

KNOWLEDGE SYNTHESIS: MOBILITY AND PUBLIC TRANSIT

Navigating Rural: Place Based Transit Solutions for Rural Canada



The project team would like to thank all the individuals from across the country who took the time to respond to requests for information – your assistance was much appreciated. We would also like to thank Wayne Kelly, Brennan Lowery, Bojan Furst, and Laurel Halleran for their contributions to the project.

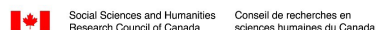
As this report is national, it is important that we acknowledge not only the traditional territories where we live, but to acknowledge the lives and lands of Indigenous peoples across Canada. We acknowledge historical and ongoing injustices that Indigenous Peoples (First Nations, Métis and Inuit) endure in Canada and encourage readers to recognize and reflect on the important task of reconciliation.

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On behalf of Selkirk College, I (we) acknowledge that we operate and serve learners on the unceded traditional territories of the Sinixt (Lakes), the Syilx (Okanagan), the Ktunaxa, and the Secwépemc (Shuswap) peoples.

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EXECUTIVE SUMMARY

Background

Transit and mobility are fundamental to rural community resilience. However, despite the importance of transit and the increase in available options, rural communities can struggle to initiate and maintain sustainable transit services. While there is some understanding of rural barriers, the utility of this information is hampered by the lack of understanding of how barriers are influenced by place-based differences across rural communities. The lack of understanding of place-based influences on rural transit systems is a critical challenge to informed decision making. This in turn impacts the development, implementation, and sharing of effective strategies, solutions, and supports, resulting in potentially inappropriate actions, unintended consequences, and inefficient use of limited resources. Without understanding the influence of place-based factors, it is challenging to understand what is missing from the existing literature, and to understand which promising policies and practices are applicable to which rural communities.

Objectives

The goal of the *Navigating Rural* project was to use place as a lens to identify, synthesize, and assess existing rural transit literature in order to identify rural barriers and understand how barriers vary by place. The objectives were:

- 1) Compile a database of existing rural transit and mobility literature, identifying gaps within our knowledge;
- 2) Create a typology of barriers impacting rural communities;
- 3) Explore existing transit support programs to understand gaps and challenges;
- 4) Identify and explore innovative rural solutions;
- 5) Clearly identify the gaps within our knowledge base, data, and existing support programs; and
- 6) Conduct a place-based analysis to understanding how barriers are influenced by place.

Summary of Results

Rural Transit Literature

- Overarching themes: treating rural as a singular or uniform concept; uneven regional knowledge and understanding; understanding who is (and is not) served; challenges of rural transit; feasibility and rationale of rural transit; growing transit opportunities; and identified transit solutions.
- Gaps: little peer reviewed research – particularly on development of rural transit systems; little understanding or differentiation between places; dominance of examples from certain regions (British Columbia, Ontario) and community types (large, urban adjacent); minimal representation of remote communities.

Barriers to Rural Transit

- There are seven categories of barriers to sustainable rural transit systems, each with multiple specific barriers:
 - Demographic factors and ridership
 - Socio-cultural aspects of transit
 - Natural and built environment
 - Local costs of operation and potential sources of revenue
 - Local governance
 - Local economic structure
 - External funding programs
- Barriers differ by place, but the extent of this is unknown due to gaps in the literature.

Existing Support Programs

- There are six categories of gaps and challenges related to rural access to existing transit support programs:
 - Challenges with access to information surrounding programs
 - Extent to which programs account for unique rural considerations
 - Exclusionary criteria
 - Expenses that are deemed to be eligible under the funding framework
 - Consideration for the human resource capacity of the funding recipient
 - Consideration for the financial resource capacity of the funding recipient

Innovative Rural Examples

- A publicly accessible web map of existing innovative rural examples was created and can be found at: <https://selkirk.maps.arcgis.com/apps/webappviewer/index.html?id=17c858b73a014fbfa55d712141847a73>.

- The majority of examples identified are from urban-adjacent communities, and are often larger communities. There are very few examples identified from remote communities.
- The most common type of innovation was changes and improvements within organizational methods.
- Most of the examples can be found in southern Ontario or British Columbia, demonstrating the influence of larger population centres (e.g., Toronto, Vancouver), as well as the impact of collaboration between multiple communities (inter-community regional systems) to achieve economies of scale.
- The examples demonstrate a contrast between smaller, volunteer run systems that are innovative, but also highly precarious; and larger, government run systems that are more stable, but less innovative.

Influence of Place

The influence of place can be seen on three distinct but overlapping levels:

- 1) **Macro Rural Trends** apply to all rural areas, limited influence of place beyond separating rural characteristics from urban ones. For example, low population density and long distances.
- 2) **Meso Rural Trends** apply over large areas based on a common place-based characteristic. For example, commuter patterns in urban adjacent communities or the characteristics of specific demographic groups.
- 3) **Micro Rural Trends** apply to specific places based on unique or near unique place-based characteristics. For example, specific economic structure – single industry, seasonality, unique demographic conditions, remoteness.

Key Messages

For Rural Communities and Regions

- Recognize what unique place-based barriers exist locally.
- Recognize and leverage existing assets and resources.
- Recognize unique local characteristics and needs.
- Establish a transit service that makes the most sense based on the above. For many rural communities this means something other than a traditional fixed-route system.

For Policies and Programs

- Recognize that policies and programs based on the existing knowledge base are limited and unable to account for the diversity of rural contexts.
- Recognize that the dominance of specific regions, community types, and transit system types leaves out experiences, considerations, and opportunities relevant to other types of rural communities.
- Applying a rural lens (rural considerations) can help in development of program and policy, but should recognize the impact of data and information gaps.
- Flexibility is required in rural transportation policies and program to ensure diverse rural transit types are supported, both within a community and between communities.

Across the Board

- Change perceptions of existing or potential users, making transit a viable and socially desirable option.
- Recognize the full benefits of transit, going beyond the simple cost to operate and return on investment to the inclusion of the impact to measures of wellbeing and social, economic, and environmental co-benefits.
- Enabling sustainable rural transit requires changes to support and increase factors of success. This includes the perspectives of users and decision makers, but also in supporting programs and policy. To do so requires a better understanding of the diversity of rural and the influence of place.

Methodology

A multi-staged, qualitative research approach was taken. The project team compiled a database of existing rural transit and mobility literature based on four parameters: inclusion of peer-reviewed or grey literature; publication within the last 10 years; Canadian focus, or that of a similar jurisdiction; and having an explicit rural component. Documents were screened for relevance related to barriers, existing support programs, and innovative examples. A separate qualitative content analysis was developed and conducted for each. The project team then applied place as a lens to explore the results of the completed content analyses. Barriers and existing examples were explored based on these factors in order to identify if/how the results varied by place.

1. BACKGROUND

Transit and mobility are fundamental to rural community resilience. However, despite the importance of transit and the increase in available options, rural communities can struggle to maintain viable transit services.

The Importance of Transit

From an individual perspective, mobility is a key factor impacting determinants of health. Mobility is key to access to basic services, including health care, education, and social supports (BC Transit 2020; Canadian Rural Revitalization Foundation 2019; Kar et al. 2014). Mobility also influences access to recreation and the ability of individuals to actively participate within the community (BC Transit 2020; Canadian Rural Revitalization Foundation 2019; Kar et al. 2014).

Transit options, or the lack thereof, directly impact personal security and safety, both in day-to-day mobility and in the case of emergencies (BC Transit 2018; Gris Orange Consultant 2012). Access to transit also directly impacts economic participation, including access to businesses for shopping and accessibility of employment opportunities (Majkut 2011). The lack of rural transit systems, or gaps in existing systems, disproportionately impact vulnerable individuals and groups, including low-income individuals, Indigenous peoples, youth, immigrants, and seniors (Marr 2015; McCue, Tolentino, and MacDonald 2014).

From a community perspective, transit and mobility are equally important (Majkut 2011; McCue, Tolentino, and MacDonald 2014). In terms of economic development, transit systems have direct, indirect, and induced economic benefits (Godavarthy, Mattson, and Ndembe 2014). The availability and functionality of transit systems can create jobs, influence resident attraction and retention, increase the available workforce, and improve accessibility to markets and customers for residents and tourists (Canadian Rural Revitalization Foundation 2019; Economic Development Research Group 2020; Mahali and Ray-Yol 2020; Majkut 2011). Having viable transit options is also an opportunity to decrease greenhouse gas emissions and reduce environmental impacts (Foord and Henry 2009; McCue, Tolentino, and MacDonald 2014).

New Transit Opportunities

Opportunities related to transit and mobility are on the rise and these increased options present opportunities for development of new systems. Opportunities include blending traditional fixed-route and on-demand systems with innovations like flexible routes, ride sharing, car shares, fleet electrification, ride hailing, and active transportation (see Section 4.1, Table 1) (BC Transit 2020; Majkut 2011; Northern Alberta Development Council 2013). Additionally, there is the idea of multimodal transit – the consideration of, and connection between, multiple modes of transit (Litman 2020).

There are more strategies and alternatives for transit today than at any other point in history, and there is also more demand. The need for viable and sustainable rural transit systems continues to grow, driven by the increased economic and environmental cost of owning and operating a personal vehicle, but also in relation to other challenges, like affordable housing and available employment – as the two are not always available in the same community.

The Uncertain Role of Place

Within the existing transit literature, rural is approached as a cohesive concept, with generalized findings. However, rural communities are far from homogenous. While there are common rural characteristics, such as a low population density and distance from high density urban settings, how these characteristics manifest across Canada ranges dramatically (Brinklow and Gibson 2017; Vodden, Baldacchino, and Gibson 2015). As the range of multi-modal strategies available to tailor solutions to local needs increases, so does the need for alignment with place-based assets, as well as coordination between services and providers (Burkhardt et al. 2004; Fleming 2020; Markey, Ryser, and Halseth 2020; Noxon Associates Limited 2009).

Conditions of place - the unique combinations of economic, socio-cultural, and environmental factors - play a critical role in influencing and impacting community conditions (Markey, Breen, et al. 2019). When it comes to rural transit systems, place-based development literature suggests that there are fundamental differences in the barriers faced by rural communities. However, within the existing transit literature, it is unclear what role place-based factors like size, location, physical landscape, economy, demographics, and culture play in influencing the critical barriers that rural

communities must overcome in order to establish and maintain a sustainable transit system. It is also unclear what types of communities may not be represented, and therefore are neither understood nor supported. As a result, both local and upper-level governments are challenged to implement or support place appropriate transit solutions that are able to work within unique community or regional contexts.

The Rural Challenge

Despite the need, potential benefits, and increase in options, rural places can struggle to initiate and maintain sustainable public transit services. On average rural communities lack transit options (Transport Canada 2006). The existing rural transit literature is limited, dominated by grey literature - reports from consultants and governments. There is an understanding of key variables and data needs, but there is limited available data (Canadian Rural Revitalization Foundation 2019). While the existing literature identifies a range of rural barriers, the utility of the information is hampered by the lack of articulation of how differences across rural communities influence these barriers. This is problematic given the considerable contextual diversity across rural Canada (Lowery, Dagevos, and Vodden 2020). There is also a high likelihood of gaps in our understanding of rural transit, as the majority of prominent case studies reference larger communities (up to 100,000 people), often in urban-adjacent settings (e.g., McCue et al., 2014; Northern Alberta Development Council, 2013; Transport Canada, 2006). Although place-based factors like geography and demographics are noted as having the potential to influence the type of transit service that is best suited to communities, the existing knowledge base does not typically provide any nuanced understanding of how barriers and challenges differ across rural contexts (Beck and Mis 2010; Mattson 2013; Noxon Associates Limited 2009). The transit literature reviewed fails to take conditions of place into account, despite the wealth of literature observing the influence of the economic, socio-cultural, and environmental conditions of place (Markey et al. 2015; Markey, Halseth, et al. 2019; Markey, Halseth, and Manson 2012).

Responsibility for transit systems is multi-jurisdictional and comprised of multiple stakeholders, including - not-for profits, private companies, and all levels of government. The current lack of understanding of place-based influences on sustainable rural transit systems is a critical challenge to informed decision making. This in turn impacts the development, implementation, and sharing of effective strategies, solutions, and supports, and results in potentially inappropriate or inefficient actions, and the inefficient use of limited resources. In the absence of understanding the influence of place, it is challenging to understand what is missing from the existing literature, as well as to understand which promising policies and practices are applicable to which rural communities.

2. OBJECTIVES

The goal of the *Navigating Rural* project was to use place as a lens to identify, synthesize, and assess existing rural transit literature in order to identify rural barriers and how these barriers vary by place. The intention of developing a rural specific, place-based understanding is to serve as a key resource to inform the design and implementation of local solutions, the development of supports from upper-level governments, and to guide future research.

To achieve the project goal the following five objectives were identified:

- 1) Compile a database of existing rural transit and mobility literature;
- 2) Create a typology of barriers impacting rural communities;
- 3) Explore existing transit support programs to understand gaps and challenges;
- 4) Identify and explore innovative rural solutions;
- 5) Conduct a place-based analysis to understanding how barriers are influenced by the economic, socio-cultural, and environmental dimensions of place; and
- 6) Clearly identify the gaps within our knowledge base, data, and existing support programs.

This report provides an overview of the project's background and objectives, as well as methods. This is followed by a presentation of results, discussion and implications, and conclusions. Also included is an overview of knowledge mobilization activities, as well as identified research gaps and future research opportunities.

3. METHODS

In order to respond to the project goal and objectives, the project team took multi-staged, qualitative research approach, described below.

Literature Review: the project team compiled a database of existing rural transit and mobility literature to serve as the basis for the content analyses. In order to be included in the database, certain parameters had to be met. The four parameters were:

- 1) Inclusion of peer-reviewed or grey literature;
- 2) Focus on literature published within the last 10 years (between 2010 and 2020)ⁱ;
- 3) A Canadian focus, or that of a similar jurisdiction, such as New Zealand or the United States of America; and
- 4) Having an explicit rural component, whether rural generally or specific to a particular community(ies) or regions.

The database consisted of articles, studies, reports, and presentations that were found through several avenues, including Google Scholar, Research Gate, library searches of researcher-affiliated schools, and reference lists within identified documents. In total, 97 pieces of literature were included in the database. The project team also took note of additional web-based resources.

These 97 documents were screened to create an annotated bibliography, which included a short summary of the resource, as well as an indication of its relevance for the subsequent analyses described below: barriers to establishing, operating, and maintaining rural transit systems; rural access and use of existing transit support programs; and innovative rural transit solutions. Related results can be found in Section 4.1. Literature referenced within this report can be found in the Bibliography Section and additional literature can be found in the Additional Literature section.

Content Analysis - Barriers: of the 97 identified documents, 84 were initially identified as being relevant to the barrier analysis during the creation of the annotated bibliography. After further document review, this number was reduced to 43 documents that were identified as having a Canadian focus with respect to barriers in establishing rural transit systems. These documents were uploaded to the qualitative analysis software NVivo for manual coding. The project team developed a code book to establish parameters and guidelines for the coding process. Coding began with an initial list of codes (deductive), identified during the creation of the annotated bibliography. However, beyond this initial list, coding was done in an inductive manner, identifying and exploring barriers as they were identified from within the literature. The process was iterative, with new codes added and codes refined throughout the process, with each document reviewed multiple times. The coding process progressed until a final coding structure with themes and various levels of sub-themes was created. Coding results were presented to, and discussed with the project team to verify the results. Related results can be found in Section 4.2.

Content Analysis – Existing Support Programs: a total of 54 of the 97 documents discussed barriers to rural community use or access of transit support programs and/or identified existing transit support programs. This documentation, combined with internet searches, were used to guide the creation of an initial list of existing transit support programs. This initial long list was reviewed with the project team and refined to a shorter list for detailed analysis based on available information. In order for a program to be included in the analysis the program had to satisfy the following parameters: 1) it must be Canadian; 2) it could be national, provincial/territorial, or local (regional or municipal) in nature; 3) it could include funding programs or significant cost sharing agencies; 4) it must currently be active, or be within five years of being active; 5) it must include a funding component and therefore could not be an exclusively knowledge-based resource or program. Each of the identified of programs had accompanying documentation, such as a program guide or website. This documentation was uploaded to the qualitative analysis software NVivo for manual coding, where they were coded to analyze rural barriers in the context of rural use of the transit support programs. Coding occurred in a primarily deductive manner, employing a pre-imposed coding structure, looking for the explicit presence or absence of the following factors:

ⁱ Documents outside this time range were included, including seminal documents (e.g., those widely referenced) or those recommended by experts. However, the systematic literature search was focused within the time frame.

