Carrier Proceedings,” February 28, 2005, <https://www.fcc.gov/document/fcc-adopts-additional-requirements-eligible-telecommunications-carrier>; Cornell Law School, Legal Information Institute, “47 CFR 54.201- Definition of eligible telecommunications carriers, generally,” accessed March 30, 2021, <https://www.law.cornell.edu/cfr/text/47/54.201>.

adjacent areas. Industry bases their bids on what they know about areas already. This step is intended to save the FCC time and money in determining the particulars of cost in specific areas. In this approach, the 'lowest hanging fruit' goes first. From the outset, auctions are set up to have multiple rounds with the recognition that it will take time to clean-up the areas that did not move first.

The reverse auction rewards the lowest proposed expenditure to do the work. For the RDOF, the performance tier basis was a speed of 25/3; the baseline was greater than or equal to 50/5; above the baseline was 100+/20; and the highest tier was gigabit greater than or equal to 1gb down/500 up. The bid with the lowest weighting would come out with a higher rating (i.e. the higher your performance the lower the weight).

The same principle applied to the weighting of the expenditure level. In RDOF Phase I, the FCC only made eligible for bidding completely unserved blocks, which allowed the FCC to get to auction faster. The Census block groups (smaller than an entire track, but bigger than bidding on single block) were used to define geographies in need of coverage. For the RDOF auction, the FCC had allocated \$16B, but only \$9.5B had winning bids. The remainder of the budget rolled forward to Phase II auction (\$4.4B + \$7B from the roll-over).

The RDOF program is technology neutral. The FCC establishes a minimum service standard (the minimum service level is a political issue; FCC considers 25/3 as good enough). The auction program has other approaches of managing speed and cost trade-offs. The FCC funds based on performance requirements and speed requirements. To demonstrate outcomes, data driven reporting requirements exist for vendors. Vendors must show with data on connectivity achievement of their deployment and speed requirements. This helps the FCC improve its own data and mapping. As a funder, the FCC is agnostic as to how the vendor allocates the subsidy to achieve the connectivity goal. They do not review receipts for reimbursement; what matters is achieving the outcome.

As an instrument, the reverse auction leverages market forces to improve connectivity and efficiency, at the lowest market price. The outcomes of the auctions are not guaranteed. Vendors, for instance, may have bid so low to be awarded the subsidy that they may not be able to obtain the financing required to fulfill their build-outs to achieve service obligations. Deployment requirements are also staggered, with 40% build-out in the first three years of funding, leaving the majority of a community's coverage on a much longer (and uncertain) timeline.⁶² There are possible trade-offs of efficiency and effectiveness with this instrument if deployment and service conditions are not well-defined to protect consumer and community interests. For other jurisdictions considering the approach, it would be necessary to define desired outcomes in concert with communities and vendors to determine what is reasonable and appropriate.

⁶² Ziggy Rivkin-Fish, "FCC's Rural Digital Opportunity Fund Auction Was Supposed to Significantly Reduce America's Rural Broadband Gap," *Benton Institute for Broadband & Society*, December 21, 2020, <https://www.benton.org/blog/fccs-rural-digital-opportunity-fund-auction-was-supposed-significantly-reduce-americas-rural>

The FCC's funding instruments are generally, market driven with a dual purpose of promoting competition and minimizing public subsidy. In its application of funding instrument, the FCC has clarity on the problem it is trying to solve, i.e. access to broadband connectivity, and the principles upon which the instrument is based. With a focus on reverse auctions for rural broadband funding moving forward, the FCC is framing its approach to service provision through supply. As a public entity, the FCC's role is determining need in communities (based on mapping and data). To set prices, the FCC undertakes its own economic analysis for model development.

Australia

In 2009, the Australian government launched an ambitious plan to build capacity for fibre to 93% of premises by 2021 at an estimated cost of 43B AUD. At that time, the National Broadband Network Company (NBN Co.) was established as a wholly owned Government Business Enterprise to manage the infrastructure build-out. The entity was to provide wholesale-only broadband on an open access network across Australia. The intent was to drive competition in industry and benefit end-users. By 2013, the original plan was amended to include a mix of technologies with a cost of 41B AUD by 2019.⁶³ Today's estimated costs for the initiative are over 57B AUD.⁶⁴

According to the NBN Co. website, "The rollout of the nbn™ broadband access network remains one of the largest and most complex infrastructure initiatives undertaken in Australia."⁶⁵ The taxpayer-funded initiative has been expensive and a challenge to deliver.⁶⁶ In November 2020, NBN Co. admitted to overlooking 300,000 premises at a cost of 600M AUD for connectivity (the project was intended to close in June 2020). During a Senate hearing on the issue, the NBN Co. chief executive blamed "out-of-date address databases," for the missed premises noting that "...there actually wasn't a database of all the premises in Australia."⁶⁷ Beyond the missed connection points, there is wide variability in speeds and reliability of the backbone, with seven possible technologies including copper. This is a very different result than the original fibre-to-premise goal.

With challenges in execution and climbing costs, an additional \$7.10/month tax was applied per non-NBN Co. fixed line broadband user (in effect as of January 2021). This subsidy was to serve as a revenue stream for NBN Co. to fund "commercially unviable

⁶³ Isabelle Lane, "\$600 million mistake: NBN Co admits to overlooking 300,000 premises," *The New Daily*, November 11, 2020, <https://thenewdaily.com.au/life/tech/2020/11/11/nbn-co-deadline-blowout/>.

⁶⁴ Isabelle Lane, "\$600 million mistake: NBN Co admits to overlooking 300,000 premises," *The New Daily*, November 11, 2020, <https://thenewdaily.com.au/life/tech/2020/11/11/nbn-co-deadline-blowout/>.

⁶⁵ NBN Co., "Our purpose," accessed March 30, 2021, <https://www.nbnco.com.au/corporate-information/about-nbn-co/our-purpose>

⁶⁶ James Fernyhough, "It's the end of the beginning for the NBN," *Financial Review*, June 13, 2020, <https://www.afr.com/companies/telecommunications/it-s-the-end-of-the-beginning-for-the-nbn-20200610-p5519n>.

⁶⁷ Isabelle Lane, "\$600 million mistake: NBN Co admits to overlooking 300,000 premises," *The New Daily*, November 11, 2020, <https://thenewdaily.com.au/life/tech/2020/11/11/nbn-co-deadline-blowout/>.

portions of its network”⁶⁸ in regional and rural areas for fixed wireless and satellite connections.⁶⁹

Among the cases reviewed in this paper, Australia’s use of a fully publicly subsidized instrument for rural broadband is an outlier. The state has owned all of the risk associated to building the network. By contrast, in the UK, US and Canada, funding sources are mixed between the public and private sectors.

