The Next Stop: An Analysis into the Expansion of Inter-regional Public Transportation Within British Columbia's Lower Mainland

by

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Abstract

Public transportation is crucial in helping to grow cities sustainably. Good public transportation allows for less car-dependence, healthier and less polluted communities, and more equitable communities. Within BC's Lower Mainland, the current lack of inter-regional transit options, combined with the high level of congestion, pollution, and growing population in the Fraser Valley and Metro Vancouver's eastern communities presents opportunities to explore different methods to better connect the Fraser Valley and Metro Vancouver with mass transit. The study looks at data from a jurisdictional scan and expert interviews to analyze several different inter-regional transit proposals that have been discussed within the Lower Mainland. The findings can help to aid urban planning within the Lower Mainland and look at how to best address this gap in the region's transportation infrastructure.

Keywords: Inter-regional public transit; express bus service; interurban rail; commuter rail; West Coast Express; Lower Mainland

Dedication

To all the transit enthusiasts, including the ELMTOTs and NUMTOTs out there, who continue to believe in better transit and mobility for all.

Acknowledgements

I'd like to thank my friends, family, and faculty within the SFU School of Public Policy for their support in making this possible. The countless virtual study sessions, hangouts, and good times made being in this program unforgettable, even if most of it was spent on Zoom. I'd also like to thank the interviewees as well for their contribution to this capstone – I have learned a lot more about this region's transit because of you and will be sure to take a trip out to the Fraser Valley once I'm able to travel.

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List of Acronyms

BC	British Columbia
BRT	Bus rapid transit
CP Rail	Canadian Pacific Railway
DMU	Diesel multiple unit
FVRD	Fraser Valley Regional District
FVX	Fraser Valley Express
GGH	Greater Golden Horseshoe
GHG	Greenhouse gas
HOT	High occupancy toll
HOV	High occupancy vehicle
HSR	High speed rail
MVX	Mountain Valley Express
SFCR	South Fraser Community Rail
SLRD	Squamish-Lillooet Regional District
SRY	Southern Railway of BC
ST	Sound Transit
STO	Société de Transport de l'Outaouais
WCE	West Coast Express

Executive Summary

The current lack of inter-regional public transportation between the Metro Vancouver and Fraser Valley Regional Districts presents a current gap in the public transportation system within British Columbia's Lower Mainland that has yet to be addressed in a fulsome inter-regional plan. While service between the two regions exists, no transit route is currently running at a service level necessary to be deemed reliable - that is, running at least seven days a week from 6am to 10pm. Unreliable inter-regional transit service leads to more dependence on private vehicle usage to travel between regions. This, in turn, leads to more congestion on major highways connecting the two regions, and can also contribute to a rise in air pollution within the Lower Mainland. Transportation is a major contributor to greenhouse gas emissions in both regions. The rapid population growth in the Fraser Valley and Eastern Metro Vancouver communities will accelerate the two problems mentioned. Thus, improving public transportation between the two regions is a vital part of growing communities within the area sustainably.

The research includes a jurisdictional scan of three North American jurisdictions: Seattle, Toronto, and Ottawa-Gatineau to pinpoint patterns in inter-jurisdictional transit modes. These studies reveal a pattern of starting with small scale transit methods (local and express bus routes) and replacing it with more advanced rapid transit options as the population in the regions grow. Funding methods and co-management strategies used in these cities are discussed further in the appendix. Discussions with four experts identify patterns related to the current challenges in coordinating and funding transit as well as support for various transportation proposals to bridge the gap. The main takeaway from expert interviews is that all proposals have merits and shortcomings when looking at reliability, cost, and ease of coordination and implementation, but all feel that stronger avenues of coordination are key to getting further inter-regional connections into the Fraser Valley.

I analyze four policy options that address the reliability of service, effectiveness in garnering ridership and transporting people quickly, rough estimates of capital and operating costs, administrative ease, and how sustainable the option is for the future. Analysis finds that express bus service and building a new rail system along Highway 1 were the two best options in helping to bridge the two regions together.

I recommend using express bus services in the short term as it is relatively easy and inexpensive to implement and can provide fast service especially with the construction of a new HOV/bus lane along Highway 1. In the longer term, as the population grows, a new rail system can be envisioned to help fit growing transportation demand in the region. To address potential funding concerns, new avenues of funding can be envisioned in the Fraser Valley, which include the conversion of the new HOV lane on Highway 1 to a HOT lane, the exploration of a community pass program to incentivize public transit usage, and a modest gas tax for the Fraser Valley Regional District. The province should also aim to be involved in funding, coordinating, and potentially operating and managing any larger rail transit projects due to potential administrative challenges between TransLink and BC Transit, but current structures of co-management can be maintained for now.

Preface

As the world's economy recovers from COVID-19, cities face an uphill battle as to how to continue moving people sustainably. Low transit ridership during the pandemic has caused massive strains on the operating budgets of transit systems, including in the Lower Mainland. Additionally, car ownership has tended to increase in the years following pandemics. The combination of strained transit operating budgets and lower usage post-pandemic could have huge consequences on the region's ability to expand public transit service in the future, which could lead to more inequity and environmental issues moving forward.

Ensuring that public transportation continues to be at the forefront of economic recovery plans is crucial in ensuring a green recovery moving forward. While this capstone uses data from pre-pandemic times, we must not lose sight of the work we have done pre-pandemic in encouraging transit usage across the region, and we must not forget about other urgent crises facing our community and our world.

1. Introduction

Metro Vancouver and the Fraser Valley are two adjacent regions in British Columbia (BC) with a high degree of integration of their economies. Yet, there is a lack of reliable public transit options available to travel between these two regions. As the population grows in the Fraser Valley and the Eastern Metro Vancouver municipalities, and with growing congestion on the major arterial highways between the two regions, alongside the need to reduce carbon emissions from transportation, public transit to help serve this region will be vital in ensuring sustainable growth in this region. Local transit authorities have identified priorities for inter-regional and regional travel markets within the two regions, and present options for how transit goals can be achieved. The main challenges arise in figuring out what mode of transport would be the best way to support these communities, how inter-regional transit projects will be funded, and how such projects will be co-managed between multiple regions.

An analysis into three different transit jurisdictions reveal different methods of transportation used for supporting inter-regional or other inter-jurisdictional public transportation, with bus service and commuter train service being the most popular. Further expert interviews explain why certain proposals are deemed more viable than others, and also address some of the challenges related to financing and managing any form of inter-regional transit. The main themes revealed were a need for strong support from senior governments in order to have larger projects realised, and political resistance to taxation methods but strong support for transit overall.

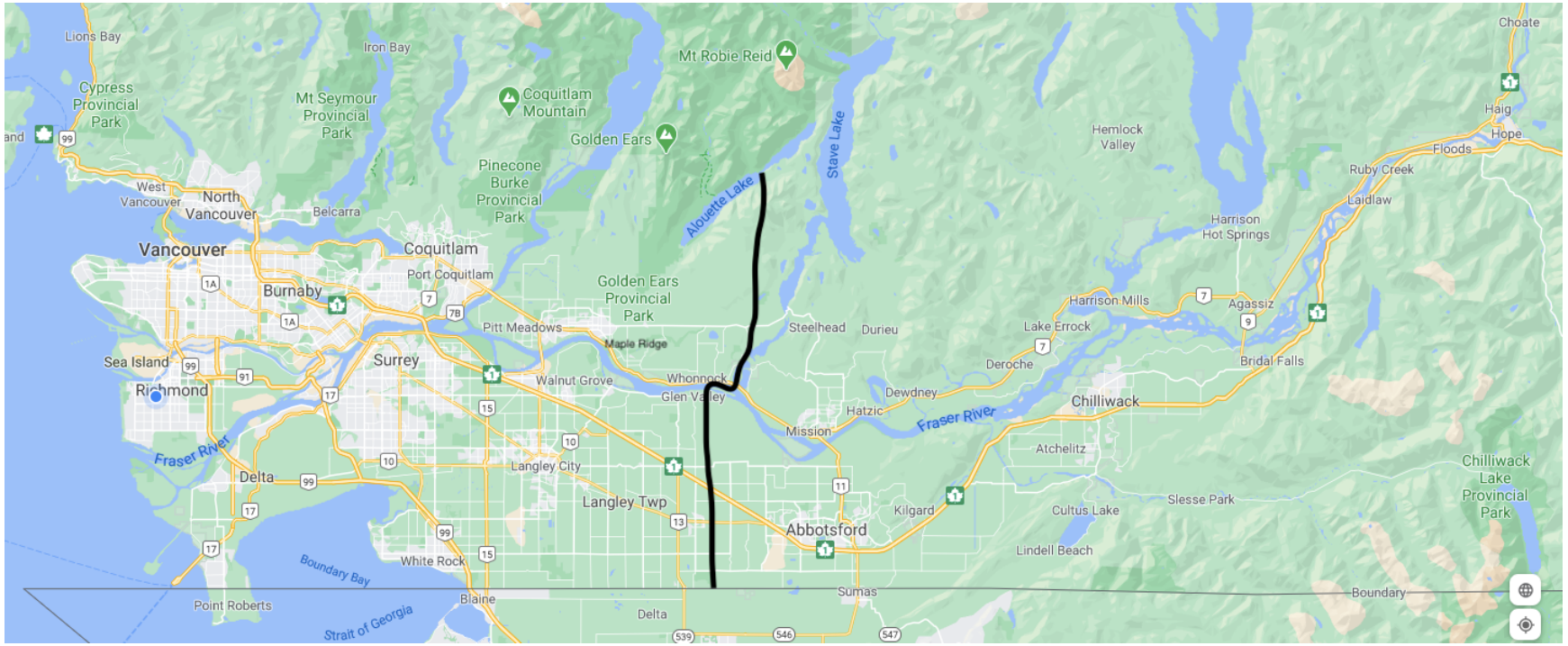
Through a policy analysis process, I make several recommendations moving forward. For transportation modes, a recommendation was to implement express bus service along highway corridors in the short term in order to help reduce congestion and give residents of the Fraser Valley a viable alternative to travel between the two regions. However, for the long term, rail transit expansion should be explored and implemented. I recommended that any additional sources of financing in the Fraser Valley come from either fuel taxes, HOT lanes, and a community pass program in order to help drive transit usage and sustainable transportation, while also agreeing with both land value capture and mobility pricing (with conditions) as mechanisms to be used within Metro Vancouver. Finally, I recommended that existing management structures be used for

existing inter-regional links, but that the province take the lead in helping to finance (with help from regions), operate, and manage any new rail link between the two regions.

2. Overview of the Metro Vancouver and Fraser Valley Regional Districts

The Metro Vancouver Regional District (Metro Vancouver) and Fraser Valley Regional District (Fraser Valley or FVRD) are two neighboring regional jurisdictions in BC's Lower Mainland (Figure 1 below shows a map of the two regions). These two regions are among the top three most populous regions in the province, with a combined population of about 2.7 million residents, which makes up more than half of BC's population (Statistics Canada, 2017c, 2017d). Additionally, Metro Vancouver alone comprises over half of BC's GDP every year (City of Vancouver, 2017). The proximity and size of these two regions means that their economies enjoy a large degree of integration on shared socio-economic interests - the most prominent being agriculture and natural capital, including management of the Lower Fraser River, one of the most important economic arteries in the province (Richmond Chamber of Commerce & D.E. Park & Associates Ltd., 2014).

Figure 1. Map of the Lower Mainland region of British Columbia



Indication: The black line indicates the boundary between the Metro Vancouver and Fraser Valley Regional Districts.
Map data: ©2021 Google

The expansion of Metro Vancouver's economy moving forward will require further integration of its neighboring regional districts, including both the FVRD and also the Squamish-Lillooet Regional District (SLRD) to the north of Metro Vancouver - the need for this further integration is highlighted in the Metro 2040 report, which was approved by all municipalities in Metro Vancouver, as well as the FVRD and SLRD (Metro Vancouver, 2011). The Fraser Valley is set to become a hotspot in the Lower Mainland for population and economic growth, with the region growing due to the affordability issues related to living in and owning/operating a business in Metro Vancouver; this reflects the growing expansion of Metro Vancouver's population and economy eastward and will also mean a more integrated economy moving forward (McCullough, 2019). Good, sustainable transportation systems between these two regions are necessary to ensure that people and goods are able to move between these two regions efficiently as the regions continue to expand.

An important aspect of sustainable transportation is access to reliable public transportation. Expanded inter-regional public transportation is included as a goal in Metro 2040 in order to help support economic growth in the Lower Mainland under Section 5.1.9:

> That the province collaborate through Metro Vancouver's Intergovernmental Advisory Committee (or an alternative collaborative mechanism) with TransLink, municipalities, Metro Vancouver, Fraser Valley Regional District, Squamish-Lillooet Regional District, First Nations, and other relevant agencies and associations, in **the planning of major interregional transportation facilities, such as inter-regional transit and provincial highways**, and the role that they are intended to play to support the Regional Growth Strategy, Air Quality Management Plan, and economic development of the Lower Mainland. (Metro Vancouver, 2011, p. 54)

This capstone examines the ways that better inter-regional public transportation links between Metro Vancouver and the FVRD can be realised, by building a reliable inter-regional network and examining challenges involved in doing so.

3. A need for better connections

This section gives a quick overview of the current inter-regional public transit options and the reasons behind why inter-regional transportation between these two regional districts in BC are important. Some of the patterns that are observed are that there is no reliable public transportation connection between communities in the Metro Vancouver area and those of the Fraser Valley. Additionally, there is a need to improve public transportation between these two regions as a method to help reduce congestion, lower the accident rate along major highways, help support the growing communities in the Fraser Valley and Metro Vancouver's eastern communities, and help to lower greenhouse gas emissions in the two regions.

3.1. Current inter-regional public transit options

Table 1 shows the current inter-regional public transportation options available at the time of writing, and compares, based off current transit schedules: the cities served, the hours of operation, the number of trips per day, and the frequency. Regarding transit routes (on Column 1), at the moment, two routes cross the Maple Ridge – Mission boundary, operated by TransLink (the public transit agency in Metro Vancouver), and two routes cross the Langley – Abbotsford boundary, operated by BC Transit (the public transit operator for all BC communities outside Metro Vancouver) (on Column 2).

Table 1. An analysis of all inter-regional public transportation services between Metro Vancouver and the Fraser Valley.

1.	2.	3.	4.	5.	6.
Transit route (Operator)	Cities served	Hours of operation	Number of trips per day	Frequency	Description
West Coast Express or WCE (TransLink)	Mission, Maple Ridge, Pitt Meadows, Port Coquitlam, Coquitlam, Port Moody, Vancouver	5am to 9am, 3:30pm to 7:30pm on weekdays only	Five trips per direction on weekdays. No weekend or holiday service.	Every 30 minutes, but the last three afternoon trains are spaced 40 minutes and 50 minutes apart respectively.	A rush-hour commuter train connecting Mission and NE Metro Vancouver to Downtown Vancouver.
#701 (TransLink)	Mission, Maple Ridge, Pitt Meadows, Port Coquitlam, Coquitlam	9am to 10pm on weekdays only	Four trips per direction on weekdays. No weekend or holiday service.	This route runs with an irregular frequency. Westbound trips leave Mission at 10:37am, 3:18pm, 9:02pm, and 10:03pm. Eastbound trips leave Coquitlam at 9:10am, 1:47pm, 7:50pm, and 8:50pm.	This bus route is meant to provide additional service between Coquitlam and Mission when the WCE is not running.
#66 Fraser Valley Express or FVX (BC Transit)	Chilliwack, Abbotsford, Langley	5am to 10:30pm on weekdays 9am to 9pm on weekends	17 trips per direction on weekdays. 8 trips per direction on weekends and holidays.	Highest frequency of 30 minutes during rush hour, and at most every 90 minutes during off peak and weekends.	Limited stop, express bus service along Highway 1 connecting Langley and Chilliwack.

1.	2.	3.	4.	5.	6.
#21 (BC Transit)	Abbotsford, Langley	6am to 8:15 on weekdays	11 trips per direction on weekdays. 6 trips per direction on weekends and holidays.	Highest frequency of 30 minutes during early morning hours on weekdays, can be up to three hours on Saturdays.	Small, infrequent bus route connecting the neighborhood of Aldergrove in Langley to Abbotsford.

The analysis excludes the service reductions brought about as a result of the ongoing COVID-19 pandemic (Data source: BC Transit, n.d.-a, n.d.-b; TransLink, n.d., 2020).

English (2018) provides a definition of reliable transit, which he defines as "network rail and bus lines operating at least every 30 minutes, all day to midnight, seven days a week," saying it is the "bare minimum service level for required for people to be able to live adequately car-free. (English, 2018, para. 4)" He adds that service that operates every 15 minutes or better is where the highest jumps in ridership are, as people can reliably use the service without consulting a schedule (English, 2018). Currently, no inter-regional transit route is reliable enough to meet the criteria (see Column 3-5). The most reliable connection between the two regions at the moment would be the #66 FVX, but given its maximum 30 minute frequency at rush hour and unreliable frequencies at other times, it is not at a point to be considered a reliable enough service for people to adequately commute car-free.