- Rural Considerations: indication of rural specific aspects within the program (e.g., targeted rural funding)
- Human Capacity Requirements: requirement for a specific level of existing skill, plan, or similar
- Financial Capacity: requirement for a specific level of financial contribution or long-term financial burden
- Eligible Expenses: flexibility in eligible expenses
- Exclusion: exclusion from funding based on geography or target audience that would impact rural
- Other: inductive coding was allowed to support the addition of any emergent themes related to existing funding programs.

Related results can be found in Section 4.3. The level (federal, provincial/territorial, local) of funding, as well as area of focus (e.g., climate, COVID-19) were also noted in the coding.

Content Analysis – Existing Rural Transit Innovations: of the 97 documents, 74 discussed innovative rural transit examples that have faced and/or overcame a barrier. Additional input from project partners and other external input identified additional examples. Based on these, a database was created to document the attributes of 117 unique examples from rural Canada, with these attributes including: 1) solution description; 2) transit type (e.g., fixed, on-demand); 3) service geography (e.g., within a single community, between communities); 4) innovation description; 5) ownership (e.g., public, private); 6) funding details (e.g., source); and 7) target user group.

All examples were then visually mapped using ArcGIS software. The resulting web map allows viewers to use different attributes to view the examples, including: 1) service geography; 2) proximity to urban centres; 3) transit type; 4) ownership; 5) population; 6) population density. Of the total examples, 28 were selected (roughly 2 – 3 from each province and territory) to be further explore to better understand the types of innovations being applied. Related results can be found in Section 4.4.

Place-Based Analysis: the project team applied place as a lens to explore and better understand the results of the completed content analyses. Building on existing place-based literature, the project team identified a range of indicators of place to guide the analysis. These indicators included economic (e.g., diversification), social (e.g., demographic), and physical/environmental (e.g., proximity to urban centres) factors. Identified barriers and existing examples were explored based on these factors in order to identify if/how the results varied by place.

The attributes of the innovative examples were explored looking for trends, and were compared to the identified barriers to determine how innovative rural transit solutions are influenced by place. The identified barriers were analyzed from a place-based lens to determine if barriers were influenced by key aspects of place. This analysis involved manually assessing the content coded to each thematic barrier and taking note of where the barriers presented themselves, and whether or not the barriers were consistent across Canadian rural areas or if they were unique to a certain place. The analysis was presented to the project team for discussion and refinement. Related results can be found in Section 4.5.

Limitations: we acknowledge that there are limitations that have influenced the results of this project. Primarily, the project is limited by the lack of primary research that has been conducted in the field of rural transportation, meaning that the results are primarily based on grey literature. Conversations with informed individuals indicate that, particularly related to innovative case studies, there may be a mis-match between the information that is publicly available and what exists in reality. However, primary data collection was outside the scope of this project. Parameters related to budget and time meant that both the literature review and innovative example identification, while systematic in their design and execution, should not be considered comprehensive. The majority of the literature included has a Western lens and perspective. Lastly, we also acknowledge that our individual experiences and geographic positioning impacts our research through bias and heuristics.

4. RESULTS

4.1. Literature Review

In response to objective #1 (compile a database of existing rural transit and mobility literature), we identified 97 documents that discussed rural transit and mobility and met the parameters discussed in Section 3. The majority (67) of documents are grey literature, consisting of items like reports and documents from all levels of government, transportation plans, consultancy reports, and non-peer reviewed books. Of the remaining 30 documents, 26 are peer-reviewed scholarly articles, two are theses, one is a peer-reviewed book, and one is a conference paper. The academic literature primarily focused on modes of transit, the role of changing technology, the transit disadvantaged, and factors influencing rural transit.

The following section provides a summary of the overarching themes found in the literature. The identified gaps and implications are discussed in Section 5.

The (Predominantly) Homogenous Treatment of Rural

Within the reviewed rural transit and mobility literature, rural appears in different ways – as rural specific section within a broader document (e.g., Ontario Ministry of Transportation 2012), as a rural specific document (e.g., Transportation Association of Canada 2016), or as a rural community case study, plan, or evaluation (e.g., BC Transit 2018).

How rural is defined ranges widely within and outside the review literature. Outside the reviewed literature how “rural” is defined often focuses on characteristics of demographics and location, such as distance to an urban centre, population size, and population density. Statistics Canada typically defines rural and small town as those areas outside of Census Metropolitan Areas and Census Agglomerations (Statistics Canada 2021). Even within this limited definition, there is variation across rural contexts. Outside the Statistics Canada definition, the concept of rural and how it is defined varies considerably (Rich, Hall, and Nelson 2021).

Within the reviewed literature there is variation in how rural is defined, if it is defined at all. Some reports include populations of up to 50,000 or 100,000 (Transportation Association of Canada 2016). Some recognize the aforementioned characteristics of demographics and location (Kidder 2006; Noxon Associates Limited 2009). Others do not provide any definition (Burkhardt et al. 2004; Kar et al. 2014).

What is largely consistent across the literature is that the majority conceptualize and discuss rural as a homogeneous (single or uniform) concept. Reports often discuss general rural challenges in establishing or sustaining transit service, and provide similarly generalized best practices (e.g., Noxon Associates Limited 2009; Transportation Association of Canada 2016). This generalized rural understanding and guidance is useful as a foundation. However, it is important to consider that one rural area may vary greatly in its assets and challenges in comparison to a neighbouring one.

That is not to say that there is no recognition of variation across rural contexts. The literature often acknowledges differing types of rural, either by size of community, or by location, including urban adjacent and remote. However, while there is acknowledgement that contextual factors will influence barriers and solutions, the presented results and findings are most often generalized to a single, homogenous rural. There are community specific documents (e.g., strategies or plans) aimed at local audiences that reflect a range of rural communities. However, where there are community case studies of existing transit systems aimed at broader audiences they often (but not always) focus on communities with larger populations, as well as those that are within proximity of urban centres (McCue, Tolentino, and MacDonald 2014). Remote communities, such as those accessed by plane or boat or at great distances, are particularly poorly represented in the literature.

Uneven Regional Knowledge and Understanding

Building on the above observations regarding the homogeneous representation of rural within the literature is the theme of geographic representation. Much of the generalized literature is primarily placeless – not specific to a province/territory or region. Where place is specified, within the Canadian context where the documents are specific

to geography the literature is skewed heavily toward rural areas within southern Ontario (e.g., Mahali and Ray-Yol 2020; Marr 2015; McCue, Tolentino, and MacDonald 2014) and rural areas in British Columbia (BC) (e.g., BC Transit 2020; Matte 2014; Ministry of Transportation and Infrastructure 2020), with modest (but noticeably less) representation in the Atlantic provinces (e.g., Beck and Mis 2010; Levesque 2020; Lysenko 2012; Majkut 2011). There is little available literature specific to the prairie provinces – Manitoba, Saskatchewan, and Alberta.

Although the innovative rural examples (see Section 4.4) include representation from every province and territory except Nunavut, the scale of the available literature is not proportional to that of southern Ontario and BC. Taken together, the above suggests that the existing understanding surrounding rural transit is likely dominated by the experiences of Ontario and BC, leaving out potentially critical experiences and considerations relevant to other areas across Canada. Further research is needed to generalize this knowledge to other areas. For example, where the literature includes successful examples of rural transit systems, such as in southern Ontario where there is a large cluster of case studies, general context is given for these cases; however, for a more in-depth analysis and understanding, one would have to conduct more primary research in order to understand the dynamics of success or failure and its transferability to other places.

Where literature from comparable jurisdictions was reviewed, this included literature from the United States, parts of the European Union, Australia, the United Kingdom. The literature also included a small number of examples from jurisdictions less comparable to the Canadian context, exploring rural transit in Korea, Japan, Indonesia, and Iran. No literature from the Global South was included. Although our focus was on the Canadian context, the limited international literature that was included suggest valuable and potentially transferable knowledge. Such literature may be helpful in adding additional observations and ideas for addressing user needs. Flexibility and a responsiveness to user needs is especially important in rural areas due to the unique challenges they face in establishing transit systems (Markey, Ryser, and Halseth 2020). Future research could further explore the international literature.

Understanding Who is (and is not) Served

Both peer reviewed and grey literature include discussion of those impacted by a lack of rural transit services, with one author referring to them as the transit disadvantaged (Marr 2015). Those individuals considered vulnerable to a lack of rural transit services include: seniors, youth, women, those with physical and cognitive impairments, low-income individuals, Indigenous peoples, and recent immigrants (Levesque 2020; Mahali and Ray-Yol 2020; Marr 2015; McCue, Tolentino, and MacDonald 2014).

It is important to realize that there may be intersectionality between one or more of these subsets of rural populations, rendering the experience of vulnerable groups as existing on a continuum (Marr 2015). When recognizing specific populations, the literature reviewed was dominated by a focus on seniors, with many case study examples gearing their service toward the needs of seniors or those with mobility issues (Kar et al. 2014). This is not unexpected, as rural areas tend to have aging populations (Kidder 2006). However, rural places also have other vulnerable populations and in order to attract a greater level of ridership, service must be more diverse in target user group.

Although included within the literature review, it was outside the scope of the *Navigating Rural* project to conduct a detailed review of literature pertaining to vulnerable populations, including racialized individuals and new immigrants and the factors that encourage and discourage them to use rural transit, which ultimately impacts ridership. However, explorations of these critical themes can be found in other Mobility and Public Transit Knowledge Synthesis projects, including *Here Today, Gone Tomorrow: Public Transportation and Vulnerabilities in Rural and Remote Canada* and *Missing the Bus: Indigenous Women, Tow-Spirit People and Public Transit in Western Canada* (Social Sciences and Humanities Research Council 2021).

Challenges of Rural Transit

The unique challenges faced by rural areas in establishing a transit service or sustaining an existing service are primarily discussed in the grey literature (Kar et al. 2014; McCue, Tolentino, and MacDonald 2014). A range of rural specific barriers are identified within the literature, including challenges related to demographics, costs of operation, governance, and support programs. These barriers are grouped into seven overarching categories and discussed in detail in Section 4.2. However, within the literature these barriers are often not discussed in relation to a place, but

are rather conceptualized as being independent of place and being transposable onto all rural areas. As mentioned above there is a great diversity as to what constitutes “rural.” Therefore, there is a need for more primary research to be conducted on this front to gain a deep understanding of barriers as they relate to place, which we begin to do in Section 4.5.

Feasibility of Rural Transit

The feasibility of rural transit represented a sizeable theme within the grey literature reviewed. This literature is primarily in the form of feasibility studies or guiding reports (e.g., IBI Group 2018; Municipality of Piney 2021; Roddick 2021b, 2021a). This literature essentially provides options and best practices for different types of transit services and the structures that govern them. For example, rural transit service expansion is explored in various ways that explain the benefits and drawbacks of particular service and governance types (Foord and Henry 2009; Kar et al. 2014; Levesque 2020; Lysenko 2012). Such reports offer recommendations in terms of various aspects of service (e.g., service level, governance type, marketing strategies). Rural transit feasibility studies offer a starting point for local governments and other organizations who are considering implementing or expanding transit systems.

Within the grey literature there are also examples of service reviews conducted by consultants that are complete with recommendations for a particular place with its own unique needs (WSP 2018). It is important to acknowledge that the communities that hired the consultants may or may not have implemented the suggestions. Therefore, one can look to the consultancy reports and transit master plans for best practices, but the extent to which documents of this nature are, or can be implemented by rural communities is unknown. In some cases, such as when the costs associated with recommendations were high, such reports may be more idealistic than realistic for rural areas (WSP 2018).

Some grey literature attempted to make a financial case for rural transit by presenting the benefits of public transit investments on the economy (Economic Development Research Group 2020; Majkut 2011). While transit provision can impact the economy through providing greater access to jobs, this should not be conflated with generating a profit from rural transit systems. Profit generation from rural transit systems is typically not possible (Beck and Mis 2010). Rather, there has been an increased understanding of the impacts on one’s overall quality of life through the provision of accessible public transit (Canadian Urban Transit Association 2005), and an understanding of the importance to properly communicate these benefits to the public and those in decision making positions (Beck and Mis 2010).

Growing Transit Opportunities

Just as all rural areas can differ from one another, so too can the types of transit, extending beyond the traditional fixed-route transit option. Oftentimes, a typical fixed-route service may not be viable in a rural area with low demand for the service coupled with low-density settlement patterns (Transport Canada 2006). The literature demonstrates a range of alternative service types that have been proposed and/or established in rural areas.

Table 1: Non-Traditional Examples of Transit Opportunities (Litman 2020; Loh et al. 2012; Majkut 2011; Matte 2014; Noxon Associates Limited 2009)

Option Name	Description
Active Transportation	Human-powered mobility, including walking and biking.
Carshares	Community-owned, collectively-owned, or privately-owned asset that can be booked by members.
Combined solutions	E.g., a combination of traditional fixed-route and demand-responsive transit.
Demand-responsive transit	The use of a taxi service or ride hailing.
Flexible routes	Allow drivers to deviate slightly from the route to drop passengers off at more convenient or safe locations.
Multimodal transit	Consideration of and connection between multiple modes of transit (e.g., a cycling route that connects to a transit stop).

Option Name	Description
Rideshare	Joining someone for a ride in a private vehicle if you are both heading in the same direction.

The growing number of options means that based upon community characteristics, existing assets, and needs, one service delivery model for a rural area may be optimal over another. However, despite the growing options, traditional fixed-route transit systems dominate the current literature, particularly related to overarching guiding documents from upper level governments.

Identified Rural Transit Solutions

Many grey literature reports and some peer reviewed literature included suggested and implemented solutions, which related to transit service type, level of service, governance structure of service providers, making investments in infrastructure, leveraging technology, or level of coordination between service providers (Economic Development Research Group 2020; Malo et al. 2018; Noxon Associates Limited 2009; Velaga et al. 2012). The majority of specific, tangible solutions presented were identified at the local scale, offering bottom-up solutions. In one instance there was a call to nationalize transit service, providing a top-down solution (Albin et al. 2021). However, while potentially more stable, a top-down solution may be less likely to respond to diverse local needs (Co+Host 2016), suggesting a need to balance local needs with supportive top-down policy and programs (Markey, Ryser, and Halseth 2020)

In order for solutions to be successful and meaningful, there must be an understanding of what exists in a community and what is needed (Markey, Ryser, and Halseth 2020). The application of the planning process to achieve this end was mentioned in the literature (Gris Orange Consultant 2012), although not to a large extent. This may be due to the fact that rural areas tend to have limited human resources, with local government employees and other local leaders often taking on multiple responsibilities and wearing several hats (Fleming 2020). The role those in planning-related positions play is critical in formal rural transit planning and provision, and can either encourage or discourage transit provision. However, the preconceptions of planners were noted as playing a potentially influencing role. For example, a planner may be influenced by the car culture that pervades rural areas to hold the preconception that all rural dwellers have access to a private vehicle, which is untrue (Transport Canada 2006). Such a preconception held by individuals who influence or make local decisions may have impacts on mobility equity amongst rural dwellers.

There was an emergent theme in the grey literature exploring the use of transit-friendly land use planning, urban design, and other practices (Ontario Ministry of Transportation 2012). An example of this is transit-oriented development (TOD), a development and planning approach focused on walkable, mixed-use forms of development (Land Use Planning & Policy 2005). These types planning process started to gain popularity roughly in 2010. This paradigm shift coincides with a focus on healthy communities from provincial planning organizations such as the Ontario Professional Planners Institute which released a call to action in 2007 for planners to advocate through their work for healthy communities (Ontario Professional Planners Institute 2007). There is an understanding that one’s built environment has implications on their mobility and health, and TOD is one way in which to achieve a healthy, transit-oriented community. However, while there are best practices and guidance for TOD available, these are primarily urban. While it is recognized that that low-density, non-mixed-use development is typical of rural areas, there is lack of a comprehensive blueprint or guidance for how rural areas can to implement such guidelines (Ontario Ministry of Transportation 2012).

