Climate Change Adaptation Planning at the Regional District Scale on Vancouver Island, British Columbia

By

Nicole Bonnett

A thesis submitted in partial fulfillment of the requirements for the degree of

Master of Arts

in

HUMAN GEOGRAPHY

Department of Earth and Atmospheric Sciences
University of Alberta

©Nicole Bonnett, 2020

Abstract

Society is currently faced with the complex and challenging task of responding to global climate change. Contemporary climate impacts include increasing temperatures, melting snow and ice, rising sea levels, and more extreme and variable weather events (IPCC, 2014). Vancouver Island has been subject to a range of climate stressors and exhibits a heightened vulnerability given its extensive coastline, prominence of development along the coast, and greater exposure to climate threats. Local and regional governments have taken the lead on adaptation planning, as climate impacts unfold directly at these scales. The urgency of adaptation has only recently been recognized, largely because of the understanding that an intensification of climate change is inevitable, even with aggressive mitigation efforts. Although British Columbia has emerged as a climate action leader in North America, mitigative efforts far outweigh adaptation at the local and regional scale. This research aims to explore pressing climate stressors on Vancouver Island and climate adaptation planning at the regional district scale in order to better understand the preparedness of local governments for climate variability.

This study employs a mixed methods approach to explore the research objectives, with a robust data set stemming from semi-structured interviews and a plan content analysis. Resilience theory is used as a conceptual lens to unpack complexities associated with climate threats and local government responses to those climate threats. Results from this study demonstrate that regional districts are vulnerable to more intense and frequent drought and flooding events with these climate stressors having key social, economic, and environmental implications. Research findings also suggest that while most regional districts are aware of the urgency of climate adaptation, mitigation remains the major focus with adaptation addressed in a more indirect manner and implementation lagging in practice. Application of the theoretical framework

revealed that a lack of political will and capacity, content of institutions, effect of Bill 27, and authoritative powers of regional districts are critical factors challenging the process of local adaptation planning on Vancouver Island. This research also found that several factors, including environmental awareness, climate change champions, and robust institutions, can facilitate local adaptation planning and resilience building. This study concludes by highlighting the importance of integrating adaptation into strategic planning and policy and proposes recommendations that can be undertaken by decision-makers to enhance local preparedness and resilience to climate variability.

Preface

This thesis is an original work by Nicole Bonnett. Research ethics approval from the University of Alberta Research Ethics Board was received for the research project; Study Title “An analysis of the incorporation of climate change adaptation into strategic planning at the regional district scale on Vancouver Island, British Columbia”, Study ID. Pro00081958, June 19, 2018. This research was supported by funding from the Social Sciences and Humanities Research Council (SSHRC).

Acknowledgement

I would first like to sincerely thank my supervisor, Dr. Jeff Birchall, for providing outstanding guidance, mentorship, and support throughout my undergraduate and graduate degree. Without his support, I would not have pursued a Master's. He brings a unique enthusiasm to his research and instilled in me a strong interest in climate adaptation and planning. Dr. Birchall has provided me with a vast array of opportunities and I am proud of our accomplishments, numerous conference presentations, publications, and motivating scholarly works. Thank you for keeping me on track, driven, and inspired throughout this degree.

I would like to acknowledge the valuable assistance received from the Student Success Center and Writing Resources. In particular, I would like to thank Stephen Kuntz, Kate Pratt, and Alison Hughes. They have provided exceptional teachings and worked tirelessly to assist me with my writing. With their guidance and ongoing consultation, my writing has improved significantly. I have been able to efficiently communicate my research and thoughts in a meaningful and impactful manner, and for these services, I am very appreciative.

I would like to thank my family and friends. I am grateful to have such supportive parents who pushed me to pursue my professional and academic goals. From the hour-long phone calls to the surprise visits, they have been there to listen to me rant, celebrated my successes, and have always reminded me how proud they are. Thank you to my sister for providing me with much needed comic relief, for participating in the egg challenge with me, and for listening to all my research stories, even when she had no idea what was going on. I could not have done this without such a strong and loving support system. I would also like to thank my fellow colleagues who constantly supported my work and provided valuable feedback. They never failed to make me laugh when I was struggling and were there to celebrate our shared achievements. I am grateful for the support received and ever lasting friendships made.

Lastly, I would like to thank the Natural Sciences and Engineering Research Council of Canada. Without their gracious contributions to research in Canada, I would not have been able to conduct my field research and focus my efforts on this project.

Table of Contents

List of Figures

List of Tables

List of Acronyms

ACRD- Alberni-Clayoquot Regional District

BC- British Columbia

CAP- Climate Action Plan

CAS- Climate Action Strategy

COWRD- Cowichan Valley Regional District

CRD- Capital Regional District

CVRD- Comox Valley Regional District

GHG- Greenhouse Gas

IPCC- Intergovernmental Panel on Climate Change

MWRD- Mount Waddington Regional District

OCP- Official Community Plan

PCA- Plan Content Analysis

RD- Regional District

RDN- Regional District of Nanaimo

RGS- Regional Growth Strategy

RP- Regional Plan

SSHRC- Social Sciences and Humanities Research Council

SLR- Sea Level Rise

SRD- Strathcona Regional District

1. Introduction

1.1 Background

Climate change is one of the world's leading challenges, requiring novel responses from all levels of government. As greenhouse gases (GHGs) continue to rise and reach concerning levels, a host of climate impacts have emerged to create significant risks for societies across the globe. According to the Intergovernmental Panel on Climate Change (IPCC), global average temperatures and sea levels have risen, extreme weather events have become much more frequent and intense, and global average snow and ice extents have decreased dramatically (IPCC, 2014). These climate impacts are most visible at the local scale and are projected to increase in frequency and severity regardless of efforts to reduce atmospheric GHG emissions (IPCC, 2014). Indeed, communities across the globe have already observed an increase in wildfire, drought, and flooding events, with coastal locations, in particular, showing enhanced exposure and vulnerability to climate impacts (IPCC, 2014).

The need to respond to climate change is more urgent now than ever, with responses often grouped into two distinct but related approaches: mitigation and adaptation. Mitigation is defined as a "human intervention to reduce the sources or enhance the sinks of greenhouse gases" (IPCC, 2014, p.125), while adaptation is intended to minimize or avoid harm by adjusting human and natural systems to cope with climate impacts (IPCC, 2014). Currently, the global policy approach to climate change is dominated by a focus on mitigation, with adaptation only recently gaining traction (e.g. Birchall, 2014; Birchall *et al.,* 2015, 2017). This is especially clear at the local government scale, where mitigation frequently outweighs adaptation (e.g. Birchall and Bonnett, 2019). Climate change scholars often warn that a reliance on mitigative strategies is insufficient since, regardless of the extent of mitigation, continued climate change is unavoidable (Klein *et al*., 2005; IPCC, 2014). Adaptation is thus a necessity, and must be pursued by decision-makers if local governments are to reduce costs, remain resilient, and protect local assets and residents. Indeed, policy discourse increasingly recognizes the critical role of local governments in addressing climate impacts, and strongly argues that a robust solution requires elements of both mitigation and adaptation (Shaw *et al*., 2014; Bosello *et al*., 2010).

The Province of British Columbia (BC), has emerged as a climate action leader within North America, largely through the passage of Bill 27, The Local Government Statutes Amendment Act, in 2008. Also referred to as the "Green Communities" Act, Bill 27 is intended to encourage local governments to reduce GHG emissions, conserve energy, and strive towards the creation of sustainable communities (Province of BC, 2008). The Act supports these objectives by requiring local governments to mitigate climate change. More specifically, Bill 27 requires that all local governments with an Official Community Plan (OCP) and Regional Growth Strategy (RGS) incorporate actions to reduce GHG emissions within these planning documents (Province of BC, 2008). While this planning mandate has facilitated the widespread incorporation of climate change considerations within strategic documents, mitigation remains the major focus with adaptation often receiving minimal attention. Because some degree of climate change is inevitable, it is critical that local governments shift their political agenda from one that largely prioritizes mitigation, to one that stresses the need to adapt to the unavoidable consequences of climate change (Eisenack *et al*., 2014).

1.2 Justification and Purpose of the Research

Literature on climate change has rapidly grown within the last decade. In particular, there is a considerable amount of research that has examined climate change mitigation strategies and the influence of human activities on the climate system (IPCC, 2014). While mitigation presents as a major focus of climate related literature, the topic of adaptation is receiving growing attention. There has been a rise in the number of studies exploring human dimensions of climate change, barriers to adaptation, adaptive capacity, and the quality of local climate related planning documents (e.g. Baker *et al*., 2012; Baynham and Stevens, 2014; Ford and King, 2015; Hamin *et al*., 2014; Lyles *et al*., 2014). Barriers or challenges to the process of adaptation planning tends to be a common theme of interest for climate scholars with an impressive number of case studies undertaken (Biesbroek *et al*., 2013). These studies largely report on barriers that relate to social and institutional factors, often occur in developed countries with a focus on larger cities, and use small inductive case study approaches (Biesbroek *et al*., 2013). There is also a wealth of research that explores strategic planning and policy as it relates to climate adaptation (e.g. Baynham and Stevens, 2014; Lyles *et al*., 2014). This scholarship often considers the extent of climate change considerations broadly within planning documents and/or aims to evaluate the effectiveness of

planning documents in general. There are thus several gaps present within climate change literature that this research aims to address.

While literature explores planning and policy dimensions of climate change, less attention is paid to analyzing how local governments are specifically incorporating adaptation into strategic planning documents. Further, there is a need for greater research that explores the decision-dynamics around adaptation planning, the reasons why adaptation barriers emerge, and the implications of climate stressors for local governments. With respect to research methodologies and scope, climate-related research at the local government scale focuses largely on municipalities and large cities with less attention given to regional scales (Birchall and Bonnett, 2019). Moreover, small case study approaches are prominent with a lack of comparative analysis (Biesbroek *et al*., 2013). Lastly, while climate impacts, such as sea level rise, are particularly pressing (Capital Regional District, 2015), research on this topic in the area of Vancouver Island is limited.

To help bridge the gap in the literature, this research aims to explore major climate threats and adaptation planning at the regional district (RD) scale on Vancouver Island. It does so by using a mixed methods approach that yields quantitative and qualitative results, which were analyzed through the lens of resilience theory. More specifically, through semi-structured interviews with key actors and a plan content analysis of regional and municipal planning documents, this study sheds light on the decision dynamics around climate change actions of RDs on Vancouver Island and the extent of adaptation integration within planning and policy responses. A regional scope was selected over a municipal scale given the deficit of climate research focused on regional planning. Regional planning is important in the context of climate change because of its direct influence on municipal action and potential to better organize and harmonize climate considerations across municipalities and rural jurisdictions. Moreover, analyzing adaptation inclusion at the RD scale presents a unique opportunity to explore the role of regional planning and to determine whether regionally set climate goals spur greater climate action on the part of municipalities (Hughes *et al.*, 2018).

1.3 Research Objectives

The primary objectives of this research are:

1. To identify pressing climate stressors and to explore how they influence regional districts on Vancouver Island
2. To better understand how regional districts on Vancouver Island plan for and respond to climate change impacts

Sub-objectives for this study are:

   a. To identify the implications of climate change threats for regional districts and examine vulnerability on Vancouver Island
   b. To analyze the extent of adaptation inclusion in regional policy and plans on Vancouver Island
   c. To examine the resilience of regional districts with a focus on factors that facilitate and impede effective adaptation planning
   d. To provide recommendations that may assist with the integration of adaptation into strategic planning

Given that RDs on Vancouver Island are not unique in their need to adapt to climate stressors, implications of the findings from this study may apply to local governments facing similar climate impacts and strategic planning challenges. Thus, in fulfilling the above research objectives, this study provides insight into local resilience and the value of integrating adaptation into strategic planning frameworks, which may be applied by decision-makers to strengthen local responses to climate stressors.

1.4 Outcomes of the Research

There are various outcomes for this research in terms of contributing to the literature and enhancing our understanding of local climate change adaptation planning. First, this research bridges several gaps in the scholarship. It does so by examining whether adaptation is integrated within local strategic planning; by investigating the extent and implications of climate threats on Vancouver Island; and, by analyzing adaptation planning at a regional scope, an under-represented area in literature. Second, this research broadens our understanding of local

government resilience to climate change, and provides insight into factors that facilitate and challenge the process of adaptation planning. Lastly, because this research draws critical inferences and provides key recommendations, this information can be applied by readers, local governments, and decision makers who face similar climate and policy related challenges.

1.5 Thesis Overview

This thesis is broken down into eight chapters: 1) introduction, 2) context, 3) literature review, 4) theoretical framework: resilience theory, 5) methodology, 6) results, 7) discussion, and 8) conclusion.

1. The introduction provides a primer and overview of the topic being explored
2. The context outlines background information needed to understand the study area and research objectives
3. The literature review provides a description, overview, and critical evaluation of scholarly works in relation to the research topic being investigated
4. The theoretical framework offers a conceptual basis for understanding, examining, and creating inferences relating to the research topic and through which the research objectives will be explored
5. The methodology chapter outlines the approach used to gather and analyze data
6. The results chapter presents the findings of the study
7. The discussion aims to interpret and describe the significance of the findings and identify new insights emerging from the investigation of the research problem
8. The conclusion highlights key messages and lessons learned in relation to the objectives of the research

Each chapter, other than the introduction and conclusion, begins with an introductory section that allows the reader to navigate the content of the following sections. The following chapters are intended to provide key information that allows for the research objectives to be explored and understood.

2. Context

2.1 Introduction

This chapter provides a detailed overview of information related to Vancouver Island and the objectives of this research. The following section outlines contextual information relating to the geography and topography, population and demographics, climate impacts, and role of RDs on Vancouver Island. These topics are important in order to ensure readers are provided with an understanding of factors that contribute to climate change stressors and strategic planning responses on the Island.

2.2 Vancouver Island: Geography and Topography

Located off the western coast of Canada, Vancouver Island is an ecologically diverse constituent of the Province of British Columbia (BC) (Figure 1). The Island is situated in the Northeast Pacific Ocean, and is the largest island on the western coast of North America with an area of approximately 32,000 square kilometers (The Editors of Encyclopaedia Britannica, 2018). The Island runs parallel to British Columbia's mainland and is over 450 kilometers in length, with a width ranging from 50-120 kilometers (Artibise, 2015).

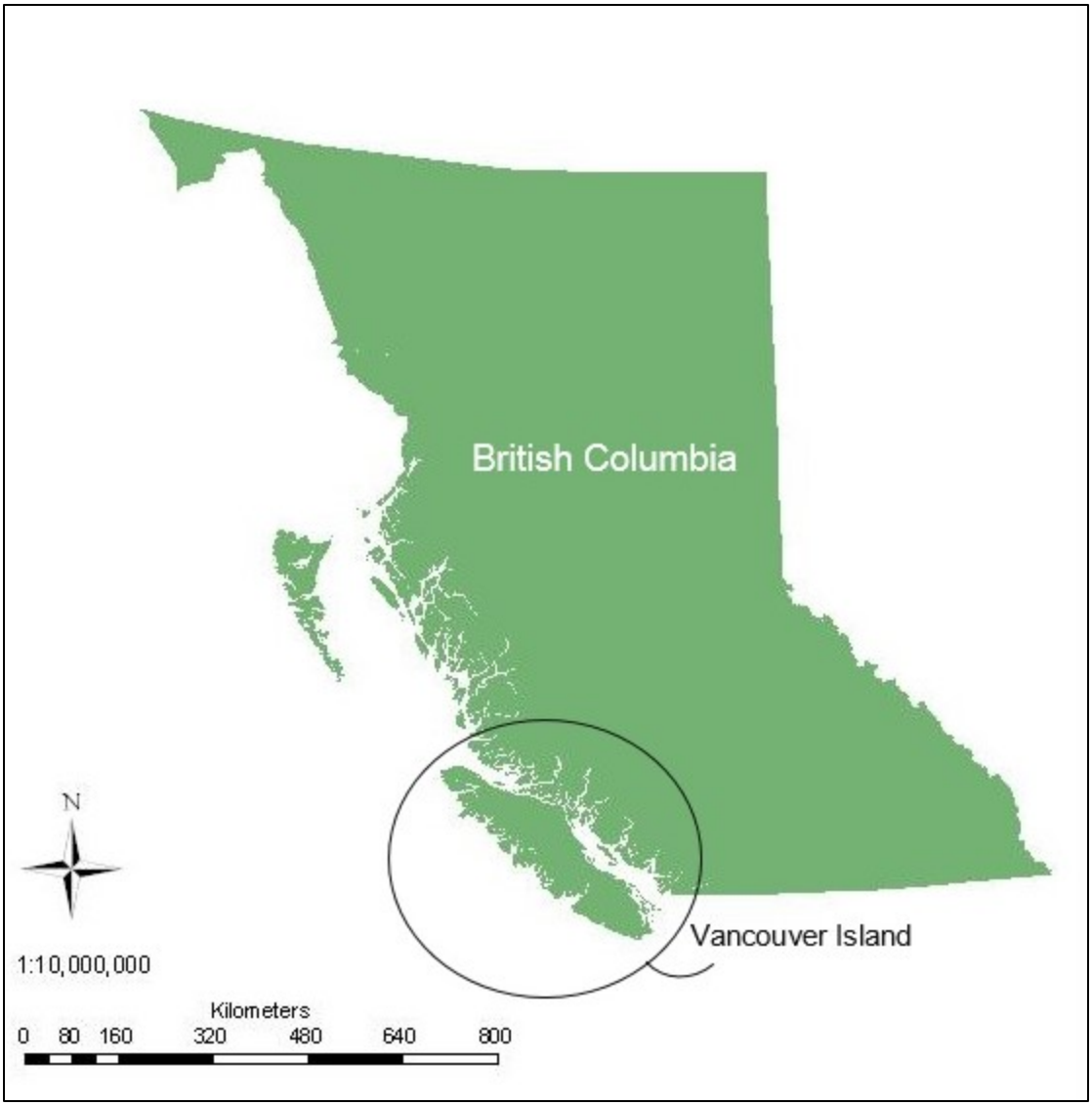

Figure 1- Location of Vancouver Island, British Columbia.
The following is the source information used to create the basemap: ESRI, (2008). B.C. Ministry of Environment, (2008) & Data Distribution Service, (2006). Adapted from: http://www.sfu.ca/geog/geog351spring09/group01/fishery.htm

The Georgia, Queen Charlotte, and Johnstone Straits separate Vancouver Island from the mainland and provide rich marine resources to the residents of the Island (Artibise, 2015). Vancouver Island shares similar topographical features with BC's mainland and the western coast of the United States, continuing the United States' coastal mountains and forming part of a partially submerged chain of the Western Cordillera (Artibise, 2015). The Island boasts diverse topographical characteristics including a rugged western coastline, several fjord-like inlets, and central mountain ranges (Artibise, 2015). The mountainous interior ranges in elevation across the Island with the highest peaks found within Northern regions of the island. These peaks include

Golden Hinde (2200 m), Elkhorn Mountain (2195 m), Mount Colonel Foster (2135 m), and Victoria Peak (2163 m) (Artibise, 2015). Coastal lowlands surround the interior mountain range and are most pronounced in the Northern and Eastern regions of Vancouver Island. These lowlands vary in elevation, with regions such as the Nanaimo lowlands being very low-lying (Artibise, 2015).

Across the Island, diverse natural ecosystems exist that provide a range of ecosystem services. Vancouver Island has many freshwater lakes, with Nimpkish, Cowichan, Buttle, Sproat, Great Central, and Campbell Lake being the largest (Artibise, 2015). The larger freshwater lakes tend to be located in the central and northern regions of the Island while the southern tip of the Island is characterized by numerous smaller water bodies. In contrast to the mainland, there are no dominant river systems located on Vancouver Island (Artibise, 2015). However, there exists a myriad of rivers that flow into the coast through broad valleys, resulting in a prominence of delta and estuary complexes (Artibise, 2015). For instance, the Nimpkish, Campbell, Nanaimo, and Cowichan rivers flow into the ocean, creating extensive deltas. The landscape around many of these rivers and creeks reflects the Island's rugged topography with steep and narrow valleys, particularly on the west coast. The landscape is also covered by dense natural ecosystems where temperate rainforests cover a majority of the Island and dense forests surround development, bodies of water, and mountain ranges (Pew and Larson, 2001).

2.3 Vancouver Island: Population and Demographics

In comparison to the mainland of British Columbia, Vancouver Island is sparsely populated. The Canadian Census shows a population of 799,400 in 2016 for the Vancouver Island and BC coast economic region (Statistics Canada, 2017). Population growth has largely occurred within metropolitan centers such as the city of Victoria, whose population increased by 6.7 per cent since the last census in 2011 (Statistics Canada, 2017). While a majority of the Island's population resides in urban centers, its rural areas are populated by numerous First Nations. A total of 53 First Nations live on Vancouver Island which translates to almost 20% of the provincial population of First Nations people (Vancouver Island Economic Alliance, 2015). For thousands of years, the Island has been home to several Indigenous populations whose cultures are strongly tied to the abundant resources offered (Turner and Clifton, 2009). Tribal villages were originally formed in relation to a reliance on fishing, hunting and gathering

(Artibise, 2015). As such, villages tend to be located a short distance upriver from the ocean or in close proximity to the coast. Indigenous movements are influenced by seasonal changes and environmental factors; for example, indigenous groups migrate through well-defined territories during the hunting season to follow important species (Artibise, 2015). Indigenous populations on Vancouver Island have shown significant fluctuation over time. The indigenous population was approximately 15,000 in the early 19th century, decreased to around 5,600 in 1880, and remained near 5,000 until the 1950s as a result of several factors, including disease (Artibise, 2015). Since the 1950s, Indigenous populations have increased to around 30,000, with over 50 First Nations located in three distinct tribal regions on the Island: Coast Salish, Nuu chah nulth, and Kwakiutl (Vancouver Island Economic Alliance, 2015). In an era of significant change, Indigenous peoples on the Island are confronted by the need to adapt to emerging climate impacts and shifting socio-economic factors. These communities are highly vulnerable to shifting climatic conditions and to poor socio-economic conditions, with relatively poor health status, high unemployment, recurrent poverty, and low levels of education (Turner and Clifton, 2009).

2.4 Vancouver Island: Climate Impacts

The climate of Vancouver Island is strongly influenced by its topography and the surrounding Pacific Ocean. The Pacific Ocean has a moderating effect on the Island's temperature and provides a source of moisture resulting in rainy conditions (Pew and Larson, 2001). The centrally located mountain range creates variable rates of average precipitation for the western and eastern coasts. The western coast is exposed to air masses carrying substantial amounts of moisture that fall as precipitation after being forced up the mountains (Pew and Larson, 2001). On the eastern coast, precipitation rates are moderate given the protection provided by the mountain range (Pew and Larson, 2001).

Climate change effects already underway for the Province of BC include rising sea levels, and increases in the average temperature and the rate of precipitation. Rodenhuis et al. (2009) found that from 1900 to 2004, the annual mean temperature in BC increased by 0.5 to 2.0°C and average annual precipitation increased by nearly 25%. In its fifth assessment report, the IPCC reported that the global mean sea level rose by an average of 0.19 m from 1901 to 2010 (IPCC, 2014, p. 42). Projected climate impacts for the province include average annual temperature

increases of 1.3 to 2.7 °C and an increase in average annual rainfall between 2-12% by 2050 (British Columbia Ministry of Environment, 2015). Moreover, the province will likely see accelerated snow and ice melt with the potential for up to 70% of glaciers to disappear by 2100, and a continued rise in sea level along most of B.C.'s coast (British Columbia Ministry of Environment, 2015). In the context of this study area, the government of BC projects that Vancouver Island will be one of many coastlines in Canada to experience the greatest relative sea level rise (British Columbia Ministry of Environment, 2015). In general, Vancouver Island will be subject to risks associated with sea level rise and storm surges, rising temperature induced wildfires and drought, and a threatened water supply as a result of variable precipitation and possible salt water intrusion. These climate impacts can have a profound impact on the resilience and functioning of both natural and human systems. For example, saltwater intrusion has the potential to compromise the health of freshwater aquifers and flood events can severely damage infrastructure and pose a threat to resident safety. Further, drought and other extreme weather events may pose serious challenges for ecosystem viability and urban/community resilience as seen in the effect of intense storms on coastal erosion and property damage. With climate impacts projected to increase in frequency and severity across Vancouver Island (British Columbia Ministry of Environment, 2015), the need for organized and proactive climate responses becomes increasingly apparent.

2.5 Role of Regional Districts

In comparison to the rest of Canada's provinces, the local government system in British Columbia is unique, given that in addition to the 162 municipal governments, it is comprised of 27 RDs, which function inherently different than other regional bodies such as counties (Province of BC, 2008). Regional and municipal planning broadly fall under the responsibility of local governments, and the power and autonomy of regional bodies are established under the Local Government Act of BC (Province of BC, 2008), the primary legislation for RDs across the province. This Act details the basis for structure and operations and specifies the main powers and responsibilities of local governments (Province of B.C, 2008). It provides a statutory framework for local governments to develop regional growth strategies (RGS), which facilitate effective planning at the regional scale (Province of B.C, 2008). Like municipalities, RDs have the ability to guide development and growth, and set planning goals in relation to economic, social, and environmental factors. Planning at the regional scale, however, differs from

municipal planning given the greater geographic area covered, the sparse population, and distinct responsibilities that include the planning and overseeing of electoral areas and provision of a range of specified services to rural residents. It is important to note that the services provided are determined by the regional board, but only with the support of the electorate. In this sense, RDs can only act on an issue if it falls under an existing service area adopted by bylaw and supported by electors. As a result, the services provided by each RD can vary according to local preferences and opinions. RDs have the power to adopt zoning bylaws and official community plans to regulate electoral areas. Regional growth strategies (RGS) exist at a broader planning scale than official community plans (OCP) and zoning bylaws. Through the passing of RGSs, RDs on Vancouver Island provide strategic planning goals that assist in the coordination and cooperation between municipalities, RDs, and the province.

Vancouver Island is comprised of seven RDs (RD) (Figure 2):

1. Regional District of Mount Waddington
2. Strathcona Regional District
3. Comox Valley Regional District
4. Alberni - Clayoquot Regional District
5. Regional District of Nanaimo
6. Cowichan Valley Regional District
7. Capital Regional District

The geographical area of each RD is highly variable with the two northernmost RDs having a political boundary that extends into the mainland of BC. Moreover, the number of incorporated communities within each RD varies substantially. With the greatest number of official municipalities, the Capital RD encompasses 13 municipalities. This is in stark contrast to the three municipalities within the Alberni-Clayoquot RD. Along with the substantial variation in the number of incorporated communities, the presence of regional growth strategies also varies between the RDs. As it is not mandatory that all RDs develop and adopt a RGS, only three of the seven RDs on the Island have passed RGSs with one using a regional plan (Comox Valley Regional District, Capital Regional District, and Nanaimo Regional District have a RGS in place, while the Regional District of Mount Waddington utilizes a regional plan).

