

The Territorial and Socio-Economic Characteristics of the Digital Divide in Canada

Katharina Koch, Ph.D.

Volume 45, numéro 2, 2022

Accès au très haut débit et développement territorial en période d'incertitude

Broadband access and territorial development in times of uncertainty

URI : <https://id.erudit.org/iderudit/1092248ar>

DOI : <https://doi.org/10.7202/1092248ar>

[Aller au sommaire du numéro](#)

Éditeur(s)

Canadian Regional Science Association / Association canadienne des sciences régionales

ISSN

0705-4580 (imprimé)

1925-2218 (numérique)

[Découvrir la revue](#)

Citer cet article

Koch, K. (2022). The Territorial and Socio-Economic Characteristics of the Digital Divide in Canada. *Canadian Journal of Regional Science / Revue canadienne des sciences régionales*, 45(2), 89–98.
<https://doi.org/10.7202/1092248ar>

Résumé de l'article

The digital divide in Canada has gained significant attention from policymakers and the public in 2020 as a result of the COVID-19 pandemic. The pandemic enhances the vulnerability of residents in rural and Indigenous communities that lack high-speed Internet access which affects their residents' ability to participate in an online work and learning environment. However, digital inequalities also remain an issue in urban settings despite the physical infrastructure that is usually in place to connect to high-speed Internet. The federal government has launched several funding initiatives at the end of 2020; however, this paper argues that the current federal policy strategy to address the digital divide is insufficient. By drawing on the intersectional character of the digital divide, which is interlinked with other types of socio-economic inequalities, this paper investigates why the federal broadband development approach remains problematic. As the digital divide in Canada persists, this paper explores current federal funding initiatives and their effectiveness in supporting broadband deployment across rural and Indigenous communities. The analysis shows inequalities regarding broadband access and funding distribution in Canada which also stem from a lack of democratic efficacy during federal hearings.

THE TERRITORIAL AND SOCIO-ECONOMIC CHARACTERISTICS OF THE DIGITAL DIVIDE IN CANADA

Katharina Koch, Ph.D.

Katharina Koch, Ph.D.

The School of Public Policy
Canadian Northern Corridor Research Program
University of Calgary
Calgary, Canada
katharina.koch@ucalgary.ca

Received: May 10, 2021

Accepted: June 1, 2022

Abstract: The digital divide in Canada has gained significant attention from policymakers and the public in 2020 as a result of the COVID-19 pandemic. The pandemic enhances the vulnerability of residents in rural and Indigenous communities that lack high-speed Internet access which affects their residents' ability to participate in an online work and learning environment. However, digital inequalities also remain an issue in urban settings despite the physical infrastructure that is usually in place to connect to high-speed Internet. The federal government has launched several funding initiatives at the end of 2020; however, this paper argues that the current federal policy strategy to address the digital divide is insufficient. By drawing on the intersectional character of the digital divide, which is interlinked with other types of socio-economic inequalities, this paper investigates why the federal broadband development approach remains problematic. As the digital divide in Canada persists, this paper explores current federal funding initiatives and their effectiveness in supporting broadband deployment across rural and Indigenous communities. The analysis shows inequalities regarding broadband access and funding distribution in Canada which also stem from a lack of democratic efficacy during federal hearings.

Keywords: digital divide, Canada, intersectional inequality, broadband development, high-speed Internet

INTRODUCTION

The COVID-19 pandemic has emphasized the challenges presented by the digital divide in Canada which refers to both a persistent North-South divide and a rural-urban inequality in terms of Internet access (Beaunoyer et al. 2020; Lai & Widmar 2021). The digital divide has garnered significant media attention during 2020 by demonstrating the challenges that residents of rural and Indigenous communities experience due to a lack of high-speed Internet access. Common problems include a lack of access to online education, healthcare, government services and effective maintenance of business operations (Knight 2020; Hambly & Rajabiun 2021).

Policymakers and academics have established that Canada's Indigenous and rural communities are particularly vulnerable to the impact of the digital divide during the transition to online education and a remote working environment as they often lack access to high-speed Internet in comparison to urban areas (Ashton & Girard 2013). However, it is important to note that the digital divide also exists within urban areas as vulnerable populations (low-income households; some newcomers/immigrants; Indigenous Peoples) sometimes lack the means to sustain high-speed Internet subscriptions and purchase digital devices. Zheng and Walsham (2021: 4) argue that digital inequality does not occur along "one singular division". Instead, the authors adopt the concept of intersectionality to show that the digital divide is a result of several interrelated inequalities, ranging from gender disparities to racial discrimination. Robinson et al. (2015: 569) suggest considering the digital divide as significant as other forms of inequality.

The studies quoted above call for a more nuanced understanding of the ways in which existing inequalities will be "amplified," "introduced" or "mitigated" in the digital age (Robinson et al. 2015: 578). Thus, further research is needed to better understand whether and how current policies, aimed at reducing the digital divide, respond to the identified intersectionality of inequalities that contribute to digital inequity. This study contributes to this literature by identifying the structural challenges that inhibit the process of closing the digital divide in Canada.

In 2016, the Canadian Radio-television and Telecommunications Commission (CRTC) announced a "universal service objective" referring to 50 Mbps download/ 10 Mbps upload speeds¹ which are supposed to be available in "100% of Canadian homes and businesses by 2030 or sooner" (CRTC 2021a). Since then, the Government of Canada has launched various policy measures to support the deployment of broadband in rural and remote areas, including Indigenous communities. This paper argues that the current Canadian federal funding programs mainly respond to issues of physical access or the first-level digital divide without addressing other types of inequalities, such as education, which contribute to the digital divide. Our analysis specifically focuses on Canada's federal broadband strategy and explores key issues that contribute to the digital divide. For example, the Canadian Internet Regulatory Authority (CIRA) has noted several key concerns that remain unaddressed in federal strategies (CIRA 2020). These include complicated funding mechanisms and a lack of digital literacy.

The paper draws on the 2020 Communications Monitoring Report (CRTC 2020a) to show the territorial characteristics of the digital divide in Canada. This is followed by an analysis of the distribution of funding to individual Internet Service Providers (ISPs) and other stakeholders from the Universal Broadband Fund (UBF) (ISED 2021a) and the CRTC Broadband Fund (CRTC 2021a). The analysis also includes policy documents related to Canada's Connectivity Strategy (INDU 2019) to identify federal focus areas and approaches, followed by a discussion of concerns that were raised throughout CRTC hearings. Together, the analysis of the research material offers

a distinct insight into the federal strategy to close the digital divide and helps to identify bottlenecks and challenges. The paper contributes to the literature on digital inclusion which has become a key policy domain in the UN Research Roadmap for the Covid-19 recovery (United Nations 2020). In Canada, the digital divide prevails across provinces and territories and this paper identifies some of the key challenges on the path to digital equity.

The article is structured as follows: the first section introduces the digital divide as a concept by reflecting on the Canadian perspective. The second section introduces the research material which is based on relevant federal policy documents pertaining to Canada's national broadband strategy. The third section discusses Canadian broadband from the perspective of federal government strategies before introducing key initiatives. The fourth section analyzes the persistent territorial digital inequality before presenting shortcomings of the federal approach to close the digital divide. The conclusion shows that the federal approach contributes to, and at times, exacerbates the digital divide as systemic inequalities remain unaddressed across federal broadband funding programs.

