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Territorial Analysis and Survey of Local Government Priorities for Climate Action: Vancouver Island and Coastal Communities

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University of Victoria

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This report develops a collective understanding of the Vancouver Island and Coastal Community (VICC) region for the purposes of supporting a regional climate action strategy. Part 1: Territorial Analysis outlines key geographic, socio-demographic, economic, and environmental features of the VICC region in support of establishing a regional climate action plan. Part 2: Survey of climate adaptation and mitigation priorities identifies the key climate impacts, policies, priorities, barriers, and opportunities that currently guide decision-making about climate change mitigation and adaptation in the region.

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COVER PHOTO: Cortes Island, Catriona Mallows

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Executive Summary

Urgent mitigation and adaptation efforts are needed. The Vancouver Island and Coastal Communities (VICC) region is already experiencing unique climate changes. Vancouver Island and Coastal Communities Climate Leadership Plan (VICC-CLP) has been convened to help catalyze climate mitigation and adaptation throughout the region. This report shares a territorial analysis (Part 1) and a survey of municipalities and districts and their approaches to climate action (Part 2).

Nearly all communities in the VICC region are *already* experiencing hazards and impacts related to climate change. The key hazards include wildfires, extreme rainfall, sea level rise, storm surges, extreme winds, and drought, while the top impact indicated by both municipalities and regional districts was to coastal ecosystems. There is some geographical variation in the hazards and impacts experienced. For example, impacts on tourism are the main concern for northern island communities whereas southern communities are concerned with impacts on land-use and coastal ecosystems. The majority of survey respondents expect climate change related hazards and impacts to continue and/or worsen into the future, and some anticipate new hazards and impacts not previously experienced.

Municipalities and regional districts are overwhelmingly supportive of climate action. 100% of local governments surveyed answered that climate change mitigation and adaptation are important or somewhat important to their community. The vast majority of municipalities and all regional districts also indicated that their communities are supportive of implementing mitigation and adaptation policies, with the highest support observed for pedestrian and cycling infrastructure (mitigation) and emergency management planning (adaptation). Most municipalities and all regional districts have implemented a variety of policies related to climate change mitigation and adaptation, with the types of policies varying by geography. Medium/large municipalities have a higher number of implemented policies compared to small municipalities. Despite the ongoing climate policy work and high levels of support for climate action, local governments face multiple climate action barriers, in particular related to lack of financial resources, authority and staffing capacity. Most local governments also noted the need for community-level climate and policy modelling information to plan for the future.

Local government cooperation and scaling-up efforts will be critical. The VICC has unique characteristics. It encapsulates many coastal communities including coastal and mountainous communities north of Vancouver. The vast majority (80%) of the VICC population resides in small to large population centers, while the remaining 20% live in what can be defined as rural areas—i.e., those without a population centre. Many rural areas have particularly high residential GHG emissions and high energy costs, especially those that rely on diesel power generators. Rural-urban connections and interrelationships are a key character of the VICC's society and economy—these connections are equally important for tackling climate change and scaling up efforts.

There is a need for increased senior government support to assist municipalities and regional districts in effective climate action. This support could help build essential low-carbon infrastructure and fund community-level modelling projections to implement most effective municipal and regional climate policies.

Introduction to the study

Territorial Acknowledgement

The authors respectfully acknowledge that the Vancouver Island and Coastal Communities Region is located upon the traditional unceded territories of many different Indigenous peoples. Although every effort is made to use unbiased data, much of the data is not framed to adequately reflect Indigenous realities.

The climate change challenge

Climate change is a complex and ongoing challenge that communities across the Vancouver Island and Coastal Communities Region (VICC) are tackling through a range of approaches. By 2050, it is anticipated that British Columbia will experience:

- Temperature increases of 1.3 to 2.7 °C;
- Increases in average annual rainfall from 2% to 12%, with summers being increasingly drier;
- Loss of glaciers resulting in changes to fish habitat, declining quality and storage of drinking water; and
- Continued rising sea levels along most of B.C.'s coast, more frequent wildfires and rainfalls (Province of British Columbia, 2020).

These environmental changes will have wide-ranging effects, from more frequent and severe heat waves and a greater propensity for forest fires to major disruptions in agricultural growing conditions. Climate change impacts all sectors of society and the economy now and in the future. Our communities are connected in tackling this challenge.

Why coordinate at the regional scale?

British Columbia has been at the forefront of actions to promote climate change mitigation and adaptation and there is widespread support for these efforts.[1] Communities big and small across the province have adopted a range of initiatives and there are a growing number of regional plans that aim to scale up these efforts and to promote co-ordinated actions. Climate change impacts are experienced at a local level, yet existing municipal and regional district governance structures can constrain climate action plans, making planning at a broader regional scale essential. An expanded regional scale for action has proved effective in other contexts, leading to the development of institutional arrangements better able to coordinate regional with local interests to navigate structural change (Birkmann, Garschagen, Kraas, & Quang, 2010; Gore, 2010). Regionally-scaled planning can help municipalities and Regional Districts to:

- Pool knowledge and map and understand functionally connected territories;
- Share expertise and build capacity;
- Share the costs of environmental assessments and other upfront planning needs;
- Co-ordinate and scale-up investments in adaptation and mitigation efforts;

[1] For example, British Columbia was the first jurisdiction in North America to have a revenue-neutral carbon tax and the government's CleanBC Plan has been notable across Canada for its vision and comprehensive ambitions.

- Speak with a common and louder voice to upper level governments about the region's unique needs and priorities; and
- Mutually support communities of all sizes to meet their climate goals, with larger administrations supporting smaller ones.

It is for this reason that three Vancouver Island Mayors—Lisa Helps (Victoria), Josie Osborne (Tofino), Michelle Staples (Duncan)—have convened an ad-hoc group: the Vancouver Island and Coastal Communities Climate Leadership Plan, VICC CLP SC. The VICC CLP SC includes representatives from each of the regional districts on the island and the Sunshine Coast to produce a plan that will catalyze climate mitigation and adaptation throughout coastal region.

The VICC represents a promising geographical region for this type of planning: comprised of island and coastal communities, the region shares a common history, as well as vulnerabilities, adaptation, and mitigation challenges. Its economic diversity and urban-rural linkages offer differential capacities and priorities, supporting the potential for building circular and sustainable economies with shared resources and coordinated action. The VICC CLP SC group shares a clear vision and priorities for its work, suggesting the potential for rapid collective progress. Collaborative planning at this scale thus offers a potential to build consensus and poly-benefits for climate action, including a shared regional vision to guide that action effectively and rapidly (Tomaney, Krawchenko, & McDonald, 2019).

This report proceeds in two parts.

- **Part 1: Territorial Analysis** outlines key geographic, socio-demographic, economic, and environmental features of the VICC region in support of establishing a regional climate action plan.
- **Part 2: Survey of climate adaptation and mitigation priorities** identifies the key climate impacts, policies, priorities, barriers, and opportunities that currently guide decision-making about climate change mitigation and adaptation in the region.

Please note that the Territorial Analysis (Part 1) covers the full VICC region, while the Survey (Part 2) covers Vancouver Island and the Sunshine Coast.

Part 1 Territorial Analysis

This Territorial Analysis supports a collective understanding of the key geographic, socio-demographic, economic, and environmental features of the VICC region in support of establishing a regional climate action plan. The analysis proceeds in six parts: i) about the region, ii) land use and the built environment, iii) population and demography; iv) economy and industry, v) community wellbeing, vi) the state of greenhouse gas emissions and vii) present and future climate change scenarios. This document identifies key trends and common challenges and opportunities in order to assist VICAPG with its planning and strategy development.

About the Region

- **The Vancouver Island and Coastal Communities Region is comprised of 11 Regional Districts, 89 First Nations Reserves and Indian Government Districts and 41 municipalities.**
- **The entirety of Vancouver Island and coastal mainland BC are the traditional territories of Indigenous peoples.**
- **Much of the territory and population is rural and remote with numerous small coastal and island communities: 40% of the population lives in Greater Victoria, 20% in medium sized population centres and 40% in small urban population centers and rural areas.**

The Vancouver Island and Coastal Communities region has unique characteristics that pose both a challenge and an opportunity for collective climate change adaptation and mitigation strategies. The region is shaped by its proximity to water and includes approximately 40,000 islands of vastly different sizes and around 67 inhabited major islands, the largest of which is Vancouver Island. Many communities rely on connections to water for both transportation and livelihoods. Given the prevalence of coastlines, sea level changes pose risks as does the prospect of more frequent and severe storms. The mainland part of the region north of Vancouver is coastal and mountainous, with many areas having limited accessibility. In this region land transport connections flow east-west towards the Pacific. Coastal routes are the life-blood of communities.

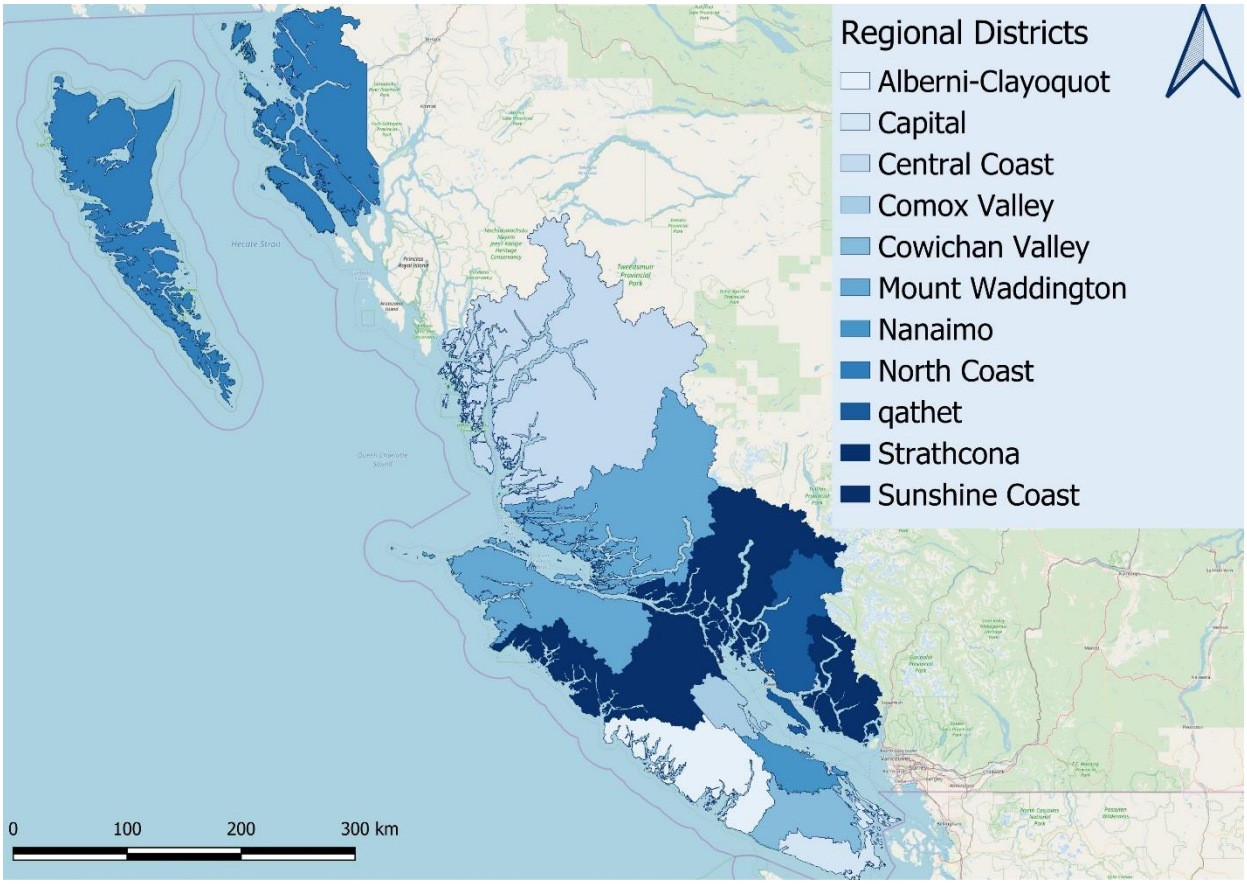
The Vancouver Island and Coastal Communities region is one of five Area Associations in BC

The territory of analysis in this document corresponds to that of the Association of Vancouver Island and Coastal Communities (AVICC), which is one of five area associations in BC. The area association was established in 1950 and includes including 41 municipalities, 11 regional districts, and Islands Trust (see Figure 1 Vancouver Island and Coastal Communities Regional Districts) that stretch from Haida Gwaii down to the tip of Vancouver Island and includes Powell River/qathet, the Sunshine Coast, the Central Coast, and the North Coast (AVICC, 2020). The Capital district at the southern tip of Vancouver Island is the largest district in the territory in terms of population and number of municipalities; it is also the seat of the provincial government. All

districts contain both municipalities and electoral areas except for the Central Coast regional district, which contains only electoral areas.

The entirety of Vancouver Island and coastal mainland BC are the traditional unceded territories of Indigenous peoples. All of the Regional Districts have First Nations reserves; the Alberni-Clayoquot Regional District has the largest number of First Nations reserves with 17, as per 2016 Census records (Table 1). The Capital Regional District has the largest on-reserve population at just over 5,000 (2016). Both qathet and Sunshine Coast Regional Districts have an Indian Government District municipality (the Sechelt Band IGD has lands in both regions) and, like Comox Valley, one reserve. There is a large population of Indigenous people living off reserve – comprising as much as 30% of the population in the North Coast district, 17% in Mount Waddington Regional District, and 13% in Alberni-Clayoquot Regional District.

Figure 1 Vancouver Island and Coastal Communities Regional Districts



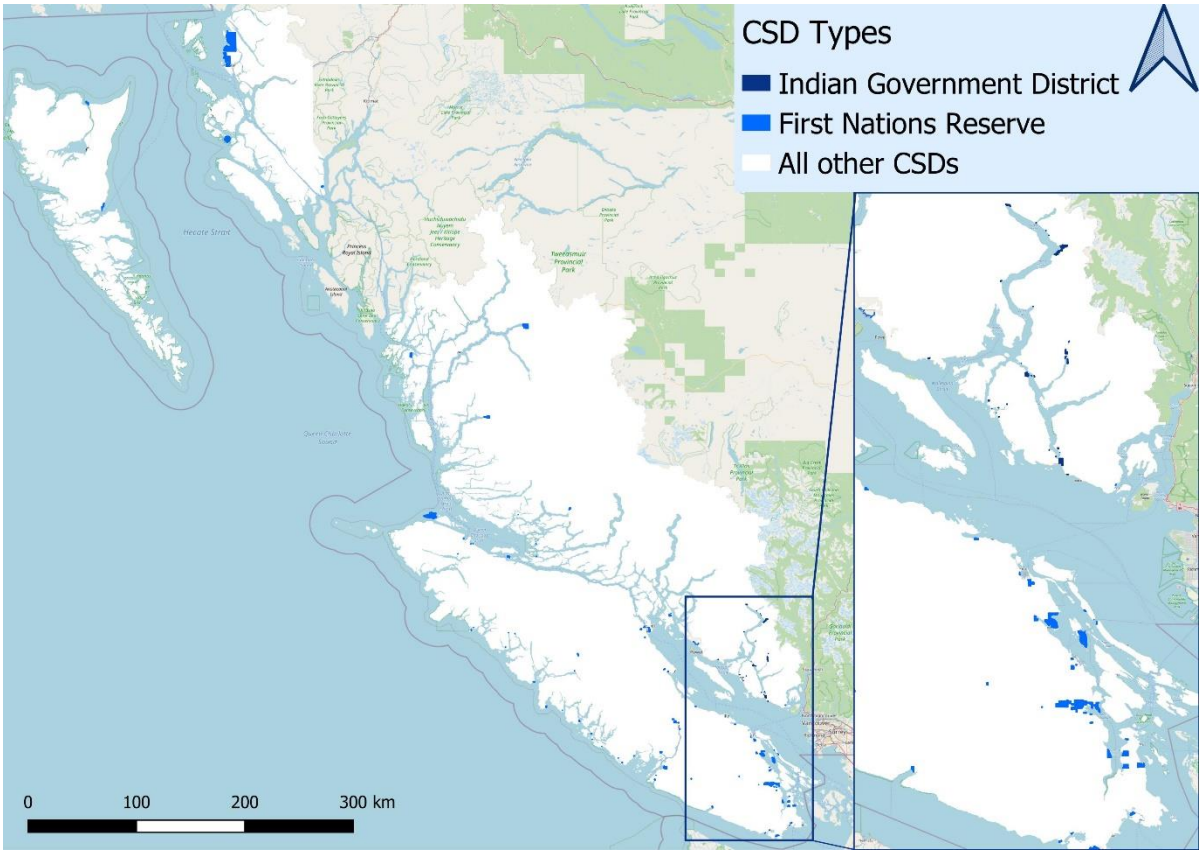
Source: British Columbia Data Catalogue. https://catalogue.data.gov.bc.ca/dataset/d1aff64e-dbfe-45a6-af97-582b7f6418b9 & https://catalogue.data.gov.bc.ca/dataset/nts-bc-coastline-polygons-1-250-000-digital-baseline-mapping-nts#edc-pow

Table 1 Municipalities, Population, and First Nations Reserves, by Regional District, 2016

Regional District	Municipalities	Total Population by District	First Nations Reserves and Indian Government Districts by Census Divisions	Population of First Nations Reserves and Indian Government Districts by Census Divisions, 2016	Population of Indigenous people living off reserve
Alberni-Clayoquot	3, + 6 electoral areas, 3 Modern Treaty First Nations	30,981	17	1,986	4,049
Capital	13, + 3 electoral areas	383,360	10	5,244	12,631
Central Coast	5 electoral areas	3,319	3	1,916	129
Comox Valley	3, + 3 electoral areas	66,527	2	222	3,603
Cowichan Valley	4, + 9 electoral areas	83,739	16	4,076	5,584
Mount Waddington	4, + 4 electoral areas	11,035	12	1,490	1,850
Nanaimo	4, + 7 electoral areas	155,698	4	1,035	9,600
North Coast	5, + 4 electoral areas	18,133	7	2,531	5,504
qathet	1, + 5 electoral areas	20,070	2	728	847
Strathcona	5, + 4 electoral areas	44,671	14	1,579	4,276
Sunshine Coast	3, + 5 electoral areas	29,970	2	671	1,349

Sources: Regional District Websites & Statistics Canada; Census Profile 2016; Census Divisions and Census Subdivisions, Statistics Canada. 2017. Focus on Geography Series, 2016 Census. Statistics Canada Catalogue no. 98-404-X2016001. Ottawa, Ontario. Data products, 2016 Census.

Figure 2 First Nations Reserves and Indian Governments Districts, VICC, 2016



Source: Statistics Canada; Census Profile 2016; Census Subdivisions

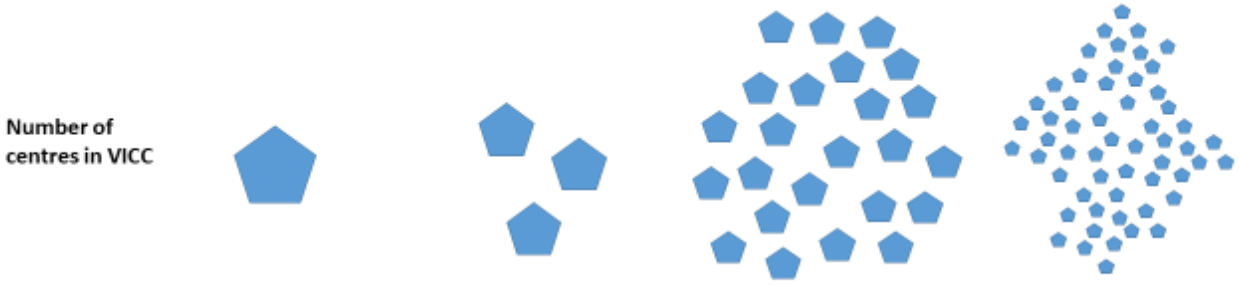
Much of the region is low density, characterised by small communities—rural-urban connections are critical to this region

The vast majority (80%) of the VICC population resides in small to large population centers, while the remaining 20% live in what can be defined as rural areas—i.e., those without a population centre (Figure 3). However, despite this definition, rurality is best understood along a gradient of more connected and dense places to less connected and dense ones. Smaller communities and rural areas may access services and labour markets in larger population centres; at the same time, these communities provide many resources and amenities that larger communities consume and enjoy, and are also a source of employment. Rural-rural connections are equally important. Across VICC, the nature of these connections and interrelationships are a key character of society and economy.

Greater Victoria is the only large population centre with a population greater than 100,000 (Figure 4Figure 4 Population Centres, VICC). Population centers are those places that have a population density of 400 persons or more per square kilometre and include more than one municipality. There are three medium-sized population centres across the region, all on the eastern coast of Vancouver Island: Nanaimo, Courtenay, and Campbell River (Figure 4). The majority of the population

centres in the region are in the middle and southern regions of Vancouver Island, forming a land-based network of urban agglomerations. There are few centres on the mainland coast, the largest being Prince Rupert. There are 24 small urban population centres. There is only one regional district without any population centres: the Central Coast.

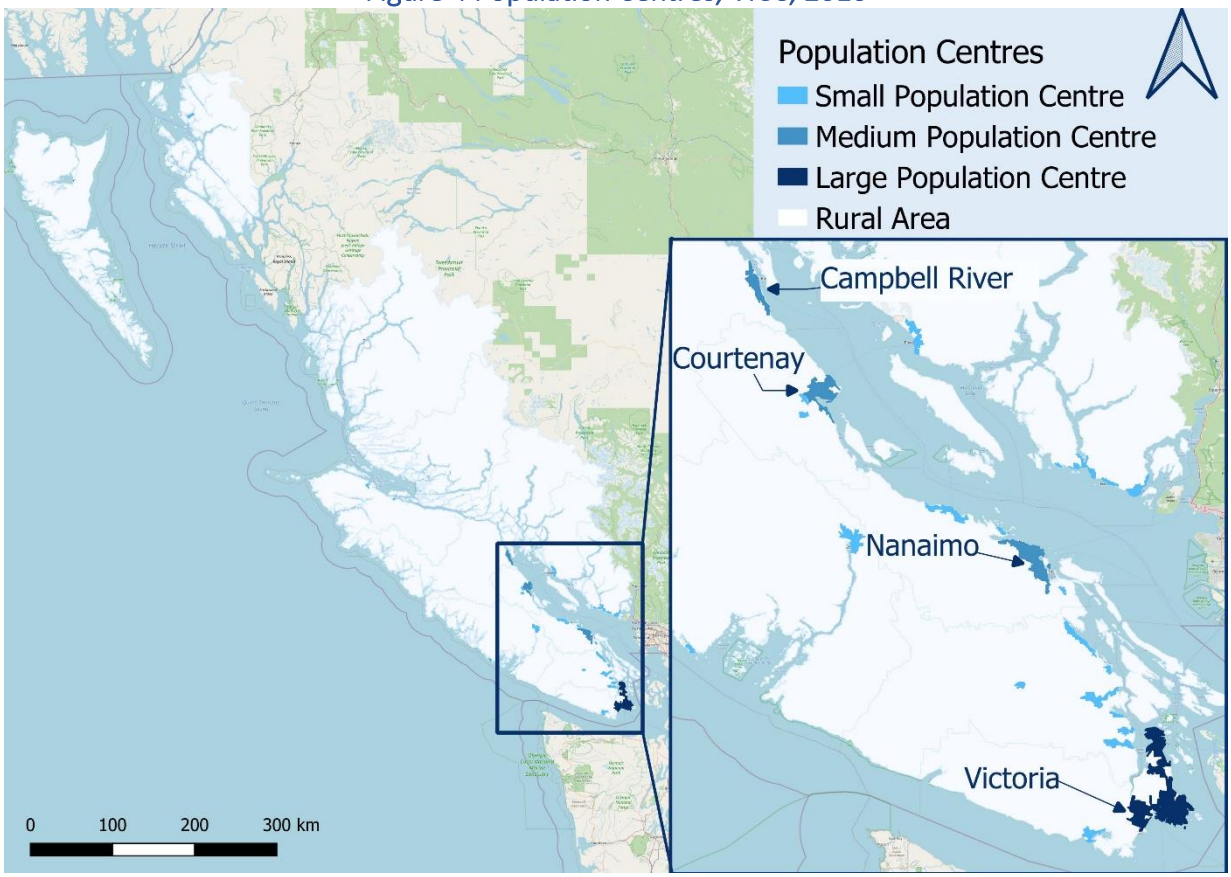
Figure 3 Urban Hierarchy by Population Centre, VICC, 2016



Type	Large urban population centres	Medium urban population centres	Small urban population centres	Rural area
Population range	100,000+	30,000 – 99,999	1,000-29,999	<1,000
Population by type	335,696	172,160	168,017	171,630
Share of population out of total	40%	20%	20%	20%

Source: Statistics Canada; Population Centre and Rural Area Classification 2016 & Population Centre Profiles, 2016 Census

Figure 4 Population Centres, VICC, 2016



Source: Statistics Canada; Census Profile 2016; Population Centres.

Land Use and the Built Environment

- **The VICC has vast forested land (60%); around 7.5% of the land has been recently or selectively logged (logged within the past 20 years)**
- **The VICC has rich ecosystems and many protected areas, including marine protected areas and Tribal Parks.**
- **A vast network of roads, ferry routes, and air travel connect people and trade across the territory; rural, remote and islands communities are at higher risk of transport disruption and isolation due to hazards (e.g., rising sea levels and more frequent and severe storms).**
- **Rural and urban areas are connected; around 8.4% of the population commutes long distances between Census Metropolitan Areas (CMA) and Census Agglomerations (CA).**
- **There are many car commuters across the southern and eastern areas of Vancouver Island; this may be in part due to high housing costs in some locales leading individuals to live in more affordable communities further from their places of work (growing suburbanisation).**

Land is life sustaining. It provides food, places to live, and its uses are fundamental to the robustness of ecosystems, air quality and even global temperatures. Human transformation of land uses has caused the fragmentation of habitats, the loss of biodiversity and the degradation of soil and water and has impacted the global carbon cycle.[2] Health outcomes are linked to land use in a myriad of ways—from the health benefits of walkable communities to the impacts of greenspaces on mental health. A wide range of social outcomes are influenced by land use; land availability is one of the major determinants of housing costs. Land and the property built on it constitute a major share of society wealth and can be a source of inequality. Land and its use also matters because people are attached to land and how it is used. Land is tied to places, communities, cultures and identities. For Indigenous peoples, land holds special importance—it provides sustenance for current and future generations; it is connected to spiritual beliefs, traditional knowledge and teachings; it is fundamental to cultural reproduction; moreover, commonly held land rights reinforce nationhood.

The unique geography of VICC creates both opportunities and challenges

VICC is a complex terrain. Included in its geography are the Coast Mountains, the Vancouver Island Ranges, and vast forests largely of Hemlock, Fir, Western Red Cedar, and Spruce (CFCG, 2020). Because of this, VICC has a range of landcover, from Alpine areas to Wetlands. The variety of landforms create great topographic relief, resulting in various climatic shifts and ecosystem changes. Due to the fact that much of VICC is on the windward side of the Coast Mountains, there is an abundance of precipitation resulting in rich rainforests flanking the coast (although some communities fall within rainshadows of these mountains, as well). Much of the VICC is covered

[2] Since 1850, roughly 35% of anthropogenic CO2 emissions resulted directly from land-use practices (Foley et al., 2005).

by forest: 45% of VICC is classified as old forest (140 years or older); 14.7% is young forest (less than 140 years old) (

Figure 5), and large tracts of the forest have been designated for logging.[3] Approximately 7.5% of the total land of VICC is either recently or selectively logged, providing revenue and jobs for the region.[4] As depicted in Figure 5, much of the logging occurs at lower elevations, which is where most urban agglomerations reside, while the majority of old growth is at higher elevations and away from populated areas. Indeed, as 94% of BC is Crown land, the intensity of forestry activities varies greatly between that and the 4% and 1% which are private and Federal Crown land, respectively (Government of BC, n.d.). Forestry is an important economic sector for many communities in the VICC which has faced challenges in recent years. Its strength as an industry going forward will require sustainable logging practices combined with higher value-added activities.

A small share of land (0.03%, or 43km²), of the region is used for mining purposes, another goods-based industry. Finally, VICC is home to a unique agriculture industry. Less than 1% of land across the VICC is agricultural.[5] Areas used for this industry commonly flank urban areas in the southern reaches of Vancouver Island and the mainland coast. These tend to be highly specialized and much smaller sized farms than that of the mainland crops in Delta, Abbotsford, and surrounding areas. That which is not forest, mining, or agriculture is mostly alpine, barren, shrubbery, or range lands, which are areas not as often utilized for resource extraction, and commonly flank the sides of mountain ranges. A large portion of the mid-eastern part of VICC is covered in glaciers and snow, providing a valuable source of pack melt freshwater in the summer seasons. The availability of pack melt, regular precipitation, and the proximity to the ocean keep the relative humidity of VICC fairly high, which is fortunate in light of the increasing threat of wildfires to the province. Even so, 99 km² of VICC has been recently burned. However, as climatic zones shift in the coming years

[3] The government of BC's land use data may overestimate the share of old growth forest by including low productivity bog and subalpine forests; they should thus be interpreted with a note of caution (Ancient Forest Alliance, 2016). Furthermore, there is no commonly accepted definition of an old growth forest but that "most of B.C.'s coastal forests are considered to be old growth if they contain trees that are more than 250 years old. Some types of Interior forests are considered to be old growth if they contain trees that are more than 140 years old" (Government of British Columbia, 2020c). A report by Price et al. (Price, Holt, Bio, & Daust, 2020) on BC's old growth forest disaggregates old growth forest by different sizes and across different ecosystems (biogeoclimatic variants) and productivity classes. By their assessment, the vast majority (80%) of old growth forest in BC is comprised of small trees and only 3% of BC's remaining forests support large trees (Price et al., 2020).

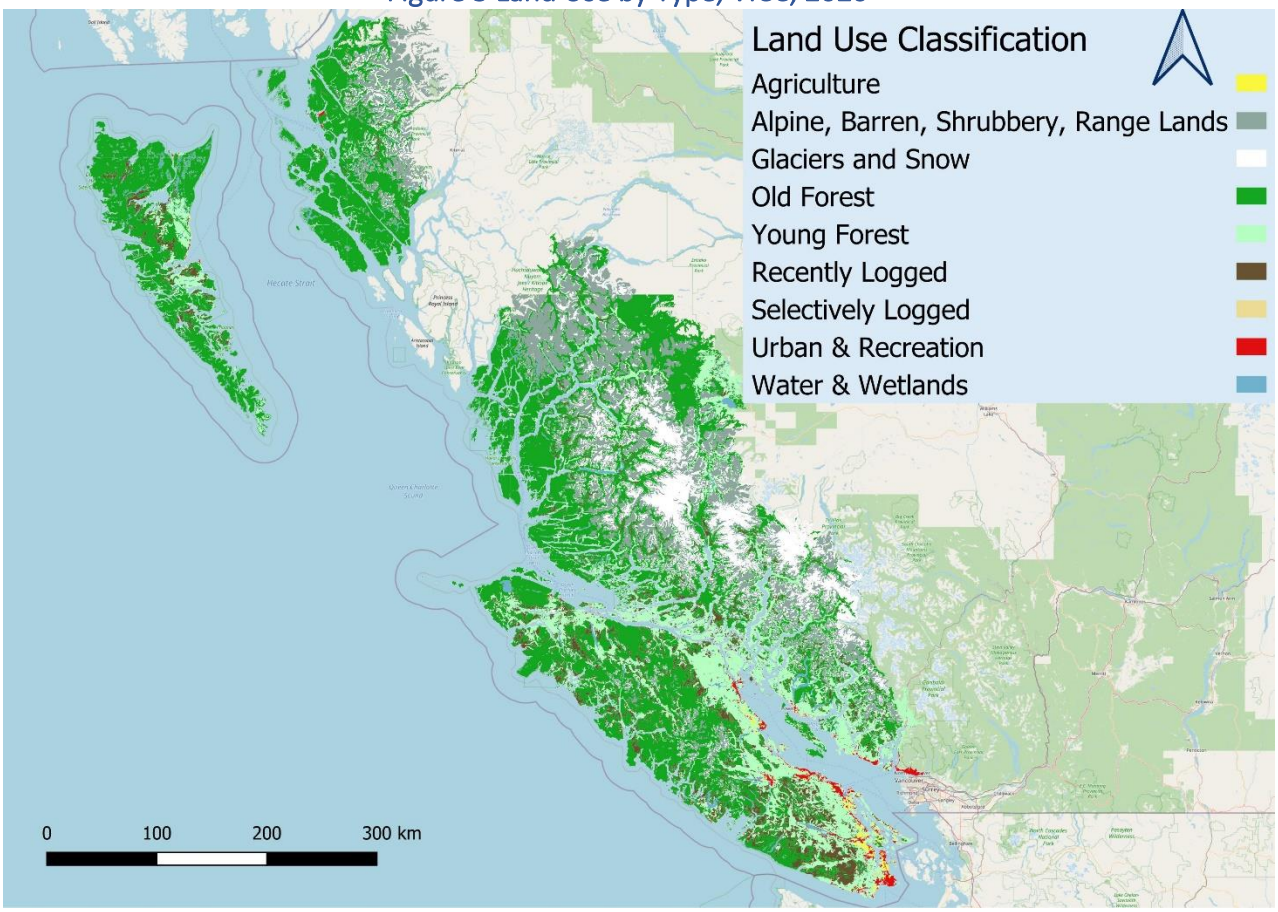
[4] Recently logged timber is that which was harvested within the past 20 years, or older if tree cover is less than 40% and under 6 metres in height. Selectively logged timber does not have a defined timeline, it is determined by viewing aerial imagery (areas where the practice of selective logging can be clearly interpreted on the Landsat TM image and TRIM aerial photography).

[5] Agriculture accounts for 310.22km2 (or 0.25% of total) mapped VICC land. Residential Agriculture Mixtures: 109km2 --- 0.10% of total mapped VICC land. This totals to only 0.35%, or 419.22km2, of total mapped VICC land being used for agricultural purposes. As per data catalogue: Agriculture is defined as land based agricultural activities undifferentiated as to crop (i.e. land is used as the producing medium); Residential Agriculture Mixtures are defined as areas where agriculture activities are intermixed with residential and other buildings with a building density of between 2 to 0.2 per hectare. Areas must be 15ha or larger to be mapped.

(discussed in the next section), the region may not be able to expect the same conditions, and both the natural and built environments of VICC may face a greater risk.

The majority of built environments in VICC cluster on the coastlines, mainly on the southeast coast of Vancouver Island and in the north around Prince Rupert, which is convenient for trade and transportation but leaves these urban areas vulnerable to changes such as sea level rise.