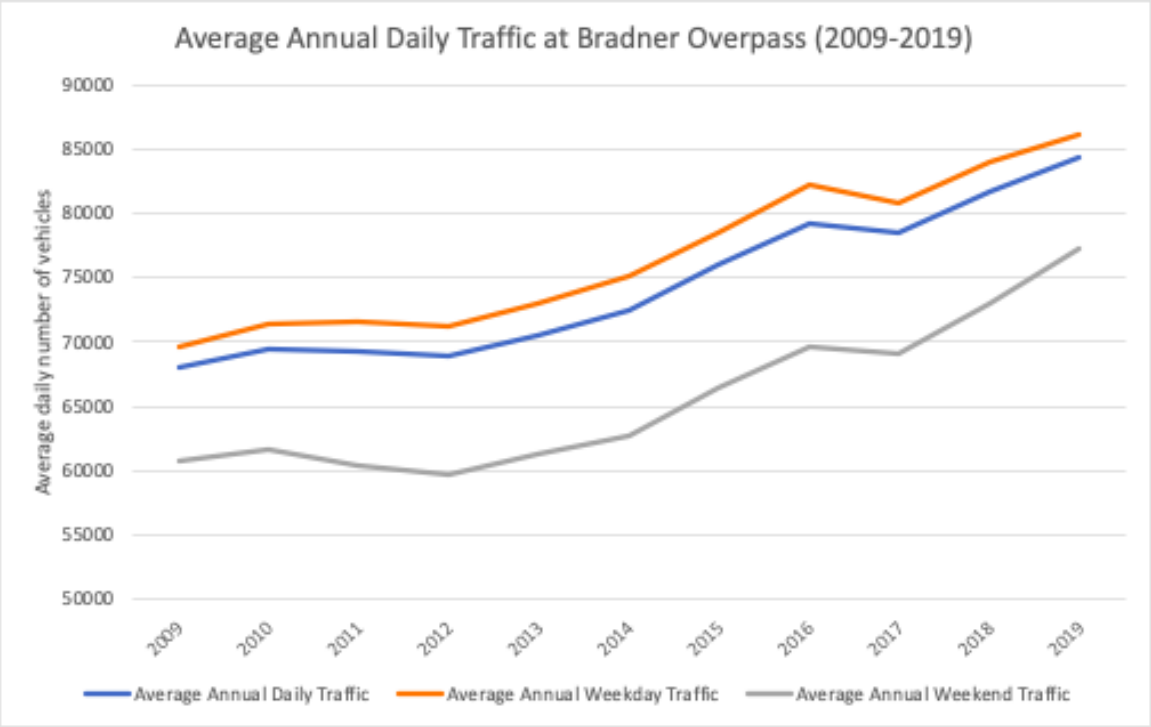
3.2. Why expand inter-regional public transportation options?

There are three justifications to make the case that there is a need for this sort of transportation improvement: the growing amount of congestion on some highways, the growing number of collisions on some highways, the increasing population which will drive a growing demand for public transportation, and the need to reduce greenhouse gas emissions to achieve regional targets.

3.2.1. Congestion

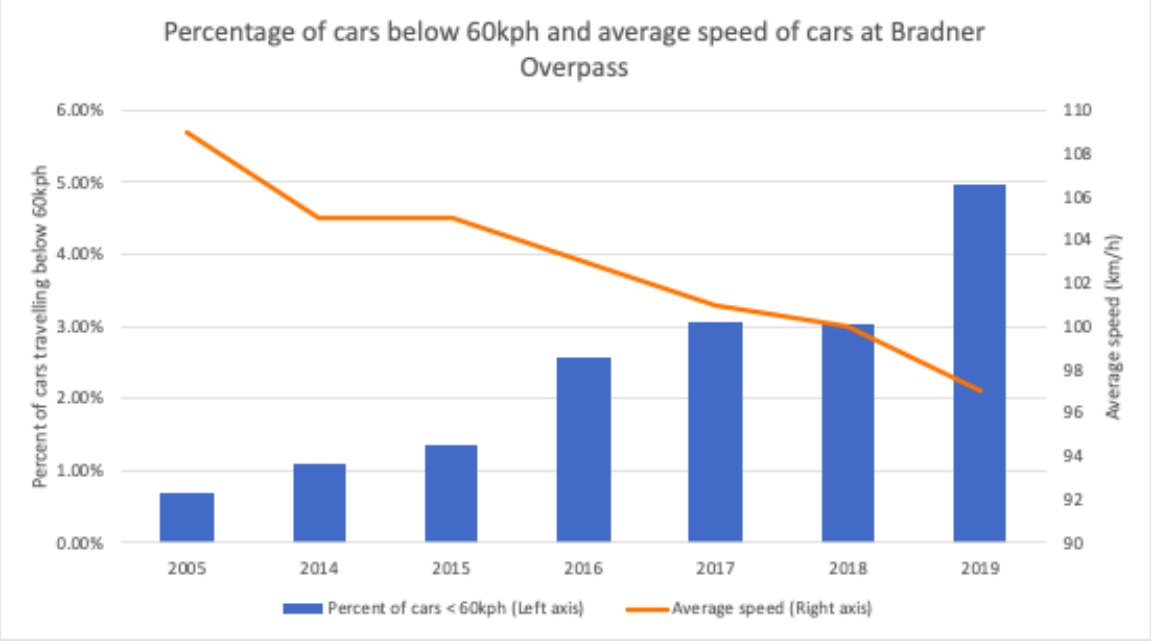
BC traffic data shows an increase in the amount of congestion on major arterial routes between Metro Vancouver and the Fraser Valley, notably in the past few years. These statistics are most pertinent along BC Highway 1, the main freeway connecting Metro Vancouver to the Fraser Valley south of the Fraser River. Figure 2 below shows the average annual daily number of vehicles passing the Bradner Overpass (an overpass on Highway 1 close to the Langley-Abbotsford boundary) between 2009 and 2019, which shows that a 24% increase in traffic volume was reported between these two years. This is seemingly correlated with the speed distribution of vehicles, as the data shows a near fivefold increase in cars travelling below 60km/h (the minimum freeway speed in BC) between 2014 and 2019, and the rate of vehicles moving below 60km/h is now 1 in 20. At the same time, the average speed of vehicles has also decreased since 2005, from 109km/h to 97km/h in 2019 (Figure 3).

Figure 2. Average annual traffic at Bradner Overpass on BC Highway 1, split between weekday traffic, weekend traffic, and overall traffic



Data source: BC Ministry of Transportation and Infrastructure, 2019

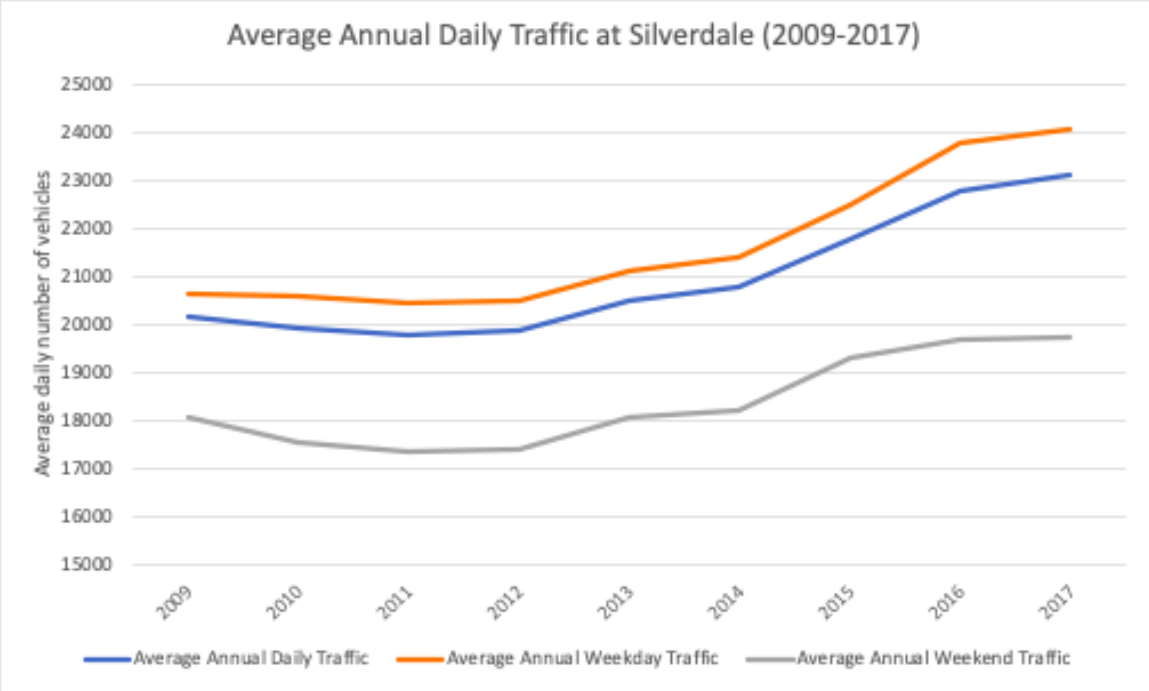
Figure 3. Percentage of cars that are travelling below 60km/h at Bradner Overpass on BC Highway 1, compared with the average speed of vehicles in 2005 and 2014-2019



Data source: BC Ministry of Transportation and Infrastructure, 2020

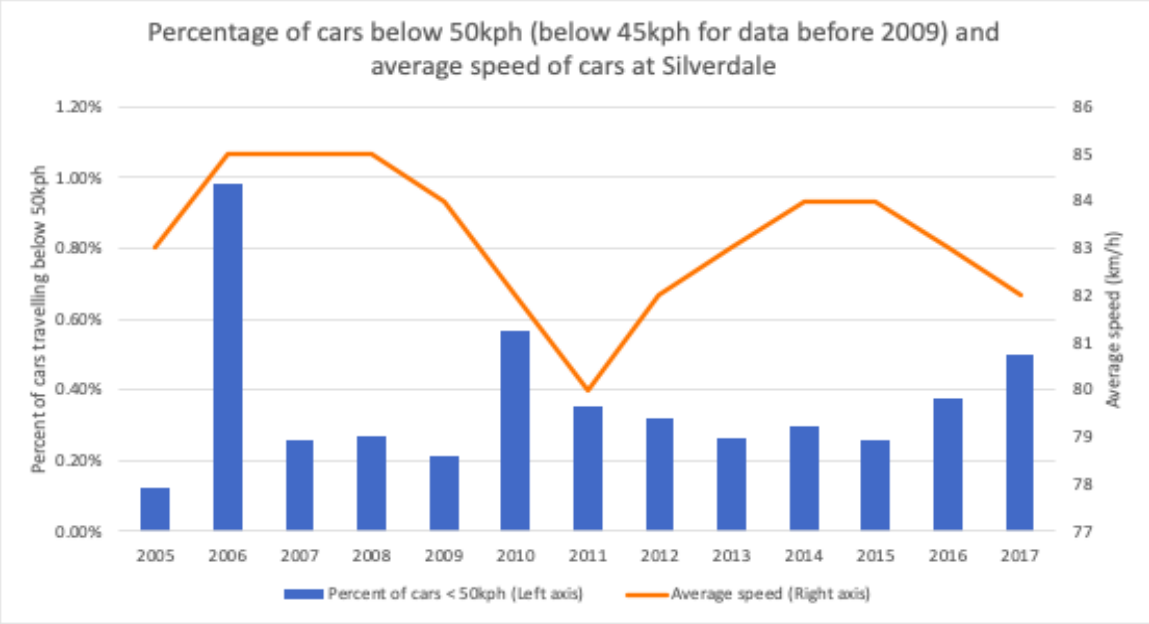
BC Highway 7 is the main highway connecting the two regions north of the Fraser River. Looking at traffic data from around the Silverdale neighborhood near the Maple Ridge - Mission boundary, evidence shows that Highway 7 does not see the same problems as Highway 1 with congestion when observing average speed and percentage of slow cars, as the percentage of vehicles below 50km/h stays consistently below 1%, and there is no consistent pattern in terms of changes in average vehicle speed or the percentage of vehicles travelling below 50km/h (Figure 5). However, there has been a near 15% increase in vehicles on Highway 7 between 2009 and 2017 (Figure 4).

Figure 4. Average annual daily traffic at Silverdale on BC Highway 7, split between weekday traffic, weekend traffic, and overall traffic



Data source: BC Ministry of Transportation and Infrastructure, 2018b

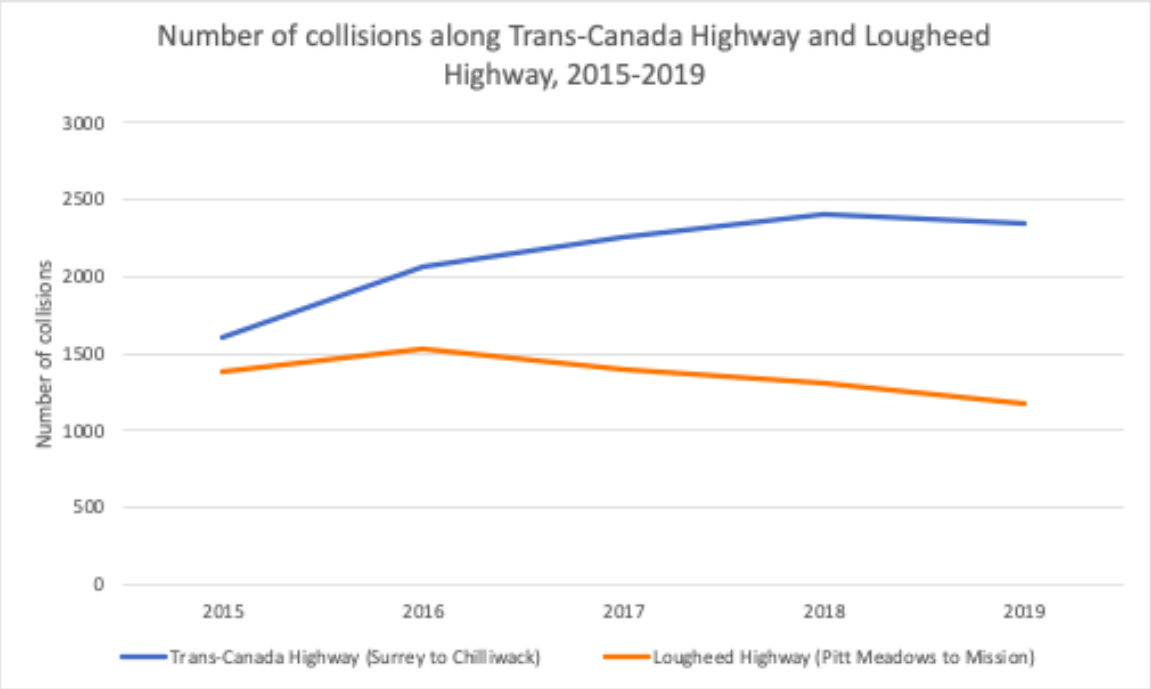
Figure 5. Percentage of cars that are travelling below 50km/h (45km/h for years 2009 or earlier) at Silverdale on BC Highway 7, compared with the average speed of vehicles from 2005 to 2017



Data source: BC Ministry of Transportation and Infrastructure, 2018a

Vehicle collisions contribute to more congestion as well. An analysis of crash data from ICBC, BC's public auto insurer, shows an overall rise in collisions along Highway 1, increasing by over 45% between 2015 and 2019 within the communities of Surrey, Langley, Abbotsford, and Chilliwack (Figure 6). We do not see the same pattern along Highway 7, which has actually seen a 16% decrease in collisions within the communities of Pitt Meadows, Maple Ridge, and Mission, after experiencing a peak in 2016. This might be the result of various new upgrades that have taken place between 2016 and 2020 which aim to improve safety and reduce collisions as a result (BC Ministry of Transportation and Infrastructure, n.d.). Collisions can take hours to clear, delaying traffic for long periods of time, and contributing to high levels of congestion in the process. High levels of collisions are also are indicative of a safety issue, contributing to death and serious injury amongst the population as well as damage to vehicles and pressure on insurance rates.

Figure 6. Number of collisions along Highway 1 (Trans-Canada Highway) and 7 (Lougheed Highway), 2015-2019



Data source: Insurance Corporation of British Columbia, 2020

Improving transit options along major transportation corridors can potentially help ensure that the Lower Mainland can reduce congestion on its roads, but it is important to note that it is not a silver bullet in reducing congestion, as evidence to suggest that investing in public transit can reduce congestion is mixed. While Duranton & Turner (2009) and many other scholars say that increasing public transit has no effect on congestion as latent demand will fill up any road capacity taken away by transit, a paper by Anderson (2013) shows that during a transit strike in Los Angeles in 2003, travel times on highways increased by 47%, and the impact was much greater on heavily congested roads. Furthermore, a paper by Aftabuzzaman et al. (2010) shows that improving public transit benefits the economy through "decongestion benefits" - which includes travel time saved and vehicle operating costs saved, lower greenhouse gas emissions and accidents. These benefits are higher in areas with heavier congestion (Aftabuzzaman et al., 2010). The paper also finds that when there are service improvements and fares are reduced, transit ridership will increase, and about 20% of the demand after a major transit project is built ends up being from former car drivers or passengers (Aftabuzzaman et al., 2010). Fewer cars on the road also means that there are less collisions overall. Additionally, public transit offers a medium in which

transportation can be provided by professional operators rather than by ordinary individuals, which can greatly improve transportation safety (Small, 2018).