In all of the reviewed cases, there is clear recognition that a subsidy is required for rural broadband. All cases apply multiple technologies to achieve connectivity and leverage various incentive-based instruments for funding, with exception to Australia. The Australian state-led approach was meant to build fibre-to-premise infrastructure for the country. The result is an expensive system that did not deliver the original goal of fibre, with indications of operational challenges. A fully state-subsidized and state-led approach is not considered a useful tool for the Canadian context.

In the US, UK and Canada, various instruments are used to collaborate with industry and incent their involvement in rural broadband connectivity. The FCC in the US plays an important role in funding rural broadband connectivity through reverse auctions with a levy from industry. The UK uses various voucher schemes for rural broadband (paid to suppliers), subsidizes infrastructure in harder-to-reach areas and entered into formal agreements (at a nearly 50-50 cost share) for mobile coverage in rural places. In Canada, it is principally application-based grant style programs that subsidize rural broadband. Australia is the outlier with its fully taxpayer-funded approach.

Part III – Instruments

In trying to understand the range of instruments applied for the allocation of subsidies to rural broadband, there are various considerations for the potential improvement of Canada’s approach (see Table 4). Current allocations for subsidizing rural broadband are assumed to be sufficient, based on findings from the Office of the Auditor General and estimates from TELUS (see p. 10 of this report, estimates ranged from \$6B-\$10B). Refining funding and associated instruments may help to improve the efficacy of public subsidies and promote connectivity.

The applicability of instruments for the goal of rural broadband connectivity are largely dependent on the policies that underpin them. The interviews suggest that the current levels of federal funding available are sufficient but underutilized. Thus, to encourage rural broadband connectivity, instruments need to be optimized by aligning need and funding. To achieve the optimization, a mapping of need in rural communities and the trade-offs in instrument choice are necessary.

⁶⁸ Justin Hendry, “Broadband tax start date delayed to January 2021,” *itNews*, March 14, 2020, <https://www.itnews.com.au/news/broadband-tax-start-date-delayed-to-january-2021-548140>.

⁶⁹ Isabelle Lane, “‘Gig State’ to rival NBN: NSW plans fibre rollout as federal government tables regional broadband tax,” *The New Daily*, May 12, 2020, <https://thenewdaily.com.au/life/tech/2020/05/12/nbn-regional-broadband-tax-gig-state/>.

Table 4

What is known	What is needed
<ul style="list-style-type: none"> - Public subsidy for rural broadband connectivity is required (current announcements and existing practices suggest a range from 2/3 public-1/3 private to a 1/2 public-1/2 private cost share, depending on the project) - Existing federal allocations (from various sources) for rural broadband connectivity are sufficient for multi-modal connectivity (as reported by the OAG and TELUS) - There is clarity around the universe of instruments to spend the allocating funding 	<ul style="list-style-type: none"> - An understanding of community need through a detailed mapping exercise that considers geography, community capacity and digital requirements/literacy - A review of available instruments and the policy changes necessary to optimize the goal of rural broadband connectivity

There are five principal instruments (spending and non-spending) for the delivery of rural broadband: tax expenditures; grants and contributions; spectrum allocation; single door federal funding; and reverse auction. To make use of the funds allocated to rural broadband, linkages between the non-spending instruments and spending instruments are necessary.

From a public finance perspective, the expenditure allocations have already been made and are deemed sufficient for a multi-modal approach to rural broadband. Administratively, the instruments would require internal coordination through horizontal management. From the perspective of policy, there are several gaps. Spectrum allocation needs to be differentiated between urban and rural places and reverse auction could be entertained as a solution to connect community need and funding.

Ensuring alignment of policy, resources and administration are necessary for sustainable and ongoing pursuit of the goal of rural broadband connectivity (Table 5). Below, Table 5 summarizes the considerations for public finance (cost to the public purse); administration (actions or activities by the bureaucracy); and policy (legal or directional decisions by the government). The final section of this note will review these approaches, their trade-offs and considerations for implementation.

Table 5

Instrument	Public finance		Administration	Policy		
Tax credit	Potential impact if not taken from existing allocation	●	Feasible with Ways and Means motion as part of budget implementation bill (or other bill)	●	Policy approval required to establish a new tax credit	●
G&Cs	Indifferent; allocation made	○	Mostly established; change in authorities may be required	●	Nil	○
Spectrum allocation	Nil	○	Change in spectrum allocation principles	●	ISED to lead change in principles and rules for spectrum allocation	●
Single door	Nil	○	Horizontal management of policy with ISED leading internal coordination	●	Internal policy change to manage horizontal accountability, including program changes	●
Reverse auction	Nil	○	Change in funding delivery mechanism	●	Reorientation of funding to target community need and geographic coverage	●

Legend	
Low difficulty	○
Somewhat challenging	◐
Challenging	◑
Very challenging	◒
Major challenge	●

Instruments for connectivity

Fostering connectivity requires technology as well as regulatory and funding instruments. The focus of the interviews was on regulatory and funding instruments to leverage public investment for rural broadband connectivity. On technology, there was a clear consensus among key informants that a multi-modal approach was the way forward.

No matter how connectivity is to be achieved, stakeholder collaboration is crucial. Key informants emphasized the need for federal and provincial governments and communities to collaborate and share funding requirements, risk and data. Building a bottom-up understanding of community need would be a step to a long-term solution to rural connectivity. Understanding what type of connectivity communities need and their capacity for uptake and maintenance can help to better align subsidies and incentives for private-sector investment.

Technology: With unanimity, key informants highlighted the need for multi-modal technologies to deliver broadband connectivity. A multi-modal approach means leveraging various types of connections for the delivery broadband, e.g. wireless using wired connections to towers, “bootstrapping” various nodes from a core connection, satellites, etc. While fibre was highlighted as the fastest and most reliable modality for connectivity with capacity for change and a long useful life, the cost and time for buildout do not always make it a feasible option for expeditious connectivity. In ideal circumstances, a conduit policy is in place, so that anytime there is ‘digging,’ pipping is added by default and you ‘dig once,’ reducing barriers to connectivity. This multi-modal approach to technology is reflected in the approaches of the US, UK and Australia.