CONCEPTUALIZING THE DIGITAL DIVIDE

From a conceptual perspective, the discussion about the digital divide began in the mid-1990s as scholars paid close attention to the emerging subject of unequal Internet access in industrialized countries (Cullen 2001; Servon & Nelson, 2003; Van Dijk & Hacker 2003; Van Dijk 2006). Studies conducted throughout the early 2000s focused on the physical lack of access to telecommunication infrastructure as well as the financial ability of households to purchase ICT (Information and Communications Technology) devices (Cullen 2001; Van Dijk & Hacker 2003). However, as market penetration of personal computers and other hardware increased across industrialized countries, scholars shifted beyond the lack of physical access to explain the digital divide. Van Deursen and Van Dijk (2019) argue that while the first-level divide refers to material access, the second-level divide relates to Internet skills and usage. Recently, scholars referred to a third-level divide which considers the "outcomes of Internet use or tangible benefits" (van Deursen & Van Dijk 2019: 355). Ferreira et al. (2021) summarize the three distinct levels as (1) coverage and access, (2) usage, and (3) real-world consequences.

In the literature, the first level of the digital divide reflects a binary perspective by focusing on accessibility to the Internet and ICT devices or the lack thereof (Ferreira et al. 2021). Cullen (2001: 312) showed that socio-economic status is closely related to the level of Internet accessibility and vulnerable populations (i.e., low-income and/or single-parent households) were sometimes at a disadvantage in the uptake of ICT. Cullen (2001) also stated that in the US context, ethnic minorities and Indigenous Peoples were less likely to have ICT access. Although this binary perspective of (in)accessibility has been re-conceptualized, the first level remains a key concern in many industrialized countries, including Canada (Mersereau 2021). The study of the Canadian first-level divide has been approached from territorial and geospatial perspectives by analyzing for example the rural-urban divide (Carson 2014). However, more recent literature suggests considering the impact of socio-economic and geospatial differences (such as gender and education levels) within urban areas (Reddick et al. 2020).

The second-level digital divide refers to the "inequality in the ability to use ICT among those who already have access" (Dewan & Riggins 2005: 300). Instead of focusing on (in)accessibility, the second-level divide reflects the unequal adoption of ICT innovations in

¹ "Canadian residential and business fixed broadband Internet access service subscribers should be able to access speeds of at least 50 megabits per second (Mbps) download and 10 Mbps upload, and to subscribe to a service offering with an unlimited data allowance" (CRTC 2016: 2).

businesses, homes, organizations, and institutions across countries. This has created a varied level of access and rendered an extensive body of scholarly work that compares broadband adoption levels on a global level (Ho & Tseng 2006; Zhang 2013). Skills and technical abilities were determined as important factors that influence the rate of Internet adoption across countries. In Canada, Haight et al. (2014: 505) found that the digital divide “reflects existing inequalities” throughout society in terms of income, education, rural/urban residence, immigration status and age. Research on the second-level divide focused on the level of education by suggesting that it corresponds with higher Internet usage (Wei & Hindman 2011). Moreover, the authors find that “the usage divide is more evident between socio-economic status segments than is the access divide of the Internet” (Wei & Hindman 2011: 228). In Canada, differences in online skills reflect an “education divide” as it influences Internet access, level of online activity and usage of social networking sites (Haight et al. 2014: 514). In this way, the first and second levels of the digital divide are closely interlinked as socio-economic status and level of education are oftentimes related.

The third level-digital divide goes a step beyond accessibility and skill levels by focusing on efficiency of Internet usage. According to Van Deursen and Helsper (2015: 32), the third-level divide presumes that “even among users with autonomous and unlimited access to the ICT infrastructure, there will be important differences in their proficiency in enlisting digital resources for the achievement of specific objectives.” The core argument is that even with equal Internet access, users may not gain the same return on their Internet usage. This means that the third-level divide is present when “the possession of digital skills and Internet use lead to beneficial outcomes” (Scheerder et al. 2017). However, scholars also recognize that a strict separation of the three levels fails to acknowledge the interlinkages of the digital divide (Van Deursen & Van Dijk 2019). Instead, Van Deursen and Van Dijk (2019) reiterate that material access presents a complex division based on several factors that pertain to all three levels of the digital divide. Furthermore, the digital divide itself does not only reinforce social inequalities but also represents a distinct aspect of social inequality that must be considered alongside factors such as income or education levels (Robinson et al. 2015). This paper shows that Canada’s key federal strategies continue to focus on the persistent first-level divide by aiming to achieve universal broadband access across urban, rural and Indigenous communities. However, this approach does not reflect the intersectional dynamics and inequalities that contribute to the digital divide.

RESEARCH MATERIAL AND METHOD OF ANALYSIS

The federal emphasis on broadband accessibility within Canada, especially in the context of the Covid-19 pandemic, shows that the digital divide represents an ever-increasing problem. To better understand the digital divide in the Canadian context, this paper presents the way in which broadband is regulated and the territorially uneven availability of high-speed Internet based on the CRTC’s 2020 Communications Monitoring Report (CRTC 2020a). The studied federal funding initiatives are the UBF (ISED 2021a) and the CRTC Broadband Fund (CRTC 2021a).

The first set of research material presented in this paper consists of open datasets published by CRTC that complements the 2020 Communications Monitoring Report (CRTC 2020a). The datasets contain information about Canada’s broadband availability across urban, rural and First Nations communities. It is important to note that the CRTC has received criticism on its hexagonal mapping approach to define high-speed internet (un)availability (Hambly and Rajabiun 2021). The analysis discusses this shortcoming as well as the issues regarding the efficacy of CRTC data collection. The se-

cond set of research material consists of CRTC policy documents related to Canada’s Connectivity Strategy (ISED 2019) and the UBF and CRTC funds. The federal government has developed a variety of major infrastructure plans and programs which entail broadband as one component, such as the “Invest in Canada Plan” (Infrastructure Canada 2018). However, to maintain the analytical focus on broadband infrastructure development, this paper considers the federal government’s two main broadband investment programs: the UBF and the CRTC Broadband Fund.

The analyzed funding programs reflect two of the largest federal investment programs in terms of monetary value which is earmarked exclusively for broadband investment. The policy documents were analyzed from the perspective of funding allocations to identify patterns and trajectories of investment to develop a detailed insight into the federal strategy of closing the digital divide. An analysis of the federal funding allocation helps to gain insight into the dynamics of the Canadian federal funding priorities from both geospatial and financial perspectives. The data on funding was collected throughout spring 2021; this means that it does not capture all the projects that were included into the funding mechanism to date; however, an overview of the funding allocation provides an insight into the funding dynamics and helps to understand their geospatial characteristics.