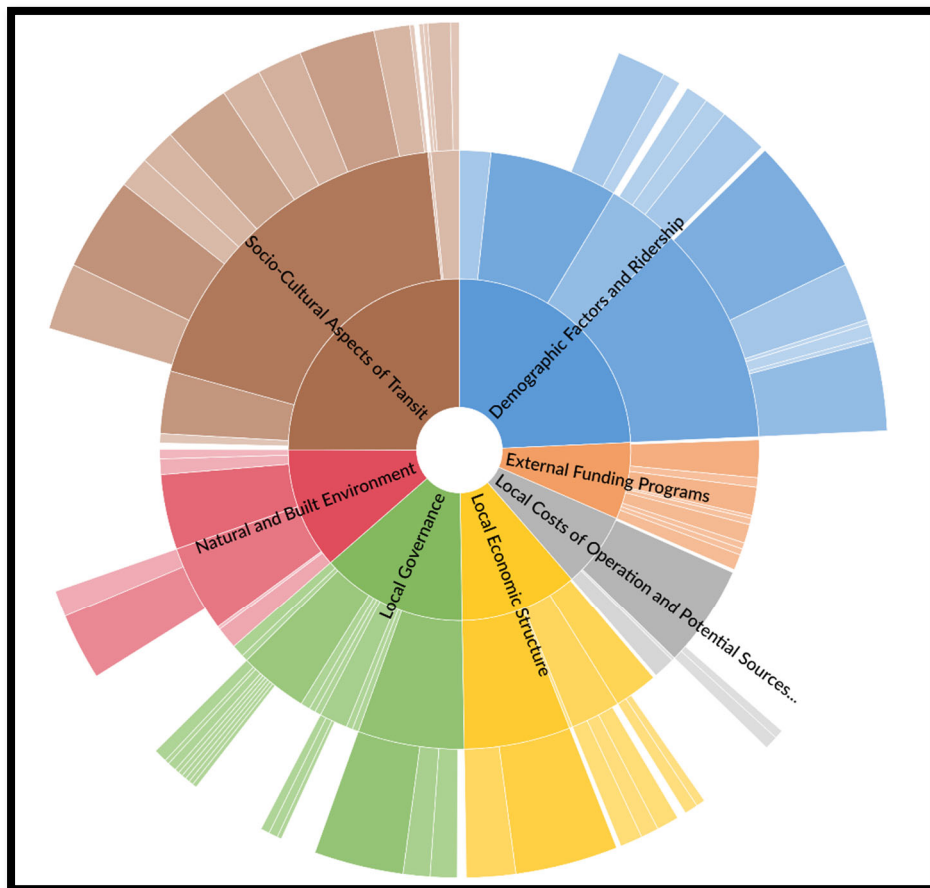
When it comes to transit solutions, rural communities were noted as potentially being better off making use of low hanging fruit, which could take the form of using existing assets (Burkhardt et al. 2004). For many rural areas that are considering a transit system, it would be helpful and encouraging for them to see successful examples of where existing assets were put to use in an efficient and innovative manner (Burkhardt et al. 2004). For some rural areas, the financial implications of a transit system are a non-starter. A few examples in the literature suggested making use of existing assets in the form of coordinating separate transit service providers as to increase efficiency, and to generally coordinate synergies between service providers (Burkhardt et al. 2004). Conversely, in the innovative examples in Section 4.4, going for the low-hanging fruit was an initiative seldom employed. Rather, case studies

tended to detail cases in which rural areas created and/or obtained new infrastructure in their pursuit to establish a transit system.

4.2. Analysis Results: Rural Barrier Typology

When establishing or maintaining a transit system, rural communities face unique barriers. In order to create a typology of barriers impacting rural communities (objective 2), we analyzed 43 documents that discussed these rural barriers. From our analysis, we identified seven major thematic categories of barriers to establishing and sustaining rural transit systems. The thematic categories are: 1) demographic factors and ridership; 2) socio-cultural aspects of transit; 3) the natural and built environment; 4) local costs of operation and potential sources of revenue; 5) local governance; 6) local economic structure; and 7) external funding programs. Each category has several sub-themes, each comprised of specific barriers. Each category is shown as a coloured section in Figure 1. The size of the coloured section indicates the number of documents where this category was found (i.e., a larger section equals more documents where this category was found) and the number of divisions indicates the complexity of sub-themes and specific barriers. Each category, and its respective sub-themes and examples of barriers are discussed in further detail below.

Figure 1: Hierarchy of Barrier Typology



Demographic Factors and Ridership

Of the 43 documents analyzed, 38 mentioned demographic barriers to establishing rural transit systems. Based on our analysis, these demographic barriers included factors related to characteristics of settlement, characteristics of actual and potential riders, social capital, and service duplication. The following paragraphs identify and describe the identified barriers.

With regards to settlement characteristics, we found that rural settlement patterns are identified as expected barriers across the literature and across rural places. As noted above, rural areas are characterized by low-density settlement patterns. This is one of the draws of rural living for many rural dwellers, but the lack of critical mass poses a barrier to bolstering an adequate level of ridership (Noxon Associates Limited 2009). This links to other thematic barriers, particularly financial factors, as cost tends to be greater for transit over greater distances, and cost rises even more when there are not enough users of the service to make providing the service worthwhile for the transit operator (Majkut 2011). The uniformity of this barrier across rural contexts will be further discussed in Section 4.5.

Ridership characteristics and needs also pose barriers to establishing or sustaining rural transit systems. Rural transit tends to be more expensive than urban transit due to the greater distance travelled and lower ridership levels (Kidder 2006). This can mean that service access (especially for vulnerable groups) can be cost prohibitive for potential users from accessing, and can limit the ridership available to sustain a service (Marr 2015). Specialized transit needs may also pose a barrier to establishing sustainable rural transit, as these needs can necessitate further driver training or specialized vehicles, both of which have associated costs (Federation of Canadian Municipalities 2005; Foord and Henry 2009). Interestingly, a community with a lack of transit need for the majority, yet a pro-transit ideology may face barriers due to the mismatch between ideology and actual demand (Columbia Basin Trust 2018). It is also evident within the literature that factors like gender and race play roles in whether or not people have access to, or able to safely use transit. Certain demographics (e.g., women fleeing domestic violence), particularly where there are overlapping and intersectional factors are often more at risk (Breen et al. 2021; Marr 2015). Equitable access, public transit and mobility are being further explored by other, related Mobility and Public Transit Knowledge Synthesis projects (Breen et al. 2021; Social Sciences and Humanities Research Council 2021).

Rural areas tend to have greater levels of social capital compared to their urban counterparts (Noxon Associates Limited 2009; Turcotte 2015). Strong social capital benefits rural areas, especially those with lower levels of financial capacity, due to the fact that it fosters volunteerism and other forms of community participation. Volunteer based rural transit systems are common (Lysenko 2012; McCue, Tolentino, and MacDonald 2014). Volunteer transit service, in the absence of more formal transit service, can decrease transit and mobility inequities (Noxon Associates Limited 2009). However, transit provided on behalf of a social network or by a not-for-profit agency face their own unique barriers in the sense that they are less stable than a formal transit service as volunteer services can be at the mercy of the availability and, in some cases, the vehicle type of the volunteer (e.g., vehicles accessible for those with mobility challenges) (McCue, Tolentino, and MacDonald 2014). Additionally, in the absence of coordination of transit services, there is the risk for duplication of service (Kar et al. 2014). With uncoordinated service, the efficiency of any one service is diminished as resources are not being used to their maximum capacity.

In communities with higher levels of social capital, there is typically greater community cohesion and support amongst community members. In this spirit, social capital fosters community care and community champions to push forward the discourse and understanding of the social good that transit provides in rural areas and break down misconceptions (Noxon Associates Limited 2009). In the same vein, it may be difficult for a rural community to garner political will or change public opinion on transit if there is not a community champion.

Socio-Cultural Aspects of Transit

We found that of the 43 documents analyzed, 35 identified sociocultural barriers to establishing rural transit systems. The socio-cultural barriers theme included factors related to the social or cultural environment that have the capacity to influence the perceptions and actions of the ridership and service providers, including car culture, perceptions (e.g., of transit, rural), level of service, and other factors. Sociocultural barriers represent an interesting challenge to innovation due to the fact that an innovation responding to this barrier type effectively must influence some sociocultural aspect of rural transit. These challenges, such as our perception of transit, can be engrained within us and are therefore more difficult to change (see Section 4.5). The following paragraphs provide an overview of the barriers identified.

The most common socio-cultural barriers that tend to relate to rural culture, including the preponderance of car culture, which was mentioned in almost half (20/43) of the documents, as well as perceptions of transit (7/43). It is commonly thought that all rural dwellers have access to a car, and therefore that the provision of transit service is

unnecessary (McCue, Tolentino, and MacDonald 2014; Roddick 2021a). However, this is an incorrect assumption and a source of conflict within the literature, as there is clear identification of several distinct groups that may not have access to a car or cannot drive (Marr 2015). As discussed in Section 4.1 these groups include: the elderly, who may not hold a license or who cannot drive any longer due to their physical and/or cognitive condition; youth, who cannot begin the process of obtaining a license until the age of 16 and may not be able to afford a car; women who may experience challenges to access vehicles or transit particularly in the case of abusive relationships; individuals belonging to low-income households; individuals with cognitive and/or physical disabilities; marginalized groups who may face discrimination and/or violence while using transit services; and recent immigrants, who may face discrimination while using transit, and may find transit difficult to navigate due to language barriers (Mahali and Ray-Yol 2020; Marr 2015). It is also important to be conscious of the impacts of intersectionality on transit access (Breen et al. 2021).

The assumption that all rural dwellers have access to a vehicle hinders the discourse surrounding the need for transit systems in rural areas, and eventually halts meaningful actions in this vein. This assumption is especially negatively impactful when it influences planning staff and decision makers (Transport Canada 2006). The car culture that dominates in rural areas and the resultant assumption that all rural dwellers have access to a vehicle feeds the notion that provision of transit services in rural areas is unnecessary and un-rural. To a lesser extent, we found that rural transit is perceived by some as being uncool or having other related stigma (Litman 2020; Ontario Ministry of Transportation 2012). This may relate to the fact that it is not socialized as an option and therefore it is not a cultural norm. However, the literature also identified some initiatives intending to change this. As recently as 2021, BC Transit proposed free transit for those 12 years old and under (Government of British Columbia 2021). In the future, it may be worth exploring how such a program may have changed perceptions of transit and how it impacted demand and supply of transit amongst youth.

We found variety in the perceptions and actions of the ridership pool that pose barriers to rural transit. The most important factor, cited in 31 of 43 documents, was the perception of level of service provided. For an existing or proposed transit service to garner ridership, the service must be on par, or as close to on par as possible, to the convenience offered by a private vehicle in terms of: cost, reliability, time, and frequency of service (Gorecki and Liepa 2018). If transit, either existing or proposed, is not viewed as being as convenient or similar in convenience to a private vehicle, it will be difficult to build ridership, as many individuals may instead use their social network to reach a destination even if they do not have access to their own vehicle, or continue unsafe practices like hitchhiking (Breen et al. 2021; Co+Host 2016). Informal social network transit provision is helpful purely from a mobility lens, it can be disruptive to the establishment of alternate transit services in rural areas that may stand to provide more stable service (Co+Host 2016).

Aspects of rural transit systems that are related to convenience and therefore to service demand are autonomy, scheduling, information about the service, and the feelings of comfort and safety while using the service. A transit service must meet a diversity of demands related to where the ridership wants to go and when (Litman 2020). Fixed-route rural transit service, while reliable, forces riders to plan their movements around transit, and is therefore less flexible. Within rural transit systems that operate on an on-demand basis there is greater flexibility to go where one wants and when (Chhay, Grollman, and Wayns 2008). However, it should be noted that on-demand service usually requires pre-booking well ahead of time, which may negate the spontaneous intention of on-demand service. In many instances, fixed-route rural service does not operate on weekends or in the evenings, with evening service generally considered unfeasible in smaller communities (e.g., populations less than 10,000) (BC Transit 2018). This aspect of scheduling potentially impedes the mobility of those who work non-traditional hours, as well as those wanting to engage in social activities in the evenings or on weekends (Malo et al. 2018).

The lack of information about existing service can also be a detriment to attracting ridership (BC Transit 2018; Co+Host 2016). It also depends where and how information is provided. For example, the need for significant improvement to broadband access and cell phone service in rural areas remains, so information disseminated online or through the form of an app may not reach the intended audience (Bosworth et al. 2020; Weeden and Kelly 2020). Depending on age and means, riders may not have access to a smart phone, and therefore any information accessible via app, such as real-time scheduling information, will be inaccessible for riders without such a device or without the related digital

capacity. Digital innovations appear within the literature (BC Transit 2020; Federation of Canadian Municipalities 2005; Ontario Ministry of Transportation 2012). However, the push to digital should be approached with consideration in rural areas, and a hybrid between hard copy and digital information will likely be a requirement for disseminating information to the maximum level of ridership.

Comfort and safety are paramount considerations that influence one's decision to use transit. If it is perceived that one's experience using a particular transit service will not be comfortable or safe, then the individual may not use the service (Ontario Ministry of Transportation 2012). However, comfort and safety do not only pertain to when a rider is using the service, as it also includes the "first and last mile," which account for the trip from the rider's initial position to the transit stop as well as their trip from the transit stop to their destination (Ontario Ministry of Transportation 2012). If the first and last mile is not, or is not seen to be, safe or even possible, then the individual may not use the service. Safety is influenced by factors like a lack of lighting, the establishments/landscapes that must be passed on the way, or a lack of transit-supportive infrastructure, such as sidewalks or active transportation infrastructure (e.g., bike lanes). Other factors include existing or potential for discrimination and/or violence experienced during the ride, or a lack of implementation of accessible fixtures for boarding and alighting the vehicle.

There are also socio-cultural barriers related to service providers, in terms of their criteria of who can use the service, as well as the extent to which different service providers are coordinated. Oftentimes, rural transit providers will target a specific demographic to provide service to, whether it be seniors or those seeking out medical care (Lysenko 2012). Those who do not meet these requirements cannot use this service, thereby limiting the potential efficiency and benefit of the service. Those that do meet the criteria may still face barriers in using the service, as filling out applications to prove their eligibility take time to process (Kar et al. 2014).

The Natural and Built Environment

Of the 43 documents analyzed, 31 discussed barriers to establishing rural transit systems related to or inherent in the natural and built environment. Based on our analysis, natural and built environmental barriers included factors related to land use development and planning, infrastructure, climate, and terrain. Section 4.5 discusses the common nature of the challenges brought on by the rural built environment and the seasonality of climate in Canada, as well as the ways in which terrain and climate extremity differ across Canada. The following paragraphs will describe the identified barriers.

The existing or pre-imposed physical infrastructure and planning of rural areas presents as a fundamental barrier to establishing transit (Transport Canada 2006). This relates to the demographic theme in terms of a lack of density. For example, the preponderance of dispersed land use planning in rural areas contributes to land uses separated by large distances. As a result, transit services must travel over greater distances to reach destinations that rural dwellers want to go – either creating large routes or a larger number of routes, which is costly over large distances. In contrast, areas of more compact development higher density, such as a main street or core with a concentration of businesses can make practical transit hubs (Noxon Associates Limited 2009). As rural areas are generally bereft of this density, there is a lack of incentive to provide transit as a service due to the corresponding lack of related challenges (e.g., traffic, smog) that are present in more urban areas. Planners are in the position to influence land use development patterns as well as mobility within these patterns. Rural transit can be a non-starter if it is of the opinion of the planner or those performing transportation planning duties that all rural dwellers have private automobiles, and therefore transit is not necessary (Noxon Associates Limited 2009).

Beyond the challenge of distance and density, the first and last mile problem as described above a barrier to use of a service, and is exacerbated by land use development patterns and infrastructure. There tends to be a lack of transit-oriented development in rural areas especially in terms of active transportation infrastructure, primarily due to car centric planning (Ontario Ministry of Transportation 2012). Active transportation infrastructure influences whether a potential rider is physically able to get to and from a stop and/or whether they feel safe getting to and from the stop (Bosworth et al. 2020; Ontario Ministry of Transportation 2012). For example, if one has to traverse along the shoulder of a highway with a speed limit of 80 km per hour to get to a transit stop, they may choose not to take transit. As noted in the section above, lack of infrastructure like sidewalks and lighting also plays a role. Additionally, it is important to

note that many new transportation options (see Table 1), or technologies related to transit, rely on connectivity – broadband and cell phone service, posing a challenge in underserved rural areas (Bosworth et al. 2020).

Beyond land use and infrastructure, a more general environmental barrier that impacts most of Canada is that of climate and terrain, of which the impacts can range dramatically across rural areas. This can include temperature as well as precipitation (e.g., snow), which can impact the basic transit infrastructure required (e.g., snow tires for transit vehicles), the conditions of roads (e.g., snow removal), and the willingness of riders, particularly in cases where active transit (e.g., walking or biking) is required for the first or last portion of the journey. Similarly, terrain in rural areas can present as barriers. For example, in rural areas with many lakes, a transit service will have to go around these obstacles, thereby increasing the distance, and subsequently cost, of the trip. The diversity of Canada’s physical terrain (e.g., coastal, mountains, prairies) ensures a range in barriers.

Local Costs of Operation and Potential Sources of Revenue

Of the 43 documents analyzed, 28 discussed financial barriers to establishing rural transit systems. Based on our analysis, identified financial barriers included the cost and expense related to transit services and the smaller tax bases and revenue sources of rural communities. The following paragraphs describe these identified barriers.