Regulatory and funding instruments: Spending (subsidy and taxation) and non-spending instruments (policy and regulation) were identified by key informants (see Figure 6).

Non-spending instruments emphasized changes needed to current federal practices to promote rural connectivity. Existing spectrum policy, multiple funding sources, and application processes would benefit from reform to better align to the goal of connecting people). There was consistent agreement on the utility of spending and non-spending instruments to improve rural connectivity, especially among those capable of encouraging changes to regulation and policy.

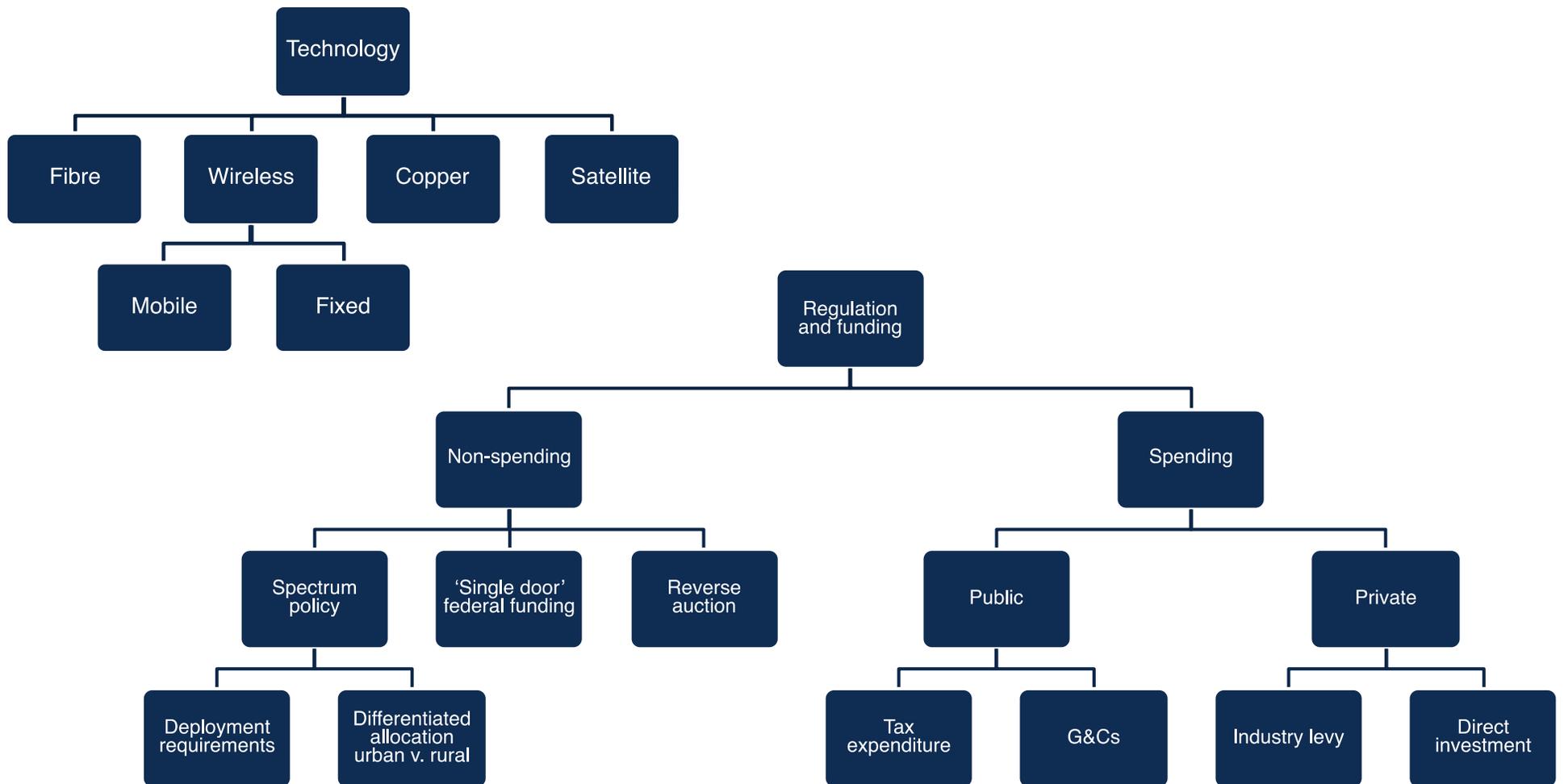
Spectrum policy

Spectrum policy allocations should be differentiated for urban and rural contexts. This means considering realities of geography, density and coverage objectives when allocating spectrum for auction. The different needs and realities of urban and rural places should be reflected in spectrum allocation.

Deployment requirements can be another useful tool to promote connectivity through spectrum policy. The conditions to deploy and operate spectrum in a specific period of time at specific speeds can help achieve goals. Rather than spectrum being purchased and sitting idle due to a lack of capital financing or other challenges, ISPs purchasing spectrum should be required to make use of it, especially in rural places, to promote connectivity.

From a policy change perspective, revisiting spectrum policy to differentiate between urban and rural contexts may be a longer-term proposal for change. An alternative approach would require ISED and its minister to advance a policy change to encourage a political directive to be provided to the department to begin the process of revisiting the existing policy. There have been some attempts by ISED to recognize different characteristics of rural and urban spectrum needs by adjusting the 'tier size' of spectrum. Smaller tiers can allow separate licensing for urban and rural areas. The tiers cannot be so small that efficiency would be lost. Deployment and sub-licensing requirements can serve to recognize differences in spectrum policy that support the differentiated management of urban and rural spectrum, if policy changes are unachievable.

Figure 6



Single-door federal funding

A ‘single door’ for all federal funding was deemed useful and necessary by key informants. Whether for reasons of expediency in applying for funding or to better support community needs, accessing federal funding through a single point of contact would help to promote access. With a single door for federal funding, all applicants would apply to the same department or program. Federal officials would then work behind the scenes to determine the most appropriate ‘pot’ of money from which to provide support (if merited). This would require horizontal management of the initiative (on which the Treasury Board of Canada Secretariat provides guidance).⁷⁰

The single-door approach was recognized by interlocutors as being a much simpler process for applicants and a means to reduce duplication in efforts by streamlining reviews. While this approach has been considered federally, there are policy and administrative challenges with existing program parameters. For instance, some funding from INFC is integrated into bilateral agreements with the provinces and territories. These agreements would have to be reopened and renegotiated to pass the funding through an alternative single door, ISED for instance. Application requirements for the various pots of funding are also different, reducing the feasibility of the single-door approach. However, a single-door for programs that can be consolidated now could be explored, with other programs added as their requirements are reviewed and updated.