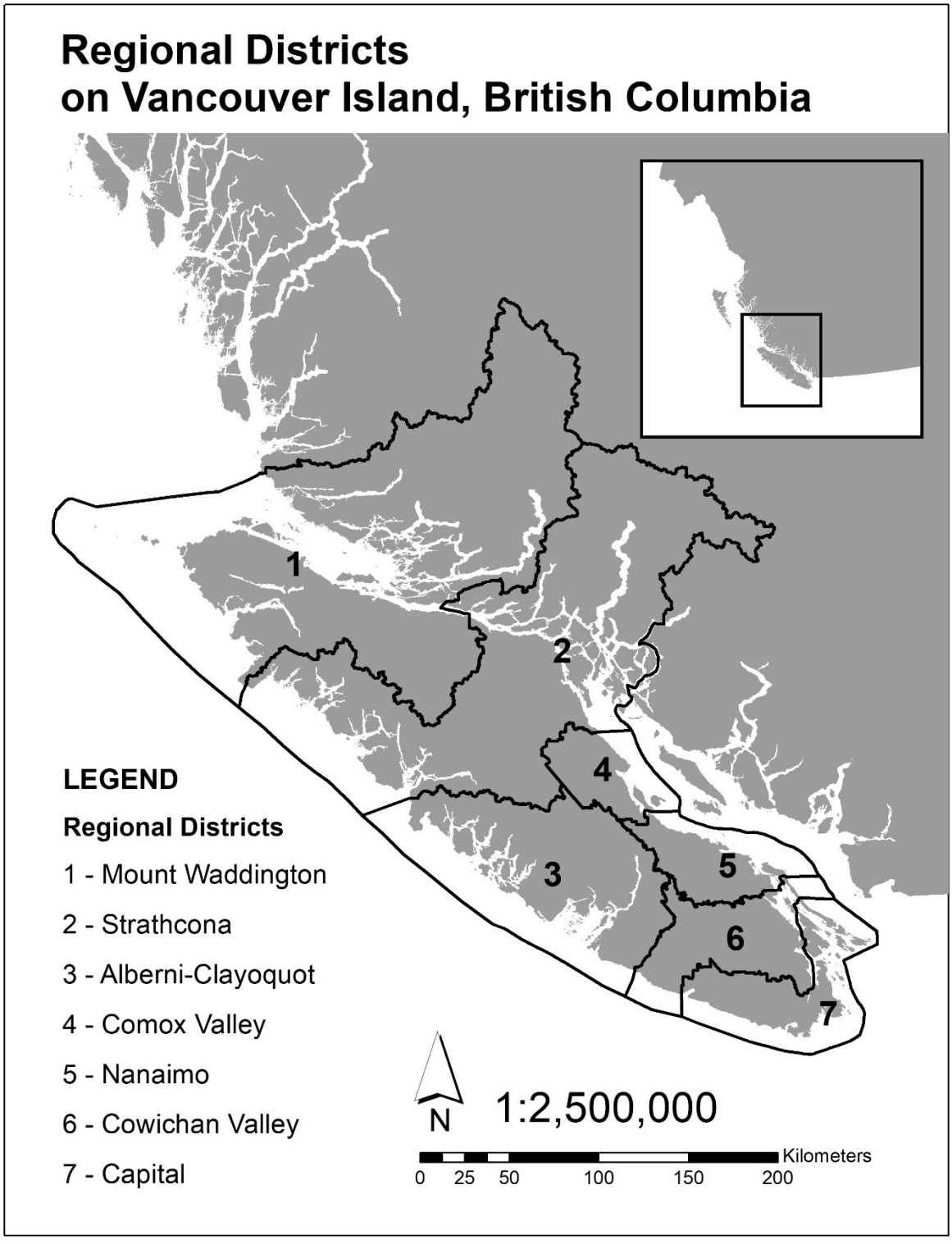

Figure 2- Regional District political boundaries on Vancouver Island, British Columbia.
The following is the information used to create the map: Coordinate System: NAD 1983 BC Environment Albers; Projection: Albers; Datum: D North American 1983 CSRS; Data Source: The Province of British Columbia; Government of Canada; ESRI; Date Created: September 24, 2019.

3. Literature Review

3.1 Introduction

The purpose of a literature review is to survey books, chapters, and scholarly articles relevant to a specific area of research (Fink, 2005). By doing so, a literature review provides a description, overview, and critical evaluation of scholarly works in relation to the research topic being investigated (Fink, 2005). This literature review demonstrates an understanding of how this research fits within and contributes to existing literature. Common issues and key themes emerging from existing research are presented and compared. Gaps in existing literature are identified in order to justify the research and highlight areas for further study.

The subject area of this literature review is climate change and climate adaptation planning, given that the topic of this research focuses on climate change threats and the extent of adaptation integration within local/regional strategic policy and planning documents. As climate impacts continue to challenge societies across the globe, an abundance of climate literature has emerged in which scholars frequently stress the need for action, outline the challenges facing adaptation, and highlight future directions. It is important to note that climate change adaptation is closely linked with efforts to enhance community resilience to environmental disturbances. While there is no section on resilience within this chapter, concepts of resilience are woven throughout this thesis, with a separate chapter dedicated to outlining resilience and resilience theory in great detail. This literature review focuses broadly on climate change, responses to climate change, the global policy approach, regional planning, the urgency of adaptation, persistent challenges, and the vulnerability of coastal communities. It concludes with a section on locating the research within existing scholarship.

3.2 Climate Change

Climate change is one of the most significant challenges facing society today, and will be for decades to come. The extent of this global problem has only recently been understood, despite the concept of the greenhouse effect existing for over a century (Urry, 2015). As defined by the IPCC, climate change refers to a change in the state of the climate, which is characterized by changes in the mean and/or variability of its properties (IPCC, 2014). Climate change does not refer to shifting weather patterns and can be distinguished by noting that changes in climate

properties persist for an extended period of time (decades or longer) (IPCC, 2014). The causes of climate change are vast and may be natural processes, including modulations of solar cycles and volcanic eruptions, and/or persistent anthropogenic activities (IPCC, 2014). In its fifth assessment report, the IPCC declared that global climate change is strongly influenced by anthropogenic activities, and that many of the observed climate impacts are unprecedented over decades to millennia (IPCC, 2014). The anthropogenic dimension of climate change relates to the production and release of GHGs through human activities such as fossil fuel combustion, deforestation, and agriculture, which drive the greenhouse effect. Human contributions to rising GHG concentrations, now recorded at an atmospheric concentration of over 400 parts per million (Rhodes, 2017), are globally recognized as clear drivers of temperature increases.

With recent anthropogenic emissions of GHGs being the highest in history, record-breaking temperatures have been observed. For instance, since 1850, each of the last three decades has been successively warmer than any preceding decade (IPCC, 2014). Warming of the climate system is unequivocal: sea levels are rising at an increasingly rapid rate, the extent of snow and ice has reached drastic lows, and precipitation and weather events are becoming highly variable (IPCC, 2014). If GHG emissions are not urgently and drastically reduced in an attempt to combat significant temperature increases, humanity may be faced with dangerous tipping points in the climate system (Scrieciu *et al*., 2014). Tipping point refers to thresholds in climate systems that, when exceeded, can lead to significant and irreversible changes in the state of the system. Concerns regarding the predicted tipping point have triggered a global response that focuses on reducing GHG emissions in an attempt to contain global warming to below 2 degrees Celsius (Bosello *et al*., 2010). Scholars stress that warming to this extent may be associated with devastating consequences, however, the effects of a changing climate are currently being observed and climate impacts have already had a widespread and marked effect on human and natural systems (IPCC, 2014). Natural systems are particularly vulnerable to temperature increases. Where freshwater bodies and oceans are warming, biological species are exhibiting a migration to higher latitudes, and marine systems are subject to risks associated with oceanic acidification (IPCC, 2014). With respect to human systems, many coastal communities have been confronted by sea level rise and intense storm surges, wildfires have ravaged vast areas of human settlement, and extreme weather events frequently overwhelm societies across the globe. In general, human systems are highly vulnerable to contemporary climate variability as

evidenced by the devastating effects of heat waves, droughts, floods, hurricanes and wildfires (IPCC, 2014). These extreme effects pose direct challenges for communities of all sizes with local governments being key actors in the global response to climate change (Baker *et al*., 2012).

3.3 Strategies to Address Climate Change

Human responses to climate change can involve mitigation and adaptation actions, to reduce GHGs and to cope with climate impacts, respectively (IPCC, 2014). Responses may involve a variety of efforts and strategies, and climate scholars stress that robust responses must involve elements of both mitigation and adaptation (e.g. Bosello *et al.*, 2010). The IPCC (2014), defines adaptation as "the process of adjustment to actual or expected climate and its effects" (p. 118). The process of adaptation is employed in human systems to moderate or avoid harm associated with climate impacts and threats. Mitigation differs from adaptation in that it encompasses a clear preventative focus; it is defined as a "human intervention to reduce the sources or enhance the sinks of greenhouse gases" (IPCC, 2014, p.125). In this sense, mitigation aims to reduce the greenhouse effect, while adaptation is employed to cope with both existing climate impacts and those yet to come. Examples of adaptation include hard structures such as sea walls and dykes to protect against flooding, or soft approaches such as floodplain development regulations and ecosystem-based approaches. Examples of mitigation include the transition to renewable energy, the planning of green cities to reduce water and energy use, and the development of energy-efficient buildings and technologies. Mitigation is a critical strategy to combat long-term catastrophic impacts that cannot be controlled through adaptation (Bosello *et al.*, 2010) however, both mitigation and adaptation is needed to effectively address climate change. While literature on climate responses is much more developed in the area of mitigation, in the last decade, scholarship on adaptation has grown significantly. Research pertaining to climate change adaptation tends to focus on the adaptive capacity of governments, challenges to the process of adaptation planning, and specific types of adaptations (Ford and King, 2015; Biesbroek *et al*., 2013). For instance, a wealth of case studies have been conducted on adaptation planning barriers and the effectiveness of adaptation types in practice (Briesbroek *et al*., 2013).

3.4 Adaptation Types

There are a variety of adaptation initiatives that can be pursued to moderate or avoid harm associated with climate stressors, and improve the well-being of populations, the security

of assets, the resilience of communities, and the health of natural ecosystems now and in the future (Marolla, 2016). Adaptation actions can be characterized according to a number of factors, including their intent to protect against or cope with climate change impacts, however, this literature review divides adaptation types into structural, non-structural, and ecosystems-based approaches (Wenger, 2015). In order to reflect the objectives of this research, adaptation types that are highly suitable and relevant for vulnerable coastal communities will be the focus of the following sections.

3.4.1 Structural Approaches

Structural adaptations are also referred to as "hard" adaptations. These can be described as infrastructural changes or improvements aimed at increasing a community's resilience to climate impacts (Bonnett and Birchall, 2019). Structural approaches are highly variable according to contextual factors and tend to focus on flood-related climate impacts. Examples of hard adaptations include levees, sea walls, drainage channels, and dams, which are engineered to protect against flooding and to divert water flows (Wenger, 2015). Many coastal communities exposed to climate threats also tend to employ adaptation strategies that focus on shoreline armoring or hardening, including breakwaters, ripraps, and seawalls (Goff, 2010). These approaches attempt to reduce coastal damage by absorbing the force of wave action and storm surges. In general, hard adaptation relies on engineering and technological responses that physically protect residents and assets from climate impacts.

Although structural responses tend to be favored across the globe because of the perceived security that comes with hard infrastructure, and the extensive history of their use (Betzold and Mohammed, 2017), these types of adaptations have several drawbacks. For example, hard adaptations are rigid, capital intensive, require recurrent upgrades and maintenance, and frequently trigger some extent of ecosystem degradation (Wegner, 2015). These associated challenges and indirect effects are often overlooked despite growing scholarship examining the effectiveness of hard adaptations. In response, scholars have stressed that communities must balance their reliance on physical structures and incorporate non-structural and ecosystem-based approaches into their adaptation planning (e.g. Bonnett and Birchall, 2019).

3.4.2 Non-Structural Approaches

Non-structural approaches are soft adaptations that focus on human behavior and the accommodation of stressors. These approaches utilize public education, policy initiatives, and the regulation of land use and development to manage risks. Non-structural approaches reflect accommodation measures because they permit the continued use of vulnerable areas by reducing their sensitivity and exposure to climate impacts (Harman *et al*., 2015). Examples of non-structural adaptation types include planned relocation or retreat, altered land use and building controls, elevated floor and increased setback requirements, and enhanced awareness, emergency management, and insurance (Harman *et al*., 2015; Wenger, 2015). In comparison to hard approaches, non-structural adaptations are less common in adaptation planning despite a growing awareness of their effectiveness. Benefits of these approaches include greater flexibility to be tailored to specific climate impacts. For example, to mitigate flood risks, communities can alter their development regulations and building codes to protect residents and assets by ensuring that development is located and designed in a resilient manner. This response has been utilized by communities across the globe who implement exaggerated setbacks, for example, to provide a buffer between hazardous areas and coastal development (Harman *et al.,* 2015). As a more extreme non-structural approach, planned retreat or relocation is described as the process of relocating homes and infrastructure under threat from climate impacts (Alexander *et al.*, 2012). Relocation thus aims to reduce risk by moving residents and assets out of hazard-prone areas. Current managed retreat efforts can be seen in the establishment of buy-out programs post Hurricane Sandy, and relocation attempts in Alaska, with a growing recognition of their potential to serve as valid coastal adaptation measures (Bronen and Chapin, 2013). However, the legitimacy of relocation as an adaptation option is a topic yielding contrasting views within the literature (e.g. Binder *et al*., 2015).

Although non-structural adaptations may address some of the shortcomings of hard adaptations, these approaches are not without their drawbacks. For example, the implementation of non-structural actions is often impeded by financial, social, and political constraints (Bukvic *et al*., 2015). To overcome the challenges associated with hard infrastructure and non-structural adaptations, scholars suggest the potential of ecosystem-based approaches as a flexible, cost-effective, and applicable alternative for addressing the impacts of climate change (Jones *et al*., 2012).

3.4.3 Ecosystem-Based Approaches

Ecosystem-based approaches are categorized as a soft defense that leverages the adaptive opportunities associated with ecosystem services (Harman *et al*., 2015). As a more natural strategy, ecosystem-based approaches act to buffer human systems against the impacts of climate change by capturing a range of ecosystem services (Jones *et al*., 2012). These strategies are commended by scholars as they are flexible, low-regret, and low-cost, and they offer aesthetic and recreational opportunities (Harman *et al*., 2015; Jones *et al*., 2012; Heang and Birchall, 2019). The scale of ecosystem-based approaches varies from large projects such as beach nourishment and sand dune restoration (Harman *et al*., 2015) to species-specific approaches that capture the adaptive opportunities offered by ecosystem engineering species such as mussel and oyster beds, and vegetation (Borsje *et al*., 2011). With climate impacts such as extreme weather and flooding increasing in severity and frequency, ecosystem-based approaches become critical for increasing resilience and preparedness in coastal areas. Approaches that aim to preserve wetlands, naturalized shores, and marshes may reduce damage caused by flooding due to the ability of various species to trap and stabilize sediment, thus raising the soil elevation and attenuating waves (Borsje *et al*., 2011). In practice, ecosystem-based approaches are used in combination with other adaptation types to create a more robust response. For example, Borsje et al. (2011) note the use of foreland vegetation restoration to reduce the forces placed on structural approaches such as sea walls and dams.

While ecosystem services have been receiving interest as plausible and effective responses to climate impacts, more research is needed about how natural systems contribute to resilience in monetary metrics (Gómez-Baggethun and Barton, 2013). This limitation sheds light on a key challenge with using ecosystem-based approaches given the lack of a valid economic justification. Ultimately, however, the challenges associated with hard adaptation types and soft, non-structural adaptations far outweigh the limitations of ecosystem-based approaches.

Use of the above adaptation types varies across the globe with their effectiveness in practice frequently the topic of climate related research (e.g. Harman *et al*., 2015; Bukvic *et al*., 2015). While scholarship exploring the implementation of adaptation strategies is growing, global responses to climate change are still largely focused on mitigative efforts with the literature reflecting this trend.

3.5 Global Policy Approach

Globally, mitigative efforts are recognized as a vital response to a changing climate. Adaptation, however, has not received similar acceptance as a vital response to climate change. It is only recently that adaptation has emerged in policy discourse as a critical aspect necessary to address climate impacts and increase resilience. This is because decision-makers have come to accept reports stressing that even with the most aggressive emissions reduction strategies, some degree of further climate change is inevitable (Klein *et al*., 2005). Adapting to both the current and potentially damaging future impacts of climate change is imperative if local governments are to be resilient and function efficiently (Noble *et al*., 2014). This is not to say that adaptation alone constitutes the best response to climate variability. Indeed, adaptation and mitigation are complementary strategies that must both be present if climate policy is to be effective (Bosello *et al.*, 2010).

In today's changing climate, community experience with adaptation and mitigation efforts is accumulating and significant progress has been observed (IPCC, 2014). It is largely accepted that effective mitigation requires international cooperation. Mitigation has thus gained greater momentum than adaptation at a global level (IPCC, 2014). This widespread cooperation has been implemented through efforts spearheaded by the United Nations Framework Convention on Climate Change (UNFCCC), for example, whose main goal is to facilitate universal participation in addressing climate change (IPCC, 2014). Moreover, the Kyoto Protocol and Paris Agreement provide lessons towards achieving the ultimate objective of the UNFCCC and set commitment targets for the vast list of signatory countries (IPCC, 2014). International cooperation on supporting adaptation actions, however, receives less attention. Scholars echo this notion, highlighting that the implementation of adaptive strategies is limited, adaptation efforts at a local scale remain in the early phases of initiation and are incremental, and mitigation continues to outweigh adaptation in terms of policy (e.g. Wise *et al*., 2014; Stults and Woodruff, 2017). With that said, the 2015 Paris Agreement calls for efforts to adapt to the effects of climate change (UNFCC, 2015). This transition towards a greater inclusion of adaptation efforts within global climate change policy exemplifies the evolving realization of the need to adapt. This enhanced awareness is reflected in decision-making processes at all levels of government and where adaptation is beginning to find its way into strategic priorities of local governments.

3.6 Regional Planning

In Canada, there are three levels of government: federal, provincial, and local. Regional planning broadly falls under the category of local governments where regional bodies function similar to municipal entities. The role and responsibilities of local governments is outlined within provincial legislation and includes the provision of goods and services to residents within a political boundary (Norton, 2013). Common services provided by local governments involve fire and police services, education, recreational opportunities, and local infrastructure such as streets, sewer, lighting, and water supply systems (Norton, 2013). To efficiently fulfil their responsibilities, local governments are comprised of various departments, such as building, engineering, and planning and development. The McGill School of Urban Planning defines urban planning as "a technical and political process concerned with the welfare of people, control of the use of land, design of the urban environment including transportation and communication networks, and protection and enhancement of the natural environment" (McGill University, 2019). Norton, (2013) simplifies this definition by highlighting that planning is a 'pragmatic activity intended to influence the form of the city and, in most cases, to make the city a more liveable environment'(p. 494). In general, regional planning is concerned with a wide range of issues, including the impacts of climate change.

Because local governments face climate impacts directly and represent the level of government closest to the resident, they are largely responsible for leading climate responses (Nalau *et al*., 2015). Scholars have recognized the local government planning system as a key tool to anticipate and respond to climate challenges (e.g. Wilson, 2006; IPCC, 2014; Nalau *et al*., 2015). This involves integrating climate change considerations into planning processes and systems to facilitate early action that offers greater flexibility and cost-effectiveness than reacting to climate impacts as they arise (Wilson, 2006). In the context of the study area, regional responses to a changing climate can be observed in the strategic planning and policy initiatives undertaken by RDs. For instance, several RDs have incorporated emissions reduction targets within their regional growth strategies and outline desires to employ anticipatory adaptation planning (e.g. Regional District of Nanaimo, 2011). Moreover, local governments can utilize land use planning and development regulations to implement non-structural and ecosystem-based adaptation strategies such as setbacks and foreshore naturalization. Embedding adaptation and mitigation considerations within strategic planning frameworks can facilitate robust climate

responses not only because of the legal weight of these documents as a community's guiding land use document, but because these plans address diverse and cross-cutting issues necessary to address climate change (Baynham and Stevens, 2014). However, scholars often find that mitigation far outweighs adaptation within local government strategic responses (e.g. Baynham and Stevens, 2014; Birchall and Bonnett, 2019).

3.7 Urgency of Adaptation

With the reality of continued climate change, and the surpassing of the 2-degree Celsius tipping point becoming more likely, adaptation becomes a necessity. Moreover, the urgency of adaptation is clearly demonstrated by the consequences of inaction. For example, numerous communities across the globe have failed to implement anticipatory adaptation actions and as a result, have been devastated by climate impacts. Across the globe the damaging and costly effects of a changing climate have already been observed where coastal communities and societies have been overwhelmed by increases in the frequency and intensity of storm surges, extreme weather, flooding events, and coastal erosion (e.g Birchall and Bonnett, 2019).

The need for adaptation is further emphasized when climate projections and the future effect of climate impacts on human and natural systems is considered. For instance, several climate change experts have projected the extent of human displacement and land inundation under future rates of sea level rise. With a one-meter rise in sea level, some predictions forecast that globally, 67 million people will be at risk, while others project numbers of up to 187 million people (Geisler and Currens, 2017). In the United States alone, Hauer *et al*. (2016) have projected that if the sea level were to rise 0.9 meters by the year 2100, it would cause massive coastal flooding, putting 4.2 million individuals at risk. The potential economic and social costs of future climate change, along with the current threats facing society, demonstrate the need to transition the global policy response to one involving both mitigation and adaptation. As the need for adaptation is expected to increase (IPCC, 2014), scholars have examined the process and implementation of adaptation planning at various levels of government with a focus on the internal and external barriers and challenges to adaptation planning (Pasquini *et al*., 2013).

3.8 Challenges to Adaptation

The literature broadly identifies five significant challenges facing the process of adaptation planning and implementation: 1) lack of leadership and guidance, 2) conflicting priorities and opinions, 3) limited capacity to act, 4) science-policy gap, and 5) limited policy framework.

1) Lack of leadership and guidance

Research on climate change adaptation has identified the critical role played by champions, both at the local level and within senior levels of government. Champions may include individuals in senior leadership or management roles who are actively advocating for positive change. They may be elected officials or senior planners, for example, who strongly encourage and facilitate the process of climate change adaptation. Pasquini et al. (2015) draw on the need for leadership, highlighting that championing climate change adaptation at the senior official and political level is crucial for spurring rapid change and ensuring that adaptation efforts are broadly integrated across all departments. Strong leadership acts to put in motion the process of adaptation, provides guidance, and ensures that momentum is sustained over time. Furthermore, a champion can highlight the need to act, make available the resources to adapt, and build key networks that are necessary to undertake adaptation (Ford and King, 2015). For instance, in a study examining the mainstreaming of adaptation in two municipal case studies in the Western Cape, South Africa, findings suggested that over the course of five years, two senior councilors were able to spur change in mind-set in their municipality that resulted in the implementation of sustainable development initiatives (Pasquini *et al*., 2015). The importance and need for local champions is clear, but strong leadership is absent in many cases, leading to either an uncoordinated approach or a complete lack of impetus to trigger the adaptation planning process. Without strong leadership and guidance, local efforts may falter in ensuring that climate change adaptation and its' implementation is a priority, resulting in a fragmented approach that receives little attention in contrast with other local priorities (Krellenberg and Barth, 2014).

2) Conflicting priorities and opinions

The responsibilities of a local government are vast, and their functioning is inherently shaped by the priorities and views of senior officials and administrators. Climate change adaptation must be prioritized by communities to guarantee that action will be undertaken, and resources dedicated to adaptation planning. Research focused on the challenges of local adaptation frequently highlights that conflicting priorities impede effective action (e.g. Hamin *et al*., 2014). These include assumptions that climate change is a distant threat not requiring immediate action, that private property interests are too strongly opposed to action, that there is a general lack of public knowledge and support, and that the science remains uncertain (Hamin *et al*., 2014). Such opinions and views strongly influence the decision-making process and bias the provision of resources within a community. It is widely recognized that action and transformation is most effective when it aligns with currently-held values and priorities (IPCC, 2014). Thus, for the process of adaptation planning to be efficient and effective, adaptation must first become a strategic priority of decision-makers and actors involved in the conception and development of adaptation actions.

3) Limited capacity to act

The limited capacity of local governments is a common theme emerging in recent literature. The capacity of an organization refers to its availability of scientific information, time, money, and personnel. Scholars reveal that while decision-makers are largely aware of climate impacts, they lack the capacity to respond and prepare effectively for climate stressors (Thorne *et al*., 2017; Baker *et al*., 2012). In general, effective adaptation planning is not occurring because of a lack of capacity, which is needed to translate climate information into geographically specific climate action plans and strategies (Baker *et al*., 2012). Climate change is a complex issue requiring a significant investment of time, personnel, and fiscal resources. Thus, a coordinated approach is called for to respond to the limited capacity of local governments. Because local governments lack access to adequate levels of capacity needed for adaptive efforts, senior levels of government are called upon to support local efforts. However, cooperation among various levels of government presents challenges. For example, Nalau *et al*. (2015) point to the common occurrence of negative responsibility-shifting which takes place when a state/province provides a clear mandate without downloading adequate resources required to tackle climate change adaptation. Moreover, scholars suggest a need for greater transparency and

cooperation to clarify the roles and responsibilities of various levels of government in addressing climate change (e.g. Ford and King, 2015). It is important to note, however, that an adequate capacity to act does not mean that action on climate adaptation will occur. In other words, a high adaptive capacity will not always translate into adaptation implementation in practice (Ford, Berrang-Ford, and Paterson, 2011) if, for example, factors such as a lack of political will and competing priorities are at play.

4) Science-policy gap

The well-studied science-policy gap is related to the concept of a limited capacity to act. It is widely accepted that local climate change adaptation planning must be rooted in, and informed by, sound science. However, research on the use of expert knowledge has revealed several complex challenges. Climate change science involves a degree of uncertainty, and is often challenging to scale to urban and local levels (Krellenberg and Barth, 2014; Van Stigt *et al.*, 2015). Ford and King (2015) highlight that the availability of useable science is a crucial factor necessary for adaptation to occur. In order to inform decision making and policy creation, useable science should be relevant and pertinent, of sufficiently high quality to be trusted, and available in time to affect decisions (Ford and King, 2015). However, many projects and adaptation strategies do not exhibit a successful link between useable science and decision-making (Thorne *et al*., 2017). This mismatch highlights the importance of the interaction between scientists and information-users when translating climate science into effective actions. It also illustrates the challenges of communicating climate science. The way in which scientific knowledge is communicated to practitioners and politicians can influence their willingness to change their priorities and political agendas (Krellenberg and Barth, 2014). Because climate change science is highly complex, inherently uncertain, and riddled with scientific verbiage, it is often misunderstood by planning practitioners, inappropriately communicated to decision-makers, and not utilized to its full extent. Ultimately, the above challenges contribute to the misuse of expert knowledge in adaptation planning and highlight the need for cooperation between scientists and the users of climate science to ensure that adaptation efforts are appropriately advised and supported.

5) Limited policy framework

Lastly, local governments are challenged from a policy standpoint by a lack of adaptation integration into local strategic documents, high level policy, and other plans. Municipalities currently prioritize mitigation strategies, even though the challenges associated with costs for local governments indicate that adaptation should be prioritized. This focus on mitigation has been translated into plans and policy that show a greater inclusion of mitigative strategies when addressing climate change that outweigh and are more developed than adaptation strategies (Baynham and Stevens, 2014). For instance, at the federal level, Labbe *et al*. (2017) note that Canada lacks a national adaptation plan, while mitigation is evidently addressed. A robust policy framework that establishes well informed adaptation goals, provides long term guidance, suggests specific adaptation actions to be implemented, and outlines an implementation plan, can be a critical tool that facilitates effective adaptation planning. A strong policy framework provides decision makers with the tools necessary to implement adaptation goals and can ensure that land use and development goals align with an adaptation agenda. In its most recent report, the IPCC stresses the urgency of incorporating adaptation into strategic documents, stating that the "integration of adaptation into planning, including policy design and decision-making can promote synergies with development and disaster risk reduction" (IPCC, 2014, p. 19).

Climate related research is saturated with case studies examining the barriers/ challenges local governments face in undertaking adaptation planning (Biesbroek *et al*., 2013). However, there is a lack of scholarship exploring decision-dynamics that relate to adaptation planning processes with a specific focus on how adaptation is integrated within strategic planning and policy and what factors contribute to or cause the barriers to effective adaptation (Biesbroek *et al*., 2013; Labbe *et al*., 2017). Greater understanding of these topics is particularly important for coastal communities, given their heightened vulnerability to climate stressors and urgent need for effective adaptation planning.