CANADIAN BROADBAND DEVELOPMENT

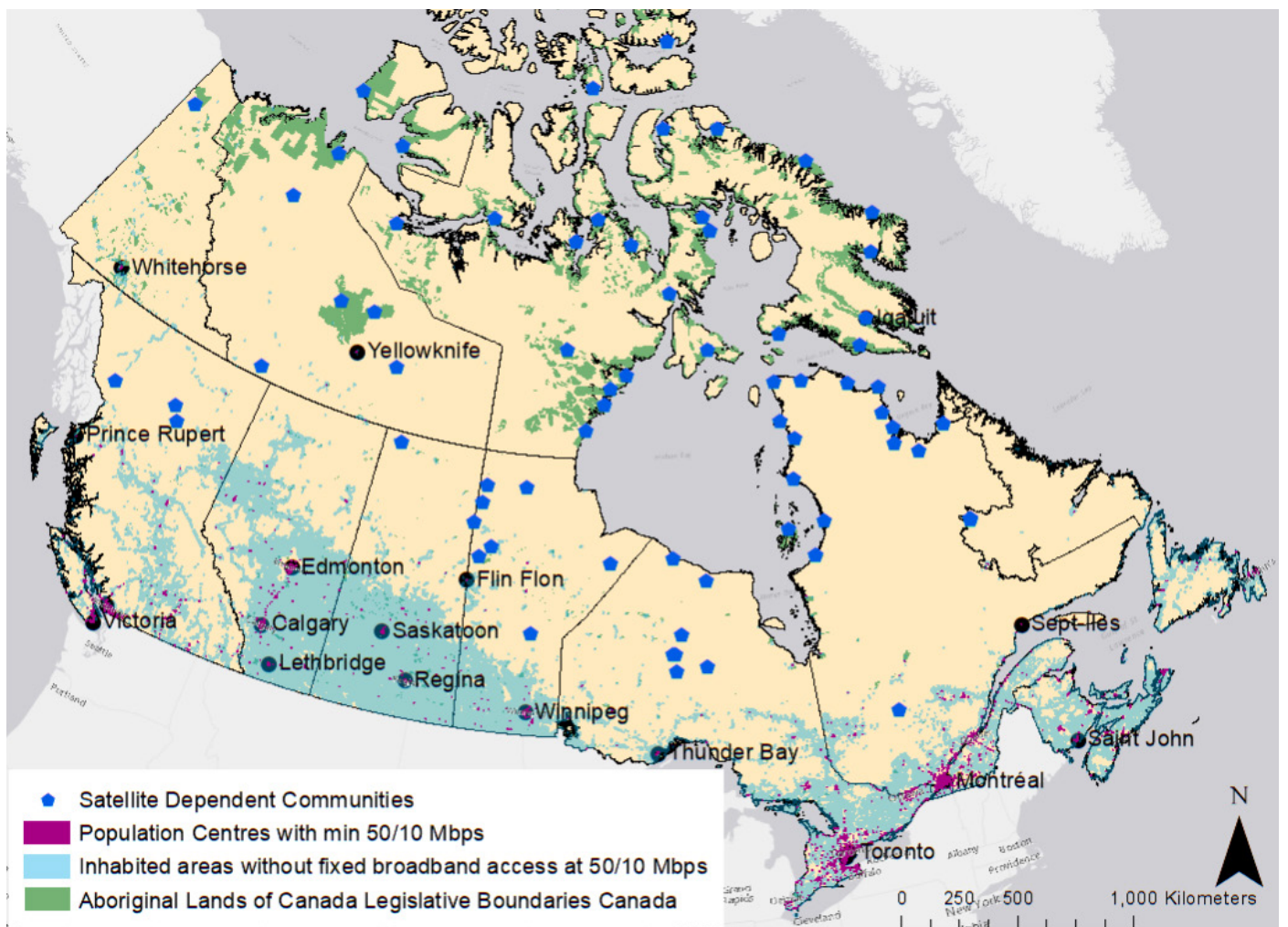
In Canada, the telecommunications sector is federally regulated, and the Federal Ministry of Innovation, Science and Economic Development (ISED) is the main department responsible for broadband infrastructure. In Article 7 of the Canadian Telecommunications Act, the Government of Canada confirms that “telecommunications perform an essential role in the maintenance of Canada’s identity and sovereignty” (Government of Canada 1993). Furthermore, Canadian telecommunications policy has the objective to “render reliable and affordable telecommunications services of high quality accessible to Canadians in both urban and rural areas in all regions of Canada” and to “enhance the efficiency and competitiveness, at the national and international levels, of Canadian telecommunications” (Government of Canada 1993). The federal government launches key funding initiatives and strategies that are accessible for provincial, territorial, municipal, and Indigenous governments as well as non-profit and for-profit ISPs (ISED 2021b).

In addition, the CRTC regulates Canada’s telecommunications carriers and represents an administrative tribunal that operates at an arm’s length from the federal government. The CRTC “regulates the wholesale rates charged by large telephone and cable companies to competitors to access their networks in order to offer their services. The CRTC does not regulate retail rates charged by Internet service providers to their retail customers.” (CRTC 2021b). The CRTC does also not intervene in the pricing policies or business practices of ISPs as it claims that the Canadian market has “enough competition” which allows consumers to choose their service package. Notably, the CRTC reversed a pricing decision from 2019 (CRTC 2019b) that potentially would have forced facilities-based telecommunications providers to lower their wholesale Internet rate (CRTC 2021c). In 2021, CRTC established that it had made mistakes and reversed the decision which means that current wholesale rates paid by service providers resemble those initially established in 2016. The incumbents evaluated the reversal as a success; for example, Telus had initially threatened to suspend rural broadband infrastructure investment in 2019 (Jackson 2019). However, service-based providers (i.e. TekSavvy) which rely on the facilities offered by the major ISPs immediately announced that they would suspend certain investment decisions following the reversal.

Table 1. Federal Broadband Programs and Initiatives.

Funding Programs and Initiatives	Description
Universal Broadband Fund (UBF) (2020)	\$1.75 billion over 7 years to support high-speed Internet projects in rural and remote communities. An additional \$1 billion was announced in the federal budget in April 2021.
Low-Earth Orbit (LEO) Satellite Capacity Agreement (2020)	\$600 million to secure capacity on LEO satellites with Telesat.
Canadian Radio-television and Telecommunications Commission (CRTC) Broadband Fund (2019)	\$750 million for underserved areas through Internet and mobile wireless services in eligible underserved areas.
Accelerated Investment Initiative (2018)	Supports new private sector investment in rural areas.
Canada Infrastructure Bank (2017)	\$2 billion innovative loans and equity for large-scale broadband projects to connect 750,000 households in underserved communities.
Investing in Canada Program (2016)	\$2 billion over the next decade for provinces & territories. Supports a variety of infrastructure including broadband in rural and northern communities through bilateral agreements with each province and territory.
Connect to Innovate Program (2016)	Investing \$585 million by 2023; targeting 400,000 households including 975 rural and remote plus 195 Indigenous communities. Also supports backbone infrastructure projects to connect institutions like schools and hospitals.
First Nations Infrastructure Fund (2016)	Connectivity as one of eight project categories to provide funding to improve the quality of life and the environment of First Nations communities by addressing infrastructure gaps.
Connecting Canadians Program (2014)	Up to \$500 million targeting 350,000 households across rural and remote communities to areas with less than 5 Mbps. Specifically includes a \$50 million northern component.

Figure 1. Inhabited areas without fixed broadband access (50/10 Mbps) and satellite dependent communities.



Sources: Inhabited areas without fixed broadband access at 50/10 Mbps from CRTC (2020b). Aboriginal Lands of Canada Legislative Boundaries from Government of Canada (2020). Satellite Dependent Communities from CRTC (2020b). Population Centres based on 2016 Census—Boundary Files (Statistics Canada 2016).

In 2016, the CRTC declared a universal service objective which entails that “Canadian residential and business fixed broadband Internet access service subscribers should be able to access speeds of at least 50 megabits per second (Mbps) and 10 Mbps upload, and to subscribe to a service offering with an unlimited data allowance” (CRTC 2016: 2). However, the CRTC emphasizes that it cannot address key issues, such as widespread availability and adoption of broadband, on its own (CRTC 2016). Although the CRTC aims to ensure access to a world-class telecommunications system for all Canadians, Mersereau (2021: 30) argues that the 2016 decision “reveals the CRTC’s reluctance to exercise its regulatory powers with a view to compelling telecommunications service providers (TSPs) to meet the quality, service penetration, and affordability targets identified in the decision”. As a remedy, the Government of Canada offers funding programs and initiatives for ISPs and sub-national governmental bodies to increase the availability of broadband. This effort is supported by financial resources from provincial and municipal governments as well as the private sector. Since 2016, the federal government has launched various programs and initiatives to enhance broadband access across Canada (see Table 1).

In late 2020, the Government of Canada launched the UBF which pledges \$1.75 billion for the support of high-speed Internet access across Canada (ISED 2021a). The UBF offers grants to subsidize broadband infrastructure projects that deliver high-speed Internet, defined according to the CRTC’s universal service objective, to rural and remote communities. Notably, \$90 million of the entire budget is earmarked for mobile wireless projects exclusively benefitting Indigenous communities. The enhanced efforts of the federal government to diminish the digital divide, particularly since the beginning of the Covid-19 pandemic, indicate the persistent digital inequality within Canada. The next section offers an overview of the territorial characteristics of the digital divide as presented by the Communications Monitoring Report of 2020 (CRTC 2020a).