Reverse auction

Rural broadband connectivity requires public subsidy. There are different ways of allocating that subsidy, e.g. application base, reverse auction. The reverse auction is an approach to align market forces to public funding. In a reverse auction, the government clearly defines the geographic areas to be connected and the associated deployment requirements. It then turns to the market requesting bids against these requirements. The winning bid meets the coverage and deployment requirements at the most reasonable price. In this approach, industry is invited to innovate to meet the broad goals of the procurement.

SWIFT, a regional intermediary designed to promote rural broadband connectivity, has adopted the approach by inviting bids to build connectivity in designated areas. With strong, internally developed mapping, SWIFT defines its needs and invites the market to bid. Their subsidy limit is 2/3 of any project.⁷¹ The FCC has designed its rural broadband funding along these lines. The approach requires good data, a clear sense of connectivity needs in communities and sound economic models to determine a reasonable subsidy for a given area.

⁷⁰ Treasury Board of Canada Secretariat, “Guide to Departments on the Management and Reporting of Horizontal Initiatives,” last modified May 17, 2018,

<https://www.canada.ca/en/government/system/finances/horizontal-initiatives-database/guide-departments-management-reporting-horizontal-initiatives.html>.

⁷¹ SWIFT, “Frequently Asked Questions,” March 30, 2021, <https://swiftruralbroadband.ca/resources/service-provider-toolkit/>.

Using the reverse auction model in Canada would require administrative and policy changes to build the information base required for the instrument. Establishing the models and geographic mapping required for a reverse auction does take time and resources. Canada may not have the relevant data required across the entire country to apply a reverse auction approach broadly. The FCC leveraged Census areas and worked based on available coverage/service to help to manage these considerations.

The way in which geographic boundaries are defined risks creating tensions with vendors, as drawing boundaries in a certain way may privilege some suppliers over others. However, there are parts of the country that could lend themselves to this approach where vendors have existing footprints that they may wish to extend. This nonetheless could risk upsetting vendors who may not have the capital resources or the geographic presence necessary to engage in such a process.

Tax expenditures

Tax expenditures (tax credits) (see Appendix B) are used in several countries to incentivize behaviours or promote policy outcomes. They represent foregone revenue for a jurisdiction, as they are designed to reduce the tax burden of an individual or corporate entity. To incentivize investment in infrastructure for rural broadband connectivity, tax expenditures were raised as tools that could be leveraged in the immediate term to encourage capital outlays by industry. The UK recently introduced a broad tax credit to incentivize capital investments by industry, including telecommunications.

There are over 200 federal tax-based expenditures in Canada at an approximate cost of \$72B. There are tax credits intended to promote capital outlays. For instance, the Atlantic Investment Tax Credit⁷² allowed eligible companies to write off a portion of their spending on capital and infrastructure in the qualifying region. Unlike many government spending programs, which last for only a handful of years or are subject to risk during election cycles, this tax break existed for 38 years, withstanding political change and economic challenges (e.g. 2008 economic crisis). Most tax expenditures last at least ten years with many in existence for much longer.⁷³

Administratively, a tax credit is typically implemented through a Ways and Means motion via the Budget Implementation Act. This makes the tax credit a potentially ready tool with requisite political support. While an expeditious tool, tax expenditures are also blunt instruments that do not guarantee investment in areas of need or deliver on specific standards (e.g. speed, timely deployment, etc.).

⁷² Department of Finance Canada, “Report on Federal Tax Expenditures - Concepts, Estimates and Evaluations 2020: part 4,” last modified February 27, 2020, [Report on Federal Tax Expenditures - Concepts, Estimates and Evaluations 2020: part 4 - Canada.ca](#).

⁷³ Department of Finance Canada, “Report on Federal Tax Expenditures - Concepts, Estimates and Evaluations 2020: Table of Contents,” last modified February 27, 2020, [Report on Federal Tax Expenditures - Concepts, Estimates and Evaluations 2020: Table of Contents - Canada.ca](#).

Grants and contributions (G&Cs)

The majority of Canada's rural broadband subsidies are allocated through G&Cs (see Appendix C) and are managed through application processes. Current levels of investment are at historic highs but accessing the funding has proven to be challenging. There were suggestions by key informants that some sources of funds may already be oversubscribed, while others, such as those from the CIB, may not be readily deployed given the limited incentive for private sector investment in rural connectivity.

Assuming G&Cs will continue to be leveraged, the instruments used for their allocation and expenditure should be reconsidered. Instruments such as reverse auctions or single door access to federal funding could serve to improve the efficiency and effectiveness of this type of funding. Regional intermediaries such as SWIFT⁷⁴ and Eastern Ontario Regional Network (EORN)⁷⁵ can be approaches within the G&C instrument to improve alignment of need in rural communities and funding for broadband connectivity.

Administratively, changes to existing G&Cs may require changes to the program authorities provided by Treasury Board. Changes to the authorities can be technical in nature, if policy and funding decisions precede it.

Conclusion

Rural broadband connectivity is a question that is larger than defining need today. It is about future capacity for service and economic participation for 20% of Canada's population. Connectivity is an indispensable service and a basic utility increasingly necessary to access services such as health and education, above and beyond entertainment and e-commerce.

Improving Canada's approach to rural broadband connectivity requires a better understanding of the marketplace, i.e. community need, to determine instrument appropriateness and the required level of subsidy. The practices of other jurisdictions can be instructive in this regard. In the US, the FCC asks the market to dictate the cost of building connectivity in unserved or underserved areas. In the UK, supplier-targeted subsidies and agreements with suppliers are intended to better align need and public money. While Australia had a vision for state-built fibre capable internet connectivity, its cost and current results suggest that a state-led initiative may not be a desirable approach for connection and risk management.

The need for public subsidy in funding rural connectivity is clear. From the international comparisons reviewed, the most effective role the state can play is as a partner with industry and communities. Public cost sharing for the building of connectivity infrastructure generally ranges from 1/2 to 2/3 of the project costs, with the balance paid by the private sector. The subsidy required to incentivize buildout will vary based on geography and consumer demand (for industry cost recovery).

⁷⁴ SWIFT, last accessed March 30, 2021, <https://swiftruralbroadband.ca/>.

⁷⁵ Eastern Ontario Regional Network (EORN), last accessed March 30, 2021, <https://www.eorn.ca/en/index.aspx>.