Figure 5 Land Use by Type, VICC, 2020



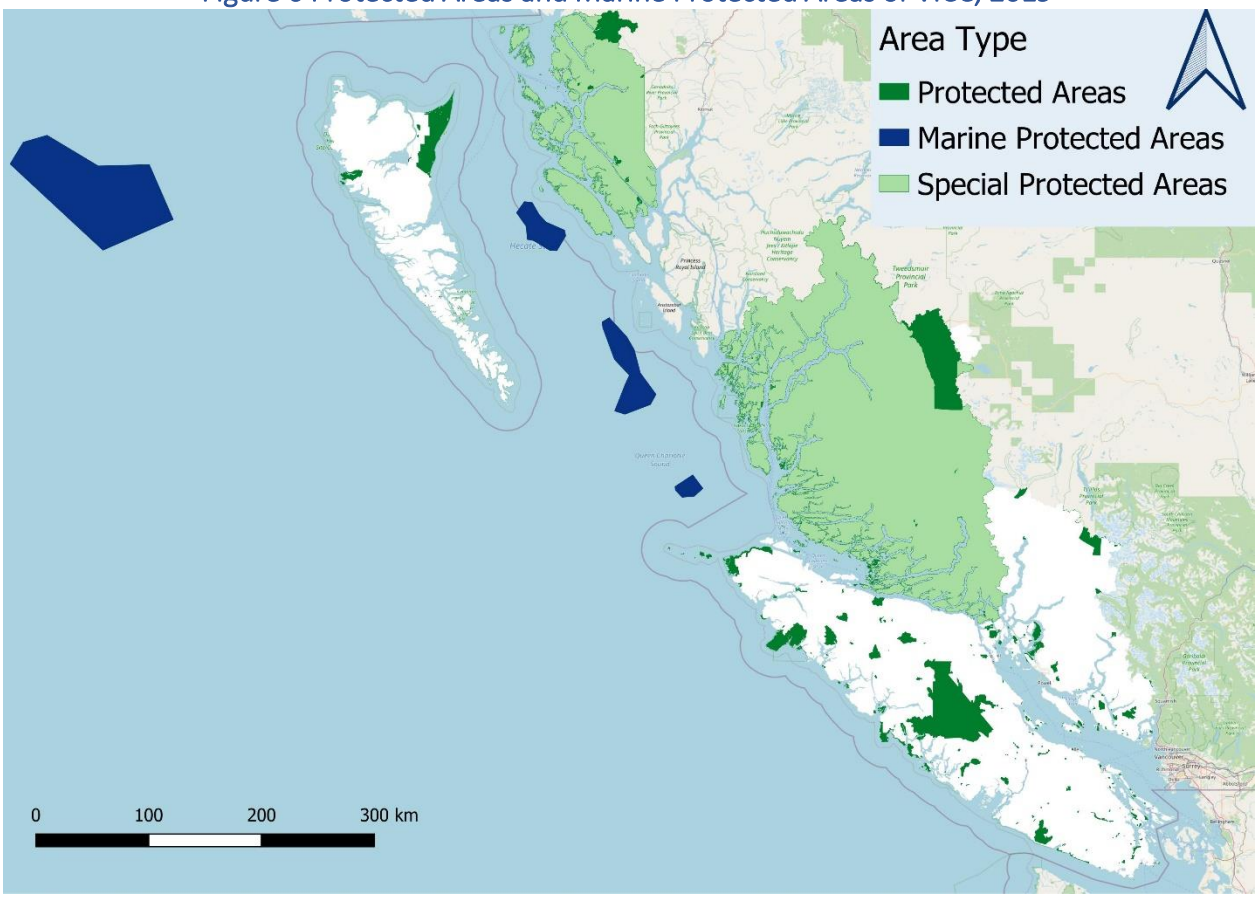
Source: BC Data Catalogue (2020), *Baseline Thematic Mapping Present Land Use Version 1 Spatial Layer*.

VICC is home to many Protected Areas and Marine Protected Areas, and needs more in the future to conserve lands and protect cultures

Coastal British Columbia is known for its rich ecosystems, and although many areas within the VICC region have been placed under protection in the form of Protected Areas and Marine Protected Areas, more are needed. Figure 6 below outlines the Marine Protected Areas established under the Oceans Act Marine Protected Area designation. Also illustrated are the BC Parks, Ecological Reserves, and Protected Areas, which symbolize the land-based areas dedicated to conserving and preserving the natural environments found there, along with Special Protection Areas such as the Great Bear Rainforest and other Special Forest Management Areas. Protected Areas of all types are important to the VICC region in many ways, not only are they crucial for

protecting wildlife and ecosystems, but also to preserve areas of important cultural significance. As such, there are many initiatives to create more and expand existing Protected Areas, as well as creating more sites under Indigenous supervision, such as Tribal Parks. Tribal Parks are unique from other types of Parks as they are created via Indigenous leadership, and they aim to support sustainability and Indigenous rights and cultures. The combination of all kinds of Protected Areas are vital to sustainability and adaptation in VICC.

Figure 6 Protected Areas and Marine Protected Areas of VICC, 2019



Sources: Government of Canada; (2019) Oceans Act Marine Protected Areas Shapefile; BC Data Catalogue; (2019). BC Parks, Ecological Reserves, and Protected Areas.; BC Data Catalogue; (2019). FADM – Special Protection Area.

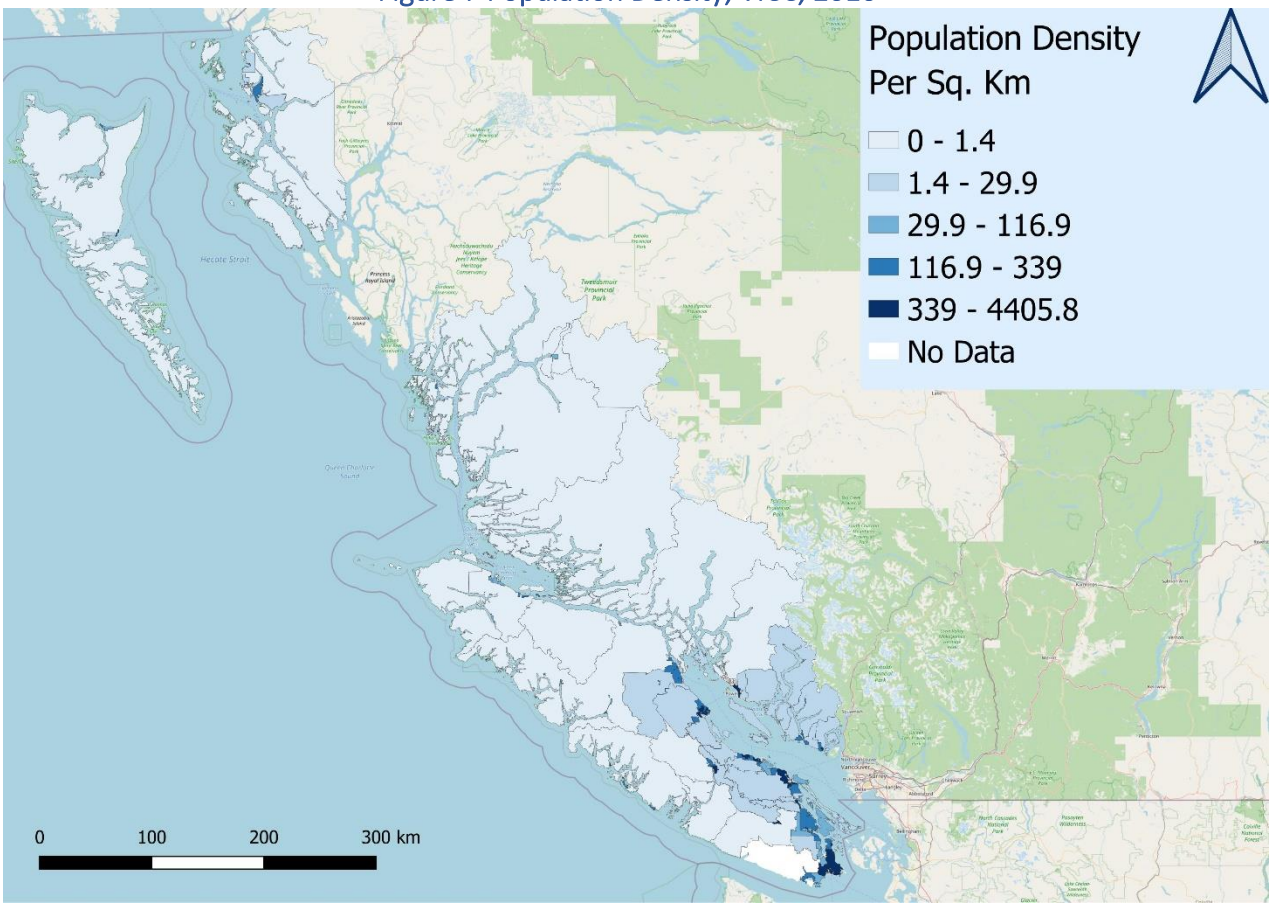
Although there are many busy population centres, much of VICC is rural land

Population density within VICC clusters around population centres. The southeast coast of Vancouver Island boasts the highest density, with moderate population densities in the areas north of Vancouver, as well as the areas immediately surrounding Prince Rupert. The denser census subdivisions in the north of VICC are very isolated from the highly populated areas in the southern reaches of the region. The areas of high-density correlate to areas which have connectivity to other population centres, especially Vancouver. These areas have major highways, ferries, and several airports to accommodate travel by citizens.

The majority of VICC, however, is far more rural, with an average population density ranging from 0-1.4 persons per square kilometer. These communities are more vulnerable to environmental

hazards, as their relative isolation can limit access to emergency assistance and resources. More generally, rural communities face the penalties of distance. They can have higher infrastructure and energy costs and higher transport costs for goods both in and out of the community. For example, rural, remote, and Indigenous communities in British Columbia spend up to three times the provincial average to heat their homes (Ecotrust Canada, 2020).

Figure 7 Population Density, VICC, 2016



Source: Statistics Canada; Population Data of 2016 Census via Canadian Census Analyser (CHASS, 2020).

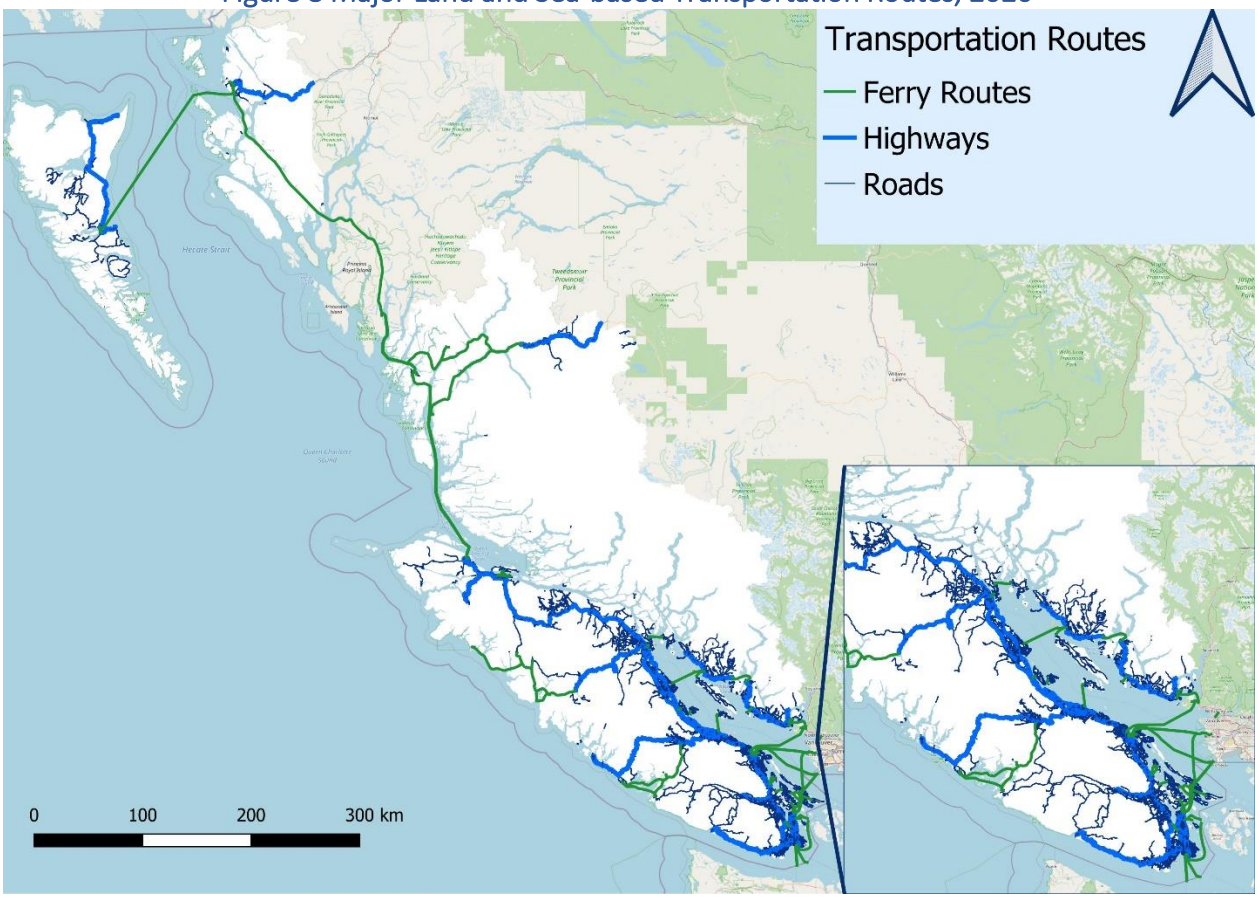
VICC is well connected to other population centres, but some rural areas are at risk

Though VICC is physically expansive, the vast networks of roads, ferry routes, and air travel connect people and trade. There are 16 highways, 73 ferry routes, 12 airports, and numerous aerodromes and seaplane landings (Figure 8). Connectivity is most concentrated in the southern reaches of VICC, linking population centres to the mainland and Vancouver. The four largest population centres in VICC are the most connected, with several highways and ferry terminals boasting high traffic thoroughfare daily.

The northern communities, such as Bella Coola and Prince Rupert, are more isolated from the rest of the territory, as the only vehicle access is through the two highways which terminate at these cities or the ferry services. The highways run on a latitudinal axis, connecting communities to the interior of BC, while the ferries run longitudinally creating a linkage of coastal communities. Some

of the more rural reaches of VICC have fewer links to depend on, which creates a vulnerability especially when storms or other hazards threaten to block or wash out the local roads. Many communities have only one road which connects them to the rest of VICC, which if obstructed leaves the community cut-off from assistance and supplies by land. VICC hosts numerous island communities whose only transportation method is by ferry. These communities face many of the same challenges as the rural communities with only single road access. Since many of these communities rely on food and resources from other areas, especially agricultural production, they are reliant completely upon the ferry systems which can be affected by both natural and mechanical hazards.

Figure 8 Major Land and Sea-based Transportation Routes, 2020



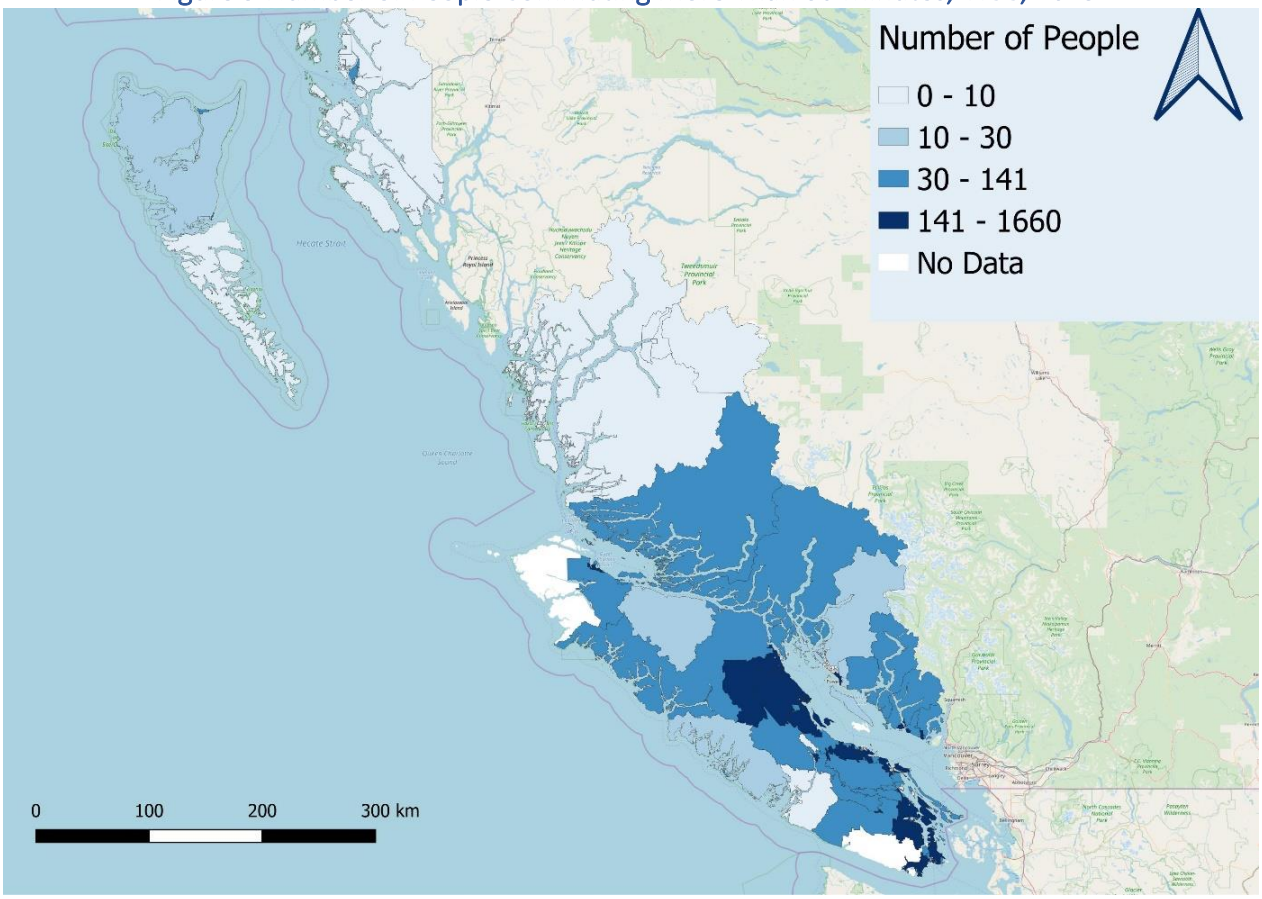
Source: BC Data Catalogue (Government of British Columbia, 2020b).

Rural and urban areas are connected by labour market commuting zones

Communities across the VICC are connected by labour market zones—the places across which people travel to live and work. On average, 8.4% of those working in the Census Metropolitan Areas (CMAs) and Census Agglomerations (CAs) of VICC commute to work *from other cities or municipalities* (Statistics Canada, 2020b). CMAs and CAs are defined as areas formed by municipalities centered around a core, which is a population centre. Therefore, this figure is only capturing long commutes between CMAs and CAs and not within them. It bears noting that while much of VICC is rural, smaller communities are connected to urban centres by these labour market commuting zones.

The southern sections of VICC have the largest commuting zones; in some cases over a thousand people commute more than one hour to work (Figure 9). As anticipated, commuters in Victoria use the largest variety transportation modes (Figure 10). Parksville has the highest proportion of workers commuting into the city, at just over 30%; most of these commuters reside in the neighbouring population centre of Nanaimo. The share of people commuting from other cities may be the result of workers being "locked out" of the city due to high housing prices. In addition, the relatively high percentage of workers commuting from other areas contributes a great deal of emissions, mainly from vehicle exhaust but also ferry and air fuels.

Figure 9 Number of People Commuting More Than 60 Minutes, VICC, 2019



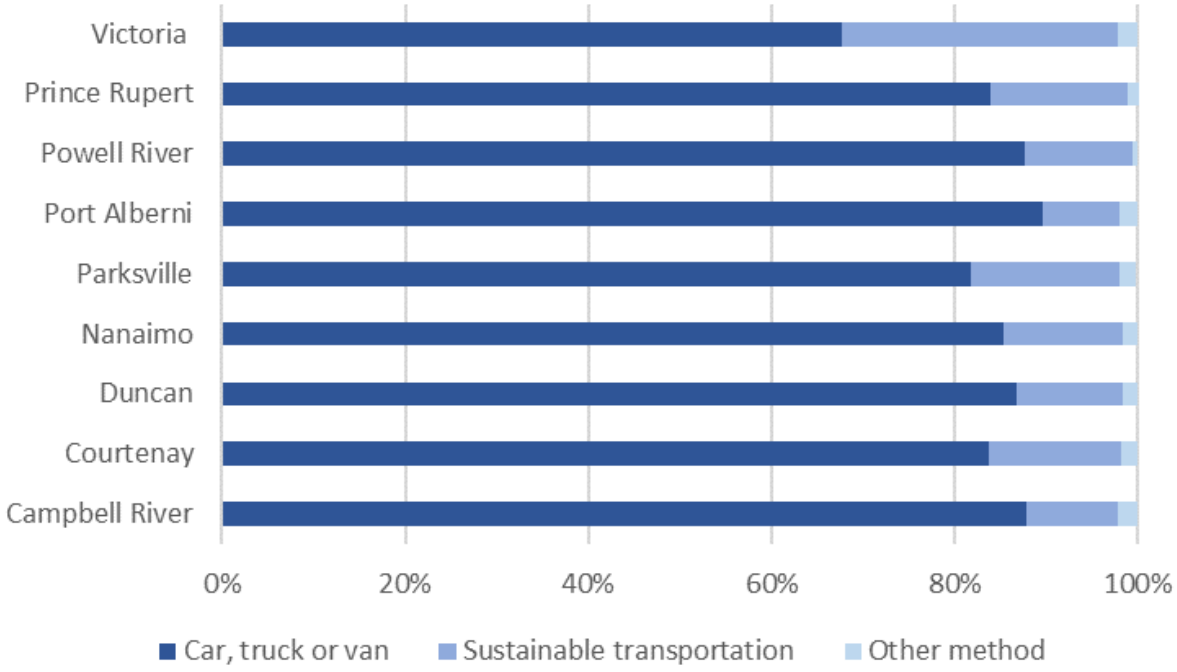
Source: BC Data Catalogue (Government of British Columbia, 2020a).

The vast majority of VICC citizens commute by car to work

In the major cities of VICC, the vast majority of commuters drive to work; over 80% in all but Victoria. There are many, however, who choose to travel by more sustainable means, such as public transit or walking/riding a bicycle. The highest percentage of sustainable travel is found within Victoria, a reflection on accessible public transit, the "walkability" of the city, and other ongoing initiatives stemming from the 2014 updates to the Bicycle Master Plan. Note that these data are form the 2016 Canadian Census and that, in the intervening years, modal share may have increased towards sustainable transportation due to ongoing investments. Additionally, more

sustainable vehicles (EVs and hybrids) are not separated from other less sustainable vehicles in the car, truck, or van category.

Figure 10 Commuter Transportation Type, Major Cities, VICC, 2016



Note: Data captures commuting for the purposes of work.
Source: Statistics Canada (2020b). *Commuting Flow from Geography of Residence to Geography of Work, 2016 Census of Population, Statistics Canada Catalogue no. 98-400-X2016327.*

Population and Demography

- **All Regional Districts in VICC are forecast to experience population growth over the next 20 years—by between 2-18% (2020-2040).**
- **Population growth is uneven: population areas in the southern VICC are growing while rural areas are shrinking. There is a trend of suburban population growth.**
- **The VICC has an older age profile than that of the province as a whole: the average age of the population of the VICC region is above that of the provincial average (44.8 years of age versus 42.3 provincially).**

Population and demography are key considerations in climate change adaptation and mitigation planning. Communities that are experiencing population growth face pressures to manage land use demand and to develop in a sustainable way while maintaining, upgrading, and expanding public amenities and infrastructure investments. Meanwhile, those communities that are losing population need strategies to address fixed capital assets and maintenance. In these contexts, key considerations include energy efficiency and community resilience against floods, coastal erosion, and other hazards amidst sometimes shrinking budgets.

Age is also an important factor in planning. The location and prevalence of different age cohorts creates demand for certain types of public amenities and services and at the same time, can intersect with increased propensities for vulnerability. Across the VICC, there are communities of very different profiles—some places are losing population while others are rapidly growing, creating a need for different, yet often interconnected, response strategies.

Another demographic aspect which is important to address in planning is culture. The abundance of differing—yet all equally important—cultures in this region creates another dimension to be considered in climate change adaptation and mitigation planning. Reaching a consensus on common goals and values between cultures is vital for the support and success of climate change programs and projects.

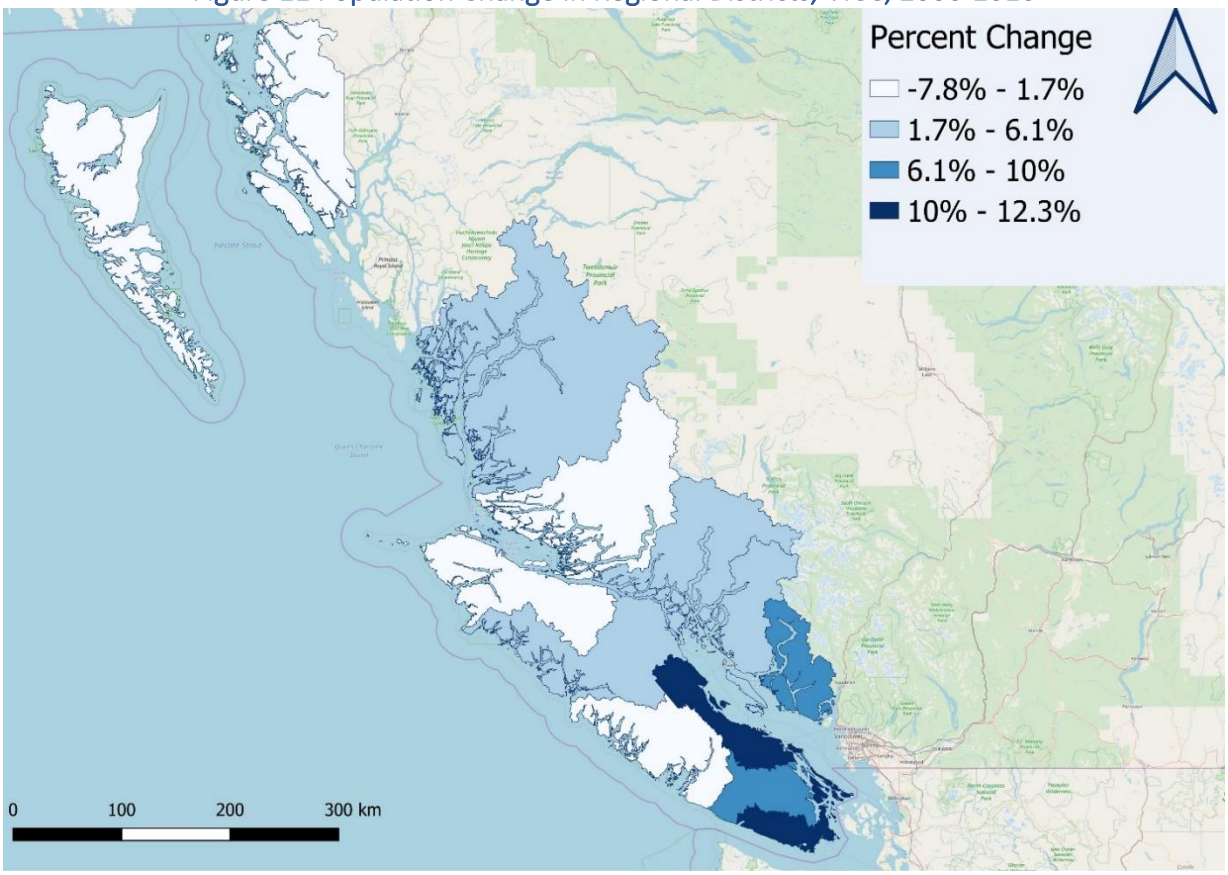
Population centers in the south are growing, while many rural areas are shrinking

The Regional Districts of VICC have a wide range of population growth in the ten-year period from 2006-2016, ranging from an increase of 12.3% to a decrease of –7.8% (Figure 11). The Regional District of Nanaimo has grown the most in the ten-year period while the Comox Valley and Capital Regional Districts had the second and third highest population growth respectively. The three districts with the highest growth rates from 2006-2016 all correspond to districts with large or medium population centres. The only other regional district with a medium population centre is the Strathcona Regional District, which falls in the middle of the range with population growth of 6.3% over 2006-2016.

The districts with highest population growth from 2006-2016 tend to be located in the southern reaches of the VICC, centred around the southern tip of Vancouver Island. On the opposite end of the region, the North Coast Regional District has had the greatest decrease in population over this

time period, followed closely by Mount Waddington. Most of these districts are rural, with some small population centres scattered throughout.

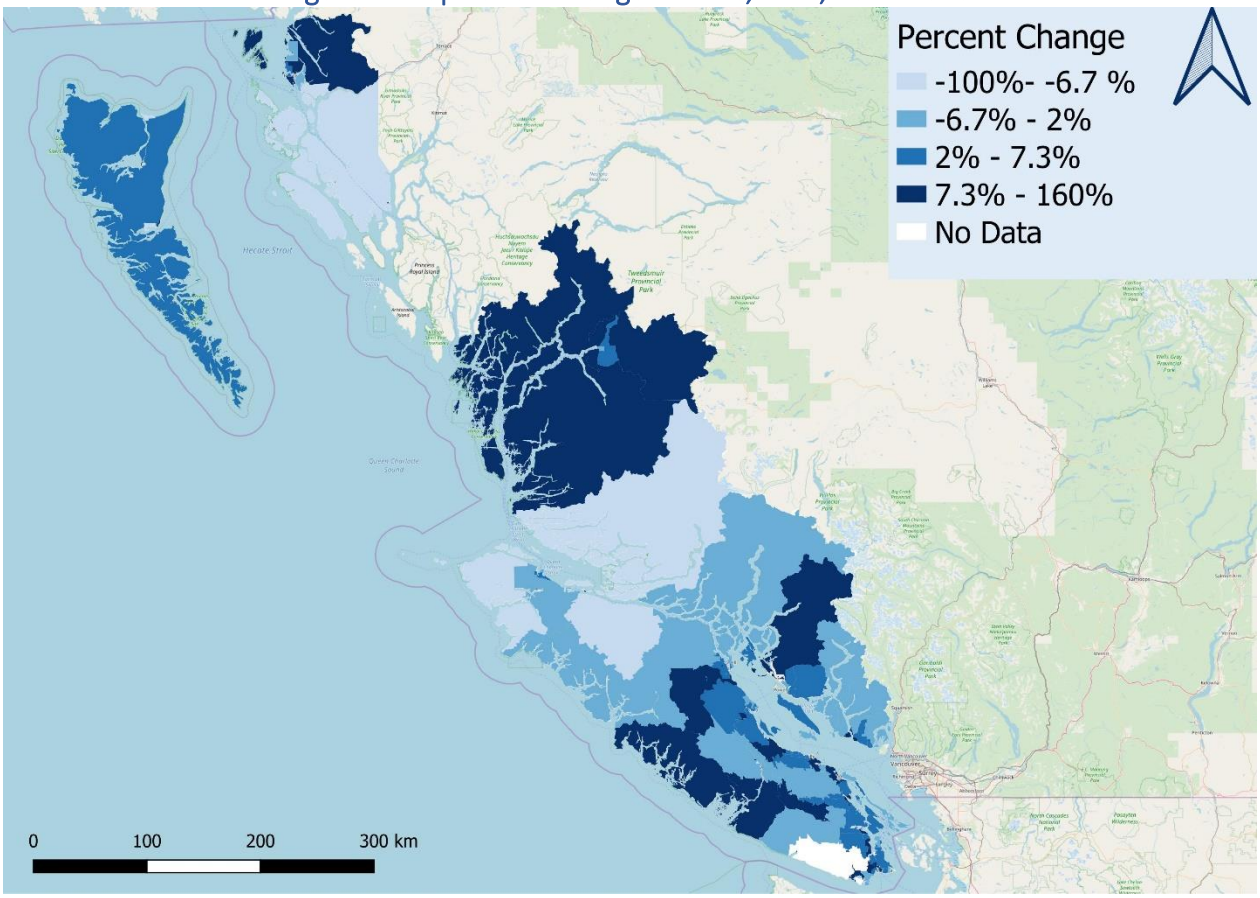
Figure 11 Population Change in Regional Districts, VICC, 2006-2016



Source: Statistics Canada; Census Profile 2016; Census Divisions.

The Census subdivisions (CSDs) of VICC provide further insight into population dynamics; CSDs are a general term for municipalities (as determined by provincial/territorial legislation) or areas treated as municipal equivalents for statistical purposes (e.g., First Nations Reserves, Indian Government Districts, and unorganized territories). The five-year timespan illustrated shows that many of the CSDs in VICC are decreasing in population. However, these decreases are often offset by large growth occurring in other neighbouring CSDs, accounting for a net increase when classed by Regional District. These increases are not only internal growth, but also contributed to by people moving from out of province and out of country to these CSDs. Many of the CSDs with the largest decreases contain First Nations Reserves and several have recorded populations of 0 in 2016.

Figure 12 Population Change in CSDs, VICC, 2011-2016



Note: there is no data for either timespan for the CSD of Juan de Fuca in the Capital Regional District
Source: Statistics Canada; Focus on Geography Series, 2016 & 2016 Census Boundary Files.

The three CSDs with the largest populations in 2006 (Saanich, Nanaimo, and Victoria) remained the largest in 2016 and all experienced population growth over that time (Table 2). Among these three, Nanaimo saw the greatest rate of growth at 15% over this time.

Among all CSDs (with populations larger than 100), those that saw the greatest population growth between 2006-2016 are a mix of urban and rural communities: Langford at 57.3%, Central Coast A at 47%, and South Saanich 1 at 44% (Table 3). While Langford and South Saanich 1 are part of the same economic region as Victoria (suburban municipalities), Central Coast A is in the district which contains no population centres and is classified as entirely rural. Central Coast A is the largest of the five electoral districts in the Central Coast Regional District, spanning well over 19,000 km², and includes parts of the Great Bear Rainforest. This may account for some of the increases, as investments flowing from the Great Bear Rainforest Agreements may have helped expand economic development opportunities in the area. Thus, growing populations are not just an urban phenomenon across this region.

Those CSDs that have seen the greatest population declines over the 2006-2016 period are largely rural and remote. The size of these population decreases should be interpreted with a note of caution. Communities with smaller populations may demonstrate population fluctuations which

are in fact a product of seasonality—reflecting when the data was collected more than the year-round population. Among CSDs in the VICC region, the communities of Kulkayu (Hartley Bay) 4, North Coast Mount Waddington B, and Refuge Cove 6 show the greatest population declines.

Table 2 Top 3 largest populations by CSD, VICC, 2006, 2016

	Population 2016	Population 2006	Percentage change 2016-2006
Saanich (Capital Regional District)	114,148	108,265	5%
Nanaimo (Nanaimo Regional District)	90,504	78,692	15%
Victoria (Capital Regional District)	85,792	78,057	10%

Source: Statistics Canada; Census Profile 2016; Census Subdivisions.