TERRITORIAL CHARACTERISTICS OF THE DIGITAL DIVIDE IN CANADA

From a spatial-territorial perspective, the following map (Figure 1) presents the distribution of broadband in Canada according to inhabited areas that have access to minimum broadband speeds of 5/1 Mbps yet do not achieve the service objective of 50/10 Mbps. Currently, the 50/10 Mbps service objectives are mainly achieved within Canada’s urban centres in the provinces, but there are notable exceptions across British Columbia, New Brunswick and Quebec. The map also shows Aboriginal Lands and those communities that are currently satellite dependent which are mainly located in the northern regions of the provinces and the three territories. Many northern rural and First Nations communities rely on satellite links which performance is determined by satellite bandwidth and the amount of power reaching the antenna(s). Fluctuations occur due to inclement weather, sun activity, interference, and other natural and man-made phenomena (CRTC 2014).

The spatial distribution of broadband access across Canada as shown in Figure 1 is also supported by the CRTC and the data published in the 2020 Communications Monitoring Report (CRTC 2020a). The following Figure 2 shows that compared to urban areas, the service objective of 50/10 Mbps was not accomplished in most of the First Nations reserves and rural areas in 2019. In 2018, Statistics Canada recorded 26.5 million people living in a census metropolitan area (CMA) which represents approximately 70% of the entire Canadian population (Statistics Canada 2018). Most medium—to large urban areas have full coverage which also means that more than half of Canada’s population has access to a minimum of 50/10 Mbps.

Figure 2 also demonstrates the Canadian spatial-territorial digital divide from a supply perspective as 34.8% of First Nations and 45.6% of rural household had access to the current 50/10 Mbps service objective in 2019. However, this does not mean that the remaining households have no broadband access at all. Figure 3 illustrates the spatial division of broadband availability by presenting the distribution of 5/1 Mbps, 25/3 Mbps and 50/10 Mbps in First Nations reserves across the provinces and territories in 2019.

The data shows that 50/10 Mbps is available in less than 50% of First Nations reserves in the provinces of Alberta, Saskatchewan, Manitoba, Ontario, Nova Scotia and Prince Edward Island. Most First Nations reserves have access to at least 5 Mbps, however, especially households in Newfoundland and Labrador, Yukon and the N.W.T. are underserved as the maximum download speed is not higher than 25 Mbps. The percentage of First Nations households in Saskatchewan and Manitoba is also critical as less than 10% have access to 50/10 Mbps (Figure 3). Although Figure 3 does not include data for Nunavut, it is the “only Canadian province or territory without access to broadband delivered by fibre cable” (Nunavut Tunngavik 2020: 10). Maximum download speeds in Nunavut reach 15 Mbps while maximum speeds in Canada’s urban areas already reach well beyond the 50/10 Mbps service objective (Nunavut Tunngavik 2020).

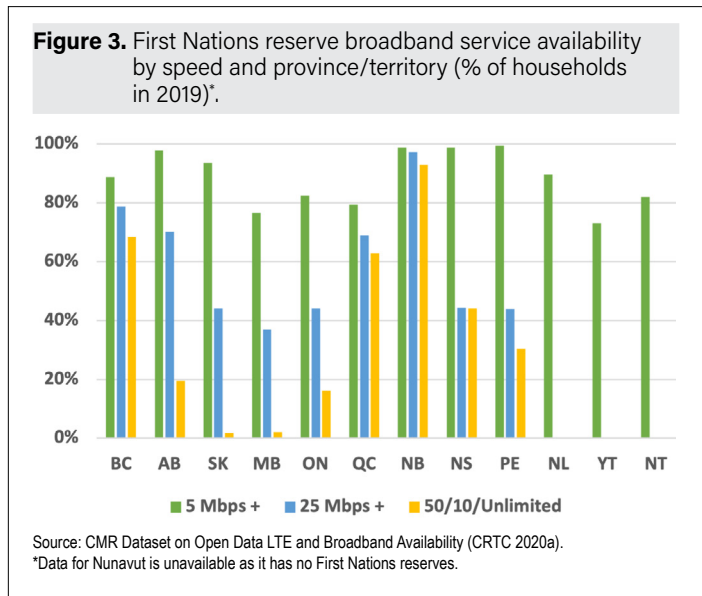
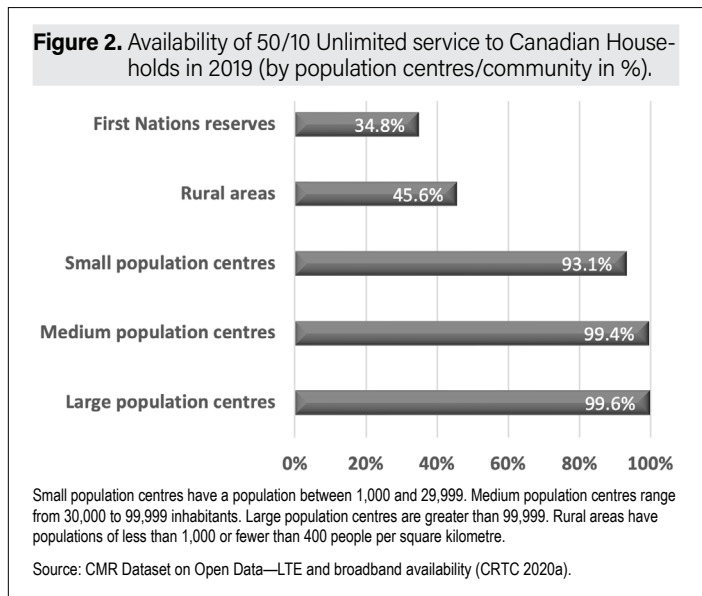
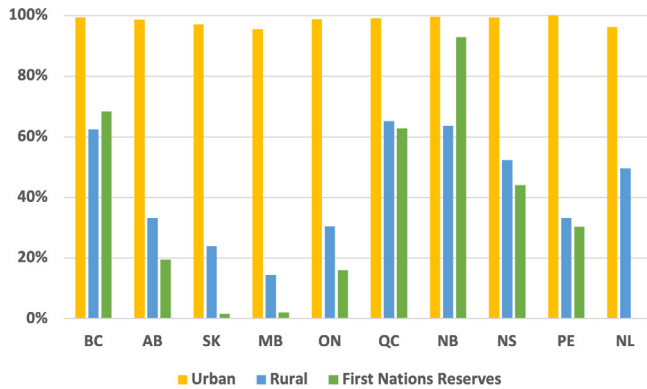


Figure 4. Availability of Internet services with speeds of 50/10 Mbps and unlimited data in 2019 by population size and province/territory (% of households).



Source: CMR Dataset on Open Data LTE and Broadband Availability (CRTC 2020a).

A more nuanced insight into the urban-rural-First Nations digital divide is provided in Figure 4 which compares access to 50/10 Mbps in the provinces. Notably, New Brunswick and British Columbia are the only provinces in which First Nations households exceed rural households in terms of broadband access. However, the accessibility gap between urban, rural and First Nations remains pronounced in 2019.

When considering the data provided by CRTC, it is important to note that scholars have found significant shortcomings in the reporting of broadband availability due to the CRTC's approach to define "served" or "unserved" communities. Hambly and Rajabiun (2021) note that the current approach of mapping Internet availability into 25 sq. km hexagons has significant limitations. The authors show two key shortcomings which relate (1) to the binary served/unserved categorization and (2) that the mapping relies on data solely provided by ISPs. This has created a situation in which an area is considered "served" when just one household has access to the 50/10 Mbps and the government assumes that the rest of the households within the hexagon will be eventually connected through market forces; thus, the area in this particular hexagon is ineligible for federal funding initiatives.

