Progress and Challenges for Remote and Indigenous Broadband

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Abstract:

The U.S. and Canada, and some other industrialized countries, are currently releasing significant amounts of funding to extend broadband to unserved and underserved regions, including remote and Indigenous communities. Yet infrastructure funding programs typically ignore other requirements besides one-time capital investment.

This paper compares current public sector funding for rural/remote and Indigenous broadband in the United States (primarily from the Federal Communications Commission, the Department of Commerce, and the Department of Agriculture) and in Canada, primarily from the Canadian Radio-Television and Telecommunications Commission (CRTC) and the Department of Innovation, Science and Economic Development (ISED).

In particular, it examines additional requirements besides capital funding, and the extent to which these programs support them, including:

- Consultation with communities
- Operation and maintenance costs
- Training in operating and maintaining networks
- Permanent jobs for local residents (in addition to short-term construction/installation jobs)
- Future proofing: installation of sufficient capacity for future needs
- Redundancy: e.g. back-up technologies or loop networks to prevent outages
- Digital literacy: training in online applications, privacy, security, etc.
- Regulatory provisions such as requirements for open access, penalties for failing to meet installation and quality of service (QoS) goals.

The paper then identifies best practices in meeting these requirements that could be relevant for remediating these programs, and for other countries and regions investing in rural and remote broadband.

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1. Introduction

For decades, the policy priority to bridge the so-called digital divide in the United States was to obtain additional funding to build out and upgrade networks, particularly in rural and disadvantaged areas. However, in the past two years, numerous federal programs, plus some state and other initiatives, have made billions of dollars available for broadband. See Table 1.

While federal funding is more limited in Canada, there are resources available from the Canadian Radio-Television and Telecommunications Commission (CRTC) and the Department of Innovation, Science and Economic Development (ISED). ISED has provided CAD$3.225 billion in its Universal Broadband Fund, and the CRTC has allocated up C$675 billion in over 5 years in its Broadband Fund.

Table 1: US Funding:

Funding Program	Federal Agency	Amount
RDOF	FCC	Up to $20 Billion
Middle Mile Program	NTIA	$1 Billion
Tribal Broadband Connectivity	NTIA	$3 Billion
BEAD	NTIA	$42.5 Billion
CPF	Treasury	$10 Billion
ARPA	Treasury	$20 Billion
Reconnect Round 4	USDA	$1.15 Billion
Total		**$97 Billion**

Acronyms:

ARPA: American Rescue Plan Act

BEAD: Broadband Equity Access and Deployment Program funded by IIJA

CPF: Capital Projects Fund funded by ARPA

FCC: Federal Communications Commission

IIJA: Infrastructure Investment and Jobs Act

NTIA: National Telecommunications & Information Administration under Department of Commerce

RDOF: Rural Digital Opportunities Fund

USDA: United States Department of Agriculture[1]

With a renewed emphasis on infrastructure funding, there has been little attention to other factors that could enhance or reduce the benefits of connectivity for previously unserved or underserved communities. The sections below identify barriers to sustainability and maximization of benefits from this capex funding.

2. Sustainability

Perhaps sustainability has received the least attention in evaluation of benefits of connectivity. Early experiments and pilot projects were funded by Canada and the U.S., primarily using capacity on experimental and early operational satellites (ATS-1, ATS-3, ATS-6, CTS, and Anik B).[2] Yet even when positive outcomes were found in evaluations, most projects died with the end of experimental funding.

In some cases, their demise resulted from upgrades in technology, making them obsolete. Yet in other cases, advances in technology did not result in scaling the successful experimental applications. The most common problem was lack of a sustainable business model which typically had not been included in project planning or in evaluation.

As in earlier eras, funders, whether government administrations or development agencies, tend to provide funds only for equipment and installation (Capex). They typically do not provide ongoing operating support (Opex). The U.S. is an exception, with various funds available to subsidize service to high cost and low-income customers.[3] However, barriers remain: for example, community networks need to be certified as Eligible Telecommunications Carriers (ETCs), usually by state regulators, and their managers may need help in obtaining certification and meeting other requirements to participate in these programs.