Table 3 Top 3 population increases and decreases, by CSD, VICC, 2006, 2016

CSDs with highest population increase, 2006-2016	CSDs with highest population decrease, 2006-2016
Langford, 57.3%, 22459 - 35342, RD: Capital	Kulkayu (Hartley Bay) 4, -66%, 157 - 52, RD: North Coast
Central Coast A, 47%, 138 - 203, RD: Central Coast	Mount Waddington B, -60%, 150 - 60, RD: Mount Waddington
South Saanich 1, 44%, 571 - 822, RD: Capital	Refuge Cove 6, -57%, 103 - 44, RD: Alberni-Clayoquot

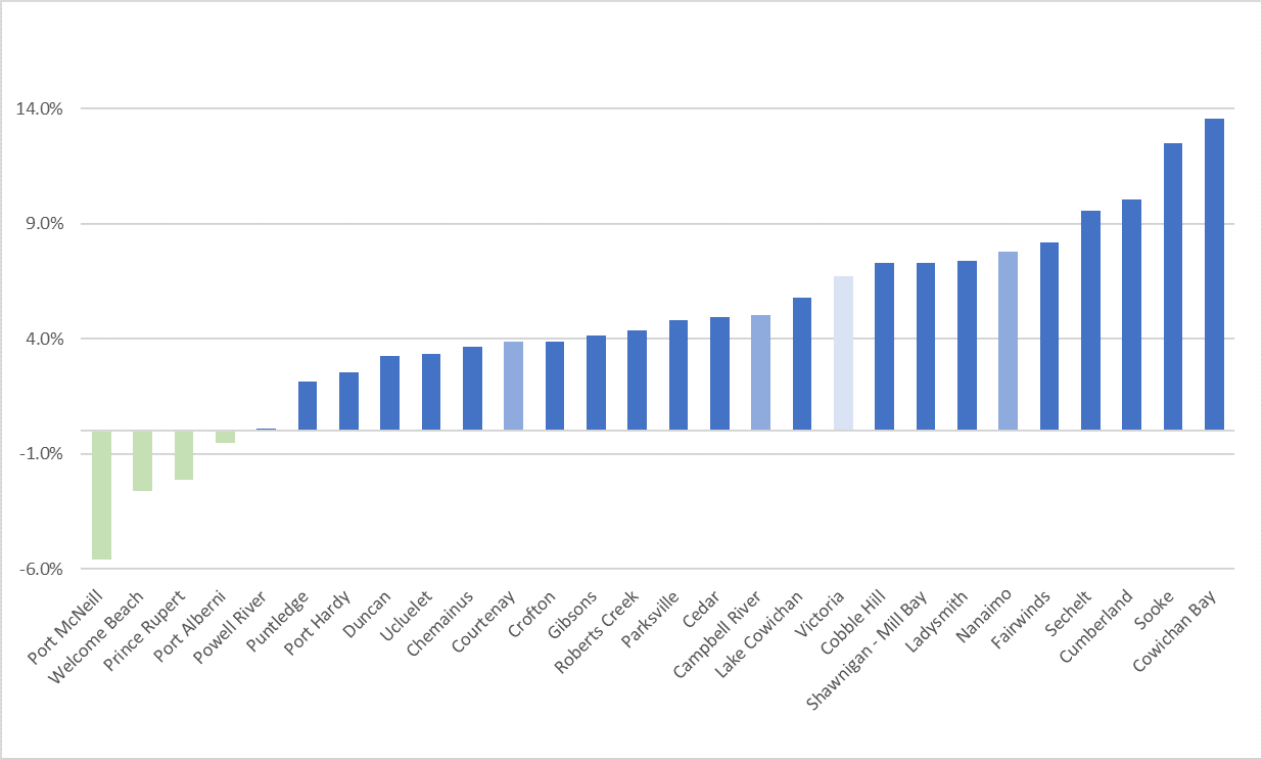
Note: Only CSDs with populations greater than 100 included in analysis
Source: Statistics Canada; Census Profile 2016; Census Subdivisions.

Cowichan Bay and Sooke have the highest population growth, while remote resource-based economies are losing population

The majority of population centres in VICC are growing, and many are growing at a rate greater than 4% (relative to their individual populations) on a 5-year timescale (Figure 13). Some small centres are growing at a much more rapid pace, such as Cowichan Bay and Sooke, advancing at 13.6% and 12.5%, respectively. The medium and large population centres are all growing at a relatively similar rate, at an average of 5.9%.

Four population centres in VICC are losing population: Port Alberni, Port McNeill, Prince Rupert, and Welcome Beach (see green bars in chart below). Of these, Port McNeill is decreasing the fastest, at a rate of –5.6%, which is related to declines in the logging industry—a dominant industry in the region. All four of these population centres are at a distance from other centres and require either several hours of driving and/or ferries to access. Remoteness combined with a lack of economic diversification has made these places vulnerable to exogenous shocks (i.e., external market demand).

Figure 13 Percent Population Change, Population Centres, VICC, 2011-2016

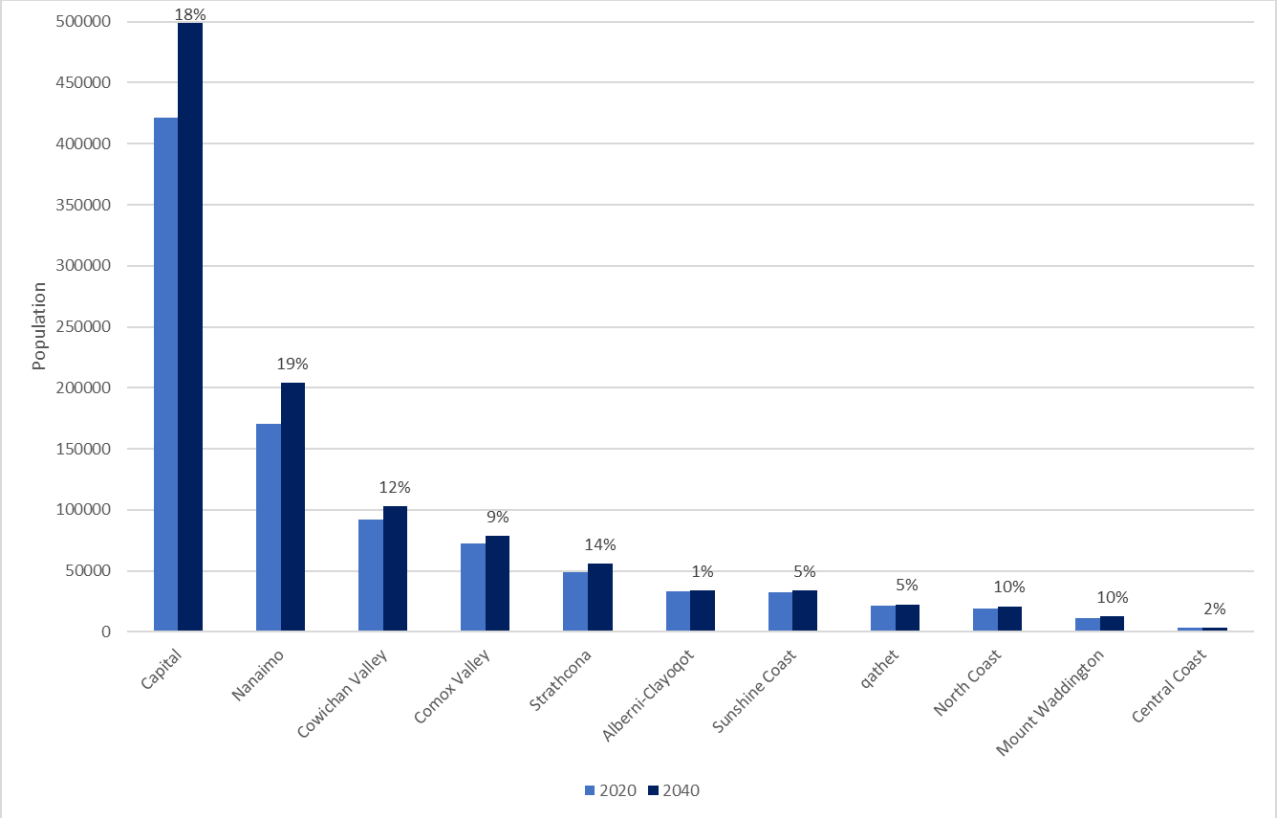


Note: Dark Blue denotes small population centres, Blue for medium population centres, and Light Blue is the large population centre.
Source: Statistics Canada; Census Profile 2016; Population Centres.

Over the next 20 years, all regional districts are anticipated to experience some regional growth, with the population centres leading the pack

All Regional Districts in VICC are predicted to continue to grow in the next 20 years. Some, such as Alberni-Clayoquot and Central Coast, are only projected to grow by a small percentage. Others, including Capital, Nanaimo, Strathcona, and Cowichan Valley, are expected to increase by over 10%. VICC is a desirable place to live and the options available in population centres such as Victoria and Nanaimo add to the incentive for people to move there. Though this provides many opportunities, it is also the source of some challenges such as increasing house prices and growing traffic congestion, to name a few.

Figure 14 Projected Population Change, VICC Regional Districts, 2020-2040



Source: BC Stats Population Projections, Data Version PEOPLE 2019; https://bcstats.shinyapps.io/popProjApp/

There is a large and growing senior population across the VICC

The average age of the VICC region is 44.8 years of age; this is above the provincial average of 42.3 (Figure 15). The dependency ratio (the ratio of the young and working age versus seniors 65+) is 72% in the region and 63.2% across the province.[6] Thus, the VICC has an older age profile than that of the province as a whole.

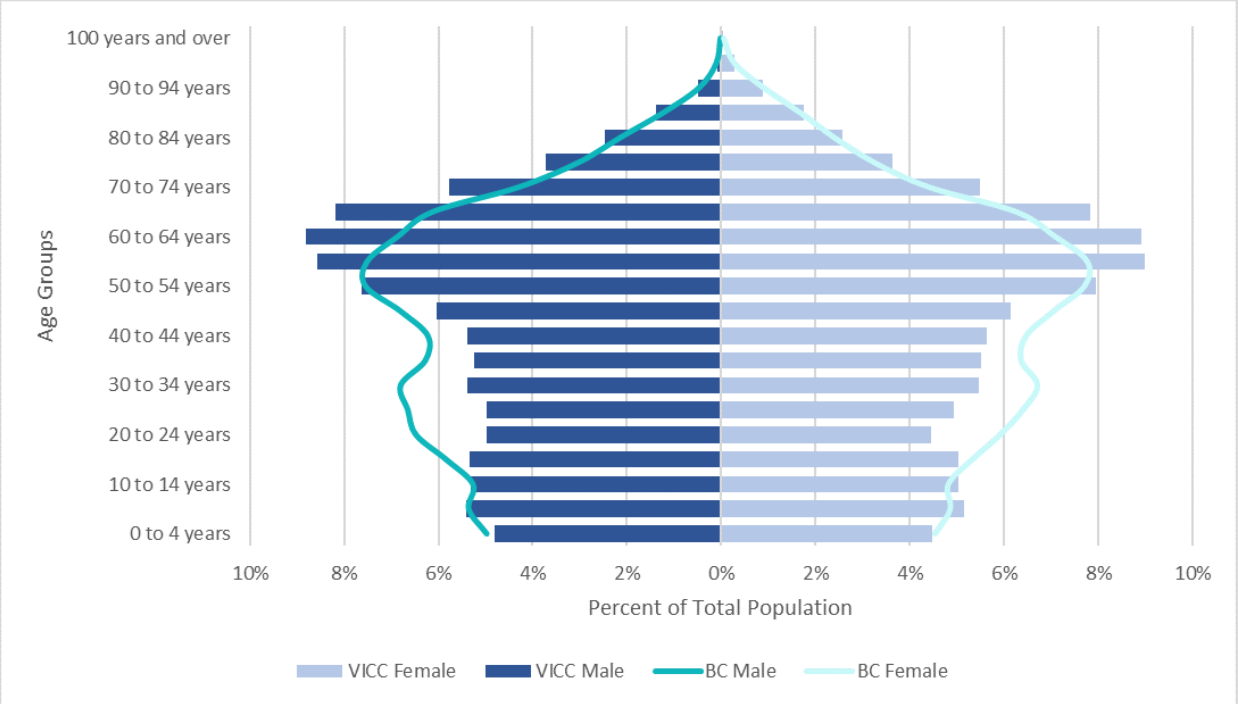
Population aging is a great accomplishment; people in Canada and across the world are living for longer and in better health than ever before. At the same time, population aging can be associated with a number of social vulnerabilities—i.e., the inability of individuals or groups to withstand negative impacts from stressors given their locality—which is connected to climate change. For example, more frequent and extreme weather events leading to coastal area flooding and other hazards can present a risk for residents and the infrastructure and services they rely on. This is particularly the case for seniors, who can be disproportionately impacted by extreme heat and cold fluctuations and who can experience greater social isolation, increasing their risk to hazard. Across the VICC region, these risks are compounded for seniors living in coastal rural and/or remote communities as environmental hazards can impact their access to assets that support Instrumental Activities of Daily Living (IADL), such as grocery stores. This is true of the population at large,

[6] Dependency ratio calculated according to Stats Can age groups of 0-19, 19-64, and 65+.

but can be particularly challenging for seniors who have lower incomes, experience social isolation, have limited mobility, etc.

Certain CSDs within VICC are experiencing changes in age balances more acutely than others; during the ten-year time span of 2006-2016, the Southern Gulf Islands experienced a -14% and -21% decrease of young and working age cohorts, while simultaneously having an increase of seniors by 51%. Even more profound are the changes found in the CSD of Sunshine Coast D: the youth population decreased by -23%, the working age population decreased by -10%, and the senior population increased by 97%. These examples illustrate the more extreme cases of changing population demographics within VICC.

Figure 15 Ages cohorts, VICC, BC, 2016



Source: Statistics Canada (2020) *Age and Sex Highlight Tables, 2016 Census.*

Economy and Industry

- **The services sector is dominant across the VICC, comprising around 87% of all jobs in the region. This sector is vulnerable in the wake of COVID-19.**
- **The VICC also have important goods-based economies including the forestry, agriculture, and energy sectors.**
- **Greater Victoria had the 8th highest GDP per capita among Canadian metropolitan areas in 2016; but it underperforms in economic growth.**
- **While incomes are higher in the urban population centers than in smaller more rural communities, urban centers have higher rates of income inequality.**
- **Rural communities face high transport and energy costs, which decreases their competitiveness.**

Economic composition has a wide-ranging impact on climate change adaptation and mitigation activities. It impacts how land is used, where and how people are employed, the intensity of energy usage, environmental impacts, and a wide range of other factors. The VICC has a mixed economy with both tradable and non-tradable sectors. Key industries include tourism, agriculture, aquaculture, forestry, manufacturing, high tech, and education, though the composition of these sectors across each sub-region differs (VIEA, 2020).

A central challenge across the VICC (and elsewhere in Canada) is to transition away from carbon intensive and environmentally harmful activities towards more sustainable ones, and to support local value chains where possible (thus reducing the carbon footprint of locally consumed goods). Such a shift requires careful attention to how people and communities are impacted. Single industry resource dependant economies are especially vulnerable to industrial transitions as they have a less diversified economy. At the same time, low-income individuals are at risk when the price of goods and energy increases.

An uncertain economic climate

The BC economy overall has experienced solid growth and a favourable labour market climate. Following strong momentum in 2019, BC was forecast to lead economic growth in Canada in 2020 (Government of British Columbia, 2019). However, the COVID-19 crisis has brought great uncertainty; economic growth forecasts for all provinces have declined with many forecasting negative growth in 2020. The TD Bank has forecast BC's economic growth at 0.5% for 2020 (on par with Ontario).

While global financial conditions pre COVID-19 indicated fiscal tightening leading to growing concerns about debt burdens in BC and beyond, we are now entering into an unprecedented time of government-backed loans and stop gap measures to reduce the employment losses and maintain industries. While it is uncertain what the future will hold and in the coming months and years, the public sector will play an oversized role in the economy, akin to the fiscal and monetary stimulus

post the 2008 economic crisis. This presents both challenges and opportunities. It could be a chance to focus public investments on climate adaptation and mitigation efforts, particularly infrastructure, as part of a programme of broader public investment to spur the economy and get people back to work.

The VICC has a services-dominated economy—which in the short term is vulnerable to the impacts of COVID-19

Like the province as a whole, the VICC has a services dominated economy. Across the VICC, 87% of all occupations are service-based (CHASS, 2020). The largest services sectors by occupation are sales and services, trades and transport, and business, finance and administration. Some areas, especially those closest to population centres, are almost entirely services-based. The impacts of COVID-19 and negative price shocks have harmed all economic sectors, however they has been particularly harmful to services sector industries like tourism which are an important economic contributor across the VICC and the province as a whole. In 2018, the tourism sector in BC contributed $8.3 billion to GDP, which is higher than that of the mining ($5.2 billion), oil and gas ($4.9 billion) and agriculture and fishing industries ($3.2 billion) (Government of British Coumbia, 2018). The real estate sector has also been a major economic contributor in recent years, especially in the growing urban areas like greater Victoria and Nanaimo. It is not yet clear how this sector will be impacted by the COVID-19 crisis. The B.C. Real Estate Association presently estimates the declines in home sales to be short term, with sales recovering in 2021 (BCREA, 2020).

Victoria—as a metropolitan area and the capital of the province—has the largest, services-dominated, economy. Victoria has many important assets for the region including three post-secondary institutions. The economy's tech sector has shown strong growth in recent years and is linked to the broader Cascadia megaregion (Seattle to Vancouver). Among Canadian metropolitan areas, Victoria had the 8th highest GDP per capita in 2016, falling just below metro-regions of Hamilton and Vancouver.[7] It is however not a dynamically growing economy. Between 2009 and 2016, Greater Victoria had the second lowest increase in GDP per capita among Canada's metropolitan areas (with a net decline of -0.54%, second only to Ottawa at -2.35%)(OECD, 2020). This indicates that it may not be making the most of its agglomeration benefits.

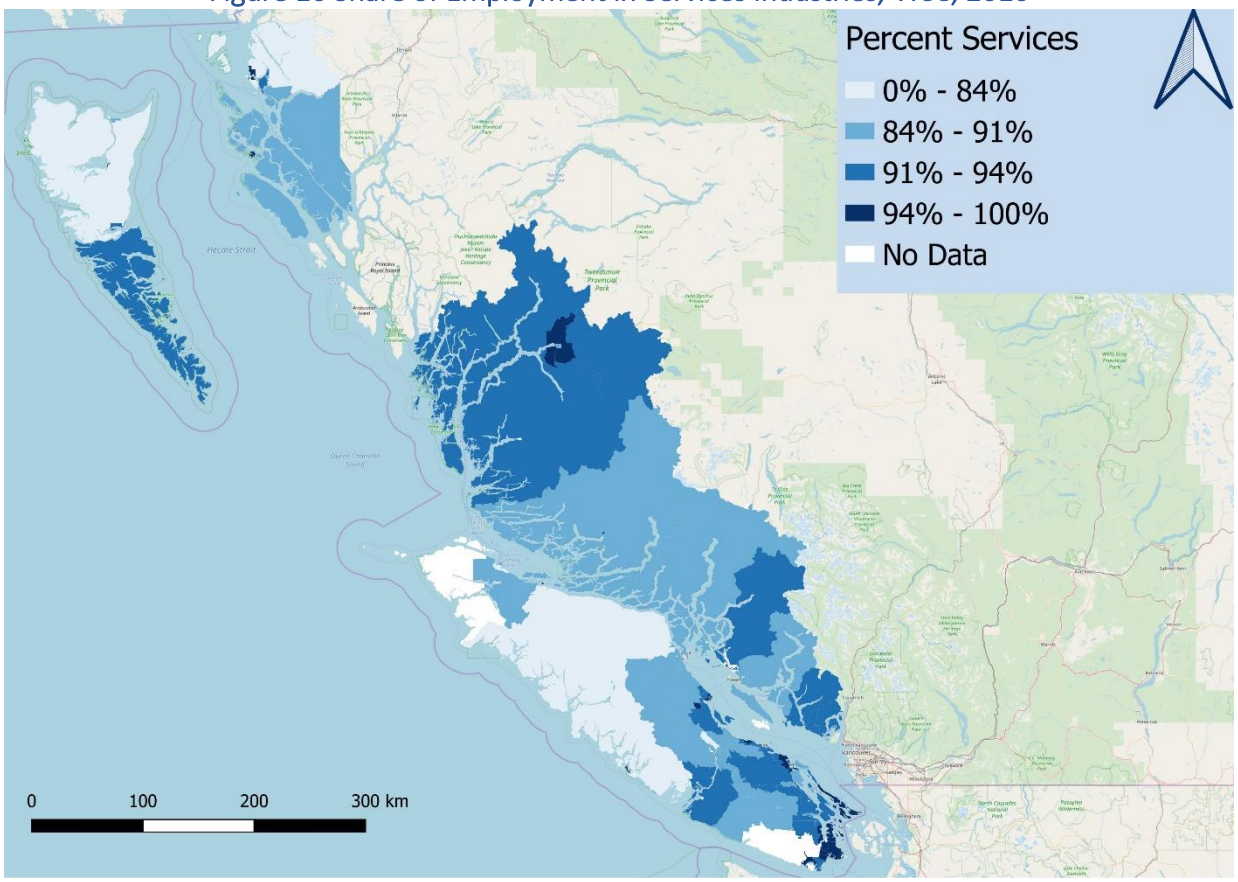
While the services sector is dominant, communities across the VICC also have important goods-based economies including the forestry, agriculture, and energy sectors. Goods-based industries are especially important in the northern halves of Vancouver Island and Haida Gwaii, as well as the mainland sections of the North Coast (Figure 16). These industries are vulnerable on a number of fronts. BC's forestry sector is currently in crises due to a number of factors such as low timber prices, reduced demand from Asian markets, U.S. tariffs, high cost structures, government fees or stumpage rates, and timber supply shortages. Transportation and energy costs are a major factor impacting the competitiveness of these industries; investments in more sustainable and affordable transport and energy options are thus important to their robustness.

BC's largely mountainous topography is not amenable to agriculture and the sector is relatively small; the smallest among Canadian provinces second only to Newfoundland. However, the VICC

[7] GDP per capita (USD, constant prices, constant PPP, base year 2015) in metropolitan Victoria (Functional Urban Area) was $38,828 in 2016 (*Strategies to Improve Rural Service Delivery*, 2010) (OECD, 2020).

includes some of the province's prime agricultural areas such as Comox, Sayward and Cowichan valleys, Saanich Peninsula, Nanaimo lowlands, Alberni Valley, Powell River lowlands and many Gulf Islands. Farms in these areas tend to be smaller and specialized: the region accounts for only around 2% of total provincial farmland but 15% of total farms (Government of British Columbia, 2011). Farms across this region mostly supply local and tourism-oriented markets as well as those on the mainland. A 2004 study of Vancouver Island food systems found a high reliance on imported food: an estimated 85% of food was imported to the region (Macnair, 2004). The agricultural sector is highly vulnerable to climate change. At the same time, it is a sector that can help communities across the VICC reduce the carbon footprint of their food consumption and to diversify food security through local supply chains.

Figure 16 Share of Employment in Services Industries, VICC, 2016



Notes: Based on National Occupational Classification, NOC.
Source: Statistics Canada; Labour Data of 2016 Census via Canadian Census Analyser (CHASS, 2020).

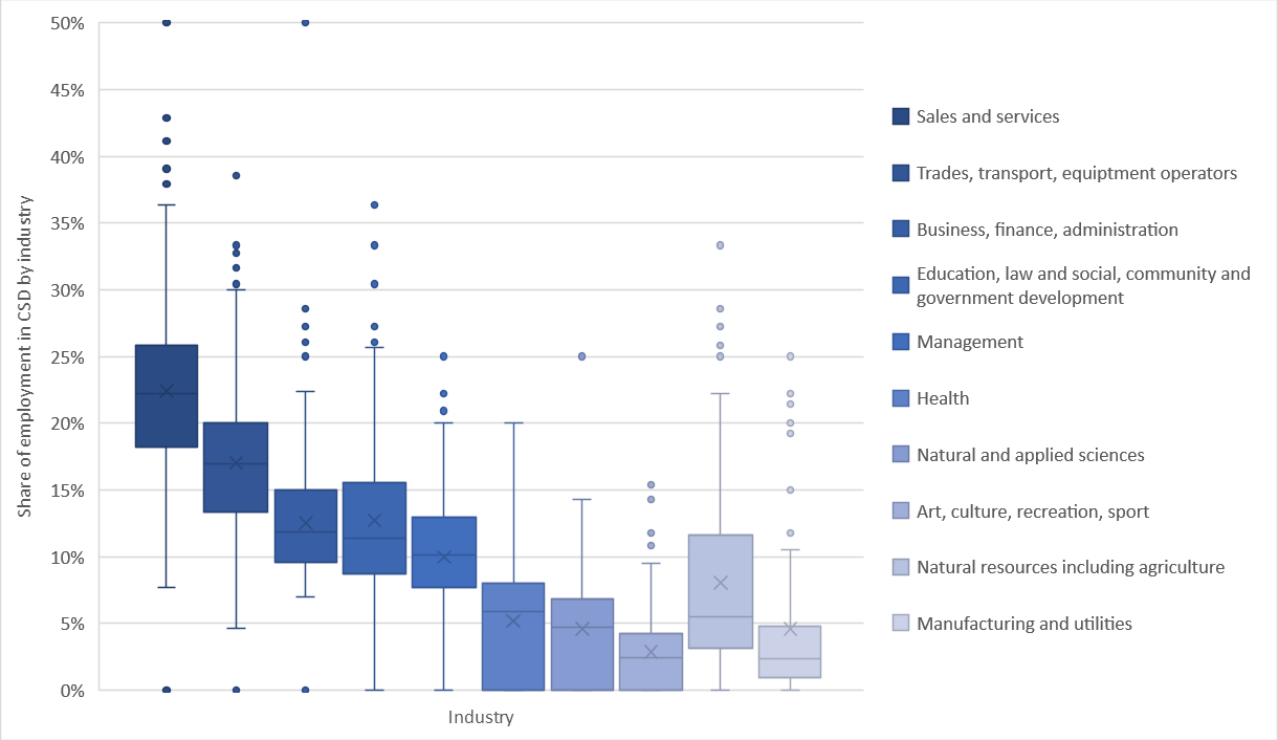
While the sales and services sector is dominant, the trades and transport sector is also a major source of employment across many communities

Occupations in the sales and services sector represent a large proportion of employment in most of the CSDs in VICC (as seen in Figure 11, which illustrates the share of employment in CSDs that is attributed to specific industry sectors). In some areas, as much as half of the total employment in the area is in the sales and services sector; the area surrounding Tofino, a renowned surfing and tourist destination, is an example of such an area (Opisat 1 CSD). The importance of trades, transport, and equipment operating occupations also stands out. There is a large proportion

of employment across many CSDs in these professions particularly on the Tsimshian Peninsula, Powell River, and Zeballos. The geography of the VICC, with island and coastal communities and mountains regions on the mainland, makes the transport sector absolutely critical.

Linked to the transport sector, manufacturing is a major employer in communities like Prince Rupert (Skeena Queen Charlotte CSD). As BCs main northern transportation hub and port, the region's industries are well connected to regional and international markets. The arts culture and recreation, health, natural and applied sciences, and manufacturing are smaller occupational groups across the majority of CSDs but a major contributor to quality of life and wellbeing.[8]

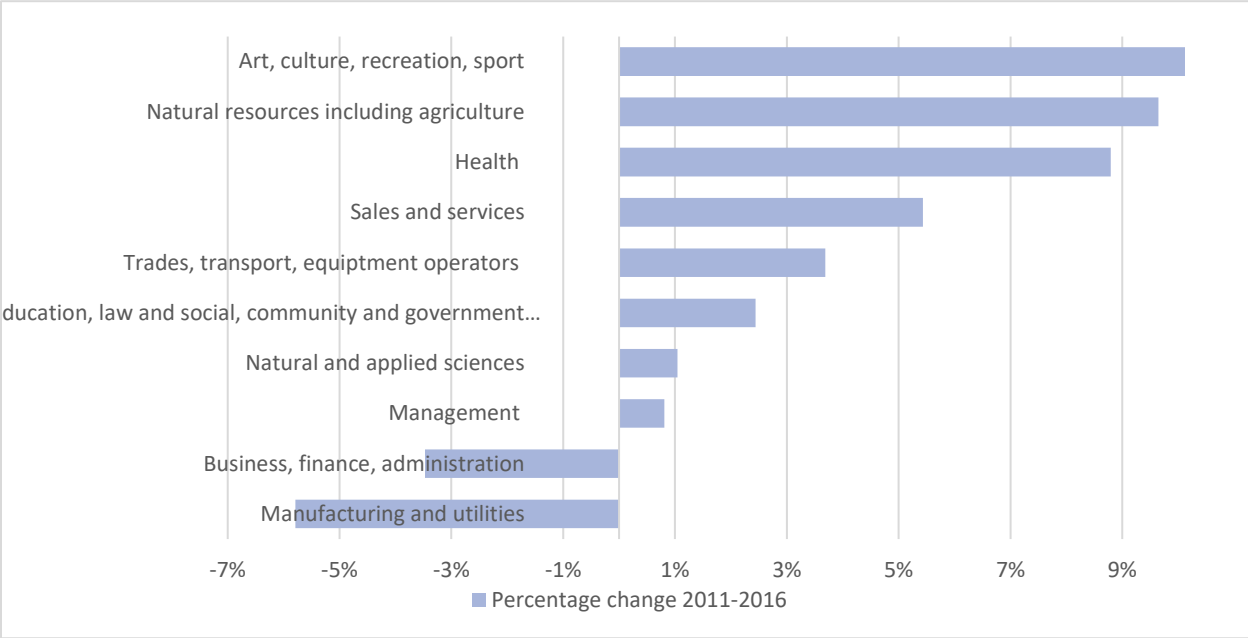
Figure 17 Share of Employment by Industry, CSD, VICC, 2016



Note: Occupational categories by industry according to single digit National Occupational Classification codes, NOC.
Source: Statistics Canada; 2016 Census Labour Data, Accessed via *Canadian Census Analyser* (CHASS, 2020).

Between 2011-2016, employment across the majority of occupational categories by industry increased. Among all sectors, jobs in arts, culture, recreation, and sport showed the strongest increase over this period growing by around 10% with the greatest gains seen in the Capital and Nanaimo Regional Districts. Jobs in natural resource occupations also showed a strong increase over this time, growing around 9.5% between 2011-2016 with the greatest gains seen in the Capital Regional District, Cowichan Valley, and Nanaimo Regional District. Sectors that saw the greatest employment losses over this time are manufacturing and utilities at around 6% and business, finance and administration at around 4.5%. Jobs in manufacturing and utilities saw the greatest declines in the Capital Region while those in business, finance and administration showed the greatest declines in the Nanaimo and Mount Waddington Districts.

Figure 18 Percentage Change in Employment, by Industry, VICC, 2011-2016

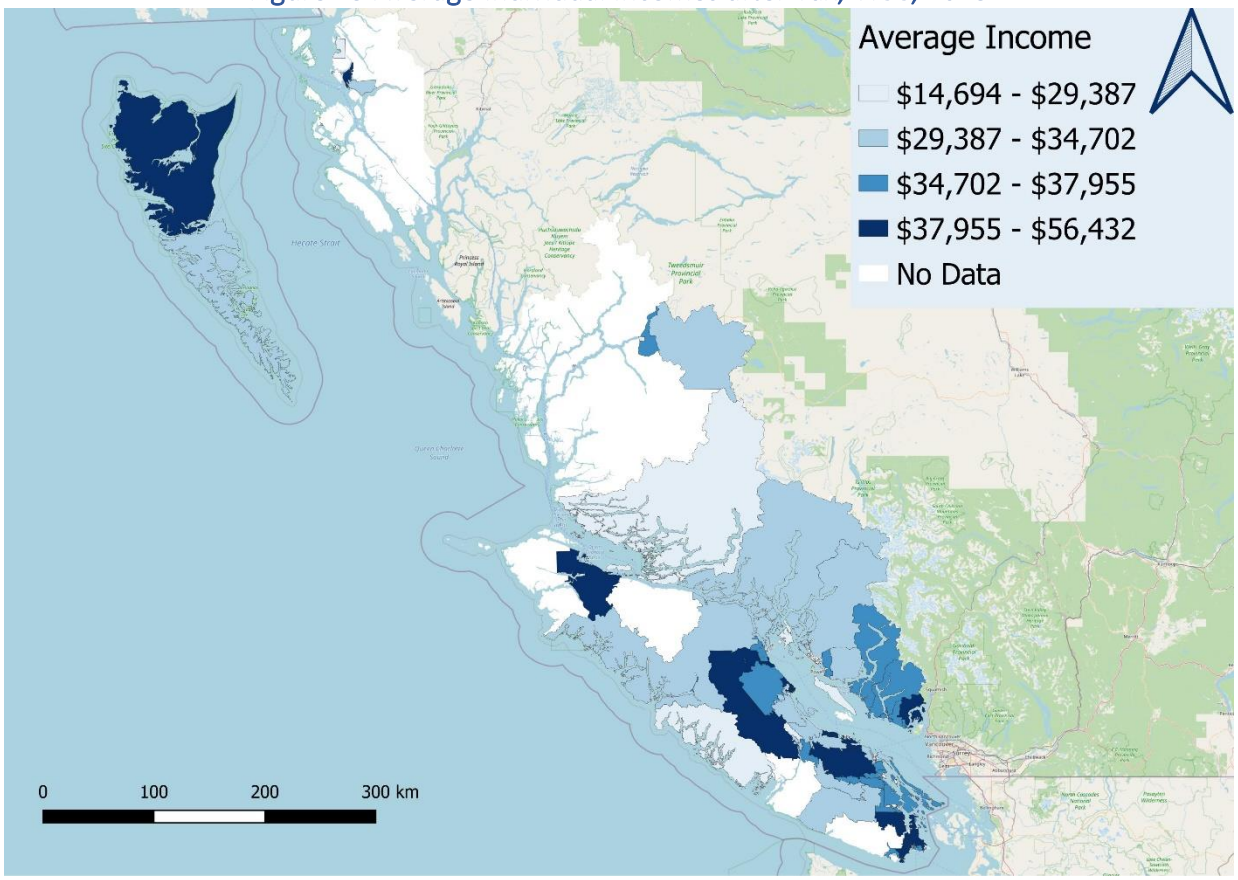


Notes: Based on National Occupational Classification, NOC.
Source: Statistics Canada; 2017 & 2013, Labour Highlight Tables, 2016 Census & 2011 National Household Survey.

Average incomes are higher for CSDs that are more connected to population centres

The average individual income (after tax) for all VICC CSDs in 2015 was $33,435. The range of average incomes was large, spanning from $14,694 to $56,432. The CSD with the lowest average income was Penelakut Island 7, a reserve in the Cowichan Valley Regional District. The CSD with the highest average income was Oak Bay, in the Capital Regional District. Interestingly, both of these CSDs are in the Southern Vancouver Island region, however Oak Bay is part of the main island, and Penelakut Island 7 is clustered near the Gulf Islands. Indeed, many of the Gulf Islands have median incomes below the territory's average. This may indicate a link between proximity and transportation to population centres, as well as a reflection upon the high average age of Gulf Island communities which correlates to a large retired population. The widest range of incomes centralize around the southern end of Vancouver Island, corresponding to locations of several population centres. Indeed, this illustrates the disparity within and around cities in respect to income.

Figure 19 Average Individual Incomes after Tax, VICC, 2015

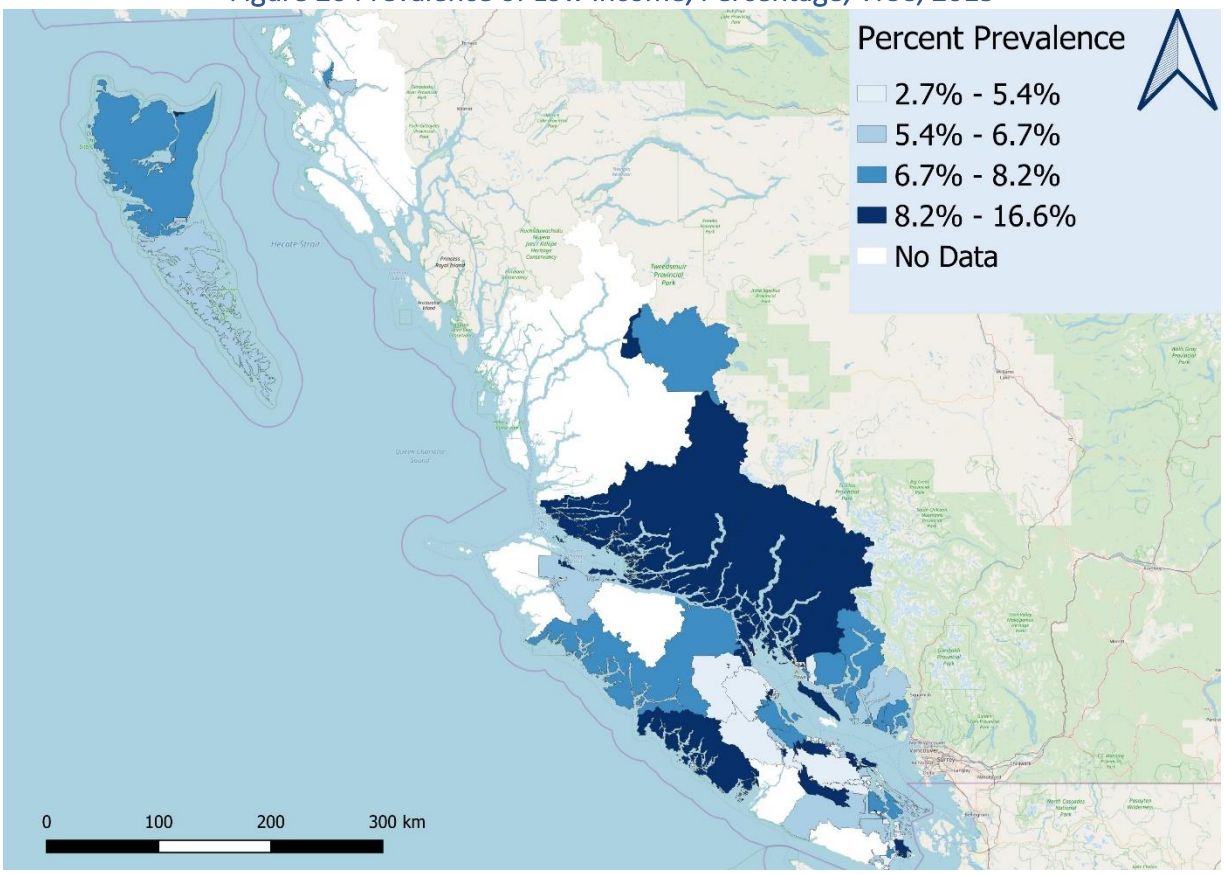


Source: Statistics Canada; Income Data of 2016 Census via Canadian Census Analyser.