- 1) **Understand need from the bottom-up.** All actors in Canada’s broadband ecosystem, i.e. federal and provincial governments, industry, communities need improved data on existing connectivity, user demand and potential to close gaps on a geographic basis.
- 2) **Leverage a variety of instruments.** Canada is a large and geographically diverse country with varying levels of community engagement and government intervention on broadband. Using a variety of regulatory and funding instruments, e.g. regional intermediaries, reverse auctions, differentiated spectrum policy, can help to better align public subsidy and policy to need on a the ground. A single approach will not be sufficient to achieve the goal of rural connectivity.
- 3) **Both political will and administrative action are necessary for change.** The instruments reviewed in this report mostly require administrative and policy changes, most feasibly and expeditiously achieved with political direction that supports policy and program changes.

Improving rural broadband connectivity in Canada will be a joint effort between government, industry and communities. Their collaboration and cost-sharing are imperative to achieving the goal of connectivity.

Bibliography

- Antony, Jenalene. “Coronavirus crisis highlights internet access inequality across Saskatchewan.” *CBC*, May 12, 2020, <https://www.cbc.ca/news/canada/saskatchewan/internet-rural-remote-saskatchewan-covid-19-1.5562476>.
- Bollman, R. “Focus on rural: Non-metro income.” *Rural Ontario Institute* (2015): 3(16).
- CBC News. “Ontario to spend \$150M on rural broadband as province reports 338 new COVID-19 cases.” *CBC*, June 3, 2020, <https://www.cbc.ca/news/canada/toronto/ontario-covid-19-june-3-1.5596401>.
- C.D. Howe Institute Telecommunications Policy Working Group. “Communiqué #2 Governments Must Cut Through Their Red Tape to Build 5G.” March 9, 2021. <https://www.cdhowe.org/council-reports/governments-must-cut-red-tape-build-5g-telecommunications-working-group>.
- Canadian Radio-television and Telecommunications Commission (CRTC). “LTE and Broadband Availability.” Last modified December 10, 2020. <https://crtc.gc.ca/eng/publications/reports/policymonitoring/2020/cmr4.htm>.
- Canadian Radio-television and Telecommunications Commission (CRTC). “Communications Monitoring Report, 2019.” Last modified December 10, 2020. <https://crtc.gc.ca/eng/publications/reports/policyMonitoring/2020/cmr4.htm - a2.3>.
- Cloke, P.J. “Whither rural studies?” *Journal of Rural Studies*, 1(1) (1985): 1–9.
- Congressional Research Service. “Broadband Internet Access and the Digital Divide: Federal Assistance Programs.” October 25, 2019. <https://fas.org/sgp/crs/misc/RL30719.pdf>.
- Cornell Law School, Legal Information Institute. “47 CFR 54.201- Definition of eligible telecommunications carriers, generally.” Accessed March 30, 2021. <https://www.law.cornell.edu/cfr/text/47/54.201>.
- Crandall, Robert. “Draft: The Government’s Spectrum Policy Will Reduce the Quality of Wireless Services for Rural Canadians.” October 6, 2020.
- Curry, Bill. “Canada Infrastructure Bank and DIF Capital Partners to expand rural broadband in Manitoba.” *The Globe and Mail*, March 26, 2021, <https://www.theglobeandmail.com/politics/article-canada-infrastructure-bank-and-dif-capital-partners-to-expand-rural/>.

Department for Digital, Culture, Media and Sport. United Kingdom. “Project Gigabit: Phase 1 Delivery Plan.” March 19, 2021.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/971903/Project_Gigabit_PHASE_ONE_DELIVERY_PLAN_v3.pdf.

Department for Digital, Culture, Media and Sport. United Kingdom. “Government launches new £5bn ‘Project Gigabit.’” March 19, 2021.
<https://www.gov.uk/government/news/government-launches-new-5bn-project-gigabit>.

Department for Digital, Culture, Media and Sport. United Kingdom. “Shared Rural Network: £1bn deal to end poor rural mobile coverage agreed.” March 9, 2020.
<https://www.gov.uk/government/news/shared-rural-network>.

Digital Mobile Spectrum Limited. “Rural mobile coverage.” Accessed March 30, 2021.
<https://dmsluk.com/our-work/our-work-srn/>.

Federal Communications Commission (FCC). “FCC Adopts Additional Requirements for Eligible Telecommunications Carrier Proceedings.” February 28, 2005,
<https://www.fcc.gov/document/fcc-adopts-additional-requirements-eligible-telecommunications-carrier>

Gaspard, V. “Help wanted: Precarious employment in Ontario – Analysis of key informant interviews.” Ph.D. diss., University of Guelph, 2018.

HM Revenue and Customs. United Kingdom. “Policy paper: New temporary tax reliefs on qualifying capital asset investments from 1 April 2021.” March 3, 2021.
<https://www.gov.uk/government/publications/new-temporary-tax-reliefs-on-qualifying-capital-asset-investments-from-1-april-2021/new-temporary-tax-reliefs-on-qualifying-capital-asset-investments-from-1-april-2021>

Infrastructure and Communities Canada. “Rural Opportunity, National Prosperity: An Economic Development Strategy for Rural Canada.” Last modified May 27, 2019.
<https://www.infrastructure.gc.ca/rural/strat-eng.html>.

Infrastructure and Communities Canada. “Supporting Rural Canada during COVID-19.” Last modified November 12, 2020. <https://www.infrastructure.gc.ca/rural/covid-19-eng.html>.

Innovation, Science and Economic Development (ISED). “High-Speed Access For All: Canada’s Connectivity Strategy.” Last updated July 16, 2019.
https://www.ic.gc.ca/eic/site/139.nsf/eng/h_00002.html.

Kolko, J. “Broadband and local growth.” *Journal of Urban Economics*. (2012): 71, 100-113.

McNally, Michael B., Dinesh Rathi, Jennifer Evaniew and Yang Wu. “Thematic Analysis of Eight Canadian Federal Broadband Programs from 1994 to 2016.” *Journal of Information Policy*, vol. 7 (2017): 38-85.

McNally, Michael B., Dinesh Rathi, Kris Joseph, Jennifer Evaniew and Amy Adkisson. “Ongoing Policy, Regulatory, and Competitive Challenges Facing Canada's Small Internet Service Providers.” *Journal of Information Policy*, Vol. 8 (2018): 167-198.