For community networks, planning for sustainability generally requires figuring out how to cover costs (in funds and time) of ongoing operations such as charges for connections to a middle-mile network and operations and maintenance of the local network equipment. If connections were initially provided for free would users be willing to pay, or is some other source of funds such as local government available? If volunteers had installed and maintained equipment, could these functions be turned into jobs?

Some projects have managed to continue their services after initial pilot funding. Indigenous network Kuh-Ke-Nah Network (KNet) in northern Ontario (Canada) contracted with government education and health agencies to deliver distance education and connectivity for telemedicine. Some community networks offer community access paid for by the town or Tribal government, or by revenues from Internet service at co-op stores or coffee shops.

3. **Engagement**

Engagement with local governments should be a required step before infrastructure projects commence, or even before public sector funding is requested. Consultations can not only explain the project, but can identify issues to be addressed such as access to existing facilities, rights-of-way, opportunities for local employment, services to be provided.

The Canadian regulator, the CRTC, has required carriers requesting support from its Broadband Fund to consult with communities it intends to serve. Original CRTC guidelines stated that applicants should show that they "attempted to consult" with communities. Such a requirement could be fulfilled by a letter never received or a telephone call never answered.[4]

Canada's *Telecommunications Act* states: "No Canadian carrier or distribution undertaking shall construct a transmission line on, over, under or along a highway or other public place without the consent of the municipality or other public authority having jurisdiction over the highway or other public place."[5] Indigenous governments argue that they are "public authorities." Indigenous organizations have also cited the articles in the *United Nations Declaration on the Rights of Indigenous People* (UNDRIP)[6] that specify consultation, as does Canada's Truth and Reconciliation Commission (TRC) in its Call to Action on "Business and Reconciliation."[7]

The Federal Communications Commission (FCC) now requires a *Tribal Government Engagement Obligation* from carriers receiving subsidies to provide services on Tribal lands (although not elsewhere). These carriers must demonstrate that they have coordinated with the Tribal government and provide a report documenting their compliance. The FCC has determined that, at a minimum, the annual Tribal engagement obligation for ETCs must include (1) needs assessment and deployment planning; (2) feasibility and sustainability planning; (3) marketing services in a culturally sensitive manner; (4) rights-of-way processes, land-use permitting,

facilities siting, environmental and cultural preservation and review processes; and (5) compliance with Tribal business and licensing requirements.[8]

However, Indigenous connectivity advocates point out the limitations of this process. According to interviews, although regulations require carriers to meet with Tribes, consultation is typically limited to a letter sent to a generic email box of the Tribal government (which may or may not have access to telecommunications expertise). After 60 days, the carrier can check the box stating that it did consult with Tribes; as one interviewee put it: "Less than one percent [of carriers] are truly doing consultation . . . it's a very small number of people who are actually doing consultation."[9]

Engagement is also required by the recent federal broadband programs, but the criteria are vague, and it is not clear how they will be formalized and monitored.

4   Digital Skills; Training and Hiring Local Workers

Effective utilization of new services may require a digital literacy strategy to ensure that residents understand how to use online services and to handle issues such as fake content and threats to privacy. Digital skills can also include installation, operation and maintenance of community networks. The Internet Society (ISOC) has hosted annual Indigenous Connectivity Summits in North America since 2017 that include workshops to train people to install and maintain community networks.[10]

Indigenous participants in Canadian regulatory proceedings have urged that commercial recipients of federal broadband funding be required to hire and train local residents to install and maintain their equipment.[11] To date, no such requirements have been imposed.

Public sector funders seek to ensure that broadband facilities are built but rarely include requirements for training and hiring of local residents. Such requirements would provide local jobs that can contribute to local economies, in turn can create additional demand for providers' services. Local employees and contractors can also reduce costs. Reliance on urban contractors typically results in typically higher installation and maintenance costs (including travel and lodging as well as wages for outside crews) and no transfer of skills or income to the community.