3.2.2. Growth and demand

The population close to the Metro Vancouver and Fraser Valley boundary is growing faster than the provincial average annual growth rate of 1.1% between 2020 and 2041. In Metro Vancouver, Langley is growing the fastest amongst cities close to the regional boundary, at 2.1% per year, and others are growing at 1.2%. Fraser Valley communities, while communities are growing slower, still are expected to grow at a rate of 1.4% on average. Chilliwack will grow faster though, at a rate of 1.6% (see Table 2).

Table 2. Population growth between 2020 and 2041 for select communities in Metro Vancouver and the Fraser Valley

	2020 population	2041 population	Average annual growth rate (2020-2041)
Fraser Valley	335,229	449,249	1.4%
Abbotsford	161,581	214,935	1.4%
Mission	42,855	57,901	1.4%
Chilliwack	95,178	134,045	1.6%
Metro Vancouver	2,737,681	3,443,000	1.1%
Langley City and Township	161,076	249,000	2.1%
Maple Ridge	91,479	118,000	1.2%
Surrey	598,530	770,000	1.2%
British Columbia	5,140,000	6,516,000	1.1%

Data source: BC Stats, 2021; Fraser Valley Regional District, 2020; Metro Vancouver, 2011

This growth rate will transform the population of the Fraser Valley to close to 450000 people and the population of Metro Vancouver to over 3.4 million by 2041. Looking through each municipality in the Fraser Valley, we can see that Abbotsford would surpass 200000 residents before 2041, Chilliwack would likely surpass 100000 in a few years, and Mission would surpass 57000 residents. Within Metro Vancouver, a high growth rate will increase the population of the Langleys to close to 250000 by 2041, adding about 50% more people within the next 20 years. Maple Ridge will see an increase to over 110000 people by 2041. Surrey, the second largest city in Metro Vancouver, will grow to over 750000 people by 2041.

Continued population growth will mean more demand for transportation, both within and between the respective regions. It is thus important that communities and regions are able to plan for the expected growth in transportation demand as their population increases. According to the latest Trip Diary data from TransLink in Metro Vancouver and the FVRD in the Fraser Valley, there is a lot of demand for trips going across the Metro Vancouver - Fraser Valley regional boundary. 9.7% of all trips originating in the Fraser Valley end in Metro Vancouver, and within the municipalities of Mission and Abbotsford, that number exceeds 12% (Fraser Valley Regional District, 2014). Further analysis shows that on a typical fall day in 2011, there were 141,658 trips made between the Fraser Valley and Metro Vancouver, in both directions (Fraser Valley Regional District, 2014). In the Fraser Valley, most trips were going to or from the big cities (Abbotsford, Mission, Chilliwack), and in Metro Vancouver, most trips were going to or from the towns near the regional boundary (Langley City and Township, Surrey, and Maple Ridge), as well as Vancouver, but there are trips that originate or terminate in almost every municipality in both regions (Fraser Valley Regional District, 2014). More recent data from TransLink's Trip Diary data from 2017 confirms this, and shows that there are as much as 60% of trips that go between the FVRD and Metro Vancouver communities, mainly to Langley Township, Maple Ridge, Surrey, and Vancouver (TransLink, 2019).

Additional evidence to show a demand for inter-regional transportation is shown in the 2016 census data, which shows that within the Fraser Valley, 24.8% of workers commute outside of the region for work (Statistics Canada, 2017c). Only 1.5% of Metro Vancouver workers do the same (Statistics Canada, 2017d). While the census data does not specify the region that they commute to, it is presumed that most would likely

commute between Metro Vancouver and the Fraser Valley due to the size and significance of these two neighboring regions. When looking at this statistic by municipality within the Fraser Valley, Abbotsford and Mission, the cities closest to the regional boundary, have higher rates of inter-regional commuting for work (29.9% and 39.8% respectively) compared to Chilliwack and Kent (11.8% and 7.5% respectively), communities which are farther away from the regional boundary (Statistics Canada, 2017i, 2017e, 2017b, 2017a). Within Metro Vancouver, while rates of inter-regional commuting are very low, the communities close to the regional boundary, as expected, would have the highest rates of inter-regional commuting. This includes Langley City and Township (at 5.7% and 7.7% respectively), Maple Ridge (at 4.8%), Pitt Meadows (3.1%) and Surrey (1.8%) (Statistics Canada, 2017g, 2017f, 2017k, 2017h, 2017j).

Understanding this, it is also important to note the growth of public transit demand over time, especially in the Fraser Valley. According to the FVRD, annual transit ridership in the Central Fraser Valley transit system has been increasing between 2007 and 2016, from just over 1.7 million rides, to over 2.3 million rides (Fraser Valley Regional District, 2018). At the same time, the amount of service per capita has also increased from 0.42 to 0.68 hours per capita within the same time (Fraser Valley Regional District, 2018). Within the Chilliwack transit system, annual transit ridership has increased from just over 471,000 riders to 604,000 from 2007 to 2016, and the amount of service per capita doubled within this same time period, from 0.24 to 0.57 hours per capita (Fraser Valley Regional District, 2018). While this is good, the number of service hours per capita still remains well below that of Metro Vancouver, and even other big cities in BC, including Kelowna, Victoria, Kamloops, and Prince George (UrbanSystems, 2010c). At the same time, public transit usage among commuters is much lower compared to Metro Vancouver. TransLink's 2017 Trip Diary shows that within Metro Vancouver, 11.6% of all trips are made by transit, compared to 1% in the Fraser Valley according to 2011 FVRD Trip Diary data (Fraser Valley Regional District, 2014; TransLink, 2019). Even in Metro Vancouver communities near the regional boundary, ridership is generally higher than in the Fraser Valley, with transit usage rates of 2% of trips in Langley Township, 2.9% in Maple Ridge, 4.1% in Langley City, and 9.2% in Surrey (TransLink, 2019). Within the Fraser Valley, Mission has the highest rate of transit usage at 3% of all trips, followed by Abbotsford at 2% and Chilliwack at 1% (Fraser Valley Regional District, 2014).

Improving transit is important to help keep up with the increasing demand of transportation. As the population of Vancouver's eastern suburbs and the Fraser Valley grows, there will be more transportation demand in the region. It is already possible to see this with the increasing demand of transit within the Fraser Valley region. Additionally, evidence shows that there is a lot of demand for transportation between Metro Vancouver and Fraser Valley communities, which could justify expanded inter-regional public transit connections. Furthermore, evidence shows that inter-regional public transportation would largely benefit Fraser Valley communities, as Fraser Valley residents are already commuting across the regional boundary at much higher rates than Metro Vancouver residents, even within Metro Vancouver communities close to the regional boundary. However, expanding inter-regional public transit connections could also open up more accessible job opportunities in the Fraser Valley for Metro Vancouver residents, and can reduce car dependence. The current lack of reliable public transit options in the Fraser Valley will ultimately mean a more car-dependent region, that will become less equitable against lower-income people and younger families that choose to move there in the future.

3.2.3. Pollution

Metro 2040 outlines Metro Vancouver's climate and pollution reduction goals, which state that greenhouse gas (GHG) emissions should be reduced by 45% of 2010 levels by 2030, and to be carbon neutral by 2050 (Metro Vancouver, 2011). In 2019, 35% of Metro Vancouver's GHG emissions came from vehicles and transportation, totalling over 5 million tonnes of GHG emissions (Metro Vancouver, 2017). Light-duty vehicles made up 84.5% of those vehicle emissions (Metro Vancouver, 2017). In communities near the regional boundary, the amount of vehicle emissions as a percentage of total emissions is higher than the Metro Vancouver average. 52% of GHG emissions in Surrey come from vehicle emissions, followed by 49% in Langley City and Pitt Meadows, 44% in Langley Township, and 42% in Maple Ridge (Metro Vancouver, 2017). At the moment, Metro Vancouver is not on track to meet this target. As of 2019, emissions have only gone down 1% from 2010 levels, so there is a need for more intense measures to lower emissions in the region (Metro Vancouver, 2017).

Within the Fraser Valley, GHG emissions reduction targets are outlined in the Regional Growth Strategy (RGS). The FVRD's target is to reduce GHG emissions by

20% from 2007 levels by 2020, and 50% from 2007 levels by 2050 (Fraser Valley Regional District, 2018). While not much recent data is available on GHG emissions to see if the region is on target to meet its 2020 target, and while there is not much community-specific data, the data available shows that between 2007 and 2010, the FVRD reduced its emissions by 3%, but on-road transportation emissions have gone up, and on-road transportation continues to be the biggest source of GHG emissions, constituting 57.7% of total GHG emissions as of 2010, an increase of 2% from 2007 (Fraser Valley Regional District, 2018). A 2015 report of air quality trends also predicts an increase in GHG emissions if further action is not taken (Fraser Valley Regional District, 2015). Better public transportation can help ensure that transportation emissions can be reduced within the Lower Mainland, and that Metro Vancouver and the FVRD can meet its emissions targets. In the Fraser Valley, the lack of reliable transit options will inevitably lead to more reliance on private vehicles, making it harder to reduce transportation emissions.

4. Plans for inter-regional transit expansion

This section examines the current plans that have been brought forward by municipal transit agencies for expanding inter-regional public transit in the Lower Mainland. It includes an outline of what is in store in BC Transit and TransLink's visions for the inter-regional transit future of the region, as well as the underlying challenges in realizing this goal that have been identified.

4.1. Existing plans for expansion

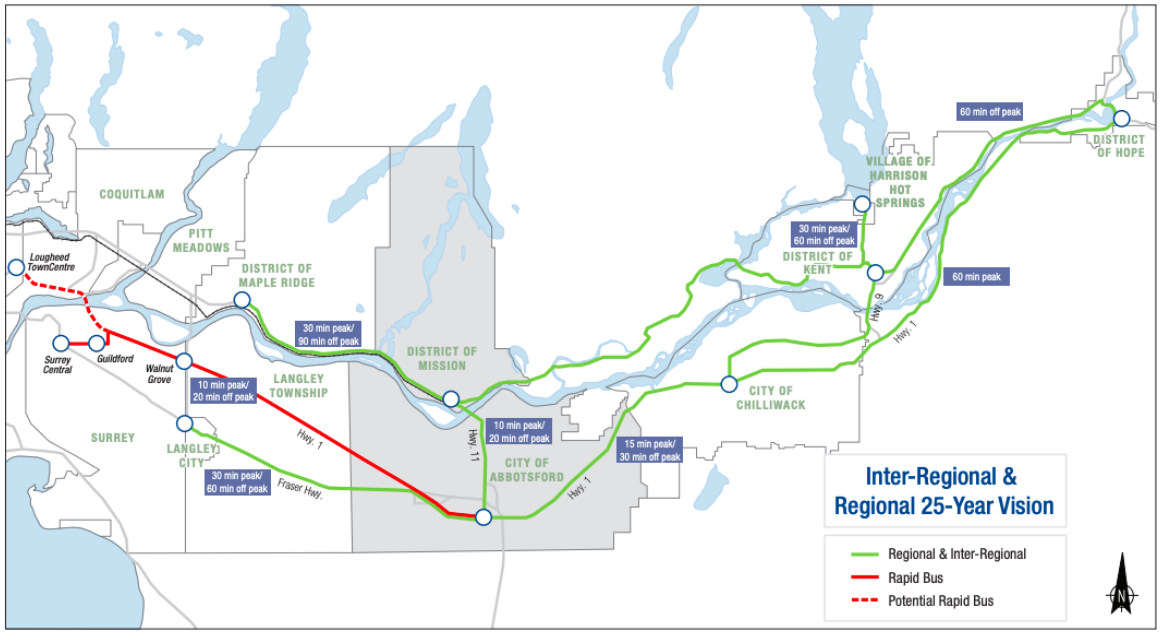
BC Transit, one of the current operators of inter-regional public transit between Metro Vancouver and the Fraser Valley, has outlined plans for expanded inter-regional public transportation within their system-specific Transit Future Plans, as well as their general strategic transit review in the Fraser Valley. The following inter-regional routes were identified as priorities within the 25-year vision:

- Abbotsford to Surrey via Langley Township (short term priority);
- Mission to Maple Ridge (medium term priority);
- Abbotsford to Langley City via Fraser Highway (BC Transit, 2012, 2013).

Figure 7 shows these routes, and other regional route priorities on a map of the Lower Mainland. These routes were identified by looking at commuting data within cities in the Fraser Valley, and identifying where there is significant demand for inter-regional travel. What data from a 2010 analysis of transit in the Fraser Valley shows is that there is the highest demand for inter-regional travel in the cities of Abbotsford and Mission, but anywhere further than these cities, demand drops to a level that is harder to justify inter-regional transit service (UrbanSystems, 2010d). Within Abbotsford, the most popular inter-regional markets are Langley City and Township, Surrey, and Vancouver (UrbanSystems, 2010c). The rest of the inter-regional trips are dispersed throughout the Metro Vancouver region. Within Mission, inter-regional connections are largely toward the communities of Maple Ridge, Langley, Surrey, and Vancouver (UrbanSystems, 2010c). The proximity to the WCE often means that Mission residents are able to take advantage of job opportunities in Metro Vancouver much easier than other communities

in the Fraser Valley (UrbanSystems, 2010c). Chilliwack, while it has a lower rate of inter-regional travel, still sees most of its inter-regional travel market going to Langley Township or to Surrey (UrbanSystems, 2010c). It is important to note that the reports were made in 2010, and commuting habits and numbers likely will have changed since then, notably with the rapid demand for housing in Fraser Valley communities.

Figure 7. Proposed inter-regional and regional network in the 25-year vision



Source: BC Transit (2013)

While the Fraser Valley does have an inter-regional transit expansion plan, it is important to note that this plan is very outdated, as these reports were created between 2010 and 2013, using data from 2006 or the early 2010s to justify decisions. Since then, improvements have been made to inter-regional connections in the Lower Mainland, most notably the introduction of the FVX in 2015, which now provides a link between Langley and Chilliwack via Abbotsford. A review of the FVX in 2016 was done about a year after the service was implemented, and recommended expansion of service to Sunday and holidays, but no major increases to service (BC Transit, 2016). The 2012 Chilliwack Area Transit Future Plan also outlines potential primary and secondary inter-regional transit markets, and states Chilliwack to Langley as a primary travel market in the region, albeit smaller than other markets to or from the Abbotsford-Mission area (BC Transit, 2012).

Within TransLink, there is not much mention of concrete inter-regional public transportation plans, besides minute discussion within the region's Transport 2040 plan as a strategy item, that they would "support improvements to inter-regional travel alternatives" (TransLink, 2008). Currently, TransLink is working on its Transport 2050 plan, and one of the identified priorities is more inter-regional connections (TransLink, n.d.-b). Within the 2018 Mayor's Council 10-year plan, a master plan of transportation improvements in Metro Vancouver, there is discussion of "expanding capacity" on the WCE, which could mean increased service beyond the five round trips it makes every weekday (TransLink, 2018).

4.2. Current challenges

The strategic review of transportation outlines several challenges that face the future Fraser Valley transit network. The challenges that face the future of inter-regional transit are largely related to funding and co-management. At the moment, funding is an issue especially within Fraser Valley communities. A 2010 analysis of transit funding shows that per household transit funding is lagging in the Fraser Valley compared to Metro Vancouver and also other BC cities (UrbanSystems, 2010b). In order for large transit projects to be realised, there must be a willingness to pay for better transit. The other issue that is addressed with funding is also the inconsistency of funding across different transit systems, which is an issue considering the Fraser Valley has four transit systems within its six main municipalities, compared to Metro Vancouver, which has one unified transit system for its 22 municipalities (UrbanSystems, 2010b). This makes any inter-municipal project difficult to operate since each system has its own funding structure.

Related to funding is one of the key coordination and management issues with inter-regional (and even regional) transit, in that all four transit systems must collaborate in order to create any inter-municipal transit link, and each municipality has a high degree of autonomy to create provisions over their own transit system (UrbanSystems, 2010b). With inter-regional transit, there needs to be further coordination with TransLink in Metro Vancouver in order to agree on who would manage any inter-regional link, and how such services would be funded (UrbanSystems, 2010b). The only such agreement exists with the WCE, with the District of Mission paying a nominal amount (about $770000 per year as of 2014) to TransLink every year (Nagel, 2014; UrbanSystems,

2010b). The separation of jurisdiction within the Lower Mainland between what is operated by TransLink and what is operated by BC Transit means that there is little incentive to work beyond the transit agencies' respective boundaries, and even if they do, any inter-regional projects must meet the transportation goals and visions of both regions to garner any support.

5. Policy problem and stakeholders

The main policy problem to be addressed with this capstone is that the current inter-regional public transit connections between Metro Vancouver and the Fraser Valley in BC are inadequate to support the growing expansion and economic integration of these two regions in BC's Lower Mainland. There is a need to agree on a specific mode of transportation, have funding mechanisms in place to help realize these projects, and structures in place to enable coordination between these two regions and their local governments when it comes to transportation planning.