The hexagonal approach was also criticized by witness testimonies to the Standing Committee on Industry, Science and Technology (2018: 32) which evaluated the current hexagonal approach as "inaccurate". During the testimonies, respondent Blue Sky Net argued that "ISED and CRTC assume households are evenly distributed throughout the hexagon, which is not the case" (Standing Committee on Industry, Science and Technology 2018: 32). Despite various academic and expert opinions, ISED and CRTC continue to utilize the hexagonal approach, for example in the Second Call for applications for the CRTC's Broadband Fund².

KEY CHALLENGES OF THE CANADIAN FEDERAL RESPONSE TO THE DIGITAL DIVIDE

Complexity of Funding Applications

Academics and experts in the field of broadband development have questioned the extent to which remote and rural communities can benefit from government-funded initiatives (McNally et al. 2018; Standing Committee on Industry, Science and Technology 2018).

² "To be eligible for funding for a fixed broadband Internet access service project, an applicant must propose to build or upgrade infrastructure in an eligible geographic area, defined as a 25 km² hexagon in which Statistics Canada's latest census data show that there is at least one household but in which no household has access to broadband Internet access service at universal service objective-level download and upload speeds (50 megabits per second [Mbps] and 10 Mbps, respectively)" (CRTC 2019a: 3).

Already before the launch of the UBF, ISPs voiced concerns about a lack of coordination among federal, provincial and territorial funding programs (CRTC 2018a). Indeed, the Public Interest Advocacy Centre (PIAC) raised the issue of funding fragmentation at the Standing Committee on Industry, Science and Technology (2020) on December 8, 2020. Executive Director and General Counsel of PIAC, John Lawford, argued that the Canadian broadband funding structure suffers from uncoordinated policy action which results in different timelines and application procedures. This can create problems for "smaller community-based providers" which lack the capacity to prepare time-consuming funding applications that are, however, required to be able to compete with the incumbent ISPs. This could potentially impede broadband infrastructure development in areas that are considered less lucrative for the incumbents. Smaller ISPs often do not have the internal financing and human resource capacities to meet the extensive application requirements which vary across the different funding programs, thus lowering competition. McNally et al. (2018: 188) show that small ISPs consider "market competition as the primary determinant of minimally acceptable broadband service speeds" and thus, competition rather than regulated minimum speeds drives small ISPs service offerings.

In a testimony to the Standing Committee on Industry, Science and Technology, witness Ian Stevens, a board member of the Canadian Communication Systems Alliance, stated that:

"Currently, we have a myriad of municipal, provincial and federal funding programs. They all have similar goals and strong support, but those programs are not aligned on their timing, their objectives, their focus, or their commitment to execution. As a result, they compete for potential applicants' limited time and resources. For that reason, we fear that in terms of solving the rural broadband problem, those various programs will actually end up accomplishing less than the sum of their parts" (Standing Committee on Industry, Science and Technology 2021: 8).

Other witness testimonies hinted towards the lack of collaboration between governmental levels as funding distribution appears to be uncoordinated. For example, Barry Field from Southwestern Integrated Fibre Technology (SWIFT) noted that funding should be made available by the federal government, which flows towards the provinces and from there, gets distributed to the municipalities which can use it at their discretion (Standing Committee on Industry, Science and Technology 2021: 8). As a result, the Committee offered several suggestions that would facilitate the funding application process by, for example, establishing criteria that prioritize local and regional providers and reserve dedicated funds that are exclusively accessible to smaller ISPs. Recommendation 16 entails that the federal government, together with provincial and territorial governments, develops a "unified, integrated and collaborative national broadband strategy" that addresses a variety of issues that relate to the supply side of telecommunications (such as allocation of funding, accessibility of support structures for ISPs and competition) (Standing Committee on Industry, Science and Technology 2021: 43). It was noted by the Committee that the lack of competition is detrimental to the efforts aimed at closing the digital divide which is addressed in more detail in the next section.

Lack of Competition

By May 2021, a major portion of the UBF has been granted to the incumbent local exchange carriers (ILECs) which in this case are

Table 2. UBF and CRTC Broadband Fund—Funding awarded by types of Internet Service Providers

Internet Service Provider	Universal Broadband Fund	CRTC Broadband Fund
Incumbent Local Exchange Carrier (ILEC) (i.e., Bell Canada, Northwestel, Telus)	\$14,872,285	\$60,600,000
Small Incumbent Local Exchange Carrier (SILEC) (i.e., Nexicom)	\$5,022,408	\$1,250,000
Cable-based Carriers (i.e., Rogers, Shaw, Cogeco)	\$3,116,189	\$15,258,000
Non-dominant Carriers (i.e., Columbia Basin Broadband)	-	\$24,200,000
Governments and other ISPs currently unregistered with CRTC (i.e., Tḻicẖ Government; Negato).	\$11,577,000	\$53,455,000
Total	\$34,587,882	\$154,763,000

Source: Data for UBF from Innovation, Science and Economic Development Canada (INDU 2021c); Data for CRTC Broadband Fund from CRTC (CRTC 2021d).

Bell Canada and Telus (Table 2). Both ISPs have been granted funding for several projects in Alberta, British Columbia and Ontario to connect a total of 9,385 rural households to high-speed Internet (50/10 Mbps). These projects focus on underserved households by increasing the capacity of existing fibre-optic cabling to meet the 50/10 Mbps service objective. Another major portion to the extent of \$5 million was allocated to the Tḻicẖ Government in the N.W.T. to connect 152 homes in Whati. Additional funding is provided by the Canadian Northern Economic Development Agency (\$3 million), the Tḻicẖ Government (\$1.5 million) and the Government of the Northwest Territories (GNWT) (\$1.5 million) to reach a total of \$11 million. Similarly, \$4.46 million (with a contribution of \$3.32 million from the municipality) were granted to the Municipality of Pictou County in Nova Scotia to connect homes to high-speed Internet.

From the total amount allocated via the UBF, by May 2021, most funds were granted to large ILECs and governmental organizations. These allocations confirm the observations made in previous research (Hambly & Rajabiun 2021) that federal funding is often required to help incentivize private investors to establish last-mile connections to homes. The federal government considers broadband access in First Nations communities essential to “help position Northerners and Indigenous Peoples across the territories to move towards self-reliance” (ISED 2021d).

In addition, by May 2021, the CRTC Broadband fund had committed approximately \$155 million for broadband and satellite technologies for 107 communities in the N.W.T., Yukon, British Columbia, Saskatchewan, Manitoba, Ontario and Quebec representing in total 24,500 rural and First Nations households (CRTC 2021d). A significant share of this amount was awarded to incumbent Northwestel which has received \$60 million to deploy broadband and satellite technologies in both the N.W.T. and Yukon for 9,204 rural and First Nations households with the goal to offer them access to 50/10 Mbps high-speed Internet with unlimited data. By May 2021, Northwestel was the single largest receiver of nearly 40% of the entire funding amount granted by the CRTC Broadband Fund. Another significant portion of the entire funding to the total of 34.5% was granted to the Kativik Regional Government in Quebec to increase transport capacity and to build an additional fibre transport network of 1,310 km in length to connect 4 Inuit communities (CRTC 2021d).

The comparison of the amounts of funding awarded to diverse types of ISPs through the UBF and the CRTC Broadband Fund shows that major portions are granted to the incumbents and large competitive exchange carriers, such as Rogers and Cogeco as well as local governments. However, government support is often required for last-mile connections to individual homes as they are not considered as profitable as updates to networks that serve multiple homes and institutions within several communities. Another important aspect is that, by May 2021, neither the UBF nor the CRTC had awarded funding to projects that would improve broadband accessibility in Nunavut.