NBN Co. “Statement of Expectations.” August 24, 2016.
<https://www.nbnco.com.au/content/dam/nbnco2/2018/documents/Policies/soe-shareholder-minister-letter.pdf>

O-Net. “About O-Net.” Accessed March 30, 2021. <https://o-net.ca/about-o-net/>.

Ofcom. “Mobile coverage obligations.” November 17, 2020.
<https://www.ofcom.org.uk/spectrum/information/cellular-coverage>.

Ofcom. “Connect Nations 2019: UK report.” March 18, 2020.
https://www.ofcom.org.uk/data/assets/pdf_file/0023/186413/Connected-Nations-2019-UK-final.pdf.

Ofcom. “Your right to request a decent broadband service: What you need to know.” March 20, 2020.
<https://www.ofcom.org.uk/phones-telecoms-and-internet/advice-for-consumers/broadband-uso-need-to-know>.

Ofcom. “2020 Coverage Obligations - Notice of compliance verification methodology.” Last accessed March 30, 2021.
https://www.ofcom.org.uk/data/assets/pdf_file/0031/192919/notice-of-compliance-verification-methodology.pdf.

Office of the Auditor General of Canada. 2018. “Fall Reports of the Auditor General of Canada to the Parliament of Canada: Report 1 – Connectivity in Rural and Remote Areas.” https://www.oag-bvg.gc.ca/internet/English/parl_oag_201811_01_e_43199.html-hd3b.

Statistics Canada. “Population and Dwelling Count Highlight Tables, 2016 Census.” Last modified February 7, 2018. <https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/hlt-fst/pd-pl/Table.cfm?Lang=Eng&T=703&SR=1&S=87&O=A&RPP=25>.

Pant, L.P. & H.H. Odame, “Broadband for a sustainable digital future of rural communities: A reflexive interactive assessment.” *Journal of Rural Studies* (2017): 54, 435-450.

Posadski, Alexandra. “Rogers lands contract to build hundreds of cell towers to expand wireless service in Eastern Ontario.” *Globe and Mail*, March 19, 2021, <https://www.theglobeandmail.com/business/article-rogers-lands-contract-to-build-hundreds-of-cell-towers-to-expand/>.

Prieto-Lara, E. & R. Ocaña-Riola. “Updating rurality index for small areas in Spain.” *Social Indicators Research*, 95(2) (2010): 267–280.

Quadro. “Internet.” Last accessed March 30, 2021. <https://www.quadro.net/internet/>.

Roberts, E., D. Beel, L. Philip, and L. Townsend, “Rural resilience in a digital society.” *Journal of Rural Studies* 54 (2017): 355-359.

Reimer, B. & R. D. Bollman. “Understanding rural Canada: Implications for rural development policy and rural planning policy.” In D. Douglas, Ed. *Rural Planning and Development in Canada* (Toronto: Nelson Publishing, 2009).

Shared Rural Network. “Frequently Asked Questions.” Accessed on March 30, 2021. <https://srn.org.uk/faqs/>.

Shared Rural Network. “About the Shared Rural Network.” Last accessed March 30, 2021. <https://srn.org.uk/about/>.

SWIFT. “Frequently Asked Questions.” Accessed March 30, 2021. <https://swiftruralbroadband.ca/resources/service-provider-toolkit/>.

TELUS Communications. “Cracking the rural broadband challenge.” 2020.

The World Bank. “Rural population (% total population).” Accessed on February 23, 2021. <https://data.worldbank.org/indicator/SP.RUR.TOTL.ZS>.

Thomas, J., et al. “Measuring Australia’s Digital Divide: The Australian Digital Inclusion Index 2020.” RMIT and Swinburne University of Technology, Melbourne, for Telstra. https://digitalinclusionindex.org.au/wp-content/uploads/2020/10/TLS_ADII_Report-2020_WebU.pdf.

Treasury Board of Canada Secretariat. “Guide to Departments on the Management and Reporting of Horizontal Initiatives.” Last modified May 17, 2018. <https://www.canada.ca/en/government/system/finances/horizontal-initiatives-database/guide-departments-management-reporting-horizontal-initiatives.html>.

Weeden, S. Ashleigh and Wayne Kelly for the Canadian Rural Revitalization Foundation. 2020. “Rural Insights Series: COVID-19, 1.5: Addressing the Digital Divide: COVID-19 and the Importance of Connecting Rural Canada.”

Appendix A – Overview of relevant federal mandate letters 2019 and 2021

Department	2019	2021
ISED	<p>“Work with the Minister of Infrastructure and Communities, the Minister for Women and Gender Equality and Rural Economic Development and the Minister of Canadian Heritage to deliver high-speed internet to 100 per cent of Canadian homes and businesses by 2030.”⁷⁶</p>	<p>“Recognizing that all Canadians need the tools to fully participate in and benefit from the digital economy, support the Minister for Women and Gender Equality and Rural Economic Development on the continued implementation of the Universal Broadband Fund to ensure that all Canadians, no matter where they live, have access to high-speed internet. Your work should include considerations around the effective use and deployment of innovative technologies, such as low-earth-orbit (LEO) satellites, to connect all Canadians.”⁷⁷</p>
INFC	<p>Ensure the Canada Infrastructure Bank’s investments align to federal infrastructure goals, including: “With the Minister for Women and Gender Equality and Rural Economic Development, and with the support of the Minister of Innovation, Science and Industry and the Minister of Canadian Heritage, work with the Bank to deliver high-speed internet to 100 per cent of Canadian homes and businesses by 2030.”</p>	<p>“As the Minister responsible for the Canada Infrastructure Bank, support the Minister for Women and Gender Equality and Rural Economic Development to accelerate the connectivity timelines and ambitions of the Universal Broadband Fund to ensure that all Canadians, no matter where they live, have access to high-speed internet.”⁷⁸</p>

⁷⁶ Office of the Prime Minister, “Minister of Innovation, Science and Industry Mandate Letter,” December 13, 2019, <https://pm.gc.ca/en/mandate-letters/2019/12/13/minister-innovation-science-and-industry-mandate-letter>.

⁷⁷ Office of the Prime Minister, “Minister of Innovation, Science and Industry Supplementary Mandate Letter,” January 15, 2021, <https://pm.gc.ca/en/mandate-letters/2021/01/15/minister-innovation-science-and-industry-supplementary-mandate-letter>.

⁷⁸ Office of the Prime Minister, “Minister of Infrastructure and Communities Supplementary Mandate Letter,” January 15, 2021, <https://pm.gc.ca/en/mandate-letters/2021/01/15/minister-infrastructure-and-communities-supplementary-mandate-letter>.