There is a higher prevalence of low-income individuals in population centres of the VICC

The prevalence of low income within the CSDs of VICC ranges from 2.7% to 16.6% as per 2015 data (Figure 20 Prevalence of Low Income, Percentage, VICC). The three CSDs with the highest rate of low income are Strathcona B (16.6%), Alberni-Clayoquot C (15.5%), and Victoria (14%). The CSDs with the highest population in 2016 (Table 3) correspond with high prevalence of low-income persons, ranging from 9.5%, 10.6%, and 14%, in Saanich, Nanaimo, and Victoria, respectively. There appears to be a correlation of low-income persons and high population regions, informing us that population centres (i.e., cities) may have more options for those in need of low-income services, and as such there is a higher concentration of people who need such assistance moving to more urban areas. This highlights the need for more accessible housing and other social services related to low-income in population centres in order to better support the citizens who reside there.

Figure 20 Prevalence of Low Income, Percentage, VICC, 2015

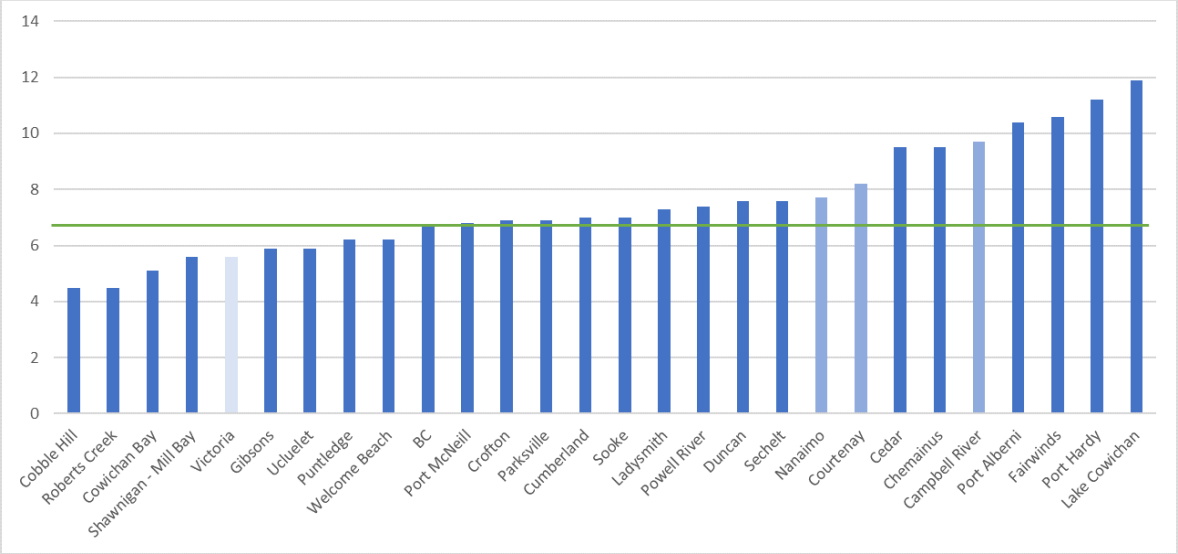


Note: Classed by LICO-AT: Income levels at which families or persons not in economic families spend 20 percentage points more than average of their after-tax income on food, shelter and clothing.
Source: Statistics Canada (2020b). *Income Highlight Tables, 2016 Census.*

The unemployment rate in most population centres across the VICC is above the provincial average

Unemployment rates in the VICC population centres are varied, ranging from 4.5% in Cobble Hill to 12.7% in Prince Rupert. The average unemployment rate for British Columbia is 6.7%, and 19 of the 28 population centres (69%) have rates higher than this average. The large population centre, Victoria, is below the average, at 5.6%, and yet the three medium population centres, Campbell River, Courtenay, and Nanaimo are situated above the average rate at 9.7%, 8.2%, and 7.7%, respectively. This indicates a relatively high unemployment rate within the VICC's towns and cities, which could be in response to individuals seeking assistance services which are not available in rural areas, but are abundant within these urban agglomerations. Note that these unemployment rates are from the 2016 Census and do not reflect current unemployment rates which are much higher due to COVID-19.

Figure 21 Unemployment Rates of VICC Population Centres, BC Average Comparison, 2016



Note: Dark Blue denotes small population centres, Blue for medium population centres, and Light Blue is the large population centre.
Source: Statistics Canada (2020c). *Labour Highlight Tables, 2016 Census.*

Community Wellbeing

- **Rural communities have lower levels of wellbeing according to Canada's Community Well-Being than their urban counterparts.**
- **Indigenous communities have lower levels of wellbeing according to Canada's Community Well-Being than non-Indigenous communities.**
- **Rural and remote communities, both Indigenous and non-Indigenous, have limited or no internet access, which detracts from their wellbeing.**

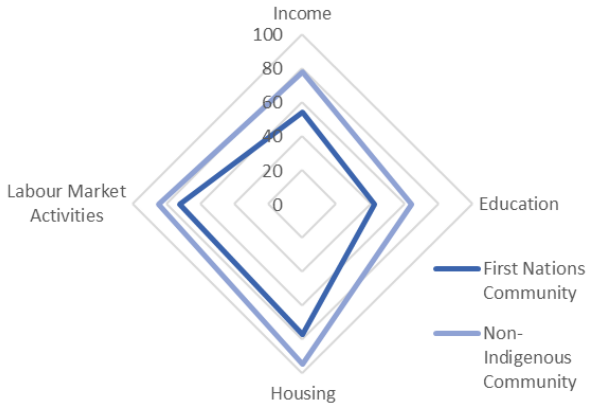
Community wellbeing scores across the VICC indicate rural-urban and First Nations-non-Indigenous community divides

Community wellbeing is a dynamic concept that links quality of life and material conditions to the goal of sustainable well-being over time. It is a multidimensional concept that is grounded in the view that economic conditions should be viewed as part of broader social and environmental systems and conditions. There are a number of different ways to measure community well-being. The Government of Canada's Community Well-Being (CWB) index measures socio-economic well-being for individual communities based on four components: education, labour force activity, income, and housing. Importantly, this index facilitates a comparison of variations in well-being across First Nations and Inuit communities and non-Indigenous communities over time. According to the Canadian Well-Being index, which uses data from the 2016 census to derive well-being scores for CSDs in Canada, the CSDs in VICC with more urban populations (those over 1000) scored higher on average than rural CSDs (those with populations less than 1000) (Figure 22 Rural and Urban Community Well-being, VICC, 2016).

Akin to the rural-urban split, First Nations communities in the VICC also have lower well-being scores across the four indicators when compared to non-Indigenous communities (Figure 23). This data should be interpreted with caution. The proxy indicators that the well-being index draws on is just one way to depict the concept of well-being. This Index does not capture many aspects of well-being that may be important to Indigenous communities such as social and spiritual connections or informal and reciprocal economies that are also important to community well-being. Furthermore, it does not capture the domains of health, food, governance, ecology, or infrastructure and does not reflect a self-assessment of well-being.

Figure 22 Rural and Urban Community Well-being, VICC, 2016

Figure 23 First Nations and Non-Indigenous Community Well-being, VICC, 2016

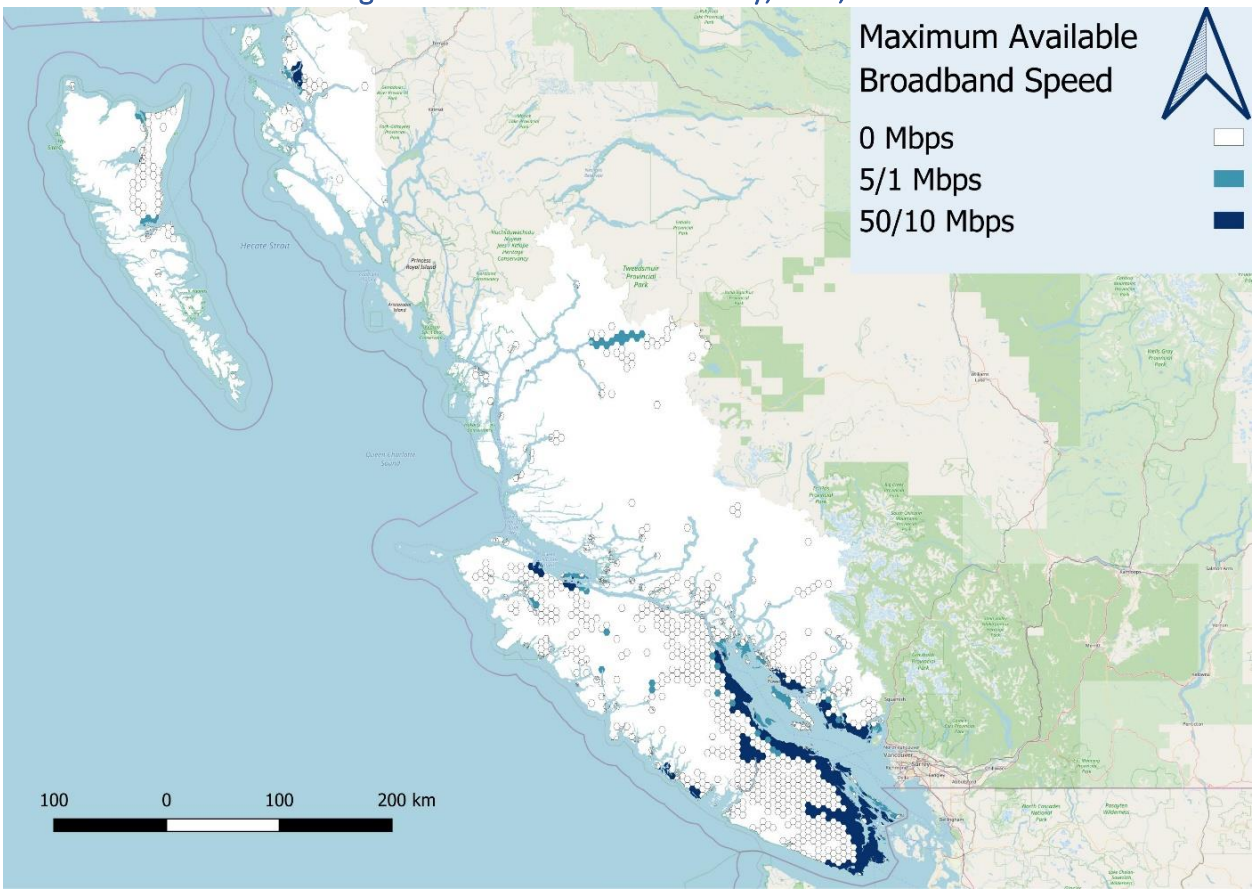


Source: Government of Canada (2020). Community Well-Being Index - Open Government Portal.

Digital network connectivity is important to community wellbeing—many rural areas and First Nations communities are poorly connected

Access to the Internet has rapidly become one of the most important sources of connectivity within a region. This digital connectivity is what helps keep communities linked and supported through challenging times, as experienced with the distancing implications of COVID-19. Although population centres and the communities adjacent to them have access to high speed broadband services, many more remote communities have limited or no access (Figure 24). This has implications for the well-being of the communities, as internet access has been associated with helping with social isolation, purchasing of goods, accessing educational material, and acquiring jobs (Kearns & Whitley, 2019). What is more, access to the Internet was not correlated to lower levels of physical activity, according to a recent study from the UK (Kearns & Whitley, 2019). These findings exemplify the necessity for more vulnerable rural and remote communities to have access to broadband Internet services, especially when one considers the amount of health-related care becoming more accessible online.

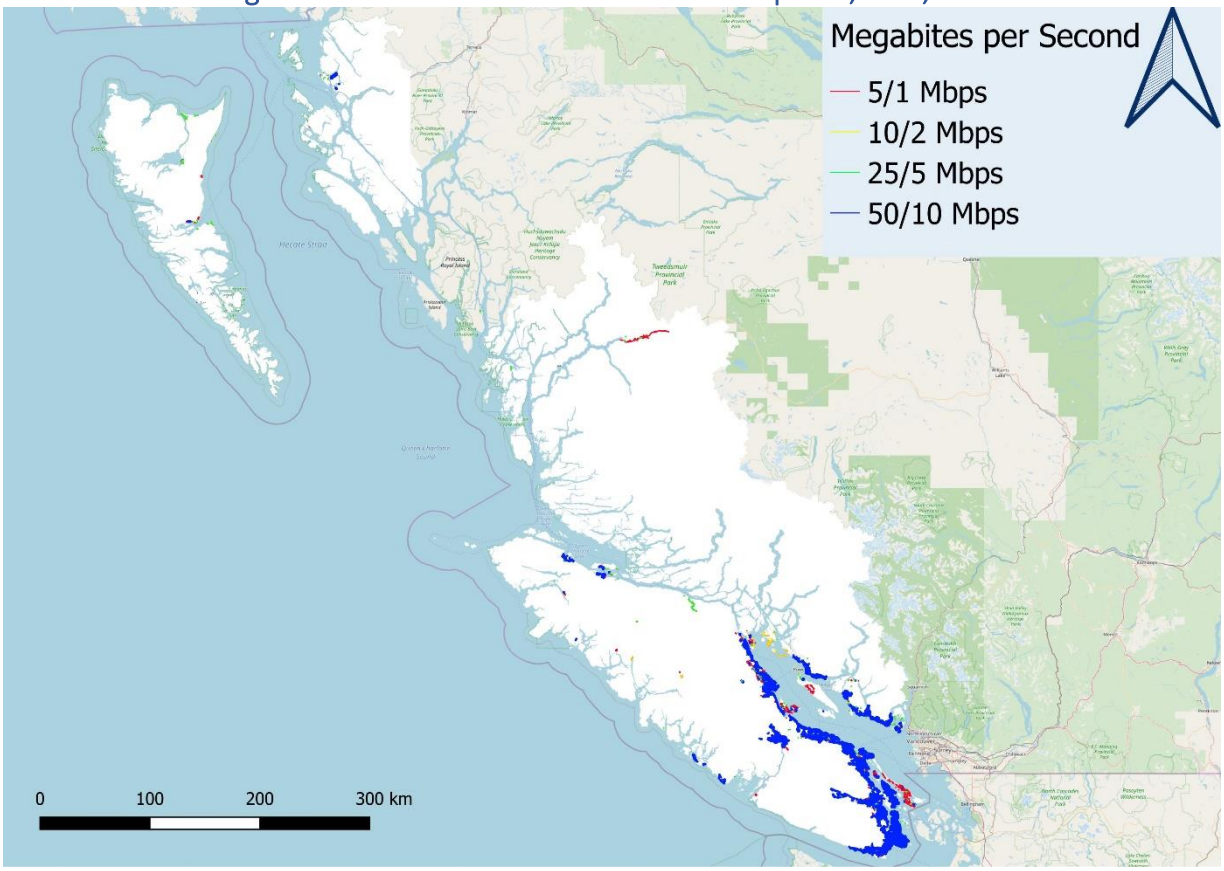
Figure 24 Broadband Connectivity, VICC, 2017



Source: Government of Canada (2020b), *National Broadband Data Information.*

Urban areas have the fastest Internet, with speeds up to 50/10 Mbps, and although some more remote communities have access to the Internet, many have "slow" access, meaning the rate of which data can travel to a household per second is much lower than urban areas (Figure 25). More remote communities with slower internet access include Tahsis, Zeballos, Gold River, Bella Coola, and Tlell. Many of the islands of VICC have slower internet access, as seen in concentrations in the Gulf Islands, Texada Island, and the islands clustered around Desolation Sound. Therefore, while communities may have internet available, the access may be inadequate to use for certain internet services, such as video conferencing and streaming—functions which are important for the delivery of e-services such as health and education.

Figure 25 Households Internet Broadband Speeds, VICC, 2017



Source: Government of Canada (2020b), *National Broadband Data Information.*

The State of Greenhouse Gas Emissions

- **Residential GHG emissions from utilities and solid waste across the VICC decreased by 3% between 2007-2017.**
- **Declines in residential GHG emissions were uneven; many rural areas have high residential GHG emissions and high energy costs, especially those that rely on diesel power generators.**
- **Commercial and Industrial emissions decreased by 17% from 2007-2017**
- **Urban centres and large industrial facilities have the highest commercial and industrial emissions**

British Columbia's Greenhouse Gas Emissions Inventory provides data for 57 communities across the VICC. Data involving single large industrial emissions which amount to greater than 50% of a community's total emissions within that subsector are withheld due to confidentiality, but all other commercial and industrial emissions are available (CAS, 2007). All Wood, Oil, and Propane data were calculated for 2007 and have been adjusted to 2017 but should be considered approximate. This is the only data available for the Islands Trust Areas of VICC, and therefore those emissions should be considered with caution. Additionally, this data has several other limitations, including the Fortis BC data collection system, which assigns emissions in a less-accurate way than previous. Because of this, the Climate Action Secretariat has adjusted the residential data to align with the older data.[9] Other considerations for this data are likewise found in the Technical Methods and Guidance Document which should be consulted when interpreting this data. Although not all-inclusive, this data is a good representation for the territory, and outlines some important features. Different kinds of emissions are counted. Residential GHG emissions are an inventory of all energy consumed for different types of homes.

On average, residential GHG emissions have declined across the VICC

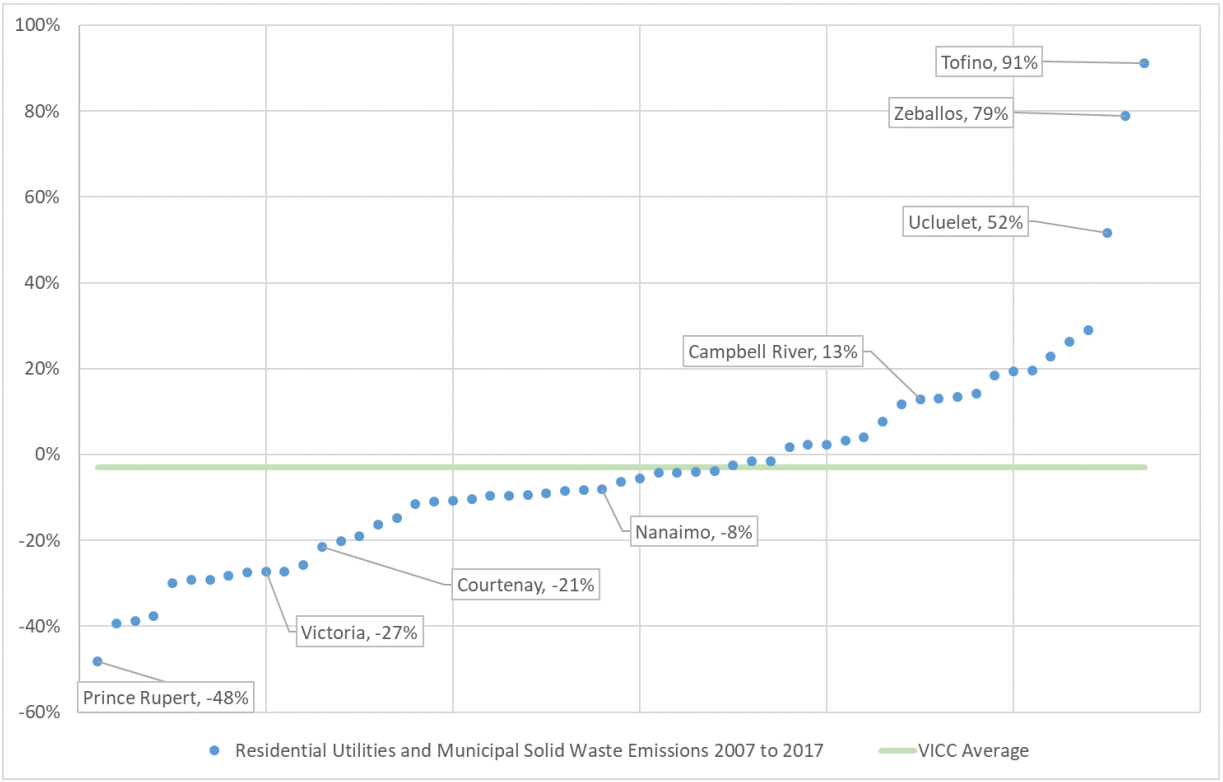
Residential GHG emissions from utilities and solid waste across the VICC decreased by -3% between 2007-2017 (Figure 26). At the lowest end, Prince Rupert has the greatest decrease in GHG emissions, at –48%, as well as having the lowest per capita residential utilities emissions for 2017 at 0.14 tonnes of carbon dioxide equivalent (tCO2e) (CAS, 2019). Port Edward, another northern community, has a decrease of -20% (CAS, 2019). However, not all northern communities are experiencing decreases in emissions; Masset and Queen Charlotte (Charlotte) on Haida Gwaii both have increases over the decade. This is likely a reflection on the remoteness of the islands, and is reflected in other island communities such as the Gulf Islands, which also are experiencing an increase in emissions. Another disparity is the difference within the Sunshine Coast communities; Gibsons and Sechelt are among the top five communities with the largest decreases, yet Sechelt Band Indian Government District is in the top five communities with the largest increases in utilities and solid waste emissions (CAS, 2019).

[9] See Technical Methods and Guidance Document, 2007-2012 Reports (BC Ministry of Environment, 2017).

The community which had the highest residential emissions per capita in 2017 was Tahsis, at 7.40 tCO2e; but they also have among the lowest commercial and industrial GHG emissions per capita (at 0.13 in 2017, see Figure 28) (CAS, 2019). More rural and isolated communities tend to have higher emissions because they do not have the capital to invest in the same scale of projects as more urban areas do, and often are having to rely on diesel generators for much of their energy. These generators are not only high in emissions, but also in cost - a heavy burden for smaller communities. Higher energy demands may also be related to their location in colder climates.

The medium and large population centres of VICC all have changes below the territorial average, ranging from –8 to -27% (Figure 26) (CAS, 2019). The decrease in tCO2e reflects the ability for urban areas to invest in greener infrastructure, low-emissions public transportation, and sustainable energy. These urban areas have had the ongoing opportunity to make such changes and investments and the data reflects the effectiveness of some of these initiatives.

Figure 26 Percent Change in Residential Utilities and Solid Waste Emissions, per capita tCO2e, 2007 to 2017



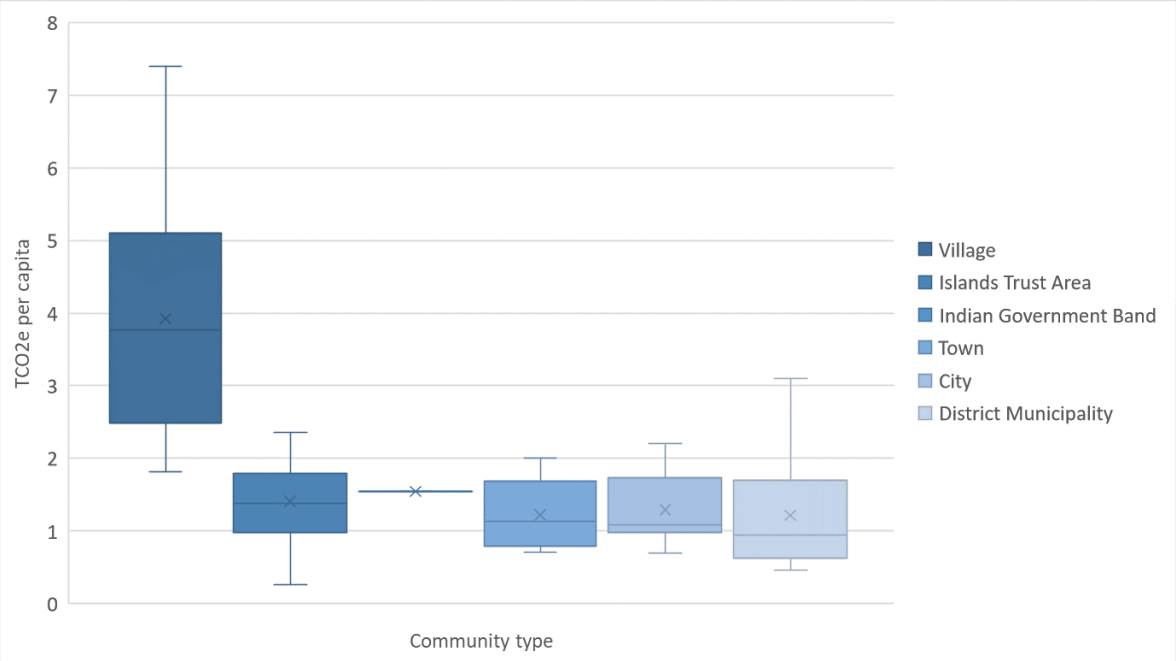
Source: Government of British Columbia Climate Action Secretariat (2019). BC utilities energy data at the community level, BC landfill waste data at the community level

Rural communities have the highest per capita GHG emissions on average

Figure 27 further illustrates the disparity between smaller communities and urban areas; the rural communities (villages) of VICC have the highest average residential GHG emissions in 2017, and includes places such as Tahsis, Zeballos, Masset, and Port Clements. These areas are all very remote in comparison to the population centres of VICC, and do not have access to the same connectivity or capital resources. Villages also display the largest range in emissions, indicating

that some communities have invested in cleaner energy options, and others do not have that ability yet.

Figure 27 Tonnes of Residential GHG Utilities and Solid Waste Emissions per capita, by Community Type, VICC, 2017

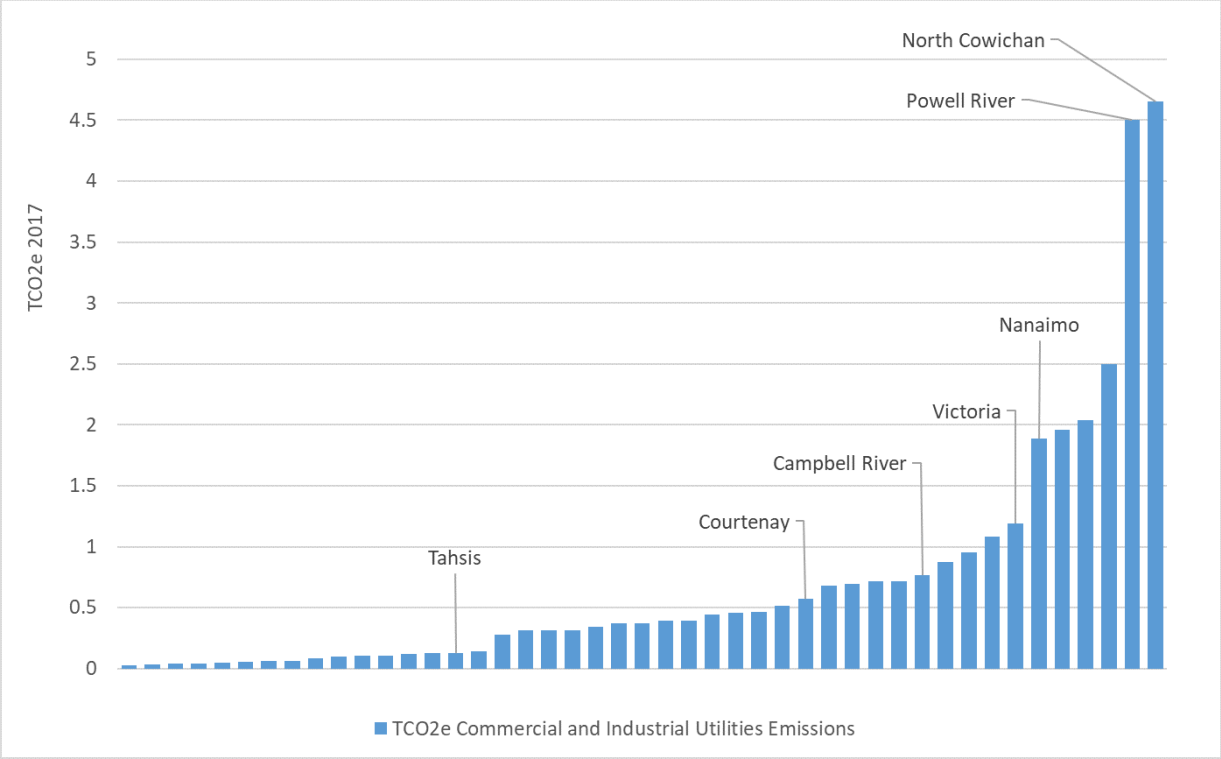


**Note: there is only one Indian Government District – the Sechelt IGD*
Source: Government of British Columbia Climate Action Secretariat (2019). BC utilities energy data at the community level, BC landfill waste data at the community level

There is little correlation between high industrial and commercial GHG emissions and communities with goods-based economies

In VICC many communities either do not have commercial and industrial (CI) data, or have a CI emission of zero; and are not illustrated in Figure 28, below. All these communities are Islands Trust Areas and, as aforementioned, there is only data for these communities pertaining to estimated oil, wood, and propane. Other communities have significant CI emissions; the communities which have the greatest CI emissions are the District Municipality of North Cowichan and the City of Powell River, both of which are home to Pulp and Paper Mills, one in Crofton and the other in Historic Powell River. The closing of the pulp and paper mill in Campbell River contributed to the decrease in commercial and industrial utilities emissions over 2007-2017, which was -17%. There is little correlation between high CI emissions and goods-based economies. It is population centres with large commercial and industrial sectors (not just goods based), as well as communities with large industrial emitters that have among the highest CI emissions.

Figure 28 Commercial and Industrial Utilities Emissions by Community, per capita tCO2e, 2017



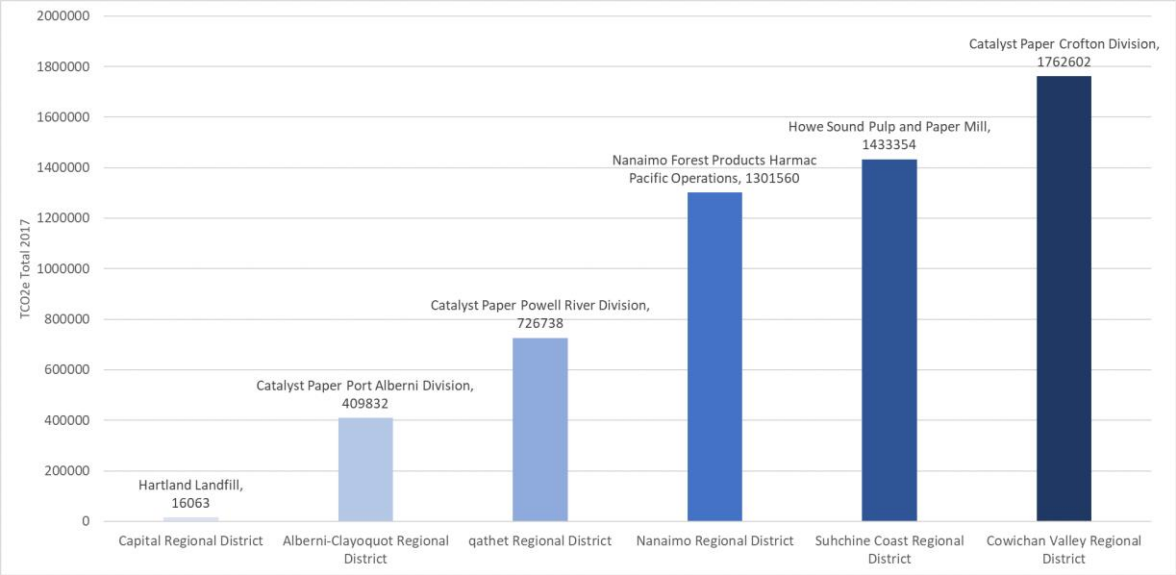
Source: Government of British Columbia Climate Action Secretariat (2019). BC utilities energy data at the community level, BC landfill waste data at the community level

Large Industrial facilities in VICC contribute heavily to emissions, but also supply important jobs and energy

VICC is home to six large industrial emitters, which are defined by the province as any facility which emits 10,000 tCO2e per year.[10] The emissions data on these six differs from the community data, as it includes all emissions, not just utilities. Additionally, large emitters do not always fall within the jurisdiction of towns and cities and so not all are reflected in the community data of Figure 29, notably Howe Sound Pulp and Paper Mill. Large industrial emitters are mostly Pulp and Paper Mills, the largest of which is the Crofton Division of Catalyst Paper (Figure 29). Hartland Landfill is the only other kind of large industrial emitter found in the Capital Regional District and emits a figure less than 1% of the Crofton Mill's emissions. For mills, the largest source of emissions stems from the combustion of biomass, for example in the burning of hogfuel to power boilers. These facilities greatly impact the emissions of VICC, yet also supply many jobs to the surrounding communities, as well as supplying power to communities and supporting the economy. Therefore, when considering these emitters, it is not a matter of just economy or environment, but both.

[10] Large industrial emitters definition(Government of BC, 2020)

Figure 29 Large Industrial Emitters, VICC, 2017

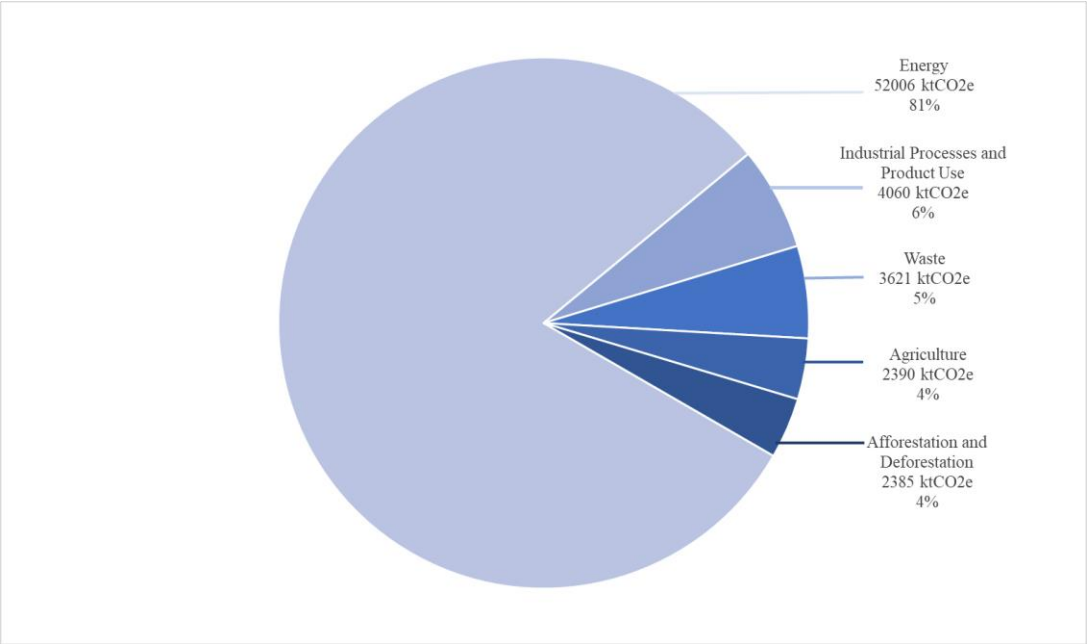


Source: Government of British Columbia (2019). Industrial Facility Greenhouse Gas Emissions.