The high service cost to provide rural transit is the central financial barrier from a government and/or service provider standpoint (Transport Canada 2006). This high cost is not only upfront (e.g., purchasing vehicles), but long-term (e.g., maintenance, salaries) (Transport Canada 2006). The barrier of cost was ubiquitous across those documents that discussed financial barriers (28/28). As discussed above, high transit service cost in rural areas is mainly resultant of low population density and dispersed land uses, meaning that any service will have to travel over longer distances with less ridership, or revenue generation. While innovations can help to lessen this challenge, the nature of rural places means it is unlikely to be solvable. Rural transit systems are generally considered unlikely to be profitable using traditional return on investment calculations. Rather, it is important to account for a broad range of benefits – financial and otherwise, including those that are more challenging to measure (e.g., access to services) (Economic Development Research Group 2020; Godavarthy, Mattson, and Ndembe 2014). The general rural nature of this barrier is further discussed in Section 4.5

High service costs are exacerbated by the fact that rural areas have smaller populations (Kidder 2006; Transport Canada 2006), which means that not only is there a smaller potential ridership, but there are less dollars available to be allocated toward providing a publicly-funded transit service (e.g., fewer dollars as a result of a smaller local tax base) (Kidder 2006). Both can result in negative public perceptions of public transit systems. Additionally, as noted above, the tax dollars that are collected locally will also be in competition for where they get directed due to limited financial resources.

Local Governance

Of the 43 documents analyzed, 27 discussed governance-related barriers to establishing and sustaining rural transit systems. Based on our analysis, governance barriers included factors related to capacity, competing needs and priorities, policy and regulation, jurisdiction, and other related factors. Section 4.5 discusses the general rural nature of these barriers, as the majority of them are common within rural governance structures with respect to transit provision. The following paragraphs will go on to describe these barriers.

Of all barriers identified relating to governance, capacity was the most commonly cited barrier – impacting the ability to initiate, operate, and maintain transit systems. Although rural areas tend to have a large amount of social capital, this can hide gaps in other forms of capital. For example, rural local governments generally have limited human, time, and financial capacity (Vodden et al. 2019). The responsibilities of local governments have grown over time, but without compensatory resources to adequately address these growing responsibilities (Polèse 1999; Savoie 2003). This can result in creased burden on social capital.

Not all local governments in rural communities have staff, and rely on elected officials and volunteers. Where there are paid staff, it is not uncommon for employees of rural local governments to have broad responsibilities, including handling multiple portfolios. As a result, local government employees may not be able to take on specialized work, such

as transportation coordination (Kar et al. 2014). Where there is planning capacity, rural planners may be responsible for all aspects of planning, or may hire external consulting firms (Vodden et al. 2019), so there may not be time to focus on developing a transit plan or to conduct research on funding options. This type of capacity limitation specific to planning, makes opportunities like transit-oriented development (see Section 4.1) difficult.

Additionally, with limited resources and competing needs local governments have to determine where to allocate funds between a variety of services. As discussed above in the socio-cultural theme, rural transit can be a polarizing topic, which can influence available political will (Beck and Mis 2010). Decision makers may not have the evidence to understand the local benefits of transit (Beck and Mis 2010). This can make it more challenging to support, particularly if there is competition amongst local priorities (Kar et al. 2014).

Jurisdiction for transit is shared across all levels of government and transit policies and regulations can exist locally, provincially/territorially, and federally. Policy and regulation take time to change and may unintentionally hinder rural transit in a variety of ways. Policy such as the one that prevents ridesharing services (e.g., Uber) is one example. Another example are policies in place related to accessibility. In Ontario all vehicles used for public transportation are required to be AODA (Accessibility for Ontarians with Disabilities Act) compliant certainly increases transit access while providing mobility justice (Kar et al. 2014). While intended to promote accessibility, this policy has an unintended consequence of preventing informal volunteer services (that may not have the funds to acquire an AODA-compliant vehicle) from providing rural service, as volunteer service providers are limited by the size of their private vehicle (Kar et al. 2014). There are myriad related policies and regulations that both positively and negatively influence transit, as well as influencing related support programs (see Section 4.3).

Related to both the issues of capacity and jurisdiction are barriers related to coordination. The lack of regional connection (e.g., transit systems that go between communities, as opposed to simply within a community) is a critical rural challenge (Roddick 2021b, 2021a). Jurisdiction can play a role as a barrier in establishing regional transit service. With a regional service, agreements would have to be made amongst the regions that the transit service makes stops in (BC Transit 2018). It can also be challenging to find financial support for regional or inter-community transit as a result of jurisdictional differences between the federal and provincial/territorial governments (Roddick 2021a). Even within a single community, the coordination of existing services is a challenge. Treating services as one family rather than as splintered entities would likely gain efficiencies and attract greater ridership compared to a framework where each service acts independently and therefore maximize the efficiency of labour and capital (Kar et al. 2014). Under such a framework, a service that was once solely for seniors would be able to provide service to youth, for example, that desire to travel on the same route. However, jurisdictional challenges, as well as related legal barriers can prevent this type of coordination (Lysenko 2012).

Local Economic Structure

Of the 43 documents analyzed, 27 discussed economic barriers to establishing rural transit systems. Based on our analysis, economic barriers included factors related to workforce, commuting and travel patterns, and economic foundations and structure. These factors are identified and discussed below.

Related to workforce, barriers included those related to availability, as well as skills and training. One of the identified barriers relates to age and available labour. On average across Canada, rural areas tend to have aging populations (Kidder 2006). Communities with greater proportions of retirees identified a smaller available pool to choose from for employing individuals in the transit service industry (Roddick 2021b). Even where there is an available labour pool, barriers were identified in terms of the skills that are required by transit service operators. This includes basic skills requirements (e.g., licensed drivers or mechanics), as well as competition for those skills (e.g., similar positions with higher pay in other sectors) (Co+Host 2016). More nuanced skill sets were also identified. For example, it was found that in some rural areas, there is a skillset mismatch in that while there are licensed drivers, they may not have the soft skills required when providing a public service to clients (e.g., licensed individuals moving from heavy industry to transit) (Malo et al. 2018). These soft skills are required to create transit environments that are suitable and a safe and inclusive environment (Marr 2015).

Economic structuring within and around a community impacts local commuting and travel patterns. For instance, a commuter-based economy in an urban-adjacent rural area will require that an inter-community transit service that shuttles employees between their rural origin and urban place of employment (Canadian Urban Transit Association 2005). Where there is a resource-based economy, shift work can impact intra-community travel needs and patterns, necessitating consideration in route planning and schedules, as well as the potential for partnerships between transit providers and employers (Kar et al. 2014). In the case that a remote resource extraction project is operating on a fly-in-fly-out (FIFO) basis, the cost of transit, as with other local necessities, may be higher. Other local economy permutations can also impact transit needs. This includes the number of individuals working remotely, purported to be growing in rural areas during the COVID-19 pandemic (Rich, Hall, and Nelson 2021). This also includes seasonal economies, such as tourism, where there will be varying levels of supply and demand throughout the high season and shoulder season, which necessitates careful management of infrastructure and human resources for this flux (Canadian Urban Transit Association 2005). Similar to local economies overall, rural mobility patterns are dictated by factors of place, which will be further discussed in Section 4.5.

External Funding Programs

Of the 43 documents analyzed, 21 discussed funding barriers to establishing rural transit systems. Based on our analysis, funding barriers included factors related to funding presence, coordination, structure and type, timeline, and related requirements. The following paragraphs provide an overview of these barriers, with further analysis provided in Section 4.3.

A common theme that emerged was that there is not enough funding with a focus on rural transit systems and that the funding that is offered does not match what is required (Transport Canada 2016). For example, capital funding is often available to purchase vehicles, but not operational costs. However, as described in the financial section above it is these long-term operational costs that are cited as representing a large and challenging proportion of the cost of a transit system (Levesque 2020). Inefficiencies may also arise when funding is not effectively coordinated in a way that will support different aspects of rural transit provision/maintenance (Kar et al. 2014).

The duration of funding can also render rural transit project a non-starter. Funding that is given consistently over a longer period of time is more attractive than funding given at one point in time, as the former aids in making long-term, sustainable rural transit more feasible (Levesque 2020). As noted above, rural transit programs are unlikely to be profitable based on a strict financial measure.

Special funding criteria that must be satisfied in order for the funding to be granted can often pose as a barrier, effectively making funding exclusive. In certain instances, funding criteria may not match up with local realities (Transport Canada 2016), which demonstrates the difficulty of making top-down transit funding responsive to diverse local needs, rather than responsive to what constitutes as “general rural” needs. Additional structural barriers related to funding programs are expanded upon below.

4.3. Analysis Results: Existing Transit Support Programs

In response to objective #3 (explore existing transit support programs to understand gaps and challenges), we identified a preliminary list of support programs (see Table 2). It is challenging to identify a complete list due to the overarching complexity of the funding landscape. For example, many relevant programs are linked, or are different streams within an overarching program. Additionally, more general community funding programs (e.g., those offered through charities or civil society organizations) may not have been identified due to the focus on transit specific supports.

Of the identified programs, all are public (i.e., the programs are led by government). The majority involve the federal government, followed by involvement of provincial/territorial governments, with the remaining involving local (regional or municipal) governments. Nearly all of the identified programs are grant programs, with two that include loans. Although difficult to determine in some cases, the majority of programs were multi-year. Similarly, nearly all identified programs fund capital purchases. Although some included funds for studies as well as capital purchases, few allowed for operational funding.

With regards to program goal or area of focus, many of the identified programs included, but were not exclusive to transit, meaning eligible applicants could also draw on these funds in support of other types of infrastructure. Many of the programs aimed to create positive environmental impacts. There were also a small number of programs specifically related to COVID-19, or specifically aimed as Indigenous applicants.

Table 2: Identified Programs

Program Name	Level of Government
CleanBC Communities Fund	Federal/Provincial
Community Economic Recovery Infrastructure Program	Provincial
Community Transportation Assistance Program	Provincial
Community Transportation Grant Program – Municipal Stream	Provincial/Municipal
Green Infrastructure Fund - PAN-CANADIAN FRAMEWORK - on Clean Growth and Climate Change	Federal/Provincial/Territorial/Municipal
Green Municipal Fund (FCM) - Capital Project: Transportation networks and commuting options	Municipal/Regional or Provincial/Territorial
Green Municipal Fund (FCM) - Capital: Transportation networks and commuting options	Municipal/Regional or Provincial/Territorial
Green Municipal Fund (FCM) - Pilot project: Reduce fossil fuel use in fleets	Municipal/Regional or Provincial/Territorial
GreenTRIP - Green Transit Incentives Program	Provincial
Integrated Bilateral Agreement - Public Transit, Regional Development Corporation	Provincial
Investing in Canada Plan - Infrastructure Canada - Canada Infrastructure Bank - Zero-Emission Buses: Challenge and Opportunity	Federal
Investing in Canada Plan - Infrastructure Canada - Public Transit Infrastructure Fund - Public Transit Infrastructure	Federal
Investing in Canada Plan - Investing in Canada Infrastructure Program	Federal/Provincial/Territorial
Investing in Canada Plan - Investing in Canada Infrastructure Program - British Columbia - Rural and Northern Communities Infrastructure	Federal/Provincial
Investing in Canada Plan - Municipal Asset Management Program	Municipal
Investing in Canada Plan - Municipalities for Climate Innovation Program	Municipal
Investing in Canada Plan - National Trade Corridors Fund	Federal
Investing in Canada Plan - New Building Canada Fund - Provincial-Territorial Infrastructure Component – National and Regional Projects	Federal
Investing in Canada Plan - New Building Canada Fund - Provincial-Territorial Infrastructure Component – Small Communities Fund	Federal
Investing in Canada Plan - The Canada Community-Building Fund - Formerly the Federal Gas Tax Fund	Federal/Provincial/Territorial /Municipal
Investing in Canada Plan - The Canada Community-Building Fund (Formerly the Federal Gas Tax Fund Small Communities Transportation Fund)	Federal/Provincial/Territorial /Municipal
Northern Transportation Adaptation Initiative Program	Federal
Program to Advance Connectivity and Automation in the Transportation System	Federal
Rural Transportation Pilot Program	Provincial

Program Name	Level of Government
Safe Restart Agreement funding	Federal/Provincial/Territorial

In terms of gaps and challenges related to rural access to existing rural transit supports and programs, six thematic categories were identified through our analysis: 1) challenges with access to information surrounding to programs; 2) the extent to which programs account for unique rural considerations; 3) exclusionary criteria; 4) expenses that are deemed to be eligible under the funding framework; 5) consideration for the human resource capacity of the funding recipient; and 6) consideration for the financial resource capacity of the funding recipient. Each of these themes is discussed below in order of prominence.

Accessible Information

One of the emergent themes from the analysis was availability of information, specifically the availability of details as to the nature of the program (e.g., how to apply, where to apply, deadlines, inclusionary and exclusionary criteria). Based on the content analysis the lack of accessible information presents a prominent challenge for rural applicants. As noted in previous sections, rural communities typically face shortages in capacity, particularly human capacity. If a student research assistant, with dedicated time to identify program details, faced challenges finding clear and available details, it is reasonable to assume that communities would face the similar challenges, which would be exacerbated where communities lack dedicated staff specific to grant writing or transit.

In order for a funding program to be accessible generally, but in particular for rural communities, the related information must be easy to locate and access, as well as clear. Otherwise, those searching for such information may prematurely cease their search in frustration, leading to low numbers of rural applications.

Rural Considerations

Funding programs were assessed on the basis of whether or not they explicitly accounted for rural considerations, including consideration of unique rural needs, rural-targeted funding streams, or dedicated rural funding. Based on the content analysis and number of items coded, we see that rural considerations, or lack thereof, is also a substantial barrier to establishing rural transit systems. Few identified programs were rural specific or included dedicated rural funding.

Our assessment of funding programs revealed that the majority of transit funding programs are inherently skewed toward urban environments, either passively (e.g., as a result of factors like the capacity required to apply) or actively (e.g., specific criteria). For example, the consideration of ridership as a factor in determining funding eligibility. Such a consideration automatically disadvantages rural areas due to their lack of density. One can argue, however, that this makes rural transit systems in even greater need of funding due to the fact that low ridership over long distances in rural areas drives up the cost of the service for the provider.

Exclusion

Funding programs were assessed on the basis of whether or not they included exclusionary criteria based on the geography or target audience. Based on the content analysis the majority of funding programs analyzed did not exclude any particular rural geography or target audience. The lack of specificity and general nature of funding programs mean that they could apply to a breadth places and communities, including the diversity across rural. Such flexibility in funding programs are generally what enable the innovative examples of rural transit discussed in Section 4.4. However, while rural communities are rarely explicitly excluded, as discussed above and below, this does not remove the challenge of implicit or inadvertent exclusion.

Eligible Expenses

Funding programs were assessed on the basis of eligible expenses. This included whether there was flexibility in terms of expenses covered or prescriptive limiting factors in terms of expenses that could be covered, whether the funding coverage was long-term and/or consistent or was short-term and/or single-use, as well as any other imposed limitations. Based on the content analysis we identified a range of factors related to expenses.

As noted above, the majority of identified funds focus on funding capital purchases. Such capital costs include infrastructure such as buses or other vehicles to be used within transit system. However, as noted in sections 4.1 and 4.2, it is the operational costs that are most often the limiting factor in the establishment and implementation of rural transit services. We found that the costs of operating rural transit systems, including human resources, are typically not eligible expenses. While the inclusion of capital assets is common amongst eligible expenses for rural transit funding, this type of funding expense represents funding at a single point in time for a tangible resource. In order to have a sustainable service there is a need for long term and/or consistent funding for day-to-day operations, as without this type of funding, the capital infrastructure is impractical due to the mismatch between the level of funding for it and the level of funding for the human resources that make its operation and efficient use possible.

Human Capacity

Funding programs were assessed on the basis of whether human capacity related criteria (e.g., a specific skillset or existing plan) were required in order to secure funding. The majority of the funding programs analyzed did not convey that a specific level or type of human capacity was required, aside from the capacity required to identify, understand, and create the application. However, it is best to interpret this finding with caution as rural local government employees often take on multiple roles in their work, not specializing in one area of expertise. For example, in the case of rural planners, it is rare that a rural local government would have a planner dedicated to transportation planning. A rural planner, if they exist, may not have the specialized knowledge and skills required to implement a transportation plan, especially if they are the only planner. These findings are consistent with those found in Section 4.2.