An early Indigenous communications project in Canada funded by the former federal Department of Communications required that participating communities provide a location for communications equipment, and at least two community members to be trained to operate and maintain the equipment. Eventually, an Indigenous communications society was formed to implement this model on a regional basis.[12]

Procurement guidelines from funding agencies or incumbents can be a barrier to hiring local residents or contractors if they require competitive bids or certifications. However, procurement

guidelines can also be designed to contribute to Indigenous skills and jobs. In Canada, an Indigenous ISP pointed out that a necessary component of any broadband development funding mechanism "is supporting opportunities for development and growth of First Nations and Aboriginal businesses" and noted that a federal mechanism known as a Procurement Strategy for Aboriginal Businesses (PSAB) is used in other sectors.[13]

5   Wholesale access to transport services

Community and Indigenous service providers need access to transport networks provided by incumbent carriers where the cost of installing their own networks is prohibitively expensive., Lease charges can be very expensive as regulation of wholesale fibre transport services has generally been forborne since 2011[14]. This forbearance is based on the assumption that all wholesale fibre facilities are potentially competitive. However, in most rural and remote regions regulatory forbearance has not resulted in facilities-based competition but rather has perpetuated difficulties in access to wholesale transport monopolies.[15]

As a large competitive provider stated in CRTC proceedings "…where a service provider is attempting to negotiate access to wholesale transport services in a monopolistic wholesale market, negotiations may result in access being granted to the competing service provider, but only at monopolistic rates …" An Indigenous provider serving isolated James Bay communities paid 41 percent more per MB to the incumbent in 2020 versus in 2016, whereas wholesale bandwidth prices have decreased dramatically elsewhere in the past decade.[16] These high transport charges make it difficult for small ISPs to meet the CRTC's connectivity targets at affordable prices.

Similarly, in the U.S., middle mile connectivity may be unregulated. Small providers in Alaska have complained that they cannot provide competitive service packages in their communities because of the high charges they must pay for backhaul (on an incumbent network installed with federal funding).

Yet some incumbents claim that there is little demand for wholesale access for rural and remote communities; as one noted: "There is also no evidence that any demand for wholesale access exists in unserved or underserved communities to date or that there will be in the foreseeable future." However, Indigenous providers have witnessed demand for much more bandwidth, exacerbated by increased use of online services during the pandemic. For example, the Indigenous provider serving James Bay now needs 10 GB circuits. Incumbents can also take an excessive amount of time to connect Indigenous providers to transport services. In Ontario, a large incumbent took more than two years to provide access to various circuits requested by an Indigenous provider.[17]

6 Access to support structures

Access to existing support structures such as poles and towers can be critical for extending and upgrading rural/remote broadband. Among the issues noted by competitive providers (both major cable companies and small ISPs) are delays in getting necessary permits, high and/or changing prices for access, and delays and costs in completing make-ready work such as repairing, anchoring or replacing poles. "Gatekeepers" of support structures lack incentives to expedite permits and make-ready work, particularly when carriers are accommodating potential competitors, or when electric utilities have concerns regarding safety and internal approvals.

Delays in providing information about support structure access charges and in approving access can result in small providers significantly underestimating costs in their funding proposals, and can make it impossible to meet project deadlines. Impacts on projects due to such delays can be enormous, particularly in regions with short construction seasons due to cold weather and limited periods for shipping equipment over ice roads (on frozen lakes and rivers).

Once access to support structures is secured, small providers face significant fees. An Indigenous provider stated that the high costs it had to absorb affected its ability to provide affordable services to remote communities. Charges for access to incumbent-owned support structures may consist of authorization fees, engineering charges, payment for repair, and maintenance – as well as ancillary costs such as snow removal. They may also include any modifications to support structures to comply with regulations that the incumbent may have either neglected or ignored.