Focus on the first-level digital divide (coverage and access)

In 2019, the federal government introduced its “Connectivity Strategy” which acknowledges the national connectivity gap in rural areas and pledges to “connect every Canadian to affordable, high-speed Internet no matter where they live” (ISED 2019: 4). Notably, the Connectivity Strategy recognized that rural communities face significant challenges to respond to federal funding calls as “some 60% of rural municipalities have fewer than five administrators” (ISED 2019: 24). While the Connectivity Strategy is an important step towards addressing the national connectivity gap across Canada, the strategy itself mainly addresses the factors related to the first-level digital divide—accessibility in terms of physical infrastructure development in rural and Indigenous remote communities and affordability by highlighting that public investment in rural connectivity can mitigate high subscription rates.

The way the Connectivity Strategy is presenting the issue of the digital divide in Canada can create the perception that it mainly stems from a lack of infrastructure and high subscription rates in rural and Indigenous communities. However, studies have found that the digital divide also prevails in Canadian urban areas such as Toronto (Andrey et al. 2021) and Calgary (Taylor et al. 2021). While physical broadband infrastructure is most likely available in urban areas, low-income households and other vulnerable members of the urban population may not be able to connect to the facilities that are available. The Connectivity Strategy claims that most of the urban population has access to the 50/10 service objective; yet, it is important to note that this only relates to the availability of physical infrastructure.

Other, intersectional inequalities such as education (c.f. Robinson et al. 2015; Zheng & Walsham 2021) are not considered in the strategy. The lack of attention towards the second- and third-level digital divides is alarming. While education is mentioned as a product that becomes available to those who have access to high-speed Internet, the strategy fails to recognize education as a tool to close the digital divide. Numerous research studies have shown the importance of education and digital literacy for closing the digital divide not only between rural/urban areas but also within urban areas (Haight et al. 2014; Hudson 2017; Scheerder et al. 2017). Hudson (2017) emphasized the role of digital literacy which helps close the digital divide; however, digital education is not included in the core mandates of CRTC and thus, limited federal support is available for programs that focus on digital skills which reflect the second level divide.

The analysis of the federal strategy indicates that the majority of funding initiatives intend to address digital inequality by addressing the first level of the digital divide. This means that most funding programs are responding to the issue of accessibility which, as shown previously in this paper, is still a significant issue particularly in the rural and northern contexts. However, federal funding programs are limited in addressing factors leading to the second—and third levels of the digital divide (i.e. education) which are also present in the urban context.

Limited Efficacy of Democratic Participation Processes

As noted previously, the CRTC regulates Canada's telecommunications carriers and represents an administrative tribunal that operates at an arm's length from the federal government. One of its defined missions is "to connect Canadians to quality and innovative communication services at affordable prices" (CRTC 2018b). For this purpose, the CRTC states that it frequently engages with Canadians in public hearings, round-table discussions, informal forums and online discussion forums for the purpose of collecting views on broadcasting—and telecommunications services which help to develop public policies (CRTC 2018b). The CRTC offers various options in which Canadians can participate in these consultation processes, ranging from online options to telephone conversations and traditional forms of written correspondence (CRTC 2017). Shepherd et al. (2014: 5-6) argue that "the CRTC has a clear history of a more open policy process than other, more industry-focused government bodies" (such as Industry or Transport Canada). The authors note that the CRTC advocated for widespread democratic participation in its proceedings since its establishment in 1976 (Shepherd et al. 2014).

However, scholars have found significant shortcomings in the democratic participation processes initiated by CRTC (Shepherd et al. 2014; Wilkinson 2020). Ozanne et al. (2009: 36) argue that "production of knowledge through discussion is never neutral, and the relationships of power may distort communication in any public sphere." Thus, any form of public engagement underlies a power relationship between the facilitator and the engaged and this is also notable during CRTC hearings. Shepherd et al. (2014) noted the uneven balance of power throughout hearings as testimonials are given in an atmosphere that resembles a courtroom in which CRTC commissioners sit on elevated platforms to question the presenter. Furthermore, Shepherd et al. (2014: 7) identified a difference between those who are engaged or consulted as "major corporate players were supported by phalanxes of lawyers, while public advocates often spoke individually." The inequality between participants was also noted by Wilkinson (2020) who states that industry participants, and notably the incumbents (Bell, Telus, and Rogers) have greater capacity to gather, analyse and prepare extensive market reports and other types of quantitative data analysis. Thus, Wilkinson (2020: 197) considers the incumbents to be in a privileged position throughout CRTC engagement and consultation processes.

Through its technocratic approach, Wilkinson (2020: 198) criticizes that the CRTC fosters "policy silences" which fail to capture those voices "that do not adhere to these norms and others are held back from the realm of decision-making". This issue is particularly prevalent in the context of Indigenous First Nations communities which can face certain barriers to participate in CRTC hearings that require lengthy and formalized rounds of "written interventions, responses, interrogatories as well as other filings and testimony" (Hudson & McMahon 2021: 4).

The CRTC has launched instruments that reimburse participants for travel and other expenses but only if they manage to meet certain criteria related to effective participation of the applicant. Thus, certain barriers have been addressed by the CRTC with funding initiatives; however, northern Indigenous participants still face significant barriers to adhere to the standards of formal proceedings. While these are only two main examples that show some of the issues with public policy consultations and hearings in broadband policy, they offer a glimpse into the issues of efficacy around broadband development in Canada.

CONCLUSION

The COVID-19 pandemic has emphasized the Canadian digital divide as many workers and students transitioned to an online environment. Those who live in rural and Indigenous communities were

facing significant struggles as they were confronted with substandard broadband availability which does not always meet the CRTC service objective of 50/10 Mbps. A lack of high-speed Internet access has been particularly challenging for remote communities as they cannot avail from online health, education, government and other services. The paper showed that Canadian rural and First Nations communities remain under- and unserved which significantly increases socio-economic inequality. However, the digital divide prevails in urban settings as well (Reddick et al. 2020).

This paper has studied the federal response to the digital divide with the goal to understand why the federal approach is insufficient. The literature review suggests that digital inequality does not only reflect a rural/urban divide but instead, scholars increasingly consider the intersectionality of digital and other related inequalities (Robinson et al. 2015; Zheng & Walsham 2021). For example, digital literacy reflects the second-level divide which is also closely interlinked with education and income levels (Min 2010). The third-level divide refers to outcomes or the effective usage of the Internet, an important element particularly in the context of user motivation. Surprisingly, the data provided by CRTC indicates that Canada's digital divide is mainly characterized by an urban-rural divide. Rural and Indigenous communities, particularly in the North, remain under- or unserved due to a variety of reasons, such as low population density and a lack of return on investment for private ISPs. Government funding, such as the UBF and the CRTC Broadband Fund, are thus crucial initiatives to support broadband deployment in underserved areas.

This paper has identified four problems that derive from the current federal approach to close the digital divide: (1) complexity of funding applications; (2) lack of competition; (3) focus on the first-level digital divide (coverage and access); (4) limited efficacy of democratic participation processes. With regards to funding complexity and competition, smaller ISPs tend to be outbid by the large incumbents due to a lack of resources that are needed to comply with the application standards required by federal initiatives. Some rural and Indigenous communities lack the necessary capacities to successfully compete in funding initiatives such as the UBF. A potential solution, brought forward by the Standing Committee on Industry, Science and Technology (2021) which would also address the perceived lack of competition, is to create dedicated regionally focused funds that are reserved for smaller ISPs in underserved communities.

The third problem relates to the federal Connectivity Strategy which indicates that the federal priorities are rural and Indigenous communities. This is commendable as these communities often face severe infrastructure barriers. However, it is also important to include urban centres as vulnerable residents still face digital inequalities. The federal Connectivity Strategy (ISED 2019) indicates that urban areas have achieved nearly full coverage that meets the 50/10 Mbps service objective. However, the strategy obscures accessibility constraints in urban areas, particularly for the vulnerable population that includes single-parent households, newly arrived immigrants and Indigenous Peoples. Thus, the federal approach to focus on the lack of physical infrastructure is not sufficient to address those concerns that stem from other types of inequality and play a key role in urban areas, such as digital literacy. The digital divide must be considered from an intersectional perspective which considers all types of inequalities that respond to and exacerbate the digital divide.