Financial Capacity

Lastly, funding programs were assessed on the basis of whether they considered factors related to financial capacity, including limited available financial resources, sliding scale based on size and/or capacity, requirements for upfront financial contributions from applicants, and long-term financial burden. Based on the content analysis there is minimal consideration for financial capacity in existing programs. The majority of funding programs do not cater toward the financial capacity that is typical of rural areas, with the consideration for financial capacity being largely absent. In this way, funding programs are more geared toward transit system establishment in urban areas where finance is not as likely to pose such a limiting factor. Upfront costs and anticipated long-term financial burdens have the potential to effectively cease any sort of meaningful conversation or progress toward the establishment of transit systems in rural areas, as these make rural transit appear to be cost-prohibitive and a non-starter. This, of course, is also dependent on other factors, such as political will, the extent to which transit is recognized as a public good, as well as the political leaning of the area (see Section 4.2).

4.4. Analysis Results: Existing Rural Transit Innovations

Based on the content analysis we compiled a list of 117 unique rural Canadian examples where communities met barriers with innovative solutions. We took a broad approach to innovation, including new or improved products, processes, or organizational methods (Working Party of National Experts on Scientific and Technology Indicators 2005). “New” was also understood to be new to a particular place or application. All 117 examples were plotted onto a publicly accessible web map, which can be found at:

<https://selkirk.maps.arcgis.com/apps/webappviewer/index.html?id=17c858b73a014fbfa55d712141847a73>.

For each example we collected and mapped the following attributes:

- Proximity to urban centres;
- Transit system type;
- Transit system ownership;
- Geographic scope of the service; and
- Population and population density.

Of the 117 cases, three innovative cases were chosen to conduct further analyses and are presented on the map as rural transit example vignettes (see call out boxes) (Federation of Canadian Municipalities 2021a; Government of British Columbia n.d.; Partners for Climate Protection 2021a).

This list of innovations should not be considered exhaustive. For example, the project team acknowledges that there are examples of rural transit systems that have not been publicly documented and therefore could not be included as primary data collection was outside the scope of this project. Other examples of transit services were omitted from our list (e.g., BC Ferries) as while they include rural, they are not rural community or region specific. The following sections will summarize the details of the examined innovative systems.

Proximity to an Urban Centre

Each example was mapped in terms of proximity to an urban centre. For our purposes, an urban centre was defined as a population of over 100,000 people.

Examples were classified as one of the following classifications (see Figure 2):

- 1) Urban Adjacent: less than 200 km away from an urban centre
- 2) Rural: over 200 km away from an urban centre
- 3) Remote: significant distance (over 800 km) away from an urban centre, or separated by a physical barrier (e.g., fly in or boat in)
- 4) General rural/urban adjacent: urban adjacent, but it also serves surrounding rural communities.
- 5) Urban: based in an urban centre, but it also serves the surrounding urban adjacent rural areas.

The following summarizes trends observed based on proximity to urban centres.

Amongst the innovative examples, the most common were in rural areas adjacent to urban centres (58/117). If those classified as general rural/urban adjacent (4/117) and urban (2/117) are added, the total is 64/117 or 55% of all examples. Of these examples, the largest cluster is seen in southern Ontario. This cluster of services is likely explained by close proximity and travel patterns, whereby individuals either choose to, or must to live further from the Greater Toronto and Hamilton Area (GTHA) where they can pay lower rents; as a tradeoff, they commute via public transit into the GTHA for employment (Leach et al. 2007). There is also a cluster of urban adjacent cases in British Columbia's Lower Mainland, Capital Region, and Kelowna area.

The second most common was the general rural classification (47/117). Examples within this classification are primarily found in the Atlantic provinces or British Columbia (BC). The most prominent cluster of general rural cases is found in British Columbia, likely as a result of BC Transitⁱⁱ, a provincial Crown corporation that, in collaboration with Local Government and First Nations, delivers public transit services (BC Transit n.d.).

Of the 117 identified examples, only six were classified as remote. Remote examples were found in the Yukon, northern BC, Haida Gwaii, and along the Pacific coast

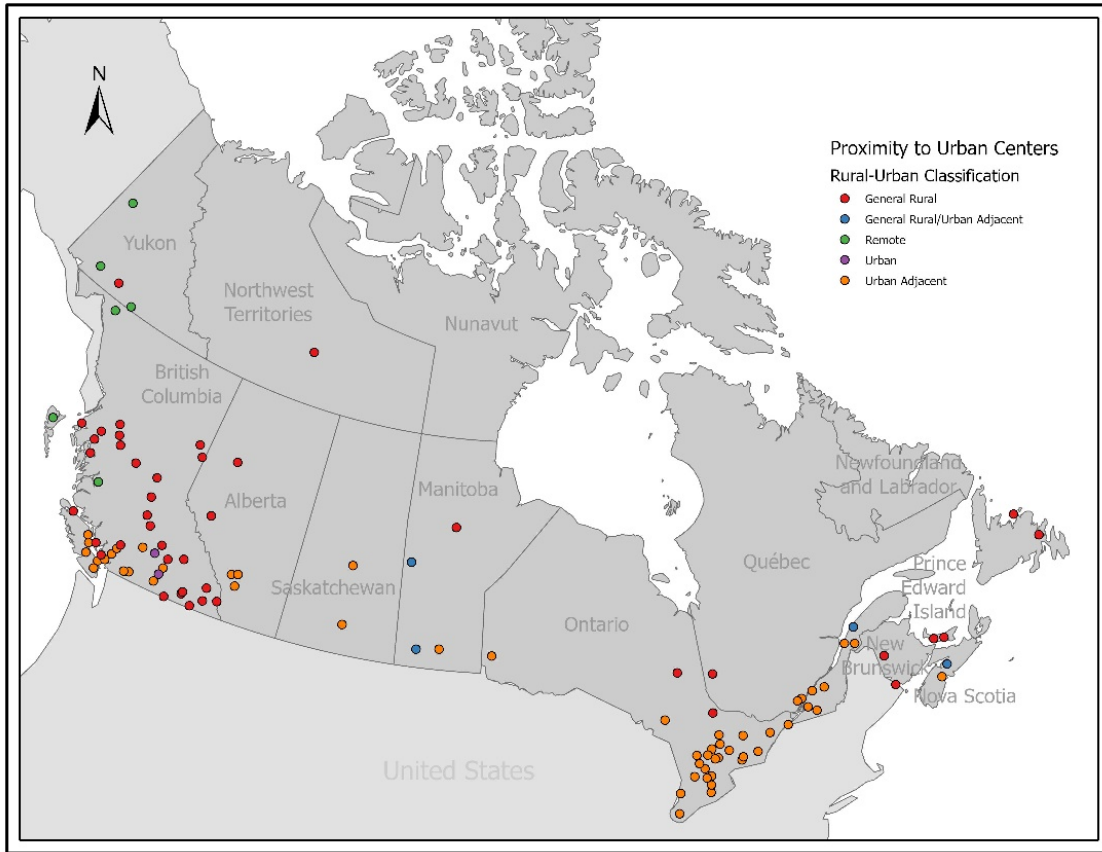
Vignette #1: Cochrane On-demand Local Transit, Cochrane, AB

COLT is the first of its kind - a responsive on-demand, all-day transit system. Community input resulted in an innovative approach to the transit challenges and the successful implementation of a low-cost alternative transit system specifically designed to meet the community's needs. By booking a specific date, time and location through their mobile app, website, or phone, the bus will only go where it has been requested, avoiding unpopulated stops and allowing it to operate at one-third the cost of traditional fixed-route systems. Efficient delivery of the service is based on the implementation of innovative software which provides up to the minute real-time routing data.

COLT's popularity is a testament to its success, with 20,000 passenger trips within the first 5 months benefiting the environment with an estimated 12 tonnes of CO₂ reductions. Prioritizing accessibility and affordability, COLT uses wheelchair-accessible buses and allows bookings by phone for those without internet access, while still offering one of the lowest monthly pass prices in Alberta. While Cochrane may not be seen as rural, this small city's approach offers transferable lessons as the agility of the on-demand system allows for matching service levels to ridership demand, resulting in less lost revenue while still meeting service demands.

ⁱⁱ BC Transit is one of few such large-scale transit authorities in North America.

Figure 2: Innovative Examples Classified by Urban Proximity



Transit System Type and Ownership

Examples were mapped by system type and ownership, summarized in Tables 3 and 4, with trends discussed below.

Table 3: Innovative Examples by System Type

System Type	Number of Examples
Combination of fixed-route and on-demand	46
Fixed-route	30
On-demand	18
Multimodal	10
Carshare	8
Rideshare	4
Flex route	1

Table 4: Innovative Examples by Ownership

System ownership type	Number of Examples
Public partnership	45
Public	43
Not-for-profit	14
Public-private partnership	9
First Nations	2
Private for profit	2
First Nations private for profit	1
First Nations public-private partnership	1

BC is dominated by partnerships between BC Transit and local governments, First Nations, and contracted transit service providers. BC Transit related service types include fixed-route, a mix of fixed-route and on-demand, and a small number of on-demand (see Figure 3). This trend highlights the importance of BC Transit as a creator of economies of scale when it comes to rural transit, where partners benefit by gaining access to BC Transit’s resources, including infrastructure, human capacity, and financial capacity (BC Transit 2020). The tradeoff of BC Transit’s economies of scale appears to be that that service types are often less flexible or innovative, demonstrated by the dominance of traditional transit.

Ontario has the greatest diversity in terms of service and ownership type (see Figure 3). While public ownership prevails in Ontario, there are also examples of not for profits, public-private partnerships, and public partnerships. The diversity of service types includes: a combination of fixed and on-demand, on-demand, flex, fixed, rideshare, and multimodal.

Moving east to the Atlantic provinces, there is a split between transit services that are owned by the public and not for profit sectors, with a minority of ownership types being public-private partnerships. Not for profits dominate service delivery (see Figure 3). With the variety of ownership types, as well as the relative freedom that comes with not having to adhere to the structure, legislation, and regulation guiding a Crown corporation like BC Transit, comes variety and innovation in service type, with cases representing fixed, on-demand, multimodal and car share service types. It appears that that the variety of services offered in the Atlantic provinces are due in part to the more flexible nature of one of the dominant ownership regimes. Operationalized, this flexibility offers a variety of service modes that are responsive and flexible to local needs and conditions (Lysenko 2012). However, it is also important to note, that while potentially more flexible and innovative, the not for profit systems are also more precarious.

We were able to identify few examples in the Prairie provinces or in the Territories, and thus trends are challenging to identify. It is unclear if this is a result of limited publicly accessible information or a result of few existing examples. In the past Saskatchewan had the Saskatchewan Transportation Company, a Crown corporation similar to BC Transit, however, it was shuttered in 2017 (CBC Radio The Morning Edition 2017). The majority of services are owned either by the public sector or by First Nations. Due to the remote nature of the rural north, creativity in service type is necessary for the sustainability of any transit service as the greater distances between destinations lessens the viability of a fixed-route service (Roddick 2021b, 2021a). Despite the challenge that rural fixed-route services, particularly in rural remote areas, there are a couple of examples in the Yukon. These fixed-route services are made more robust with the addition of multimodal services servicing the vicinity of Whitehorse. In the Northwest Territories, a more flexible service option of a mixture of fixed and on-demand service exists for the Yellowknife area.

Vignette #2: Highway 16 Action Plan - BC North Coast and Interior

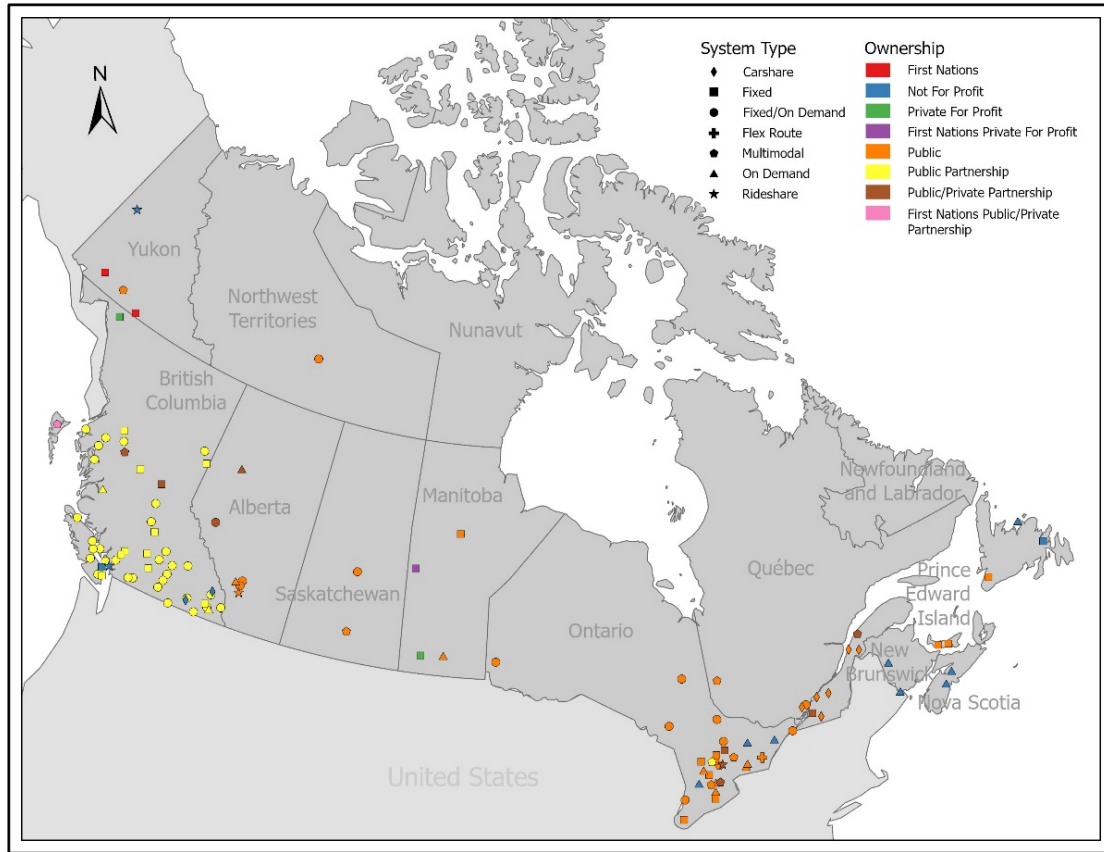
The Highway 16 corridor spans from Prince Rupert to Prince George and connects many rural and Indigenous communities. Known as the “Highway of Tears”, Highway 16 has been the site of disappearances and murders of Indigenous women. British Columbia’s Ministry of Transportation and Infrastructure allocated \$10.2 million in funding through 2024/25 to support a Five-Point Action Plan with the goal of implementing an innovative multi-faceted approach focused on community needs, including: safety, education, and economic opportunity.

BC Transit will be working alongside existing long-distance transit providers while leveraging its shared service model with expansion into the surrounding rural communities. The focus will be on establishing an inter-community transit system with return same-day transportation from smaller communities to their nearest larger neighbours.

Twelve remote and Indigenous communities will also receive funding to purchase community vehicles in addition to four years of operational support. Routes, schedules, and bus fares will be set based on the specific needs of communities. Indigenous peoples will receive driver education, supporting individual mobility, as well as employment and ride sharing opportunities.

Rider and road safety will be improved with the installation of cameras, bus shelters, and pull-outs along Highway 16. A collaboration working group will be formed focused on coordinating existing private, public, and not for profit organizations to ensure the locals are provided with safe and reliable transit.