Further, applicants for access may find that support structures have not been adequately maintained, or are otherwise not ready for attachments of the providers' equipment, and attachment rates typically ignore the condition of the support structures. An Indigenous provider in Quebec stated that whenever the staff visit communities, they discover poles are often old and poorly maintained. According to Indigenous providers in Quebec and Ontario, it appears that in some cases the incumbents do not even know the condition of their poles in the communities.[18]

The need to complete make-ready work may result in delays as well as disputes over which entity should pay for repairs and upgrades. The FCC has introduced a procedure called One Touch Make Ready (OTMR), "whereby the attacher, who has the incentive to move quickly, is able to perform simple make-ready work in the telecommunications space on a pole, subject to notice requirements and other safeguards needed to ensure the quality of the make-ready work." New attachers are not responsible for costs other than those incurred to accommodate While OTMR has a relatively short history and may be subject to modification, it is an example of a policy that relies on incentives of new entrants to conduct necessary work to provide access to their services.

7 Spare capacity and scalability

While Indigenous populations in the North are a small percentage of the total Canadian population, they are also the fastest growing. Households are often large, with growing demand for bandwidth; therefore, networks must be built so that they can scale to accommodate more users and/or more bandwidth-intensive uses. Despite public statements that there will be little future demand in remote and Northern regions, incumbents may decide to reserve pole or conduit space for future upgrades, thereby retaining a competitive advantage over competitors, regardless of whether they intend to use this reserved capacity.

Northern ISPs have also found that some incumbent fibre and microwave backbone (or middle mile) networks have no additional capacity available. For example, in Northern Ontario, an incumbent's engineering of a fibre backbone did not anticipate residential and anchor institution demand. Accordingly, five years after lighting up the backbone, its electronics reached end-of-life.[19]

In addition to the difficulties in accessing poles to add capacity discussed above, some providers have advocated that fibre networks built using public funds should include additional capacity in the form of "dark fibre". An incumbent challenged this proposal which it characterized as "carriers who build dark fibre [would] be required to build for unknown future capacity," adding "It would be unprecedented for the Commission to order construction of excess capacity." However, installing extra dark fibre during construction is much cheaper that adding fibre in later upgrades and overbuilds.

Some utilities own infrastructure such as fibre and microwave that could be used to extend broadband. For example, surplus optical fiber capacity could be used to extend broadband in rural regions as was done through negotiating with a major commercial telecommunications operator that wanted to transit through the state of Oregon. In Canada, provinces own hydro electric utilities that could also lease spare communications capacity, but negotiating access can be difficult for small providers.

8 Jurisdictional confusion

Another barrier to broadband installation is negotiation of access to rights-of-way that may involve multiple jurisdictions including cities, municipalities, and Indigenous lands. Also, telecommunications networks may cross Indigenous lands, but the people living on those lands may not be allowed to access them. As noted above, in the U.S., the Federal Communications Commission (FCC) requires a *Tribal Government Engagement Obligation* from carriers receiving subsidies to provide services on Tribal lands. These

carriers must demonstrate that they have coordinated with the Tribal government and provide a report documenting their compliance.[20]

Jurisdictional barriers involving other utilities may also hinder broadband projects. For example, the CRTC has jurisdiction over telecommunications carriers' poles, but not those owned by electric utilities, which are regulated by the provinces. Canada's federally-established Broadcasting and Telecommunications Review (BTLR) Panel recommended an amendment to the *Telecommunications Act* to: "[E]mpower the CRTC to review and vary the terms and conditions of access to the support structures of provincially regulated utilities, to ensure non-discriminatory arrangements."[21] However, these recommendations have not been adopted to date.

Jurisdictional limitations also exist in the U.S. States are responsible for telecommunications within the state, and may impose their own regulations. In some cases, state public utilities commissions regulate telecommunications and electrification, so that it is possible that they could mandate terms for access to electricity poles and conduit. In other cases, electricity poles are the responsibility of the county or local municipality.

9 Conclusion

An understanding of the benefits of broadband and what variables may affect their impact, such as demographics, digital skills, engagement and sustainability– is particularly relevant for current broadband initiatives in Canada, and those in the U.S. such as the Infrastructure, Investment and Jobs Act of 2021 (IIJA) which includes the Digital Equity Act of 2021 (DEA), the Inflation Reduction Act, the Broadband Equity, Access, and Deployment (BEAD) Program, and the Tribal Broadband Connectivity Program, as well as the Affordable Connectivity Program (ACP) and other user subsidies.