3.9 Vulnerability of Coastal Communities

Vulnerability is a central concept in climate change research. Definitions of vulnerability are highly variable according to the field of research in which it is being applied. In its fifth assessment report, the IPCC notes that vulnerability refers to the susceptibility of human and natural systems to harm and is characterized as the tendency or likelihood of human and natural systems to be adversely affected by climate impacts and threats (IPCC, 2014). Scholars have

adapted this definition to identify factors that contribute to the vulnerability of a system to climate change. For instance, Adger *et al*. (2003) suggest that factors such as the exposure, physical setting and sensitivity, and capacity of a system to adapt influence the vulnerability of systems. While the literature broadly identifies that local governments bear the brunt of climate impacts and face vast challenges when employing the process of adaptation, it is coastal communities in particular, that are highly vulnerable to a changing climate. Coastal locations exhibit a heightened vulnerability because of a number of interacting factors, including their geographic location, population density, dependence on marine resources, and exposure to various climate threats. These coastal communities show an accentuated exposure of humans and assets to risk and are predicted to experience increasing risk over time (IPCC, 2014). Moreover, many coastal locations are tasked with preparing for future climate impacts while they are reacting and responding to immediate threats. This frequent response to immediate impacts tends to consume a substantial amount of resources, which could otherwise be applied to preparing for future climate impacts, thus hindering anticipatory action.

A key factor influencing the vulnerability of coastal communities is their population density and geographic location. As coastal areas are often densely populated, they represent a concentration of infrastructure and population inherently vulnerable to climate threats (Nicholls *et al*., 2008). Many predictions show that coastal locations are likely to experience further population growth, urbanization, and economic development, which in turn enhances coastal vulnerability and exposure (IPCC, 2014). Because coastal communities are often low-lying and located in close proximity to the sea, they are increasingly susceptible to harm associated with rising sea levels and sea surface temperatures, ocean acidification, storm surges and extreme weather. For instance, communities located on the Eastern coast of Vancouver Island have already observed rising sea levels and an increase in the intensity of storm surge events (British Columbia Ministry of Environment, 2015). Although sea level rise (SLR) is characterized as a slow onset challenge given its delayed rate of impact, it will translate into a persistent problem in the future and preparing for its effect must not be overlooked (Bonnett and Birchall, 2019). Scholars have warned decision-makers that without anticipatory action, coastal communities will face mass SLR-induced displacement (e.g. Geisler and Currens, 2017). Predictions of human displacement as a result of SLR range from 67 million to 187 million people at risk with a one-meter rise in sea levels (Geisler and Currens, 2017). In addition to rising sea levels, coastal

communities are subject to ocean warming and its associated impacts. Rising sea surface temperatures strongly influence the formation and duration of extreme weather events, including hurricanes. These weather systems originate over the sea, and as a result, are more likely to threaten coastal areas. It is important to note that the factors contributing to the vulnerability of coastal locations interact in ways that accentuate the susceptibility of coastal human and natural systems to harm. These effects highlight the need for interventions enhancing resilience in the face of climate threats.

In the context of the study area, it is very likely that vulnerability to climate impacts is heightened given the Island's extensive coastline and susceptibility to changes in the climate that are already underway. Numerous climate related planning documents such as the Province of B.C document "Indicators of Climate Change for British Columbia" identify parts of Vancouver Island as a coastal region at risk to the impacts of climate change (British Columbia Ministry of Environment, 2015). In association with provincial led studies and reports on climate change stressors, the government of BC has developed documents intended to assist local governments with their responses to climate variability. However, climate data and adaptation strategies scaled to Vancouver Island are limited. Moreover, while climate impacts, such as sea level rise and more extreme and variable weather events, are persistent, research connecting to this topic in the area of Vancouver Island is underdeveloped.

3.10 Locating the Research

This literature review provides a systematic overview of scholarly work in the area of climate change planning. Several themes and concepts were drawn from the literature, including climate change broadly, adaptation types, persistent challenges, and the vulnerability of coastal communities. Given the purpose and objectives of this research, this study fits within and contributes to a critical area of research: climate adaptation planning. Moreover, this research addresses several gaps that exists in the literature.

Climate scholarship is saturated with studies that analyze human contributions to rising GHG emissions, mitigation strategies and policies, and climate impacts facing socio-ecological systems (e.g. Adger *et al*., 2003; Bosello *et al*., 2010; Bulkely and Tuts, 2013; Donner and Webber, 2014; Klein *et al*., 2005; Scrieciu, 2011). While mitigation and the physical impacts of climate change receive significant attention, literature on adaptation is nonetheless growing. This

field of scholarship features studies that explore local government resilience to climate change, adaptive capacity, adaptation strategies, and climate change planning barriers (e.g. Adger *et al*., 2003; Bosello *et al*., 2010; Bulkely and Tuts, 2013; Donner and Webber, 2014; Klein *et al*., 2005; Scrieciu, 2011). Research that analyzes local climate change planning tends to focus on the municipal scale, with larger cities receiving excessive attention (e.g. Marolla, 2016). These studies also show a greater focus on the ways in which mitigation is incorporated into local planning documents and policy and the common barriers to undertaking adaptation planning (Biesbroek *et al*., 2013; Baynham and Stevens, 2014). Given the above, and in order to contribute to the literature, this research aims to examine the implications of climate impacts for local governments, decision dynamics around regional climate change actions, and the extent of adaptation integration within planning and policy responses at a regional planning scale. Further, through use of a resilience theoretical lens, this study will identify key factors that contribute to common adaptation barriers and enhance our understanding of urban resilience to climate variability.

4. Theoretical Framework: Resilience Theory

4.1 Introduction

Theories are developed with the intent to predict, explain, and understand phenomena (Labaree, 2013). In many instances, theories are used to challenge and advance existing knowledge within the scope of standing assumptions (Labaree, 2013). A theoretical framework is comprised of concepts and existing theories used to provide a conceptual view of how relationships between varying factors are important to the objectives of a research study (Labaree, 2013). When applied, the theoretical framework must demonstrate an understanding of theories and concepts that are relevant to the research topic, and that connect the researcher to broader areas of existing knowledge (Labaree, 2013). Theories are thus used as a conceptual basis for understanding, examining, and creating inferences relating to relationships within social systems (Labaree, 2013). With this in mind, resilience theory has been selected as the conceptual lens through which the research objectives will be explored. It is important that "resilience" be defined prior to reporting on the elements of resilience that contribute to the theoretical framework.

Building resilience has become an increasingly accepted strategy for adapting to climate change. In fact, the terms "adaptation" and "resilience" are frequently used interchangeably in climate related discourse. As a rapidly growing concept, some scholars note that resilience is beginning to replace the term "sustainability" (Davoudi *et al*., 2012). While resilience is gaining global acceptance with many societies striving to be resilient, its meaning remains unclear (Davoudi *et al*., 2012). A prominent challenge with using resilience theory is the lack of a common definition for the term. This problem is widely recognized in the literature, where scholars note the complexities of defining the seemingly simple concept of resilience (Windle, 2011).

4.2 The Three Faces of Resilience

The term "resilience" originates from the Latin word *resiliens*, which broadly refers to elasticity and the ability to bounce back (Windle, 2011). Resilience as a term was first used in the physical sciences to describe the stability of materials and their resistance to external shocks (Davoudi *et al*., 2012). The term then found its way into ecological fields in the 1960s, where it

took on many different meanings (Davoudi *et al*., 2012). During this era of resilience thinking, many scholars differentiated definitions of resilience into "engineering resilience" and "ecological resilience" (e.g. Davoudi *et al*., 2013; Holling, 1973). "Engineering resilience" refers to a stable system which can return to equilibrium following a disturbance (Davoudi *et al*., 2013). In this sense, the ability of a system to resist a disturbance, and the speed at which it can return to a stable state, is a measure of resilience (Davoudi *et al*., 2012). For example, if a human system can withstand a flooding event and bounce back to its previous state quickly, it is resilient. Crawford Stanley Holling, a Canadian theoretical ecologist, defined "ecological resilience" as "the magnitude of the disturbance that can be absorbed before the system changes its structure" (Holling, 1996, p. 33). From this perspective, ecological resilience refers to the ability of a system to embrace changes and still persist. This concept deviates from the engineering perspective by considering how long it takes for a system to recover as well as how much disturbance can be tolerated.

A third concept of resilience, "evolutionary resilience," is often referenced in the literature as well (Davoudi *et al*., 2013). Both engineering and ecological resilience are concerned with a stable state and the ability to bounce back, while evolutionary resilience considers the ability of socio-ecological systems to adapt in response to stress (Davoudi *et al*., 2013). Here, systems undergo an "adaptive cycle" which involves growth, conservation, creative destruction, and reorganization (Davoudi *et al*., 2013). Evolutionary resilience challenges the underlying notion of equilibrium states in engineering and ecological resilience definitions by arguing that systems may change over time, and that it is unnecessary that they return to their prior state (Davoudi *et al*., 2012). This definition of resilience reflects a paradigm shift in how scientists perceive our world (Davoudi *et al*., 2012). Rather than seeing our world as orderly and stable, scientists are increasingly recognizing that it is complex and unpredictable (Davoudi *et al*., 2012).

This transition in viewpoint strongly reflects the impact of climate change on our world, and accepts that climate change is inherently complex and associated with some degree of uncertainty. As a result, this study will employ an evolutionary resilience perspective and definition. This perspective best suits the purpose and objectives of this research, given the adaptive nature of evolutionary resilience. The very purpose of this research is to examine the

extent of climate change adaptation integration into strategic policy and planning, justifying the use of an evolutionary resilience definition.

4.3 Resilience Theory in the Literature

Resilience theory has been used in many disciplines where its definition has been adapted to best suit the topic at hand. In the context of climate change, a range of definitions and characteristics of resilience have been developed with the primary aim of building resilience. While this further supports the claims of complexity surrounding the theory, some scholars argue that this complexity may be beneficial. For example, Borquez et al. (2017) describe that "this diversity is positive, because it gives flexibility which can be applied to different contexts and is part of the complexity inherent in the real world" (p. 164). Within political and environmental fields, resilience theory can serve to unpack the complexities associated with climate threats and the ability to adapt to those threats. While the complexity of resilience has been used by scholars to argue in favor of resilience theory, others point to its drawbacks in scientific research. For example, Olsson et al. (2015) highlight that the varying definitions may blur and dilute the meaning of resilience. They also add that, because the term "resilience" is associated with ambiguity, it does not belong in science, which rests on core underpinnings of accuracy and precision (Olsson *et al*., 2015). These arguments focus on the need for exactness in scientific research, and fail to take into account the unpredictable nature of climate change. Research on climate change is constantly evolving with predictions and projections changing over time. As a result, accuracy and precision are still strived for, but are often less achievable in climate sciences. Scholars studying climate change aim to present the most reliable and up-to-date information in order to contribute to climate literature. However, climate change's inherent complexity and unpredictability renders accuracy of reporting difficult.

Moving outside physical sciences, resilience theory has found its way into social sciences where scholars present arguments for and against its use. Olsson et al. (2015) highlight that resilience theory constrains the dialogue because the core concepts of social sciences -- such as conflict, knowledge, and power -- are absent from resilience theory. In this sense, resilience theory cannot be utilized as a unifying concept in social sciences, which is evidenced by the lack of its use in many published social science studies (Olsson *et al*., 2015). However, while resilience theory tends not to be advantageous in social sciences, Olsson et al. (2015) highlight

that it serves as a unifying concept in ecology and environmental studies. The utility of resilience thinking within environmental, and specifically climate research, has been detailed by numerous scholars. For example, Tschakert and Dietrich, (2010) speak to the adaptive and transformative aspects of resilience and it's relation to responding to climate impacts: "A resilience perspective on adaptation emphasizes learning, self-organization, and flexibility as crucial ingredients for navigating complex feedbacks, thresholds, and system changes" (Tschakert and Dietrich, 2010, p. 4). Here, the authors leverage the key concepts of resilience theory to understand and describe processes of climate change adaptation. In the context of climate change adaptation, however, resilience theory proves to be challenging when it is translated into practice.

Policy makers and researchers frequently embed resilience into overarching adaptation goals, objectives, and strategies (Morecroft *et al*., 2012). Here, resilience is something to be pursued with the intent of creating sustainable and prepared systems. However, translating an obscure concept framed as a strategic goal to 'increase resilience' into effective, on-the-ground, action presents many challenges (Morecroft *et al*., 2012). Moving from resilience theory to practice is challenging largely because there are a number of definitions and meanings of resilience, and because there are uncertainties about the most effective ways to enhance resilience (Morecroft *et al*., 2012). Moreover, Morecroft et al. (2012) argue that resilience is a useful concept for climate adaptation in a broad sense, only if decision-makers understand their system and have clear adaptation goals. Resilience theory is thus useful in climate research if those applying the theory have a deep understanding of resilience itself and a host of contextual factors.

4.4 Resilience Theory as a Conceptual Framework

This research uses resilience theory as the theoretical framework to better understand the extent of adaptation integration within local policy frameworks and local climate change adaptation planning efforts on Vancouver Island (e.g. Davoudi *et al*., 2013; Tyler and Moench, 2012). Resilience theory can serve to unpack the complexities associated with climate threats and the ability to adapt to those threats. This study uses elements of urban resilience to create a conceptual framework in which the research objectives are explored. This method is adapted from the approach used by Tyler and Moench (2012) in their study of urban climate resilience. There, the conceptual framework integrated knowledge on the factors contributing to urban

resilience. Tyler and Moench (2012) identified three generalizable elements of urban resilience: systems, agents and institutions (Figure 3). The characteristics of each element will be reviewed and integrated into the present research's conceptual framework to better understand the process of building urban climate resilience.

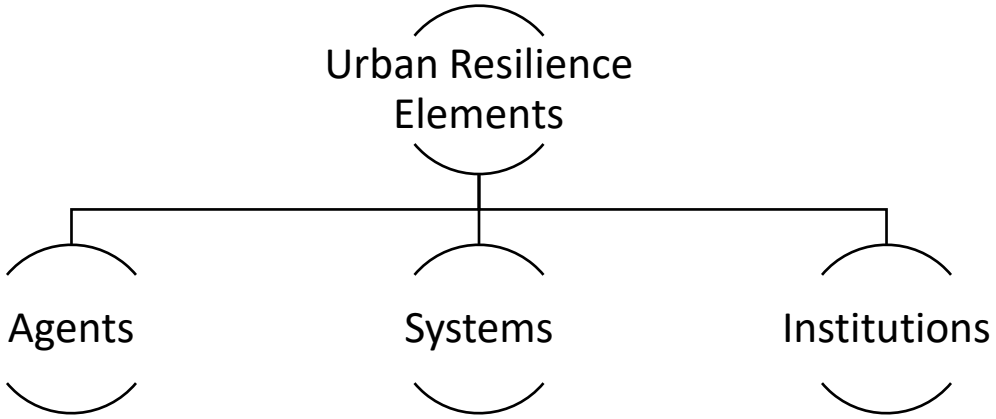

Figure 3- Urban resilience elements.
A conceptual framework for examining urban resilience includes the use of three elements of urban resilience: agents, systems, and institutions.

4.4.1 Agents

Agents as elements of this framework include individuals, households, and organizations (Tyler and Moench, 2012). Examples of individuals and households may include farmers and consumers, while examples of organizations include governments and non-governmental organizations (NGOs). Agents differ from the other resilience elements in that they are capable of deliberation, independent analysis, interaction, and strategic choice when presented with new information (Tyler and Moench, 2012). Agents are actors with volition who behave differently according to their location and structure within society, their preferences, and the opportunities and constraints they face (Tyler and Moench, 2012). It is important to note that the resilience of actors is variable across urban populations and depends on factors such as poverty, gender, ethnicity, and age. However, social agents are an integral part of the framework given their influence on the capacity for learning and innovation. When considered in the context of climate

change adaptation, the ability of individuals and organizations to learn and strategically make choices is a crucial aspect of resilience approaches (Adger *et al.,* 2003). Kim and Lim (2016) highlight that agent capacities, including responsiveness, resourcefulness, and capacity to learn, are key factors that influence urban resilience. For instance, a high capacity agent has the ability to anticipate and respond to external stresses such as climate change. This may be exemplified in the case of a government anticipating and identifying climate change threats and responding quickly by imposing floodplain regulations to prevent harm. The ability of an agent to respond to change and stress, however, is influenced by the resources available to them, and their ability to access supporting systems (Davoudi *et al*.,2012).

4.4.2 Systems

Systems are an essential element of urban resilience, and include physical infrastructure and ecosystems (Adger *et al*., 2003; Tyler and Moench, 2012). These systems provide key services for urban populations and may be located within an urban area, immediately adjacent, or in remote locations in the case of ecosystems. While not located within an urban area, remote ecosystems are key factors that contribute to urban resilience by providing critical services such as food production, runoff management, or flood control. Tyler and Moench (2012) highlight that critical or core systems, such as food and water supply, are essential to urban functioning as their failure creates significant challenges for human well-being. Additional examples of support and core systems include roadways, energy grids, and wetlands. Systems that are resilient retain functionality and can be quickly reinstated through system linkages despite failures or operational disturbances (Moench, 2014). In this sense, resilient systems do not rely on hard protective structures and the strength of individual components. Many scholars have identified various characteristics that contribute to the resilience of urban systems (e.g. Alberti *et al.*, 2003; Andersson, 2006; Bruneau et al., 2003; Gunderson and Holling, 2002; Leichenko, 2011; Meadows, 1999). Such characteristics include flexibility and diversity, redundancy, and safe failure (Tyler and Moench, 2012).

4.4.3 Institutions

Within social sciences, institutions are defined as social rules or conventions that structure human behavior and interactions (Tyler and Moench, 2012). Institutions may be formal or informal and are generally created to maintain social order and stabilize forms of human interaction by creating a sense of predictability and certainty (Tyler and Moench, 2012).

Institutions are a key element within the resilience framework given their influence on the interaction between agents and systems (Tyler and Moench, 2012). This influence is reflected in the example of institutions that enable or constrain agents to engage in decision-making, thus determining whose interests are considered. If the individuals most vulnerable to climate impacts are prevented from engaging in decision-making processes to respond to climate impacts, then resilience may be reduced. Key aspects of institutions that should be considered with respect to the enhancement or hindrance of resilience are: rights and entitlements linked to system access, decision-making processes, information flows, and the application of new knowledge (Moench, 2014). In general, resilience is enhanced if institutions provide agents with the right to use key resources and access urban systems, enable decision-making process that follow widely accepted principles of good governance, allow for agents to have ready access to credible and meaningful information, and facilitate the generation, exchange and application of new knowledge (Moench, 2014).

4.5 Resilience Framework in Practice

The vulnerability of urban and human systems to climate change refers to the susceptibility of those systems to harm (IPCC, 2014). Vulnerability can be thought of as the tendency or likelihood of human and natural systems to be negatively affected by climate threats and hazards. Tyler and Moench (2012) highlight that vulnerability to current and future climate impacts can be reduced by building resilience. Building urban resilience through the lens of this conceptual framework is described as "strengthening systems to reduce their fragility, building the capacities of social agents to anticipate and develop adaptive responses, and addressing the institutional factors that constrain effective responses or undermine the ability of agents to take action" (Tyler and Moench, 2012, p. 319). In practice, this conceptual framework can effectively enable decision-makers to identify elements contributing to the resilience of urban systems. By considering the function of core infrastructure and ecosystems, together with the capacities of agents and the influence of institutions on systems and agents, practitioners can easily apply this framework to a range of different contexts with the intent of addressing resilience issues (Tyler and Moench, 2012).

When applied, the framework has successfully assisted Asian cities, such as Surat, Da Nang, and Chiang Rai, in planning for and implementing climate adaptation efforts. Actors were

able to leverage their local knowledge to identify significant vulnerabilities and interventions with guidance from the climate resilience framework (Tyler and Moench, 2012). This highlights the utility of this framework in translating broad climate objectives into simplified and identifiable issues/vulnerabilities. For the purpose of this research, the resilience framework is used to interpret the research objectives, better understand the research findings, and act as a tool for developing key inferences.

5. Methodology

5.1 Introduction

To fulfill the research objectives, a mixed methods approach is employed, yielding both quantitative and qualitative findings. Described as a "scientifically rigorous methodology," this approach is characterized by the presence of a core method that is combined with or supplemented by a second method (Morse, 2016). This design, while often valued for its robust nature, is also criticized in the literature from a variety of standpoints. Many scholars cite the "incompatibility thesis," which is grounded in the notion that quantitative and qualitative methods cannot be mixed (Johnson and Onwuegbuzie, 2004). This is because the two methodologies are inherently different, and there is a rich history of scholarly debate about their validity. However, the contrast between the two can be viewed positively, where a mixture of both methods creates a strong, thorough approach. This occurs through a supplementary process which enhances the understanding of a topic by verifying results from another perspective (Morse, 2016). However, the supplemental concept of mixed methods approaches can be a detriment if, as noted by Onwuegbuzie (2014), the supplementing method is viewed to be incomplete or less rigorous than the method it supports. While this argument holds true, it can be avoided by thoroughly justifying each method and ensuring the combination is fluid and scientifically sound. In general, mixed method tactics are gaining interest within the climate change and policy literature base as a robust methodology that provides rich data. Scholars from a variety of disciplines have argued that to adequately explore complex phenomena, more than one research methodology is needed, thus warranting the use of mixed methods approaches (Morse, 2016). Undertaking such an approach allows for a topic to be explored at various levels, with a range of results as the outcome (Morse, 2016). This approach is thus ideal, as it lends itself well to multi-disciplinary issues such as climate change (Birchall *et al*., 2016). The process for employing a mixed methods approach varies according to the outcome desired. This study, however, uses a twofold approach, consisting of quantitative and qualitative aspects.

5.2 Mixed Methods

5.2.1 Quantitative

Firstly, a plan content analysis was undertaken involving the systematic gathering of relevant local and regional strategies and plans, and evaluating the content of the plans using a

method adapted from Baynham and Stevens (2014). Strategic documents necessary for the analysis were gathered by reviewing the municipal and regional databases of planning documents and confirming the extent of documents with qualified personnel. Once the documents were selected and reviewed for applicability, the contents were then scored or evaluated against a framework of critical elements (e.g. Baker *et al*., 2012 and Tang *et al.,* 2011).

Plans included:

1. Comox Valley RGS
2. Comox Valley Climate Action Plan
3. Capital Regional District RGS
4. Capital Regional District Regional Climate Action Strategy
5. Nanaimo RGS
6. Mount Waddington Regional Plan

RGSs were selected as these documents act as overarching regional planning tools for RDs, the Mount Waddington Regional Plan was included given that it mimics a RGS while not being a binding strategic document, and climate related regional documents were reviewed in order to evaluate the content of climate specific regional plans. While the focus of the plan content analysis was on regional planning documents (RGSs, regional plans, and Climate Change Plans), the Official Community Plans (OCP) from each incorporated municipality were also evaluated. There are a total of 36 incorporated municipalities involved in this study, each having an OCP. These plans will be analyzed to investigate the influence of regionally set climate goals on municipal climate planning. Moreover, including the 36 OCPs within the quantitative analysis created a more rigorous research project and produced findings that demonstrate the influence of regional planning on municipal action.

Plan content methodology is an approach to quantify qualitative information by way of sorting and scoring existing data. For the purpose of this study, the analysis was intended to evaluate certain aspects of plans or the overall functioning of a plan. Content analysis is used in various disciplines and is comprised of several steps. The first step involves the identification of data sources. Once the data have been identified and collected, categories are then devised. The categories are intended to reflect the research objectives and are subject to change as the project progresses. The next step is to code the data, generally by assigning scores. Finally, the data is analyzed, and the reliability of the findings is assessed. The systematic nature of plan content

analysis has resulted in this approach being commended for its transparency (Kolbe and Burnett, 1991). However, while the process for undertaking a plan content analysis is clear and logical, the devised categories may be subject to criticism. This is because there are no set categories – the development of the categories falls to the discretion of the researcher. To avoid reproach, all categories must be soundly justified, and the advantages clearly indicated. In general, the criticisms of this methodology noted in the literature relate to its susceptibility to researcher bias (e.g. Kolbe and Burnett, 1991). The advantages presented in the literature, however, are vast and include the method's unobtrusive nature, simplicity, and potential as a companion research method in mixed methodology research (Kolbe and Burnett, 1991). In general, this methodology was selected because of its clear benefits and given the presence of a policy focus within this research project. All levels of government have recognized the utility of policy as a tool for responding to climate change. Therefore, this study employed a plan content analysis to analyze the extent and quality of climate change adaptation in regional plans, and the effectiveness of both regional growth strategies and climate change action plans. With respect to the local OCP's, the plan content methodology revealed the extent of climate change adaptation considerations at the municipal level.

Four broad categories were used to evaluate the content of the selected regional and municipal plans: goals, policies, fact base, and implementation. These categories guide the scoring process and were informed by the PCA process used by Baynham and Stevens (2014). Categories were developed to reflect the general organization of planning documents where each category allows for overarching sections in plans to be evaluated. Following a protocol used by Tang et al. (2011) to evaluate local climate change action plans, a number of indicators were assigned to each category. Indicators are used to score a plan based on the extent of the functioning within each category with scores ranging from 0-2. A score of 0 is received if the plan does not mention an aspect of interest, a score of 1 is established if an element is considered but not to a great extent, and a score of 2 is given if the plan thoroughly considers the element in question. For example, within the goals category, the indicator "climate adaptation goals" was used to identify if the plans are integrating and prioritizing climate change adaptation. If the plan failed to mention adaptation, a score of 0 was received, if adaptation was simply mentioned within a broader goal, a score of 1 was given, and if adaptation was prioritized and well thought out as part of an overarching goal, the plan was given a score of 2. Indicators are determined

according to a number of different factors. Some indicators are developed by identifying 'best practice' approaches to planning. For example, it is well understood that a rigorous implementation section within planning documents will establish an implementation timeline and identify sources of funding. Other indicators are developed to directly evaluate the presence of critical elements related to the study objectives. As seen within the goals category, the indicator "climate change adaptation integrated" was established to directly identify if adaptation is considered within the goals section. Because the four selected categories are present within each type of planning document to be analyzed, the approach is consistent across the plans. Indicators however, may vary based on whether a Regional Plan or Climate Change Plan is being examined. For example, the concept of climate change indicator was not used to score climate change plans because it was clear that the focus of the plans is climate change. The following list of indicators (Table 1) was used to undertake the plan content analysis for regional growth strategies and plans and climate change plans.

Goals	**Policies**	**Fact Base**	**Implementation**
Concept of climate change	Climate change adaptation policies and risk reduction	Reliable climate data	Implementation plan with individual actions
Climate change adaptation integrated	Land use and development policies related to climate impacts	Scaled climate data	Implementation timeline
Climate adaptation as part of its own goal	Transportation policies related to climate impacts	Long term projections	Funding identified
Long term goals	Energy policies related to climate impacts	Risk assessment or vulnerability analysis	Responsible parties identified
	Language used and strength of policies (e.g. should vs must)		

Table 1- Plan content analysis categories and indicators.
Broad categories of goals, policies, fact base, and implementation are used to guide the scoring of strategic planning documents with a number of indicators within each category used to determine plan scores.

The analytical process was organized in such a way that each RD functioned as its own case study. Findings within each RD were used to devise an overarching understanding of the region which was then compared across RDs. To maintain consistency, only like documents were directly compared within the regional context. For example, findings from the content analysis on a RGS and OCP were not compared with each other as the documents serve slightly different purposes. However, findings at the regional level may have been used to explain findings at the municipal level.

The results gathered from a plan content analysis reveal the overall functioning of a plan, areas of improvement, and factors contributing to the success (or ineffectiveness) of strategic documents. Completion of the plan content analysis allows for regions to be compared and contrasted, the overall preparedness of the Island to be evaluated, and the extent of adaptation incorporation to be numerically identified. This quantitative aspect serves to bolster the qualitative findings and provide a range of informing data from which critical inferences can be drawn.

5.2.2 Qualitative

The qualitative aspect of this research complements the investigative aim of the study and seeks to gather valuable information relating to individual experiences. This was achieved by conducting semi-structured interviews with 13 key actors (see Table 2). Two key actors from each RD, other than the Strathcona RD (one key actor), were interviewed. Key actors were purposefully selected using a criterion and snowball sampling approach. A criterion approach was utilized to ensure that the interviewees could effectively contribute to the dialogue and thus help produce useful results. The interviewees consisted of professional planners, elected officials, and senior staff who could speak to local governmental functioning and their community's climate change agenda. Note: the research aimed to include key actor interviews with other stakeholders, including representatives from the Province, but despite contact with these provincial actors, interviewees from the Province of British Columbia could not be recruited for this study.