Figure 3: Innovative Examples by Ownership and System Type



Service Geography

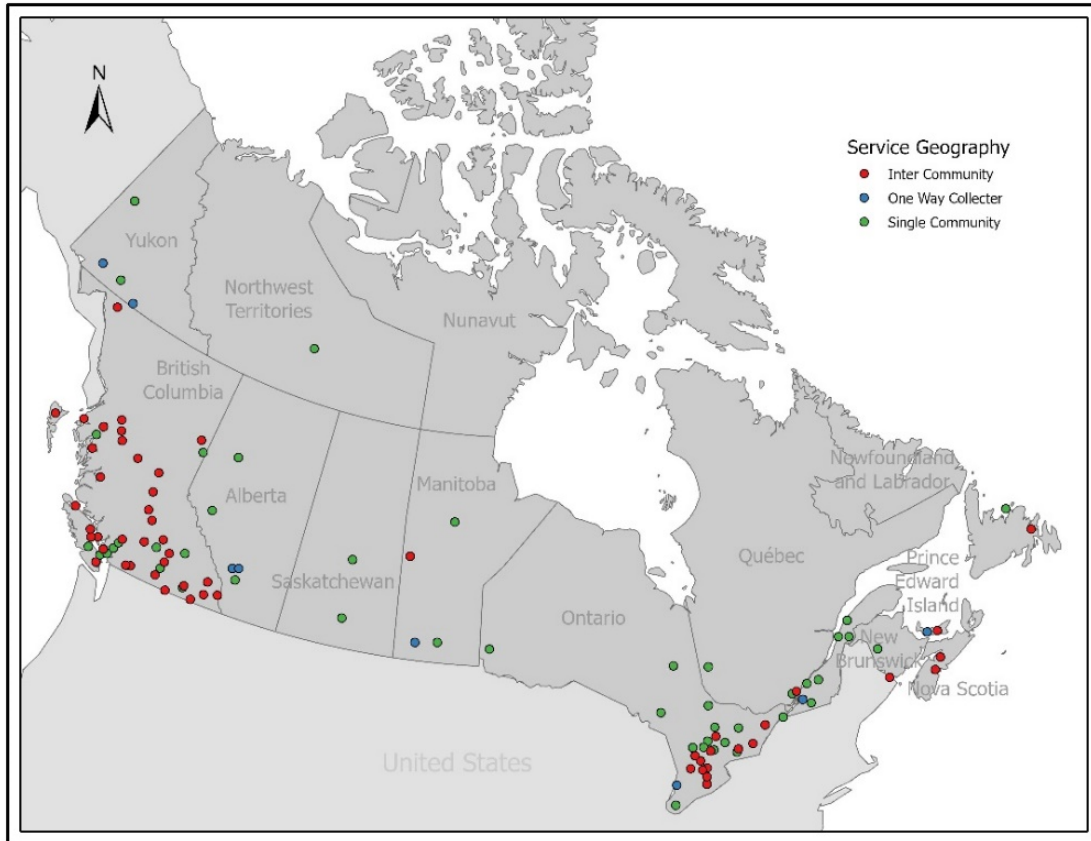
The innovative examples were mapped based on the service area. In this respect, there were three classifications (see Table 5).

Table 5: Innovative Examples by Service Geography

Classification	Description	Number of Examples
Inter-community	Examples operate in multiple communities	59
One-way collector	Examples are commuter-focused	8
Single community	Examples are contained within a single community	50

Among the examples, rural transit services that operated on an inter-community basis were the most common service geography type (see Figure 4). There is clustering of inter-community services in British Columbia and Ontario, with additional examples spread across New Brunswick, Nova Scotia, and Newfoundland and Labrador. Again, in BC service delivery and coordination is at least in part due to BC Transit, which may explain the dominance of intercommunity service in the province. Many of the BC examples demonstrate a partnership between BC Transit and multiple rural communities, creating a regional transit service. In south and eastern Ontario, the inter-community cluster is likely explained by close proximity and commuting patterns for employment and leisure opportunities. This is also where we see examples that include larger (50,000-100,000) population centres. As the Atlantic provinces are smaller, inter-community service can be more efficient and viable.

Figure 4: Innovative Examples by Service Geography



Transit services operating in a single community were the second most common service geography type. Single community services are dispersed throughout the country, but there are small clusters between this service type and inter-community services in BC and Ontario. The two service types have the potential to complement one another in that an intercommunity service can bring riders from one community to another, but once they are in the community, they can get around by using a single community service. In addition to the clusters, this service type is found in every province and territory (excepting Nunavut where no examples were identified).

Single community transit systems that are not clustered with inter-community service highlight mobility challenges for rural dwellers, and posing barriers to inter-community employment, service access, and partaking in social and recreational activities. This is discussed in Section 4.2. Dedicated, one-way collector services were found throughout the country, although this service geography type is the least common.

Types of Innovations

Each of the identified examples incorporated an element of innovation, but in different ways. In order to better understand the innovations, used the following definition of innovation to guide an analysis of the examples: *“the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations”* (Working Party of National Experts on Scientific and Technology Indicators 2005, p. 46).

A short list of innovations was created. To be included on the short list, the transit system had to have an interesting or unconventional approach to one or more of the following:

- Funding
- Planning
- Scheduling
- Transit type

- Cost reduction
- Resource allocation
- Technology
- Marketing

Providing representation across provinces and territories was also considered when choosing cases for the short list.

We then used these considerations to assist in assigning each selected example into one or more of the following innovation categories:

- 1) Innovation related to a product;
- 2) Innovation related to a process;
- 3) Innovation related to an organizational method; and
- 4) Innovation related to marketing method.

The innovations found did not necessarily have to be innovative on a global scale in order to be considered. Rather, we considered location and context and as such the innovations identified may be completely new, new to an area, or simply a new use of an existing asset. The findings are summarized below.

Innovation Related to a Product

There were 32 examples that included a product-based innovation. In terms of rural public transit, the product can be understood as the capital component of the service. An example of where this class of innovation is employed is the not-for-profit Spark – Wildsight service in Columbia Valley, British Columbia (Keitch 2021). The service offers an inter-community car sharing program that uses electrical vehicles. The product, being electrical vehicles, are innovative in that they deliver an essential service while minimizing their carbon footprint, all while responding to barriers. As inter-community travel is often a need identified in rural areas (Federation of Canadian Municipalities 2021b; Roddick 2021b, 2021a), the Spark – Wildsight service leverages the benefits of its innovative product (e.g., lower maintenance fees that are associated with electric vehicles) in order to provide a needed service (Keitch 2021). The carsharing aspect of this service also represents an innovation in that each vehicle is operating more efficiently than a vehicle that is singularly owned and used. The carsharing model also provides more flexibility and autonomy for those that are able to drive when compared to a typical fixed-route bus service.

Innovation Related to a Process

There were nine examples identified that included a process-based innovation, something related to the processes guiding service delivery. An example this is the Agence Métropolitaine de Transport (AMT)'s Village de la Gare project in Ville de Mont Ste. Hilaire in Quebec (Partners for Climate Protection 2021b). This project intends to employ an innovative long-term planning process whereby the AMT is proposing to create a dense built-up area within walking

Vignette #3: Société d'innovation en environnement (SIE) and YHC Environnement pilot project

Six municipalities (Plessisville, Nicolet, Bromont, Témiscouata-sur-le-Lac, Rivière-du-Loup, and Sainte-Julienne) in Quebec have successfully implemented a low-cost, energy efficient electric car-sharing transit system in small and medium sized rural communities to reduce the use of personal vehicles and encourage green public transportation. The pilot project, SAUVÉR, was started by the Société d'innovation en environnement (SIE) and YHC Environnement in 2016 and funded by the Green Municipal Fund of the Federation of Canadian Municipalities. This innovative project established a low-cost, green public transit systems in small municipalities that could not sustain traditional public transit.

Each municipality was given one or two electric vehicles to integrate into their fleet, reducing fossil fuel vehicle use. Additionally, these electric vehicles could then be shared with the community through the vehicle's integrated fleet management/car-share software. The built-in car-share software can record vehicle usage, such as how far they were driven, the duration of the trips, and how often they were used over the course of the three-year pilot project.

The data revealed that the incorporation of the electric cars into the fleet reduced all the fleets' collective greenhouse gas emissions by 59.5 tonnes of carbon dioxide equivalent (CO₂e) and saved them \$21,018 in gas expenses. The SAUVÉR projects success is in large part due to its ability to address numerous challenges such as municipal fleet operational costs and environmental impact, the cost of installation of electric charging infrastructure, and alternative public transit, all with a single solution. As a result of their success, a further 10 Quebec and 5 New Brunswick municipalities joined the project in 2020.

distance of the Village de la Gare train station. The density target includes 1,000 residential units mixed with commercial and institutional uses. This planning process is revolutionary within the context of rural transit, as a lack of density and walkability, coupled with generally long distances between destinations represents one of the greatest challenges that advocates of rural transit face when trying to make the case for rural transit (Partners for Climate Protection 2021b). The Village de la Gare project's planning process promotes ridership, as those living in the village can commute to Montréal, and those outside of the village have reasons and the means to come to the village for commercial and institutional uses.

Innovation related to Organizational Method

The dominant category by far, 84 identified examples included an organizational method-based innovation. An innovation in organizational method could include partnerships between service provider organizations, or something that the organization leverages. The majority of cases in BC could be considered as this type of innovation due to the uniqueness of BC Transit (Government of British Columbia 2020). A specific example of this innovation class is the West Kootenay Transit System which is an inter-community transit service. This public partnership between BC Transit, Regional District of Central Kootenay, Regional District of Kootenay Boundary, and the City of Nelson allows for an inter-community transit service (BC Transit 2021). This partnership leverages BC Transit's economy of scale and serves as a solution to many common barriers that rural areas face in establishing a transit system, which is a lack of the aforementioned resources.

Innovation related to Marketing

There were two identified examples that included a marketing method-based innovation. Marketing-based innovations effectively work to increase ridership by increasing awareness of the transit service offerings. This awareness is sustained in the collective consciousness of the ridership pool through branding, which riders can identify and identify with (BC Transit 2018). One of the barriers to establishing rural transit systems (see Section 4.2), is a lack of information regarding an existing or planned transit service, which ultimately prevents the maximum potential level of ridership from being realized. In addition to increasing awareness of a service, marketing and branding can also increase the desirability of a service by changing public perception of the service over time. For instance, in a rural area, transit marketing may focus on the convenience of the service compared to that of a private vehicle. North Bay Transit is an example of where this innovation class has been leveraged (North Bay 2020). The system provides a combination of fixed-route and on-demand service. In addition to requiring Smart DRIVER training for their drivers and implementing a dynamic dispatching app to match riders travelling in the same direction so as to decrease duplication, the service increases its desirability through marketing by offering incentive programs (North Bay 2020). North Bay Transit also offers a Youth Travel Pass where up to three children can ride for free if they are accompanied by a fare-paying adult (North Bay 2020). This both provides financial relief for families with children and second normalizes transit from an early age, which may effectively increase overall ridership due to decreased stigmas surrounding public transit.

The above categories of innovation are not mutually exclusive. Many examples encompassed multiple innovation classes. An example is the COLT RideCo serving Cochrane, Alberta (see Vignette #1). The COLT is an on-demand, one-way collector and single community pilot project that uses bus stops for an on-demand service, which decreases the cost of the service since it only runs when there is demand. COLT also connects regionally to Southland's On-It service. This regional connection between the two services provides interim connection to the Brentwood light rail transit (LRT) station in downtown Calgary. COLT employs an innovative product in that its on-demand software matches riders with transit in real time. COLT's innovative organizational method of public ownership allows for a cost reduction of sixty-six percent (Federation of Canadian Municipalities 2021a).

Different types of innovations were found throughout activities and outcomes. In some cases, one influenced the other, with innovative activities and processes resulting in innovative outcomes and products. For this reason, it is difficult to separate activities from outcomes. Additionally, the lack of comprehensive information available, along with the fact that primary research was beyond the scope of this project, makes it difficult to understand this relationship.

When considering innovations alongside the barriers identified in Section 4.2, the majority of innovations respond to a core group of barriers:

- Meeting a specific need;

- Decreasing service cost;
- Addresses the capacity limitations; and
- Leveraging of funding opportunities.

The innovations identified responded less so to the following barriers:

- Barriers within the natural and built environments; and
- Barriers within workforce availability and training.

Lastly, there are those barriers that cannot be overcome by innovation easily, if at all:

- Dispersed land use patterns;
- Low population density;
- Aging and / or declining populations;
- Funding structures; and
- Transit policy and regulation.

4.5. Analysis: Place-Based Differences

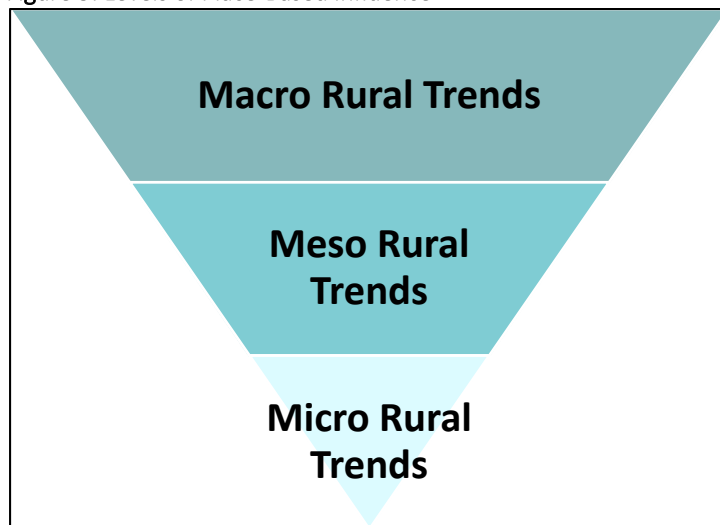
Rural communities share characteristics that make them innately “rural.” However, there are also differences between rural communities and regions. Conditions of place - the unique combinations of economic, socio-cultural, and environmental factors - play a critical role in influencing and impacting community conditions (Markey, Breen, et al. 2019). It is recognized that place specific information is needed to design services – like transit – that are appropriate to circumstances and assets (Markey, Ryser, and Halseth 2020; McCue, Tolentino, and MacDonald 2014).

We identified place specific themes and linked these themes to the typology of rural barriers (see Section 4.2). Based on our analysis we found that place-based trends can be understood as operating on three levels (see Figure 5):

- 1) **Macro Rural Trends:** Apply to all rural areas, limited influence of place beyond separating rural characteristics from urban ones.
- 2) **Meso Rural Trends:** Apply over large areas based on a common place-based characteristic.
- 3) **Micro Rural Trends:** Apply to specific places based on unique or near unique place-based characteristics.

Details related to each level are discussed below.

Figure 5: Levels of Place-Based Influence



Macro Rural Trends

Macro rural trends typically apply across all rural areas. When we think about rural, there are certain characteristics that come to mind (e.g., distance and density). Although there is a multiplicity of rural contexts, these core characteristics hold true across rural areas in that they present themselves as barriers to transit. There is little influence of place on these trends beyond the largely uniform rural characteristics that separate these areas from urban.

The trends that typically apply consistently across rural areas are tied primarily to socio-cultural and environmental facets of place: demographics and patterns of development

(e.g., settlement patterns; land use patterns; general development patterns).

Trends related to the demographics and development patterns that are generally consistent across rural areas relate to other ubiquitous rural barriers. Examples of these general, macro rural trends include:

- Demographic: aging population; low population density
- Sociocultural: the predominance of car culture; higher levels of social capital compared to urban
- Capacity: rural jurisdictions generally have less capacity to establish and maintain transit systems
- Natural and built environment: dispersed land use; general lack of transit-supportive infrastructure
- Funding: absence or general misalignment of local needs and what is funded
- Financial: high cost to provide rural transit as a service

However, it is important to note that for each macro trend there are communities that prove to be exceptions. For example, an innovative example of where barriers that follow the macro rural trend are being circumvented is the example of Agence Métropolitaine de Transport (AMT)/Village de la Gare program in the urban-adjacent rural area of Ville de Mont-Saint-Hilaire of Montréal, Québec (see Section 4.4). The project endeavors to overcome the macro rural barriers relating to demographic and the natural and built environment by developing a dense, highly walkable, mixed-use community where residents will be within walking distance to the train station that connects to Montréal (Partners for Climate Protection 2021b).

Meso Rural Trends

Meso rural trends do not apply universally across rural, but were found to apply over large areas based on place-based characteristics. The meso-level trends identified as being barriers to establishing rural transit systems occur over relatively large geographies and relate to economic, socio-cultural, and environmental facets of place.

Economic

Travel Patterns: Travel patterns related to labour and economic activities influence transit. These functional economic regions differ in size, pattern, and need (Freshwater, Simms, and Ward 2014). Labour travel patterns, particularly related to commuter patterns act as an influence on rural transit systems. Rural communities and regions that are urban adjacent (e.g., southern Ontario, BC's Lower Mainland) can act as sources of labour to urban job markets, creating a predictable economic need for transit service and reliable market demand. For instance, in southern Ontario there is a cluster of rural transit systems that supports travel between communities for work. For rural communities without a major urban influence, travel patterns within a functional region differ. For example, a functional region that contains multiple communities can demonstrate movement between communities for work and recreation.

The rise of working from home brought about by the COVID-19 pandemic has potentially influenced these travel patterns in ways that are currently not clear and require further research. Potential implications include a decrease in the necessity of commuter economies, either in the short- or long-term, will may impact the provision of transit services, particularly in urban adjacent regions.

Development, Investment, and Capacity: Rural areas where there is less rural investment and/or where there are fewer local development resources appear to be at a disadvantage in that there are fewer formal resources to support public transit. In the absence of rural transit investments from the public and/or private sector, social capital often appears in order to fill gaps in service. For example, we identified a cluster of flexible, locally responsive rural transit systems in the Atlantic provinces, that were instigated and maintained through social capital - volunteers, charities, and not for profits. While social capital is often high in rural areas, we observed a difference between those regions with more obvious investment and support for rural transit (e.g., BC Transit) in comparison to those without. In the latter we saw examples of leveraging existing local assets (e.g., social capital, private vehicles), working with what they already have in order to provide innovative, but precarious rural transit.