A better understanding of these issues is important not only for researchers but also for policy makers and funders in the broadband era where governments and private industry are investing in infrastructure to extend access to broadband to rural, remote and Indigenous communities.

References

[1] Derived from **https://www.nokia.com/networks/rural-broadband/us-government-broadband-funding-opportunities/infrastructure-funding-explained/**

[2] See Hudson, Heather E. (1990) *Communications Satellites: Their Development and Impact*. New York: Free Press.

[3] Hudson, Heather E. and Rob McMahon. (2022) "Remote and Indigenous Broadband: A Comparison of Canadian and U.S. Initiatives and Indigenous Engagement." *Journal of Information Policy*, vol. 12, December.

[4] CRTC. (2019) "Telecom Notice of Consultation CRTC 2019-45: Call for comments – Application Guide for the Broadband Fund." Section 6.2.1(d).

[5] Telecommunications Act, Section 43/(3)

[6] United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP). See **https://www.un.org/development/desa/indigenouspeoples/wp-content/uploads/sites/19/2018/11/UNDRIP_E_web.pdf**

[7] Truth and Reconciliation Commission of Canada: *Calls to action*. (2015), Winnipeg, MB, p.10.

[8] Form available at: **https://www.usac.org/wp-content/uploads/high-cost/documents/Forms/FCC-Form-481-Template.pdf**

[9] Quoted in Hudson, Heather E. and Rob McMahon. (2022) "Remote and Indigenous Broadband: A Comparison of Canadian and U.S. Initiatives and Indigenous Engagement." *Journal of Information Policy*, vol. 12, December.

[10] See **https://www.internetsociety.org/events/indigenous-connectivity-summit/2022/**

[11] First Mile Connectivity Consortium. (2020) Reply comments in "Telecom Notice of Consultation CRTC 2019-406: Call for comments regarding potential barriers to the deployment of broadband-capable networks in underserved areas in Canada." paras 67-72, July 10.

[12] The Northern Pilot Project, for which the author served as evaluator. The project resulted in the establishment of Wawatay Native Communications Society, which still exists today, serving remote Indigenous communities in northern Ontario.

[13] See **https://www.sac-isc.gc.ca/eng/1354798736570/1610985991318**

[14] In CRTC Telecom Decision 2008-17, the Commission forbore from the regulation of high-speed fibre-based transport services across all of Canada. (This forbearance was phased in over three years.)

[15] Gauthier, Natasha. (2014). Bolder aspirations needed to improve broadband connectivity in Canada's North. *Northern Public Affairs, 2*(3), 62–64.

[16] Quoted in First Mile Connectivity Consortium (FMCC) (2020a) *Telecom notice of consultation CRTC 2019–406: Call for comments regarding potential barriers to the deployment of broadband-capable networks in underserved areas in Canada. Submission of the First Mile Connectivity Consortium*. Fredericton, NB: FMCC. URL: **http://firstmile.ca/wp-content/uploads/FMCC-CRTC -2019-406-April-23-2020.pdf**.

[17] Ibid.

[18] FMCC. (2020b). *Telecom notice of consultation CRTC 2020–366: Call for comments regarding potential regulatory measures to make access to poles owned by Canadian carriers more efficient. FMCC intervention*. Fredericton, NB: FMCC. URL: **http:// firstmile.ca/wp-content/uploads/FMCC-Submission-TNC-2020-366-FINAL.pdf**

[19] Quoted in First Mile Connectivity Consortium (2020a).

[20] Form available at: **https://www.usac.org/wp-content/uploads/high-cost/documents/Forms/FCC-Form-481-Template.pdf**

[21] BTLR [Broadcasting and Telecommunications Review Panel]. (2020). *Final report— Canada's communications future: Time to act*. Ottawa, ON: ISED Citizen Services Centre. URL: **https://ised-isde.canada.ca/site/broadcasting-telecommunications-legislative-review/sites/default/files/attachments/BTLR_Eng-V3.pdf**