The fourth problem stems from the issues around the efficacy of democratic processes. Oftentimes, during formal CRTC hearings, the incumbents and other major stakeholders are better equipped to participate instead of individuals or smaller organizations, including Indigenous communities. The CRTC has already initiated some help to support the participation of marginalized groups; however, in such democratic processes the CRTC should consider all necessary steps to combat policy silences and to ensure inclusivity of all rights—and stakeholders.

The Canadian digital divide is a complex phenomenon which cannot be solved at one governmental level; rather, all governments, rights—and stakeholders should collaborate and develop a strategy to address the intersectional inequalities that exacerbate the digital divide. This also means working closely with other levels of government that may not directly work with broadband policy but include for example education to enhance digital literacy across Canada. The federal government has implemented a myriad of initiatives and funds to combat the digital divide by improving access through broadband deployment; however, there are other mechanisms (such as education) that contribute to the digital divide and which will require attention in forthcoming federal connectivity strategies.

BIBLIOGRAPHY

Andrey, S., Masoodi, M.J., Malli, N. & S. Darkenoo (2021). Mapping Toronto's Digital Divide. *Ryerson Leadership Lab and Brookfield Institute for Innovation + Entrepreneurship*. Accessed March 22, 2022. https://ryersonian.ca/wp-content/uploads/TorontoDigitalDivide_Report_final.pdf

Ashton, B. & R. Girard (2013). Reducing the Digital Divide in Rural Manitoba: A Proposed Framework. *Journal of Rural Community Development* 8(2): 62-78.

Beaunoyer, E., Duperé, S. & M.J. Guitton (2020). COVID-19 and digital inequalities: Reciprocal impacts and mitigation strategies. *Computers in Human Behavior* Vol. 111, Oct. 2020, 106424.

Carson, A.S (2014). The Remote Rural Broadband Deficit in Canada. *Journal of Rural and Community Development* 8(2): 1-6.

CIRA (2020). Unconnected: Funding Shortfalls, Policy Imbalances and How They Are Contributing to Canada's Digital Underdevelopment. *Canadian Internet Registration Authority*. Accessed April 14, 2021. <https://www.cira.ca/resources/state-internet/report/unconnected>

CRTC (2021a). Broadband Fund: Closing the digital divide in Canada. *Government of Canada*. Accessed March 29, 2021. <https://crtc.gc.ca/eng/internet/internet.htm>

CRTC (2021b). Internet—Our Role. *Government of Canada* Accessed March 17, 2021. <https://crtc.gc.ca/eng/internet/role.htm>

CRTC (2021c). Telecom Decision CRTC 2021-181. *Government of Canada*. Accessed March 23, 2022.

CRTC (2021d). Broadband Fund. Project selected for funding. *Government of Canada*. Accessed April 12, 2021. <https://crtc.gc.ca/eng/internet/select.htm>

CRTC (2020a). Communications Monitoring Report 2020. *Government of Canada*. Accessed March 23, 2022. <https://crtc.gc.ca/eng/publications/reports/policymonitoring/2020/index.htm>

CRTC (2020b). Broadband Fund. Maps of Areas to enhance Broadband Access. *Government of Canada*. Accessed March 12, 2021. <https://crtc.gc.ca/eng/internet/band2.htm>

CRTC (2019a). Broadband Fund—Second Call for applications – Telecom Notice of Consultation CRTC 2019-372. *Government of Canada*. Accessed March 4, 2022. <https://crtc.gc.ca/eng/archive/2019/2019-372.htm>

CRTC (2019b). Telecom Order CRTC 2019-288. *Government of Canada*. Accessed March 23, 2022. <https://crtc.gc.ca/eng/archive/2019/2019-288.htm>

CRTC (2018a). Telecom Regulatory Policy CRTC 2018-377: Development of the Commission's Broadband Fund. *Government of Canada*. Accessed April 12, 2021. <https://crtc.gc.ca/eng/archive/2018/2018-377.htm>

CRTC (2018b). Our Mandate, Mission, and What We Do. *Government of Canada*. Accessed March 23, 2022. <https://crtc.gc.ca/eng/acrtc/acrtc.htm>

CRTC (2017). It's Your CRTC: Here's How To Have Your Say!. *Government of Canada*. Accessed March 23, 2022. https://crtc.gc.ca/eng/info_sht/g10.htm

CRTC (2016). Telecom Regulatory Policy CRTC 2016-496. *Government of Canada*. Accessed February 4, 2022. <https://crtc.gc.ca/eng/archive/2016/2016-496.htm>

CRTC (2014). Satellite Inquiry Report. October 2014. *Government of Canada*. Accessed April 20, 2021. <https://crtc.gc.ca/eng/publications/reports/rp150409/rp150409.htm>

Cullen, R (2001). Addressing the digital divide. *Online Information Review* 25(5): 311-320.

Ferreira, D., Vale, M., Carmo, R.M., Encalada-Abarca, L. & C. Marcolin (2021). The three levels of the urban digital divide: Bridging issues of coverage, usage and its outcomes in VGI platforms. *Geoforum* 124: 195-206.

Government of Canada (2020). Aboriginal Lands of Canada Legislative Boundaries. Accessed March 12, 2021. <https://open.canada.ca/data/en/dataset/522b07b9-78e2-4819-b736-ad9208eb1067>

Government of Canada (1993). Telecommunications Act. Accessed February 4, 2022. <https://laws.justice.gc.ca/eng/acts/T-3.4/>

Haight, M., Quan-Haase, A. & B.A. Corbett (2014). Revisiting the digital divide in Canada: the impact of demographic factors on access to the internet, level of online activity, and social networking site usage. *Information Communication & Society* 17(4): 503-519.

Hambly, H. & R. Rajabiun (2021). Rural broadband: Gaps, maps and challenges. *Telematics and Informatics* 60(101565).

Ho, C-C. & S.F. Tseng (2006). From digital divide to digital inequality: the global perspective. *International Journal of Internet and Enterprise Management* 4(3): 215-227.

Hudson, H. & R.D. McMahon (2021). Remote and Indigenous Broadband: A Comparison of Canadian and US Initiatives and Indigenous Engagement. *Social Science Research Network*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3902248

Hudson, H (2017). When Regulation Fills a Policy Gap: Toward a Universal Broadband in the Remote North. *Social Science Research Network*. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2944295

Infrastructure Canada (2018). Investing in Canada—Canada's Long-Term Infrastructure Plan. *Government of Canada*. Accessed May 8, 2021. <https://www.infrastructure.gc.ca/alt-format/pdf/plan/icp-pic/IC-InvestingInCanadaPlan-ENG.pdf>

Innovation, Science and Economic Development Canada (ISED) (2021a). Universal Broadband Fund. *Government of Canada*. Accessed March 5, 2021. https://www.ic.gc.ca/eic/site/139.nsf/eng/h_00006.html

Innovation, Science and Economic Development Canada (ISED) (2021b). High-speed Internet for all of Canada. *Government of Canada* Accessed March 15, 2021. http://www.ic.gc.ca/eic/site/139.nsf/eng/h_00000.html

Innovation, Science and Economic Development Canada (ISED) (2021c). Selected Universal Broadband Fund projects. *Government of Canada*. Accessed April 13, 2021. <https://www.ic.gc.ca/eic/site/139.nsf/eng/00021.html>