An example of social capital in action is the Crest Bus Service in Newfoundland and Labrador that operates primarily out of the community of Clarenville and travels between 12 communities (Town of Clarenville 2020).

The service caters to seniors and those with moderate mobility impairments. The non-profit is community-run by volunteers.

Socio-Cultural

Transit Disadvantaged: Those rural populations that are transit disadvantaged (e.g., elderly, youth, women, those with visible or invisible disabilities, Indigenous and other racialized individuals, low-income individuals) also tend to be marginalized in other ways (Mahali and Ray-Yol 2020; Marr 2015). Just as there are a range of different transit needs, these populations also tend to face different barriers to transit, including prejudice, discrimination, lack of general access, and/or violence when using public transit. Intersectionality between groups further complicates this and can create additional barriers for regions.

For example, Highway 16, also known as the Highway of Tears, is a stretch of highway between Prince George and Prince Rupert in BC that has historically lacked public transit. There are multiple First Nations communities situated along this over 700 km long stretch of the highway (Government of British Columbia n.d.). There are safety issues for those travelling along Highway 16, but particularly for Indigenous women and girls. A disproportionate amount of Indigenous women and girls have gone missing and been murdered along this route (Carrier Sekani Family Services n.d.; Roddick 2021a). The call for safe travel options along Highway 16 was underscored in 2018 when Greyhound Canada's northern bus route along Highway 16 was shuttered (Roddick 2021a). Addressing this complex situation goes beyond transit. Any transit system currently operating or proposed to operate along this stretch of highway must address underlying, systemic issues as part of truth and reconciliation, in addition to addressing the infrastructural safety issues inherent with travelling along this stretch of highway. See Vignette #2 for additional details.

Environmental

Climate Considerations: There are varying degrees of seasonality across Canada, impacting the provision of transit. With the exception of the Lower Mainland and southern Vancouver Island regions of BC, every province and territory in Canada has winters that are characterized by snow cover and temperatures below zero degrees Celsius (Krueger 2021). This impacts road safety, especially in remote rural areas that may face challenges related to snow removal services, as well as challenges with ridership getting to and from a transit stop. Freeze and thaw cycles that are indicative of seasonal climates impact road infrastructure, as well as the vehicles themselves, increasing the cost of maintenance (Rodrigue 2020). In the Arctic regions where permafrost exists, there are additional challenges in establishing transit systems, as permafrost is damaged by heavy machinery that may be used to establish transit infrastructure such as roads, or the mode of transit itself (e.g. a heavy bus travelling over the permafrost) (Krueger 2021). Variations in climate across physiographic regions also have meso scale impacts.

Physiographic Considerations: The physical environment can either help or hinder rural transit systems; it impacts the viability of different modes of transit and, as a result, influences capacity, reliability, the physical extent that the service can extend over, and the cost of service (Rodrigue 2020). Canada is divided into seven physiographic regions: Appalachian Uplands, Great Lakes – St. Lawrence Lowlands, Canadian Shield, Hudson Bay Lowland, Interior Plains, Arctic Lands, and Cordillera (see the Atlas of Canada: <https://atlas.gc.ca/phys/en/index.html>). Each region is divided into subregions of varying physical environment and terrain (Government of Canada 2019).

Generally, the spatial structure of transportation system networks remains static over time. This is due to two factors. First is physical conditions. The natural environment can be modified in order to establish transit networks, although it may be costly and/or require significant engineering (Rodrigue 2020). Transit patterns tend to follow the path of least resistance (or least cost), resulting in land transit patterns through valleys and plains (Rodrigue 2020). Second is historical patterns, where existing transit patterns tend to be reinforced by new transit infrastructure (Rodrigue 2020).

Considering the physiographic regions in Canada, each with differing topography that presents differing challenges to the establishment of transit systems. Much of Canadian physiography poses a physical

impediment to transit systems. In assessing the physiographic regions and their impact on the establishment of transit systems, we found that physiographic attributes such as plains, valleys and plateaus present the least physical impediment to transit.

Micro Rural Trends

Micro trends are those were found to apply specifically to certain places, therefore demonstrating the greatest influence of place, including economic, socio-cultural, and environmental facets.

Economic

Economic Structure: Building on the macro trend of travel patterns and functional regions, the specific way in which the economy of a rural region or community is structured can influence the type and level of transit service needed. This can include factors related to economic diversification, industry and employment type, and seasonality – all of which impact market size, needs, and travel patterns.

For example, in single industry, natural resource-based economies, there is a dominance of shift work scheduling. To serve this specific need may require coordination between the transit service provider and the central employer for scheduling. Given the likelihood that a major industrial employer would be outside the boundaries of the local government, this also requires a transit system that works across jurisdictions. Efficiencies can also be achieved through a transit network that eliminates duplication of services for other individuals who are not necessarily travelling to primary industry site, but may be on their way to a destination along the same route.

Other examples include seasonal economies, as well as service-based economies, which have different needs and opportunities than the example described above. For example, tourism-based economies have the benefit of a greater potential market, contributing to critical mass required to make transit sustainable. Similar to the above example, greater efficiencies can be achieved when duplication of service is eliminated. As noted previously, increased remote work also adds a new and largely un-studied influence on transit.

It is also prudent to consider the intersection of demographic factors like gender alongside economic structure. For example, the continued dominance of men in many natural resource-based sectors contribute to the isolation of women in the case of single vehicle households and a lack of available transit. This can be exacerbated by other factors, such as that in some regions it is not uncommon for women in rural areas to not hold a driver's license or to cease driving at an earlier age than men (Lysenko 2012).

Socio-Cultural

Demographics: Although the majority of rural areas tend to have aging populations, there are notable departures from this trend. For example, the Indigenous population in Canada is on average younger than the non-Indigenous population (Statistics Canada 2017). The average age of Inuit Peoples is 27.7, 30.6 for First Nations Peoples, and 34.7 for Métis Peoples, all younger than the average age of 40.9 for Canada's non-Indigenous population (Statistics Canada 2017). The younger age structure of Indigenous Peoples influences patterns of movement and impacts transit needs.

Another notable example are rural communities that are amenity migrant destinations for remote working professionals. Local mobility patterns will be different owing to younger populations, differing types of work, lifestyles, and expectations. Examples of this type of community where the rural population skews younger are places like Revelstoke BC. Data from the 2016 Census shows that the most populous age group was those between 30 and 34 years old (Statistics Canada 2019), with an average age lower than that of the provincial and national averages (Columbia Basin Rural Development Institute 2021).

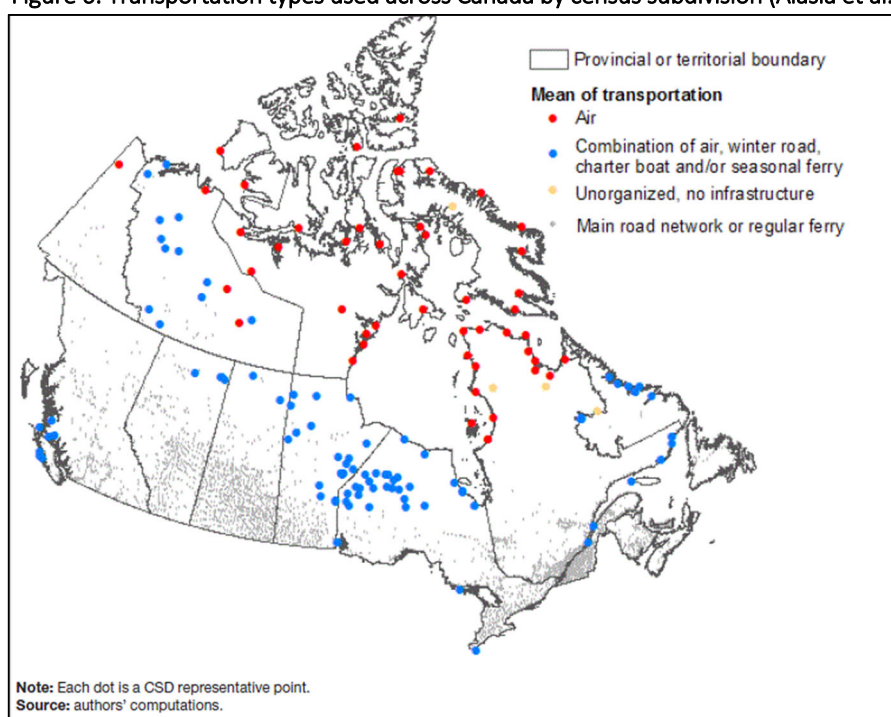
Environmental

Remoteness: Although most rural areas have large distances between places due to the predominance of low-density land use development patterns, there is a spectrum of what constitutes as a "long" distance to travel

whether you are referring to urban adjacent, remote rural, or those communities that are in between the two. In remote rural areas, distances travelled are significantly further. And while remoteness is a key place-based influence, it is the least well represented within the existing literature.

Remoteness tends to increase as one travels north in Canada, with the Yukon, Northwest Territories and Nunavut being among the most remote areas of Canada. Remoteness impacts the amount of time one must travel to live, work, and play, as well as the type of transportation required (all with varying associated costs). Figure 6 shows the various transportation types used in census subdivisions (CSDs) throughout Canada. In the southern portion of the country, main road networks, and regular ferry services are dominant (Alasia et al. 2017). When we begin moving north the more dominant type of transportation is a combination of air, winter road, charter boat and/or seasonal ferry service (Alasia et al. 2017). These transportation types are generally greater in cost compared to transit services that use main road networks. There are few examples of CSDs with unorganized or no transportation infrastructure (Alasia et al. 2017).

Figure 6: Transportation types used across Canada by census subdivision (Alasia et al. 2017)



Dawson City is an example of a rural remote area in the Yukon that has had to circumvent the challenges of remoteness in its establishment of a transit system. The Dawson City Rideshare is a program facilitated through a social network, making it an informal (and therefore more flexible) form of transit. It has had success in filling the gaps in formal transit service provision though providing a citizen-run program via a Facebook page where trips within the community can be coordinated on an as-needed basis (Roddick 2021b, 2021a).

Islands are remote in that they are physically separated by a body of water. Within our analysis island transit systems were primarily explored from an intra-island community perspective as opposed to the connections between island and mainland.

Interaction between Macro, Meso, and Micro Place-Based Trends

The aforementioned place-based trends – macro rural, meso rural, and micro rural – are not mutually exclusive, but rather, there is intersection and overlap between them.

For example, natural and built environment patterns in the form of development patterns (macro rural trend), remoteness (micro rural trend), and seasonal climate (meso rural trend) all interrelate. Remote areas have multiple challenges, including establishing transit infrastructure over large distances and challenging geography, but also require riders to be able, and motivated to deal with challenging climates as part of the first and last mile problem, which is often much more than 1 mile in remote areas. In places like Dawson City, Yukon, where winters are harsh, the absence of transit-supportive infrastructure (e.g., a shelter to wait in for a formal transit service to arrive) may be a non-starter for someone who would otherwise take advantage of the service.

There are additional interactions between the natural and built environment (meso rural trend) in the form of dispersed land use development (macro rural trend) and demographics in the form of low-density settlement (macro rural trend). As land uses are further separated over distances, the incentive to densify can decrease, posing challenges to the design of an efficient transit service.

Another point of intersection of place-based themes that pose barriers to rural transit is between the capacity of local governments (macro rural trend), the financial burden of transit service (macro rural trend), and organizational structuring (meso rural trend). Rural areas generally tend to have less capacity in the way of human and financial resources, which puts them at a disadvantage in terms of establishing or maintaining a transit system. We have observed jurisdictions where capacity limitations lead to establishing informal, volunteer- or community-led transit services that attempt to address the absence of formal services.

Economic structure (micro rural trend) and low population density (macro rural trend) also interact with one another. Where there is a seasonal economic base (e.g., tourism) the fluctuation in the tourist population during the high season may result in a system that is over-taxed in peak periods and overkill for low periods, or where services are lost outside peak periods, with financial complications if the system is paid for through another mechanism beyond rider fees (e.g., municipal taxes). The same interaction can be seen in resource-based economies that operate on a fly-in-fly-out (FIFO) basis, where employees that fly into a rural remote community are not contributing to property taxes, although they may be using local transit services during their shifts.

Implications of place-based influences on rural transit are further discussion in Section 5.

5. IMPLICATIONS

The following section draws on the findings from Section 4, identifying and discussing implications for policy and practice. A summary of key findings and implications is presented in Section 6.1 and opportunities for future research are identified in Section 6.2.

The Impact of Knowledge Gaps

Our analysis of the literature related to rural transit identifies several critical factors for consideration. Transit services are recognized within the literature for their benefits (where present) or related challenges (where absent). However, literature focused on the development and implementation of rural transit systems is relatively small and dominated by grey literature, suggesting an absence of in-depth, peer reviewed research. This absence of research is particularly problematic when considered alongside two of the dominant themes from within the existing literature.

First, the majority of the literature treats rural as a single, homogenous unit – it is effectively placeless. Even when differences across rural are acknowledged, the subsequent findings, lessons, and/or recommendations do not provide guidance related to how to adapt and apply findings across the diversity of rural communities that exist in Canada. Second, there is a noticeably uneven geographic distribution of knowledge, wherein the literature is dominated by larger, often urban adjacent communities, often from specific geographic locations – primarily southern Ontario and British Columbia. As a result, the generalized rural findings are likely to favour larger, more urban adjacent communities, diminishing the applicability to smaller and more remote rural communities.

Within the literature we also see a focus on traditional transit solutions – fixed-route or combination of fixed and on-demand. This is despite, and somewhat contrary to, the acknowledgement in the same literature that these options may not be suitable for all rural places, as well as the growth in available new and innovative multi-modal transit options, including car and ride shares. There are many potential explanations for this, including a direct relationship with the factors described above – particularly the dominance of larger and urban adjacent communities where traditional transit systems are most likely to have success, further diminishing applicability to smaller and more remote rural communities.

Within the literature there is little explicit understanding or discussion of the impact of place - of the role that unique economic, socio-cultural, and environmental factors play in influencing or impacting rural transit. While we identified three levels of place-based trends (i.e., Macro, Meso, and Micro), the existing guiding documents, as well as programs, predominantly focus on macro rural trends. Communities or regions with differing economic, demographic, or environmental characteristics or trends are not represented or understood, reducing the potential for such communities and regions to be successful, or for upper levels of government to successfully support them. Transit systems need to not only respond to the needs of potential users, but to the unique local contexts.

Acknowledgement and understanding of place-based factors is critical to not only identifying which type(s) of transit system(s) may be successful locally, but also which barriers may be encountered and how to address them. Place is also a predictor of what factors may be helpful in establishing and sustaining a rural transit system. An understanding of place locally, as well as better representation of place within the literature, guiding documents, and programs, is essential to set all rural communities up for successful, long term transit solutions.

It is important to be cognizant of the fact that place-based trends can be subject to outward influences, which makes it difficult to predict change over the long-term. For example, it is unknown exactly how transit patterns in a post COVID-19 era will be influenced as more people are able to work from home in some capacity.

At the Community Level

Ideally, this section would be divided by place-specific considerations. However, this is not possible with the current available knowledge base. However, rural communities and regions should be aware that the existing literature (e.g., reports, guidelines) is more applicable for larger and urban adjacent communities, and requires readers to make additional effort to consider what they are reading through the lens of their specific community.

It is helpful for all rural communities to recognize what and how place-based barriers apply locally. This is particularly important in terms of understanding what can and cannot be influenced locally. Some factors cannot be easily changed, if at all. For example, physiography and climate are impossible to change, requiring transit systems to be developed and funded accordingly. There are certain physical elements that will likely always present as barriers to establishing transit systems, such as the presence of mountainous terrain or many small lakes in an area that must be circumvented. Similarly, rural communities cannot easily change external constraints, such as available governmental funding, or related legislation.

Our findings suggest that strained local capacity and resources presents a barrier. While some of this may be outside local control, there is potential for local actions. Innovations from the identified examples of rural transit systems suggest a key to success is identifying and leveraging existing assets and resources. For example, the examples identified within the Atlantic provinces demonstrate leveraging of an existing asset - social capital – in order to address transit needs. Even if we explore the principles of active transportation/walkable neighbourhoods, small activities can have an impact on transit infrastructure improvements. For example: providing a bike rack at a transit stop or on a transit vehicle to minimize the first and last mile problem for transit users (Ontario Ministry of Transportation 2012).

Rural areas also cannot easily change the historical land use development and settlement patterns that both define them and make transit difficult to establish and provide sustainably. However, with support and access to information, rural areas can recognize unique local characteristics and needs and respond by establishing a service type that makes the most sense for their local conditions. For many rural communities this means something other than the establishment of a traditional fixed-route transit system.