There are several key stakeholders that should be involved when making decisions surrounding transit. These include residents of the Lower Mainland that will be affected by these projects, relevant businesses or organizations that could be impacted, the relevant transportation agencies (TransLink, BC Transit), local governments within the Lower Mainland that will be affected by inter-regional transportation, the BC Ministry of Transportation, and potentially Infrastructure Canada (the procurers of the Public Transit Infrastructure Fund).

6. Methodology overview

The methodology of this capstone involves two parts. The first is a jurisdictional scan of different urban areas around Canada and the United States to observe how different jurisdictions tackle public transportation that runs between adjacent regions, counties, or even adjacent municipalities that run transit systems independently from each other. The three jurisdictions that I examine are Seattle, Toronto, and Ottawa-Gatineau, as they offer different examples of inter-jurisdictional transit, funding, and coordination. The second is interview findings with experts on this topic that have a vested interest in inter-regional transit are then conducted. The interviewees include politicians, advocates, and TransLink / BC Transit officials that are involved in regional transportation planning, to better understand some of the challenges faced in funding, planning and implementing inter-regional transportation projects. This will help to verify some of the findings and patterns that have been brought out in the jurisdictional scan.

7. Jurisdictional scan

A jurisdictional scan investigates three metropolitan areas and examples of how they work to bring about transit between different regions, counties, or cities. The modes of transportation used to connect different regions, their management structure, and their funding mechanisms for building and maintaining inter-regional transit are examined. What is observed is that different metropolitan areas tend to use different methods to move people between regions, with a common pattern to start with buses and then move to a rail system as soon as there is enough ridership.

7.1. Seattle Metropolitan Area

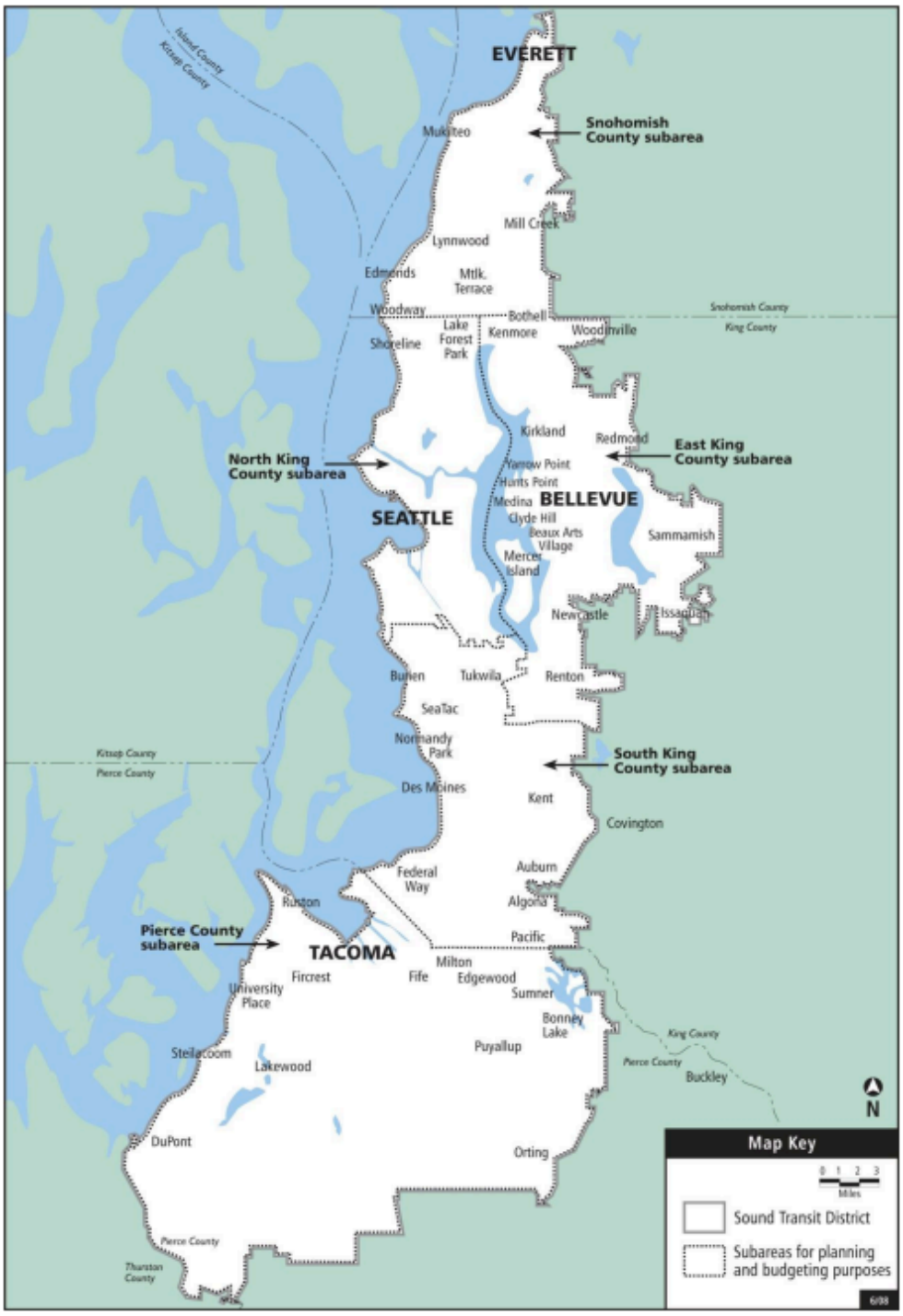
Seattle's metropolitan area consists of three counties: King County (consisting of the City of Seattle and Bellevue, as well as Seattle's eastern suburbs), Pierce County (consisting of the City of Tacoma and Seattle's southern suburbs), and Snohomish County (consisting of the City of Everett and Seattle's northern suburbs). Each county has their own separate bus transit system which serves local communities within their respective borders:

- King County Metro, which serves King County,
- Pierce Transit, which serves Pierce County,
- Community Transit, which serves Snohomish County outside the City of Everett, and
- Everett Transit, which provides local transit within the City of Everett.

Within the metropolitan area as a whole, Sound Transit (ST) is the transit agency that provides inter-county connections within the metropolitan area, serving a population of about 3 million people (see Figure 8 for ST's service area). ST's funding for the first set of transit projects (known as the Sound Move) was approved by a referendum in 1996 (Cohen, 2017). Two subsequent mandates, ST 2 and 3, were approved by referenda in 2008 and 2016 respectively (Cohen, 2017). County bus transit systems also provide some inter-county service to communities near county lines to provide connections to other county transit systems (Community Transit, 2019; King County

Metro, 2020; Pierce Transit, n.d.), but Community Transit in Snohomish County provides rush hour, inter-county bus services between some smaller Snohomish County communities and Downtown Seattle and the University of Washington (Community Transit, 2020).

Figure 8. Map of Sound Transit's service area



Source: Sound Transit, 2020b

ST provides various modes of transportation to help serve its inter-regional markets. The Sounder is a commuter rail system that connects the cities of Everett and Lakewood to Downtown Seattle. Its two routes, Sounder North and Sounder South,

provide rush-hour only service that served 4.6 million passengers in 2019 (Sound Transit, 2020b). Sounder North (Everett to Seattle) runs two trips per direction per day, but monthly pass holders can also use four Amtrak trips going between these two communities. Sounder South (Lakewood to Seattle) runs seven trips per day per direction between Lakewood and Seattle, and an extra two trips per direction between Tacoma and Seattle (Sound Transit, 2020a). There are currently plans in ST 3 to provide extended service on Sounder South, including an expansion project which could see additional trips being added, as well as an extension project to Dupont, which is expected to be completed by 2036 (Sound Transit, 2016).

ST Express are a network of 28 commuter buses that connect various communities within the Seattle Metropolitan Area (Sound Transit, 2020b). Out of 28 routes, 10 routes run every day of the week, and 12 routes offer all day service, servicing the largest intra- and inter-county commuter markets in the area, including routes between major cities like Everett, Seattle, Tacoma, and Bellevue (Sound Transit, 2020b). In the future, there are plans to create a new bus rapid transit (BRT) system along Interstate 405 between Lynnwood and Burien via Bellevue, providing additional inter-county connections. This is expected to be realized by 2025 (Sound Transit, 2016).

Currently, the Link, Seattle's light rail system, is not an inter-regional service, as it only offers service within Seattle and Tacoma. However, there are plans to make the service serve inter-county markets, as outlined in ST 3, creating an extension of the current Link system between Seattle and Tacoma by 2030 and Everett by 2036 (Sound Transit, 2016).

In 2019, prior to the COVID-19 pandemic, ST provided 653012 service hours on ST Express buses, 275024 service hours on Link Light Rail, and 75,641 service hours on the Sounder commuter train, totalling 1003677 service hours overall for a service population of about 3 million people (Sound Transit, 2020b). Local transit agencies also provide further service hours on top of this.

7.2. Toronto / Greater Golden Horseshoe

Metrolinx is a regional transit agency that serves the Greater Golden Horseshoe area in Southern Ontario. It was formed in 2006 by the Government of Ontario, and is

currently responsible for overseeing GO Transit, the Union Pearson Express, and the PRESTO tap card system (Metrolinx, n.d.). The goal of Metrolinx's creation was to create a more integrated transit system for the Greater Toronto and Hamilton Area, bringing together stakeholders and governments to help achieve this goal (Metrolinx, n.d.). It has since released two long term transportation plans, the Big Move in 2008 and the 2041 Regional Transportation Plan in 2018; these plans help to guide regional transportation planning in the region (Metrolinx, 2008, 2018).

GO Transit, a subsidiary of Metrolinx following a merger in 2009, is the provider of inter-regional transit coverage within the Greater Golden Horseshoe (GGH) area, servicing the area with a mix of commuter rail lines and commuter bus services. GO's coverage includes three cities, six regions, and four counties (see Figure 9 below), servicing a population of over 7 million people (Metrolinx, 2018). Local jurisdictions within the GGH also have their own local public transit systems – some of the notable ones are the Toronto Transit Commission, which serves the City of Toronto, York Regional Transit, which serves York Region, and MiWay and Brampton Transit, which serve Mississauga and Brampton, two major cities in Peel Region.

Figure 9. Map of the GO Transit network

Source: GO Transit, n.d.-d

The GO Train system consists of seven lines, with all lines terminating at Toronto's Union Station. The seven lines extend as far north as Barrie, as far south as Niagara Falls, as far east as Oshawa, and as far west as Kitchener (GO Transit, n.d.). The frequency for each line varies, with some lines like the Lakeshore East and West lines providing all day service up to every 15-30 minutes at its peak, and lines like the Kitchener and Barrie lines, which have irregular frequencies, and provide train service to their termini only during rush hour, but runs additional trains throughout the day that terminate at earlier stops (GO Transit, 2020f, 2020e, 2020c, 2020d). GO Bus service also provides additional connections that compliment train service, which can help to increase the number of trips per day between Union Station and the termini of some lines. Plans for expansion are also expected to increase frequency on more routes to a 15-to-30-minute frequency, while also providing all-day service in both directions. New train technology will also provide faster service on several routes, including the Kitchener, Barrie, Stouffville, and both Lakeshore lines. In total, the GO Train network carried about 80% (judging from mid-year reports of ridership) of Metrolinx's 76.3 million rides in the 2019-2020 fiscal year (Metrolinx, 2020a, 2020b).

GO Bus not only provides additional connections along GO Train routes, but also provides some connections to cities outside of the GO Train network, including places like Peterborough County, Brantford, and Orangeville (GO Transit, n.d.). The amount of service varies from route to route, and in some corridors, multiple bus routes allow for more frequent service to some areas, such as the 407 East and West corridors, which can provide service up to every fifteen minutes during rush hour (GO Transit, 2020b, 2020a). While there are no plans on expanding GO Bus service in expansion plans due to declining need with the expansion of GO Train service, there are proposals for new BRT routes as outlined in Metrolinx's 2041 Regional Transportation Plan, some of them connecting different regions. Examples include the new Durham-Scarborough BRT line (connecting the Durham Region with Scarborough) and Dundas BRT line (connecting Halton Region with Peel and Etobicoke) (Metrolinx, 2018). The GO bus ridership encompassed about 15% of Metrolinx's ridership in the 2019-2020 fiscal year (Metrolinx, 2020b).

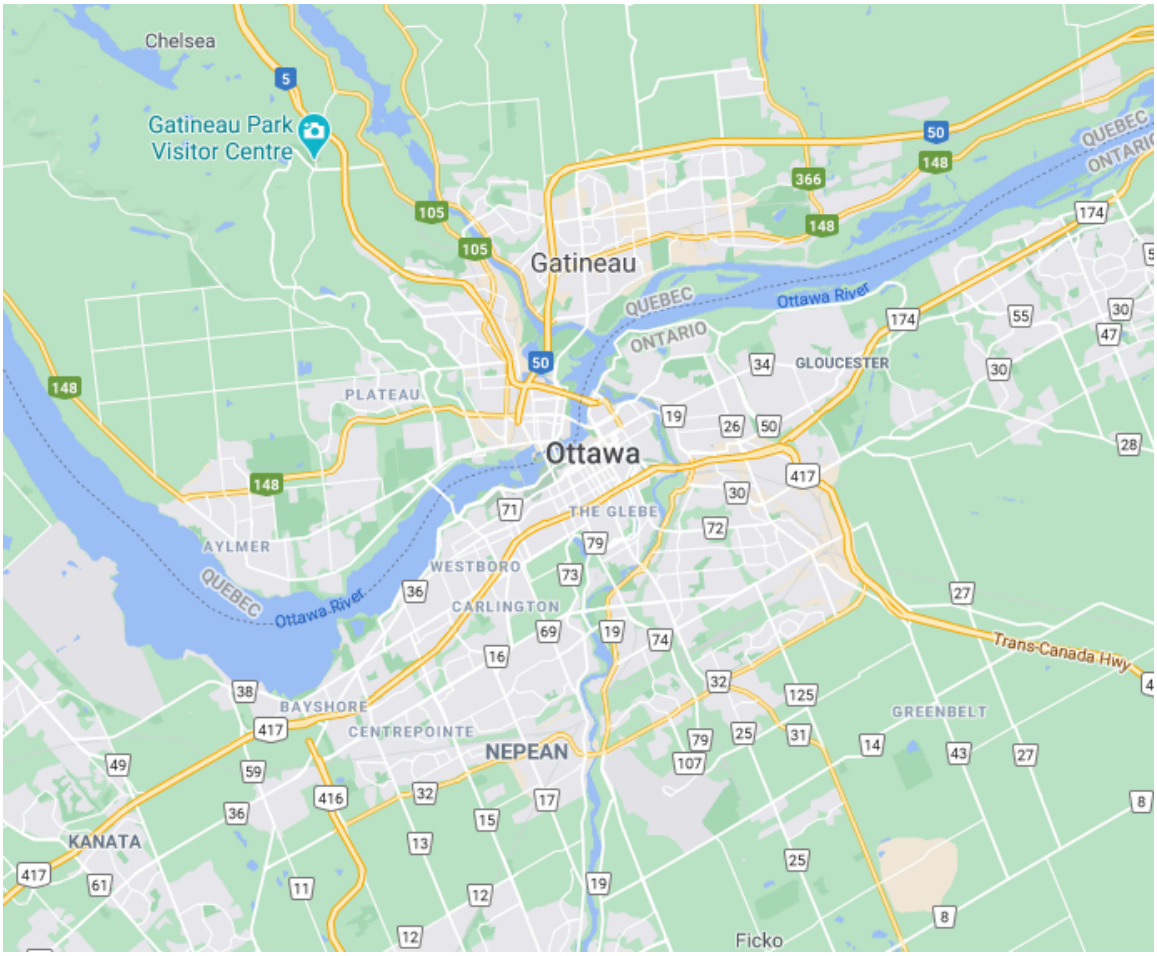
Information on annual service hours within the GO Transit region was not readily available, but in 2019, GO Buses provided 13422 weekly trips, and GO Trains provided 2163 weekly trips (Metrolinx, 2019). In total, both services provided over 810000 trips in

2019 serving 7 million people. Local transit services also provide additional transit service on top of this.

7.3. Ottawa-Gatineau (National Capital Region)

Ottawa, Ontario and Gatineau, Québec are two cities that form Canada's National Capital Region (see Figure 10 below). They are serviced by OC Transpo on the Ottawa side and the Société de Transport de l'Outaouais (STO) on the Gatineau side. Unlike Seattle or Toronto, there is no inter-provincial transit agency that is responsible for transit between these two cities; instead, both transit agencies run services that cross the inter-provincial border. The two organizations have collaborated on many inter-provincial initiatives, including inter-provincial transit studies, fare integration, and infrastructure (STO, n.d.). The National Capital Region is an example of how coordination between many different stakeholders works. Inter-provincial transit projects have to be coordinated between two cities, two transit agencies, the National Capital Commission, two provincial governments, and the federal government (Gauthier, n.d.). Together, STO and OC Transpo serve a population of about 1.48 million people (City of Ottawa, 2019).