Interviewee Code	Interviewee Type	Location	Date
ACRD1= Interviewee 1 from Alberni-Clayoquot Regional District	Elected Official	Port Alberni, B.C	August 10th, 2018
ACRD2= Interviewee 2 from Alberni-Clayoquot Regional District	Senior Management	Port Alberni, B.C	August 13th, 2018
COWRD1= Interviewee 1 from Cowichan Valley Regional District	Senior Management	Duncan, B.C	August 3rd, 2018
COWRD2= Interviewee 2 from Cowichan Valley Regional District	Professional Planner	Duncan, B.C	August 3rd, 2018
CRD1= Interviewee 1 from Capital Regional District	Elected Official	Victoria, B.C	August 1st, 2018
CRD2= Interviewee 2 from Capital Regional District	Senior Management	Colwood, B.C	August 1st, 2018
CVRD1= Interviewee 1 from Comox Valley Regional District	Professional Planner	Courtenay, B.C	August 7th, 2018
CVRD2= Interviewee 2 from Comox Valley Regional District	Professional Planner	Courtenay, B.C	August 7th, 2018
MWRD1= Interviewee 1 from Mount Waddington Regional District	Professional Planner	Port McNeill, B.C	August 17th, 2018
MWRD2= Interviewee 2 from Mount Waddington Regional District	Elected Official	Port McNeill, B.C	August 17th, 2018
RDN1= Interviewee 1 from Regional District of Nanaimo	Professional Planner	Nanaimo, B.C	August 2nd, 2018
RDN2= Interviewee 2 from Regional District of Nanaimo	Elected Official	Nanaimo, B.C	August 8th, 2018
SRD1= Interviewee 1 from Strathcona Regional District	Professional Planner	Campbell River, B.C	August 14th, 2018

Table 2- Key to assist with navigating interviewee code names.
Codes are used to refer to interviewees in order to ensure interviewee identity is secure. The above table highlights the interviewee code name, interviewee type (professional planner, elected official, or senior management) and location and date of the interview.

Effective discourse during the interviews was facilitated by following a semi-structured format. This approach promotes greater flexibility in questioning and enables continuous conversation that progresses over time (Birchall *et al*., 2016). The interviews consisted of a hierarchy of questions that aimed to unpack the following themes (sample questions are provided):

1. **Key climate threats**
    - What are the major climate impacts, if any, your community is experiencing and how is it effecting the region (challenges, opportunities, impacts on planning, safety, your economic security, etc.)
2. **Responses to climate threats**
    - What actions, if any, are being undertaken to respond to climate challenges? This may involve structural adaptations, policy initiatives, the development of climate action plans, altered development regulations and building design, etc.
3. **Nature of climate responses**
    - In your view, what is the nature of the actions your community/region is undertaking in response to climate variability? Is your community being proactive with anticipatory actions or is it reacting to climate impacts on a more immediate scale?
4. **Extent of adaptation in local planning**
    - In your opinion, what is the extent of adaptation inclusion in strategic planning? Is adaptation prioritized at the local level? Is climate change adaptation outweighed by mitigation? Is adaptation embedded in strategic planning documents?
5. **Overall preparedness for climate variability**
    - How would you characterize your community's/region's preparedness for the impacts of climate change? Is it being overwhelmed by climate impacts or has it not yet felt the effects of climate change?
6. **Capacity to undertake action**
    - How would you characterize your community's/region's capacity to respond to climate impacts? Do you have sufficient personnel, climate change information, financial capacity (funding, internal revenue, etc.) and time to undertake adaptive efforts?
7. **The influence of Provincial Mandates (Bill 27) on local climate planning**
    - In your opinion, how has the passing of Bill 27, The Local Government Statutes Amendment Act, influenced your community's/region's climate change planning? Has the mandate triggered greater climate action?
8. **The role of regional planning on municipal climate action**
    - How does regional planning and regional policy influence local/municipal planning? Do climate goals present in regional plans increase the likelihood of

municipal climate action through adherence?

9. **The role of planners**
    - How would you characterize the role played by planners in responding to climate change? Are they involved in the adaptation/mitigation planning process? What skills do they have or not have that influence their ability to contribute to climate change planning?

Each section is hierarchical in format and designed to create conversation that yields findings broadly related to the region's climate change and adaptation planning. Individual interviews lasted approximately 60-90 minutes and took place face-to-face, in an environment that was comfortable for the interviewee (e.g. a community conference room or personal office). The interviews were digitally recorded and professionally transcribed verbatim. Interviewees were given the opportunity to confirm the content of those transcripts prior to their use in the study.

The subsequent transcripts were then examined by following a narrative analysis approach. This methodology has recently gained interest among scholars in climate research as it enables the extraction of valuable information pertaining to individual experiences. The validity of narratives has, however, been questioned as a climate change research data source due to its inherent bias and reliance on interpretation. But the relating of individual experiences has the potential to provide researchers with critical information that cannot be obtained from a purely quantitative approach. Because narratives, or stories, possess the ability to bring the past together with the present (Oliver, 1998), a narrative analysis is highly suitable for climate related research. This is because climate data from the past is incomplete or absent in some instances, and has only recently become vigorous. Scholars within scientific domains tend to favor abstract rationality which utilizes hard, quantitative data to explain or bring meaning to a scientific phenomenon such as climate change. This stems from the view that scientific topics should not be subject to individual perception, and that objectivity is critical. Recently, however, qualitative methodology, including narrative analysis, has emerged in climate science on the grounds that such an approach can be beneficial to broaden our lens and provide a deeper level of understanding (Oliver, 1998). Ultimately, a narrative analysis aims to organize an array of data into narratives that provide explanations or offer insights into the motivation and purpose behind an event (Oliver, 1998).

Narrative analysis involves several steps that may be tailored to the research topic of interest. The first step involves an initial read-through of the transcripts to identify key points relevant from a climate adaptation standpoint. To properly code the transcripts, a more thorough read-through is then undertaken where major themes that are frequently raised are flagged. Like themes from all interviews are then organized and used to create a narrative. These narratives encompass critical information relating to the research objectives and serve as informing data for the study. This qualitative aspect supplements the quantitative findings, provides rich data relevant to climate response complexities, and reveals context specific challenges and insights not easily gleaned from a quantitative analysis.

5.3 Ethical Considerations

Given that this research includes a qualitative component through the use of semi-structured interviews with human participants, ethical considerations were taken into account. This study was approved by the Research Ethics Board of the University of Alberta on June 19, 2018, after the following documents were submitted and reviewed: Letter of Initial Contact, Information Brief, Statement of Consent, Interview/Research Protocol, Agreement of Security and Confidentiality, and Agreement of Security and Confidentiality for the transcription company used in this study.

All interviewees/human participants involved in this study were informed of the purpose of the research, the procedures used for conducting the research, the risks and benefits associated with the research, the voluntary nature of research participation, and the procedures used to protect confidentiality. This was all explained in an information brief and supplemental documents that were provided to the interviewees in an invitation email (initial contact) prior to their participation. Moreover, prior to face to face interviews, the interviewees were required to sign a consent form and agreement of security and confidentiality form.

5.4 Limitations

One limitation to the methodology of this study was the presence of only one interviewee from the Strathcona RD, while two perspectives were used for all other RDs. However, that single interviewee was in a senior position and had longstanding experience in the region, which increases the likelihood that the interviewee was able to speak to a range of topics and capture

various perspectives. Another limitation of this study was the lack of human participants from the province; as a result, this research includes no provincial perspective and is therefore subject to bias associated with opinions of interviewees from exclusively local levels of government.

Lastly, scholars suggest that there are limitations associated with the design of qualitative methods. These include arguments that qualitative studies cannot be reproduced or generalized, and there is no guarantee that different researchers would not come to radically different conclusions and form contrasting inferences (Mays and Pope, 1995). Qualitative research is also criticized as potentially being subject to researcher bias. Indeed, because this study is qualitative in nature and seeks to provide an enhanced understanding of interviewee responses, interpretation of the data may be influenced by the researcher's social and cultural identity (Mays and Pope, 1995). It is important for researchers to be aware of these limitations, and to acknowledge how their social and cultural identities may influence the interpretation of the findings. For instance, as a researcher and student with a Bachelor of Science and strong ties to environmental and land use studies, I must guard against my beliefs and perspectives influencing the analysis and understanding of interviewee responses and data in a manner that misconstrues the perspectives of the participants. It must be noted that not only qualitative methods are subject to limitations, but also quantitative studies as well. Indeed, because the categories and indicators of the PCA are not set and their development falls to the discretion of the researcher, the quantitative method may also be subject to researcher bias and limitations. To eliminate potential limitations and drawbacks associated with the qualitative and quantitative aspects of this research, I incorporated a high level of transparency in the explanation of the method used, detailed the process, provided the raw data and scores, and compared findings to the findings of similar studies to ensure that bias in the scoring process was not occurring. To further demonstrate rigor, several tactics were included in the design and process of this research to address limitations.

5.5 Quantitative and Qualitative Rigor

I have employed strategies to ensure qualitative rigor, which are also used to enhance the trustworthiness of the quantitative method, given that the PCA may be associated with drawbacks related to researcher bias and replicability. There are accepted frameworks and strategies in place that can be used to enhance the trustworthiness of qualitative research based

on researchers satisfying four criteria: credibility, transferability, dependability, and confirmability (Figure 4).

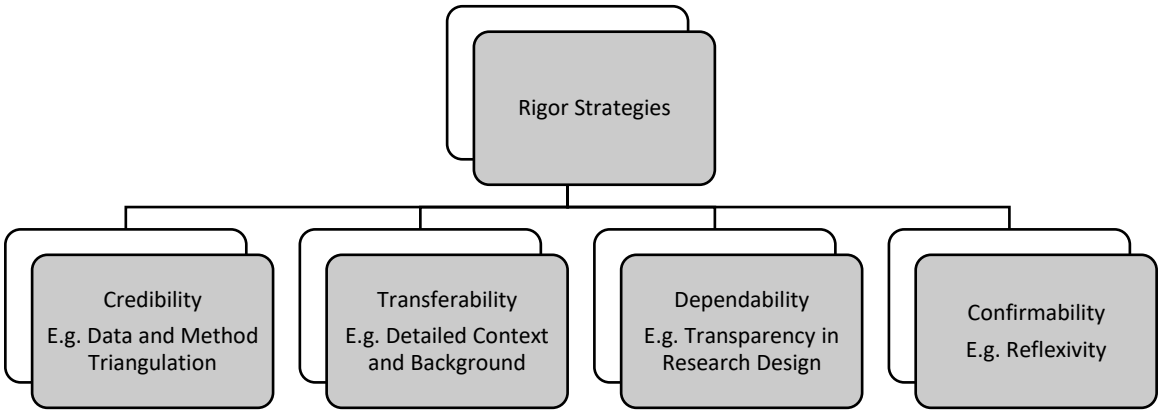

Figure 4: Rigor strategies.
Strategies to ensure qualitative and quantitative rigor involve the researcher satisfying four criteria: credibility, transferability, dependability, and confirmability. Examples of each rigor criteria are provided in the above figure.

5.5.1 Credibility

Credibility relates to the internal validity of qualitative research, where the researcher aims to ensure that their study tests or measures what is actually intended (Shenton, 2004). In this sense, credibility is concerned with how consistent the findings are with reality, and a number of steps can be taken by researchers to enhance credibility. For example, this research used tactics to ensure honesty in participant responses along with data and method triangulation. Participants were made aware the voluntary nature of their participation of this research and were given the opportunity to refuse to participate at multiple times throughout this study. Shenton (2004) argues that when participants are given opportunities to refuse to participate, it ensures that those involved are genuinely interested in participating in the research and are willing to provide honest perspectives. The triangulation tactics used to enhance credibility involved the use of a supplemental method to validate interview findings, a wide range of informants to ensure there was a variety of perspectives and data, and frequent debriefing sessions with my supervisor (Shenton, 2004). For example, by using a mixed-methods approach with an array of

informants, I was able to fact check interviewee responses using the data obtained from the plan content analysis and could compare interviewee responses. Moreover, by consistently meeting with a supervisor and referring to diligent field notes, the investigator's vision was broadened and flaws in research design and processes were identified (Shenton, 2004).

5.5.2 Transferability

Transferability refers to the extent to which the findings and conclusions of a study can be applied to other situations and scenarios (Shenton, 2004). Scholars often note that because the findings of a qualitative study are specific to a limited number of environments, scenarios, and individuals, it is challenging to show how those findings relate to other situations (Shenton, 2004). However, if readers can find similarities to the situations described in the study, they can relate the findings to their specific situations (Shenton, 2004). Thus, to satisfy the transferability criteria, a detailed section providing background and contextual information on the study area is included in this thesis. Moreover, this study provides conclusions and recommendations that are phrased in an accessible way, allowing other researchers, readers, and decision-makers to apply the findings to other situations.

5.5.3 Dependability

The dependability criteria aims to demonstrate that if the study were repeated in the same context, using the same methods and participants, similar results would be obtained (Shenton, 2004). This becomes challenging with the use of human participants and when the qualitative and quantitative study explores a phenomenon that is subject to change over time (e.g. climate impacts and policy). However, the researcher can enhance the dependability of the study by using several tactics that aim to improve transparency and enable replication. The dependability issue is addressed in this study by outlining in great detail the research design, purpose, objectives, methods used and their effectiveness, and processes of data collection and analysis (Shenton, 2004). Moreover, field notes were taken and processes for collecting and analyzing the data were documented, which offers a greater level of transparency in research design and implementation, thus allowing readers and researchers to replicate this study.

5.5.4 Confirmability

Lastly, the confirmability criteria speaks to the level of confidence in real objectivity, in that the findings reflect the true opinions and ideas of the informants and are not influenced by

researcher biases (Shenton, 2004). To reduce the effect of researcher bias, the roles of the audit trail and reflexive research design become important. "Audit trail" refers to the ability of the reader to trace the research step-by-step through a description of decisions made and processes used (Shenton, 2004). This was achieved by clearly outlining why decisions were made and how data was collected and analyzed. Furthermore, I practiced reflexivity by considering how my background and experience would influence the processes of data collection and examination, and by accounting for any biases that may be present. For instance, I acknowledged my beliefs in climate change and adaptation, and ensured that interview questions did not sway interviewees to favour adaptation by wording questions in a manner that enabled the informants to draw their own conclusions (e.g. "*In your opinion, is climate change adaptation a priority for the regional district*?" as opposed to "*In your opinion, why should adaptation be prioritized by the regional district*?"). Ultimately, a reflexive research design can be fostered by explicitly reporting researcher perspectives, positions, values, and beliefs (Birchall *et al*., 2016). Here, it is important to note that as a researcher, I value the environment and resilient planning practices, and I strongly believe in climate change and the need to adapt to climate impacts through soft and hard adaptation measures.

6. Results

6.1 Introduction

Research findings were divided into two broad sections. The first section reports on the responses from 13 semi-structured interviews conducted with key actors from the seven RDs across Vancouver Island: Capital RD, Cowichan Valley RD, Comox Valley RD, RD of Nanaimo, Alberni-Clayoquot RD, RD of Mount Waddington, and Strathcona RD. Three major themes emerged from the interview findings: 1) key climate threats facing the RDs, 2) adaptations to climate impacts, and 3) policy responses. Within each theme, a number of subthemes and sections emerged, presenting unique results that relate to climate change adaptation planning and implementation, and local government resilience. Direct quotations from interviewees are embedded throughout this section to enhance transparency and to support claims.

The second section of this chapter presents the results from the plan content analysis with a focus on the findings for regional growth strategies and regional climate change plans. Findings from both the semi-structured interviews and plan content analysis create a robust data set with support and validation stemming from both sets of results.

6.2 Results from the Semi-Structured Interviews

6.2.1 Key Climate Change Threats

There are two key climate change threats that all RDs on Vancouver Island face: drought and flooding. With rising average temperatures and decreased rates of precipitation in summer months, the Island has seen an increase in the occurrence and severity of drought conditions. Because of the more prevalent drought conditions, several related impacts have emerged, creating challenges for the seven RDs. Such challenges include an increase in the frequency and intensity of wildfires, recurrent water shortages, and negative impacts to biodiversity. While drought is a newly-emerging climate change threat, flooding has been a longstanding impact the Island has experienced for several decades. Although the Island has long grappled with flooding, the frequency and severity of flood events has increased significantly in recent times. Both coastal and overland flooding events pose a threat to the RDs as a result of more extreme and variable weather events, more intense precipitation, and rising sea levels. In general, the key

climate change threats facing all RDs are associated with a lack of water in summer months, and an over-abundance in the spring and winter. It is important to keep in mind, however, that the intensity of drought and flood, and the subsequent impacts on RDs, vary substantially due to significant changes in weather conditions and geographic features across the Island.

6.2.1.1 Drought

Mentioned by all but two interviewees, drought has emerged as a key climate change impact across Vancouver Island. Increasing average surface temperatures and more extreme weather have dramatically changed the weather conditions on the Island. Historically, Vancouver Island experienced mild temperatures and rainy conditions (British Columbia Ministry of Environment, 2015). However, with a changing climate, the Island has seen a shift towards significantly warmer and drier conditions. Some interviewees describe the shifting weather as creating a "Mediterranean climate" (COWRD1) characterized by much warmer temperatures and far less precipitation during the summer months. These changes combine to create drought conditions that have been accompanied by a host of challenges. The interviewees often referenced more frequent and intense drought events, which result in an increase in the occurrence and severity of wildfires, and a decrease in availability and quality of water.

Wildfire is a common threat for British Columbia generally, resulting in widespread property damage and resident evacuation (BC Flood and Wildfire, 2018). Despite it being commonplace for the province, wildfire is a new challenge for Vancouver Island, according to the interviewees. A CTV News report stressed the emergent nature of wildfire threats, noting that the 67 wildfires recorded on Vancouver Island in the summer months of 2018 was abnormal, given the usual wet climate of the region (CTV Vancouver Island, 2018). In recent years, drought conditions have intensified on the Island, increasing the likelihood and occurrence of

wildfires (Figure 5).

Figure 5- Wildfire in the Alberni-Clayoquot Regional District.
View of a wildfire actively burning in a forested and mountainous area near the Port-Alberni municipality. Photo was taken by researcher on August 10, 2018.

These wildfires were ignited by varying sources including human activities and lightning strikes, but they were fueled by the drier conditions that increased the vulnerability of vegetation to fire (CTV Vancouver Island, 2018). Several interviewees detailed the emergence of wildfire as a key threat, and spoke to its impact on the regions:

> ACRD1: "It gets very hot. Which is just going to increase the vulnerability for wildfires."

> MWRD1: "As we can see by just looking out the window, with the smoke and haze, drier summers, more volatile weather. Definitely an increase in the vulnerability of some of our assumptions. Just extreme weather with the drought and the fire-season being what

it is."

RDN2: "Not opportunities but challenges. As you know, in BC there is a lot of forests and the wildfires are rampant and they are now to be expected on a yearly basis."

MWRD2: "Yes we're dealing with a bunch of little forest fires right now which is unusual for our area. Last year we had one. Right now we have several going on, but that was brought on by… You know we don't very often get lightning storms, thunder and lightning storms."

The more intense and frequent wildfire events across the Island have created several negative impacts for the RDs. Challenges associated with wildfire include its impact on resident health and safety, property damage, the logging industry, biodiversity, and regional financial budgets. Similar challenges have been noted with respect to the impact of drought on regional water supply and quality. Rising temperatures and decreased rates of precipitation have caused very dry conditions in summer months, creating stress on the Island's water reservoirs. Moreover, many interviewees noted that the amount of snow accumulating over the winter has diminished, resulting in less run-off in the spring. This reduced snowpack and spring run-off further diminishes the Island's water supply. The interviewees raised concerns about the impact of drought on water availability where, for example, COWRD1 describes that "… at one time we thought we were in a rainforest [and] never had to worry about water ever. Now we are going into early-stage restrictions." RDN2 supplements this statement by highlighting that "… droughts and shortages of water, I think is another [impact] that everybody is worried about, [and] what that does to our watershed protection." It is thus clear that the RDs must take into account the impact of drought on their water supply and respond with adaptive actions including the restriction of water use. Indeed, many RDs have begun restricting the usage of water and are proactively thinking about watershed protection. Some have also started to consider adaptive responses to the decreased quality of water.

Finally, several RDs have encountered changes in water quality as a result of rising

temperatures and diminished precipitation. Increasing temperatures promote rapid algal growth, which can produce toxins harmful for human ingestion (IPCC, 2014). Water turbidity also influences the quality of drinking water, and the combined effect of increased temperatures and higher turbidity have forced many regions to issue boil water advisories. CVRD1 confirms this by noting that the Comox Valley RD has "seen multiple boil water notices related to turbidity over the last several years", which appears to be rising in occurrence in recent times.

6.2.1.2 Flooding

Flooding is arguably the greatest climate threat facing RDs on the Island, as indicated by all 13 interviewees. The Island is subject to both coastal and overland flooding, which appears to be increasing in frequency and severity due to a number of factors acting together (BC Flood and Wildfire, 2018). In the case of overland flooding, the interviewees referenced the impact of intense winter precipitation, complex river systems, mountainous terrain, and impervious surfaces. In many instances, the interviewees stressed that the Island has seen an increase in extreme weather events in winter months, which are more violent in terms of wind and volume of precipitation (e.g. COWRD1). This precipitation is becoming more intense and occurs over a shorter time span, frequently exceeding the capacity of infrastructure and resulting in overland flooding (British Columbia Ministry of Environment, 2015). For instance, COWRD1 described "torrential rains" that can act in combination with the surrounding mountainous terrain to produce flash flooding. Overland flooding is also influenced by the complex river systems running throughout the Island. The interviewees highlighted many rivers that are flood prone:

> RDN1: "The Nanaimo River is flood prone and, of course, it drains into the ocean and at the mouth of the ocean, there's actually our First Nation Reserve there, so we have worked in the past on emergency response for those communities, and we anticipate that to be a more frequent occurrence going forward because of the topography of the area, the Sentinel patterns and, of course, the climate change."

> SRD1: "The Oyster River is the southern boundary of Strathcona Regional District and the residential area directly adjacent to the Oyster River, that's where we experience flooding concerns. And we also have a dike that we need to monitor to

ensure it withstands the assault of big floods in the river."

These flood events have the ability to "wash out some roads" (RDN2), pose a serious threat to regional assets and infrastructure, result in widespread property damage, and force resident evacuation (BC Flood and Wildfire, 2018). The interviewees recognized the increasing frequency and intensity of flooding events where, for example, ACRD1 described severe flooding occurring in the last two rainy seasons and that the term "Hundred Year Flood Event" is no longer applicable. Because overland flooding is becoming a more common and intense occurrence with immense potential to impact infrastructure, property, and resident safety, it is clear that RDs must prioritize adaptive efforts to respond to and prepare for these events.

While coastal flooding has already occurred in most RDs and creates similar challenges as overland flooding, its impacts are likely to become more visible and pronounced in the near future (IPCC, 2014). The interviewees exhibited a heightened awareness of coastal flooding as a key climate change threat. Like overland flooding, an array of factors combine to influence the occurrence and extent of coastal flooding. Rising sea levels, ground subsidence and rebound, tidal influences, and more extreme storm events interact to varying degrees to accentuate the threat of coastal flooding (IPCC, 2014). Data from Fisheries and Oceans Canada show variable rates of sea level rise across the Island; over the last century, average sea levels rose 6.6 centimetres at Victoria while in contrast, average sea levels fell at Tofino at the rate of 12.4 centimetres per century (British Columbia Ministry of Environment, 2015). This significant variation is largely the result of differing rates of land rebound and subsidence. Vertical land movements caused by glacial rebound and shifting tectonic plates have caused parts of Vancouver Island to rise. This phenomenon acts to offset the rise in sea levels and thus decreases the likelihood of coastal inundation in those regions experiencing uplift. However, when tidal influences and storm events are taken into account, the likelihood of coastal flooding is greatly accentuated. CRD2 describes that "if we have a high tide at the time of the storm then the results are even worse." MWRD1 supplements this statement by highlighting that sea level rise is "already an issue in terms of some of the spring tides." Adding to the complexity of coastal inundation is the concentration of development along the coast and the prominence of low-lying

areas. The interviewees repeatedly emphasized the consequences from flood events on low-lying and coastal development:

> CVRD1: "We've got 87 km of coastline, marine coastline, and yes, a lot of it is low-lying…. And in coastal communities, people want to live close to the sea, and have for a long time. So we've got a lot of legacy development that's frankly in the wrong place."

> CRD1: "The Capital Region has, I think, 1,500 kms of coastline, so sea level rise and kind of violent marine storms definitely have a big impact on coastal communities in terms of everything from damaging property, either public or private property, on foreshore areas but also things like erosion of shore lines and that kind of thing."

> RDN1: "Looking longer term, sea level rise is of particular interest and concern to us. Our entire regional district is based on a coastline of the Georgia Straight. That's over 800km of coastline, and we have a significant population currently within that hazard zone, that 1m sea level rise prediction by the year 2100 as well as any potential future development in those areas."

> COWRD2: "There's obviously sea level rise, that's a factor in terms of coastal issues. Hypothetically, if our entire shoreline wasn't already developed there would [be] a possibility of… using planning power, specifically in potentially hazardous areas that might be affected by say, coastal erosion, from being developed."

When the concentration of development in low-lying areas, extensive coastline, rising sea levels, tidal influences, ground subsidence and rebound, and storm events are taken together, the threat of coastal inundation becomes clear. To reduce costs and remain resilient in the face of flooding events and drought, RDs must be proactive and engage in climate change adaptation planning.

6.2.2 Adaptation to Climate Change Impacts

As defined by the IPCC, climate change adaptation is "the process of adjustment to actual or expected climate and its effects" (IPCC 2014, p.118). Adaptation can be viewed as a damage-reducing strategy where it is employed in human systems to prepare for and cope with climate change impacts. With extensive research in this field, the necessity of adaptation is now well understood by climate scholars. However, generally speaking, climate change mitigation significantly outweighs adaptation at the local government scale (e.g. Birchall, 2014). This trend tends to hold true for the RDs on Vancouver Island, which appear to be significantly more involved in mitigative rather than adaptive efforts. Despite the continued reliance on climate mitigation, several RDs have clearly recognized the urgency of adaptation and as a result, have undertaken some adaptive actions to prepare for climate change. Many interviewees highlighted the complexity of climate change, noting that while mitigation is an important strategy to pursue, it cannot prevent further climate change. As a result, the interviewees stressed the importance of adapting to current and future climate change:

> COWRD2: "It's so high level and global, it's increasingly apparent that we're not going to be able to make a dent in actual greenhouse gas emissions, globally, that's going to get us off this fast track to major, major change. It's really coming down to a question of adaption and in some cases, this is going to mean strategic retreat and other things."

> MWRD2: "Okay, so if this keeps going on, we have to adapt."

While a majority of RDs are aware of the need to increase their preparedness through adaptation planning, some interviewees called for an increase in mitigative efforts. This preference for mitigation over adaptation was highly visible in the Capital RD where one interviewee described that before adaptation can be undertaken, the RD needs to take mitigation seriously by implementing mitigative policies and striving towards their emissions reduction targets. Overall, a large proportion of RDs recognize the importance of both adaptation and mitigation. Indeed, these two strategies are intended to be complementary. A reliance on mitigative strategies alone is insufficient because even if the most aggressive mitigation efforts

are undertaken, continued climate change is unavoidable (Klein *et al*., 2005; IPCC, 2014). A robust response to climate change should thus involve components of both mitigation and adaptation. However, across the island, mitigation appears to significantly outweigh adaptation. This is particularly the case in Mount Waddington RD:

> MWRD1: "What we can do and what we do do at a local level is we are reducing our own greenhouse gas emissions. As a very small regional district, we don't necessarily have major resources, but we've managed to work in-house to do some very significant things. For example, we have a biocover at the landfill that reduces methane. It does produce carbon dioxide, but it's changing methane to carbon dioxide. We have the first solar Zamboni in the country."

All RDs have worked towards reaching their emissions reduction targets in response to the provincial mandate, with some having advanced further than others. It can thus be inferenced that because no mandate exists in relation to adaptation, far less effort has been invested into adaptation across Vancouver Island.