Communities may benefit from exploring the feasibility of transit service sharing between communities in order to create economies of scale within a region. Communities are demonstrating that this type of collaboration and coordination is possible. For example, in the South Georgian Bay area of southern Ontario Colltrans provides transit connection links between Collingwood and Wasaga Beach and Collingwood and Blue Mountain through a regional transit framework supported by municipal partnerships and public-private partnerships (McCue, Tolentino, and

MacDonald 2014). Collaborations can also prevent duplication of service if this arrangement includes multiple transit service types, including social service providers.

Long range planning is important for all communities, and land use and transportation are often seen as two sides of the same coin. Future reviews/updates/amendments to Official Community Plans could include assessments of whether land use is transit oriented (i.e. transit oriented development - TOD) (Ontario Ministry of Transportation 2012). Rural areas have opportunities to densify land uses and implement TOD to better facilitate public transit. However, as noted, available development guidance is primarily urban and there is lack of a comprehensive blueprint or guidance for how rural areas can to implement such approaches to planning and development.

Local community service agencies and governments are the “boots on the ground” and have deep understandings of their unique place-based communities and constituents. Gathering and communicating this information to upper levels of government is key to facilitate better policies and programs.

At the Provincial/Territorial and Federal Level

Our findings suggest that barriers to sustainable transit systems vary by place. This has implications on the ways in which federal and provincial/territorial transit policy and programs are conceptualized and administered. Additionally, our findings recognize that transit relates to many issues of importance, from economic development to climate change.

However, the limitations of the existing literature and the lack of consideration for place poses a challenge. Policies and programs created based on the existing knowledge base will be limited by the dominance of certain community types and locations, and subsequently unable to account for, or support the diversity of rural communities, particularly remote communities. The dominance of specific community types and transit types leaves out experiences, considerations, and opportunities relevant to other types of rural communities. This challenge is further exacerbated when considering vulnerable and transit disadvantaged populations.

Our findings suggest that there is a lack of support in some regions and by some funders for regional rural transit that connects communities. This is a critical gap due to the fact that many necessary services are unlikely to exist in each community, necessitating travel between communities. Additionally, costs of living (e.g., housing) and available opportunities (e.g., employment) vary across regions, also necessitating travel between communities. Coordination of transit systems between communities is critical. We also found that province-wide transportation supports (e.g., BC Transit) offer an opportunity for coordination, providing greater rural service coverage, and creating economies of scale.

The federal government plays many roles related to rural and transit, including creating strategies, policies, and programs that cut across ministries and agencies like the Centre for Rural Economic Development. Directly relating to transit, investments in public transit is one of the stated federal goals specific to rural Canada, supported by the 2021 announcement of the Rural Transit Solutions Fund announced in 2021 (Infrastructure Canada 2021). More broadly, the federal government plays a role in the health and welfare of Canadians, including myriad areas which are impacted or influenced by rural transit. Applying explicit rural considerations during the development of all policy and programs can help make them more relevant and accessible to rural communities. One example of this is having more flexibility in rural transportation policies and programs (e.g., reflexivity with respect to local needs, structure and timing of funding, type of funding).

Like the federal government, transit relates to many ministries, programs, and policies at the provincial and territorial level. From a development perspective, partnerships for rural transit systems are supportive of goals related to economic growth. While cities are typically targeted for growth, there are also opportunities in rural and remote areas. For rural communities with aging and/or declining populations, providing comprehensive transit is one potential solution to attract new residents. COVID-19, along with competitive housing market conditions, saw a trend of city dwellers moving out from the core to rural areas. While this trend is not without challenges for rural communities,

viable transit systems can serve as both another attractant, but also contribute to local solutions (e.g., supporting people to live and work across different communities).

At the federal and provincial/territorial level, addressing climate change is a priority, including reduction in greenhouse gas emissions. Innovative transit solutions can help to reduce greenhouse gas emissions from personal vehicle use – something that is important across Canada, not only in urban communities. However, the types of transit systems will differ between urban and rural, as well as across rural.

Across the Board

It is necessary to shift perceptions surrounding rural transit in two key ways. First is in terms of changing perceptions of existing or potential users, making transit a viable and socially desirable option. This change in perception has the potential to increase both ridership and support. This may occur naturally to some extent with shifting demographics (e.g., urban to rural migration; aging populations), but will likely require targeted action to reach critical mass.

Second is how decision makers and leaders perceive the purpose of transit and how its value is measured. There needs to be recognition of the full benefits of transit beyond the simple cost to operate and return on investment, to the inclusion of the impact to measures of wellbeing and social, economic, and environmental co-benefits.

The identified existing rural examples illustrate the success comes as a result of combinations of factors (e.g., access to BC Transit in BC, high social capital in Nova Scotia, access to urban periphery and large numbers of people in southern Ontario). In order to enable sustainable rural transit sustainability requires changes to support and increase factors of success. This includes the perspectives of users and decision makers, but also in supporting programs and policy. This requires changes, including changes in support programs, what is funded, and how. To do so requires a better understanding of the diversity of rural and the influence of place. This research has provided a foundation for how place influences rural transit. Further work is required, including primary research, to explore this further, and to use the results to better inform future programs and policy.

6. CONCLUSION

6.1. Summary

Background

Transit and mobility are fundamental to rural community resilience. However, despite the importance of transit and the increase in available options, rural communities can struggle to initiate and maintain sustainable transit services. While there is some understanding of rural barriers, the utility of this information is hampered by the lack of understanding of how barriers are influenced by place-based differences across rural communities. The lack of understanding of place-based influences on rural transit systems is a critical challenge to informed decision making. This in turn impacts the development, implementation, and sharing of effective strategies, solutions, and supports, resulting in potentially inappropriate actions, unintended consequences, and inefficient use of limited resources. Without understanding the influence of place-based factors, it is challenging to understand what is missing from the existing literature, and to understand which promising policies and practices are applicable to which rural communities.

Objectives

The goal of the *Navigating Rural* project was to use place as a lens to identify, synthesize, and assess existing rural transit literature in order to identify rural barriers and understand how barriers vary by place. The objectives were:

- 1) Compile a database of existing rural transit and mobility literature, identifying gaps within our knowledge;
- 2) Create a typology of barriers impacting rural communities;
- 3) Explore existing transit support programs to understand gaps and challenges;
- 4) Identify and explore innovative rural solutions;
- 5) Clearly identify the gaps within our knowledge base, data, and existing support programs; and
- 6) Conduct a place-based analysis to understanding how barriers are influenced by place.

Summary of Results

Rural Transit Literature

- Overarching themes: treating rural as a singular or uniform concept; uneven regional knowledge and understanding; understanding who is (and is not) served; challenges of rural transit; feasibility and rationale of rural transit; growing transit opportunities; and identified transit solutions.
- Gaps: little peer reviewed research – particularly on development of rural transit systems; little understanding or differentiation between places; dominance of examples from certain regions (British Columbia, Ontario) and community types (large, urban adjacent); minimal representation of remote communities.

Barriers to Rural Transit

- There are seven categories of barriers to sustainable rural transit systems, each with multiple specific barriers:
 - Demographic factors and ridership
 - Socio-cultural aspects of transit
 - Natural and built environment
 - Local costs of operation and potential sources of revenue
 - Local governance
 - Local economic structure
 - External funding programs
- Barriers differ by place, but the extent of this is unknown due to gaps in the literature.

Existing Support Programs

- There are six categories of gaps and challenges related to rural access to existing transit support programs:
 - Challenges with access to information surrounding programs
 - Extent to which programs account for unique rural considerations
 - Exclusionary criteria
 - Expenses that are deemed to be eligible under the funding framework
 - Consideration for the human resource capacity of the funding recipient
 - Consideration for the financial resource capacity of the funding recipient

Innovative Rural Examples

- A publicly accessible web map of existing innovative rural examples was created and can be found at: <https://selkirk.maps.arcgis.com/apps/webappviewer/index.html?id=17c858b73a014fbfa55d712141847a73>.
- The majority of examples identified are from urban-adjacent communities, and are often larger communities. There are very few examples identified from remote communities.
- The most common type of innovation was changes and improvements within organizational methods.
- Most of the examples can be found in southern Ontario or British Columbia, demonstrating the influence of larger population centres (e.g., Toronto, Vancouver), as well as the impact of collaboration between multiple communities (inter-community regional systems) to achieve economies of scale.
- The examples demonstrate a contrast between smaller, volunteer run systems that are innovative, but also highly precarious; and larger, government run systems that are more stable, but less innovative.

Influence of Place

The influence of place can be seen on three distinct but overlapping levels:

- 1) **Macro Rural Trends** apply to all rural areas, limited influence of place beyond separating rural characteristics from urban ones. For example, low population density and long distances.
- 2) **Meso Rural Trends** apply over large areas based on a common place-based characteristic. For example, commuter patterns in urban adjacent communities or the characteristics of specific demographic groups.
- 3) **Micro Rural Trends** apply to specific places based on unique or near unique place-based characteristics. For example, specific economic structure – single industry, seasonality, unique demographic conditions, remoteness.

Key Messages

For Rural Communities and Regions

- Recognize what unique place-based barriers exist locally.
- Recognize and leverage existing assets and resources.
- Recognize unique local characteristics and needs.
- Establish a transit service that makes the most sense based on the above. For many rural communities this means something other than a traditional fixed-route system.

For Policies and Programs

- Recognize that policies and programs based on the existing knowledge base are limited and unable to account for the diversity of rural contexts.
- Recognize that the dominance of specific regions, community types, and transit system types leaves out experiences, considerations, and opportunities relevant to other types of rural communities.
- Applying a rural lens (rural considerations) can help in development of program and policy, but should recognize the impact of data and information gaps.
- Flexibility is required in rural transportation policies and program to ensure diverse rural transit types are supported, both within a community and between communities.

Across the Board

- Change perceptions of existing or potential users, making transit a viable and socially desirable option.
- Recognize the full benefits of transit, going beyond the simple cost to operate and return on investment to the inclusion of the impact to measures of wellbeing and social, economic, and environmental co-benefits.
- Enabling sustainable rural transit requires changes to support and increase factors of success. This includes the perspectives of users and decision makers, but also in supporting programs and policy. To do so requires a better understanding of the diversity of rural and the influence of place.

Methodology

A multi-staged, qualitative research approach was taken. The project team compiled a database of existing rural transit and mobility literature based on four parameters: inclusion of peer-reviewed or grey literature; publication within the last 10 years; Canadian focus, or that of a similar jurisdiction; and having an explicit rural component. Documents were screened for relevance related to barriers, existing support programs, and innovative examples. A separate qualitative content analysis was developed and conducted for each. The project team then applied place as a lens to explore the results of the completed content analyses. Barriers and existing examples were explored based on these factors in order to identify if/how the results varied by place.

6.2. Future Research

Throughout the course of the Navigating Rural project, we identified several areas for potential future research. These have been grouped by theme and listed below.

Primary Research Exploring Existing Canadian Rural Transit Systems

- Identify metrics to track the impact of transit on rural communities in order to better understand and measure value and contribution. This should include better understanding and quantifying impacts on economic development, workforce, education, health, and environment.
- Building on the identified examples of rural transit systems, conduct a more in-depth analysis through primary research in order to understand the key factors influencing the success or failure of different approaches and innovations, as well as transferability.
- Exploration of inter-community transit systems, including geographic size, services offered, and overlap with other types of regional collaboration.
- Exploration of what prevents implementation of innovative ideas and exploration of pathways around these barriers. For example, anecdotally ideas related to the re-deployment of school buses in small communities were challenged by insurance issues.
- Exploring pathways to addressing precariousness in rural transit systems (e.g., reliance on social capital).
- Spatial analysis to explore relationship between route length, number of stops, schedules, and ridership in order to identify true nature of coverage and what improvements would most impact ridership.
- Exploring what activities will impact and change perceptions of transit in rural areas in the long term. For example, exploring how programs aimed at youth change perceptions of transit, tracking impacts to demand and supply, and looking for differences across communities.
- Direct comparison between transit system types for efficacy and utility. For example, between traditional transit systems and multi-model systems or between government run systems and volunteer run systems.

- Explore feasibility of provincial/territorial scale transit support agency (e.g., BC Transit) in other Canadian jurisdictions.

Primary Research Specific to the Role of Place

- Primary research exploring place-specific factors. There is a need for primary research to build on what is identified in Section 4.5 in order to gain a deeper understanding of factors as they relate to place in order to provide guidance across all rural contexts.
- Target studies to expand geographic representation within the literature, in order to better inform general guides, policies, and programs.
- Analysis of activities aimed at supporting or enhancing transit through the lens of place. How does place influence the impact and success of programs and policies?
- Role of political climate. Although insufficient evidence was identified to include in the report, the project team observed a potential influence of the political representation and political trends on rural transit, particularly related to public investment.

Understand the Impact of COVID-19

- Exploration of the rise of working from home brought about by the COVID-19 pandemic has potentially influenced travel patterns, as well as shifting demographics and service expectations within rural communities. Both have the potential to impact transit systems.
- Related to travel patterns another question to consider is whether or not rural connectivity (broadband and cell phone) would be viable to support a major shift that would impact the transit patterns of the commuter economy.

Potential for Lessons from Outside Canada

- Expanded literature review that included literature and examples from around the world.

7. KNOWLEDGE MOBILIZATION ACTIVITIES

A knowledge mobilization plan was developed and implemented to reach multiple audiences and to generate a multidirectional flow of information. Seven knowledge mobilization methods were used, described below.

- 1) **SSHRC Required Products:** This report and associated two-page evidence brief are completed and will be made publicly available.
- 2) **Rural Transit Innovation Map:** examples of rural transit innovations from across Canada were identified and are displayed on a publicly accessible virtual map: <https://selkirk.maps.arcgis.com/apps/webappviewer/index.html?id=17c858b73a014fbfa55d712141847a73>.
- 3) **Targeted Summaries:** targeted summaries were completed, each summarizing the final report material for a different audience: local governments, provincial/territorial governments, and the federal government. Summaries were shared through the networks of the project team and partner organizations. The provincial/territorial and federal summaries were provided directly to key policy and decision makers through Dr. Gibson's Cross-Provincial-Territorial-Federal Rural Dialogues. The project team will explore options for publication of summaries in targeted trade magazines, such as *Municipal World* or *Plan Canada*.
- 4) **Project Website:** Space dedicated to the project has been made available on the research webpages of Dr. Breen (Selkirk Innovates - <https://selkirk.ca/rural-resilience>) and Dr. Gibson (<http://ruraldev.ca/navigating-rural>). A description of the project, as well as links to the final products will remain active for at least 5 years beyond the funded initiative.
- 5) **Webinar:** A public webinar entitled *Rural Mobility and Public Transit* was organized and delivered on December 7, 2021. This webinar was a collaborative effort between the Navigating Rural project team and other Knowledge Synthesis funded projects: *Here Today, Gone Tomorrow*; *Missing the Bus*; and *Equity and Justice in*

Public Transit. The webinar was advertised, delivered, and facilitated by the Rural Policy Learning Commons (RPLC). It was open to the public, and attended by 41 people from across Canada. The webinar was recorded and the recording is available on the RPLC YouTube channel at <https://www.youtube.com/watch?v=45HGGrE8K3s>.

- 6) **Conference Presentations:** The project team delivered a presentation and participated in a discussion session at the national *Creating Inclusive Economies* conference hosted by the Canadian Rural Revitalization Foundation (September 28-29 2021). The presentation was recorded and is available at <https://www.youtube.com/watch?v=21IOTEBT-OU&list=PLrzpP8UaccSM1fd98AwHsef5fPqcVPGzK>.

The project team also delivered a presentation summarizing key project findings for rural policy makers from across Canada at the October meeting of the Cross-Provincial-Territorial-Federal Rural Dialogues (October 12, 2021).

A summary presentation of the project will be presented in January 2022 as part of SSHRC's Mobility and Public Transit KSG Forum.

- 7) **Newsletters and social media:** Project announcements, updates, and materials have been circulated through electronic newsletters and social media by the Canadian Rural Revitalization Foundation, Rural Policy Learning Commons, Selkirk College (Columbia Basin Rural Development Institute newsletter and Selkirk Innovates social media), and through the University of Guelph's School of Environmental Design and Rural Development social media platforms and rural partners.
- 8) **Peer-Reviewed Manuscript:** The project team is working on several peer-reviewed publications based on the results of this project. Articles are expected to be submitted in 2022.
- 9) **Rural Routes Podcast Episode:** Project findings will provide input into one thirty-minute episode of Rural Routes – an open access podcast available online and on multiple radio stations. The podcast will focus on key findings and links to innovative solutions in rural transit systems. This episode is expected to air in 2022.

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