Innovation, Science and Economic Development Canada (ISED) (2021d). Government of Northwest Territories and Tłı̨chǫ Government invest to bring high-speed Internet to 152 homes in Whati. *Government of Canada*. Accessed April 21, 2021. <https://www.canada.ca/en/innovation-science-economic-development/news/2021/04/government-of-canada-government-of-northwest-territories-and-tl̨chǫ-government-invest-to-bring-high-speed-internet-to-152-homes-in-what.html>

Innovation, Science and Economic Development Canada (ISED) (2019). High-Speed Access for All: Canada's Connectivity Strategy. *Government of Canada*. Accessed February 18, 2021. [https://www.ic.gc.ca/eic/site/139.nsf/vwapj/ISED_19-170_Connectivity_Strategy_E_Web.pdf/\\$file/ISED_19-170_Connectivity_Strategy_E_Web.pdf](https://www.ic.gc.ca/eic/site/139.nsf/vwapj/ISED_19-170_Connectivity_Strategy_E_Web.pdf/$file/ISED_19-170_Connectivity_Strategy_E_Web.pdf)

Jackson, E (2021). Telcos threaten to pull rural internet investment after CRTC lowers wholesale rates. *Financial Post*, August 21, 2019. Accessed March 2022. <https://financialpost.com/telecom/telecos-threaten-to-pull-rural-internet-investment-after-crtc-lowers-wholesale-rates>

Knight, E (2020). If a crisis like COVID-19 hasn't pushed government to take action to improve broadband access, what can?. *CBC Opinion* August 23, 2020. Accessed March 9, 2021. <https://www.cbc.ca/news/opinion/opinion-erin-knight-internet-access-1.5682217>

Lai, J. & N.O. Widmar (2021). Revisiting the Digital Divide in the COVID-19 Era. *Applied Economic Perspectives and Policy* 43(1): 458-464.

Mersereau, M. (2021). Universal and non-excludable broadband Internet access: A modest proposal for municipal provisioning of broadband as a basic service. *Canadian Journal of Urban Research* 30(1): 30-39.

McNally, M., Rahti, D., Joseph, K., Evaniew, J. & A. Adkisson (2018). Ongoing Policy, Regulatory, and Competitive Challenges Facing Canada's Small Internet Service Providers. *Journal of Information Policy* 8: 167-198.

Min, S-J (2010). From the Digital Divide to the Democratic Divide: Internet Skills, Political Interest, and the Second-Level Digital Divide in Political Internet Use. *Journal of Information Technology & Politics* 7(1): 22-35.

Nunavut Tunngavik (2020). Nunavut's Infrastructure Gap. October 2020. Accessed March 23, 2022. https://www.tunngavik.com/files/2020/10/2020.10.20-Nunavuts_Infrastructure_Gap_Report_vf.pdf

Ozanne, J.L., Corus, C. & B. Saatcioglu (2009). The Philosophy and Methods of Deliberative Democracy: Implications for Public Policy and Marketing. *Journal of Public Policy & Marketing* 28(1): 29-40.

Reddick, C.G., Enriquez, R., Harris, R.J. & B. Sharma (2020). Determinants of broadband access and affordability: An analysis of a community survey on the digital divide. *Cities* 106: 11-12.

Riggins, F.J. & S. Dewan (2005). The Digital Divide: Current and Future Research Directions. *Journal of the Association for Information Systems* 6(12): 298-337.

Robinson, L., Cotton, S.R., Ono, H., Quan-Haase, A., Mesch, G., Chen, W., Schulz, J., Hale, T.M. & M.J. Stern (2015). Digital inequalities and why they matter. *Information, Communication & Society*, 18(5): 569-582.

Servon, L.J. & M.K. Nelson (2003). Community Technology Centers: Narrowing the Digital Divide Low-Income, Urban Communities. *Journal of Urban Affairs* 23: 279-290.

Shepherd, T., Taylor, G. & C. Middleton. (2014). A Tale of Two Regulators: Telecom Policy Participation in Canada. *Journal of Information Policy* 4: 1-22.

Scheerder, A., Van Deursen, A. & J. Van Dijk (2017). Determinants of Internet skills, uses and outcomes. A systematic review of the second- and third-level digital divide. *Telematics and Informatics* 34(8): 1607-1624.

Standing Committee on Industry, Science and Technology (2021). Affordability and Accessibility of Telecommunications Services in Canada: Encouraging Competition to (Finally) Bridge the Digital Divide. *House of Commons Canada*. Accessed March 22, 2022. <https://www.ourcommons.ca/Content/Committee/432/INDU/Reports/RP11439444/indurp07/indurp07-e.pdf>

Standing Committee on Industry, Science and Technology (2020). Evidence Number 010 2nd Session 43rd Parliament. *House of Commons*. Accessed April 13, 2021. <https://www.ourcommons.ca/DocumentViewer/en/43-2/INDU/meeting-10/evidence>

Standing Committee on Industry, Science and Technology (2018). Broadband Connectivity in Rural Canada: Overcoming the Digital Divide. *House of Commons*. Accessed March 30, 2021. <https://www.ourcommons.ca/Content/Committee/421/INDU/Reports/RP9711342/indurp11/indurp11-e.pdf>

Statistics Canada (2018). Canada's population estimates: Subprovincial areas, 1 July 2018. Accessed April 15, 2021. <https://www150.statcan.gc.ca/n1/en/daily-quotidien/190328/dq190328b-eng.pdf?st=SRIqzZzW>

Statistics Canada (2016). 2016 Census—Boundary Files. Accessed April 5, 2021. <https://www12.statcan.gc.ca/census-recensement/2011/geo/bound-limit/bound-limit-2016-eng.cfm>

Taylor, G., Anderson, K. & D. Cramer (2021). Municipal digital infrastructure and the COVID-19 pandemic: A case study of Calgary, Canada. *Journal of Digital Media & Policy* 12(1): 137-157.

United Nations (2020). UN Research Roadmap for the Covid-19 Recovery. Accessed June 2, 2022. <https://www.un.org/en/coronavirus/communication-resources/un-research-roadmap-covid-19-recovery>

Van Deursen, A.J. & J.A.G.M. Van Dijk (2019). The first-level digital shifts from inequalities in physical access to inequalities in material access. *New Media & Society* 21(2): 354-374.

Van Deursen, J.A.M. & E. Helsper (2015). The Third-Level Digital Divide: Who benefits the most from being online? *Communication and Information Technologies Annual: Digital Distinctions and Inequalities Studies in Media and Communication* 10: 29-53.

Van Dijk, J.A.G.M (2006). Digital divide research, achievements and shortcomings. *Poetics* 34(4-5): 221-235.

Van Dijk, J. & K. Hacker (2003). The Digital Divide as a Complex and Dynamic Phenomenon. *The Information Society* 19(4): 315-326.

Wei, L. & D.B. Hindman (2011). Does the Digital Divide Matter more? Comparing the effects of New Media and Old Media Use on the Education-Based Knowledge Gap. *Mass Communication and Society* 14(2): 216-235.

Wilkinson, S (2020). Four phases of Internet Policy Development. *Journal of Information Policy* 10: 184-209.

Zhang, X (2013). Income disparity and digital divide: The Internet Consumption Model and cross-country empirical research. *Telecommunications Policy* 37(6-7): 515-529.

Zheng, Y. & G. Walsham (2021). Inequality of what? An intersectional approach to digital inequality under Covid-19. *Information and Organization* 31: 1-6.

ACKNOWLEDGEMENTS

I would like to express my gratitude to Dr. G. Kent Fellows and Dr. Alaz Munzur for comments and feedback. I would also like to thank Dr. Brunelle for the helpful suggestions on previous drafts. The constructive comments and advice by the two anonymous reviewers have been a great help in further strengthening the paper. This work was funded by Western Economic Diversification Canada (# 111411) and the Government of Alberta (# 1050826). The funds are held by the School of Public Policy, University of Calgary.