	<p>“Work with the Minister of Indigenous Services to co-develop and invest in distinctions-based community infrastructure plans, and move forward with addressing critical needs including housing, all-weather roads, high-speed internet, health facilities, treatment centres and schools in First Nations, Inuit and Métis communities by 2030. These plans should also include new investments to support the operation and maintenance of this infrastructure.”</p>	
Women and Gender Equality and Rural Economic Development	<p>“Work with the Minister of Innovation, Science and Industry to increase high-speed broadband coverage in rural Canada by leading the rollout of existing investments, developing and implementing programming towards further improvements and ensuring that investments by the Government of Canada, provincial and territorial partners and the private sector are coordinated to best prepare rural Canada for success in the digital economy.”</p>	<p>“With the support of the Minister of Innovation, Science and Industry and the Minister of Infrastructure and Communities, continue to implement the Universal Broadband Fund to ensure that all Canadians, no matter where they live, have access to high-speed internet.”⁷⁹</p>
ISC	<p>“Supported by the Minister of Infrastructure and Communities, work to co-develop and invest in distinctions-based community infrastructure plans, and move forward with addressing critical needs including housing, all-weather</p>	None

⁷⁹ Office of the Prime Minister, “Minister for Women and Gender Equality and Rural Economic Development Supplementary Mandate Letter,” January 15, 2021, <https://pm.gc.ca/en/mandate-letters/2021/01/15/minister-women-and-gender-equality-and-rural-economic-development>.

	<p>roads, high-speed internet, health facilities, treatment centres and schools in First Nations, Inuit and Métis communities by 2030. These plans should also include new investments to support the operation and maintenance of this infrastructure.”</p>	
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Appendix B – An overview of tax expenditures

Governments have several tools at their disposal to pursue policy objectives. Tax-based expenditures (TBE) are a type of policy instrument used by governments worldwide to achieve specific outcomes or goals, similar to direct program spending (DPS) and government grants and contributions (G&C).

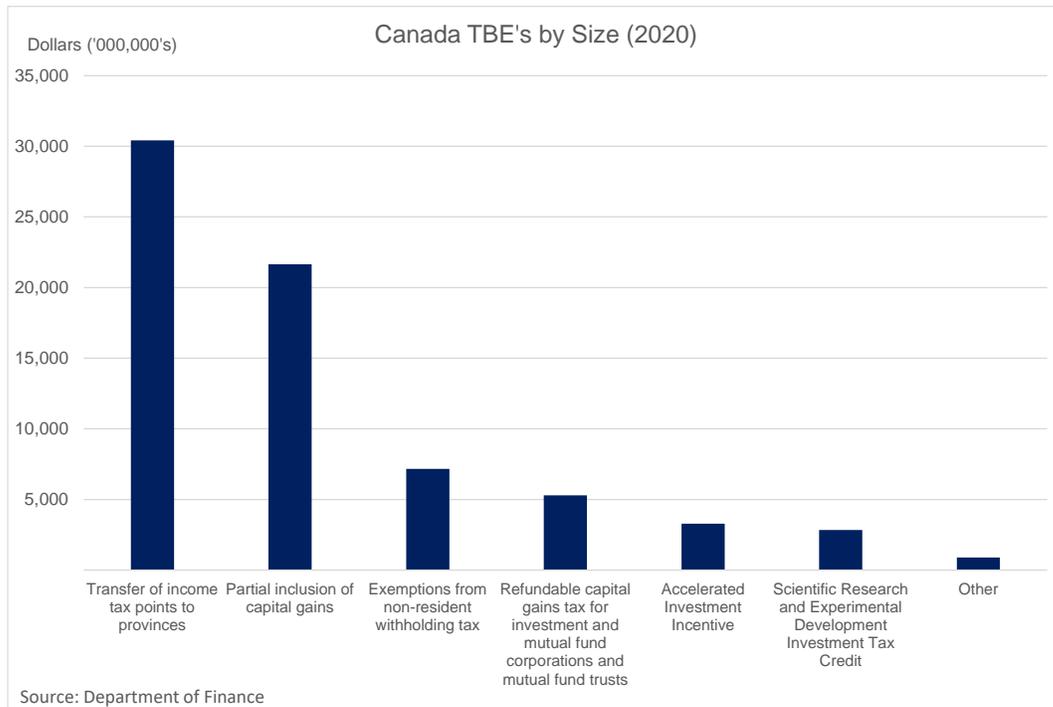
TBEs are used by public authorities for policy such as boosting investment, innovation, and employment. As reported by the OECD, TBEs are “provisions of tax law, regulation or practices that reduce or postpone revenue for a comparatively narrow population of taxpayers relative to a benchmark tax.”⁸⁰ TBEs can take many forms, including tax deferrals, credits, exemptions, allowances, or rate reliefs. Unlike other forms of government financing, however, TBEs are not considered to be government spending. Instead, they are considered foregone revenues, representing a loss in revenue for the government and a reduction in tax liability for the entity (individual or corporations). This distinction means that TBEs can be implemented, maintained, and changed with greater ease than a budgeted program and require less direct oversight from government bodies once enacted.

Government spending tools such as DPS, and G&Cs, can be used to tackle policy objectives more forcefully relative to TBEs that are limited to trying to change the underlying incentives and actions of economic actors. For example, the government may believe that companies should pursue more advanced research and development programs. Companies may not want to risk their capital on projects that are not guaranteed successes or where their predicted payoff is too small. In this case, the government could create a TBE that allows companies to write off a portion of their research spending against their corporate income tax or enable companies to accelerate the depreciation they claim on the equipment or facilities required. Either of these policy actions, in the right conditions, could change the choices of economic actors by making previously unprofitable decisions profitable.

Since the implementation of TBEs allows for a lighter touch on economic policy and an easier and more efficient experience for the government, they have found widespread use in Canada. Federally, Canada has over 200 TBEs,⁸¹ ranging from tax credits that incentivize individual savings (Tax-Free Savings Accounts) to accelerated capital write-off timelines for clean energy projects. In the fiscal year 2020, the total value of federal TBEs was approximately \$72 billion.

⁸⁰ OECD, “Tax Expenditures in OECD Countries - OECD publication,” January 27, 2010, <https://www.oecd.org/gov/budgeting/taxexpendituresinoecdcountries-oecdpublication.htm>.