Energy use is by far the highest emitting sector for BC…

Although there are no further sectoral and sub-sectoral emissions data available for VICC, the Provincial Inventory can provide blanket characteristics for the region, drawing on the provincial trends. Energy is the largest sectoral contributor to total emissions, making up 81% of total BC emissions in 2017 (Figure 30). The four other sectors, Industrial Processes and Product Use, Waste, Agriculture, and Afforestation and Deforestation, are all very similar in numbers, accounting for 6%, 5%, 4%, and 4% of total emissions respectively (see **Error! Reference source not found.**, Appendix for provincial emissions categorizations).

Figure 30 Sectoral Emissions of British Columbia, in ktCO2e, 2017

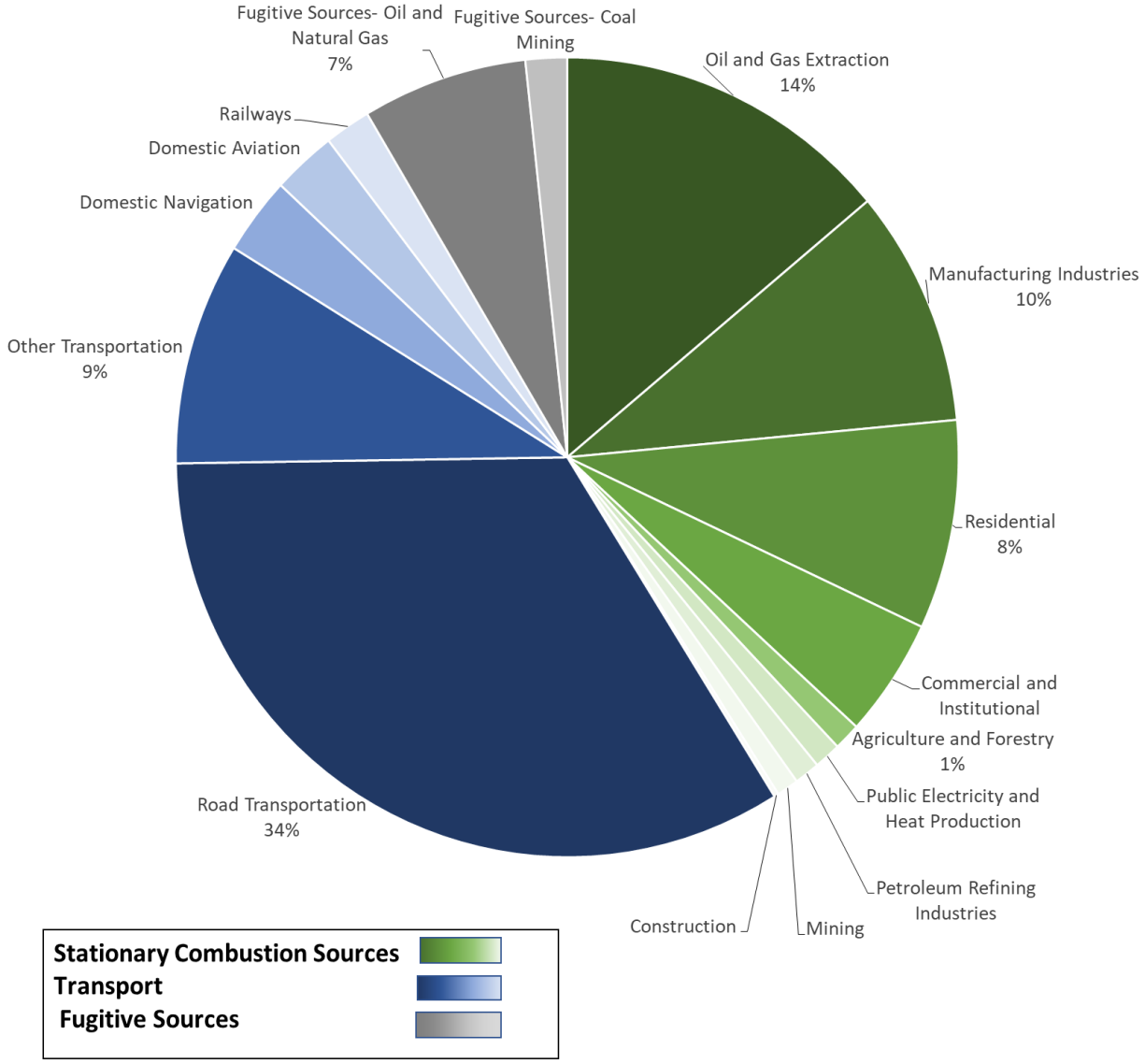


Source: Government of British Columbia, (2019). Provincial Greenhouse Gas Emissions Inventory.

…of which transportation emissions are around half

Transportation encompasses 50% of energy sector emissions (blue shades, Figure 31 Energy Sector Emissions Breakdown for British Columbia, 2017). The VICC is heavily reliant on transportation in several ways; the region imports many of its goods (especially food) from other parts of BC by way of ferry systems and large transport trucks. Road Transportation makes up 34% of BC's energy emissions. Also, the rurality of VICC lends itself to an increased transportation sub-sector, as it requires significant travel to reach many of the remote and rural communities of the region. Oil and Gas Extraction is the next highest energy emitter at 14%, and Manufacturing Industries at 10%; both are part of the Stationary Combustion Sources sub-sector which is the second largest and accounts for 41%. These are not as dominant in VICC. Agriculture and Forestry are relatively low emitters, accounting for only 1% of the total energy emissions in BC.

Figure 31 Energy Sector Emissions Breakdown for British Columbia, 2017



Source: Government of British Columbia, (2019). Provincial Greenhouse Gas Emissions Inventory.

The 2017 wildfires contributed over three times as many greenhouse gasses into the atmosphere than the total provincial emissions

Finally, there are some emissions that are not included in the BC totals, but that are important to help understand the emissions profile for VICC: these are emissions from Other Land Use (Table 4 Emissions Related to Other Land Use in British Columbia, 2017). This category of emissions includes Forest Management, which accounts for 202,993 ktCO2e—this is over three times as high as the Provincial total. The reason for this is largely due to wildfires: in 2017 BC experienced its worst fire season on record, and totalled to 176,550 ktCO2e. It is important to note this, as all other years on record have significantly lower emissions. Wildfires are a large source of greenhouse gas emissions, and are expected to increase in the coming years due to climate change, and so need to

be considered not only in terms of preserving land and hazards to humans, but also from an emissions standpoint. It is important to note while considering this data that carbon sinks are not included in this data; forest carbon management (through sustainable forestry and conservation practices) reduces forest carbon sources like wildfires and slash piles, which is needed to maintain and/or increase carbon sinks in the VICC forests.

Table 4 Emissions Related to Other Land Use in British Columbia, 2017

Category	Sub-Category	Emissions, ktCO2e
Forest Management		202,993
	Wildfires	176,550
	Emissions from Decomposition of Harvested Wood Products	42,034
	Slash pile burning	3,990
	Forest growth minus decay	-19,581
Cropland Management		158
Wetland Management		40
Grassland Management		0
Settlement Management		-498

Source: Government of British Columbia, (2019). Provincial Greenhouse Gas Emissions Inventory.

Present and Future Climate Change Scenarios

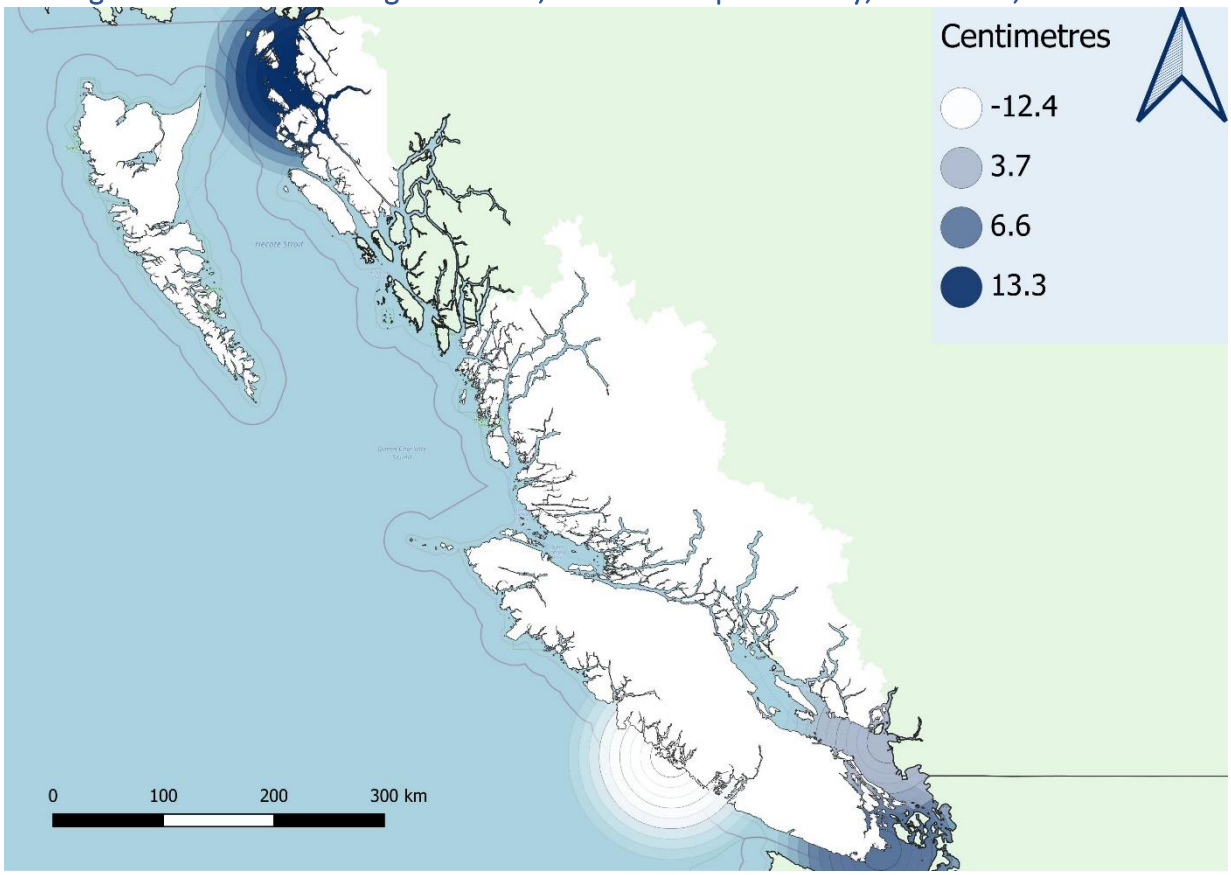
- **Sea-level rise together with more frequent and severe storms due to climate change poses hazard to VICC communities and industries.**
- **Sea level rise over the past century has been uneven across the VICC due to isostatic rebound from the last glaciation; some areas are under greater threat than others.**
- **Ocean surface temperatures vary across the VICC, but overall depict a warming trend, threatening marine life.**
- **Communities face current and ongoing risk of flooding, landslides, and structural damage to critical infrastructure.**

As a coastal territory, the changes in the ocean pose a serious threat to communities within VICC

The VICC region is intrinsically connected to the ocean, and therefore the changes to the ocean due to climate change are of significant importance to the region. Globally, mean sea level has risen 0.19m from 1901-2010, and it is very likely that the rate of sea level rise was 1.7mm/yr within that time range, but 3.2mm/yr from 1992-2010 (IPCC, 2014). It is very likely that the rate of rise will continue to increase in the coming years (IPCC, 2014). However, sea level rise varies across the VICC (

Figure 32). In Prince Rupert the average sea level rise was 0.13m/century, and 0.06m/century in Victoria, while in Tofino the average sea level dropped at -0.12m/century (BCMoE, 2016). At first this may seem counter-intuitive, but there is a simple explanation; due to the isostatic rebound from the last glaciation, parts of Vancouver Island are rising at ~0.25m/century, while other areas are not moving (to a significant degree) (BCMoE, 2016).

Figure 32 Observed Change Sea Level, Centimeters per Century, Coastal BC, 1910-2014



Sources: BC sea level data (Government of British Columbia, 2020e)*; US cartographic file* (US Census Bureau, 2020)*; BC cartographic file* (Government of British Columbia, 2020d).

Isostatic rebound is the lifting of land after a large quantity of ice in the form of glaciers has retreated from the area; it is a slow response which takes place over thousands of years. This rising of the land is responsible for the apparent lowering of sea level in Tofino, and accounts for the large differences between there and Prince Rupert where there is little rebound occurring. The implications of sea level rise within VICC are vast, including:

- Flooding, especially beaches, wetlands, coastal dunes, and waterfront properties;
- More frequent extreme high-water occurrences, impacting property, infrastructure (docks, wharves, port facilities), especially in Prince Rupert;
- Salinification of agricultural lands from intrusion of saltwater into groundwater aquifers and;
- Wave changes, including magnitude and direction, as well as storm waves and surges (BCMoE, 2016).

In addition to sea level rise, the oceans are also experiencing an increase in temperature. From 1971 to 2010, the ocean surface increased on average by 0.11°C/decade (IPCC, 2014). In VICC the temperatures at the ocean surface vary from a low of 0.6°C at Kains Island to a high of 1.4°C at Entrance Island, but on average agree with the IPCC numbers (BCMoE, 2016). Marine organisms are very sensitive to temperature increases, and as such the warming of the surface layer

of the ocean impacts the fish and shellfish which are crucial sources of food and income for many residents of VICC, and are of significant cultural importance. Additionally, the heating of the surface layer is increasing stratification in the ocean – the warm, less dense water "floats" upon the deeper, colder, and more saline water below. The problem with this is that the mixing of surface and deep water is what brings mineral-rich water in autumn to replenish the nutrients in the surface layer, which are necessary for feeding the phytoplankton that are the basis of the marine food chain. The lower the mixing, the less nutrients are available, and the lower the productivity of the ocean (BCMoE, 2016).

Alongside temperature increases, the increasing amount of CO_2 entering the ocean is altering the pH of the water, making it more acidic (Canadian Climate Forum, 2017). Ocean acidification occurs as the CO_2 from the atmosphere dissolves into multiple ions, notably hydrogen ions, which lower the pH of ocean water and make it more acidic (Canadian Climate Forum, 2017). The implications of ocean acidification include deteriorating habitats for fish and shellfish, and decreasing carbonate ions needed by shellfish to build their shells (Canadian Climate Forum, 2017). This is just one of the several impacts of climate change to shellfish, which are an especially vulnerable but equally important class of life to the VICC region. As an example, in 2014 ten million scallops died in the waters near Qualicum Beach (Shore, 2014). These types of die offs have been increasing over the past decade.

VICC is experiencing rising temperatures, putting vulnerable populations at a higher risk

Average global surface temperatures have been warming since 1850 (IPCC, 2014). In BC, the temperature changes are felt more acutely: globally, temperatures have increased on average by 0.85°C/century, while BC on average has experienced increases on average of 1.4°/century from 1900-2013 (BCMoE, 2016). Due to the complex geography of VICC, there are variations in the average temperature increases. The southern coastal reaches of VICC have experienced increases of 0.8°/century, while more northern areas, such as Prince Rupert, have experienced increases of 1.1°C (BCMoE, 2016).

One of the further changes predicted to occur is the increase of heat waves; heat waves are expected to happen more often in urban areas, because the built environment (paved roads, buildings, other infrastructure) retains heat more so than the natural environment (BCMoE, 2016). As such, the heat waves are felt more acutely in urban agglomerations where there is a higher concentration of people, as well as more vulnerable populations, especially seniors. In Victoria, between 1951-1980, there were usually only 3 days a year which reached temperatures above 30°C, but within this century that is expected to increase more than four-fold, to 13 days per year (BCMoE, 2016).

Increased precipitation and glacial meltwater help soil moisture, but increase flooding hazard to communities

VICC spans two unique ecoprovinces; the Georgia Depression, which covers Victoria and the southeast sections of Vancouver Island, and the Coast and Mountains, covering the remaining portions of VICC (BCMoE, 2016). Within the Georgia Depression, precipitation increased by 14% per century, and by 10% per century in the Coast and Mountains ecoprovince, The increase

in precipitation has many implications for VICC (BCMoE, 2016). Some of these implications are beneficial to the territory, the increased precipitation assists in adding to groundwater stores, replenishing soil, and adding to river discharge (BCMoE, 2016). However, increased precipitation does have some negative effects, namely increased risk of flooding, landslides, and damage to infrastructure (BCMoE, 2016). Flooding is a common hazard in British Columbia, and the increasing precipitation is an indicator that this hazard may become more frequent. As such, it is an important event to be prepared for, with attention to storm drains, culverts, and river characteristics.

Much of BC's freshwater is stored in glaciers, however from 1985-2005 BC lost 2525km² of glacial coverage (BCMoE, 2016). Most of the glaciers within VICC are found in the Coast and Mountains ecoprovince, yet the glaciers with the greatest percentage of area loss are found in the Georgia Depression (BCMoE, 2016). The increased melting of glacial ice has similar implications to increased precipitation; the added meltwater increases the discharge of rivers, which has both positive and negative ramifications.

Increasing temperature means more available energy for plants, but may decrease yield of crops

The temperature increases within VICC do have some benefits, as there is an increase in available heat energy for plants, which stimulates growth, and correlates to an increase of Growing Degree Days (BCMoE, 2016). The result is that plants are able to successfully grow for more days out of the year than in previous years. This has implications for agriculture in VICC, which has been able to expand due to a more favourable climate. However, the IPCC warns that if these annual temperature increases are more than a few degrees then there will be a generalized loss in mid-latitudinal potential crop yields, a threat to VICC's food security (IPCC, via BCMoE, 2016). These changes may be important to keep in mind while decisions are made upon the type of crops to be planted. As well, the increase of temperature may bring more droughts to the region; this will impact both agricultural activity and the supply of drinking water for the communities of VICC. Not only that, but the decrease in relative humidity experienced in droughts increases the risk of wildfire activity.

Species are relocating as their zone of tolerance within their habitat shifts

Additionally, the climatic changes appear to be altering the tree coverage within VICC: there is a decrease in Mountain Hemlock, which is being replaced by the more abundant Western Hemlock (Wang, Hamann, Spittlehouse, & Carroll, 2016). This illustrates the movement of species to be expected in VICC: certain species are able to thrive or adapt to higher temperatures and increased precipitation, but for some that change will put the territory of VICC outside of their range of tolerance, and they will cease to grow in this region. A damaging result of this change is the spread of invasive species, which have already influenced many of the VICC ecosystems and can drive out keystone species. This altering of ecosystems in turn changes habitats, as many faunae in VICC are dependent on specific flora to provide food and/or shelter. With the changes in coming years it is expected that the habitats of animals may also shift. This impacts not only the flora and fauna, but also the people who reside in these habitats; certain species are vitally important to communities, especially Indigenous communities. One species of note is the Western Red Cedar,

which has been declining on the eastern flank of Vancouver Island, and holds high cultural importance to Indigenous communities. The relocation of key species may be damaging not only in a resource-based frame, but also culturally, and as such reforestation and habitation efforts need to be a collaborative process respecting values from all sides. There are already examples of species moving from traditional habitats because of the various climate changes, including increased precipitation, changes in river discharge, drought impacts, wildfire, and flooding, to name a few.

Climate change impacts on the health of VICC communities

The result of these many changes to the environment have far reaching ramifications for the citizens of VICC. Water quality is already a concern for many communities, and the changing climate has impacts on this as well. As aforementioned, the rise in sea level may flood low-lying areas, bringing in salt water and contaminants from the ocean (BCMoE, 2016). Further, the increased risk of flooding due to heavy precipitation has the ability to overwhelm sewage systems and to carry runoff into drinking reservoirs, a hazard experienced previously in BC several times, leading to outbreaks of disease transmitted from both sewage and animals (BCMoE, 2016). An example from the CRD comes from 1995, where an outbreak of toxoplasmosis was thought to be linked to a municipal water reservoir following two heavy precipitation events which caused significant turbidity in the reservoir concerned (Bowie et al., 1997). Another implication of sewage runoff is the negative effects it has on shellfish, this in turn not only harms the ocean life but also has threats to the shellfish industry and the consumers of it. There are additional ocean borne diseases which transfer from shellfish to humans, and are also implicated with climate change (James, Carey, O'Halloran, Van Pelt, & Škrabáková, 2010).

Other health considerations associated with climate change include the illnesses related to air quality which is degraded by emissions from vehicles and industrial activities; the smog which can form from emissions is created faster at warmer temperatures, and as such the occurrence of respiratory illnesses may increase (BCMoE, 2016). Heat related illnesses, as aforementioned, are an ongoing concern, and combined with that citizens will see that although they may spend less on heating in the winter, they may be spending more in the summer to keep their houses cooler (BCMoE, 2016). This highlights the importance of energy efficient upgrades, as the cost of energy required to maintain "room temperature" is heightened with older less efficient systems. However, the cost of replacing heating and cooling systems is outside the budget of many families, and as such retrofits and other more economical solutions may be presented as more attainable.

Social inequities are a major determinant of population health and play an important role when trying to understand the health impacts of climate change. Vulnerable populations are at greater risk of phenomena such as flooding, heatwaves, and extreme cold because they have less capacity to adapt to environmental and health risks.[11] The populations most at risk of harmful consequences from climate change events are the most disadvantaged and vulnerable, and those living in arctic ecosystems, drylands, small islands, and least developed countries (IPCC, 2018). In Canada, the most affected are "those living closest to the land" (Goyena & Fallis, 2019), many of whom are farmers and Indigenous communities in coastal and remote communities. The IPCC (2018) also warns that "poverty and disadvantage are expected to increase in some populations as global

[11] See for example: (Cutter, 2006; Douglas et al., 2012; Nicholas et al., 2015).

warming increases." As climate change impacts deepen, it is important to increase population/community resilience.

Our Shared Future

Climate change—sea level rise, an increase in ocean temperatures, more frequent and severe storms, flooding, and landslides—challenges communities across the VICC to pursue adaptation and mitigation measures. These trends impact all communities across the VICC, but in different ways. Some communities are more vulnerable than others both in terms of how they are impacted by climate changes and in terms of their capacity to address it through adaption and mitigation measures.

This Territorial Review has highlighted the interconnectedness of the VICC region and critically, the importance of rural-rural and rural-urban linkages and partnerships. Rural and urban communities are linked by their environments and ecosystems, social connections, labour markets and economies. Rural areas provide critical resources and environmental amenities for the region while urban areas are important service centers and transport hubs. Remote rural communities are especially vulnerable to climate related hazards due to their greater isolation and less diversified transport connectivity and critical infrastructure. Small town and rural VICC communities have inherently smaller administrations and fewer resources with which to manage increasingly complex issues. Rural-rural and rural-urban partnerships can help build economies of scale through such measures as joint procurement, infrastructure and land management and service agreements. These types of partnerships are critical to the region's resilience.

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Appendix Part 1

Table 5 Sectors and Subsectors of Provincial Inventory, 2019

Sector	Subsectors
Energy	Stationary Combustion Sources
	Transport
	Fugitive Sources
	CO2 Transport and Storage
Industrial Processes and Product Use	Mineral Products
	Chemical Industry
	Production and Consumption of Halocarbons, SF6 and NF33
	Non-Energy Products from Fuels and Solvent Use
	Other Product Manufacture and Use
Agriculture	Enteric Fermentation
	Manure Management
	Agricultural Soils
	Field Burning of Agricultural Residue
	Liming, Urea Application and Other Carbon-containing Fertilizers
Waste	Solid Waste Disposal
	Biological Treatment of Solid Waste
	Wastewater Treatment and Discharge
	Incineration and Open Burning of Waste
Afforestation and Deforestation	Deforestation
	Afforestation
	Grassland converted to Cropland
	Other Land converted to Wetlands

Source: Government of British Columbia, (2019). Provincial Greenhouse Gas Emissions Inventory.

Part 2 Survey of Climate Adaptation and Mitigation Policies and Priorities

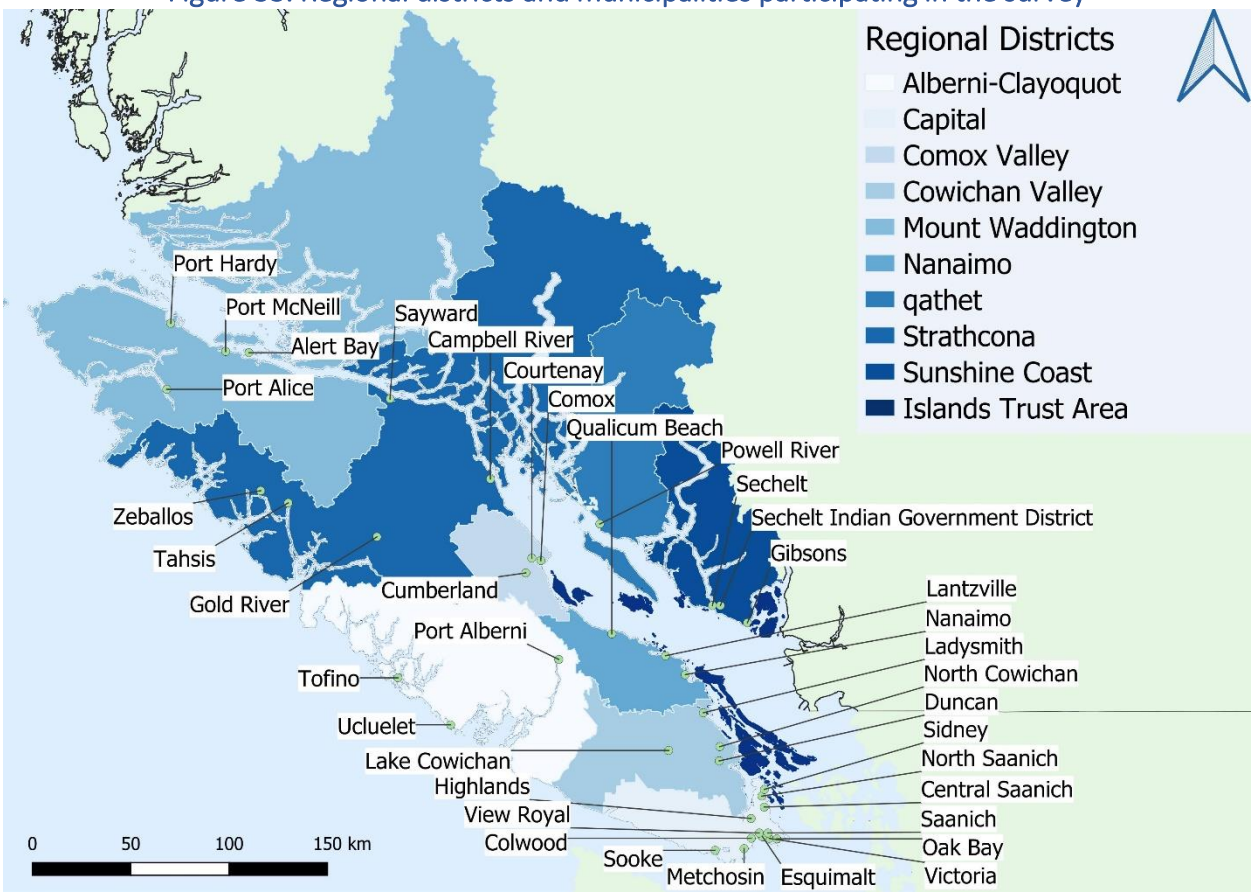
An understanding of the various climate impacts and policy priorities across the region is a critical part of regional climate planning. This is especially relevant for the VICC region given that it is not an established administrative unit and information about its communities' climate change impacts and actions to address them is not systematically summarized. The following survey identifies the key climate impacts, policies, priorities, barriers, and opportunities that currently guide decision-making about climate change mitigation and adaptation in the region, using a web-based survey of municipal government officials. Understanding local priorities will help enhance social and political acceptance of climate policy solutions and their rapid implementation (Goulder and Parry, 2008).

This survey identifies the key climate impacts, policies, priorities, barriers, and opportunities that currently guide decision-making about climate change mitigation and adaptation in the region. A total of 106 government officials, including 69 elected representatives and 35 staff from 38 municipalities and 10 regional districts participated in the survey. Multiple individuals from each local government were invited to participate in the survey, with responses for a single municipality or regional district aggregated into one complete response.

Survey area: Geography of study

The VICC represents a promising geographical region for regional planning: comprised of island and coastal communities, the region shares a common history, as well as vulnerabilities, adaptation, and mitigation challenges. Its economic diversity and urban-rural linkages offer differential capacities and priorities, supporting the potential for building circular and sustainable economies with shared resources and coordinated action. The region partially corresponds to that of the Association of Vancouver Island and Coastal Communities (AVICC), one of five area associations in BC. The planning process and survey cover the areas of Vancouver Island, the Sunshine Coast, and the smaller islands in between, and includes 40 municipalities and 10 regional districts (Figure 33).

Figure 33. Regional districts and municipalities participating in the survey



Due to its coastal nature, the hazards experienced in the VICC region can be expected to differ from other parts of the province. Changes to the ocean caused by climate change, such as sea level rise, warmer temperatures, and acidification are of particular concern in coastal areas. Sea level rise is linked to numerous impacts to coastal communities, including more frequent and severe flooding, salinification of groundwater aquifers and agricultural lands due to saltwater intrusion, increased stress on drainage and sewage systems, and more frequent and severe storms (BCMoE, 2016). Warming ocean temperatures harm marine organisms, including fish and shellfish, which are economically and culturally important as well as being crucial food sources. Ocean acidification, caused by the dissolution of CO_2 into the water, likewise is harmful to marine life, particularly to shellfish, as it interferes with their ability to form shells. While many of these changes are significant throughout the region, the impacts are not uniform, illustrating the importance of collecting information from communities in order to identify varying impacts and priorities.

As noted in Part 1, the global trend of rising surface temperatures also affects the VICC region, and due to the complex geography of the region, there are variations in the average temperature increases, with northern areas experiencing greater increases than southern coastal area. There are a number of impacts associated with rising temperatures affecting the region, which include increased droughts, more frequent heat waves, increased risk of wildfire, threats to food security

and drinking water supplies, and changing habitats for flora and fauna including the relocation of culturally and economically important species. Precipitation patterns are also changing, with the region experiencing an overall increase in precipitation. The effects are mixed, as increased precipitation adds to river discharge and replenishes soil and groundwater stores, but also increases risk of flooding, landslides, and damage to infrastructure (BCMoE, 2016).

The VICC region is culturally, geographically and economically diverse, and as a result, the climate change related hazards experienced by communities, their corresponding vulnerability to impacts, and their capacity for adaptation varies widely. Much of the territory is rural and remote, with a majority of the population clustered in population centres in the southern part of Vancouver Island. Due to their greater isolation, remote rural communities are especially vulnerable to hazards related to climate change and are less equipped to respond in terms of administrative capacity and resources.

Urban areas typically have more extensive mitigation and adaptation measures in place, but experience their own challenges, such as greater development pressures, stormwater management issues, and unique impacts like urban heat islands (Simperler et al, 2020). Urban municipalities can act as service centres for surrounding areas, resulting in differing patterns of vulnerability compared to more rural areas. Cities are often located on or near the coast and have larger and denser populations, resulting in major impacts to people, properties, and infrastructure from climate change hazards. With respect to climate change mitigation, urban centres are responsible for a large share of global energy consumption and GHG emissions and therefore have a key role to play in transitioning to a sustainable future.

Many of the larger urban municipalities in the VICC have climate plans, including the City of Victoria's (2018) Climate Leadership Plan, the District of Saanich's 2020 Climate Plan: 100% Renewable and Resilient Saanich, and the City of Nanaimo's (2012) Community Sustainability Action Plan, with mitigation policies focusing on buildings, transportation, land use, waste management, municipal operations, and energy systems. Canadian municipal climate plans have tended to prioritize mitigation over adaptation (Guyadeen et al., 2018). For example, Nanaimo's 2012 Sustainability Action Plan focuses solely on energy and GHG emissions (i.e., mitigation only). However, municipalities in the VICC are starting to turn their attention toward adaptation planning, which is reflected in the more recent plans. Victoria's plan has adaptation as one component out of five sections, but adaptation is integrated into various sections of the plan and also into other plans, including the stormwater management plan. Saanich's 2020 climate plan integrates adaptation throughout, and Nanaimo has just produced an adaptation plan: the Climate Change Resilience Strategy (2020). The City of Campbell River has a community energy and emissions plan and climate adaptation planning is underway (City of Campbell River, 2020). Some smaller municipalities are also working on climate plans, for example, the District of Ucluelet, which developed its first climate action plan in 2019 is presently developing a climate adaptation plan (District of Ucluelet, 2020).

In these municipalities, mitigation policies are designed in alignment with established provincial and national commitments, as well as international climate targets. For example, Victoria committed in 2016 to reduce community-wide GHGs by 80 percent by 2050 from 2007 levels and to shift away from fossil fuels to 100 percent renewable energy by 2050 (City of Victoria, 2018). Nanaimo has set GHG emissions reduction targets of 33 percent below 2007 levels by 2020 and

80 percent below 2007 levels by 2050 (City of Nanaimo, 2012). Saanich has the most ambitious plan, with a goal to cut emissions in half by 2030 and net zero by 2050, as well as to transition to 100 percent renewable energy by 2050 (City of Saanich, 2020).

Almost every local government in B.C.—187 of 190 municipalities, regional districts and the Islands Trust—has signed the BC Climate Action Charter. The Charter requires local governments to take action to reduce greenhouse gas emissions, report on community climate initiatives, and become carbon neutral in municipal operations. Two island communities – Sechelt Indian Government District and Zeballos – have not signed the charter.

Despite this provincial commitment and the existence of climate plans and policies in larger urban centres, information on climate-related hazards, actions, and priorities is not well-documented in the rest of VICC. The information gathered through the survey will help summarize all mitigation and adaptation policy information in a consistent manner.

Survey Methodology

Data collection

Primary data about existing climate change hazards, climate action plans, policies, and priorities were collected using a web-based survey of local government officials (n=106) in each VICC community. Purposive non-representative sampling of respondents was employed using open-access contact information of government officials from the BC CivicInfo website and individual local government websites. Government officials included elected officials as well as senior staff and administrators in municipalities and regional districts who are responsible for climate change mitigation and adaptation policies and actions. Multiple individuals from each local government were invited to participate in the survey, with the intention of aggregating the responses for a single municipality or regional district into one complete response.

Specifically, the survey invitation was sent by email to 384 government officials including 334 elected officials in 40 VICC municipalities, 10 regional districts and 23 Island Trust communities. A total of 50 municipal and regional district chief administrative officers (CAOs) were also invited to participate and were asked to distribute the survey to relevant staff within the organization.

Responses were received from 38 municipalities and 10 regional districts for a 96% response rate. Of the total 106 individual responses, 69 came from elected officials while 35 were from staff (2 respondents declined to provide their role). All 10 regional districts provided full responses; 38 of 40 municipalities provided responses (i.e., Langford and Parksville did not complete the survey), and of these, 35 were complete while 3 were incomplete (i.e., substantial sections of the survey were not filled out). The average amount of time to complete the survey was 23 minutes. Participation in the survey was completely voluntary with no incentives or compensation offered in exchange for completing the survey. The survey was designed and administered using University of Victoria's SurveyMonkey platform.