Figure 10. Map overview of the National Capital Region



Map data: ©2021 Google

Currently, numerous bus routes cross the provincial boundary. From STO, there are as many as 40 bus routes that cross into Ottawa, including two RapiBus BRT routes (STO, 2020c). From OC Transpo, there are 7 bus routes that cross into Gatineau (OC Transpo, 2020). While there is no data on specific bus routes that cross the inter-provincial boundary, the STO carried 17.37 million trips in 2019, and OC Transpo carried 94.4 million passengers in 2017 (OC Transpo, n.d.; STO, 2020b).

There are plans from STO to build a new dedicated rapid transit system between West Gatineau and Ottawa; this would be either a BRT system (with separated lanes in Ottawa) or a tramway connecting the two cities (STO, 2020a). The rationale for this project is to encourage transit usage, decrease automobile traffic, and also reduce the number of STO buses that cross into Ottawa on a daily basis (STO, 2020a). When

completed, this will increase the reliability of inter-provincial connections between the two cities (STO, 2020a).

In 2017, OC Transpo provided 2.73 million service hours and STO provided 749472 hours of service (OC Transpo, n.d.; STO, 2018). This in total adds to about 3.5 million service hours for a region of 1.48 million people – this is more than what was mentioned above for Seattle and Toronto but keep in mind that these numbers represent all transit service, not simply service from inter-regional service providers.

8. Interview findings

Four expert interviews were conducted with individuals who had experience with planning and governing transit on a regional and inter-regional level, to get a sense of support or opposition to different transportation proposals, their perception of financial and management issues related to inter-regional transit development and operation, and ways they believe they could address these identified issues. The four individuals interviewed were:

- Sandy Blue, Abbotsford City Councillor, FVRD Board member, and Chairperson of the Abbotsford Development, Infrastructure, and Transportation Committee,
- Rick Green, former Mayor of the Township of Langley and President of the South Fraser Community Rail (SFCR) group,
- Alison Stewart, Manager of Strategic Planning of FVRD
- Bob Paddon, former TransLink Executive VP, Strategic Planning and Public Affairs

The rest of the section highlights themes that were identified in these conversations.

8.1. Expanding Highway 1 and express buses

All interviewees discussed expanding Highway 1 with a bus/high occupancy vehicle (HOV) lane in each direction due to its inadequacy to serve the growing population of the South Fraser communities. Proponents of express buses hope that expanding Highway 1 will address the unreliability of bus services along Highway 1 in heavy traffic, which hinder the ability to provide fast and frequent service along the corridor. The hope is that an extra lane on the highway can turn a simple express bus route into a rapid bus route with service at least every 15 minutes throughout the day. Using express buses is desired by proponents because of its cost and ease of implementation compared to rail.

> …having the bus right now is great, but we also need bus lanes and…Highway 1 improvements in order to accommodate that. I know there are arguments that you shouldn't widen Highway 1 but if you expect more people to take transit, having a bus sitting in traffic is not going to convince people to take the bus. You have to have the facilities

> to support bus transit whether it's just express bus or, at some point in the future, rapid bus… – Alison Stewart

Proponents of reviving the interurban rail line, however, have noted that while they acknowledge that such expansions will eventually happen, it is something that will take a long time – potentially several decades in order to add a lane along Highway 1 to Chilliwack, and say that the growth of the Fraser Valley will outpace the construction of the lane. Furthermore, they criticize this notion that simply adding one lane to a highway and serving communities with express buses will not be adequate to meet the inter-regional demands of the Lower Mainland. This sentiment is shared lightly by express bus supporters too, some who acknowledge that rail should be considered as a solution on top of buses and highway expansions, but that concentrating on rail right now will become a distraction in getting a highway expansion completed, which they believe to be the higher priority.

> There is no doubt in this world that Highway 1 will be widened over a period of time. But…I was the mayor in 2009-10 when we got the Ministry of Transportation in to talk about the widening from 202nd St to 216th St, plus the interchange….They just finished it now, which is just basically 2020. They've approved that widening from 216th to 264th now. And if you…extrapolate those numbers, both in terms of time and money and everything else, you won't finish adding one lane each way till 2051. – Rick Green

8.2. Rail projects

There is some desire to bring in rail in the South Fraser communities, as a way to provide an alternative to Highway 1 traffic – one interviewee argues that an express bus system is not a proper inter-regional solution because buses will still be stuck in traffic with other vehicles. However, there is disagreement amongst the rail proponents about whether or not to reuse existing infrastructure by reviving the old BC Electric Interurban Rail line, or to build tracks from scratch. On one side, those supporting the revival of the interurban rail line argue that such a system would be much more cost effective than building tracks from scratch and would also aim to boost tourism, enrolment in universities, and also serve some underserved neighborhoods and First Nations communities of the Lower Mainland. On the other hand, those supporting the construction of new tracks argue that there are large administrative complexities involving rail companies that would make interurban revival difficult. Additionally, they

argue that while population growth in the South Fraser was historically shaped by the interurban rail line, it is not the case today, and the road infrastructure has largely shaped present-day growth in the South Fraser.

> If you take a look at the education issue, the shortfall of enrollment in 14 postsecondary institutions out the Valley, including the Canada Education Park in Chilliwack, [the interurban rail line] would just be a massive boon to their access for enrollment. First Nations, there's a massive transit deficit within and for First Nations communities, to be able to access jobs, employment, growth, and everything else. – Rick Green

> …the challenge with [the interurban route] is the people aren't around that now, right? You know 70 years, since that's…coming up on a century since that was a vital transportation corridor and people just aren't there. What has happened is, Hwy 1 has become…the primary corridor and [there is] a lot of growth around Hwy 1, so I think if it's possible rather, you know, yeah, they're talking about adding more lanes, but I think you could build a fairly a fairly robust interregional train along the Highway 1 corridor and utilize that, but the other part of it is how do you move people within actually within the Fraser Valley… – Bob Paddon

Within the North Fraser, where a passenger rail service (the WCE) already exists, talks with some interviewees have revealed potential opportunities to expand the WCE. The most concrete proposal discussed was to simply add one train going in the counterflow direction each weekday (one morning train from Waterfront to Mission, and one afternoon train from Mission to Waterfront). However, another interviewee discussed how Canadian Pacific Railway (CP Rail)'s plans to potentially double track the WCE route could potentially allow for more service hours along the route, without giving specific details about what that could look like. Both agree that expanding service hours is necessary as the current WCE service is approaching its capacity.

8.3. Provincial support and local support

There is a sentiment that the provincial government must have the political will to tackle this issue, potentially taking the lead on such a topic as well. At the moment, interviewees acknowledge that the current NDP government has strong plans to develop transportation infrastructure in the Fraser Valley. The expansion of Highway 1 to Abbotsford has been an identified goal in provincial mandate letters, alongside promises of a Fraser Valley rail study (Government of British Columbia, 2020). This presents

opportunities for inter-regional transit projects to be acknowledged and realised. However, what is also identified is how transportation agencies are dependent on the province not just in terms of funding projects, but also for acting as a link to help manage and coordinate larger inter-regional projects. One interviewee acknowledged that the FVRD does not have the money and resources necessary to fund large studies and maybe even larger infrastructure projects, so senior governments have to be involved. Another interviewee acknowledged that provincial government of the day can often dictate the success in getting funding for different projects, highlighting his struggle with the former BC Liberal government to get funding, due to their transportation priorities being focused on other parts of the province. He hopes that the BC NDP's newfound support in the Fraser Valley from the 2020 election can incentivize more investments in public transportation there.

> …[the provincial government is] the level of…where these investigations should happen because smaller regions do not have the capacity to undertake large cross jurisdictional studies especially as senior governments are going to have to implement, plan and pay for such infrastructure… – Alison Stewart

One of the other sentiments brought up from members within the Fraser Valley was the importance of coordination in getting projects done, discussing how every inter-regional project has to be agreed between TransLink and the FVRD, and it can often be hard to advance any major inter-regional proposal in the Fraser Valley without either party's support. One interviewee discussed the problem with trying to treat Metro Vancouver and the Fraser Valley as two separate transit jurisdictions, talking about how the perceived lack of care outside one's jurisdictional area is not productive in the long run, especially when both regions are quickly becoming intertwined with each other. There is a wish that there will be productive conversations in the future to help advance coordination on inter-regional transportation goals; conversations are ongoing between the FVRD and TransLink as part of TransLink's Transport 2050 planning process.

8.4. Funding and managing transit

Interviewees discussed the challenges and opportunities of trying to come up with money and resources to fund capital and operating costs for transit projects. From the FVRD side, the greatest opportunity arises in ridership. For transit systems within the

Fraser Valley, most have been able to have significant expansions within the past decade, and as one interviewee discusses, most goals within the 2010 Strategic Review and the FVRD's RGS have been met. Additionally, while the FVX was initially doubted in its success, the service has become increasingly popular, not just among commuters but also for people doing everyday errands, with ridership doubling as soon as weekend service was expanded. This has allowed the service to be funded largely by fare revenue and service has been expanded several times without increasing the requisition limit that the regional district has from its municipalities. This shows, from her viewpoint that there is a lot of political support for transit. Within Metro Vancouver, the change in government in 2017, as mentioned above, has led to increased funding for different projects as a result of greater cooperation. This offers opportunities for support within the Mayor's Council 10-year plan in Metro Vancouver as well as other projects within the Fraser Valley.

> But…if you've got one party is that is not willing to do anything like we went through that, you know, with the you know the last Liberal government under Christy Clark. They just didn't want to do anything, and they just did not want to come in any way….Now you get a change of government and suddenly all the funding starts to arrive, right, and then you know the NDP recognized that the focus of the last Liberal government was not on the Lower Mainland, right? – Bob Paddon

Several challenges were highlighted. Within the FVRD, limited resources and funding from a smaller population mean that any bigger studies or projects that will require significantly more spending will need to involve provincial support for capital funding as mentioned above, but there also is a challenge within both regions in terms of getting appropriate operating budgets should the region choose to have a bigger rail project. While capital projects are largely funded by provincial and federal funding alongside municipal or regional taxes, operating budgets are funded mainly by municipal or regional taxes. Interviewees generally agree that there is little political will to tax Fraser Valley residents more in order to cover better operating costs, which is highlighted in a negative perception of TransLink. TransLink's 2007 governance review recommended that its jurisdictional area be expanded to include parts of the FVRD and SLRD (TransLink, 2007). This would be the ideal model of governing inter-regional transit; however, it would be unpopular in the FVRD due to the negative perception of the significantly greater level of taxation within TransLink's jurisdiction. The high level of car ownership in the Fraser Valley is also believed to contribute to these sentiments.

Not a lot of concrete solutions were discussed, but a respondent mentioned that a method to sway public opinion in funding transit was to try to envision transit as being an integral part of people's lives, an example being more transit-oriented development in long-term development plans, which encourage less car-dependence.

> The reality is, if you take a look at the Lower Mainland to have two transit providers within two districts that are really becoming one. Now there's a problem with that, and I understand the problem. If you talk to people in Abbotsford, in Chilliwack, they don't want anything to do with Metro Vancouver or the TransLink taxation… – Rick Green

> I think that you know if you grow up here, which I didn't. But if you grow up here, you know it's largely an automobile-oriented community, so people are waiting to buy their car and they're waiting to you know their friend has a car and everybody has a car… – Sandy Blue

On the creation of an inter-regional transit agency in the Lower Mainland, interviewees were mixed to opposed to this idea. Some of the mixed to positive opinions included the fact that such a system would have to involve a lot more coordination and collaboration in order to get things done, and also that transportation is difficult to collaborate when different organizations run different entities. However, one of the reasons against this was that the Fraser Valley's population is smaller in comparison to Metro Vancouver than Toronto or Seattle's suburbs are to the main core. Additionally, while there is a perception that the Fraser Valley is a "bedroom community" to Metro Vancouver, this is not the case, as many Fraser Valley residents stay within their own community. The argument that Fraser Valley residents do not want to join TransLink due to the taxation levels, is also another sticking point that may prevent such an organization from being created.

Overall, there are different opinions with regards to how people envision public transportation within the regions. However, for any project, there must be the political will from both local and/or senior governments to move these ahead. Additionally, public opinion of TransLink in the Fraser Valley creates a negative connotation with regards to further integration with TransLink or the Fraser Valley, due to the high level of taxation involved, which further influence views toward transit funding.

9. Policy criteria, measures, and options

9.1. Policy criteria and measures

Table 3 below shows the objectives, criteria (and their definitions), measures and respective values that are used in conducting the policy analysis. The first policy objective that is used in this analysis is freedom, referring specifically to freedom of movement – this looks at whether each option fits the criteria of a reliable service. As the options explored all provide regional and inter-regional service rather than local service within communities, the minimum operating hours of a reliable service defined by English, 2018 are altered in this analysis, from 6am to midnight to 6am to 10pm. Two criteria are used to assess for this objective: frequency of the service and operating hours of the service. The next objective is effectiveness, observing how well the option can attract reduce congestion and provide fast service. This is measured in both projected ridership numbers (a surrogate for congestion reduction) and also a comparison of travel times between major city centres compared to driving times in good conditions. Cost/budgetary impacts are examined to compare the proposed capital cost (the cost to build the project) and also the annual operating cost (the cost per year to run the system). Administrative ease is examined qualitatively by looking at the ease of coordination with different stakeholders that would be involved or impacted by the project. It also examines the ease of implementation by comparing how quickly a project can be developed. Finally, the analysis examines how sustainable this option is in the long term. The first variable is GHG emissions by looking at what each option can do for individual GHG reduction. The next variable looks at future demand, by looking at the maximum design capacity of these options as they are, to see how viable they can be in the long term. Because the policy problem is mostly concerned with addressing the inadequacy of public transit between these two regions, and because high levels of service can often be determined by the ridership levels and the ability for such a service to compete with private vehicle usage, I double the point values for each criterion in both the freedom and effectiveness objectives.

Table 3. List of objectives, criteria, measures, and respective values for analyzing policy options

Objective	Criteria	Definition	Measure	Value
Freedom (x2)	Adequate frequency	How frequently does the service run?	Frequency of 30 minutes or better	3
			Frequency of 30-60 minutes	2
			Frequency of more than 60 minutes	1
	Adequate operating hours	Do the transit options meet these criteria? Operates between 6am and 10pm, and Operates seven days a week	Meets both criteria	3
			Meets one of the two criteria	2
			Meets none of the criteria	1
Effectiveness (x2)	Congestion reduction	What is the projected ridership of these options?	Projected ridership of more than 6000 people per day	3
			Projected ridership of between 4000 and 6000 people per day	2
			Projected ridership of less than 4000 people per day	1
	Speed of service	How fast can one get between city centres in the Fraser Valley and Metro Vancouver, presuming good traffic conditions?	About the same or faster than vehicle travel times	3
			Slightly slower travel times than driving (up to 50% slower on average)	2
			Much slower than vehicle travel times (more than 50% slower on average)	1
Cost / budgetary impacts	Capital costs	How much would it cost to fund the construction of the project?	< $1.5B	3
			$1.5B to $10B	2
			> $10B	1
	Operating costs	How much would it cost to operate the project per year?	< $10M	3
			$10M to $100M	2
			> $100M	1

Objective	Criteria	Definition	Measure	Value
Administrative ease	Ease of coordination	Will coordination between relevant stakeholders be easy or hard?	Relatively easy	3
			Neither easy nor hard	2
			Relatively hard	1
	Ease of implementation	How quickly can the transit mode be implemented?	Almost immediately to the next five years	3
			Within the next 5-10 years	2
			Within a longer time period	1
Sustainability	GHG emissions reduction	How much do these options work to reduce GHG emissions?	Option has an average reduction of individual GHG emissions by more than 45%	3
			Option has an average reduction of individual GHG emissions by 15-45%	2
			Option has an average reduction of individual GHG emissions by less than 15%	1
	Fitting future transit demand	What is the maximum design capacity of these options?	Option can carry more than 2000 passengers per hour per direction (pphpd)	3
			Option can carry between 1000 and 2000 pphpd	2
			Option can carry less than 1000 pphpd	1

9.2. Policy options

Several proposals have been discussed to better connect these two regions: a network of express buses, a revival of the Interurban rail corridor, a plan to build a second commuter rail service out into the Fraser Valley, and the expansion of current WCE service.