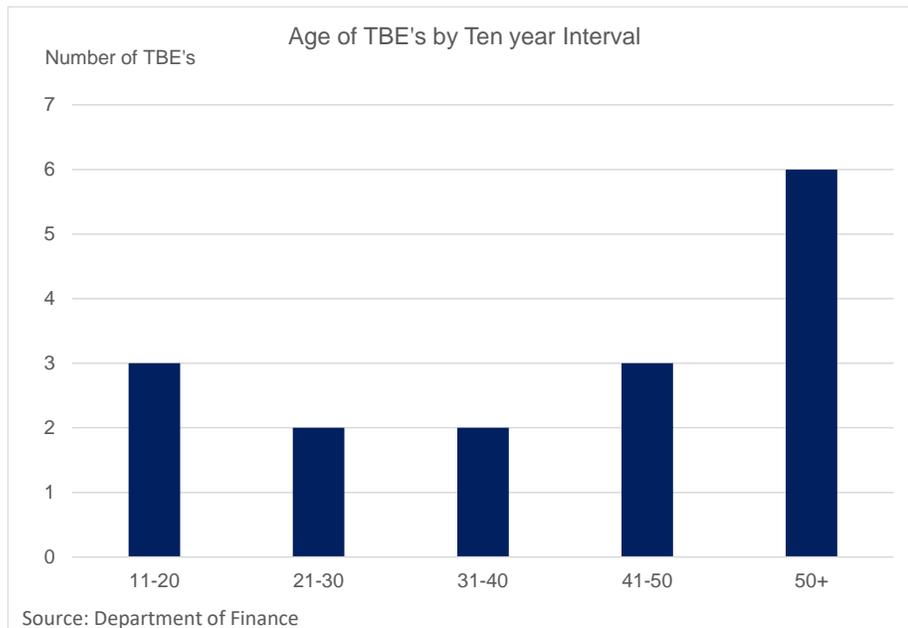
⁸¹ Department of Finance Canada, “Report on Federal Tax Expenditures - Concepts, Estimates and Evaluations 2020: part 3,” last modified February 27, 2020, <https://www.canada.ca/en/department-finance/services/publications/federal-tax-expenditures/2020/part-3.html>.



Of these 200 plus federal TBEs, nearly one in ten is designed to confront sectoral or regional outcomes challenges. For instance, the government administered a tax credit specifically to incentivize development in the Atlantic region. The Atlantic Investment Tax Credit⁸² allowed eligible companies to write off a portion of their spending on capital and infrastructure in the qualifying region. Unlike many government spending programs, which last for only a handful of years or are subject to risk during election cycles, this tax credit existed for 38 years. This means that this tax credit was able to withstand significant changes in political governance and was unaffected by government spending cuts in both the 1990s and the 2008 economic crisis. Among TBEs, durability is the trend. Of the TBEs reviewed that were designed to target a specific sector or region, the shortest lifespan was ten years, with the longest running at 77 years (and still going).⁸³

⁸² Department of Finance Canada, “Atlantic Investment Tax Credit,” February 27, 2020, <https://www.canada.ca/en/department-finance/services/publications/federal-tax-expenditures/2020/part-4.html#Atlantic-Investment-Tax-Credit>

⁸³ Department of Finance Canada, “Report on Federal Tax Expenditures - Concepts, Estimates and Evaluations 2020: Table of Contents,” February 27, 2020, <https://www.canada.ca/en/department-finance/services/publications/federal-tax-expenditures/2020.html>



TBEs are not without their drawbacks. For example, TBEs are available to all companies that meet broad tax criteria. While this is beneficial for ease of access, the instrument is blunt and does not require an outcome or reporting on results. Entities may make minor administrative changes or do the minimum needed to meet the tax break criteria without supporting the overall objective the TBE. This means that it becomes nearly impossible to accurately state the impacts or efficacy of TBEs and makes it complicated to review the TBE wholistically. Since TBEs generally persist, their lack of government oversight can be problematic. Studies supported by the OECD⁸⁴ have found that they might be both more costly and less efficient given the lack of oversight and overly broad requirements than a more formal and direct government spending program.

⁸⁴ OECD, "OECD Taxation Working Papers: The Evaluation of the Effectiveness of Tax Expenditures - A Novel Approach," November 3, 2011, https://www.oecd-ilibrary.org/taxation/the-evaluation-of-the-effectiveness-of-tax-expenditures-a-novel-approach_5kg3h0trjmr8-en;jsessionid=Nma8wtcDJZYbAbbO8lzMmHK.ip-10-240-5-5

Appendix C – An overview of grants and contributions

Governments have a variety of ways to pursue policy objectives. Grants and contributions (G&Cs) are two distinct approaches to funding. A grant has pre-established eligibility criteria that is not typically subject to departmental audit. The recipient however, is typically required to report on results.⁸⁵ A contribution has specific performance conditions, typically defined in an agreement and is subject to audit.

G&Cs enable the government to engage directly with a partner to achieve policy goals. These partners become part of a symbiotic relationship and are given government financial and administrative support in return for their expertise and services. By partnering with these entities, the government can lower the program's cost through efficiencies, involve leading subject matter experts, and track the program's effectiveness. This support also comes strict oversight requirements throughout the partnership period.

G&Cs and TBEs are useful in different policy contexts. When the government is targeting an entire sector or geographic area, it will likely use a TBE to incentivize increased economic activity. The combination of a low administrative burden, and flexibility in application, allows TBEs to be the tool of choice for broad applications. While they are flexible, their passive design means that they may not directly address problems and do not provide the same opportunity to track effectiveness. In contrast, G&Cs can be used directly with partners when a specific policy goal is attempting to be achieved.

Consider rural broadband connectivity. The federal government has allocated billions to the Universal Broadband Fund (UBF) for use with industry and community partners. Recently, the province of Quebec capitalized on the fund with a matching federal grant for its investments in broadband. To access the funding, standards terms and conditions were applied to the grant from the UBF to achieve the goal of connectivity in parts of Quebec.

For a large corporation, G&C funded programs can provide a direct cash subsidy for activities. This can allow a corporation to fully fund a program they may not have been able to pursue. The benefits come with accountabilities, particularly transparent and rigorous reporting requirements. G&Cs can also be changed, as political and economic priorities of a government change or during a transition of power. Such funding, while useful, comes with a measure of uncertainty.

⁸⁵ Library of Parliament, "Grants and Contributions," April 23, 2020, <https://hillnotes.ca/2020/04/23/grants-and-contributions-implementing-federal-policy-by-transferring-funds/>.