Participants in the survey were given a brief overview of the purpose of the survey project and were advised of the benefits and limited risks of participation, steps taken to protect anonymity, confidentiality of data, and dissemination of results. Respondents were requested to complete the

survey in their formal role as staff or representative of their local government and to refrain from offering personal opinions. Survey respondents were given the option to skip questions as well as to pause and save the survey and resume at a later time if needed. Respondents were also allowed to return to previously answered questions to review or edit their answers at any time during or after completing the survey.

The survey consisted of four key sections related to (1) information about the community, (2) climate change mitigation, (3) climate change adaptation, and (4) hazards and impacts (see Appendix A for a full survey questionnaire). This survey design and structure was informed primarily by municipal climate change action survey guidelines by Fisher (2011). Sections on mitigation and adaptation policy options also drew on and BC Government's (2012) climate policy implementation guide for local governments, the Federation of Canadian Municipalities (2009) summary of municipal mitigation policies, as well as existing municipal and regional climate action plans including the City of Victoria's (2018) Climate Leadership Plan, the City of Nanaimo's Community Sustainability Action Plan (2012), the Capital Regional District's (2017) Regional Climate Action Strategy, the Regional District of Nanaimo Community Energy and Emissions Plan (2013), and the City of Barrie (2017) Climate Change Adaptation Strategy.

Each survey section included a mix of open-ended and closed-ended questions. Because this research is exploratory in nature, the questions were not designed to test a specific conceptual framework. Rather, the questions were designed to gather information in order to inform an understanding of current and future local government priorities to support the development of a regional climate plan. The survey questions were pre-tested with the University of Victoria research team and VICAPG representatives.

In Section 1, respondents were asked overview questions about their local government, including administrative capacity to work on climate change issues, the existence of strategic climate plans in their community, the most important natural resources in their community, and the inclusion of Indigenous knowledge in the analysis and decision-making. In section 2 on climate change mitigation, respondents were provided with the definition of climate change mitigation and asked questions about the importance of climate change mitigation to their community and general support for climate change mitigation (on a four-point Likert scale ranging from "not important at all" to "very important").[12] Other questions asked to identify the top priorities for climate change mitigation and investment in the community, the main mitigation policies already implemented by their local government with a list of 22 policy choices and an open-ended response option, as well as support for those policies with an option "I don't know." The policy list was based on the FCM (2009) summary of municipal mitigation policies as well as a review of policy options from local government climate plans. The last two questions in this section addressed barriers to climate change mitigation (with multiple choice response options from the lack of authority to the lack of capacity, financial resources, and senior government support) and an open-ended question on mitigation policies the local government would like to implement next but could not.

Section 3 on climate change adaptation employed a similar set of questions as in the preceding mitigation section but with the term "adaptation" replacing "mitigation."[13] Respondents were

[12] "Climate change mitigation" refers to efforts to reduce greenhouse gas emissions in your entire community.
[13] "Climate change adaptation" refers to efforts to adapt to existing and expected impacts of climate change.

provided with the definition of climate change adaptation in the beginning of the section. The two questions listing policy options differed in that this set of questions contained 19 possible choices for adaptation measures, with response options tailored toward adaptation policies rather than mitigation policies. The list of adaptation policy options was primarily derived from a review of government documents including the provincial government's implementation guide for preparing for climate change (BC Government, 2012) and the City of Barrie's (2017) adaptation strategy.

In the final section on hazards and impacts, questions were asked about past and future hazards based on Fisher (2011). Definitions of the terms "hazard" and "impact" were provided to respondents based on IPCC (2014).[14] To assess past hazards, respondents were asked to identify the top five hazards facing their community from a list of 12 options, with an option of indicating "not applicable/no hazards" or an open-ended option to specify additional hazards. This question was followed by an open-ended question on the measures taken to respond to the indicated hazardous events. Next, respondents were asked to identify the top five critical challenges to the community in terms of impacts from a list of 16 options (with similar options to respond "not applicable/no impacts" or to provide an open-ended response). The questions about hazards and impacts carried forward responses into a number of future questions, using the survey logic application available in SurveyMonkey. A series of matrix style questions were then used to elicit further detail about the hazards being experienced in the community. Respondents were asked to indicate how prepared their local government is if hazards or events occur again or become more frequent or severe, on a three-point Likert-type scale ranging from "not prepared," to "somewhat prepared," and "prepared," with an "I don't know" response option for each hazard. Respondents were next asked to assess their local government's capacity to manage the next hazardous events and the frequency of those events on similar Likert-type scales. Another series of matrix questions asked respondents to evaluate the severity of impacts of the hazardous events previously indicated. Respondents were asked to rank the severity of economic impacts, environmental impacts, and social impacts of each hazard with Likert-type scale answer options from "low" to "medium," "high," or "I don't know." Respondents were then asked to rank the severity of the impacts on Indigenous communities in the region, with the same answer options.

Future hazards questions asked respondents whether impacts of past hazards will continue into the future and become more problematic without climate action. This question was a matrix style format which carried forward the impacts that had been indicated by respondents in the previous section. Answer options included "yes," "maybe," "no," and "I don't know." Next, respondents were asked what climate change impacts will become more of a problem for the community over time, with a list of 12 options and additional options to indicate "not applicable (no events/hazards)" or "I don't know". The next questions asked about the information needed to plan effectively for the future hazards with multiple choice options and an open-ended response option. Finally, respondents were asked about new opportunities for their community related to the

[14] "Hazard" refers to the potential occurrence of a natural or human-induced physical event or trend or physical impact that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources. "Impacts" refer to effects on natural and human systems of extreme weather and climate events and of climate change. Impacts generally refer to effects on lives, livelihoods, health, ecosystems, economies, societies, cultures, services, and infrastructure due to the interaction of climate changes or hazardous climate events occurring within a specific time period and the vulnerability of an exposed society or system.

changing climate action as well as the impact of the COVID-19 crisis on mitigation and adaptation efforts.

Data analysis

Of the total 48 local governments that responded to the survey, 21 had one respondent, while 19 municipalities and 8 regional districts had more than one respondent. The Islands Trust had the highest number of individual respondents (13). Responses from communities with more than one respondent were merged together to form one complete response per municipality or regional district using the following methods: 1) responses were combined to fill in blank sections of survey (i.e., in some cases, respondents from one community divided sections of the survey among themselves); 2) where two or more respondents filled in the same sections of the survey, procedures were developed to merge the responses. These procedures included using an averaging/majority rules strategy where the most frequent response was chosen, and grouping of response options (e.g., "important" and "somewhat important" were combined into one category; "supportive' and "somewhat supportive" were combined into one category; "low" and "medium" impacts were combined into one category coded as "not severe" while "high" was coded as "severe impacts"). For answers with an "I don't know" option, any alternative response would replace "I don't know" (e.g., rating severity of impacts, where to find information). As well, new categories of "limited preparedness/capacity/frequency" were developed where disagreements could not be resolved using the above rules.

Respondents were followed up with by email to confirm information in cases where variation between answers from a single jurisdiction could not be otherwise resolved. In total, 10 local governments (2 regional districts and 8 municipalities) were followed up with via email. The questions requiring follow up included: strategic climate plan (9), dedicated climate staff (3), Indigenous knowledge (3), climate adaptation importance (1), overall support for climate adaptation (1).

Municipalities were categorized into four sub-regions--North Island, Central Island, South Island, and Coast in order to examine the effects of geography on climate action as well as hazards and impacts experienced. Municipalities were also categorized by population size in order to examine how differently sized municipalities experience and respond to climate impacts. The population size categorization followed that used by the Union of BC Municipalities (UBCM), which categorizes municipalities with populations less than 5000 as small, 5000-20,000 as mid-sized, and greater than 20,000 as large (see Appendix B).

Descriptive statistics were used to analyze data, including calculation of frequencies for multiple choice questions. There were three municipalities that only filled in a small section of the survey and others that skipped certain questions. In calculating frequencies, municipalities that did not answer a question/section of the survey were excluded from the total. Contingency tables, using the pivot table function in Excel, were used to compare multiple variables, as in the analysis of the effect of geography and municipal size on hazards/impacts experienced and policy options implemented. Open-ended questions were analyzed to identify common response themes using manual scanning of responses given the small sample size. These themes were used to support and/or explain findings from multiple choice questions.

Survey Results

What Motivates Governments to Act?

Municipalities and regional districts are overwhelmingly supportive of climate action

The survey found that both municipalities and regional districts are overwhelmingly supportive of climate action: 100% of municipalities and regional districts answered that climate change mitigation and adaptation are "important" or "somewhat important" to their community.

An analysis of open-ended responses found that the top five common themes of motivation to act include:

1. Public and/or political demand;
2. Science and data on climate change including observable impacts from changing weather patterns such as increased storms, droughts, and wildfires;
3. concern about sea level rise;
4. Preparation for the future and concern for future generations; and
5. Support and funding from senior levels of government. Several municipalities referenced their declarations of climate emergency and mentioned emissions reductions targets and/or climate action committees that have been established.

Regional districts were particularly likely to mention senior government funding and support as an enabling factor in being motivated and able to take action. The survey results showed that on the whole, municipalities and regional districts in the VICC region are well aware of the issues related to climate change, are already observing the effects, and are motivated to take action:

> ***"****We are motivated and have declared a climate crisis, have written to oil companies and, most significantly, are re-writing our Official Community Plan with a climate change lens."* – Courtenay
>
> "*Council members are strongly and personally motivated. For some councillors, it is their prime motivation for being in local politics*." – Highlands
>
> "*A changing climate has many implications in our region – affecting our health, infrastructure, water supply, agriculture, ecosystems and species, and marine environments. The global scientific community agrees that the more we reduce our total greenhouse gas (GHG) emissions in the short term, the less intense these climate changes will be over time. The costs of inaction exceed the cost of action…In addition, there are significant co-benefits to climate action, including, improved air quality, healthier active lifestyles, reduced operating costs, and potential local economic opportunities*." – Central Saanich
>
> "[We are motivated by] *public pressure, escalating costs for infrastructure repair/replacement, but mostly having senior government enable us (and fund us) to take action*." – Sunshine Coast regional district
>
> "[We are motivated by] *sea level rise, obvious changes to our weather patterns, specific environmental issues as they arise*." – Strathcona regional district

> *"Climate change is a public and therefore political priority. CRD and Islands Trust emergency declaration is spurring action. Climate change impacts such as forest fires and drought are already being felt here*." – Islands Trust

Hazards and Impacts

Climate change hazards and impacts are already being experienced

Virtually all municipalities and regional districts are already experiencing hazards and impacts related to changing weather patterns caused by climate change. The unique island and coastal geography of the region influences the types of hazards and impacts that are experienced in this area compared to other regions of the province. The distinct challenges related to island and coastal communities were reflected in open-ended comments:

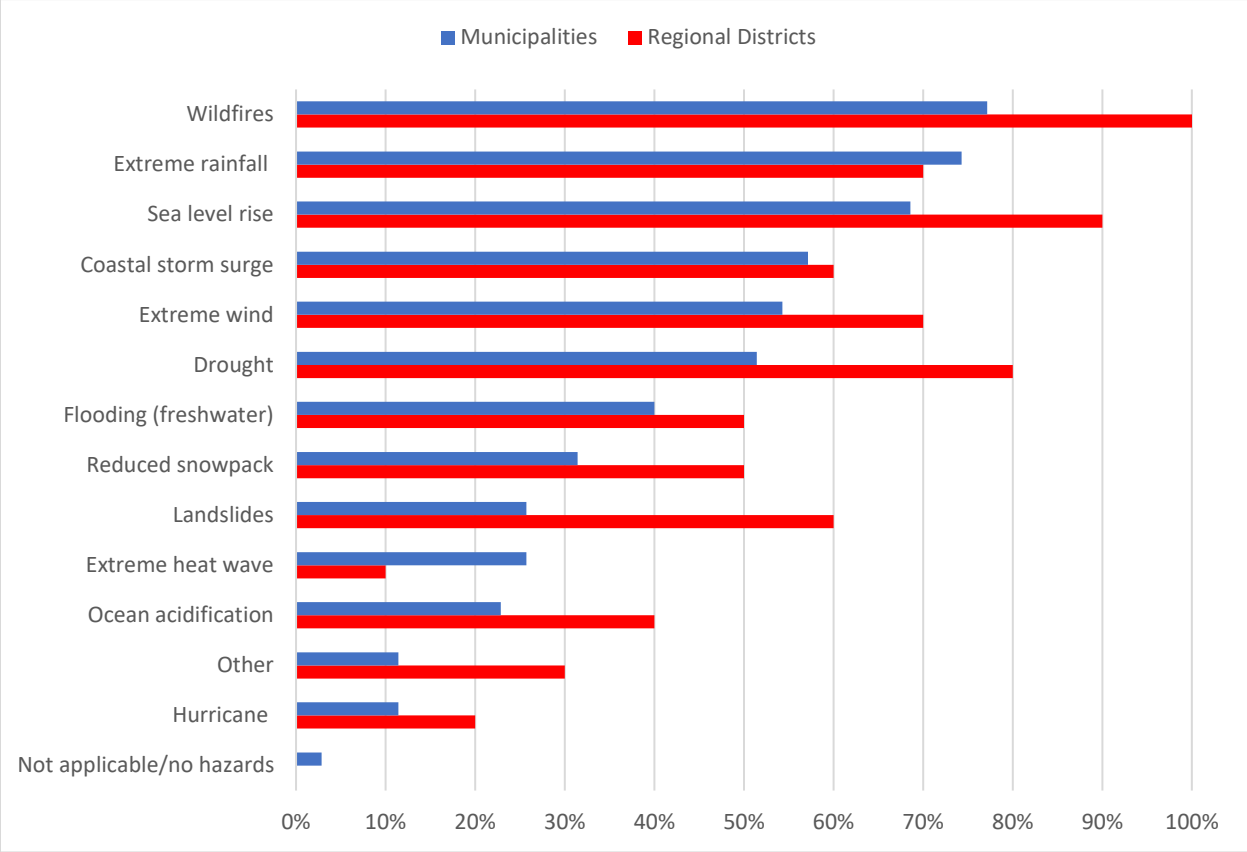
> *"We experience multiple power outages in any given year and often have road/access issues due to wind/rain storms on a yearly basis. We had a wildfire above the town 2 years ago. We live in a deep valley, surrounded by forest, on a flood plane in an earthquake and tsunami zone." –* Zeballos

> "*Saanich is positioned in a climate that is naturally challenging such as being located within a rainshadow and a rare ecosystem. This has caused many streams to dry up during the summer and loss of biodiversity. Climate change is adding to these stressors by further reducing environmental flows, stressing remnant ecosystems, and impacts from poor air quality from wildfires*." – Saanich

> "*Small islands have a more obvious finite land base and natural resources and any climate impacts will have a greater impact to our communities*." – Islands Trust

All except for one municipality indicated that they have experienced hazards related to climate change with wildfires, extreme rainfall, sea level rise, storm surges, extreme winds, and droughts being the key hazards (Figure 34). Municipalities and regional districts identified additional hazards other than those listed in multiple choice responses including tsunamis, earthquakes, heating tank oil spills, air quality, and pandemics. Tsunamis and earthquakes were the most frequently mentioned "other" hazards.

Figure 34. Hazards experienced in municipalities and regional districts



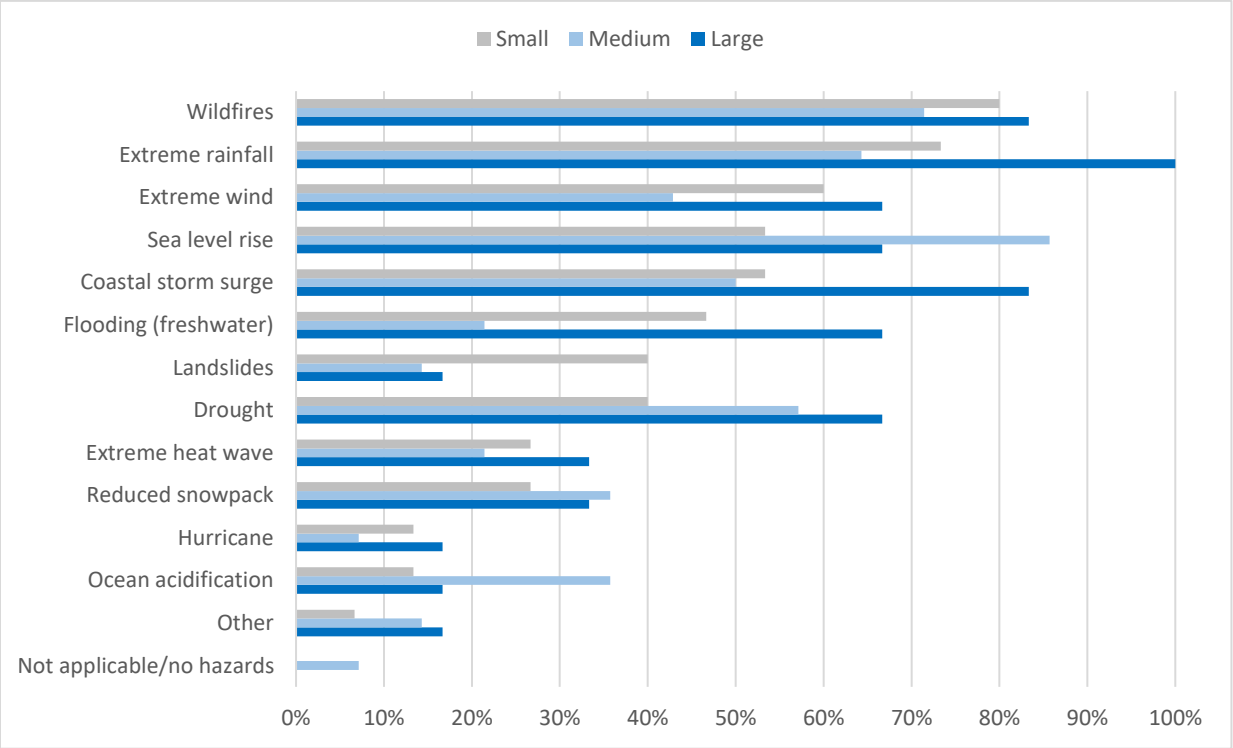
There are some geographic differences in the hazards experienced in different sub-regions, and also commonalities. Wildfire is the top hazard overall for both municipalities and regional districts, and is a top three hazard in all areas (i.e., North Island, Central Island, South Island, and Coast). Extreme rainfall is one of the top three hazards for island municipalities but is not in the top three for coastal municipalities. Sea level rise and drought are top concerns in the Southern region of Vancouver Island and the Coast region but less of a concern in the Central and Northern parts of Vancouver Island. Reduced snowpack was less of an issue in Northern municipalities compared to other areas; conversely, landslides are a top concern in Northern municipalities but not a high concern in other areas.

In the North Island, the top hazards indicated by municipalities included wildfires (89%), extreme rainfall (78%), landslides (78%), storm surges, flooding, and extreme wind (56% each). Central Island top hazards included wildfire (82%), extreme rainfall (73%), reduced snowpack (73%), drought (64%), and sea level rise (64%). In the South Island, top hazards included sea level rise (83%), extreme rainfall (75%), wildfires, extreme wind, and drought (58% each). Finally, in the

Coast sub-region, the top hazards were wildfires, storm surges, sea level rise, and drought (100% each).

Hazards also varied by the size of municipality (Figure 35). The top hazards for small municipalities included wildfires (80%), extreme rainfall (73%), extreme wind (60%), sea level rise (53%), and freshwater flooding (53%). Medium municipalities indicated top hazards such as sea level rise (86%), wildfires (71%), extreme rainfall (64%), drought (57%), and storm surge (50%). The top hazards for large municipalities were extreme rainfall (100%), wildfires (83%), coastal storm surge (83%), sea level rise (67%), drought (67%), extreme wind (67%), and freshwater flooding (67%).

Figure 35. Comparison of hazards by size of municipality



Wildfire and extreme rainfall were top hazards in municipalities of all sizes

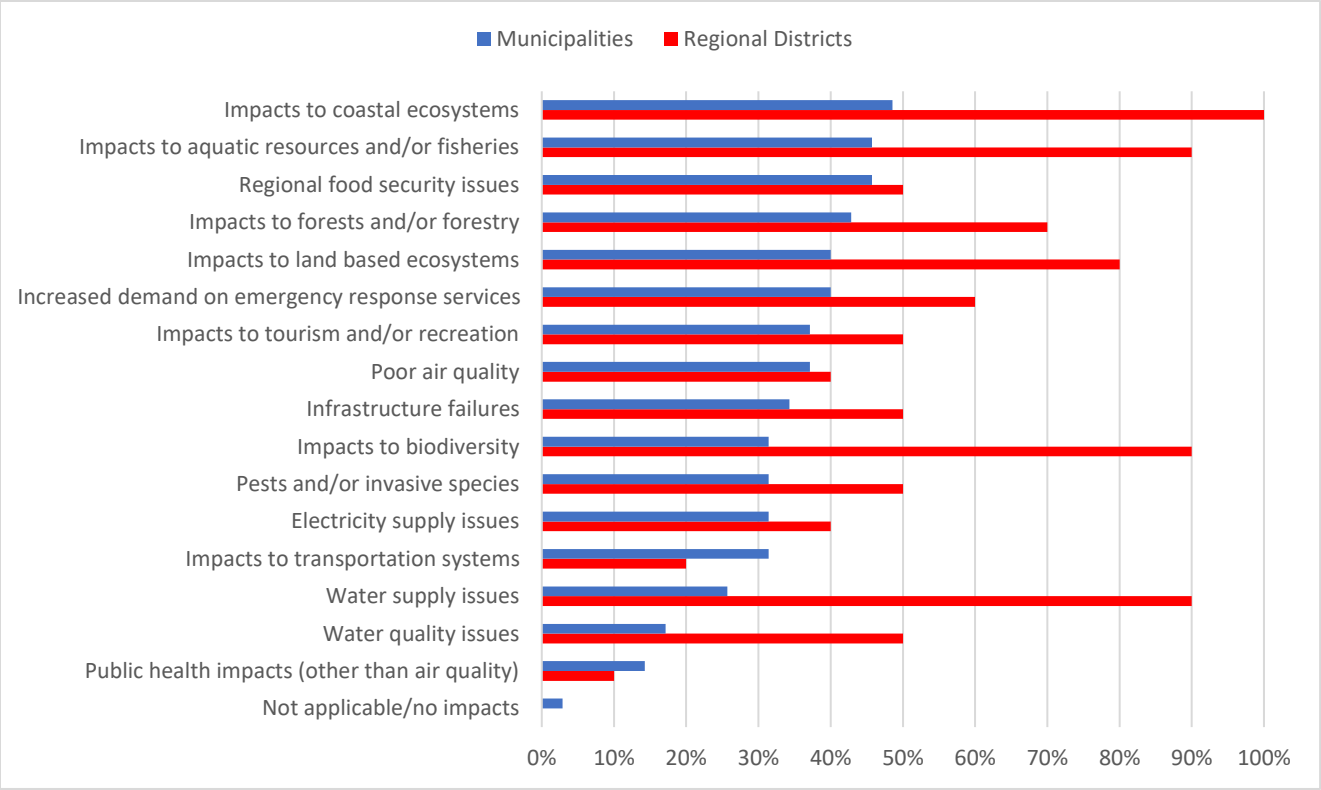
Hazards were identified as more prevalent in large municipalities than small and medium sized municipalities. Although heat waves were not a top hazard overall, they were identified as more of a problem in urban areas, and are a top concern in two out of three of the largest urban municipalities. Landslides stood out as being more a concern for small municipalities as compared to medium and large municipalities, which may relate to the remote nature of many of the smallest municipalities.

In terms of being prepared for most top hazards identified, most municipalities indicated they are fairly well prepared. Although wildfires are the most frequent hazard, almost all municipalities (93%) that identified wildfire as a top hazard are “prepared” or “somewhat prepared” to handle the next event. Sea level rise and ocean acidification are the hazards municipalities feel least prepared to handle (of those who identified sea level rise as a top hazard, only 42% are “prepared/somewhat

prepared"; of those who identified acidification as a top hazard, all have "limited or no preparedness"). Similar to findings on preparedness, most municipalities felt they have either strong capacity or some capacity to handle the next hazard. The hazards that municipalities felt they have the least capacity/resources to handle are sea level rise (63% have some/strong capacity), and ocean acidification (0% capacity).

After identifying hazards, respondents selected top impacts of those hazards. The top impact identified by both municipalities and regional districts was impacts to coastal ecosystems. The most frequently identified impacts for municipalities included impacts to coastal ecosystems (49%), aquatic resources and fisheries (46%), food security (46%), forests and forestry (43%), and land-based ecosystems (40%). The most frequently identified impacts for regional districts included impacts to coastal ecosystems (100%), aquatic resources and fisheries (90%), biodiversity (90%), water supply issues (90%), and land-based ecosystems (80%) (Figure 36).

Figure 36. Climate change impacts experienced in municipalities and regional districts



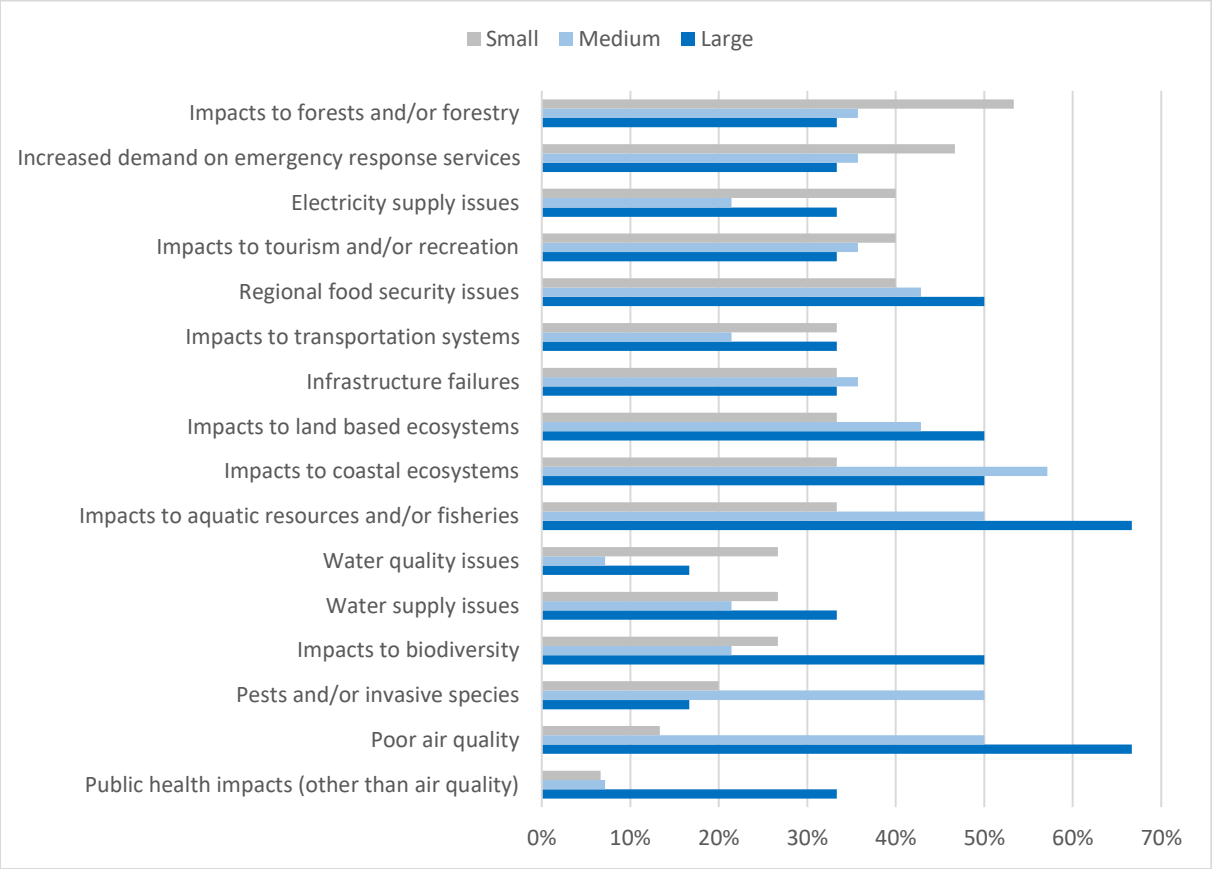
There are distinct regional differences in the impacts experienced

In the North Island, the top impacts indicated by municipalities were to tourism/recreation (67%), forests/forestry (67%), and electricity supply (56%). In this sub-region there were no air quality, public health impacts, or water supply issues identified. Municipalities in the Central Island indicated poor air quality (55%), demand on emergency services (45%), aquatic resources/fisheries (45%), and water supply issues (45%) as top impacts. In the South Island, the top impacts included land-based ecosystems (67%), coastal ecosystems (67%), poor air quality (50%) and aquatic

resources/fisheries (50%). The top impacts in the coastal sub-region included pests/invasive species (100%), food security (100%), land based ecosystems (67%), and coastal ecosystems (67%). No public health impacts or water quality impacts were indicated in the Coast area.

Climate change impacts also varied by municipality size (Figure 37). In small municipalities the top impacts included impacts to forests/forestry (53%), demand on emergency response services (47%), tourism/recreation (40%), food security (40%), and electricity supply (40%). The top impacts in mid-sized municipalities included impacts to coastal ecosystems (57%), poor air quality (50%), pests and/or invasive species (50%), aquatic resources/fisheries (50%), land-based ecosystems (43%), and food security (43%). In large municipalities, the top impacts were poor air quality (67%), impacts to aquatic resources and/or fisheries (67%), impacts to coastal ecosystems (50%), impacts to land based ecosystems (50%), regional food security issues (50%), and impacts to biodiversity (50%).

Figure 37. Comparison of climate change Impacts by size of municipality



Small municipalities were more likely than mid-sized and large municipalities to identify impacts to forestry, emergency response resources, electricity supply, tourism/recreation, and water quality. The impacts that are important to small communities reflect to some extent the closer linkage and dependency on natural resources, especially the importance of forestry. The demand on emergency response services may be a bigger problem for these small municipalities due to their smaller administrative capacity and the remoteness of many small communities.

Medium and large municipalities were more likely to identify impacts to aquatic resources, coastal ecosystems, and land-based ecosystems as a top impact compared to small municipalities. Large municipalities were the most likely to identify impacts to biodiversity compared to smaller municipalities. Air quality and health impacts were the least frequently chosen for small municipalities, but medium and large municipalities are much more affected by poor air quality and other types of public health impacts as compared to small and medium sized municipalities. These differences are even more pronounced when examining only the largest urban municipalities all three of which indicated poor air quality as a top impact, with two out of three indicating other public health impacts.

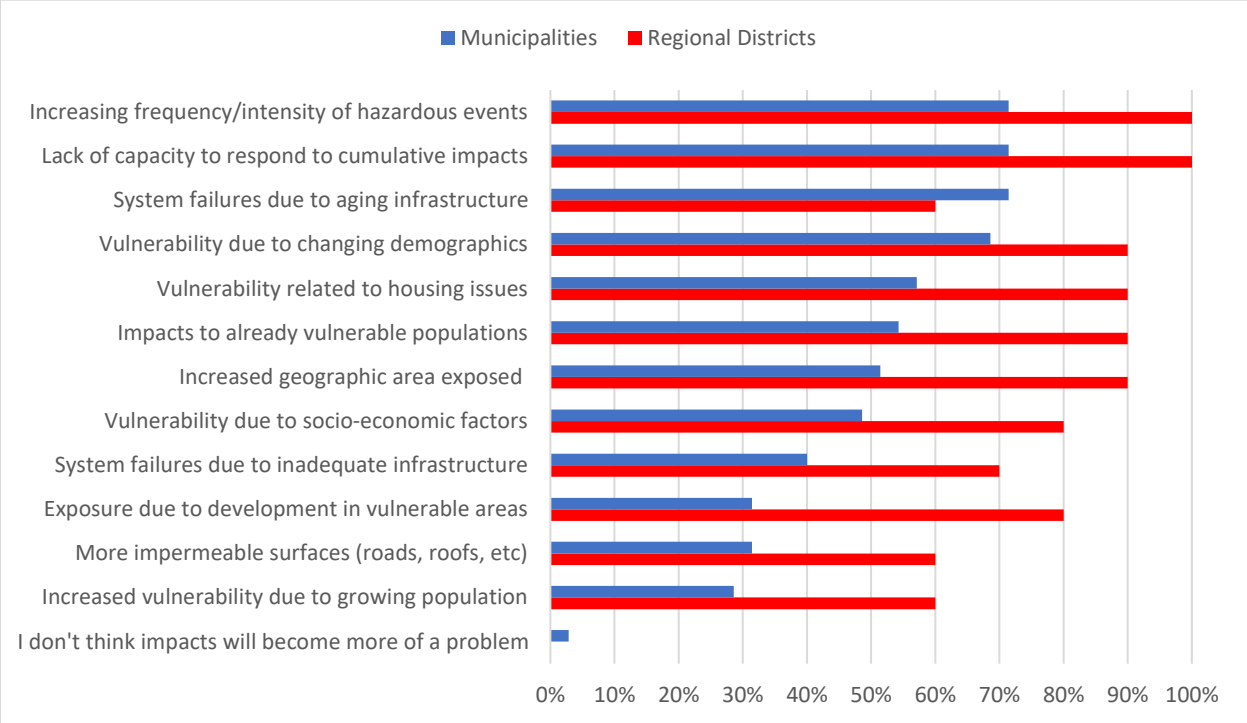
A number of respondents pointed to the interrelated and cumulative nature of hazards and impacts in open-ended comments. Most communities expect these hazards and impacts to increase into the future. The majority of municipalities believe that the climate change related impacts they identified will continue and/or worsen, ranging from 67% for water quality issues to 93% for food security and impacts to land-based ecosystems. The majority of regional districts believe impacts to the community identified in the survey would become more problematic in the future for all impacts except for electricity supply (only 25% that identified this impact believed it would become more of a problem). For all other impacts, the percentage that believe impacts will get worse ranged from 60% to 100%.

Survey respondents were also asked how and why they expected climate impacts to become more of a problem over time (

Figure 38). The most frequent response for both municipalities and regional districts was increased frequency and/or intensity of hazardous events (71% municipalities; 100% regional districts), and lack of capacity to respond to multiple or cumulative events (71% municipalities; 100% regional districts). Municipalities also identified system failures due to aging infrastructure (71%) and changing demographics (69%) as key areas of vulnerability. Regional districts identified changing

demographics, housing issues, vulnerable populations, and increased geographic area exposed to hazards (90% each) as key vulnerabilities.