Adaptation actions are commonly divided into structural, non-structural, and ecosystems-based approaches (Wenger, 2015). Globally, structural adaptations tend to be preferred and more heavily relied upon as a traditional pathway (Bonnett and Birchall, 2019). Non-structural adaptation types, including development regulations and retreat, while gaining traction, tend to be less common. Lastly, ecosystem-based approaches which seek to make use of green space and natural assets to increase resilience, are rarely utilized in adaptation planning (Bonnett and Birchall, 2019). Although across the globe, coastal communities exhibit heavy reliance on structural adaptations, this was not found to be the case in most RDs. Dykes, riprap, and shoreline armoring can be found in several RDs in response to flooding events (e.g. Figure 6).

Figure 6- Shoreline armoring in Strathcona Regional District.
View of piled rock along the coastline, which serves as shoreline armoring to protect against storm surge and sea level rise. Photo was taken by researcher on August 13, 2018.

However, these structural adaptations are minimal, with the exception being Comox Valley RD. The interviewees from this RD describe how shoreline armoring is an issue for the region with "tons of it all over" (CVRD1). This armoring was mainly instituted by private citizens with some owned by the region. The region has conducted studies and found that "75% of [their] coastline has been altered in some way…whether it's through a dock, hardening, [etc]" (CVRD1). In response, they are advocating for a naturalization of their shores, stating expressly

in their OCP that shoreline armoring can no longer occur. This push towards ecosystem-based approaches and non-structural adaptations was highly apparent across most RDs that recognize the drawbacks of hard types of adaptations. The interviewees frequently highlighted their attempts to educate the public on the disadvantages of structural adaptations, and provided several examples of where RDs are embracing soft adaptation types:

> COWRD1: "Designing our communities not building on the flood plain, which is now in our official community plan… Protecting and, we used to think that armouring the foreshore [meant] building walls and what we've learnt is we're teaching soft shores. So how to naturally armour your foreshore so that it protects the foreshore, so we've had to teach a lot of foreshore protection."

> CRD1: "So, the other thing is we do have like a rainwater programme that in principle tries to encourage people to treat their rainwater on site, which means you don't have it go down into the road and then into the gutters and into the Municipal pipes, so that can definitely help… You get away from hardscaped surfaces on private land, and natural surfaces and green space and bioswales and… basically just keep the water on that private parcel rather than the conventional engineering approach..."

> CVRD1: "But now what we've done since 2014, we wrote in our OCP, or we had the board write in the OCP, no more development floodplains. So we have since 2014, we've seen a significant drop in the number of folks who apply to either reduce that floodplain setback, which is minimal. Like to the sea it's 15 metres, like it's nothing."

The RD of Nanaimo in particular stands out in terms of their soft adaptation efforts. The region has recognized the threat posed by sea level rise, flooding, and wildfire and as a result, has implemented several non-structural adaptations. For example, the RD is currently preparing a Sea Level Rise Adaptation Program, has embraced bioswales and a rainwater program, and has made use of innovative emergency management protocols. RDN1 described in great detail the Sea Level Rise Adaptation Program:

> RDN1: “It’s a four-phase program. The first phase was the initiation, establishing our terms of reference. We also acquired some LIDAR mapping information that helped us move into our research stage along with receiving some funding from the province. So now we’re able to at least partly, half of the regional district, engage a consultant to prepare flood plain maps for us… And using that mapping information, like I mentioned, we start updating our plans but it also kind of allows us then to move to the next stage to phase two, three, which is our vulnerability and assessment phase, which is where we actually go out and talk to people and to get a sense of what is their tolerance when we start talking about mitigation and adaptation. Following that phase, we would move to our climate adaptation strategy where we actually start the planning for the strategy.”

In general, semi-structured interview findings suggest that a majority of RDs on Vancouver Island have a deep understanding of the need for adaptation, use minimal hard adaptation types, and showcase innovativeness in their push for soft adaptations. Despite this recognition of the necessity of climate change adaptation, research findings suggest that implementation in practice remains limited and mitigation continues to outweigh adaptation in local strategic planning documents.

6.2.3 Policy

The following section is divided into eight subsections: 1) adaptation: level of priority; 2) nature of climate change responses; 3) level of preparedness; 4) extent of adaptation integration within strategic policy and plans; 5) capacity to act; 6) role of RDs and the Province of B.C; 7) local viewpoints on Bill 27; and 8) the function of RDs. These subsections are included within the findings of the research because they emerged as major themes from the 13 semi-structured interviews with key actors. This chapter reports on general themes across Vancouver Island, with a more detailed comparative presentation of the findings for each of the seven RDs provided within appendix A.

6.2.3.1 Adaptation: Level of Priority

Before reporting on the preparedness and nature of climate change responses of each RD, it is important to compare the findings on whether or not climate change adaptation is prioritized.

With some exceptions, RDs on Vancouver Island tend to recognize the urgency of adaptation, although this has not translated into their strategic priorities. Adaptation is not, generally, a key focal point. For example, MWRD2 describes that adaptation "won't be prioritized probably until we (the region) see more immediate effects up from it." The interviewee then states that "you have to convince politicians that they need to change their priorities and focus their shift in use of tax dollars". In this sense, the need for adaptation may not be recognized until climate change impacts become devastating or more visible. In most RDs, it is evident that mitigation outweighs adaptation on the list of strategic priorities for a number of reasons, including the overwhelming focus on mitigation at the provincial level through the mandate, the greater focus on mitigative policies within strategic planning frameworks, and the lack of public and political interest in adaptation. Moreover, in some RDs, such as Alberni-Clayoquot and Strathcona, not only is adaptation failing to be prioritized, climate change itself is not a priority. The priorities of local governments strongly influence the nature of their responses to climate change. Climate change scholars find that when adaptation is held as a top priority, subsequent actions tend to be anticipatory in order to advance preparedness (Wilson, 2006). The findings of this research agree with this premise to a certain extent, and will be discussed in the following section.

6.2.3.2 Nature of Climate Change Responses

Climate responses can be categorized into reactive or proactive/anticipatory. In the context of a changing climate, reactive actions are efforts or adaptations that occur after the impacts of climate change have been observed (IPCC, 2014). Proactive adaptation, on the other hand, involves efforts that occur before the impacts of climate change are observed (IPCC, 2014). Proactivity can then be described as anticipating the future and implementing efforts before climate impacts become overwhelming, while reactivity involves responses to impacts as they arise. Because climate change is associated with a great degree of uncertainty, scholars favor anticipatory actions. These proactive efforts offer greater flexibility and have the potential to advance local governmental preparedness for climate impacts to come.

Across the Island, the nature of climate actions is highly variable with most RDs reacting to climate impacts or employing a combination of both reactive and proactive efforts. For example, the nature of climate change actions in Comox Valley RD are characterized as reactive

and “not very aggressive” (COMOX2) by both interviewees. It is important to note that none of the RDs show purely anticipatory climate change responses. Research findings reveal that many RDs struggle to employ proactive adaptation planning despite an enhanced awareness of its benefits, as there is a lack of clear direction and support from higher levels of government and elected officials. Results from the semi-structured interviews suggest that the authoritative powers and jurisdiction of RDs may also act as a barrier to proactive adaptation planning. While staff may be interested in anticipatory efforts, the lack of a framework, tools, and authority has hindered the ability of RDs to implement these initiatives. This tendency towards reactive efforts calls into question the resilience and ability of the RDs to prepare for and cope with climate change impacts.

6.2.3.3 Level of Preparedness

In the context of this study, the preparedness of local governments was analyzed to determine the resilience of the RDs in general, and their ability to adapt to climate change impacts. Understanding of the term “preparedness” has been drawn from definitions of resilience with the IPCC definition serving as a baseline. The IPCC describes resilience as the ability of a system to anticipate, accommodate, or recover from the impacts of climate change in a timely and efficient manner (IPCC, 2014). Preparedness can then be described as the ability of local governments to predict, plan for, adapt to, and recover from climate change impacts. Findings from the semi-structured interviews reveal a spectrum of preparedness levels across the seven RDs and hint at the vulnerability of some regions to climate change impacts.

Interestingly, none of the 13 interviewees described their RD as entirely prepared for the impacts of climate change. For instance, many interviewees described major barriers to enhancing regional preparedness and resiliency that included a need for a more organized response to climate change impacts, limited authoritative powers of RDs, and the need for a “stronger provincial role” (CVRD1) to ensure political support for adaptation and preparedness planning. Interviewees shed light on the fact that mitigative actions are widespread across the island largely due to a strong provincial push for climate change mitigation and suggested that in order to advance regional preparedness and adaptation planning, there must also be strong provincial direction focused on climate change adaptation.

While a large portion of RDs exhibited an inadequate level of preparedness, most are working on advancing their preparedness, with only two regions being ill prepared for climate impacts, as outlined by the interviewees. Efforts to advance regional preparedness and resiliency are highly variable across the Island, with the integration of climate change adaptation into policy and plans being a necessary component to strengthen regional preparedness.

6.2.3.4 Extent of Adaptation Integration into Policy and Plans

Because the extent of adaptation integration within policy and plans is a major focus of this research, this sub-theme presents highly detailed findings for each of the seven RDs. The extent to which climate change adaptation is integrated into local policy and plans is a key indicator of local preparedness for climate change and whether or not adaptation is prioritized. This is because the ability of local governments to respond to climate change is strongly influenced by their policy framework in place. Without adaptation policies present within strategic planning documents, efforts on the ground become disorganized and less likely to be efficiently implemented. As a result, to effectively plan for and respond to climate change impacts, climate change adaptation must be embedded within strategic policy and plans. The extent of adaptation integration within policy and plans is highly variable across the RDs, with some being much further ahead than others.

Alberni-Clayoquot Regional District

It is first important to note that the Alberni-Clayoquot RD does not have a Regional Growth Strategy (RGS). The interviewees stated that there is no need for a growth strategy because "growth has not been an issue [the region has] had to deal with" (ACRD2). The region's population has remained relatively static for the last 20 years, justifying the lack of a RGS. Instead, the region relies on Official Community Plans (OCPs) and other bylaws to regulate development and respond to local issues. The extent of adaptation inclusion within planning documents was described as the best the region can do with the limited resources available. For example, the region has integrated climate change considerations within their OCP through regulations that restrict development within flood-prone areas. However, these regulations came into place in response to a tsunami event and as a result, do not reflect climate change predictions. Interview findings from the Alberni-Clayoquot RD indicate a lack of climate change adaptation policies, with adaption only indirectly being considered. Nevertheless, the interviewees indicated that there is a growing interest in the development of a Climate Action

Strategy and adaptation policies given that climate impacts have become more visible and frequent.

Cowichan Valley Regional District

Like Alberni-Clayoquot RD, Cowichan Valley RD has no RGS but not because growth has remained static. The interviewees revealed that there is no political appetite for a growth strategy because of political tensions with municipalities. COWRD2 described that because "municipalities have to conform with their regional growth strategy, there's a political tension between the RDs of BC and the municipalities that are within them." Instead of using a RGS, the region decided to develop a less binding "non-statutory version of a growth study that is intended to mimic in some ways the effect of a growth strategy in the sense that it examines the same issues at a high level that a growth strategy would, but [without] the force of law behind it" COWRD2. Additionally, the region manages growth through OCPs which are currently being harmonized to more effectively address planning issues throughout the region.

With respect to the extent of adaptation integration within those planning documents, the interviewees revealed that climate change mitigation and adaptation are directly and indirectly woven throughout the region's planning documents. However, they are largely fragmented and represent high-level aspirations, rather than specific actions. The region's struggles with flooding and drought have facilitated the recent integration of climate adaptation within strategic planning. Although the interviewees recognized that more work needs to be done with respect to adaptation planning, the RD is making progress particularly in the areas of watershed planning, foreshore protection, and development regulations. They stated that the driving forces behind this more recent work were the region's commitment to the climate action charter and subsequent availability of funding, as well as the realization that climate impacts are becoming more frequent and challenging.

Mount Waddington Regional District

Like Cowichan Valley RD and Alberni-Clayoquot RD, Mount Waddington RD does not have a RGS. Where it differs is in its use of a Regional Plan. MWRD2 outlined that "it's not a growth strategy… it's a regional plan. Ours isn't something that's actually recognized in legislation, whereas a regional growth strategy is. But it's there to show [and] to sort of portray how we intend to do things." The lack of a growth strategy was explained by the fact that the

region has a small population and is not experiencing growth-related pressures. In the recent updates to the Regional Plan, climate change considerations became much more prevalent than they had been in the previous plan. The interviewees stated that the impetus for integrating climate change within strategic planning documents was the heightened awareness of the need to plan for climate change impacts. Although the plan now has climate change policies within a newly created section, the focus remains predominantly on mitigation. Because climate change is only considered within its own dedicated section, it is not woven throughout the plan nor has it filtered down into more localized plans. MWRD1 described how the regional plan has not been the priority of action over the last few years and highlighted that adaptation is not as embedded within the plan as it should be. Where action has occurred is in the area of mitigative efforts -- the region has been very proactive in its attempts to reduce its greenhouse gas emissions. The interviewees did, however, recognize that mitigation alone is insufficient to respond to climate change and emphasized their interest in developing more concrete adaptation policies and a Climate Action Strategy. In general, Mount Waddington RD lacks a policy framework that considers adaptation, and has few adaptations implemented in practice.

Comox Valley Regional District

Comox Valley RD has several strategic planning documents which directly and indirectly consider climate change. The interviewees highlighted that their commitment to sustainability has facilitated the integration of climate change within strategic planning. This process of integration was made more efficient because sustainable goals tend to work in tandem with goals associated with climate change. It is clear that while the region has integrated climate change within their RGS, actions are "most specific around mitigation" (CVRD2) with adaptation policies being "…really high-level aspirations" (CVRD1). In this sense, although their RGS includes climate change adaptation, it is considered at a vision-setting level with no real actionable policies. The use of high-level and non-committal language suggests that there is a lack of clear and definable adaptation goals. The interviewees stated that climate change is also considered within the region's Floodplain Bylaw, OCP, and Community Climate Action Plan. Although the Floodplain Bylaw indirectly considers climate change adaptation, it is described as inadequate to effectively protect residents from the impacts of climate change as it is informed by historic data and enables the board to reduce setbacks:

CVRD1: "We have a growth strategy so that's really important in defining where growth can happen. But I think in our main tools, we have a floodplain bylaw that establishes a minimum flood construction level… But it's pretty modest, and it hasn't been, we're reviewing it now, but… it reflects historic data."

CVRD2: "It hasn't been adjusted to reflect projections for sea-level rise or storms."

CVRD1: "The legislation builds in the ability for the board to reduce the floodplain setback."

The region has recognized the shortcomings of the Floodplain Bylaw and in response amended their OCP in 2014 to prevent development in floodplains. Since the OCP was amended, the interviewees highlighted that the region has seen a significant drop in the number of residents who apply to reduce the floodplain setback. Moreover, the region has proposed the introduction of a 20 meter setback from the sea because currently it does not use exaggerated setbacks. Interview findings point to adaptation beginning to find its way into regional strategic planning documents despite not being embedded in the Floodplain Bylaw. Adaptation is being woven into the region's OCP and is broadly considered in the RGS, but these documents remain much more focused on climate change mitigation. The interviewees spoke to a number of driving forces behind the integration of climate change within their strategic planning, but stressed that the major impetus was provincial direction in the form of Bill 27. This may explain the clear focus on mitigation as opposed to adaptation, given the fact that there is no mandate requiring local governments to include adaptation policies within their RGS or OCPs.

Capital Regional District

The interview findings from the Capital RD are unique and reveal significant insights into the relationship between adaptation inclusion in strategic plans and implementation in practice. Unlike most of the RDs, the Capital RD has a vast array of planning documents which consider climate change and include a robust set of adaptation policies woven throughout. Adaptation is integrated within the region's RGS, OCPs, Climate Action Strategies, and other high-level strategies. This strong policy framework for addressing climate change considerations was facilitated by provincial direction (Bill 27) and "progressive senior management" (CRD2).

However, CRD1 stressed that these adaptation policies and goals are not being implemented in practice and remain as lofty statements:

> CRD1: "I think it's the implementation plans they're not very strong from what I've seen. So, the strategies are the high-level policy documents like the zoning or the OCPs and the Regional Growth Strategy are all strong in terms of their policy statements, but it's not translating into implementation plans that are actually kind of tracked year over year for follow-up. And it's not translating to the extent that I think it needs to be in terms of zoning bylaws. Because ultimately, it's the zoning bylaw that's binding on the landowner. That's the document that determines what they can do on their land and, parallel to that, there are bylaws around buildings and the land use procedures. But I think there's been a bit of an attempt to just keep it at the higher policy level and keeping it from drilling down to the level where it would have an impact on developers and others undertaking activities in the Region. So, if it was a priority, it's not hard to come up with those kinds of resources."

The interviewee sheds light on the need for adaptation goals and policies to be translated into more granular plans and bylaws. This would ensure that policies pertaining to adaptation are binding and can be enforced. Although climate change adaptation has not filtered down into land use bylaws, the region showcases a more robust policy framework including adaptation than is seen in most other RDs. The next step for the Capital RD in advancing their preparedness for climate impacts would be to translate the high-level adaptation statements and goals into bylaws and regulations.

Regional District of Nanaimo

Semi-structured interview findings from the RD of Nanaimo directly reveal that climate change adaptation is woven throughout the region's strategic planning documents. Both interviewees stated that adaptation is integrated within their RGS, OCPs, Sustainability Strategy, and development regulations. In particular, the region is concerned with adapting to sea level rise, and this has triggered the development of a Sea Level Rise Adaptation Strategy/Program. The RD of Nanaimo thus has a strong policy direction for undertaking adaptive efforts. However, RDN1 expressed concern about the fact that climate change adaptation is not integrated in the board's strategic plan. Moreover, RDN2 described the need for greater fluidity

within strategic planning documents to ensure that climate risks are appropriately reflected. The absence of fluidity and adaptation within the board's strategic priorities make it challenging to implement adaptation policies on the ground. However, RDN1 described that there is still enough support to move forward. For example, adaptation actions have been implemented in practice through a variety of tools:

> RDN1: "An example would be through our development permit areas, so that would be the environmental component of reinforceable areas, hazard land protection, etc., so we have those tools. Higher up, there's a lot of enabling policies in that OCP, such as encouraging alternative energy, encouraging electric vehicles and electric vehicle outlets and things that we can ask for at the stage of residential and commercial development, so there's different tools there."

It is clear that adaptation is a key factor considered within the region's policy and plans, and is filtering down into actionable items. The region's commitment to climate change adaptation was spurred by both provincial direction and the region's "…obligation to ensure public health and safety" (RDN1), allowing them to pursue resilience to climate change impacts.

Strathcona Regional District

Political constraints have been a critical factor influencing Strathcona RD's action on climate change adaptation planning. SRD1 noted that elected officials have not prioritized either adaptation or climate change generally. For example, it is not present within the region's strategic priorities, which are rarely reviewed. The interviewee effectively exemplified the lack of importance placed on strategic climate planning:

> SRD1: "I went looking for a printout or a summary of Strathcona Regional District's strategic initiatives. And if we took it seriously, it would have been like a poster in every office, I couldn't find it, I couldn't even find it on our website anywhere. That just shows how little value is attached to the strategic initiatives that are existing."

The region does not have a RGS and as a result, regulates growth through the statements in OCPs. Because it is mandatory that OCPs include a section on climate change, climate change policies are present within the region's planning documents. SRD1 explained that "[t]he guidelines of the official community plan would have words that speak in favor of adaptation

measures and mitigating and reducing flooding, but… [there is not] one example, where it has been pulled through to became a reality." In the case of Strathcona RD, the extent of adaptation integration within strategic planning is minimal and fragmented and adaptive policies are rarely implemented in practice. The region has expressed willingness to advance its adaptation planning and develop a climate action strategy, but there is currently no political will to do so. The interviewee stressed the challenges of advancing their adaptation planning without political support and direction, and noted that without this support, resources and staff time cannot be dedicated to adaptive efforts. This is a barrier frequently raised within climate change literature, and it highlights the importance of political championing and support in the process of adapting to climate change.

6.2.3.5 Capacity to Act

The capacity of local governments to act on climate change is a key factor influencing the ability to adapt and local preparedness for climate impacts. Local capacity includes the availability of finances and funds, expertise, time, and personnel. A deficit of any of these factors may hinder the ability of governments to dedicate those resources to planning for and responding to climate change. Interview findings reveal that, in general, RDs tend to have poor capacity, with most heavily reliant upon provincial support. For instance, interviewees from Mount Waddington RD speak to a lack of internal financial resources, expertise, and personnel:

> MWRD1: "We're fairly limited in our staff resources. It's a small regional district. We have a low population. We don't have very many services. In terms of local government, our jurisdiction is also fairly limited."
>
> MWRD2: "…if I was told that [climate change] was my priority and everything else could take a backseat, that would be great, I could sure focus on it. But that's not going to happen. You have to keep the day-to-day flowing, so, no, we don't have the capacity. We really do need some support staff here to be able to help us out."

Interestingly, no interviewee indicated that their RD had an adequate capacity to address and prepare for climate change impacts. This lack of capacity varied across RDs, some experiencing financial constraints while others exhibiting a deficit of climate change expertise and knowledge. This variation is further fleshed out in appendix A.

6.2.3.6 Role of Regional Districts and the Province of British Columbia

Understanding the role of various levels of government is a key sub-objective of this study, with a view to determining whether higher levels of government can influence municipal climate action. Scholarship has often found that strong policy direction from provincial and regional levels of government may spur greater climate action on the part of local governments (e.g. Lyles *et al*., 2014). To a certain extent, the findings in this study agree that the province has a much stronger influence on local climate change planning than do RDs.

Regional Districts

RDs have the ability to influence municipal climate change action through regionally set goals and their actions as role models. Where a RGS is present, municipalities within that region must comply with the goals outlined in the growth strategy, which is detailed in regional context statements. These statements are provided within municipal OCPs and demonstrate how municipalities are consistent with or are aligning to the RGS. As a result, if a RGS includes a section on climate change planning, municipalities are obligated to show how they are working towards regionally set climate related goals. CRD1 detailed the influence of regional planning:

> "[T]he Regional land use planning is important in terms of the Regional growth strategy… and technically all development within municipalities has to be consistent with the Regional growth strategy. So, that can put constraints on urban sprawl and other types of land use patterns that contribute to climate change or can help ensure resilience and help mitigate climate change."

However, several interviewees highlighted the limitations of regional planning with CVRD1 describing that "there's nothing that compels a municipality to comply with a regional policy framework." Although member municipalities are required to align with the RGS, regional context statements tend to be very high-level and RDs have limited authority to reject a regional context statement. Moreover, interviewees frequently noted that municipalities have their own autonomy and rarely interact with RDs unless they participate in a service together. As a result, interviewees noted that RDs may influence municipal climate action by setting a good example, by providing guidance, and by enabling policies. MWRD2 emphasized that the work done by the region can be "a great example of things that can be done" and added that Mount Waddington RD "has been a good role model." Interviewees from the RD of Nanaimo spoke to

the role of RDs in providing policy guidance, data, and information as a means of assisting municipalities in their climate action efforts. In this sense, there is the potential for collaboration between local governments, despite cooperation currently being limited. Although RDs have limited authority to compel municipalities to undertake climate action, the province acts as a significant influencer through their policy guidance and legislation.

Province of British Columbia

The Province of BC, and other provincial governments, set the legislative framework within which local governments operate. Through the Local Government Statutes Act (Province of BC, 2008), the province outlines the function and authoritative powers of local governments. In 2008, this Act was updated to mandate that local governments apply a climate action lens. It stipulated that local governments must include emissions reduction targets within their OCPs and RGSs in an attempt to meet provincially set climate action targets. As a result, this mandate has spurred significant climate action on the part of local governments. Moreover, many interviewees described how provincial guidance in the form of policy direction and financial support has been a significant factor triggering greater climate action. However, nearly all interviewees expressed grievances with the provincial mandate and guidance as it related to climate change efforts:

> CVRD1: "I think it's huge because I think so very often local governments, you know, we are tasked with a lot of responsibility. But sometimes it feels like no backing. So when the province isn't actively involved in something, it's like we're out there on our own trying to implement something for the greater good, with very little support."
>
> CVRD2: "Yes. I mean, I don't think there is a provincial climate adaptation strategy, and if there is they're really not pushing it. But that should come and there should be programmes attached to that for giving local governments resources… And educating elected officials and offering guidance to staff on how to deal with things, you know, best practices and other tools. So you know, if that were in place it would be a very different story."

CVRD1: "So I think things like that, when you're treated like the child, but you're tasked with the responsibilities of the adult, but really not given the tools."

CRD1: "In the Constitution… Ultimately, the provinces decide everything that the municipalities can do and so that shift about a decade ago in terms of mandating that municipalities apply a climate action lens was definitely useful. I think what's really needed is greater consistency from the Provincial and Federal Governments. They also have these lofty climate action commitments but they continue to invest heavily in oil and gas infrastructure and in sectors of the economy that are contributing to… well, not continuing to contribute, they're actually driving catastrophic climate change.… I think that sends the completely wrong message. It essentially says to a local government, you can have whatever you want in your climate action plan and you can do the opposite with how you spend your money and what kind of infrastructure you pursue."

MWRD2: "But traditionally in BC there's been very, very limited support as provided at a provincial level. The province doesn't hire enough staffing resources, or provide enough resources to assist local governments with implementing a wide range of things that it just typically expects the local governments to do."

In general, the interviewees were aware of and supported the intent behind the province's push for greater climate action on the part of local governments. They described the role of the province as critical with respect to advancing climate resilience through the provision of policy guidance, tools, and financial support. However, RDs appeared to struggle to meet provincial climate action goals due to a lack of authority, tools, and finances. The role of the province in advancing local climate change planning must clearly be shifted to provide the adequate support needed for local governments to achieve provincial targets. Moreover, the design and efficacy of mandates is a key consideration for the Province, given its direct impact on local governments.

6.2.3.7 Local Viewpoints on Bill 27

Bill 27 is the provincial mandate requiring local governments to include climate action targets in their strategic planning documents. Local governments' perceptions of this Bill are key for understanding the Bill's effectiveness, the relationship between different levels of

government, and how the mandate could be improved. Several themes emerged from the semi-structured interviews, shedding light on the advantages and disadvantages of the provincial mandate.

Interviewees highlighted the benefits of Bill 27, noting that the mandate is innovative in North America and has brought climate change to the forefront of decision makers' agendas. For example, COWRD2 stated that "if you look at the intent behind it, it's great, actually… I think there wasn't enough thought being given to this sort of thing before that came out." In this sense, the provincial Bill has raised awareness about the necessity of climate action and ensured that climate change is acknowledged at the local level. Although the mandate is impressive in theory, the interviewees described its flawed implementation in practice.

Interviewees frequently outlined that their RD supports the mandate and is working to comply with provincial targets but are impeded by a number of different factors. ACRD1 stressed that the region struggles with its ability to comply with the mandate due to a lack of resources and funding, while COWRD2 highlighted that competing priorities have made it difficult to reach their climate action targets. The vast array of local governmental responsibilities has often been described as overwhelming. This observation holds true for local governments across Canada who have an extensive list of responsibilities and a lack of funding and resources to meet those responsibilities. These challenges were commonly referenced by several other interviewees who expressed frustration with the Bill not being accompanied by funding and tools. As a result, many RDs have merely complied with the Bill by setting emissions reduction targets in their growth strategies and doing "the minimum" (COWRD2) to adhere to it. Some interviewees went as far as stating that RDs are physically unable to meet the targets because local governments have "zero control over 83% of the emissions" (COWRD2) produced. This notion was echoed by SRD1 who stated that "most often the targets are too ambitious, and it's just pulled out of the sky without giving it real consideration and thought." The interviewee then added that "if it's unreasonable, it loses its meaning." Interviewees also noted that the Bill loses meaning and effectiveness due to its lack of authoritative language:

> MWRD2: "Now, there are provisions in the local government act which say that, just because you have it in the community plan, doesn't mean you have to do it. So, it's kind

of, it's misleading in some ways, when you think that if it's a policy in a plan, but you're not obligated to undertake it, what's the point of having it in the first place?"