9.2.1. Express buses (North and South Fraser Communities)

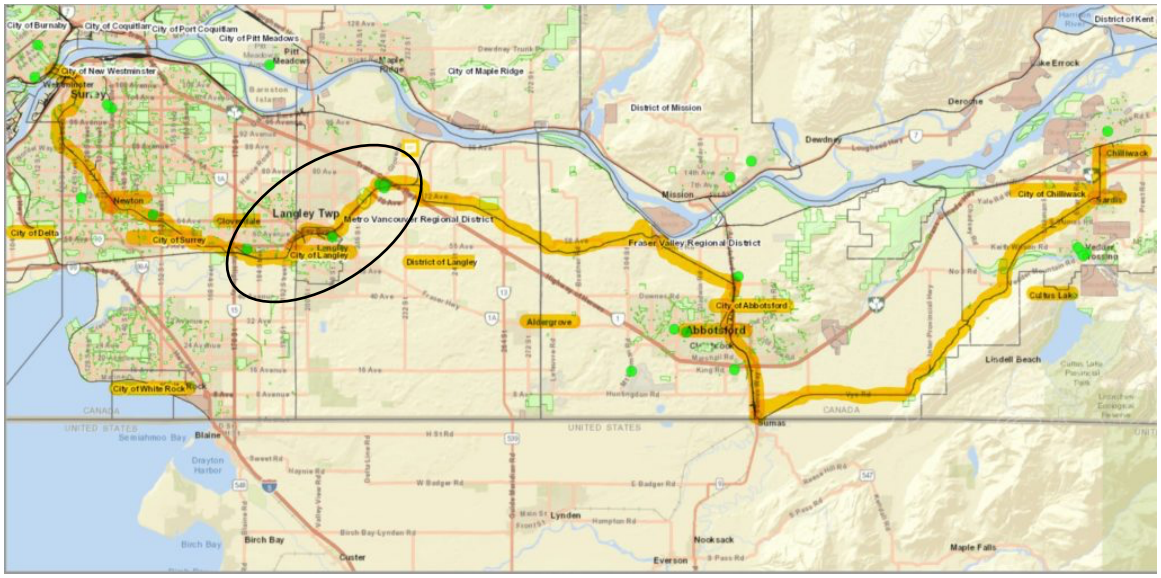
This proposal connects communities between the regional boundary with new bus services. Potential inter-regional routes are shown in Figure 7 above and would include adding new regional bus services between Langley City and Abbotsford (along the Fraser Highway), between Maple Ridge and Mission (along Highway 7) and upgrading the existing FVX to a rapid bus route (along Highway 1). While the 25-year vision shows that the Fraser Highway and Highway 7 bus services are hoping to have a peak hour frequency of every 30 minutes during peak hours and every 60 minutes in non-peak hours, there is an opportunity to potentially increase service along the Fraser Highway to every 10 minutes during peak hours and every 20 minutes during non-peak hours.

In upgrading the FVX, there are also plans to widen Highway 1 to add HOV/bus lanes. The BC government plans to widen Highway 1 to Whatcom Road in East Abbotsford by 2026, which would attempt to alleviate the issue of buses being caught in heavy traffic, a challenge that has made the FVX service unreliable and uncompetitive compared to private vehicle usage (Government of British Columbia, 2020). It would also allow buses to run more frequently, with the 25-year vision envisioning frequencies of up to 10 minutes during peak hours, and 20 minutes in non-peak hours. There are also plans to extend the current FVX route to Lougheed Town Centre Skytrain station in Burnaby from its current terminus at Carvolth Exchange in Langley (Fraser Valley Regional District, 2019).

9.2.2. Interurban rail revival (South Fraser communities)

This proposal would revive a 100km interurban rail line, connecting Scott Road SkyTrain Station in Surrey to Downtown Chilliwack (see Figure 11 below for map). Once operated by the BC Electric Railway (under BC Hydro), an interurban rail service operated from 1910 until it was decommissioned in 1950 due to the rise of car usage. The Province sold off the tracks in 1988 to ITEL Chicago (now the Southern Railway of BC or SRY) and CP Rail, but retained ownership of the right-of-way and importantly, the right to reinstate passenger rail service at no cost (Government of British Columbia, 1988). Interurban rail advocates point to the Master Agreement that was signed between CP Rail and BC Hydro, that they claim would not just allow the province to use a third of the traffic on CP Rail's tracks for free, but also would require CP Rail to pay, at their expense, any necessary double tracking on their tracks (as circled in Figure 11 below) to accommodate this passenger service (South Fraser Community Rail, 2019b). While there is disagreement from some municipal politicians and CP Rail over the interpretation of the agreement, should the wording work in favour of the advocates, it would allow a rail service to run between across South Fraser communities relatively cheaply (South Fraser Community Rail, 2020).

Figure 11. Map of the Interurban Corridor route



Indication: Black oval indicates track segment owned by CP Rail
Source: South Fraser Community Rail, 2019a

There are several proposed technologies to be considered. UrbanSystems (2010a) does an analysis on two kinds of technologies: Heavy Diesel Multiple Unit (DMU), a technology similar to that of the WCE, and Light DMU, a technology similar to that of the O-Train in Ottawa. The South Fraser Community Rail (SFCR) group, one of two interurban rail advocacy groups in the Lower Mainland, has proposed a third technology using hydrogen fuel cell powered trains (Hydrail), a new technology that has been used for regional rail purposes which eliminates the need for rail electrification.

9.2.3. Building a new rail system (South Fraser communities)

Due to the complexity involved in negotiating with rail companies to use the interurban track, some have considered building a separate rail system in order to help mitigate this issue. Two proposals that have recently gained public attention. The first is Abbotsford Mayor Henry Braun's proposal to build a separate commuter rail system connecting Vancouver and Abbotsford along the middle of Highway 1, with a potential extension to Chilliwack, with a plan to run trains between the two cities (Olsen, 2020). The second is the Mountain Valley Express (MVX), a proposed high speed rail (HSR) line running between Chilliwack, Vancouver, and Whistler (The MVX Collective, 2020), which also follows similarly Highway 1. For the purposes of the analysis, I focus solely on the part of the MVX running between Chilliwack and Vancouver, as this capstone focuses on transportation running between Metro Vancouver and the Fraser Valley. These concepts are still very preliminary, with very few studies to back them up. However, it is important to consider these options in this analysis using best guess estimates.

9.2.4. West Coast Express expansion (North Fraser communities)

A WCE expansion was listed as a priority of both TransLink and the BC government, but there is no concrete plan on how it would look like. Discussing with interviewees, there were hopes to at least get one counterflow train per direction per day, but there was also hope that CP Rail's potential track expansion may allow room for more trains per day. For this analysis, I work with the idea of one additional counterflow train for now.

10. Analysis of policy options

10.1. Express buses (North and South Fraser communities)

In terms of performance, all three of the projected inter-regional bus routes have frequencies and operating hours which meets the threshold set out by English (2018) given their 10-20 minute frequencies and all-day service, so I give a 3 for adequate frequency and 3 for operating hours.

In terms of ridership numbers, while UrbanSystems (2010a) treats the current FVX route as two separate routes, one can attempt to predict the number of riders on the bus that would run from Surrey to Chilliwack to be somewhere between 4500 and 5500 riders per day by 2031 (presuming all the projected 800 daily users of a Chilliwack to Abbotsford bus route are lumped in with the projected 4000 daily riders of an express bus service between Abbotsford and Surrey with some leeway). The projected ridership for a route along Highway 7 and the Fraser Highway is at 1000 and 3800 respectively, so in total, an inter-regional bus network like this can expect to carry about 10000 daily riders. I give ridership numbers a 3.

Comparing travel times to major city centres of service in the North Fraser and South Fraser (as opposed to driving, traffic excluded), an express bus service would generally be slower compared to driving, with some shorter connections (e.g., Chilliwack to Abbotsford, Abbotsford to Langley City) being slightly slower and longer connections (e.g., Abbotsford to Surrey Central) taking almost twice as long compared to driving times in good traffic. I give travel times a 1.5.

As there are already plans to expand Highway 1 to Abbotsford, and likely to Chilliwack, costs associated with the highway expansion will not be included, in order to focus on costs of running the bus service. The UrbanSystems report gives cost estimates, presuming that the annualized cost of the project would be $3.3M in 2031 dollars from Abbotsford to Surrey, which includes the cost of highway widening to accommodate a bus/HOV lane. Presuming that the annualized capital cost of running a bus service alone is about $0.2M out of the $3.3M, and a 30-year payment, this would cost approximately $6M in capital costs. Add the annualized cost of running a service along Highway 7 ($0.1M per year over 30 years) and the Fraser Highway ($0.3M per

year over 30 years) would add to about $12M in capital costs. Aggregating the costs would make the capital costs total around $20M overall. Thus, I give the capital costs a 3.

Operating costs of three express bus routes would likely not be too high. The UrbanSystems (2010a) report suggests that annual operating and vehicle costs of the Highway 1, Fraser Highway, and Highway 7 services would be $3.6M, $4.6M, and $4.1M in 2031 dollars respectively, totalling $12.3M annually. As the cost of paying off rolling stock over 30 years is small, it can be seen as being relatively small compared to the operating costs. I give the operating costs a 3.

Administratively, presuming that the current model of having inter-regional bus service managed by FVRD and operated by BC Transit is maintained, this would make the administrative complexity of managing such a service much easier and less complex. There would still need to be negotiations and talks with TransLink about overlap of BC Transit and TransLink services, but similar work has already been done in the current expansion plans. It also is much easier to implement compared to rail transit options. I give both ease of coordination and implementation a 3.

Environmentally, bus transit (presuming that it uses diesel-powered buses) can reduce individual GHG emissions per km by 33% on average compared to private vehicle usage (Federal Transit Administration, 2010). Should buses be running with full seats, this can dramatically reduce individual GHG emissions per passenger mile, by 81.3% compared to private vehicle usage (Federal Transit Administration, 2010). It is important to note as well that the advent of green technology, such as low-emission or zero-emissions buses, can help to further reduce emissions from public transportation. I give GHG emissions a 2.

The design capacity of an express bus service, assuming that BC Transit operates the service with conventional 40-foot buses (with a capacity of 60 people each) would be approximately 420 pphpd at peak hour frequencies and 240 pphpd at non-peak hour frequencies for each route, totalling about 1260 pphpd and 720 pphpd for three routes. These numbers could about double with double-decker buses or articulated buses. This could serve the immediate short-term needs of the Fraser

Valley, but depending on growth, it may not itself be a viable enough option in the long term. I give capacity a 1.5.

10.2. Interurban rail revival (South Fraser communities)

In terms of frequency, UrbanSystems (2010a) has presumed interurban revival to likely be done as a peak-hour only commuter rail service using Heavy DMU trains (with a 30 minute frequency), or an all-day rail service using Light DMU trains (with 30 minute peak hour and 60 minute non-peak hour frequencies). Discussing with Rick Green, he envisions 15-to-30-minute frequencies throughout the day, at least between Abbotsford and Chilliwack. I presume that this frequency is the same across the entire route. As such, the Heavy DMU and Hydrail proposals gets a 3, and the Light DMU proposal gets a 2 on frequency. On operating hours, the Light DMU and Hydrail proposals get a 3, while the Heavy DMU option gets a 1.

Ridership numbers are an area of contention between transit officials and interurban proponents. While UrbanSystems (2010a) has outlined that the ridership would likely land in the magnitude of between 1.7 to 1.8 million riders per year for the Heavy DMU and Light DMU proposals, the SFCR group disputes this number, claiming that the WCE, which serves a population of about 370000 people has seen 2.3 million boardings in 2017, and that they presume a rail system that serves a population of 1.2 million people would receive much higher ridership than what is proposed. They extrapolate that such a system would receive 5.5 million riders per year based on the information of WCE ridership (South Fraser Community Rail, 2019c). However, it is important to know that while the population south of the Fraser River is higher, the track does go through more rural areas compared to the West Coast Express, and as one interviewer had pointed out, most of the modern-day development of South Fraser communities has followed the path of the major road network, rather than the interurban railway line. To make a conservative guess, I presume that the ridership is somewhere around 2-3 million per year, or on average about 5500 to 8200 per day, while noting that updated ridership studies should be done. I thus give ridership numbers a 3 for all proposals.

Proponents estimate that the trip time from Chilliwack to Scott Road Station is 90 minutes (UrbanSystems, 2010a). In terms of travel times between major city centres, it

would take about the same amount of time for shorter regional and inter-regional trips (e.g., Abbotsford to Chilliwack or Langley City to Abbotsford) but for longer trips (e.g., Abbotsford to Surrey Central), the travel time will likely be close to double that of the driving time. It is ideally more reliable compared to buses, as it is unaffected by vehicle traffic. However, the number of grade crossings around some of the denser areas may slow down the journey time overall. Hence, I give travel times a 2.

In terms of capital cost, there is also disagreement. Interurban advocates claim that the capital cost of reinstating the rail would be about $12.5M/km, totalling $1.25B for the entire 100km line. This figure comes from a 2010 study done by Leewood Projects, a UK-based engineering firm that concluded that reinstating the interurban would cost around $5M/km when based off diesel powered units (Cockle, 2010). Rick Green responded to the difference in figures being the adjustment of costs for hydrogen technology, as well as “significant latitude in final costs”. UrbanSystems (2010a) states the cost for Light DMU and Heavy DMU trains, costing between $11.4M/km and $18.6M/km to upgrade tracks for the Heavy and Light DMU technologies respectively, thus costing $1.14B and $1.86B in total to upgrade these tracks; these costs do not include rolling stock. TransLink, however, disagrees with these numbers, and believes that the cost to be much higher than what interurban advocates have stated, proclaiming costs of between $50M and $85M/km due to their view of needing to double track the length of the interurban line and to make necessary upgrades to allow for frequent service (Cross, 2019). However, it is important to acknowledge that the 2012 report TransLink references looks at the feasibility of implementing a true rapid transit service (with minimum 5 minute frequencies during rush hour), and that the proposed frequency of a community rail service would have a maximum of 15 minute frequencies, with 30 minute frequencies in off-peak hours (Cross, 2019). Hence, there may not need to be double track the entire length of the 100km track if there can be proper negotiations done with freight companies over when they may use the tracks. If the terms of the CP Rail - BC Hydro Master Agreement also hold, this would also mean that the double tracking of their route would be done at CP Rail’s expense (South Fraser Community Rail, 2019b), but as mentioned later, CP Rail would likely not concede their assets easily without a legal battle. Due to uncertainties, I would put the estimate of the Hydrail project at between $1.25B to about $8.5B, accounting for any additional double tracking and necessary upgrades (notably of grade crossings near busy intersections to grade

separated trackways) may need to be done on some parts of the SRY railways to improve reliability, if there is any that may be required. This is a lot more expensive than expanding bus service routes. I give a 2 to all proposals.

In terms of operating costs, the operating cost of Heavy DMU would be about $3.12M per car per year ($600 per service car hour) and $3.9M per car per year ($300 per service car hour) for Heavy DMU and Light DMU trains (UrbanSystems, 2010a). Assuming that each train has about five cars, that would be a service fee of about $15.6M and $19.5M per year for the Heavy and Light DMU trains respectively. There have not been any reports specifically on the costs of operating Hydrail on the interurban, but there have been studies done in other jurisdictions, including by Metrolinx in Toronto, that have found that the costs of operating and maintaining Hydrail are about the same or higher than an electrified rail service (CH2M HILL Canada Limited et al., 2018). One can presume that the cost of operating Hydrail would be around $300 per service car hour (about the cost of electrified light rail in the United States), which would equate to about $15.7M per car per year (MacKechnie, 2020). With four cars, this comes out to around $63M per year on average. I give operating costs of the Light and Heavy DMU proposals a 2, and the Hydrail proposal a 1.5.

A high level of coordination is required for this proposal. While the CP Rail - BC Hydro agreement and the terms of sale of the railroad to SRY would ideally give the right to reinstate passenger rail services at no cost and would require CP Rail to concede a third of their wheelage for passenger rail, it is unlikely that CP Rail, a large, multi-billion dollar rail company, would willingly concede parts of their assets to satisfy the needs of a passenger rail service without a large legal battle or substantial payments. If this issue is unresolved, it would lead to such a service being unfeasible, as freight traffic would then have priority over passenger rail, which would lead to very unreliable travel times and thus, low ridership. Beyond this initial problem, there are more complications to address. Not only would this project require collaboration with TransLink and the FVRD, a high level of negotiation with CP Rail and SRY would be needed in order to ensure that freight rail traffic can safely share tracks with a passenger rail service. This would involve scheduling freight traffic around passenger rail traffic or double tracking to ensure that there would be appropriate physical separation between trains. Freight traffic along the CP Rail track section is expected to increase due to the expansion of the nearby Roberts Bank Superport, thereby making this project complex. Should the

province take over such a project, this may potentially lessen the administrative strain on the regional districts, but determining the relationship between the operators and the rail companies would be the biggest challenge with this proposal. Implementation may also take some time, as rail projects generally can take many years to secure funding, and while the tracks are in place, the necessary upgrades and double tracking would also take at least several more years to construct. Double tracking would also require appropriate acquisition of land in order to expand the railway right-of-way, requiring further negotiations. I give all proposals a 1 for coordination and a 1.5 for implementation.

Environmentally, Hydrail is a zero-emissions technology, and thus would be an ideal technology in helping the Lower Mainland reduce GHG emissions from transportation. Commuter and light rail using Heavy and Light DMU respectively would produce about 60-66% less emissions per person compared to personal vehicle usage (Federal Transit Administration, 2010). I give the Hydrail proposal a 3 and the Heavy and Light DMU proposals a 2.

In terms of meeting transit demand, the Heavy and Light DMU options likely would not meet demand as they only serve the area with limited service. If each heavy rail train had five cars with 144 passengers each, then peak hour capacity would be 1440 pphpd. If each light rail train carries four cars (consisting of two two-car segments of about 250 passengers each), that would serve a design capacity of 1000 pphpd during peak hours and 500 pphpd at other times. However, the Hydrail proposal would meet the necessary demand of longer-term needs of the Fraser Valley, as it can provide adequate capacity to accommodate a more rapidly growing community, in a way that could be more efficient than a bus service. Proponents envision each train having four cars, and each two-car segment (using the Alstom Coralia iLint) can accommodate up to 300 passengers, with up to 15-minute frequencies. This would give this service a design capacity of 2400 pphpd during peak hour and 1200 pphpd during off-peak hours. I give the Light DMU proposal a 1.5, the Heavy DMU proposal a 2, and the Hydrail proposal a 2.5.