Figure 38. Reasons for increased vulnerability to climate impacts



Nearly half of municipalities (46%) believe their community will experience new impacts in the future, and another 51% think they might experience new impacts. Most regional districts (80%) believe they will experience new impacts which have not affected them in the past. Some of the future impacts described by respondents include: flooding, sea level rise, increased pests and invasive species, impacts to food security including local agriculture and food supply chains, more

frequent extreme weather events, more frequent droughts and wildfires, impacts to water resources including drinking water scarcity, increased human disease, impacts to forests including specific tree species such as cedars, damage to ecosystems, loss of biodiversity, impacts on salmon streams, migration of climate refugees, and loss of Indigenous food and medicines. The quotes below from respondents speak to the anticipated future impacts of climate change and their cumulative effects:

> *"The way climate impacts combine or accumulate means there are many impacts we can't anticipate but will likely deal with…As our landscapes change and we lose biodiversity, we can't predict the cascading impacts that will have on other living systems. Climate migrants and local food shortages are potential impacts we could deal with in the future. Climate change may impact trends in tourism, interface fire risks, etc"* – Victoria

> *"Sea level rise has not affected us to date, but this is changing. Likelihood of pests/invasive species appearing not previously seen. Wildfire and air quality, invasive plants and animals including noxious pests, human disease, climate refuges, ecosystem collapse, food insecurity, social breakdown."* – Campbell River

> *"Electricity supply issues have not occurred yet, but may become an issue with sea level rise and storm surge for our buried lines throughout the town at sea level, or high winds*." – Sidney

> *"While water quality and quantity don't seem to be an issue yet…our study indicates that ground water resources are expected to be affected by climate change."* – Highlands

> *"Once very rare emergency events (extreme weather, storm surges, drought, floods, wildfires) are now becoming regular although still manageable events."* – Mount Waddington regional district

> *"Many of the likely impacts have not been functionally realized on the islands but it is inevitable that they will including wildfires, loss of bio-diversity, sea level rise and increase in storms."* – Islands Trust

> *"Cumulative/compounding impacts will become increasingly challenging to address."* – Capital regional district

Climate Change Mitigation

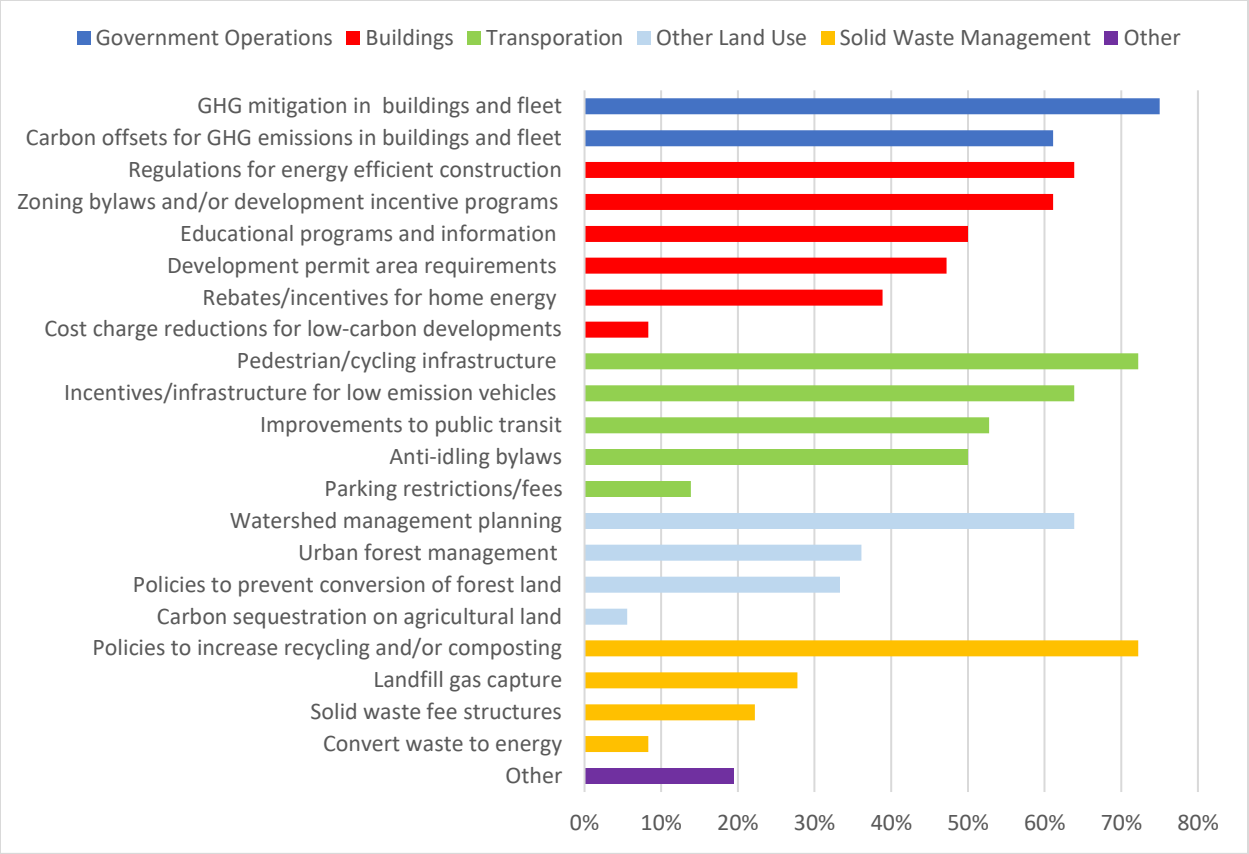
This is a high level for support for climate mitigation policies and practices

Municipalities and regional districts overall are highly supportive of taking action to mitigate climate change, and almost all have mitigation policies in place. Some of the most frequently mentioned priorities for climate change mitigation include land use planning, green infrastructure, public transit, pedestrian and cycling infrastructure, building standards including civic buildings, fleet management, tree and forest conservation, and general community emissions reductions.

Municipalities and regional districts have implemented mitigation policies across a range of sectors, including government operations, buildings, transportation, land use, and solid waste management. Policies exist in almost all municipalities (Figure 39); only two indicated they have no mitigation policies currently in place. Most policies are investment-like policies, followed by

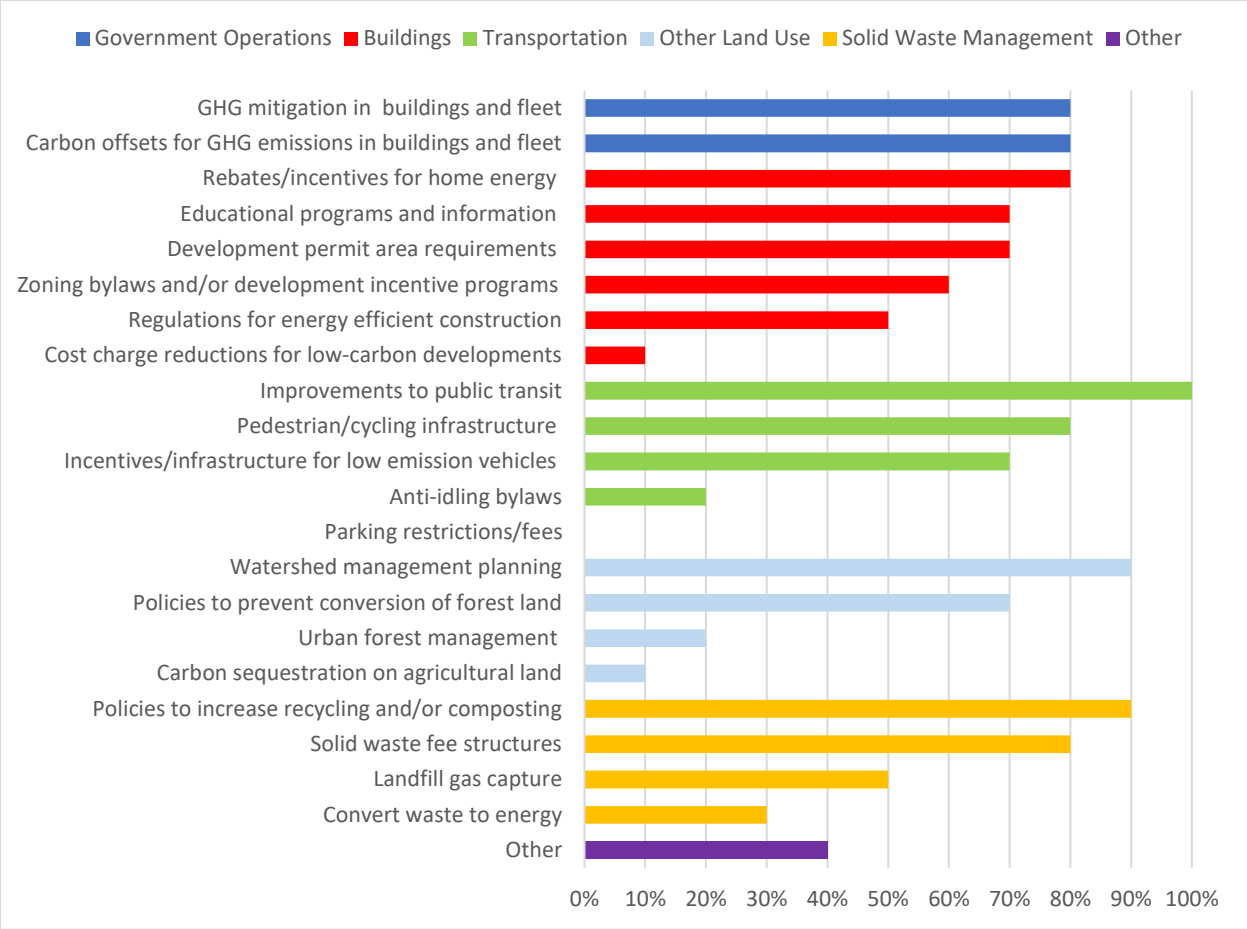
regulations and incentives. The most frequently selected policy options included GHG mitigation in buildings and fleet (75%), pedestrian/cycling infrastructure (75%), and policies to increase recycling and/or composting (72%). Respondents were given the choice to indicate other policies not included in the list of options. They identified policies such as asset management, flood/sea level rise impact and mitigation studies, use of bio-diesel or renewable natural gas, investments in urban forest/tree planting, public education and corporate catering related to lower impact food choices, and environment committees.

Figure 39. Municipal mitigation policies by sector



Climate change mitigation policies exist in all regional districts, across all sectors (Figure 40). Regional districts tend to have a higher number of mitigation policies in place compared to municipalities (average of 13 versus 9 for municipalities). The most frequently implemented policies in regional districts included improvements to public transit (100%), watershed management planning (90%), and policies to increase recycling and/or composting (90%). Differences in jurisdiction explain some of the differences in policies between regional districts as compared to municipalities; for example, regional districts tend to have more policies in the area of solid waste management. "Other" policies indicated by regional districts included water conservation measures, heat recovery, biosolids/woodwaste composting, integration of mitigation into plans including OCP and regional growth strategies, urban containment boundaries, emission reduction targets, and protection of Douglas fir.

Figure 40. Regional districts' mitigation policies by sector

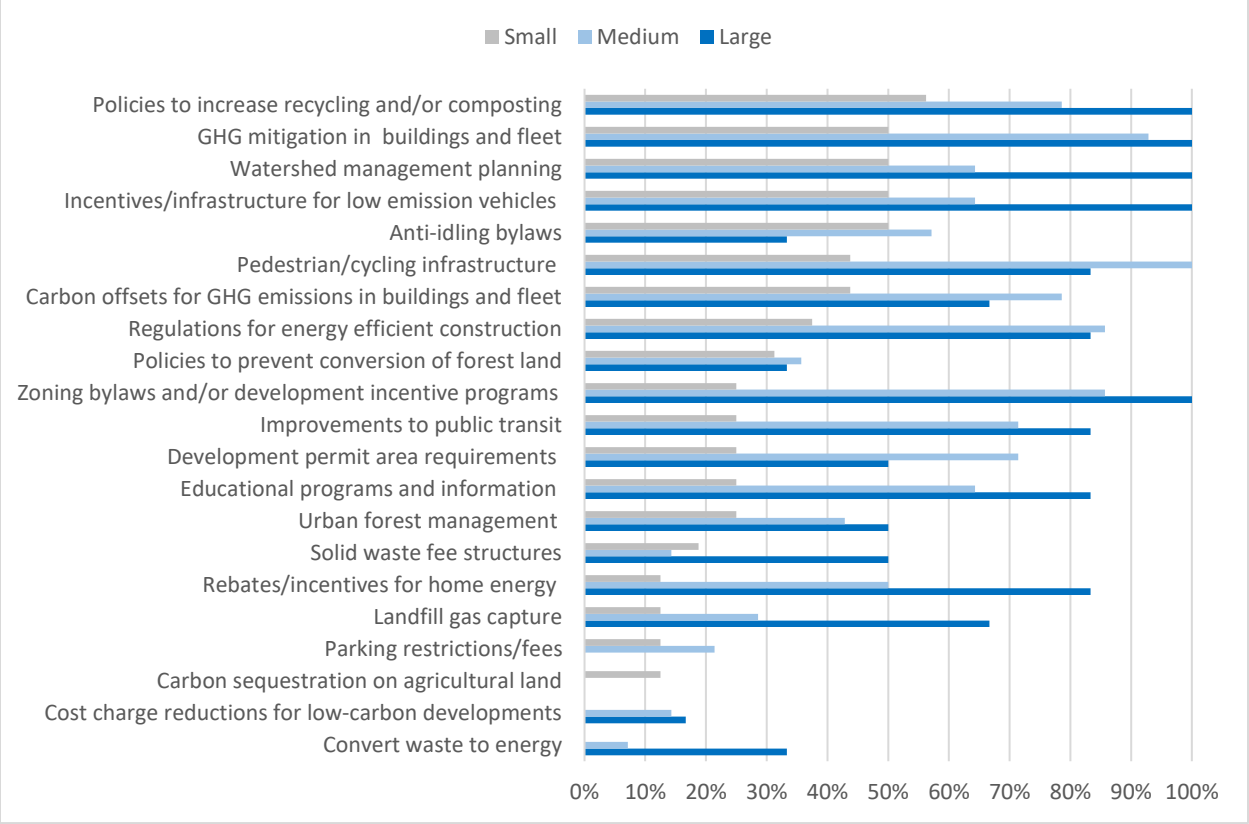


Municipalities in the North Island sub-region tend to have the fewest climate change mitigation policies in place, with an average of 5 policies per municipality. The average is even lower when controlling for municipality size, with an average of only 3 policies per small municipality. Interestingly, the sole large municipality in the northern area, Campbell River, had the highest number of policies of any municipality with 18 policies. The most frequent policies in northern municipalities included recycling/composting, watershed management, and GHG mitigation in civic buildings and fleet (44% each). In the Central Island, municipalities had an average of 10 mitigation policies each. The most frequent policies included recycling/composting and GHG mitigation in buildings and fleet (83% each), followed by watershed management, pedestrian/cycling infrastructure, incentives/infrastructure for low emissions vehicles (LEVs), zoning bylaws/development incentives, and carbon offsets (75% each). In the South Island, there was an average of 12 policies per municipality. The top policies included regulations for energy efficient new construction (100%), pedestrian/cycling infrastructure (92%), educational programs/information (83%), GHG mitigation in civic buildings and fleet (83%), recycling/composting (75%), incentives/infrastructure for LEVs (75%), and zoning bylaws/development incentives (75%). The Coast also had an average of 12 policies per municipality. The most frequent policies implemented in coastal municipalities include recycling/composting, pedestrian/cycling infrastructure, zoning bylaws/development incentives, development permit area requirements, GHG mitigation in buildings and fleet, and carbon offsets (100% each).

The total number of mitigation policies implemented corresponds roughly to municipality size, with small municipalities having an average of six policies, mid-sized municipalities having an average of 11 policies, and large municipalities an average of 13 policies. The smallest, remote municipalities in the north have the fewest policies (only three policies per small northern municipality on average), while the three largest urban municipalities average 15 policies each.

Climate change mitigation policies vary by municipality size (Figure 41). In small municipalities, the most frequently implemented policies included recycling/composting (56%), GHG mitigation in buildings and fleet (50%), watershed management planning (50%), incentives/infrastructure for LEVs (50%), and anti-idling bylaws (50%). In mid-sized municipalities, the top policies included pedestrian/cycling infrastructure (100%), GHG mitigation in buildings and fleet (93%), zoning bylaws and/or development incentive programs (86%), and regulations for energy efficient construction (86%). In large municipalities, the most frequent policies included recycling/composting, GHG mitigation in buildings and fleet, watershed management planning, incentives/infrastructure for LEVs, and zoning bylaws/development incentive programs (100% each).

Figure 41. Mitigation policies by municipality size



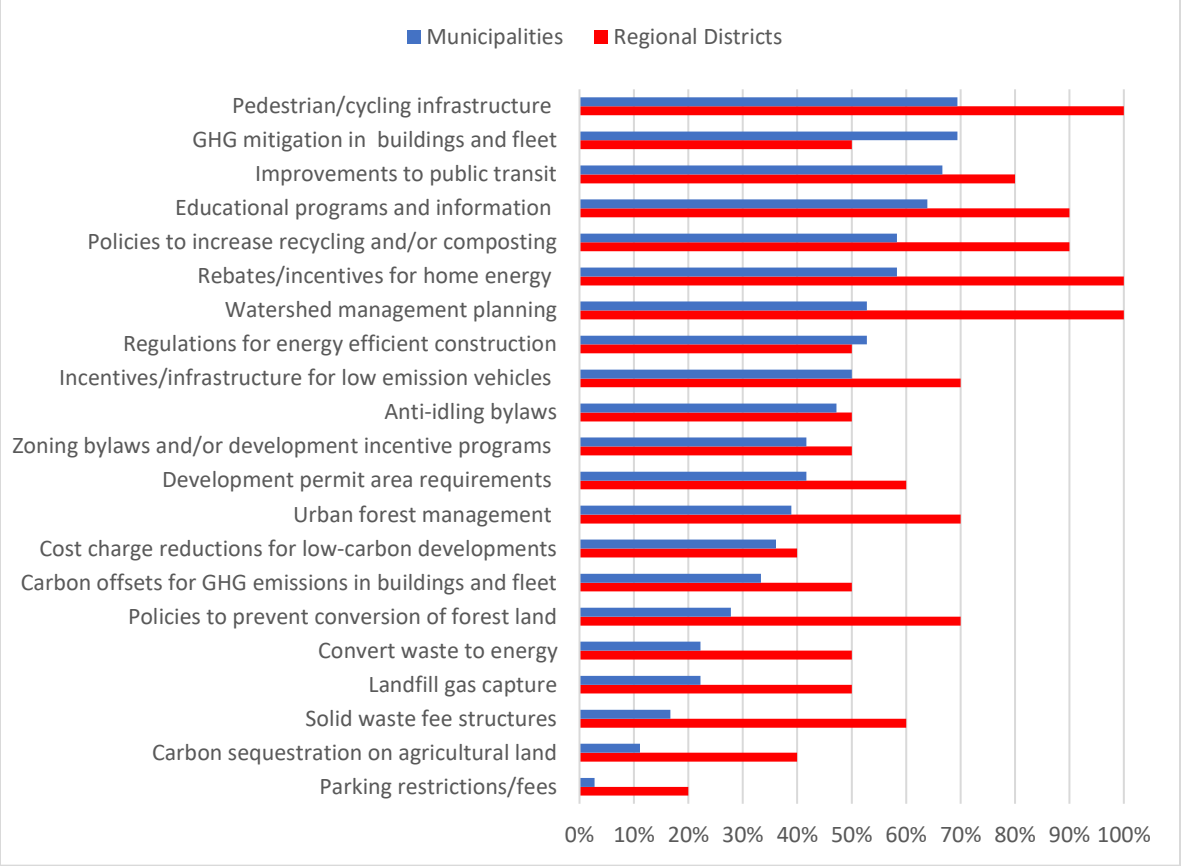
Pedestrian and cycling infrastructure have the highest support

When asked about community support for different policy types, respondents indicated the highest level of support for investments in pedestrian and cycling infrastructure (69%), GHG mitigation in civic buildings & fleet (69%), and improvements to public transit (67%) (Figure 42). In regional

districts, the policies with the highest support included pedestrian & cycling infrastructure, rebates/incentives for home energy upgrades, and watershed management planning (100% each). Government investment and incentives, as well as voluntary actions tend to receive higher support than regulations and pricing. Although most municipalities and regional districts indicated support for climate action, one respondent noted concerns about costs of climate change mitigation:

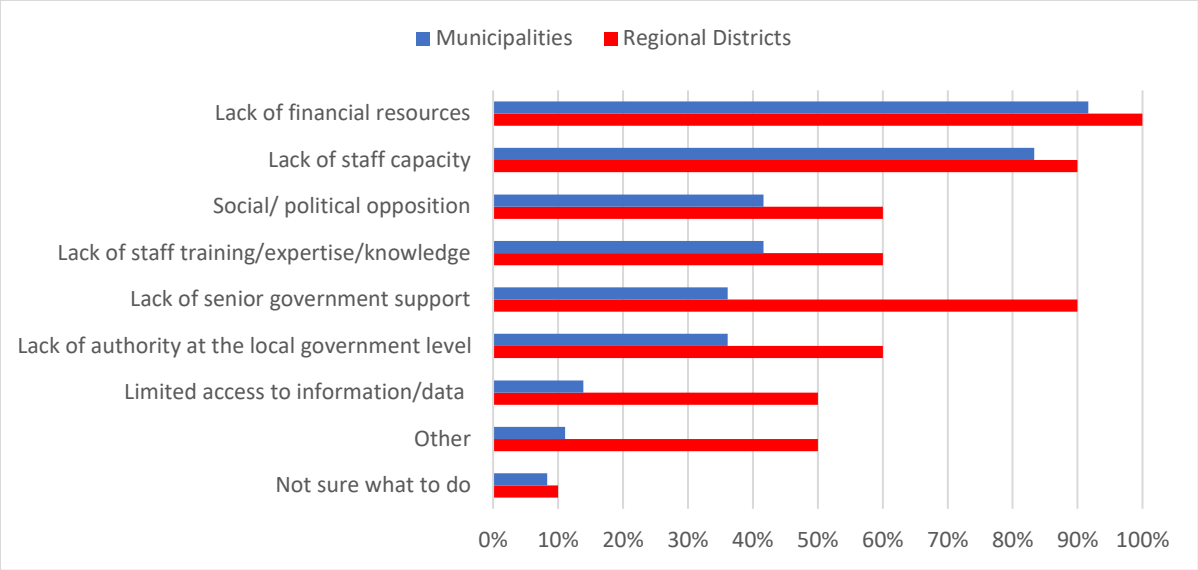
> *"Support is sometimes a hard sell, even if it is cost effective because there is a general belief that climate policies have higher costs than need be."* – Mount Waddington

Figure 42. Support for mitigation policies



Despite high support for climate action, local governments face a number of barriers to climate action. In both municipalities and regional districts, lack of financial resources (92% of municipalities, 100% of regional districts) and lack of staff capacity (83% of municipalities, 100% of regional districts) are the top barriers (Figure 43).

Figure 43. Climate change mitigation barriers



Dedicated staff to work on climate issues is uncommon

In terms of capacity, the majority of municipalities and regional districts do not have dedicated staff working on climate issues. Only 32% of municipalities and 40% of regional districts indicated that they have dedicated climate staff. Although the majority of municipalities do not have dedicated climate staff, four small municipalities do: Tofino, Ucluelet, Highlands, and Sechelt Indian Government District. Larger municipalities are more likely to have climate staff, with the four largest municipalities indicating that they have dedicated staff. Regional districts with climate staff indicated they have between 1 to 4 staff.

Multiple respondents commented that although they may or may not have staff that work solely on climate change, many staff work part time on climate change issues as it relates to their mandates and climate change is integrated throughout several departments. Most municipalities (79%) and all regional districts do employ planners, with large municipalities tending to have the highest number of planners (Saanich and Victoria lead with 18 and 20 planners respectively). The municipalities with no planners are all small municipalities located in the northern part of Vancouver Island. Regional districts have an average of 6 planners, ranging from 1-2 to 15 in Islands Trust.

As well as funding and capacity issues, small municipalities face additional barriers including lack of expertise and limited data. Small and mid-sized municipalities were more likely to choose these options, with lack of staff training, expertise, and knowledge being the third largest barrier among small municipalities (63%). By contrast, no large municipalities chose lack of expertise/training or limited access to information as barriers.

Regional districts also tend to face additional barriers as compared to municipalities, struggling with limited authority and feeling a stronger lack of senior government support. Nearly all (90%) regional districts selected lack of senior government support, while only 36% of municipalities face this barrier. Several regional districts cited the limited authority of regional districts in the survey comments, for example:

> *"Regional districts have very limited authority, and rural areas have limited access to many resources, such as energy audits. It is also difficult to implement solutions like transit in low density dispersed communities."* – Sunshine Coast

As illustrated by the quote above, rural and remote communities face additional challenges, as many typical mitigation policies focus on urban based solutions and may not apply in less densely developed areas. Although limited regulatory authority was indicated more frequently by regional districts, municipalities also face this barrier, for example:

> *"Reducing emissions from existing building stock is one of the most difficult areas for local governments to target due to the limited regulatory authority and the large amount of existing building stock. There is a critical need for tools such as property-assessed clean energy (PACE) financing in BC to enable local governments to address the challenge of lowering greenhouse gas emissions from existing buildings."* – Central Saanich

The COVID-19 crisis has added to the challenges faced by local governments. Open-ended responses from survey respondents indicated that staff capacity and funding issues are magnified, there is less ability for public engagement, communities are experiencing decreased transit ridership, civic projects have been delayed, and financial challenges may delay residential building retrofits. When asked about how COVID-19 has affected climate change mitigation and adaptation efforts, some of the comments included the following:

> *"It will change the way we engage with the public, funding for climate action might become more scarce if funding is needed to respond to COVID, Public support for climate change measures might be more challenged than usual if they perceive the funds better spent elsewhere."* – Victoria

> *"It has already delayed progress and the financial uncertainty has hindered the potential to allocate funds on these activities. Ability to take action has been delayed. rules around community meetings make it harder to interact with citizens."* – North Saanich

Climate Change Adaptation

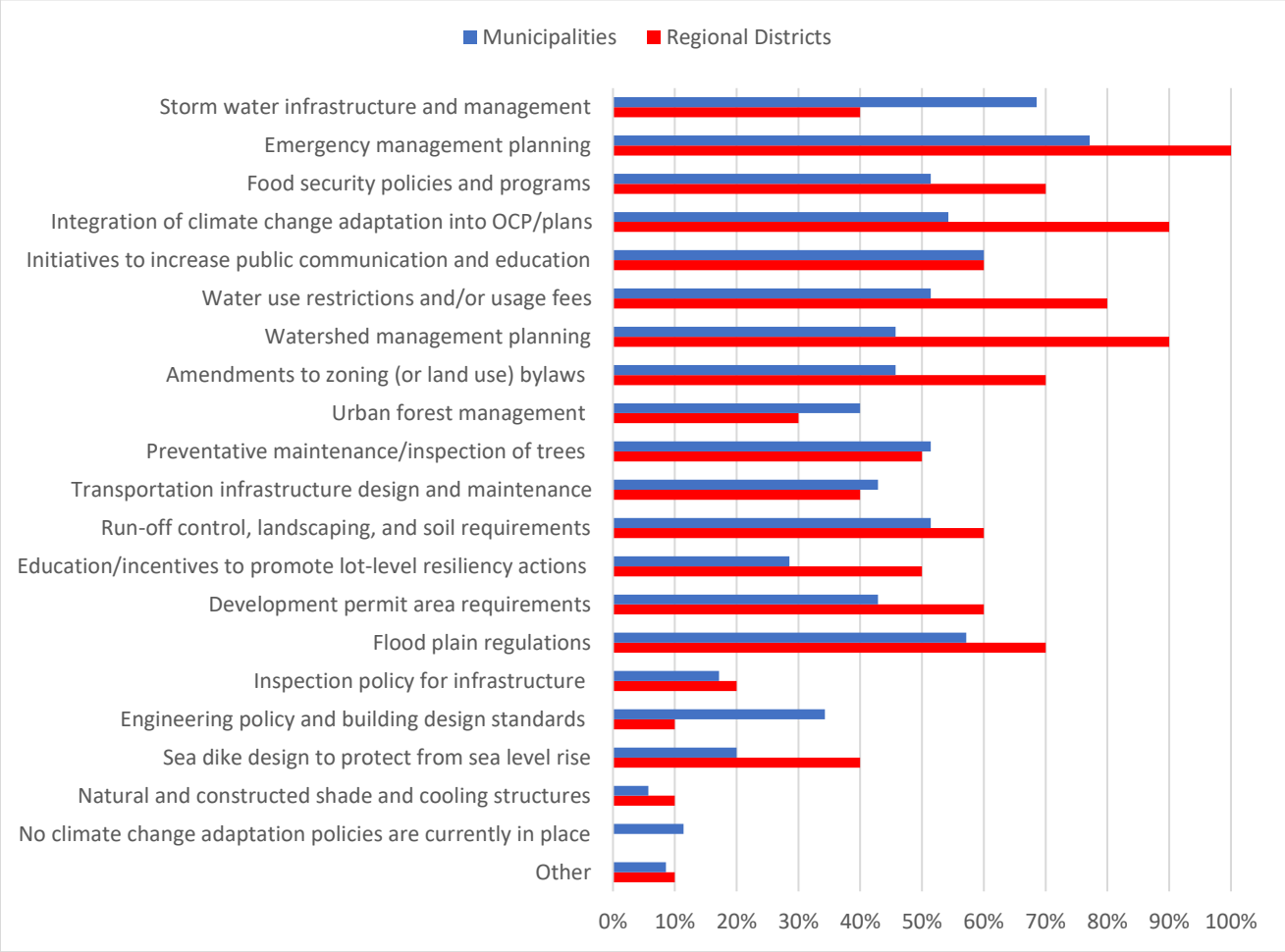
There is a high level of support for climate adaptation policies

Similar to mitigation, municipalities and regional districts are overall highly supportive of taking action to help their communities adapt to climate change, and almost all have adaptation policies in place. Some of the top priorities for climate change adaptation mentioned in open-ended comments included emergency management planning, land use planning, infrastructure upgrades, green infrastructure, forest management and conservation, watershed management, asset management, water conservation, urban forests, food security and local food production, civic building standards, air quality, and planning for sea level rise.

All regional districts and all but three municipalities have adaptation policies. Emergency management planning is the most frequently implemented adaptation policy in municipalities (77%) and regional districts (100%) (Figure 44). Other policy areas prioritized by municipalities include storm water management (69%), public communication (60%), and flood plain regulations (57%). In regional districts, other top policies include watershed management planning (90%),

integration of adaptation in OCPs (90%), and water use restrictions (80%). Respondents also indicated "other" adaptation policies outside of those listed, including sea level rise interventions other than sea dikes, natural asset management strategy, groundwater protection, revegetation for dying trees, and declaration of climate crisis. Two respondents commented that some of the adaptation policy actions they have implemented had been originally undertaken for other reasons and not specifically to address climate change. Respondents also noted that some adaptation policies are under development but not yet implemented.

Figure 44. Adaptation policies currently implemented in municipalities and regional districts



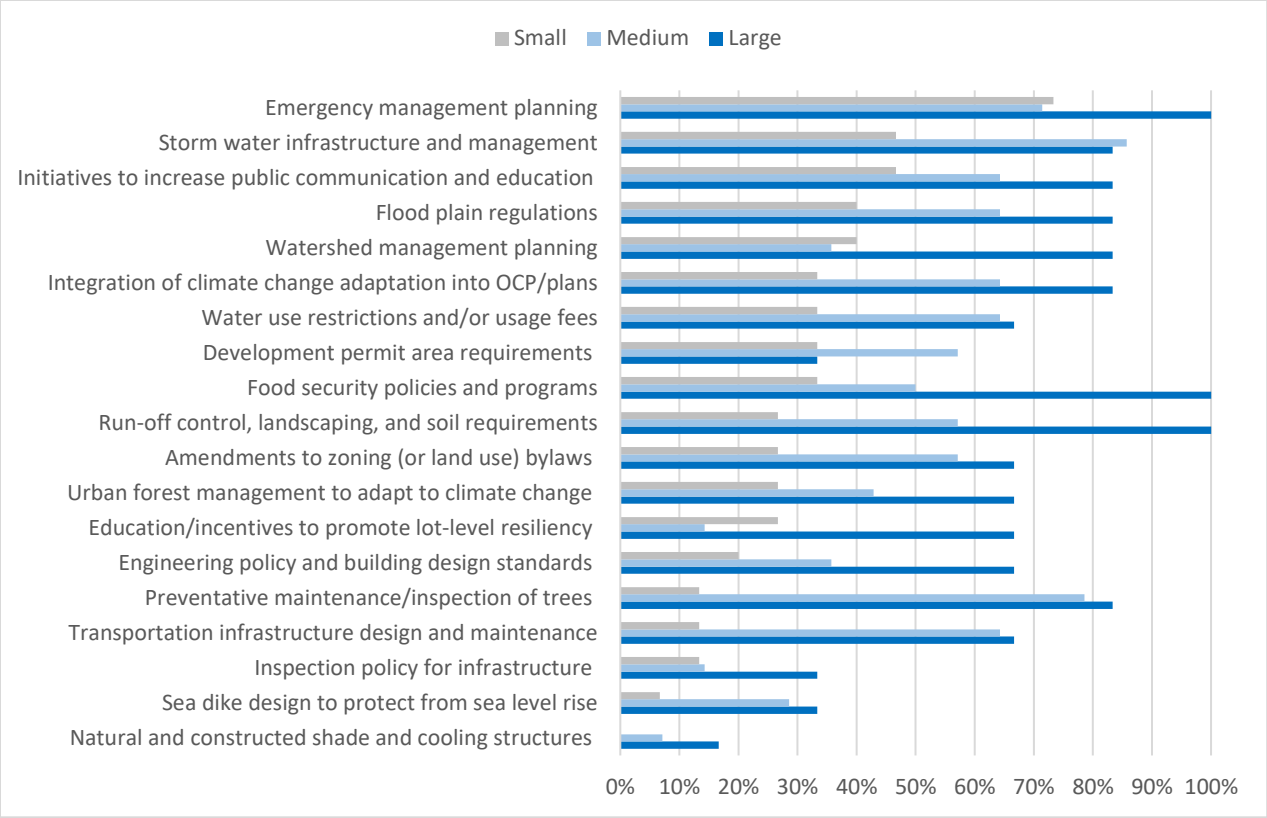
There are geographic differences in the types and average number of adaptation policies. Municipalities in the North Island tended to have the fewest policies, with an average of 5 each, although Campbell River, the sole large municipality in this sub-region, had among the highest number of policies of any municipality. The most frequently implemented policies in the North Island included emergency management planning (78%), storm water management (56%), and watershed management planning (44%). In the Central Island, there was an average of 9 policies per municipality. The most frequent policies included water use restrictions (73%), flood plain regulations (73%), food security programs (64%), emergency management planning (64%), and integration of policies into OCP (64%). Municipalities in the South Island had an average of 11 policies each. The most frequently implemented policies in this sub-region included public

communication (92%), emergency management planning (83%), stormwater management (83%), and preventative maintenance and inspection of trees (83%). Finally, municipalities in the Coast sub-region had the highest average number of adaptation policies, with 12 per municipality. Top policies in this area included emergency management planning, stormwater management, transportation infrastructure, urban forest management, and integration of policies into OCP (100% each).

The average number of policies also varies with municipality size. As with mitigation, medium and large municipalities tend to have more adaptation policies in place compared with smaller municipalities. Small municipalities averaged 6 adaptation policies each, mid-sized municipalities averaged 10 each, and large municipalities averaged 13 each. There was less of a difference apparent between the largest urban municipalities and other large municipalities as the average number of adaptation policies for these three municipalities was the same as the overall large municipality average, unlike the case with mitigation policies where the three largest urban municipalities had a higher average number of policies. Campbell River and Gibsons had the highest number of policies at 18 each. The three municipalities that indicated they had no adaptation policies were all small municipalities, located in either the North or Central Island areas.