CRD1: "The next step, the Provincial statutes could be amended further to say you don't just have to have targets and plans but that you have to implement them, so make stronger mandatory requirements on local governments to take climate action, not just to sort of plan for it or study it. So, you'd get like clear emissions, not just targets, in making legislative emission reductions with financial penalties on local governments that don't meet those."

MWRD1: "Bill 21, the necessity to legislate an action plan is, I think, a very important step. I think we'll see, or we need to see that fleshed out a little bit more. I think if we can be told that we need to meet these type of targets, in a more authoritative type method, we might see more action."

The semi-structured interview findings shed light on the benefits of Bill 27 which largely include its ability to raise awareness and guarantee that climate change is on the radar of local governments. Although some advantages were noted by the interviewees, responses were predominantly focused on the shortcomings of the mandate. The weaknesses of the Bill include its failure to provide for funding and tools, the lack of consideration given to the targets set, the ability of local governments to reach those targets, and the lack of authoritative language. Revealing these weaknesses in the findings of this research, however, provides an opportunity for the mandate to be improved through the development of associated recommendations. This section thus serves as a key learning opportunity for senior levels of government in their efforts to improve climate change planning.

6.2.3.8 Function of Regional Districts

There is a complex relationship between the function of RDs and their ability to adapt to climate change. In nearly half of the interviews conducted, the function and authorities of RD were referenced by interviewees, largely as constraining factors. As prescribed in the Local Governments Statute Act, there is a specific set of powers and responsibilities to which RDs must adhere. Unlike many other regional bodies across Canada, RDs are unique and quite limited in their ability to address climate change. This is because they are predominantly focused on

service delivery. They cannot tax for and act on an issue unless it is associated with an established service that "is adopted by by-law and approved by the province and voted in favor of in a referendum" (COWRD2). As a result, the region has "a specific budget for a specific service" (ACRD1) and is not able to dedicate resources to issues that fall outside of determined services. With respect to climate change adaptation efforts, RDN1 notes that adaptation can be prioritized "in terms of service efficiency [given that] RDs are very responsive in terms of what services they provide and also, are somewhat limited in scope to what services we (RD) provide." For example, if a RD has a drainage service, it could implement adaptive efforts such as bioswales to ensure that that service is provided in the most efficient and cost-effective manner. However, CVRD1 highlights that if the region does not have a drainage service, it has no authority to act. These findings are significant given that if a region does not have a climate change adaptation service, it has no authority to dedicate resources to planning for and responding to climate impacts. While the efforts of RDs appear to be limited to the provision of accepted services, interviewees from Comox Valley RD indicated that there is a loophole.

There are two ways in which a region can act on climate change: through board direction or through provincial direction. CVRD1 highlighted that the "board could direct us (the region) to pursue development of a service if they wanted to be proactive." This is expanded upon by CVRD2 who stated that "if people were to get together and petition the regional district to establish a service, say a climate adaptation service, then we (the RD) would have a lot more ability to be proactive." This would require the residents and board to be aware of and concerned about climate change adaptation, which is not always the case. For example, in Comox Valley RD the interviewees highlighted that there is no climate change champion striving for adaptive efforts, nor is the public requesting a climate related service. As a result, the RD has no authority to plan proactively for climate change impacts outside of localized responses to immediate impacts. Without a legislative framework to act outside of a service area, it becomes highly challenging for RDs to respond to climate change. However, the interviewees raised a key inconsistency whereby all RDs have been able to successfully undertake climate change mitigation outside of a service. This is because of the strong provincial direction to do so through Bill 27. CVRD2 effectively exemplifies the role of the province in pushing for climate change mitigation:

CVRD2: "Thinking back to the work I do around climate mitigation, because we do actually do a fair amount, and similarly we don't have a service. But there was champions at the board level who were very interested in addressing climate mitigation. There was also a huge provincial push, like huge provincial push around climate mitigation and our board signed onto that, and because of that we developed a community climate action plan. We developed specific programmes to provide energy rebates and put up renewable energy plan...So they've been operating outside of a service fairly successfully, or medium successfully, because it would be way better with a service. Could there be something similar on adaptation? Yes, if there was a huge provincial push, and we had a board champion, they could say, you know what, we need a climate adaptation strategy, and from the adaptation strategy would roll out a bunch of programmes."

This example highlights the potential for climate change adaptation to be integrated into the work of RDs. Strong board and provincial direction have enabled RDs to take action on climate change mitigation, even without developing an associated service. As a result, if the province and local elected officials wanted climate change adaptation to be prioritized, it could be. There is huge potential for adaptation to be integrated into the efforts of RDs through a similar process that enabled local governments to take responsibility for mitigation. Ultimately, adaptation must be prioritized by the province to the same extent mitigation is, in order to justify and guide local governmental actions.

6.3 Results from the Plan Content Analysis

With respect to the Plan Content Analysis (PCA) results, scores for regional documents will be focused on, although this section includes a paragraph that summarizes the scores for municipal OCPs as well. Scores are only presented for those RDs having a RGS or a Regional Plan and for the two regional climate change plans, given that several RDs are lacking a RGS and/or climate change plan.

For reference purposes, a score of 0-12 is characterized as low, 13-23 as mid-range, and 24-34 as high. The scores of the four regional plans varied from 17 to 24 out of 34 (Table 6.1). The RD of Nanaimo RGS scored the highest with a score of 24, followed closely by the Capital RD RGS, which scored 23 out 34. With a score of 17 out of 34, the Mount Waddington Regional

Plan was the lowest scoring document. Finally, the Comox Valley RGS placed in the lower scoring category with a score of 21. The plan content analysis process was slightly adapted to evaluate regional climate change specific documents. For these documents, an indicator was taken out of the scoring process, which resulted in scores ranging from a possible 0-32. With respect to climate change specific documents, only two regional Climate Action Strategies/Plans were identified for this study: the Comox Valley Regional District Climate Action Plan and the Capital Regional District Regional Climate Action Strategy. Both documents scored very high with the Comox Valley Regional District Climate Action Plan receiving a score of 27/32 and the Capital Regional District Regional Climate Action Strategy scoring 31/32 (Table 3). While scores were highly variable between regional planning documents, plans tended to score the lowest in the fact base category, and highest in the policies category. To improve transparency and understanding, the following section will justify why each plan received the score it did.

	Comox Valley RGS	Capital RGS	Nanaimo RGS	Mount Waddington RP	Comox CAP	CRD Regional CAS
1. Goals (total out of 8)	**5**	**4**	**6**	**4**	**4**	**6**
Concept of Climate Change	2	2	2	1	N/A	N/A
Climate Change Adaptation Integrated	1	0	2	1	1	2
Climate Change Adaptation as Part of its Own Goal	0	0	0	0	1	2
Long Term Goals	2	2	2	2	2	2
2. Policies (total out of 10)	**8**	**9**	**8**	**6**	**9**	**9**
Climate change adaptation policies and risk reduction	1	1	1	1	1	2
Land use and development policies related to climate impacts	2	2	2	1	2	1
Transportation policies related to climate impacts	2	2	2	1	2	2
Energy policies related to climate impacts	2	2	2	1	2	2
Language used and strength of policies (should vs must)	1	2	1	2	2	2
3. Fact Base (total out of 8)	**4**	**4**	**2**	**3**	**6**	**8**
Reliable climate data	2	1	0	1	2	2
Scaled climate data	0	2	0	1	1	2
Long term projections	1	1	1	1	2	2
Risk assessment or vulnerability analysis	1	0	1	0	1	2
4. Implementation (total out of 8)	**4**	**6**	**8**	**4**	**8**	**8**
Implementation plan with individual actions	1	2	2	1	2	2
Implementation timeline	2	2	2	1	2	2
Funding identified	0	0	2	1	2	2
Responsible parties identified	1	2	2	1	2	2
TOTAL	**21**	**23**	**24**	**17**	**27**	**31**

Table 3- Plan content analysis results for regional planning documents.
Scores for each indicator are presented with category scores and a grand total calculated for each regional planning document. Scores show that on average, regional plans score the highest in the policy category and the lowest in the fact base category.

6.3.1 Regional District of Nanaimo Regional Growth Strategy

The RD of Nanaimo RGS received a total score of 24 out of 34.

Goals and Vision

In comparison to other RGSs, the RD of Nanaimo RGS is highly transparent and emphasizes public collaboration, education, and awareness. The document highlights the region's commitment to sustainability and grounds the goals and policies in sustainable principles. The document establishes 11 overarching goals with the first goal being to "Prepare for Climate Change and Reduce Energy Consumption: Reduce GHG emissions and energy consumption and promote adaptive measures to prepare for climate change impacts." Although both mitigation and adaptation are considered, mitigation is addressed in a more direct manner. However, the Nanaimo RD has also recognized the necessity of adaptation by including policies that address the need to adapt to potential sea level rise, water deficits, flooding, wildfires, and other hazards. The plan then received a score of 2 for outlining the concept of climate change and adaptation integration indicators knowing that within the document, adaptation is explained and its importance is recognized. Adaptation is not part of its own goal which thus resulted in a score of zero for that indicator.

Policies

The region has established ten policies that directly relate to the climate change preparedness goal, with three policies considering adaptation. The RGS deviates from others by explicitly supporting adaptation and emergency planning measures that respond to the potential impacts of sea level rise, water deficits, flooding, wildfires, etc. However, while an array of climate impacts are considered, specific policies aimed at preparing for climate vulnerability are not included. For example, the plan does not mention measures such as retreat and development regulations to minimize flood threats as was seen in the Capital RD RGS. Rather, adaptation is indirectly referenced through the encouragement of land use planning that ensures safe development and addresses natural hazards. In addition to the policies in the climate change section, climate change is also integrated into all other sections through 13 separate policies. Lastly, the RGS scored a 1 on the language section as it relies on vague wording such as "promote," "encourage," and "support."

Fact Base

With respect to the fact base informing the document, the region does not appear to use reliable climate data as there are no sources in the reference list relating to climate change. Instead, the strategy cites a website, www.communityintransition.org, which does not exhibit a climate change focus. Nonetheless, the climate information presented in the RGS is accurate but limited. Long-term projections regarding GHG emissions are present, but there are no long-term predictions regarding climate impacts. Furthermore, while the document does not specify that a risk assessment was done to inform the document, environmental and water assessments were conducted which may indirectly relate to climate change impacts.

Implementation

The implementation section of the RD of Nanaimo RGS is its highest scoring category. The document has a thorough implementation plan that is categorized by each policy area. Within each area, indicators are developed, a timeline is established, and responsible agencies are identified. Furthermore, the plan considers financial aspects by describing that "[w]hile some projects may be funded solely through the RDN's Regional Growth Management function, with no additional costs to member municipalities, others may require financial contributions from the member municipalities."

6.3.2 Capital Regional District Regional Growth Strategy

The Capital RD RGS received a total score of 23 out of 34.

Goals and Vision

The Capital RD RGS received a score of 4 out of 8 for the goals category. The document has a vibrant vision describing a resilient community that facilitates a great quality of life for its residents. The vision statement also highlights that "[o]ur choices reflect our commitment to collective action on climate change" (Capital Regional District, 2018, p. 1). Moreover, climate action is its own overarching goal with the objective to "significantly reduce community-based greenhouse gas emissions" (Capital Regional District, 2018, p. 1). The RGS thus scored a 2 for the concept of climate change indicator although the focus is dominated by mitigation. This is evidenced by the broad statement on reducing GHG emissions, with little attention directly paid to adaptation. The plan then scored very low in the areas of adaptation integration and adaptation

as part of its own goal. Because the RGS is intended to guide development and land use choices until the year 2038, it received a score of 2 for the long-term goals indicator.

Policies

The climate action goal and subsequent objective to significantly reduce GHG emissions exhibits the region's focus on mitigation. The goal appears to be inadequately informed, and this can be inferenced from statements such as "The Regional Growth Strategy supports the reduction of community-based greenhouse gas emissions to address the effects of a changing climate" (Capital Regional District, 2018, p. 39). Despite the dominance of mitigation within the overarching goal and objective sections, half of the plan's climate action principles consider climate adaptation. The Capital RD has effectively included statements that integrate advanced adaptation tactics, such as:

- Protect and assess the carbon sequestration and ecosystem values of natural systems, including forested lands, agricultural lands and wetlands;
- Be resilient to climate change impacts, including climate-related natural hazards; and,
- Promote adaptation principles of managed retreat, avoid, accommodate and protect.

While the strategy exemplifies a clear understanding of the need to adapt, this is not reflected in the established policies. There are only three policies within the climate action goal, only one of which simply mentions adaptation. Adaptation is however, indirectly referenced and directly mentioned within other sections such as housing and environment and infrastructure. In contrast to many other strategic documents, the Capital RD RGS makes use of strict language by employing words that prompt action and reflect a need to comply (e.g. design, avoid, identify, etc.).

Fact Base

With respect to the fact base used to inform the RGS, the region largely relies upon the Province of BC's Community Energy and Emissions Inventory (CEEI). While this data is appropriately scaled to the region, is reliable, and encompasses long term projections, it does not reflect climate impacts and other related information that can be used to inform adaptive efforts. Moreover, the region relies exclusively on provincial data and does not incorporate other sources such as the IPCC or any regionally-conducted risk assessments.

Implementation

The Capital RD RGS showcases a rigorous implementation plan that explicitly identifies implementation actions, responsible parties, and a timeline for each policy area. The plan details how the goals and objectives will be achieved and avoids the broad/vague implementation language frequently used in planning documents. The plan scored poorly in this section in the area of identified funding, as there is no mention of sources of funding.

6.3.3 Comox Valley Regional Growth Strategy

The Comox Valley RD RGS received a total score of 21 out of 34.

Goals and Vision

The Comox Valley RGS received a score of 5 out of 8 for the goals category. Its performance within the indicators 'concept of climate change' and 'long term goals' resulted in the highest score of 2 for each. This was because the RD has recognized the significance of climate change by establishing a section dedicated to climate change policies under the overarching goal "Minimize regional greenhouse gas emissions and plan for adaptation" (Comox Valley Regional District, 2010, p. 21). There are eight policy areas, of which climate change is its own policy area, operating within a timeframe of 20 years. Thus, the document effectively considers long-range planning. A score of 1 was given for the section relating to climate change adaptation integration, because adaptation is simply mentioned in the wording "…and plan for adaptation" (Comox Valley Regional District, 2010, p. 21). Finally, the document scored low in the area of 'climate adaptation as part of its own goal' as this is not present in the document. Rather, mitigation and adaptation are combined in an overarching policy area with a clear focus on mitigation.

Policies

Within the climate change policy area, there are six objectives. All but one of the objectives address climate change mitigation with the last objective being "plan for climate change adaptation" (Comox Valley Regional District, 2010, p. 78). Despite the disproportionate emphasis on mitigation, there is a clear understanding of the need to adapt. This is evidenced by numerous explanatory statements which highlight that "addressing climate change requires actions to respond to environmental changes that are already taking place" (Comox Valley Regional District, 2010, p. 71). While it is evident the document appreciates the necessity of

adaptation, this is not reflected within established objectives and policies, resulting in a score of 1 out of 2. The RGS effectively details actions to reduce emissions within the building, transportation, energy, and land use change sectors to receive a score of 2 for the land use, transportation, and energy indicators. Moreover, adaptation is integrated within these areas to varying extents. For example, the strategy describes avoiding development and redevelopment within flood-prone areas to create a more resilient region. With respect to the language used, there is a clear lack of strict wording with a majority of the policies using statements such as 'to promote' and 'municipalities should.' There are, however, some instances where the strategy clearly requires municipalities to address an issue, thus explaining the score of 1.

Fact Base

The Comox Valley RGS received a score of 4 out of 8 for the fact base category. Within this category, the strategy scored the highest within the reliable climate data indicator with a score of 2. This is because the document has clearly referenced the IPCC's predictions on climate impacts. However, this data pertains to global impacts, and as a result is not properly scaled to the region. Long-term projections are integrated within the climate change policy area, but only relate to long-term emissions. What is lacking are long-term projections relating to climate impacts and subsequent risk assessments. The strategy does, however, mention assessments conducted for the region's water supply, thus warranting a score of 1.

Implementation

The Comox Valley RGS encompasses a very strong implementation and monitoring section with three individual and critical sections. It details the implementation process which includes a review of OCPs, the preparation and inclusion of Regional Context Statements, the development and adoption of Implementation Agreements, and the creation of a monitoring and evaluation program plan. For each specific implementation action, a timeline has been established. For example, the document specifies that annual reports must be prepared on implementation and progress toward the goals and objectives of the regional growth strategy. While this statement ensures reporting on the region's progress, its aim is broad. To receive a score of 2 for the implementation plan indicator, statements on how the region will reach its goals and policies must be included. Additionally, the RGS scores low in the indicator dealing with the identification of responsible parties and funding.

6.3.4 Mount Waddington Regional Plan

The Mount Waddington RD Regional Plan received a total score of 17 out of 34.

Goals and Vision

It is important to note that this document is not a RGS but is instead a "Regional Plan." It was last amended and adopted in 2015. In an introduction statement, it is noted that the Regional Plan contains "policies on land use and development, regional and local services, economics, climate change adaptation, transportation, parks and recreation, and communication" (Regional District of Mount Waddington, 2015, p. 4). Interestingly, adaptation is specifically referenced as opposed to mitigation or the broad term "climate action." The plan includes four strategic goals, none of which directly consider climate change, which explains the score of 1 for concept of climate change and adaptation integrated within the plan.

Policies

Section three of the plan relates to policies, with the first policy area being climate change. Here, climate impacts are listed and scaled to the region. There are four subsequent policies with one directly considering climate adaptation: "continue to develop an understanding of all potential impacts of climate change, identify potential opportunities and risks, and adopt adaptive strategies related to its infrastructure and in implementation of its land use planning policies" (Regional District of Mount Waddington, 2015, p. 6). The section pertaining to climate policies appears to be an afterthought, which was clearly added during the last amendment. Despite the plan now considering climate impacts and stating that it prioritizes adaptation strategies, this is not reflected throughout the rest of the plan.

Fact Base

Strategies indirectly considering adaptation can be found in the emergency planning section which notes that "[c]limatic changes on BC's west coast will likely continue to amplify landslide and river flow related hazard risks" (Regional District of Mount Waddington, 2015, p. 18). As a result, scaled and reliable climate data appears to be used to inform the section on climate change.

Implementation

Lastly, with respect to the implementation section, the plan scores relatively well as there is a clear implementation plan with individual actions, consideration of financial resources, establishment of a timeline for review, and broad identification of responsible parties (e.g. the RD, municipalities, etc).

6.3.5 Comox Valley Climate Action Plan

The Comox Valley RD Climate Action Plan received a total score of 27 out of 32.

Goals and Vision

It is important to note that this document serves as the Comox Valley Regional District Rural Areas Partners for Climate Protection Milestone Three document. This plan has clearly recognized that adaptation and mitigation are equally important strategies necessary for a robust response to climate change. The document, however, is overwhelmingly focused on mitigation largely due to the provincial requirement to involve emission reduction targets. For example, while adaptation is present in several policy areas, it is only mentioned five times throughout the entire document. This is why the plan received a score of 1 out of 2 for adaptation integration indicator. Adaptation is part of its own goal within an overarching policy section focused on buildings and infrastructure. Here, the region intends to review and update Development Permit Guidelines, Zoning Bylaw, and other bylaws to consider flood risk, sea level rise, wildfire risk, and extreme weather event risk. This goal is further broken down into 'Next Steps' which include actions such as developing a climate change resiliency plan and reviewing fire hazard mapping.

Policies

The policy section is robust with very strong language used. This commits the region to undertake climate-related actions. A variety of policies have been established for many sectors, and adaptation measures are integrated within a majority of them. In certain cases, adaptation is indirectly referenced. For example, the plan establishes actions for "green infrastructure standards including green roofs, open storm water channels, ecological wastewater treatment ponds, rain gardens and limiting total impervious area" (Comox Valley Regional District, 2015, p. 20).

Fact Base

A majority of the plan's policies are informed by British Columbia's Community Energy and Emissions Inventory (CEEI). While this source provides information that is reliable, scaled, and includes long-term projections, it relates to GHG emissions alone. The information presented on specific climate impacts is accurate and reliable; it has not, however, been scaled to the region and mainly presents broad, global impacts. Lastly, no risk assessments have been conducted outside of fire hazard mapping.

Implementation

Although the plan does not have a section dedicated to an implementation plan, each policy area is divided into objectives and next steps. These are individual implementation actions with lead and support, partners, costs, potential funding and monitoring metrics identified. Implementation of the established policies within the Comox Valley CAP is highly likely given the rigorous implementation plan in place.

6.3.6 Capital Regional District Regional Climate Action Strategy

The Capital RD Regional Climate Action Strategy received a total score of 31 out of 32.

Goals and Vision

The Capital RD CAS is clearly a robust strategy as evidenced on the first page through its guiding vision: "The Capital Region is low carbon, energy-efficient and values its natural resources; the community minimizes emissions, is well informed and prepared for the potential impacts of climate change and works collaboratively to increase resilience for the uncertainties ahead" (Capital Regional District, 2017, p. 1). The Strategy has eight overarching goals, three of which are focused specifically on adaptation: 1) Regional vulnerabilities to the impacts of climate change are understood; 2) Communities are prepared for and resilient to the impacts of climate change; and 3) Natural assets are resilient to the impacts of climate change. Thus, adaptation is effectively integrated within the goals and is part of its own goal.

Policies

The adaptation policies focus on identifying the region's vulnerabilities and strategies to enhance awareness and create resilient communities. Specific policies of interest include: 1) Conduct region-wide climate risk and vulnerability assessments for natural and social impacts

(e.g. ecosystem shifts, invasive species, drought, disease) every five years, or sooner as new information (e.g. climate projects) becomes available; 2) Continue to use environmental development permit areas, covenants and other mechanisms to improve the resiliency of shoreline and marine habitats in the Juan de Fuca Electoral Area; and 3) Work with stakeholders and interested First Nations governments, on an integrated watershed management approach to adapt to changes in flows, groundwater storage and other stressors due to climate change (Capital Regional District, 2017). What is missing, however, are specific actions related to land use and development regulations aimed at protecting residents and assets from climate impacts (e.g. floodplain regulations, setbacks, retreat, etc.)

Fact Base

This Capital RD Regional CAS stands out from others in the section dealing with fact base. This plan uses reliable data from international and provincial sources, clearly scales the data by presenting region-specific climate impacts, directly scales projections to the region, and effectively utilizes this science to inform the rest of the document. Climate information is used to justify the need for both mitigation and adaptation, proactivity, and cooperation. Moreover, risk assessments have been conducted and are integrated into the strategy. For example, the strategy outlines that North Saanich conducted a Sea Level Rise Risk Assessment.

Implementation

The implementation section alone is not as rigorous as other documents. However, within the goals and actions section, responsible parties (e.g. divisions) are identified and their roles are detailed. For example, in some instances, the strategy highlights the region's role and its cooperation with partners (e.g. to purchase parkland through the Land Acquisition Fund).

6.3.7 Municipal Planning Documents

Municipal OCPs were evaluated largely to make inferences about the role of regional planning in influencing municipal climate action planning. A total of 36 OCPs were evaluated with grand scores highly variable within and between RDs (Appendix B). Scores for the municipal documents ranged from 7 to 32, showing great variation at the municipal level. In general, it was found that municipal planning documents scored lower if the municipality was located in a RD lacking a RGS. For example, the lowest scoring plans (7/34) were found in

Strathcona RD and Mount Waddington RD. Although Mount Waddington RD has a Regional Plan, it is not binding on the incorporated municipalities within the region. Contrary to expectations, the highest scoring OCPs are not those of bigger cities and towns. It was expected that larger cities would have the highest scoring plans given the greater access to necessary resources such as funds and sufficient personnel. Rather, smaller towns such as Oak Bay and Parksville have exemplary plans that integrate climate change adaptation and aim for resiliency. This may be influenced by regional climate goals or the need for adaptation due to prominent climate impacts including sea level rise and extreme weather.

Municipal OCPs tend to score the lowest in the "fact base" category. This is largely because the climate information provided focuses on emissions, does not consider climate impacts, does not scale climate impacts, and fails to use risk assessments to inform/justify specific policies and actions. Where OCPs generally score the highest is in the "policies" category. This is because most OCPs include policies relating to mitigation throughout a variety of policy areas to adhere to the provincial mandate. While this is the case, there are far fewer policies directly relating to adaptation, and they are of lower priority.

With respect to the inclusion of climate change and adaptation within municipal planning documents, in many instances climate change considerations are highly fragmented and only present within recently-amended sections. In this case, climate change is addressed separately and is not incorporated throughout the rest of the OCP (e.g. Gold River OCP). Moreover, climate change appears to be an afterthought that is addressed solely to comply with the provincial mandate. In terms of the integration of adaptation, many OCPs differentiate adaptation and mitigation within introductory statements relating to climate change. Adaptation is often described as a critical element for responding to climate change within these statements. However, this is not reflected in the subsequent policies which focus almost exclusively on greenhouse gas emissions reduction. There is consequently a discrepancy between climate information/knowledge and established policies.

In terms of the influence of regional planning on municipal climate action planning, it is first important to note that a majority of OCPs include a regional context statement describing how the OCP aligns with regionally set goals. When a RGS incorporates a climate action goal, this ensures that the underlying OCP undertakes efforts to align with that goal. For example, the

Nanaimo OCP highlights a regionally set goal to "Prepare for Climate Change and Reduce Energy Consumption" (City of Nanaimo, 2008, p. 17). It is then outlined that:

> "The City's Official Community Plan, planNanaimo, is based upon a guiding principle of sustainability. This guiding principle is supported through goals and objectives that address climate change and energy consumption, urban growth and land use, and transportation modes and mobility patterns."

The influence of regional planning may not be as effective at spurring local climate action as are provincially set mandates. This is evidenced in local OCPs that are outdated and therefore not subject to Bill 27, but are still required to align with regionally set goals. For example, the Lantzville OCP, passed in 2005, notes that it will align with the climate change goal set in the Nanaimo RGS. However, there is no section specifically dealing with climate change, and mitigative and adaptive policies are absent.

7. Discussion

7.1 Introduction

This research has employed a mixed-methods approach to collect and examine qualitative and quantitative data from RDs on Vancouver Island. The findings of this study shed light on the vulnerability of local governments to climate impacts and the state of climate change adaptation planning at the RD scale. The intent of this discussion is to interpret and describe the significance of the findings, identify new insights emerging from the investigation of the research problem, and relate the findings to existing scholarship. This chapter uses key concepts within existing literature and the conceptual framework of resilience theory to examine the research objectives. To reiterate, the primary objectives of this research are to explore how climate change threats impact RDs on Vancouver Island and better understand how RDs plan for and respond to climate change impacts. More specifically this research aims to: 1) identify pressing climate threats and vulnerabilities facing RDs, 2) analyze the extent of adaptation inclusion in regional policy and plans on Vancouver Island, 3) examine the resilience of RDs with a focus on factors that facilitate and impede effective adaptation planning, and 4) propose recommendations that will assist with integration of adaptation into strategic planning.

The discussion is broken down into two key themes that delve into: 1) climate change impacts and vulnerability on Vancouver Island, and 2) application of the theoretical framework. First, research findings related to climate threats and strategic responses are discussed in the context of existing literature to examine the implications of climate stressors for RDs and to identify vulnerability across Vancouver Island. Resilience theory is then used to evaluate regional strategic planning frameworks, examine the extent of adaptation integration within policy and plans, and analyze the effectiveness of planning documents in responding to climate threats. Application of the theoretical lens allowed for a plethora of factors that facilitate and challenge regional climate adaptation planning to be identified with key insights emerging in relation to urban resilience.