10.3. Building a new rail system (South Fraser communities)

In terms of frequency, there is no data given to the commuter rail proposal, but given that they will be on separate tracks, there likely would be an attempt to get all day, bi-directional service. I presume that it will have 20-minute service during peak hours and 30 minute service during non-peak hours. The MVX Collective envisions up to 12 trains per hour (The MVX Collective, 2020). I give a 3 for all proposals.

There have not been any ridership projections for Mayor Braun's project. The WCE had about 2.6 million boardings per year, but given the higher frequency assumption may trigger higher rates of ridership, and also because the South Fraser communities have a higher population, I estimate that ridership on this line could be about 5-7 million per year, or around 14000-19000 riders per day, noting that there might be a lot of error associated with this number (TransLink, n.d.-c). Doing a rough extrapolation of traffic data on Highway 1 and Highway 99 (from Vancouver to Whistler), the MVX proponents predict that the project could see about 97200 users per day, assuming 20% of drivers switch to the MVX due to its ease and speed. This includes 18200 riders per day within the Fraser Valley. I give a 3 for all proposals.

Travel times and a specific route for a commuter rail proposal also are not certain at the moment, but it can be presumed that the commuter rail would start from Surrey Central Station, and would go to Chilliwack in about 45 minutes, which would be marginally faster than driving times in good conditions. However, as Mayor Braun's proposed route of the train is to parallel Highway 1, this will not directly reach Langley City. Connecting to Langley City will require further connections on buses, which may add time. The MVX proposal proposes that a trip from Chilliwack to Surrey would take less than 20 minutes, which outperforms the other options, and is able to travel to between city centres faster than a car (The MVX Collective, 2020). They forecast that a trip to Vancouver would take about 30 minutes (The MVX Collective, 2020). I give a 3 for both proposals.

An ambitious project would have a large capital cost. Currently, Mayor Braun's commuter rail plan would cost at least $8B but would likely be higher (Olsen, 2020). It is unsure if such a plan would also include an extension to Chilliwack. The MVX proposal, in its entirety from Whistler to Chilliwack, would cost between $7B and $16B, according

to its proponents (The MVX Collective, 2020). As this capstone focuses on transportation between Metro Vancouver and the Fraser Valley, and not into the SLRD, the cost can be cut in half to $3.5B to $8B. I give a 1.5 for the commuter rail proposal and a 2 for the MVX proposal.

There are currently no studies on operational costs of these proposals at the moment. If one assumes the commuter rail service cost would be about the same as the WCE and uses the same heavy rail technology (the $600 per service car hour figure given in UrbanSystems, 2010a), and such a service runs every 20 minutes during peak hours (6-9am, 3-6pm), and 30 minutes during non-peak hours, and the trip from Surrey to Chilliwack takes about 45 minutes, then the cost of running the rail could be extrapolated as being approximately $14M in 2010 dollars per car per year. Assuming five cars per train, that would be approximately $70M per year. The MVX proposal's operating cost can be estimated from other proposals, such as Ontario's HSR study. A similar operating time (an hour) between Toronto and London, with three trains per hour at its peak, would have an operating cost of about $8.9B over 60 years, or about $150M per year on average (Steer Davies Gleave, 2016). If only the route between Metro Vancouver and Fraser Valley is concerned, that would halve the operating cost to about $75M per year. The MVX proposal runs at four times the frequency at its peak compared to the Ontario HSR study, so multiplying that number by four would give us an approximate cost of $300M per year. I give a 2 for the commuter rail proposal and a 1 the MVX proposal on operating costs.

In terms of administrative ease, building separate tracks for rail would be easier to coordinate than an interurban line, due to the elimination of freight rail companies that would also have to share the line with passenger trains. Both proposals, if realized, would likely be managed by the province with collaboration with different transit agencies in order to determine connections with their services. The BC Transit Act has provisions on how commuter rail cost-sharing between municipalities and regional districts would work, but it is important to know that the provisions were made at the time the WCE was implemented in 1995, which pre-dated the creation of TransLink, and any new inter-regional rail project would likely need to work around TransLink's policies (British Columbia Transit Act, 1996). Implementation of this project would take longer, since new tracks will have to be constructed over long distances, and the level of capital

funding may have to come over many years. I give both proposals a 2 in coordination and a 1 for implementation.

Sustainability wise, the commuter rail proposal would reduce carbon emissions by about 66% compared to driving (Federal Transit Administration, 2010). If the MVX proposal is electrified, then this would be a zero-emission transportation method. In terms of maximum capacity of these options, the commuter rail proposal would serve approximately 2160 pphpd (assuming each train has five cars of 144 people each) during peak hour and 1440 pphpd during non-peak hours, and the MVX proposal would have a maximum capacity of about 10800 pphpd (The MVX Collective, 2020). This presumes that each high-speed train holds about 900 passengers. I give both proposals a 3 on environmental sustainability and a 3 in terms of capacity.

10.4. West Coast Express expansion (North Fraser communities)

This proposal provides a marginal increase in service on the WCE. It could potentially serve an extra 1000-3000 people per day, depending on the number of cars of the train. I presume that capacity is lower in the counterflow train and will say that five cars would be necessary. In terms of speed, it is the same as the current WCE, at 75 minutes per direction between Mission and Downtown Vancouver, which provides service that is about the same as driving between these cities. I give the frequency, operating hours, and ridership a 1, and the travel times a 3.

In terms of capital cost, the cost of a new train would cost about $3.4M per train car (UrbanSystems, 2010a). Five cars in a train would cost $17M in total, plus several million more for a locomotive. I give the capital cost a 3.

In terms of operating cost, one would need to account for general operating costs, but also the cost for added lease time from CP Rail. In terms of general operating costs, presuming the operating costs of the WCE in 2016 was around $18.1M, the added cost of an extra train could be extrapolated to be about $3.63M more. There are no official published numbers on track lease fees, but in 2003, TransLink paid $5M in track lease fees (around $7M today). The SFCR group paints another picture, claiming that number to be closer to about $20M per year. For now, I state that the cost is around

$16M per year. Extrapolating that number gives an additional track fee of around $3.5M per year. I give the operating cost a 3.

Administratively, this should be easy to manage as TransLink already has contracts with different companies to operate the WCE. However, track usage negotiations with CP Rail will be a challenge, especially as the WCE has not had any service hour expansions since the service began in 1995, and CP Rail's increasing freight traffic to the Port of Vancouver poses a staunch challenge in guaranteeing more operating time (Chan, 2018). If track negotiations are successful, however, implementation is relatively easy as it would be relatively easy to secure funds and implement a new train. I give the ease of coordination a 2 and the ease of implementation a 3.

In terms of sustainability, commuter rail travel will reduce personal GHG emissions by 66% compared to driving (Federal Transit Administration, 2010). The extra design capacity, given a five-car train with each car holding 144 passengers, would be an extra 720 people in each direction. If expanded to a 10-car train, that would give a design capacity of 1440 people in each direction. I give GHG emissions a 3 and capacity a 1.5.

Table 4 below displays a full analysis of the four options above.

Table 4. Summary of analysis of options

Objective	Criteria	Express bus service	Interurban rail revival	Building a new rail system	WCE expansion
Freedom	Adequate frequency (x2)	6	4 (Light DMU)	6 (all proposals)	2
			6 (Heavy DMU)		
			6 (Hydrail)		
	Adequate operating hours (x2)	6	6 (Light DMU)	6 (all proposals)	2
			2 (Heavy DMU)		
			6 (Hydrail)		
Effectiveness	Congestion reduction (x2)	6	5 (all proposals)	6 (all proposals)	2
	Speed of service (see Appendix C for comparisons) (x2)	3	4 (all proposals)	6 (all proposals)	6
Cost / budgetary impacts	Capital costs	3	2 (all proposals)	1.5 (Commuter rail)	3
				2 (MVX)	
	Operating costs	3	2 (Light DMU)	2 (Commuter rail)	3
			2 (Heavy DMU)	1 (MVX)	
			1.5 (Hydrail)		
	Ease of coordination	3	1 (all proposals)	2 (all proposals)	1.5

Objective	Criteria	Express bus service	Interurban rail revival	Building a new rail system	WCE expansion
Administrative ease	Ease of implementation	3	1.5 (all proposals)	1 (all proposals)	3
Sustainability	GHG emissions reduction	2	3 (all proposals)	3 (all proposals)	3
	Fitting future transit demand	1.5	1.5 (Light DMU)	3 (all proposals)	1.5
			2 (Heavy DMU)		
			2.5 (Hydrail)		
TOTAL /42		**36.5**	**30 (Light DMU)**	**36.5 (Commuter rail)**	**27**
			28.5 (Heavy DMU)	**36 (MVX)**	
			32.5 (Hydrail)		

11. Recommendations

In the short term (10 years), to help ease congestion along Highway 1 and promote increased transit usage for trips across the regional boundary, implementing an express bus service is recommended. Its low cost and ease of implementation allows service to be implemented quickly. This should be accompanied with the construction of an HOV or high occupancy toll (HOT) lane along Highway 1, when feasible given the schedule of the highway's widening, in order to better the reliability of such express bus services during busy periods – an HOT lane could raise additional revenue to help fund transit in both regions, while helping to encourage sustainable transportation options.

However, as the population of the South Fraser continues to grow, governments should consider looking at long-term options to implement rail in the Fraser Valley. While this analysis is based on the best available information, it is important to note that a lot of reports that have been mentioned are fairly outdated, dating from the late 2000s to the early 2010s, and do not mention newer technologies or proposals such as hydrail, a commuter rail in the South Fraser, and the MVX. A province-led Fraser Valley rail study is happening at the time of writing and could offer opportunities to give more clarity on the cost of these rail projects. Such a study should examine some of the options not mentioned in previous rail studies in the early 2010s and try to make recommendations on developing rail transit in the South Fraser. Should an interurban rail line be an option, there may also be an opportunity to implement a short demonstration line for several months in order to test the ridership potential and potential success of such a system before serious consideration. Such a proposal was suggested in the early 2010s but never happened, according to interviews conducted.

On the North Fraser, track negotiations with CP Rail will likely make frequent, all-day WCE service impossible. Nonetheless, it is an attractive service within the North Fraser due to its fast service between Mission, Metro Vancouver's northeastern communities, and Downtown Vancouver compared to bus services. Hence, any expansion to the WCE, no matter how small, should be considered, but it should be accompanied with other express bus services between Mission and Metro Vancouver to provide a viable, all day connection between these two areas.

Implementing more transit may require further funding options to continue to grow the transit tax base of both regions – Appendix A highlights some of the different funding methods to do so. The biggest considerations in funding transit in the Fraser Valley would likely be regarding equity, public perception, and revenue generation. Methods to encourage more transit usage would likely also be an additional tool to meet the FVRD's public transit usage goals. Hence, I would suggest that a community pass program be instated, as it would help to raise revenue while incentivizing transit usage – such a move would involve an additional hike on property taxes in exchange for an annual transit pass at a reduced cost, but details are not clear if such a proposal would be an opt-in or an opt-out program – an opt-out program would likely see some resistance from the public. In public consultations with Fraser Valley residents, a community pass program was seen as one of the most popular ways to fund transit (BC Transit, 2013). The conversion of the current and future HOV lane on Highway 1 to an HOT lane would help encourage carpooling and transit usage, while also raising revenues to build transit – HOT lanes are more equitable than implementing a highway toll or congestion charge and are well liked by the public. Finally, a modest transit tax on motive fuels in the Fraser Valley can also help to raise revenues and encourage, to an extent, more transit usage. It is important to note, however, that due to the rise in zero-emissions vehicles, fuel taxes will not be a stable, long-term source of revenue, and may have to be supplemented with other sources of revenue. Within Metro Vancouver, TransLink is exploring various techniques of land value capture around existing and potential transit stations – this may generate significant revenue and can help create dense environments around transit hubs in Metro Vancouver. Mobility pricing has been explored in recent studies, but has a number of operational complexities as well as concerns about equity and impact.

With regards to managing inter-regional transit in the future, any existing inter-regional transit structure should be maintained for now, as they have generally worked with few problems – this is the case for express buses and the WCE. Any new services, particularly passenger rail services, will likely need to be facilitated by the BC government due to the limited capacity of the regional districts, especially the FVRD, to plan, finance, and operate larger projects. The Province should operate the rail system and coordinate a cost-sharing agreement between itself and the FVRD and TransLink, to determine how operational funding should be shared. Designing and construction work

can be done by the private sector through a procurement process. Capital costs of building rail projects, especially from scratch, should try to come from all sources: municipal, provincial, and federal funds, as well as transit reserves collected from revenues. While Appendix B looks at other management opportunities available with larger projects, using these options may pose challenges in serving the Fraser Valley's population.

Facilitating this, while there is growing recognition of the need for a more inter-regional approach to public transit that recognizes the need for TransLink's services to be more integrated with BC Transit's services in neighbouring regions, greater coordination between these multiple transit agencies is desirable in order to ensure regional transportation goals between different regions align with one another, and additionally, there needs to be appropriate avenues of discussion (either through joint committees or meetings) between the regional transit systems in order to best collaborate and implement inter-regional transportation plans moving forward.

12. Conclusion

As Metro Vancouver's population continues to expand eastward into the Fraser Valley, it is vital to address the long-term transportation needs of the region and shift away from heavy car-dependence and growing congestion on roads between the two regional districts. The research above shows the need to provide other options for transporting passengers between the two regions that try to curb private vehicle usage in the region. The findings from a jurisdictional scan and expert interviews uncover various possible transportation methods and proposals that can help connect mobility between the two regions. I explore some of the challenges with financing and managing larger projects, and offer potential solutions. Policy interventions should aim to address inter-regional transportation needs for an expanding region and attempt to curb growth in private vehicle usage.

The research above provides recommendations over what are the most promising public transit options to facilitate inter-regional transit connections in the Lower Mainland. My analysis suggests that express bus service and improved bus infrastructure on highways in the short term (the next 10 years), accompanied with plans for rail expansions in the long term, are the preferred options to help provide good, sustainable growth moving forward. In order to work toward this goal, coordination between provincial governments and the FVRD and TransLink are critical, especially to realise larger projects like rail. Transit funding sources may have to be expanded with a fulsome exploration of methods for revenue generation.

12.1. Limitations and Further Research

One of the greatest challenges with this project was getting fulsome data on the options. When estimating capital and operating costs, for example, there is an understanding that cost estimates are often very crude, and often can change once a project is underway. Additionally, throughout the research process, I encountered conflicting viewpoints from different sources of information. The biggest example of this came from trying to evaluate the interurban rail line options. With different estimates coming from interurban advocates and regional transportation agencies, it was a difficult challenge to figure out what data were more representative of the expected costs and

operating complexities. I have tried to present both viewpoints throughout the analysis and indicate where information was insufficient to draw more definitive conclusions.

Data coverage in general is a challenge. There was not a lot of publicly available data or information on some of the proposals that were mentioned, and when there was, the information was often dated, with most of it published in the early 2010s or late 2000s. When no information was available, I tried to find other ways to present a proper analysis, either by looking at different case studies in a similar jurisdiction (as was done in finding operating costs for the HSR proposal), or by making assumptions using other sources of information. I acknowledge the weaknesses in this approach.

If more time were given, I would have attempted to run a survey as a third methodology. This would be a way to help understand public opinion for and against certain transit proposals and funding mechanisms but could allow for cross-tabulation of public opinion with other variables such as where one lives, how frequently one uses transit or how frequently one travels across the regional boundary in order to observe more patterns surrounding who favours certain proposals more than others. This could give a better idea on public opinion surrounding transit that goes beyond the information given in BC Transit's Transit Future Plan consultations.

Further research on inter-regional transit, especially from the provincial government's inter-regional rail study, should investigate several topics. The first is to look at how the COVID-19 pandemic will affect transit ridership numbers within the Lower Mainland. There should also be updated feasibility studies and cost-benefit analyses on several newer proposals, such as hydrail technology on the interurban rail line, HSR, and a regular commuter rail into Abbotsford that were not captured in previous reports from the early 2010s. Finally, there should be a further study looking at ways to implement some of the methods of taxation that are proposed within the Fraser Valley, including ways to tailor the funding mechanisms to the needs of the Fraser Valley. Such mechanisms will need more consultation within the region.