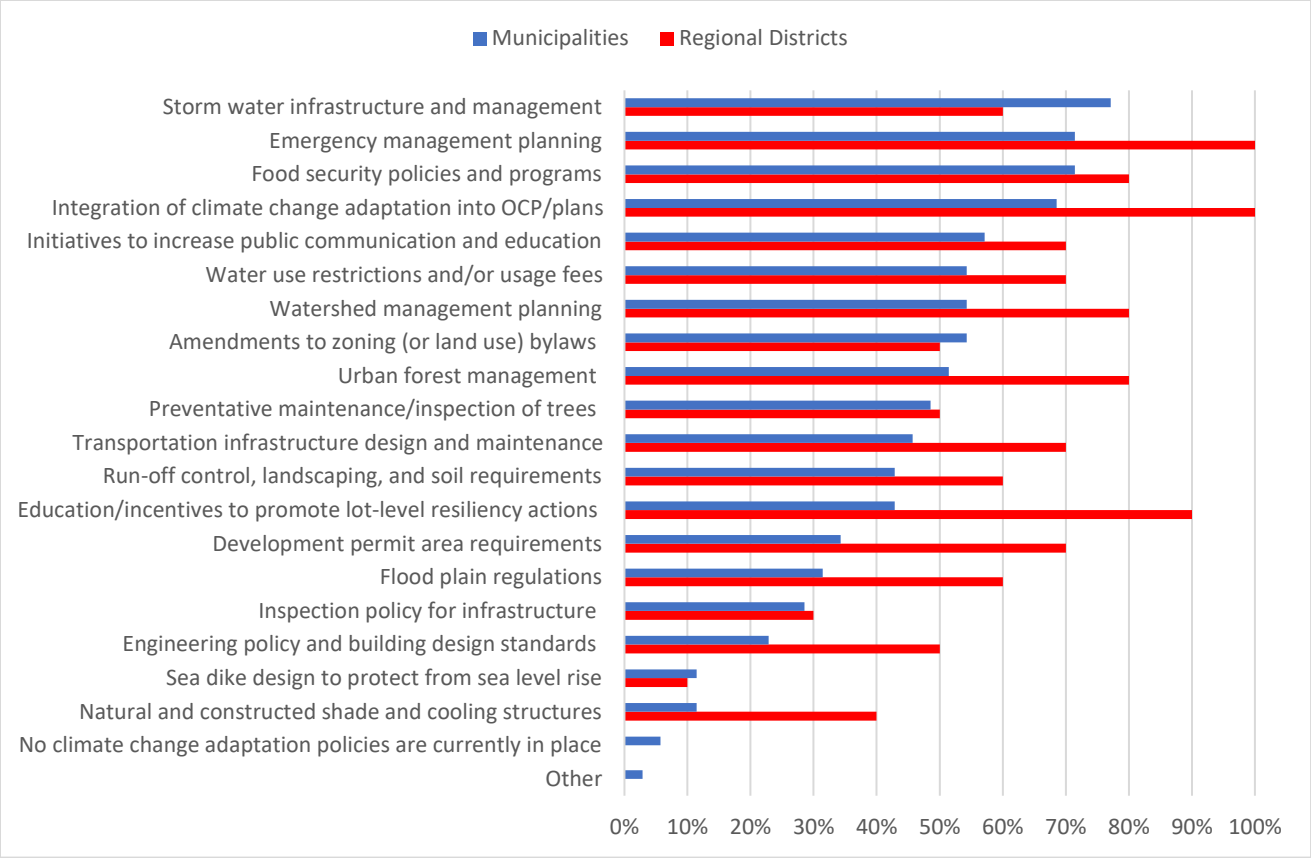
There are some differences in the types of policies most frequently implemented among different sized municipalities (Figure 45). In small municipalities, the most frequent adaptation policies included emergency management planning (73%), storm water management (43%), and public communication (43%). In mid-sized municipalities, the most frequent policies included storm water management (86%), preventative maintenance and inspection of trees (79%), and emergency management planning (71%). In large municipalities, the top policies included emergency management planning; run-off control, landscaping, and soil removal and deposit requirements; and food security programs (100% each).

Figure 45. Adaptation policies by municipality size



Support for adaptation policies varies (Figure 46). In municipalities, the most supported policies included storm water management (77%), emergency management planning (71%), and food security programs (71%). In regional districts, the policies with the most support included emergency management planning (100%), integration of adaptation into OCP/plans (100%), and lot level resiliency (90%). One respondent noted that it is very difficult to gauge community support for the various policy options. Also, it was noted that in the case of regional districts, support can vary widely between communities.

Figure 46. Support for adaptation policies

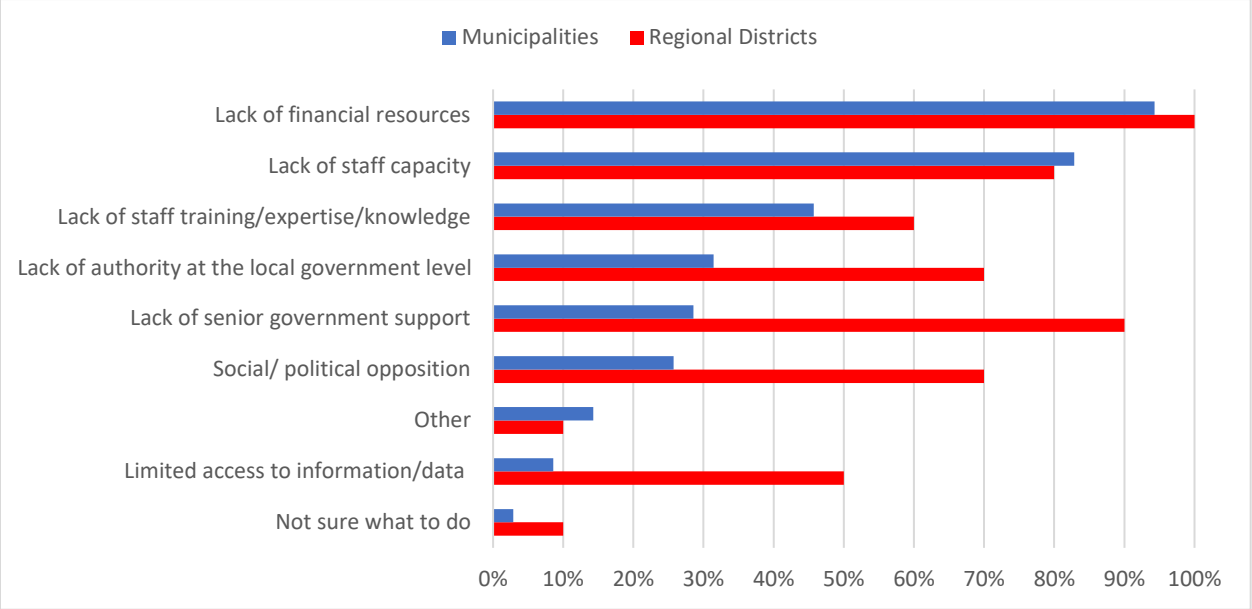


Lack of financial resources are the top barrier

Despite high levels of support for climate change adaptation, local governments face a number of barriers to action, with lack of financial resources indicated as the top barrier for both municipalities (94%) and regional districts (100%) (Figure 47). As described by one respondent:

"Policy implementation is not an issue. Lack of financial resources is." – Campbell River

Figure 47. Climate change adaptation barriers



A lack of staff capacity is a major challenge

The second major barrier for municipalities is lack of staff capacity (83%). Regional districts tend to face more barriers to adaptation compared to municipalities, with lack of senior government support (90%), lack of staff capacity (80%), lack of authority (70%), and political/social opposition (70%) as other key barriers. As discussed in the previous section on mitigation, in terms of capacity most municipalities and regional districts do not have dedicated climate staff, though the majority do have planners. Staff responsible for implementing policies related to adaptation may be spread through various departments, as adaptation measures can be broad and can vary considerably depending on the needs of each individual community. Respondents commented that climate change work is integrated throughout departments as it relates to their mandates. One respondent summed up the challenges related to lack of capacity:

> *"Our staff is at capacity with existing work. We need more staff to manage new projects such as climate adaptation planning or even to finish the work on the list now."* - Cumberland

Smaller communities face additional challenges. Lack of staff training, expertise, and knowledge was the third largest barrier to adaptation for municipalities overall (46%), but similar to mitigation, lack of staff expertise was much more of an issue for smaller municipalities, with no large municipalities indicating this barrier. Regional districts also struggle with lack of staff expertise (60%), along with limited access to information/data (50%). The following quotes from respondents speak to some of the challenges faced when it comes to climate change adaptation:

> *"Generally there is a greater understanding of climate mitigation combined with better data collection, indicator sets, globally consistent methodologies and well researched strategies. This is lacking when it comes to climate adaptation."* – Saanich

> *"Adaptation [is] not framed as a political priority from senior governments. No authority for systematic implementation of a regional approach to land use, transportation or infrastructure planning."* – Capital Regional District

> *"There is limited regulatory authority for the local government to do anything but encourage adaptation practices within the community. Climate adaptation actions may be specific to each neighbourhood or area of the District and require a more tailored approach than mitigation actions, which are easier to communicate."* – Central Saanich

> *"Green space protection faces political opposition by landowners, developers. Groundwater and multi-family rainwater catchment for potable purposes face regulatory barriers and complications. Very limited local financial capacity a barrier to new firehall and water/sewage treatment infrastructure. Greater senior government regulatory and financial support for climate adaptation initiatives needed."* – Islands Trust

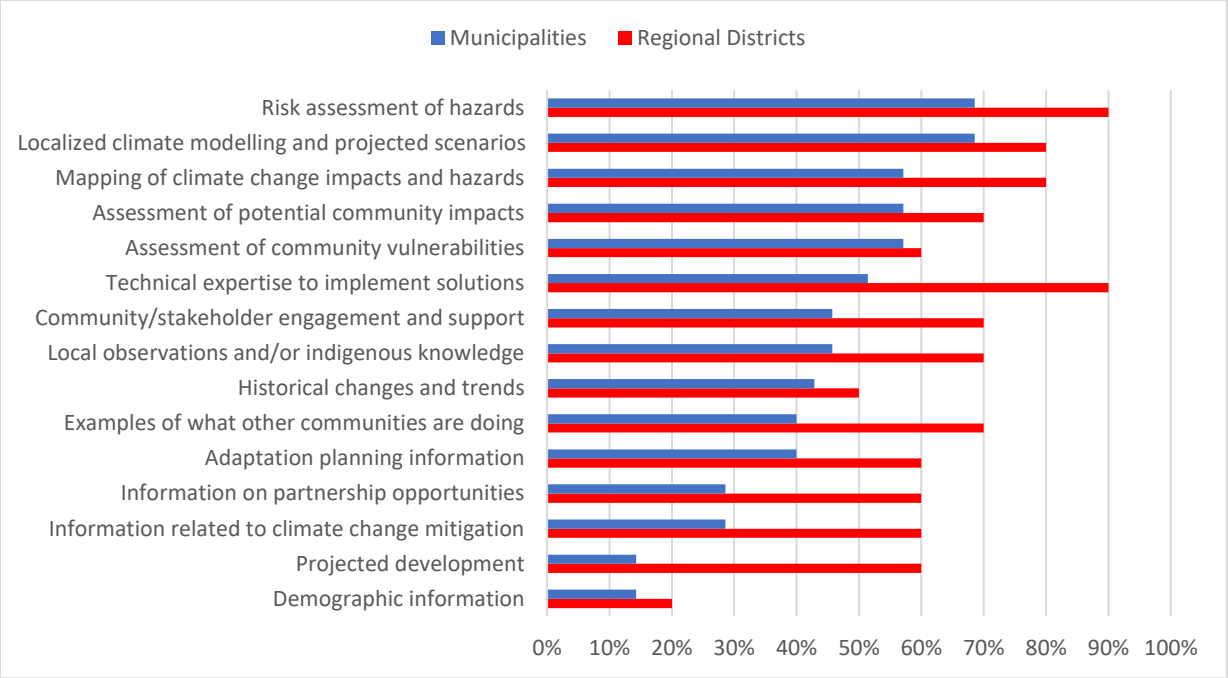
> *"Electoral areas cannot implement tree by laws but they are becoming increasingly important [with regard to] protecting water supply."* – Cowichan Valley

The quotes above illustrate that while the major barriers to action on climate change adaptation are similar to the barriers to mitigation, there are specific challenges when it comes to adaptation, in part related to less overall understanding and data, challenges communicating the issues, opposition, and limited regulatory authority. As discussed with respect to climate change mitigation, the COVID-19 crisis has magnified the challenges faced by local governments in many arenas, including climate action. In terms of adaptation, COVID-19 may result in further reduced staffing capacity, funding challenges, and project delays.

What Information is Needed to Act?

Survey respondents listed the top five types of information needed to plan for the future with respects to the impacts and issues identified in the survey (Figure 16). Municipalities identified localized climate modelling and projected scenarios (69%), risk assessment of hazards (69%), assessment of potential community impacts (57%), assessment of community vulnerabilities (57%), and mapping of climate change impacts and hazards (57%) as the most important information needed.

Figure 48. Information needed to plan for the future



Regional districts tended to identify more information needs than municipalities. The types of information identified by regional districts included risk assessment of hazards (90%), technical expertise (90%), localized climate modelling and projected scenarios (80%), mapping of climate change impacts and hazards (80%), local observations and/or indigenous knowledge (70%), assessment of potential community impacts (70%), community engagement (70%), and examples of what other communities are doing (70%).

Opportunities for Climate Action

Green growth, clean energy, new jobs, rural vitality

Although responding to climate change is a huge challenge and local governments face a number of barriers to climate action, the climate crisis also presents opportunities for the future. Almost half (49%) of municipalities see new opportunities for their community as the climate changes; another 17% answered "maybe." Among regional districts, 70% anticipate new opportunities and 30% answered "maybe". Some examples of opportunities mentioned by respondents include building a circular economy, green jobs, benefits to agriculture including an extended growing season, tourism, new economic sectors such as the low emissions building sector, work from home/telecommuting opportunities, and increased migration to small communities, such as those in the VICC region. Some of the open-ended comments from respondents on future opportunities included the following:

> *"Green growth - We are seeing a lot of re-development on our coastline and there is an opportunity to build back better."* – Comox Valley Regional District

"*Economic development shaped around climate action and the opportunity to attract new investment, businesses and jobs to our community."* – Esquimalt

"New jobs in dealing with water conservation/green building/tourism." - Sechelt

"New jobs and new economic sectors. An example is the low emissions building sector, where jobs in energy advising and with low emissions technologies such as heat pumps have emerged in recent years." – Central Saanich

"We should be able to grow a wider variety of agricultural products." – Metchosin

"Clean energy projects, utilization of woodwaste, remote working from home for knowledge industries." – Mount Waddington

"Tourism, food production, human migration coming here." – Sunshine Coast

Several municipalities mentioned the attractiveness of smaller, safe, and/or rural communities in the future:

"Smaller communities because of livability will attract more jobs and investments." – Nanaimo

"[We are] already seeing a migration of people to what is perceived as a fairly resilient, safe community for food production, telecommuting." – Powell River

"Rural areas have the potential to be attractive for city workers for health reasons (i.e. air quality)." – Ucluelet

In addition to migration, increased tourism and an extended tourist season was one of the potential opportunities mentioned by respondents, including the following comment about the potential to become a destination as a learning centre for sharing knowledge:

"We think we could be a great learning center for climate change adaptation, particularly around indigenous knowledge and practice (worldview) sharing as our collaborations with indigenous community members grows. We have a large number of very active climate change scientists, activists and educators working to develop this type of edutourism." – Islands Trust

The COVID-19 crisis has created additional challenges for local governments but also potentially presents opportunities:

"Remarkable response to COVID by all levels of govt and by the public suggests we are capable of rising to the climate challenge. COVID has reinforced concerns about and is encouraging changes to address self-sufficiency (e.g., reliance on imported food and tourism)." – Islands Trust
"The speed with which all levels of government and community responded to [the COVID-19] health crisis demonstrates the possibility, should the climate emergency be considered with a similar sense of urgency. There is a substantial opportunity for investment in climate change mitigation and adaptation as part of a green economic stimulus package." – Saanich
"In many ways COVID has allowed our community more time to engage with the [Land Use Bylaws] review and make it more robust." – Islands Trust

> *"It may reduce our staffing and funding capacity even further; however, it may also increase public support for active transportation measures and urban forestry improvements for social distancing reasons that would have the add on effect of climate change mitigation and adaptation."* – Sidney

Our common priorities

The survey found that nearly all communities in the VICC region are already experiencing hazards and impacts related to changing weather patterns caused by climate change, and most expect these hazards and impacts to continue and/or worsen into the future. Both municipalities and regional districts are overwhelmingly supportive of climate action, with 100% of local governments surveyed answering that climate change mitigation and adaptation are either important or somewhat important to their community. The vast majority of municipalities and all regional districts also indicated that their communities are supportive of implementing mitigation and adaptation policies. Most municipalities and all regional districts have implemented policies related to climate change mitigation and adaptation, with the numbers and types of policies varying by geography and by size of municipality. Despite these high levels of support for climate action, local governments face multiple barriers, particularly related to a lack of financial resources and staffing capacity.

There are a number of limitations to the analysis. First, there are potential biases that could affect the answers provided by respondents. Both elected officials and relevant staff within municipalities and regional districts were invited to participate, and it is possible that biases related to an individual's role within the organization could influence their answers. Though respondents were asked to provide answers on behalf of their community based on their professional or elected role, rather than personal opinions, there could also be some degree of personal bias in the responses. Survey based responses may also be affected by a social desirability bias whereby support for climate action and policies might have been overemphasized. Results could be influenced by a questionnaire design bias, as how the questions were framed and the ordering of questions could potentially influence how respondents answer the survey. Varying levels of knowledge could also be a source of bias in the survey results. For example, in some cases individuals from the same community provided different answers to the same question (e.g. which policies have been implemented in their community). Finally, some survey questions required making an assessment (for example, assessing community support for various policies). Citizens in the community may think differently, and some respondents did point out that gauging community support can be challenging. In addition to various potential biases, a further limitation of the analysis relates to the study design. As this research was an exploratory study, the survey was designed to gather information and not to test a specific conceptual framework. Further research is needed to identify causal linkages between the identified barriers and climate actions, as well as impacts of actions on mitigating and adapting to hazards and impacts.

Despite these limitations, this survey research makes an important contribution to developing an understanding of the various climate impacts and policy priorities across the VICC region. There are potential policy recommendations arising from the results of the survey. One such recommendation is that increased senior government support is needed to support municipalities and regional districts in climate action. A key finding of the survey was that lack of funding is a major barrier to local governments when it comes to climate change mitigation and adaptation. Limited authority and lack of senior government support were also important barriers, especially

for regional districts, and survey respondents called for more regulatory and financial support from senior levels of government. This support could help build essential low-carbon infrastructure and fund community-level modelling projections to assess localized climate change impacts as well as the impacts of various policies on GHG emissions and costs to choose among most effective and efficient municipal and regional climate policies.

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Appendix Part 2

Appendix A: Survey Questionnaire

Exploring policies and priorities for creating resilience in the Vancouver Island and Coastal Communities region

*1. Selecting the "yes" button below indicates that you understand the above conditions of participation in this study and that you have had the opportunity to have your questions answered by the researchers.

- Yes (I consent to the aforementioned terms of the survey)
- No (I do not consent to the terms of the survey)

Part One: Overview of your Community

Please fill out the survey in your formal role as staff or representative of a local government or regional district. Please do not offer personal opinions. Given that the survey is distributed to multiple staff and officials in your local government or regional district, it is acceptable to skip questions that others will be better placed to answer.

2. Respondent identification
First and last name:_____

3. Local government name (or electoral district name if no local government in the district):
_____

4. Position (if you serve multiple roles, please identify what role you are answering the survey from): _____

5. How many staff work in your local government? _____

6. Does your local government have dedicated staff working on climate change related issues?

- Yes
- No
- If yes, how many? _____

7. Does your local government employ planners?

- Yes
- No
- If yes, how many? _____

8. Does your local government have a strategic climate plan?

- Yes
- No

- Don't know

9. What are the most valuable natural resources in your community from the **ecological preservation** perspective? **List up to three natural resources** (e.g. clean groundwater, shorelines, vegetation for slope stability, coastal douglas fir ecosystem)
Resource #1_____
Resource #2_____
Resource #3_____

10. What are the most valuable natural resources in your community from the **economic development** perspective? **List up to three natural resources.**
Resource #1_____
Resource #2_____
Resource #3_____

11. Is Indigenous knowledge included in analysis and decision making in your local government? _____

12. How does your local government work with First Nation communities on climate change issues (if at all)? _____

13. What motivates (or would motivate) your local government to act on climate change? _____

Part Two: Climate Change Mitigation

"**Climate change mitigation**" refers to efforts to reduce greenhouse gas emissions in your entire community.

14. Overall, how important is climate change mitigation to your community?
- Important
- Somewhat important
- Not important

15. On average, how supportive is your community of implementing climate change mitigation policies?
- Supportive
- Somewhat supportive
- Not supportive

16. What are the **top priorities** for action and investment in your community with respect to climate change mitigation? (Examples might include: infrastructure upgrades, green infrastructure, land use planning, public transit, pedestrian and/or cycling infrastructure, urban forests and conservation, civic building standards, fleet management, air quality planning)
Priority #1_____

Priority #2_____
Priority #3_____

17. Please indicate the main policy actions that your local government has taken/implemented to address climate change mitigation. **Please check all that apply and/or indicate other policies not listed below.**

- Carbon offsets for GHG emissions in government buildings and fleet
- GHG mitigation in government buildings and fleet
- Regulations for energy efficient new construction
- Development permit area requirements (e.g. energy and water conservation, green infrastructure requirements)
- Amendments to zoning bylaws and/or development incentive programs to increase density, mixed use, and infill development
- Cost charge reductions for low-carbon developments
- Rebates/incentives for home energy audits, energy efficient retrofits, and/or installation of alternative energy technology
- Educational programs and information to promote energy efficiency awareness and/or alternative energy to homeowners and/or businesses
- Improvements to public transit
- Pedestrian/cycling infrastructure improvements (e.g. sidewalks, bike lanes, etc)
- Parking restrictions/fees
- Incentives and infrastructure for low or zero emission vehicles (e.g. EV charging stations, priority parking, etc)
- Anti-idling bylaws
- Policies to prevent conversion of forest land to non-forest land
- Carbon sequestration and emission reduction on agricultural land
- Urban forest management to reduce carbon emissions
- Watershed management planning
- Policies to increase recycling and/or divert organic material (composting)
- Landfill gas capture
- Convert non-diverted waste to energy
- Incentives to reduce waste through solid waste fee structures
- No climate change mitigation policies are currently in place
- Other (please specify) _____

18. Among the following climate change mitigation policies/actions, which ones would have the greatest support from your community? **Please check all policies that are likely to have the greatest support (or the lowest opposition).**

- Carbon offsets for GHG emissions in government buildings and fleet
- GHG mitigation in government buildings and fleet
- Regulations for energy efficient new construction
- Development permit area requirements (e.g. energy and water conservation, green infrastructure requirements)
- Amendments to zoning bylaws and/or development incentive programs to increase density, mixed use, and infill development

- Cost charge reductions for low-carbon developments
- Rebates/incentives for home energy audits, energy efficient retrofits, and/or installation of alternative energy technology
- Educational programs and information to promote energy efficiency awareness and/or alternative energy to homeowners and/or businesses
- Improvements to public transit
- Pedestrian/cycling infrastructure improvements (e.g. sidewalks, bike lanes, etc)
- Parking restrictions/fees
- Incentives and infrastructure for low or zero emission vehicles (e.g. EV charging stations, priority parking, etc)
- Anti-idling bylaws
- Policies to prevent conversion of forest land to non-forest land
- Carbon sequestration and emission reduction on agricultural land
- Urban forest management to reduce carbon emissions
- Watershed management planning
- Policies to increase recycling and/or divert organic material (composting)
- Landfill gas capture
- Convert non-diverted waste to energy
- Incentives to reduce waste through solid waste fee structures
- I don't know
- Other (please specify) _____

19. Are climate change mitigation strategies reflected in your community's Official Community Plan?

- Not integrated – no stand alone plan
- Not integrated – have a stand alone plan
- Integrated comprehensively across the policies and objectives within the OCP and mainstream associated action throughout all guidelines and regulations.
- Used to frame specific climate change adaptation objectives to advance climate change assessment and planning, and/or to modify specific policies and objectives to incorporate adjustments to climate change impacts

20. What are the **key challenges** preventing climate change mitigation in your community? **Please select all responses that apply.**

- Lack of authority at the local government level
- Lack of staff training/expertise/knowledge
- Lack of staff capacity
- Lack of financial resources
- Limited access to information/data on climate change mitigation
- Social/ political opposition
- Lack of senior government support
- Not sure what to do
- Other (please specify) _____

21. What are the next climate change mitigation policies your local government would like to implement but cannot? What barriers are they facing to implementation? _____

Part Three: Climate Change Adaptation

"**Climate change adaptation**" refers to efforts to adapt to existing and expected impacts of climate change.

22. Overall, how important is climate change adaptation to your community?
- Important
- Somewhat important
- Not important

23. On average, how supportive is your community of implementing climate change adaptation policies?
- Supportive
- Somewhat supportive
- Not supportive

24. What are the **top priorities** for action and investment in your community with respect to climate change adaptation? (Examples might include: infrastructure upgrades, green infrastructure, land use planning, emergency management planning, urban forests and conservation, civic building standards, air quality planning)
Priority #1_____
Priority #2_____
Priority #3_____

25. Please indicate the main policy actions that your local government has taken/implemented to address climate change adaptation. **Please check all that apply and/or indicate other policies not listed below.**
- Amendments to zoning (or land use) bylaws to adapt to climate change impacts
- Development permit area requirements to adapt to climate change impacts
- Flood plain regulations
- Run-off control, landscaping, and soil removal and deposit requirements
- Emergency management planning
- Urban forest management to adapt to climate change impacts
- Watershed management planning
- Transportation infrastructure design and maintenance
- Sea dike design to protect from sea level rise
- Integration of climate change adaptation into Official Community Plan and other plans
- Initiatives to increase public communication and education (e.g. about road conditions/safety during weather events, etc)
- Food security policies and programs
- Storm water infrastructure and management

- Preventative maintenance/inspection of trees to reduce damage caused by extreme weather events
- Requirements for natural and constructed shade and cooling structures on public and private property
- Engineering policy and building design standards to reflect climate change impacts and projections
- Inspection policy for infrastructure to identify damage from extreme weather events
- Water use restrictions and/or usage fees
- Education and/or incentive programs to promote lot-level resiliency actions and storm water management (e.g. green roofs, shade structures, rain gardens, rain barrels)
- No climate change adaptation policies are currently in place
- Other (please specify) _____

26. Among the following climate change adaptation policies/actions, which ones would have the greatest support from your community? **Please check all policies that are likely to have the greatest support (or the lowest opposition).**

- Amendments to zoning (or land use) bylaws to adapt to climate change impacts
- Development permit area requirements to adapt to climate change impacts
- Flood plain regulations
- Run-off control, landscaping, and soil removal and deposit requirements
- Emergency management planning
- Urban forest management to adapt to climate change impacts
- Watershed management planning
- Transportation infrastructure design and maintenance
- Sea dike design to protect from sea level rise
- Integration of climate change adaptation into Official Community Plan and other plans
- Initiatives to increase public communication and education (e.g. about road conditions/safety during weather events, etc)
- Food security policies and programs
- Storm water infrastructure and management
- Preventative maintenance/inspection of trees to reduce damage caused by extreme weather events
- Requirements for natural and constructed shade and cooling structures on public and private property
- Engineering policy and building design standards to reflect climate change impacts and projections
- Inspection policy for infrastructure to identify damage from extreme weather events
- Water use restrictions and/or usage fees
- Education and/or incentive programs to promote lot-level resiliency actions and storm water management (e.g. green roofs, shade structures, rain gardens, rain barrels)
- I don't know
- Other (please specify) _____

27. Are climate change adaptation strategies reflected in your community's Official Community Plan?

- Not integrated – no stand alone plan
- Not integrated – have a stand alone plan
- Integrated comprehensively across the policies and objectives within the OCP and mainstream associated action throughout all guidelines and regulations.
- Used to frame specific climate change adaptation objectives to advance climate change assessment and planning, and/or to modify specific policies and objectives to incorporate adjustments to climate change impacts

28. What are the **key challenges** preventing climate change adaptation in your community? **Please select all responses that apply.**

- Lack of authority at the local government level
- Lack of staff training/expertise/knowledge
- Lack of staff capacity
- Lack of financial resources
- Limited access to information/data on climate change adaptation
- Social/ political opposition
- Lack of senior government support
- Not sure what to do
- Other (please specify) _____

29. What are the next climate change adaptation policies your local government would like to implement but cannot? What barriers are they facing to implementation? _____

Part Four: Past hazards

30. What are the top five **hazards** facing your community? **Please select up to FIVE hazards most critical to your community.** ("Hazard" refers to the potential occurrence of a natural or human-induced physical event or trend or physical impact that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources.)

- Drought
- Extreme rainfall (amount, duration and/or intensity)
- Extreme wind
- Flooding (freshwater)
- Coastal storm surge
- Hurricane and/or hurricane force winds (wind speeds >118 km/h)
- Extreme heat wave
- Reduced snowpack
- Landslides
- Wildfires
- Sea level rise
- Ocean acidification
- Not applicable/no hazards
- Other (please specify) _____

31. What kind of actions or measures (if any) were undertaken in order to address or respond to the hazardous events indicated in the previous question? _____

32. What **impacts** or adverse effects, resulting from weather events and weather patterns driven by climate change, have become issues for your community? **Please select up to FIVE of the top priorities/challenges critical to your community**. (*"Impacts" refer to effects on natural and human systems of extreme weather and climate events and of climate change. Impacts generally refer to effects on lives, livelihoods, health, ecosystems, economies, societies, cultures, services, and infrastructure due to the interaction of climate changes or hazardous climate events occurring within a specific time period and the vulnerability of an exposed society or system.*)

- Water supply issues
- Water quality issues
- Electricity supply issues
- Infrastructure failures
- Regional food security issues
- Pests and/or invasive species
- Poor air quality
- Public health impacts (other than air quality)
- Impacts to tourism and/or recreation
- Impacts to coastal ecosystems
- Impacts to land based ecosystems
- Impacts to aquatic resources and/or fisheries
- Impacts to forests and/or forestry
- Impacts to biodiversity
- Increased demand on emergency response services
- Impacts to transportation systems
- Not applicable/no impacts
- Other (please specify) _____

33. Would you like to offer any further explanation of your answers above?

34. How well prepared is your local government if such hazards or events occur again; especially if such an event becomes more frequent or severe as a result of climate change?

Event/hazard name	Not prepared	Somewhat prepared	Prepared	Don't know
Hazard #1				
Hazard #2				
Hazard #3				
Hazard #4				
Hazard #5				

35. Does your local government have the capacity/resources to manage the next hazard/event?

Event/hazard name	No capacity/ resources	Some capacity/ resources	Strong capacity/ resources	Don't know
Hazard #1				
Hazard #2				
Hazard #3				
Hazard #4				
Hazard #5				

36. How often do these hazardous events occur?

Event/hazard name	Not frequently (once every 5 years or less)	Somewhat frequently (every year on average)	Frequently (several times a year)	Don't know
Hazard #1				
Hazard #2				
Hazard #3				
Hazard #4				
Hazard #5				

37. What is the severity of the **economic impacts** of these events in your community?

Event/hazard name	Low	Medium	High	Don't know
Hazard #1				
Hazard #2				
Hazard #3				
Hazard #4				
Hazard #5				

38. What is the severity of the **environmental impacts** of these events in your community?

Event/hazard name	Low	Medium	High	Don't know
Hazard #1				
Hazard #2				
Hazard #3				
Hazard #4				
Hazard #5				

39. What is the severity of the **social impacts** of these events in your community?

Event/hazard name	Low	Medium	High	Don't know
Hazard #1				
Hazard #2				
Hazard #3				
Hazard #4				
Hazard #5				

40. What is the severity of the impacts of these events on **Indigenous communities** in your region?

Event/hazard name	Low	Medium	High	Don't know
Hazard #1				
Hazard #2				
Hazard #3				
Hazard #4				
Hazard #5				

Part Five: Future hazards

Top of Form

41. Do you think the impacts to your community identified earlier will continue into the future and become more problematic unless actions are taken to minimize their effects?

Impact name	Yes	Maybe	No	Don't know
Impact #1				
Impact #2				
Impact #3				
Impact #4				
Impact #5				

42. How and why do you think climate change impacts will become more of a problem for your community over time? **Please select all that apply.**

- Increased exposure to hazards due to expansion of development into vulnerable areas
- Increased geographic area that is vulnerable or exposed to hazards (e.g., larger areas affected by coastal flooding)
- Increased vulnerability due to changing demographics (e.g. aging population)
- Increased exposure and/or vulnerability due growing population
- Increase in impacts to already vulnerable populations
- Vulnerability due to socio-economic factors
- Vulnerability related to housing issues
- Lack of capacity to respond to multiple or cumulative impacts
- Increasing frequency and/or intensity of hazardous events
- More impermeable surfaces (roads, roofs, etc)
- System failures due to aging infrastructure
- System failures due to inadequate infrastructure
- Not applicable (no events/ hazards)
- I don't know
- I don't think impacts will become more of a problem
- Other (please specify) _____

43. Do you think your community will experience other kinds of climate related issues in the future, which have not affected you in the past?

- Yes
- Maybe
- No
- I don't know

If you answered yes or maybe, what types of climate related issues do you think will affect your community in the future? _____

44. What information do you need to know to be able to plan effectively for the future of your local government, with respect to the impacts and issues you have identified? **Please select up to FIVE of the most important types of information needed.**

- Local observations and/or indigenous knowledge
- Historical changes and trends
- Localized climate modelling and projected scenarios
- Assessment of potential community impacts
- Assessment of community vulnerabilities
- Risk assessment of hazards
- Mapping of climate change impacts and hazards
- Demographic information
- Projected development
- Adaptation planning information
- Information related to climate change mitigation
- Technical expertise to implement solutions
- Community/stakeholder engagement and support
- Information on partnership opportunities
- Examples of what other communities are doing
- I don't know
- Other information (please specify): _____

Part Six: Final comments

45. With reference to the information identified in the previous question, do you have this information, and/or do you know where it can be obtained?

Type of Information	Yes	Maybe	No	Don't know
Information #1				
Information #1				
Information #1				
Information #1				
Information #1				

46. Do you see any new opportunities for your community in the future as the climate changes? (e.g. economic development opportunities, green growth, new economic sectors, new jobs)

- Yes
- Maybe
- No
- I don't know

If you answered yes or maybe, please describe what type of new opportunities you anticipate.

47. Will the COVID-19 crisis impact your climate change mitigation and adaptation efforts? If so, please explain how. _____

48. Will you be able to attend the AVICC convention on November 6, 2020, to discuss the development of the VICC Climate Leadership Plan?

- Yes
- No

49. Is there anything else it would be helpful for us to know about how your local government is responding to climate change? _____

Appendix B: Study Area Population by Municipality and Regional District

Sub-Region	Regional Districts		Municipalities	
	Name	Population	Name	Population
North	Mount Waddington	11035	Alert Bay	489
			Port Alice	664
			Port McNeill	2337
			Port Hardy	4132
	Strathcona	44671	Zeballos	107
			Tahsis	248
			Sayward	311
			Gold River	1212
			Campbell River	32588
Central	Alberni-Clayoquot	30981	Ucluelet	1717
			Tofino	1932
			Port Alberni	17678
	Comox Valley	66527	Cumberland	3753
			Comox	14028
			Courtenay	25599
	Nanaimo	155698	Lantzville	3605
			Qualicum Beach	8943
			Nanaimo	90504
	Cowichan Valley	83739	Lake Cowichan	3226
			Duncan	4944
			Ladysmith	8537
			North Cowichan	29676
South	Capital	383360	Highlands	2225
			Metchosin	4708
			View Royal	10408
			North Saanich	11249
			Sidney	11672
			Sooke	13001
			Central Saanich	16814
			Colwood	16859
			Esquimalt	17655
			Oak Bay	18094
			Victoria	85792
			Saanich	114148
Coast	Qathet	20070	Powell River	13157
	Sunshine Coast	29970	Sechelt Indian Government District	692
			Gibsons	4605
			Sechelt	10216
Total	**9 regional districts**	**826051**	**38 municipalities**	**607525**

Note: Only municipalities that participated in survey study are listed. Islands Trust is not included in table as population is reported within other regional districts. Islands Trust population: 26,245 (State of the Islands report)