7.2 Climate Change Impacts and Vulnerability on Vancouver Island

As anthropogenic GHG emissions continue to increase, the world has been subject to significant change. Leading climate scholars have found that many of the observed climate impacts are unprecedented over decades to millennia (IPCC, 2014). As these climate impacts unfold, societies across the globe are faced with a plethora of effects, including increasing drought conditions and more frequent and severe flooding events. While many regions are vulnerable, coastal locations show a heightened susceptibility to contemporary climate change. This is echoed in the case of Vancouver Island, where key climate change threats have been emphasized by the interviewees and reflected in strategic documents. A primary objective of this research is to explore how climate change stressors impact RDs on Vancouver Island and to identify vulnerabilities. The following section interprets the findings related to key climate threats on Vancouver Island in order to identify pressing climate stressors and how they influence RDs. Concepts of vulnerability in climate literature are then used to examine Vancouver Island's vulnerability to climate change.

7.2.1 Key Climate Threats

The results of this research indicate that on Vancouver Island, climate impacts underway include rising average temperatures, increasing rates of precipitation, and sea level rise. Climate data collected for the Province of British Columbia supports these claims where historical data from 1900-2013 indicates that, across the Province of British Columbia, average annual temperature warmed by 1.4 °C, overall annual precipitation increased, lakes and rivers become ice free earlier in the year, and average sea level rose along most of the coast (British Columbia Ministry of Environment, 2015). These climate impacts have the potential to create significant challenges across Vancouver Island, including risks associated with sea level rise and storm surges, rising temperature induced wildfires and drought, and threatened water supply as a result of variable precipitation. Indeed, the interviewees agree that all RDs on Vancouver Island are facing threats associated with drought and flooding. Of particular concern are the impacts of drought on local water supply and quality, economic stability, and the occurrence and intensity of wildfire events. Moreover, it is apparent that although the island has long grappled with flooding, the frequency and severity of flood events has increased significantly in recent times, with both coastal and overland flooding events creating challenges related to infrastructure and

asset management, property damage, and resident health and safety. Climate stressors on Vancouver Island are thus having social, economic, and environmental impacts. While a wealth of scholarship identifies physical effects of climate change on urban areas, such as rising sea levels and melting snow and ice, less attention is given to examining how the risk of these climate impacts affects the economic, environmental, and social fabric of communities (Gasper, Blohm, and Ruth, 2011).

Gasper et al. (2011) argue that in order to understand the implications of climate change threats for local governments, it is important to first assess how they affect social, environmental, and economic conditions, which are critical to urban function. Examining the interaction between these factors is also key to assessing the implications of climate change on local governments. Social implications of climate stressors include impacts on the physical and emotional well-being of residents (Gasper *et al.*, 2011). Negative environmental impacts may involve the loss of biodiversity, reduced water availability, and degraded ecosystem health as a result of rising temperatures, variable precipitation, and sea level rise (IPCC, 2014; Gasper *et al.*, 2011). Economic impacts disrupt the flow of goods and services within an urban area, which may include the destruction of infrastructure and economic resources and loss of connectivity (Gasper *et al.*, 2011).

On Vancouver Island, social impacts for RDs thus include health effects, food and water scarcity, livelihood impacts, and displacement. For instance, the findings of this research indicate that drought and extreme warm temperatures have resulted in water scarcity and significant negative impacts to resident health. Moreover, with more severe flooding and wildfire events, and the resultant loss of habitable land, resident displacement may become a social challenge of concern for RDs. In terms of environmental implications, research findings suggest that RDs on Vancouver Island face environmental challenges such as coastal ecosystem degradation as a result of coastal erosion and sea level rise and reduced biodiversity stemming from rising temperatures and wildfire. These environmental impacts are strongly tied to social and economic factors where coastal ecosystem degradation, for example, can increase both social and economic impacts. In this case, unhealthy coastal ecosystems have a reduced ability to attenuate or absorb wave action and thus result in enhanced flooding, which threatens resident safety and can damage critical infrastructure. A degraded coastal environment also decreases aesthetic value,

which may reduce potential for tourism (Gasper *et al.*, 2011). Research findings suggest that intense coastal and inland flooding has major implications for infrastructure damage. Indeed, scholars stress that intense climate events and slow-onset changes have the potential to damage infrastructure and negatively impact industrial operation, including the provision of electricity, water, and sewerage (Gasper *et al.*, 2011). Other economic concerns raised by interviewees relate to the impact of wildfire on the Island's logging industry. In general, the interaction between the host of social, environmental, and economic implications of climate change is complex and can have accentuating effects that should not be overlooked. RDs on Vancouver Island must consider these implications within long range strategic planning if they are to remain resilient and effectively address vulnerabilities.

7.2.2 Vulnerability on Vancouver Island

Understanding vulnerability is multifaceted, with numerous definitions and conceptual frameworks identified in climate literature. Definitions from recent reports of the IPCC outline that vulnerability involves the extent to which a system is susceptible to adverse effects of climate change variability and climate extremes (IPCC, 2014). Vulnerability is influenced by a systems exposure and sensitivity to climate hazards, and its adaptive capacity (IPCC, 2014). These factors are also referenced by Adger et al. (2003) who identify that the exposure, physical setting and sensitivity, and capacity of a system to adapt are factors that contribute to the vulnerability of a system to climate change. Using these concepts to characterize vulnerability is challenging and lacks specificity, however. In response, many scholars have devised conceptual frameworks intended to assist with vulnerability analysis. For instance, Füssel, (2007) presents a framework of vulnerability that combines components of the system in question, the hazards of concern, the attributes of concern, and a temporal reference. By combining the above factors and specific components, vulnerability on Vancouver Island can be examined.

It is first important to identify the systems in question, which involve RD's on Vancouver Island, or more specifically, socio-ecological systems (e.g. human and natural systems). Research findings allow for pressing hazards to be identified, which largely relate to drought and flood related challenges, along with associated stressors such as wildfire, storm surge, and coastal erosion. Valued attributes of the vulnerable system refer to those attributes that are threatened by its exposure to a hazard (Füssel, 2007). In the case of Vancouver Island, attributes

of concern include human lives and health, the economic and operational functioning of RDs, and the health of key ecosystems. Lastly, the temporal scale used to characterize vulnerability takes into account both present time and future projections, given that continued climate change is inevitable (Füssel, 2007). The following section will apply the factors of exposure, physical setting and sensitivity, and system capacity to examine the vulnerability of socio-ecological systems on Vancouver Island and their valued attributes, to drought and flood related climate hazards.

Vulnerability varies substantially between the seven RDs according to climate impacts faced and regional factors such as population, location, and capacity (Adger, *et al*., 2003). For instance, the research findings suggest that Mount Waddington RD and Alberni-Clayoquot RD are particularly vulnerable to drought-induced wildfire events because of local weather patterns, a lack of resources, and greater exposure to climate impacts. The Capital RD, on the other hand, exhibits a greater capacity to act and experiences milder temperatures, resulting in a lowered vulnerability to wildfire. Vulnerability of socio-ecological systems to drought is heightened across Vancouver Island in general given the effect of drought, extreme temperatures, and wildfire on valued attributes. For example, these climate hazards undoubtedly have an impact on human health and safety, the logging industry, and the health of forested systems. With respect to the vulnerability of RDs to flooding, key factors at play include population density, location of infrastructure, capacity, and topographical features. The interviewees highlighted that flooding events are a significant concern in the areas of Nanaimo RD (Nanaimo River), Strathcona RD (Oyster River), and in the valley and western coast of Alberni-Clayoquot RD. Moreover, coastal inundation is a key threat for all RDs with all interviewees expressing varying degrees of apprehension. Vulnerability to flooding is further realized when the impact of both coastal and overland flooding on valued attributes is considered. For instance, the significant negative impacts of intense flooding events on resident safety and critical infrastructure necessary for regional operations, contributes to Vancouver Island's accentuated vulnerability. Moreover, it is critical to note that vulnerability is likely to be accentuated with further climate change and population growth.

7.2.3 Nature of Climate Responses

The Island's clear vulnerability raises key issues about the nature of climate responses and strategic priorities. Responses to a changing climate can be categorized into reactive or proactive/anticipatory actions. Reactive responses refer to efforts or adaptations that occur after the impacts of climate change have been observed, while proactive responses involve efforts that occur before the impacts of climate change are observed (IPCC, 2014). In general, reactions on Vancouver Island can largely be described as a mix of reactive and proactive efforts, with a greater focus on reactive measures. For example, interviewees from Strathcona RD and Alberni-Clayoquot RD stress that planning responses are reactive to impacts as they arise and none of the RDs employ purely anticipatory planning interventions. It is widely accepted that proactive efforts are more effective than reactive responses, particularly when it is understood that climate change is inherently complex and associated with a great degree of uncertainty (e.g. Palmer *et al*., 2009). Proactivity involves the anticipation of future impacts and the implementation of efforts before climate impacts become overwhelming. Scholars argue that without deliberate management actions that anticipate future stress, decision-makers will be left reacting to impacts as they arise, which is often costly, ad hoc, and inexact (Palmer *et al*., 2009). In general, proactive efforts offer greater flexibility and have the potential to advance local governmental preparedness for climate impacts to come. Interview findings suggest that there is an awareness of the importance of anticipatory adaptation with growing willingness to utilize a proactive approach. Moreover, findings from the plan content analysis show that several RDs plan to employ anticipatory adaptation. However, several barriers may hinder effective proactivity on the ground, including conflicting priorities, limited ability to access and communicate climate information, a lack of policy mandates from higher levels of governments, scarce resources, and lack of leadership (Nalau *et al*., 2015; Shi *et al.,* 2015). These will be discussed in great detail in later sections.

Ultimately, the research findings show that Vancouver Island exhibits an accentuated vulnerability to contemporary climate impacts and RDs face several interlinked challenges that prevent robust anticipatory adaptation efforts. These challenges are translated into the planning process and can have profound effects on the extent of adaptation integration within strategic policy and planning documents.

7.3 Resilience and Adaptation Planning

Resilience theory is used to unpack the complexities associated with climate threats and the ability of local governments to adapt to those threats. The following sections will first use the resilience theoretical lens to analyze the policy and planning framework of RD's on Vancouver Island. As a key objective of this research is to better understand how RDs plan for and respond to climate change impacts, institutional concepts of resilience theory are applied to this case study to examine whether institutions present facilitate resilience building and effective adaptation planning. Although the impact of agents and systems, and the interaction between these elements, can influence local resilience, institutional elements in particular are key to assessing local preparedness for climate variability. The framework is then used to review each resilience element in order to identify and explain facilitating and challenging factors to the regional climate adaptation planning process. This section concludes with insights on how to build resilience, as understood through the theoretical framework. Findings from both the plan content analysis and semi-structured interviews will be examined and compared to highlight key discrepancies and opportunities.

7.3.1 Resilience Building Institutions

Resilience theory emphasizes the importance of institutions in influencing community preparedness for climate change. Institutions, which include planning documents, regulations, and policy, can have a substantial impact on the ability of local governments to employ effective adaptation and resilience building strategies (Davoudi *et al*., 2013). Scholars and decision-makers have identified the planning system as a key tool to anticipate and prevent adverse climate change impacts (e.g. Wilson, 2006). The most recent IPCC assessment report stresses that effective adaptation and mitigation efforts will depend on policies across international, national, regional, and local scales (IPCC, 2014). In general, the ability of governments to respond to climate change is strongly influenced by their policy framework and institutions in place. The literature supports this concept and suggests that integrating climate change considerations into planning processes and systems facilitates early action that is better organized and more cost-effective than responding to changes in an unplanned manner (e.g. Wilson, 2006; Tang *et al*., 2011). In this sense, adaptation considerations must be present within institutions to

provide strategic guidance for planning efforts that align with climate adaptation goals, and to facilitate the efficient implementation of practical actions.

7.3.2 Regional Institutional Frameworks

While the role of RDs is consistent across Vancouver Island, the institutions in place differ with some RDs much further ahead than others. Of the seven RDs, only three have developed and passed a Regional Growth Strategy (Capital RD, Nanaimo RD, and Comox Valley RD). Moreover, the Comox Valley and Capital RDs are the only regional bodies to have a regional climate-related strategy. Several scholars identify that a lack of resilience building institutions may act as a barrier to effective climate adaptation planning (Wilson, 2006; Ford and King, 2015), however, factors that contribute to a lack of institutions are often left out of climate adaptation literature (Biesbroek *et al*., 2013). In general, the development of RGSs is lagging because of three key factors. First, provincial policy factors are at play where RDs are not mandated to adopt a RGS. Local contextual factors also influence the appetite for a RGS; some regions revealed that political tensions explain the lack of a growth strategy while others indicated that stagnant population growth warrants the absence of a RGS. Without a growth strategy in place, RDs are forced to use other planning tools (e.g. OCPs, regional plans, development permit areas) to manage growth and respond to key planning issues including climate change.

The extent of adaptation integration within policy and plans is also highly variable across the seven RDs. Findings on the extent of adaptation integration within institutions can be grouped into two categories. Regions that do not have a RGS tend to show a lesser extent of adaptation consideration in strategic planning while RDs having a RGS show higher rates of adaptation integration. The first grouping includes the Alberni-Clayoquot, Cowichan Valley, Strathcona, and Mount Waddington RDs, and the second includes Nanaimo, Comox Valley, and the Capital RDs. As a result, it can be inferenced that the first grouping has not yet established an institutional framework that encourages effective adaptation planning, while the second group encompasses the institutions necessary to facilitate resilience building. This is highly visible in practice where RDs without a regional plan tend to address climate change in a fragmented manner with adaptation rarely considered within planning frameworks and implementation of resilience building actions lagging. In general, this lack of adaptation integration and

consideration of climate change in an indirect and fragmented manner within local strategic planning documents is a topic receiving significant attention within the literature. For instance, several studies aimed at assessing local strategic planning in relation to climate preparedness tend to find that adaptation is addressed in a piecemeal manner, adaptation plans are under-developed (Preston *et al*., 2011), and documents aimed at responding to climate change are constrained from several standpoints (Baynham and Stevens, 2014; Horney *et al*., 2017; Tang *et al*., 2011).

The second group of RDs having a RGS show a greater extent of adaptation integration within regional institutions. These RDs encompass a strong policy framework for addressing climate change considerations and building resilience, however, results from the analysis of the semi-structured interviews show that the adaptation policies and goals are not being implemented in practice and remain as lofty statements. This trend is seen in many other parts of the world where, Woodruff and Stults (2016) for example, find that while several adaptation strategies and policies have been developed within adaptation plans in the United States, plans fail to prioritize impacts and provide detailed implementation processes, which raises concerns regarding the likelihood that adaptation goals will translate into on-the-ground reductions in vulnerability.

7.3.3 Content and Quality of Institutions

As argued in resilience theory scholarship, effective climate adaptation planning is not only influenced by the presence of resilience building institutions, but by the quality of institutions as well (e.g. Tyler and Moench, 2012). Indeed, the content and quality of strategic planning documents can have a significant impact on local adaptation policy conception and implementation (Tang *et al*., 2011). Climate literature often suggests that institutions that include high quality content on climate change considerations with detailed strategies and policies can facilitate anticipatory action that is better organized and more cost-effective than responding to changes in an unplanned manner (e.g. Wilson, 2006; Tang *et al*., 2011). Baynham and Stevens (2014) expand on this concept by describing that integrating climate change within planning documents such as an OCP or RGS has the potential to be a highly effective approach to enhancing local governmental preparedness and resilience. Embedding adaptation and mitigation considerations within strategic planning frameworks may be effective not only because of the legal weight of these documents as a community's guiding land use document, but because these

plans address diverse and cross-cutting issues necessary to address climate change (Baynham and Stevens, 2014). For these reasons, the results of a PCA can enhance our understanding of the significance of embedding adaptation into local institutions. The following sections will use resilience theory to better understand the PCA findings and identify key inferences that will contribute to literature on climate change adaptation planning.

7.3.3.1 Regional Growth Strategies and Plans

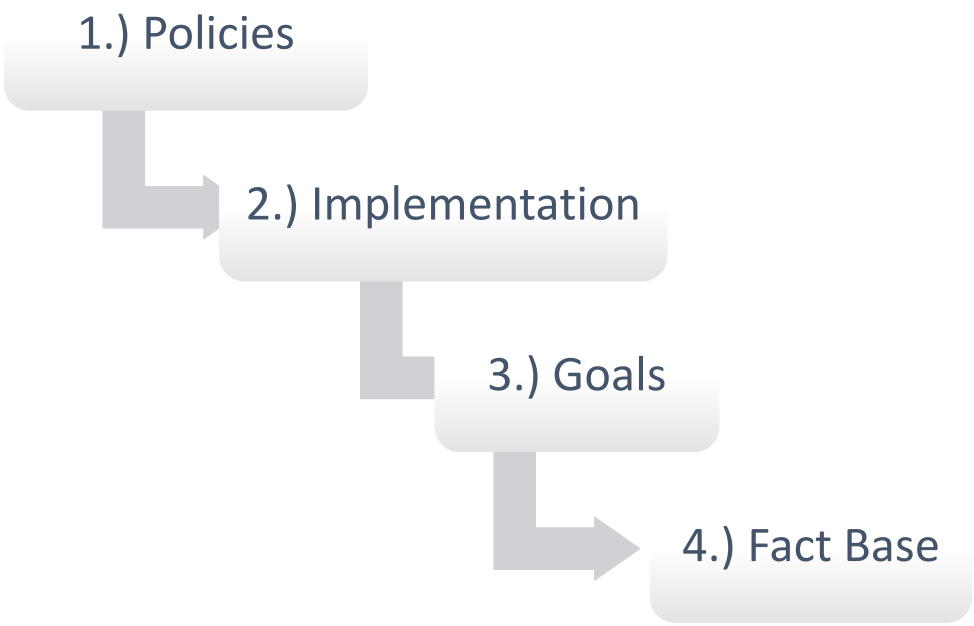

Figure 7- Ranked scores of plan content analysis categories.
Ranking of the highest scoring categories for regional planning documents as revealed from the plan content analysis show that on average, the policy category scores the highest followed by the implementation and goals category with the fact base category scoring the lowest.

On average, the three RGSs and one regional plan scored 21 out of a total of 34. Where the planning documents tend to lose points is in the fact base and goals categories of the PCA (Figure 7). As the PCA was tailored to focus on the integration of climate adaptation into local planning documents, the results show that regional planning documents tend to lack a specific focus on adaptation within the broad goals and visions of these guiding documents. Instead, mitigation remains the focus of any climate related goals with adaptation only mentioned or addressed in a vague and non-committal manner. An examination of the individual scores for each indicator within the goals category reveals that RGSs score high for indicators looking into

whether climate change is included as an overarching goal and whether or not long-term goals are set. Of importance are the low scores received for indicators associated with adaptation integrated within climate goals and adaptation as its own goal. Again, these findings align with the results of the Baynham and Stevens (2014) study where the authors highlight that the lowest scoring indicator within their goals category of the PCA was the inclusion of specific goals related to adaptation. These findings shed light on the imbalance between climate action priorities, where local governments continue to prioritize mitigation over adaptation. It can be inferred that the provincial mandate has effectively enhanced the consideration of climate mitigation within strategic planning given the prominence of mitigation goals and policies embedded throughout regional planning documents. It is thus very likely that adaptation integration into regional goals and plans will be improved with the development of a climate change adaptation mandate (Baynham and Stevens, 2014). Indeed, guidance in the form of national and state/provincial mandates is critical for spurring local governmental action. However, it is critical to recognize that flexibility and lack of legislative "teeth" within mandates may result in a mere compliance where local governments are not incentivized to go beyond basic national requirements (Lyles *et al*., 2014; Stevens and Senbel, 2012).

With respect to the results within the fact base category of the PCA, it is first important to note that this is the lowest scoring category for both RGSs and municipal OCPs. This category is intended to evaluate the extent and quality of climate information and data used to inform planning documents. The lowest scoring indicator within this category is the inclusion of risk assessments and vulnerability analysis as informing data for the development of climate related policies and actions. Moreover, climate data that is present within planning documents tends to focus on emissions projections and targets with little consideration given to contemporary and predicted climate impacts. This suggests that RDs and municipalities on Vancouver Island are challenged by a lack of climate data that is appropriately scaled and specific to their area of interest. In their study that employed a PCA for OCPs in BC, Baynham and Stevens (2014) also found that of the four category areas in the protocol, fact base received the lowest assessment. The authors hypothesized that these results may suggest "that the rationale for including climate change within OCPs is not well communicated or perhaps not well understood by the communities themselves" (Baynham and Stevens, 2014, p. 568). In general, the low scores received within the fact base category point to the need for greater cooperation with climate

experts and greater access to climate data and knowledge to ensure that climate goals and policies are grounded in accurate and scaled information. It is widely accepted that local climate change adaptation planning must be rooted in, and informed by, sound science (Ford and King, 2015). However, research on the use of expert knowledge has revealed several complex challenges. For instance, climate change science involves a degree of uncertainty, and is often challenging to scale to urban and local levels (Krellenberg and Barth, 2014; Van Stigt *et al*., 2015). Ford and King (2015) highlight that the availability of useable science is a crucial factor necessary for adaptation to occur, however, many projects and adaptation strategies do not exhibit a successful link between the useable science and decision-making (Thorne *et al*., 2017). This mismatch underscores the importance of the interaction between scientists and users of information in communicating climate science and the challenges of translating it into effective actions. Because climate change science is highly complex, inherently uncertain, and riddled with scientific verbiage, planning practitioners often experience difficulty in comprehending the knowledge, thus inappropriately communicating it to decision-makers and not utilizing it to its full extent.

RGSs and municipal OCPs score the highest in the policies section largely because of the inclusion of mitigative policies across various sectors despite a lack of adaptation specific policies. These include policies and actions intended to reduce emissions and enhance energy efficiency within, for example, transportation, agriculture, and land use sectors. The plans score the lowest within the policy category in the climate change adaptation and risk reduction indicator. These findings suggest that local governments are better equipped and informed to set mitigation policies than they are to develop climate adaptation policies. Mitigation appears to be a higher priority than adaptation despite climate impacts increasing in frequency and severity across Vancouver Island. Furthermore, it can be inferenced that the widespread inclusion of mitigation-focused policies and actions throughout planning documents is strongly influenced by the provincial mandate requiring local governments to integrate emissions reduction targets within OCPs and RGSs (Baynham and Stevens, 2014). Finally, with respect to the implementation category of the PCA, results showed that RGSs and municipal OCPs tended to score relatively high. Most planning documents have identified an implementation timeline with individual action items; however, plans score lower for the indicators associated with whether or not funding and responsible parties are identified. These results suggest that although climate

action policies are identified and embedded throughout local planning documents, implementation of these policies is challenging particularly because of a lack of specific funding and responsible parties within the implementation plans.

7.3.3.2 Climate Action Strategies

Notably, only two RDs across the island have developed climate action strategies/plans. Comox Valley RD has adopted a climate action plan and the Capital RD has developed and adopted a regional and corporate climate action strategy. Both of these documents score very high in total with the Capital RD CAS scoring the highest. High scores for the climate action plans/strategies were expected given that the PCA was tailored to examine embeddedness of climate change considerations within strategic planning documents. However, these findings are in contrast to findings presented within literature that focuses on climate change plans. For example, several studies on climate change focused planning documents reveal that overall, plan quality was low, which was attributed to several factors including poor guidance from senior levels of government and failure to establish clear goals and objectives, quantifiable targets, and an effective implementation strategy (Baker *et al*., 2012; Lyles *et al*., 2014; Stevens and Senbel, 2012). While total scores for the climate related plans were high, low scoring indicators can be identified and used to make inferences regarding plan efficacy. The only indicator not receiving a score of 2 for the Capital RD CAS was the land use and development policies related to climate impacts indicator, hinting at a lack of adaptation policies intended to improve resilience through land use and development measures (e.g. setbacks, restrictive zoning, etc.). The Comox Valley CAP scores below a 2 for indicators associated with broad goals that integrate adaptation, adaptation as part of its own overarching goal, scaled climate data, and the use of risk assessments and vulnerability analysis. This trend is seen across RGSs and OCPs as well, and suggests that there is a need for greater consideration given to adaptation as a strategic priority and the use of reliable, scaled, climate data within strategic planning documents.

7.4 Elements of Resilience

The three elements of urban resilience, which include agents, systems, and institutions, are used to create a conceptual framework in which the research objectives are explored. This conceptual framework integrates knowledge on the factors contributing to urban resilience and uses the characteristics of each element to better understand local government vulnerability and

preparedness for climate change. When applied to RDs on Vancouver Island, this theoretical framework enables the identification of vulnerabilities, assists with the comprehension of factors that facilitate and challenge regional climate adaptation planning, and helps to pinpoint areas where resilience and adaptation planning can be enhanced.

7.4.1 Agents

Agents are a key element of urban resilience and may include individuals, households, and organizations (Tyler and Moench, 2012). A critical characteristic of agents is their ability to undertake independent analysis, deliberate, interact, learn, and make strategic choices when presented with new information (Tyler and Moench, 2012). The resilience of agents is strongly influenced by factors such as poverty, gender, ethnicity, and age. These factors vary across RDs; in general, however, Vancouver Island has an ageing population with low rates of poverty (Statistics Canada, 2016). RDs are responsible for providing services and amenities to rural populations for the most part, with this population showing a smaller ethnic diversity, higher income and average age than urban populations. With this in mind, the capacities of agents, including their responsiveness, resourcefulness, and capacity to learn, become key factors influencing urban resilience. Tyler and Moench (2012) highlight that a high capacity agent would have the ability to anticipate and respond to external stresses such as climate change. This potential to anticipate and respond to change, however, is strongly influenced by the availability of resources and access to supporting systems (Adger *et al*., 2003; Kim and Lim, 2016).

When the characteristics of agents are examined and applied to the research findings, several facilitating and challenging factors emerged. Facilitating factors associated with the agent element include the capacity of RDs, environmental awareness of agents, and presence of agents who function as local champions. Challenging factors involve the capacity of RDs, conflicting priorities held by local agents, and political will.

7.4.1.1 Facilitating Factors

Greater Capacity

When RDs are characterized as an organization or agent, their capacity can be used to examine resilience. Research findings suggest that capacity is a key aspect influencing the ability of local governments to prepare for and cope with climate impacts. This is evidenced by

examining the highly-visible trends emerging in the relationship between regional capacity and regional adaptation planning: RDs having greater financial resources, personnel, and climate knowledge show enhanced adaptation planning. While findings revealed that, in general, all RDs suffer from a lack of capacity (whether it be in the form of limited finances, personnel, or climate knowledge), according to the interviewees, the Capital RD, Nanaimo RD, and Comox Valley RD have a greater capacity than the other four RDs on the island. For instance, the Capital RD has a sufficient financial capacity to act and interviewees from Nanaimo RD highlighted the presence of highly aware and knowledgeable personnel. These factors have enabled the RDs with higher capacities to enhance their resilience by anticipating climate impacts and creating a strategic framework to respond to climate change with adaptation embedded throughout. For example, the RD of Nanaimo anticipated climate threats by identifying that coastal flooding was a key climate challenge for the region now and in the future, and in response, the RD spearheaded the creation of a sea level rise adaptation strategy. In the case of Vancouver Island, capacity is then a critical factor that determines the ability of agents to enhance resilience and adapt to a changing climate. Indeed, scholars note that numerous conditions influence the ability of local governments to adapt, including economic resources, technology, information and skills, infrastructure, institutions, and equity (e.g. Adger *et al*., 2003; Ford and King, 2015). Although local capacity may strongly influence the ability of institutions to adapt it is not always a strong indicator of adaptation in practice (Ford and King, 2015). While capacity can ultimately enable a local government to undertake adaptation planning, adaptation will not occur if it is not a strategic priority. Thus, the influence of environmental awareness and local champions becomes key to understanding the effectiveness of adaptation planning.

Environmental Awareness

Local action on climate adaptation is strongly influenced by the presence of local champions and the extent of environmental awareness throughout the community. These concepts go hand in hand: a deep-rooted commitment to environmental goals and issues can facilitate an awareness of the need for climate action, which is further propelled by the actions of local leaders. Since the mid-1990s, there has been a progression toward sustainable and resilient development as concerns about environmental quality and equity in urban areas have gained traction (Carmin, Anguelovski, and Roberts, 2012). Environmental issues and sustainability are already a strategic priority within the planning framework of many RDs. Having long coped with

environmental and climate hazards, several RDs on the island showcased an enhanced environmental awareness with environmentally sensitive residents. Scholars make a clear connection between environmental sustainability and climate adaptation, whereby the process of adaptation is often facilitated by the ability of local governments to link adaptation to existing sustainable development agendas (Carmin, Anguelovski, and Roberts, 2012). In general, adaptation planning and the integration of adaptation into strategic documents can occur efficiently given that sustainable objectives tend to work in tandem with adaptation goals. Thus, environmental awareness and the subsequent commitment to environmental goals can be a key factor facilitating the process of local climate adaptation planning and the ability to build resilience. Moreover, the findings and literature suggest that adaptation advocates and champions play a critical role in triggering climate adaptation action.