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Appendix A. Financing inter-regional transit

Building larger projects may require an expansion of tax revenues, especially within the FVRD but also potentially within TransLink's jurisdictional area. At the moment, TransLink is funded through fuel taxes, parking taxes, property taxes, a BC Hydro levy, fares, and a new development cost charge (South Coast British Columbia Transportation Authority Act, 1998). BC Transit in the Fraser Valley is funded through provincial funding, property taxes, fares, and advertising revenues (BC Transit, 2013). While many in Metro Vancouver complain that TransLink imposes a lot of taxes, it is important to note that as a stand-alone organization, it typically does not receive operational funding from provincial governments unlike BC Transit, which is a Crown corporation. Changes in the demand of motor fuel over time (as more zero-emissions vehicles are sold) will also mean that gas tax revenues will slowly decline. A 2015 referendum to raise the provincial sales tax by 0.5% in Metro Vancouver to help fund a 10-year transit expansion plan overwhelmingly failed as well. Hence, new sources of revenue will be needed to help fund future transit expansions. TransLink has proposed two other potential sources of revenue (TransLink, n.d.-a):

- **Mobility pricing or congestion charging.** Used in major cities across the world, this idea could take different forms ranging from a charge to vehicles entering a city core to distance-based pricing throughout the region. The objective is not only to raise revenue, but provide incentives that encourage people to use other modes of transportation and thus reduce vehicle high congestion.

- **Land value capture.** Land value near rapid transit hubs increase when new rapid transit projects are generated. A new tax would aim to "capture" the increase in land value when new rapid transit projects are completed. Such proposals have been used to fund housing projects but can also be used to help expand transit projects.

Additionally, BC Transit has proposed several potential methods to generate more tax revenue for the Fraser Valley (BC Transit, 2013):

- **Fuel tax**, an added tax on motor fuel, currently used in Metro Vancouver and Greater Victoria.

- **Parking tax**, an added tax on parking fees, currently used in Metro Vancouver.

- **Capital reserve**, a designated reserve from property tax revenue to help fund transit projects.

- **Vehicle levy**, a tax collected upon renewal of auto insurance.

- **Community pass**, an annual transit pass each household can receive in exchange for paying a fraction of the cost of a regular annual pass through their property tax bill.

Given the potential of a new HOV lane along Highway 1, the idea of transforming the HOV lane into a **high occupancy toll (HOT) lane**, which would allow solo drivers to enter if they pay a traffic-adjusted toll rate, should be considered.

Capital costs for financing a rail system or new infrastructure is often done through government funding at multiple levels (municipal/regional, provincial, federal), while operating costs are done at the municipal level. The Canadian Urban Transit Association (CUTA) analyzed different methods cities in Canada have used to help fund transit to figure out the pros and cons of each, including looking at potential revenue, equity (horizontal and vertical), impact on travel behaviour, economic efficiency, development impact, ease of implementation, and public perception (Canadian Urban Transit Association, 2015). Looking at the different policy options mentioned in section 9.2.2, and comparing the options against CUTA's analysis, one can divide the different proposed taxation methods into five categories of methods with comments about each's viability.

- User fees (fuel taxes, HOT lanes, mobility pricing) tend to produce more sustainable revenues over time and can be useful to reduce heavy automobile usage, but should not be used in areas with sizeable low-income communities due to them having a larger burden. It is important to note that Fraser Valley politicians have opposed mobility pricing as it is something that they feel will largely impact Fraser Valley residents (who are very car-dependent).

- Vehicle ownership charges (vehicle levy) provide sustainable moderate revenues (good for operational purposes) but can have economic distortions on vehicle sales within a jurisdiction. Implementation is easier for these options, and these tools are equitable horizontally, but can be vertically inequitable depending on how levied. Provincial legislation is required to adjust any vehicle insurance fees under ICBC.

- Land value capture can help to encourage efficient travel behaviour and create economies because of increased densities. They require high levels of developable land to be successful and the availability of such lands will differ

across the region. They may be regressive, however, and should not be used in low-income areas. There are several kinds of techniques to do this; TransLink has also documented some approaches in their land value capture study. Some examples include selling station air rights to developers, transportation utility fees, development cost charges.

- Land-based charges (parking taxes, property taxes, and by extension BC Transit's capital reserve proposal) can be used to generate substantial amounts of revenue with ease of implementation. There is, however, only modest change to travel behaviour expected, and are generally quite economically inefficient. They can be seen as regressive as well, so they will not work in low-income areas.

- Non-user based charges (the community pass proposal is a variant of this) generally can provide substantial revenues, but can be inequitable if imposed and not optional and may not change travel behaviour. However, while an opt-in program would be more equitable and could change travel behaviour, it may not be as successful at generating revenues if not a lot of people buy into the program. BC Transit's Fraser Valley consultation, however, shows this method to be one of the most popular among other forms of taxation such as fuel taxes, property taxes, and road tolls.

Examples from other jurisdictions

Seattle Metropolitan Area (Sound Transit)

Sound Transit's mass transit proposals are funded through car tabs, property taxes, sales and use taxes, and taxes on rental car sales, alongside fares, borrowed debt, accrued interest and federal grants (Sound Transit, 2016). As Sound Transit's mandates and funding are approved through referenda, it means that residents democratically choose to fund transit with the various methods mentioned.

Toronto/GGH (Metrolinx)

GO Transit and other Metrolinx projects are funded by municipal, provincial, and federal contributions. The 2019-2020 Metrolinx capital budget was $3.8 billion, with the Government of Ontario funding most of it, and additional contributions from the Canada Strategic Infrastructure Fund ($19M) and municipal governments ($30M) (Metrolinx, 2019). Operating expenses, however, are funded through fares, PRESTO fees, non-fare revenues such as advertising, and provincial operating subsidies (Metrolinx, 2019).

Ottawa-Gatineau (OC Transpo and STO)

OC Transpo's 2020 budget was funded through fares, gas taxes, and municipal contributions (OC Transpo, 2019). STO's 2019 budget was funded through a mix of municipal, provincial, and federal contributions, as well as fares and auto fees (STO, 2020b).

Appendix B. Managing inter-regional transit

Proposed management mechanisms are attached to the proposals in the analysis in Chapter 10, suggesting either using existing management structures in place for upgrades to existing inter-regional projects (express bus service and WCE), and for larger inter-regional projects, presuming that the province may potentially take over the role in operating the project once completed, in order to alleviate some of the financial and managerial burden from the regional districts. However, I would also like to list several other financial and managerial models that have been discussed and looked into, which may be useful for larger rail projects:

- **A public-private partnership (P3).** A private company is contracted to be involved in all or some of the process of designing, building, funding, operating, or owning a project. One common mode of this is called the Design-Build-Fund-Operate (DBFO) model, where a private company designs, builds, helps to fund the project in part or in whole, and operates the project for a set number of years under a contract, all while the public maintains ownership of the project (Bian, 2016). In exchange for the investment, the company hopes to make a return from the operating revenues of the project. The Canada Line in Vancouver, which was built and operated by Montréal-based engineering firm SNC-Lavalin, is a good example.

- **An infrastructure subsidiary of an institutional investor.** This model is somewhat similar to a P3, but involves a public institutional investor taking on projects that would normally be taken on by private organizations in a P3. Such a model exists in Québec, with the creation of CDPQ Infra in 2015, a subsidiary of the Caisse de dépôt et placement du Québec (CDPQ), Québec's public investment bank (CDPQ Infra, 2019). This organization has helped to fund and build the 67km Réseau Express Metropolitain (REM) project in Montréal with relative efficiency, investing $3B into the $5.5B project and allowing the project to break ground within two years of its announcement (REM, n.d.).

In terms of managing inter-regional transit moving forward, while other methods of procurement and management through a P3 or a public investor have been successful in many jurisdictions in helping build mass transit, conversations with experts have exposed doubts about such mechanisms when funding a rail project to the Fraser Valley, due to its uncertainty with regards to ridership numbers. When companies or investors invest money into assets like transit projects, there is an expectation that they will have a stable rate of return on their investment, and hence they would need a high rate of ridership in order to get that return. Projects such as Vancouver's Canada Line

or Montréal's REM can produce those high ridership numbers, but it is questionable whether or not a rail project to the Fraser Valley would be able to produce those same rates, and hence it would be a much greater risk for companies or investors to invest in such a rail project.

Examples from other jurisdictions

Seattle Metropolitan Area (Sound Transit)

Sound Transit's projects are managed by the Board of Directors, consisting of 18 members, which include the Washington State Department of Transportation secretary, and 17 representatives from each county, proportional to their population within the Sound Transit service area (Sound Transit, n.d.). The county representatives are usually mayors, city council members, and county executives, and thus are largely elected officials. When creating new projects, the Board is responsible for setting budgets, identifying alternatives in an environmental review, selecting preferred alternatives, determining the final project to be built, and establishes baselines for project scope, budget, and schedule (Sound Transit, n.d.). It also approves major contracts (Sound Transit, n.d.).

Toronto/GGH (Metrolinx)

The Ministry of Transportation is responsible for overseeing Metrolinx, through setting its strategy and policy framework through the Metrolinx Act, 2006, which states the roles and responsibilities of the organization, and additionally, includes requirements for transportation plans that the agency makes – one of them includes the requirement to integrate local transit systems into its plan (Metrolinx Act, 2006). The Ministry has the right to make amendments to transportation plans as it sees fit (Metrolinx Act, 2006). The Board of Directors structure is outlined in the Act, and consists of 15 members who are appointed by the Ministry (Metrolinx Act, 2006). It is responsible for maintaining the business and affairs of the organization, including creating and approving the high level plans for transportation (Metrolinx Act, 2006). Unlike Sound Transit in Seattle, the Board members are not politicians, but are independent members, which are usually a mix of business executives, urban designers, and engineers (Metrolinx Act, 2006). Politicians and public servants are barred from holding positions on the board (Metrolinx Act, 2006).

The Board chair liaises with the Minister of Transportation through a memorandum of understanding (Metrolinx, 2010).

Ottawa-Gatineau (OC Transpo and STO)

OC Transpo is managed directly by the City of Ottawa, as prescribed in the City of Ottawa Act, 1999 (City of Ottawa Act, 1999). Its Transit Commission reports to City Council, and consists of eight City Councillors and four public members, with the mayor being an ex-officio member of the committee, and are responsible for "ensuring the development of a safe, efficient, accessible and client-focused transit system and for providing overall guidance and direction to the Transportation Services Department on all issues relating to the operation of public transit, including conventional bus service, the O-Train and Para Transpo (City of Ottawa, 2020)." Coordination with the STO on inter-provincial transit is also listed as one of the Commission's responsibilities (City of Ottawa, 2020). The STO's governance structure is set out in Québec's Public Transit Authorities Act, and mandates that the Ville de Gatineau choose its Board of Directors members from its City Council, except for two members who are residents of the Ville de Gatineau (Act respecting public transit authorities, n.d.). This includes one member who is a user of public transportation and one user of para-transport services (Act respecting public transit authorities, n.d.).

The high level of coordination required to build transit in the National Capital Region has brought about some calls for reform in the past. In 2004, a proposal for creating an amalgamated Ottawa-Gatineau transit agency in lieu of OC Transpo and STO was voted down by Ottawa City Council, due to the worries of more bureaucracy (CBC News, 2004). Gauthier, n.d. has also proposed short-, medium-, and long-term plans to address issues with coordination. This includes creating a tripartite planning agency responsible for coordination, developing and implementing a collaboration protocol for operations plans, and developing a collaborative planning model in the long term.

Appendix C. Travel times between city centres

Table C1. Travel times between major inter-regional travel markets for different transit options compared to driving times (in good traffic)

Option	Trip	Trip time with option	Driving time (in good traffic) *
Express buses	Mission to Maple Ridge	40 minutes	22 minutes
	Mission to Coquitlam	70 minutes	37 minutes
	Abbotsford to Langley City	40 minutes	30-35 minutes
	Chilliwack to Abbotsford	30 minutes	25 minutes
	Abbotsford to Surrey Central	55-60 minutes	36 minutes
Interurban line revival	Abbotsford to Surrey Central	70 minutes	36 minutes
	Chilliwack to Abbotsford	30 minutes	25 minutes
	Abbotsford to Langley City	30 minutes	30-35 minutes
Commuter rail (estimations)	Chilliwack to Abbotsford	20 minutes	25 minutes
	Abbotsford to Surrey Central	~ 30-35 minutes	36 minutes
	Abbotsford to Langley City	~ 30-35 minutes	30-35 minutes
MVX	Chilliwack to Abbotsford	7 minutes	25 minutes
	Abbotsford to Surrey Central	11 minutes	36 minutes
	Abbotsford to Langley City	~25-30 minutes	30-35 minutes
WCE	Mission to Maple Ridge	~20 minutes	22 minutes
	Mission to Coquitlam	45 minutes	37 minutes

(Driving time data from Google Maps)

Appendix D. Interview guide

Interview #:

Date:

Person interviewed (title):

Information objectives:

- Understand, from a professional or political viewpoint, support or opposition to different inter-regional transportation proposals
- Understand the challenges from a professional or political viewpoint that are associated with funding projects
- Understand the challenges from a professional or political viewpoint that are associated with co-management of projects
- Understand how some of these challenges can be overcome

1. Introduction (< 5 minutes)

Welcome, and thank you for your time today.

Confirm the name of the person, organization, position.

Purpose of the interview

- To understand the support or opposition of different modes of inter-regional transit, and the financial and co-management challenges with building inter-regional transit.
- To understand some potential solutions to some of the challenges outlined.

Interview process - taping, anonymity

Guidelines

- Speak from your own perspective
- No right or wrong answers
- We want to hear your responses, not mine.

Questions?

2. Questions on inter-regional transit modes (25 minutes max)

What is your role and connection to the topic of inter-regional public transit?

- I am a city planner, and I have been working on planning inter-regional connections.
- I am a politician/advocate, and I have been advocating on behalf of public transit projects for my community,
- Will likely discuss further about their work that they have done.

There have been many different proposals for an expansion of inter-regional transit. Your or your group have openly supported (insert proposal). Why do you think this proposal is the best proposal to serve the needs of your community or the Fraser Valley?

- It helps to serve the growing population in the area (all options)
    - **Probe for all:** How so?
        - More people = more demand for service

It is cheaper to operate (likely if they support express buses).

- **Probe for all:** How so?
    - Running a bus costs a lot less than a train

It is more environmentally friendly (likely if they support trains)

- **Probe for all:** How so?
    - Trains have less pollution than buses
    - Helps reduce GHG emissions from private vehicle usage

It can help attract more ridership (likely if they support trains, but can be for buses)

- **Probe for all:** How so?
    - Trains can travel faster than buses
    - Frequency will make the ridership more attractive

It is faster than the bus (likely if they support trains, especially high-speed rail)

- **Probe:** How much faster?
    - For HS Rail: A lot faster, going near 250-300kph.
    - For light rail/commuter rail: definitely at a speed that is competitive with driving.

It can also connect to the Sea-to-Sky region (high speed rail)

What are some of the criticisms of your proposal that you have heard of?

- Buses: cannot allow for growth to occur, may see it as being not an attractive service, and isn't fast enough.
- Trains: too expensive to build, may not be viable enough to make up the cost.
    - **Probe for all:** How do you respond to and counter these criticisms?
        - Buses: Counter by saying that it can be attractive and fast with HOV lanes in place, and that it can help to see if there is an appetite for greater expansion in the future.
        - Trains: Counter by saying that fast service and good amenities can make the service more attractive.

3. Questions on financing (15-20 minutes max)

What are some of the challenges associated with financing inter-regional transit in the Lower Mainland?

- Lack of funds from federal and provincial governments
    - **Probe for all:** Why are these issues in the region?
        - Governments don't see it as a priority

No willingness to pay from citizens

- **Probe for all:** Why are these issues in the region?
    - Car culture
    - Fraser Valley has historically been politically conservative, and generally favours lower taxes and more "personal freedom".
    - Citizens feel disengaged from transit network and don't see the need to fund it
        - **Probe:** How could we further engage citizens to take public transit?
            - Public education, may mention the transit referendum that failed and how in the USA they pass due to years of public transit education.

What could be done to solve some of these challenges?

- A lot of consultation and advocacy to help shift the political will
    - **Probe:** What sort of consultation and advocacy?
        - Presenting evidence to the Ministry of Transportation to show that it is an important issue; this will involve a collective push from all mayors involved
        - Talking to members of the public to discuss the benefits of public transit, and especially drivers who face a lot of congestion every day.

We look at ways to fund projects that are not a burden to taxpayers

- **Probe:** What do you mean through that?
    - Transit can be funded through developers or land value capture.

4. Questions on co-management (15-20 minutes max)

What are some of the challenges associated with coordinating and managing inter-regional public transit in the Lower Mainland?

- Differing priorities
- Lack of cohesion between different areas
- No co-agreements
    - **Probe:** How are current inter-regional transit routes managed?
        - WCE: Mission pays money to TransLink to operate
        - Discussion of other routes

What could be done to solve some of these challenges?

- A lot of cooperation with TransLink (may give 555 bus and 66 bus example, where 66 FVX does not pick up passengers westbound and does not drop off passengers eastbound between Langley and Lougheed Station in new 66 extension proposal).
- A new inter-regional transit organization like Sound Transit or GO Transit
    - **Probe:** Which would be better?
        - Cooperation if possible, but an organization to supersede TransLink and BC Transit in the FVRD for inter-regional transit purposes may also be possible if you can overcome the legal and logistical hurdles associated with it.

5. Closing (< 5 minutes)

Thank you for taking the time to speak with me today. Do you have any questions before we conclude?