Local Champions

Adaptation advocates can be present at all levels of government and may include agents such as elected officials, senior management, private actors, and/or active members of the public. Pasquini et al. (2015) highlight that strong leadership at the senior official and political level in particular is crucial for triggering rapid change and ensuring that adaptation efforts are broadly integrated across all departments. Moreover, an advocate for climate action can spearhead the process of adaptation, provide guidance, make available the resources to implement adaptation, and ensure that momentum is sustained over time (Ford and King, 2015). In the case of Vancouver Island, while the presence of provincial direction does exist (e.g. policy guidance, climate related mandates, climate specific funding), research findings suggest that progressive senior management leadership and an environmentally sensitive public are often the major drivers of regional progress on adaptation. Several interviewees noted that a range of leaders, including elected officials, senior management, and the public, have enabled RDs to efficiently embed adaptation into local strategic priorities. Taken together, the presence of an adequate capacity, environmental awareness, and local champions can effectively lead to the integration of adaptation into strategic policy and plans, which is critical for regional resilience and the likelihood of climate adaptation implementation in practice.

7.4.1.2 Challenging Factors

Capacity

The capacity of RDs to plan for and respond to climate change impacts is multi-faceted. While the results from semi-structured interviews showed that RDs having a greater capacity tended to have a more robust strategic planning framework with adaptation integrated within, all RDs were challenged by limited capacity in general. Research findings revealed that not one single interviewee described that their RD had an adequate capacity to undertake effective climate adaptation planning. This lack of capacity varied among the local governments, with some experiencing significant financial constraints and a lack of personnel, and others exhibiting a deficit of climate related data, knowledge, and expertise. This case study has revealed a complex relationship between financial resources and the existence of climate data and knowledge within local governments. Scholarship has long recognized that local governments are frequently under financial pressure as a result of their multitude of responsibilities and limited sources of revenue (e.g. Bird and Slack, 1993). With limited financial capacity, it becomes challenging to dedicate funds to the acquisition of climate studies and analysis. This is supported by several interviewees who stressed that more financial support is required in order to conduct the detailed climate risk studies needed, for example (CVRD1). As a result, a lack of financial capacity and climate data/knowledge tend to go hand in hand, and combine to hinder the ability of local governments to adapt to climate impacts and build resilience. Moreover, research findings show that conflicting priorities and provincial support factor into this relationship and further complicate the process of local climate adaptation planning.

Conflicting Priorities and Political Will

Strategic priorities of agents, specifically regional decision-makers, can have a profound impact on the process of adaptation planning and implementation in practice. The responsibilities of a local government are vast, and their functioning is inherently shaped by the priorities and views of senior officials and administrators. Research delving into the challenges to local adaptation often suggests that conflicting priorities and opinions may impede effective climate action. Common opinions that conflict with climate adaptation include a sense that climate change is a distant threat not requiring immediate action, that private property interests are too strongly opposed to action, that day-to-day municipal responsibilities take precedence, and that climate science is uncertain (Hamin *et al*., 2014). Such opinions and views strongly influence the

decision-making process and bias the provision of resources within a community. This is supported by the research findings where a lack of political will and conflicting priorities frequently emerged within semi-structured interview results. For instance, the interviewee from Strathcona RD stressed that while staff is eager to work towards regional climate resilience, the opposing priorities of politicians frequently prevent the employment of proactive climate adaptation planning. Interviewees also stressed that elected officials are hesitant to dedicate resources to climate action when they face political pressure from residents and members of the public who are less accepting of change and who believe their property values will be adversely affected. This example highlights that political will, priorities, and viewpoints of elected officials are key determinants of the effectiveness of climate adaptation planning. In general, climate change adaptation must be prioritized by decision-making agents to guarantee that action will be undertaken, and resources are dedicated to adaptation planning.

7.4.2 Systems

Systems is the second element of the resilience conceptual framework, and includes physical infrastructure and ecosystems that provide key services for urban populations (Tyler and Moench, 2012). Physical infrastructure on Vancouver Island provides critical services including roadways, rail infrastructure, airports/sea ports, and other key assets. Ecosystems, whether remotely located or not, can also provide core services through the production of food, runoff, management, and/or flood control as seen in the examples of wetlands and marine ecosystems. Scholars from a variety of disciplines have identified numerous characteristics that contribute to the resilience of urban systems (e.g. Alberti *et al*., 2003; Andersson, 2006; Bruneau *et al*., 2003; Gunderson and Holling, 2002; Leichenko, 2011; Meadows, 1999). Notable characteristics for the purpose of this study include flexibility, diversity, redundancy, and safe failure (Tyler and Moench, 2012). In this sense, a resilient system is one that can retain functionality and be quickly reinstated through system linkages despite failures or operational disturbances (Adger *et al*., 2003; Tyler and Moench, 2012). When this framework and the understanding of resilient systems is applied to RDs on Vancouver Island, areas of opportunity and vulnerability can be identified.

7.4.2.1 Facilitating Factors

Prominence of Diverse Ecosystems

Vancouver Island is characterized by lush forests and a complex system of waterbodies that can provide ecosystem services that enhance resilience. For example, in the context of warming temperatures and more frequent flooding, forests and green space can help to reduce the urban heat island effect and coastal wetlands, naturalized shores, and marshes may reduce damage caused by flood events. With respect to the latter, protection occurs due to the ability of these natural systems to trap and stabilize sediment, thus raising the soil elevation and attenuating waves (Borsje *et al*. 2011). The vast potential of natural systems across Vancouver Island to be used as an ecosystem-based approach to adaptation can facilitate efforts to enhance resilience and create a more robust response to climate impacts (Bonnett and Birchall, 2019). Ecosystem-based approaches are more natural strategies that buffer human systems against the impacts of climate change by capturing a range of ecosystem services (Jones *et al*., 2012). Research findings revealed that these strategies are increasingly encouraged by RDs on the Island. This approach is highly praised by scholars, as ecosystem-based adaptations are flexible, low-regret and low-cost, and offer aesthetic and recreational opportunities (Harman *et al*. 2015; Jones *et al*. 2012).

7.4.2.2 Challenging Factors

Location and Connectivity of Infrastructure

It is important to highlight at the outset that key infrastructure tends to be located in coastal regions across the island given the presence of a centrally located mountain range. For example, the two primary highways (Highway 1 and 1A) connecting the south and northern areas of the island run along the eastern coast with highway 1A in very close proximity to the ocean. Although the eastern coast is more sheltered from storm surge and extreme weather events, the potential for sea level rise and additive factors resulting in coastal flooding is still plausible. This points to a need for enhanced resilience, given that the only two major highways on the island are at risk of being washed out or damaged by flood events. Moreover, the connectivity of roadways on the western coast is minimal, suggesting that system linkages are insufficient in the RDs of Alberni Clayoquot and Mount Waddington in particular.

Vulnerability of Natural Systems

Resilience is also deficient in the areas of food production and water supply systems. Here, marine ecosystems are often relied upon as a means of food production and are subject to the impacts of climate change. For example, interviewees from Cowichan Valley RD highlighted that rising ocean temperatures and ocean acidification have resulted in a decline in the availability of marine species. Sources of clean drinking water vary across with the island, with many RDs reliant on surface water sources. This suggests that, as an element of the resilience framework, water systems are not diverse, flexible, or resilient given the prominence of water shortages and boil water advisories, with the RD of Nanaimo and Capital RD showing more resilient water systems than other RDs. Furthermore, the existence of dense natural forests increases the susceptibility and potential damage associated with wildfire events.

7.4.3 Institutions

Finally, the characteristics of institutions as an element of the resilience conceptual framework allow for vulnerabilities and areas of potential resilience across Vancouver Island to be postulated. Institutions can be described as social rules or conventions that structure human behavior and interactions (Tyler and Moench, 2012). They may be formal or informal, and are a key element within the resilience framework given their influence on the interaction between agents and systems (Adger *et al*., 2003). Key characteristics of this element that should be considered in order to explore the research objectives include rights and entitlements linked to system access, decision-making processes, information flows, and the application of new knowledge (Kim and Lim; 2016; Tyler and Moench, 2012). There are key formal institutions influencing the ability of all RDs on the Island to build resilience and adapt to climate change. Formal institutions having a marked effect on regional resilience include regional strategic planning frameworks, the function of RDs, and provincial policy, regulations, and mandates.

7.4.3.1 Facilitating Factors

Robust Strategic Planning Framework

A strategic planning framework that identifies adaptation as a priority and includes policies and actions aimed at increasing local resiliency provides decision-makers with a statutory or planning justification for action on the ground. Because RGSs guide long term developmental and planning decisions, the integration of adaptation into these documents is key

to ensuring that future growth aligns with a climate change agenda (Baynham and Stevens, 2014). Moreover, the presence of a climate action strategy or climate adaptation plan can put in motion the process of adaptation planning and guide adaptation implementation. In addition to the above internal factors facilitating climate adaptation planning, research findings suggest that external factors are also at play. External factors having the largest influence on the adoption and process of adaptation planning on Vancouver Island appear to be government commitment to the Climate Action Charter and provincial mandates. Although few interviewees explicitly identified the Climate Action Charter and provincial mandate as facilitating factors for local adaptation efforts, their effect on local climate change planning must not be overlooked. Indeed, Birchall and MacDonald (2019) highlight that programs and commitments such as the Building Adaptive and Resilient Communities and Climate Action Charter can help local communities enhance their resilience to the impacts of climate change by providing the tools and guidance necessary to develop and implement adaptation plans.

Although regional successes can be seen across the Island with an array of factors contributing to the growing preparedness of RDs, adaptation planning remains in its infancy, and the implementation of adaptive efforts is lagging. For example, most RDs have already integrated climate change considerations into their strategic planning frameworks. However, the broad integration of adaptation is limited and adaptations to climate impacts on the ground are deficient. The findings of this study reveal numerous factors that challenge the process of adaptation planning at the RD scale.

7.4.3.2 Challenging Factors

Provincial Support

Given that RDs on Vancouver Island are subject to limited capacity and conflicting local priorities, the province becomes a key influencer in the effectiveness of local climate adaptation planning. In particular, the provision of funding, policy guidance, and tools are needed to assist local governments in their efforts to enhance resilience to climate variability. Interview findings revealed that most RDs are heavily reliant upon provincial funding and data; according to the interviewees, however, this support has not recently been sufficient to enable effective climate adaptation planning. Despite climate-specific funding streams, data, and guiding provincial documents being available, RDs are still challenged by the need to dedicate resources to the task

of applying for funding and translating the provincial data and guidance into actionable plans. The role of senior levels of government in affecting local climate change action has been frequently reviewed in the literature. Scholars stress that provincial funding must be accessible and reflect climate threats, provincial mandates must be well considered, and provincial policy guidance must be rooted in, and informed by, sound science that is scaled and accompanied by support tools (e.g. Birchall and Bonnett, 2019; Ford and King, 2015).

Impact of Bill 27

Higher levels of government have great potential to spur enhanced local climate action through their ability to set mandates and determine the authoritative powers of local governments. Semi-structured interview findings show the provincial mandate being commended for its novelty within North America and for its effect on bringing climate change to the forefront of local governmental agendas. By requiring that emissions targets be integrated within local OCPs and RGSs, the Province of BC has raised awareness of the necessity of climate action and ensured that climate mitigation targets are integrated into strategic planning frameworks. Moreover, many scholars have found that the presence of a climate-focused mandate is positively correlated with local plan quality (e.g. Tang *et al*., 2011; Barbour and Deakin, 2012). While Bill 27 is innovative and effective in ensuring that emissions reduction targets are embedded in local strategic planning, interviewees stressed that it is entirely focused on mitigation, was not accompanied by adequate funding and tools, and is deficient of any authoritative language and financial penalties. These deficits of Bill 27 challenge the ability of local governments to undertake effective climate action and adaptation planning. This is supported in the literature where, for example, Baynham and Stevens (2014) identify opportunities to strengthen the Provincial mandate through the inclusion of financial and technical assistance, a deeper motivation for action, and development of a climate change adaptation mandate. Research findings suggest that the development of a provincial climate change adaptation mandate, in particular, is key to the success of local climate adaptation planning. This is because of the complex relationship between climate action and the authoritative powers of RDs.

Function of RDs

Unlike many other regional bodies across Canada, RDs are unique and quite limited in their ability to address climate change. Results from the semi-structured interviews reveal that RDs can only act on an issue if it falls within an existing service area voted on by residents and adopted by bylaw. The Local Governments Statute Act outlines a specific set of powers and responsibilities that RDs must adhere to. The Act identifies that RDs cannot dedicate resources to a task falling outside of an established service area. As a result, they are not granted the powers to work on climate adaptation unless it was listed within a service area. For this reason, several interviewees highlighted that their ability to undertake proactive adaptation planning is limited. However, most RDs have made great strides in their efforts to mitigate climate change, despite mitigation not being a direct service provided by RDs. In this sense, RDs are effectively operating outside of a service area to undertake climate change mitigation. The interviewees described that this is possible because of strong provincial direction and guidance to mitigate climate change through the provincial mandate. As a result, if the province were to prioritize and create a climate change adaptation mandate, this direction would facilitate the ability of local governments to work outside of a service area to adapt to climate impacts and to justify their efforts to enhance resilience.

Provincial policy, particularly the Local Governments Statute Amendment Act, has largely prevented the enhancement of resilience and effectiveness of adaptation planning across all RDs given its provisions on regional function and authoritative power. Lorenz et al., (2017) identify similar findings in their case studies of local adaptation planning in England and Germany. The authors stress that institutional drivers, including government policy and regulations, prevented the use of climate projections in local strategic planning documents and as a result, contributed to the lack of effective adaptation planning (Lorenz *et al*., 2017). Indeed, resilience may be deficient if institutions do not provide agents with the right to use key resources and access urban systems, enable decision-making processes that follow widely accepted principles of good governance, allow for agents to have ready access to credible and meaningful information, and facilitate the generation, exchange and application of new knowledge (Tyler and Moench, 2012). However, it should be noted that provincial institutions such as Bill 27 have facilitated an awareness of the need for climate action, thus initiating processes of resilience-building across the Island.

7.5 How to Enhance Resilience

In general, RDs across the Island are working to enhance their resilience to climate impacts through a variety of pathways, including integrating climate considerations within strategic planning and utilizing public education to enhance awareness. As revealed through the use of the conceptual resilience framework, however, there are several areas of opportunity to enhance preparedness and resilience. At the agent level, a significant characteristic hindering effective adaptation planning is the lack of capacity of RDs to anticipate and respond to climate impacts. Capacity can be enhanced through increased access to funding, improved coordination between climate experts and higher levels of government to effectively obtain and use climate science in the planning process, and enhanced education and knowledge-sharing to combat a lack of political will and public awareness (e.g. Moench, 2014; Borquez *et al*., 2017). Within the systems element of the framework, RDs can significantly enhance resilience by ensuring that physical infrastructure displays sufficient linkages and reflects concepts of flexibility and diversity, and redundancy. This can be achieved through a diversification of adaptations and the creation of flexible food and water systems, the safe location of physical infrastructure and assets out of hazard-prone areas, and the preservation and utilization of ecosystems to protect against climate impacts and reduce vulnerabilities to water shortages, for example. Finally, interventions aimed at enhancing regional resilience from an institutions standpoint are largely associated with provincial policy and regulations. Here, the provincial government can bypass amending the Local Governments Statute Act by developing a climate change adaptation mandate that is similar in function to Bill 27. In doing so, RDs can justify their efforts to work outside of a service area and undertaking proactive adaptation planning to adhere to provincial guidance and direction. The province should also ensure that adequate policy, funding streams, and guidance is provided to allow agents to have ready access to credible and meaningful information, and to facilitate the generation, exchange and application of new knowledge.

8. Conclusion

8.1 Summary of the Research

Contemporary climate change is a key challenge facing all levels of government. Global climate impacts include increasing temperatures, more extreme and variable weather events, and rising sea levels (IPCC, 2014). Responses to these impacts are urgent and may include mitigation and adaptation strategies. Scholars stress that a robust response to climate change must involve elements of both mitigation and adaptation, however, local government responses largely focus on mitigation. This trend is apparent in the Province of BC where local governments have made significant headway in terms of their efforts to reduce GHG emissions, largely in response to the provincial mandate to integrate emissions reduction targets within OCPs and RGSs. Because continued climate change is inevitable and vulnerability to climate impacts is likely to be accentuated, it is critical that local governments adapt to climate impacts if they are to reduce costs, protect residents and assets, and enhance resilience. While understanding of the need to adapt is growing, mitigation remains the focus of local climate responses in BC. This is reflected within the literature as well, which tends to be much more developed in the area of mitigation strategies. Moreover, where adaptation is addressed in the scholarship, the focus is on large cities, local adaptive capacity, and challenges that local governments face in undertaking adaptation planning.

There is then a gap in the literature looking into the decision-dynamics around adaptation planning and resilience building, how adaptation specifically is integrated into regional scale planning and policy responses, and how adaptation barriers emerge and influence local resilience. This research employed a mixed-methods approach to explore climate change stressors and strategic planning and policy responses to climate threats at the RD scale on Vancouver Island. Key objectives of this study were to identify pressing climate threats and vulnerabilities facing RDs, analyze the extent of adaptation inclusion in regional policy and plans on Vancouver Island, examine the factors that facilitate and impede effective adaptation planning, and to propose recommendations that will assist with local government resilience building.

Research findings demonstrate that RDs on Vancouver Island are vulnerable to climate stressors that include an increase in the intensity and frequency of drought and flooding events. These climate stressors have implications for RDs that include more severe wildfire events, persistent water shortages, enhanced threat posed to resident safety, and susceptibility of infrastructure and assets to flood induced damage. RDs tend to focus on mitigative efforts that outweigh adaptation strategies and respond to climate impacts in a more reactive manner with no interviewee describing a purely anticipatory approach to climate adaptation planning. This is echoed within the strategic planning and policy frameworks of RDs where the extent of adaptation incorporation is limited and fragmented, particularly in regions without a RGS, climate related policies focus on emissions reduction, and adaptation implementation is lagging. Findings were examined through the lens of resilience theory, which revealed that the Alberni-Clayoquot, Mount Waddington, Cowichan Valley and Strathcona RDs largely do not have the institutions necessary to facilitate resilience building and robust adaptation planning. While the Capital RD, Comox Valley RD, and RD of Nanaimo encompass resilience building institutions with a greater extent of adaptation integration within strategic planning, implementation of adaptive efforts is nonetheless lagging. The quality of institutions was found to have a key impact on the implementation of adaptation strategies and application of the three elements of urban resilience revealed that the capacity of RDs, political will, strategic priorities, planning framework in place, effect of Bill 27, and unique function of RDs are key factors influencing the process of adaptation planning. Opportunities to improve resilience and adaptation planning were identified in the areas of agent capacities and political will, infrastructure location and connectivity, and provincial guidance and mandates.

8.2 Recommendations

The findings of this research reveal key opportunities for improvements to enhance regional climate adaptation planning and resilience to climate variability. The recommendations are organized into actions for RDs and for the Government of British Columbia.

8.2.1 Recommendations for Regional Districts

Findings show that while RDs are largely aware of the necessity of adapting to climate impacts, local climate adaptation planning is still outweighed by mitigation, fragmented and limited in strategic planning documents, and lacking in practice. Several challenges were

identified in the discussion section that contribute to a lack of climate adaptation planning and serve as areas for intervention. Recommendations for the RDs can be grouped into three categories:1) Initiating Efforts, 2) Strategic Planning Interventions, and 3) Adaptation in Practice.

Initiating Efforts

Initiating efforts are intended to spur the adaptation process and increase the likelihood that climate adaptation will be prioritized by decision-makers. These efforts include recognition and awareness, political leadership and guidance, and cooperation.

- Climate change adaptation can only be pursued once it is recognized as a crucial component of climate responses. Thus, it is recommended that RDs facilitate the adoption of adaptation efforts by raising awareness of the utility and urgency of adaptation.
    - This can be achieved through education efforts and networking that brings adaptation to the forefront of decision-making agendas and increases public acceptance (Pasquini *et al*., 2015; Hamin *et al*., 2014).
- Several RDs were inherently challenged by conflicting priorities and a lack of political will. Scholars recognize that political leadership and championing is critical for ensuring that adaptation is prioritized on the political agenda, spurring the process of adaptation planning, and for sustaining momentum over time (e.g. Birchall & Bonnett, 2019). Ford and King (2015) stress that political leadership and championing from decision-makers has the potential to highlight the need to act, make available the resources to adapt, and build key networks necessary for effective action (Ford and King, 2015). It is then recommended that RDs undertake efforts to enhance political leadership and championing.
    - Political leadership and guidance in the area of climate change adaptation can be significantly enhanced through the use of education efforts for elected officials and senior management that raises rates of acceptance and increases understanding of the benefits of adaptation strategies.
- Results from the PCA suggest that adaptation is addressed in an isolated and piecemeal manner, raising the need for greater communication and cooperation

between regional departments to ensure that climate adaptation is embedded throughout strategic planning frameworks. Indeed, cooperation is a factor necessary for integrating adaptation across various levels of government and throughout internal departments, propagating priorities, and organizing planning efforts (Pasquini *et al*., 2015). Moreover, Mukhiebir *et al*. (2013) argue that a collaborative approach is required to overcome local adaptation challenges, where a joint recognition of the scale of the issue and its inherent cross-scale complexities are realized.

These initiating factors are broadly recognized as critical components necessary for triggering adaptation efforts (e.g. Pasquini *et al*., 2015; Ford and King, 2015). The process of adaptation planning however, is subject to several institutional challenges that require unique interventions.

Strategic Planning Interventions

The strategic planning and policy framework of RDs is a key area for intervention to enhance the efficiency of climate adaptation efforts. Findings revealed that many RDs are lacking adaptation considerations within strategic documents, adaptation is addressed in a broad and fragmented manner, and implementation of adaptation goals and policies is limited. To overcome the fragmented approach to adaptation planning and its lack of implementation, there are a number of interventions RDs can pursue.

- It is first recommended that RDs without a RGS dedicate resources to the conception and development of a RGS. Moreover, given that only two of seven RDs have adopted climate change plans/strategies, it is recommended that decision-makers consider the development of these strategies. These two planning documents are key areas in which adaptation goals and policies can be integrated, which may increase the likelihood that climate adaptation is implemented in practice. Indeed, scholars often note that institutions and the planning system is an important tool to anticipate and prevent adverse climate change impacts (e.g. Wilson, 2006).
- Within existing strategic planning documents, it is critical that climate adaptation is first embedded within documents in an effective manner to increase the efficiency of adaptation planning.

    - There are several opportunities for improvement within strategic planning frameworks where it is recommended that adaptation be considered to a greater extent in the areas of plan goals and visions and land use and development related policies. Adaptation policies and goals should be specific and informed by scaled, reliable, and timely climate information as suggested within the literature (e.g. Ford and King, 2015). Moreover, PCA findings suggest that implementation can be enhanced through a strengthening of regional planning frameworks and institutions. This may involve the use of committal language within planning documents, identification of responsible parties and finances for implementation, dedication of specific personnel and programs for adaptation implementation, and translation of adaptation policies and goals into regulations and bylaws.
- Findings from the semi-structured interviews, the PCA, and the application of the resilience framework show that regional capacity, authoritative powers, and institutions are key factors influencing the planning and implementation of adaptation strategies. While capacity is variable across RDs, there is a general lack of local finances, personnel, and climate expertise/data across the Island.
    - Some of these issues can be addressed at the RD scale through a shift in decision-making processes that prioritize the dedication of resources to climate action. This lack of capacity can also be bridged through increased cooperation with other levels of government. Furthermore, the institutional factors and limited authoritative power of RDs can be improved through interventions at the provincial level of government.

Adaptation in Practice

These recommendations are specific to adaptations in practice and are aimed at enhancing resilience using inferences that emerged from the application of the resilience conceptual framework. Recommendations include interventions regarding adaptation types, the capacity of agents, and resilience of systems.

- While findings suggested that structural adaptations are minimal in practice across Vancouver Island, these adaptation types are nonetheless present and associated with significant drawbacks (Bonnett and Birchall, 2019). It is recommended that RDs use a

combination of adaptation types and focus adaptation efforts in areas of enhanced vulnerability.

  - A combination of adaptation types that include both hard and soft adaptation measures will create a more robust response to climate threats, offer greater flexibility, and increase the cost effectiveness of adaptations (Bonnett and Birchall, 2019; Harman *et al*. 2015; Jones *et al*. 2012). Applicable combination approaches for RDs may involve the use of foreland vegetation restoration to reduce the forces placed on structural approaches such as sea walls and dams used in combination with non-structural measures such as setbacks from the coast.
  - In terms of focusing efforts in regions of heightened vulnerability, findings show that RDs are susceptible to climate impacts in the areas of overland flooding near river systems, coastal flooding within low-lying areas, drought induced water shortages, and wildfire in forested regions. As a result, RDs should focus interventions within these areas to reduce vulnerability and minimize harm to residents and infrastructure.

- This research revealed that as organizations, RDs are challenged by a lack of capacity in the form of limited financial and personnel resources, and climate data.
  - Given that local governments have limited control over their sources of revenue, financial support from senior levels of government is needed to aid adaptation efforts. Moreover, to effectively advance adaptation, Ford and King (2015) argue that funds dedicated to adaptation efforts must be integrated into baseline funding, be comprehensive, coordinated, and stable over time. With respect to the lack of climate data, it is recommended that RDs undertake risk assessments and vulnerability analysis where possible. Cooperation across RDs and with municipalities, climate experts, and the province in the area of data sharing will also greatly assist with the acquisition of climate information.
- With respect to the resilience of systems across Vancouver Island, the location and connectivity of core systems, such as major highways, was identified as an element contributing to the vulnerability. Furthermore, the dense forested nature of certain regions increases vulnerability and potential damage associated with wildfire events.

- When implementing vulnerability and risk reduction measures, these areas should be the focal point to ensure that infrastructure and residents are located out of vulnerable areas and forests are managed to reduce wildfire threat.

8.2.2 Recommendations for the Province

While it is widely accepted that local governments should take the lead on climate adaptation (e.g. Nalau *et al*., 2015), the role of higher levels of government must not be overlooked. As revealed by the findings of this study, there are several institutional, policy, and support factors that may challenge the process of local climate adaptation planning. For example, the authoritative powers of RDs outlined in the provincial Local Governments Statute Act do not create a facilitating environment for the planning and implementation of climate adaptation efforts. The jurisdiction and ability of RDs to undertake climate adaptation is expressly limited by their requirement to operate within established service areas. It is thus recommended that the province consider the development of an adaptation mandate that will provide strategic guidance for climate action and an opportunity for RDs to operate outside of a service area. Baynham and Stevens (2014) also make this inference, highlighting that given the lack of an adaptation focus and potential consequences for inaction on adaptation measures, the development of a mandate to include adaptation in OCPs and RGSs may be a crucial next step for BC.

This research revealed further provincial interventions that may enhance local climate adaptation planning, including the provision of adequate funding, tools, and policy guidance to facilitate local adaptation planning and alleviate capacity issues felt by RDs. Provincial funding should reflect the major climate impacts felt across the province and policy guidance must be rooted in and informed by up-to-date climate information (Birchall and Bonnett, 2019). Lastly, it is recommended that the province consider the outcome of climate-related mandates on local government climate change planning. This consideration is key, given that mandates in the absence of support (i.e. expertise, funding, and tools) can put pressure on already overburdened local governments and given the influence of provincial mandates on local plan quality (Birchall and Bonnett, 2019; Lyles *et al*., 2014).

8.3 Contribution to Knowledge

While this research has focused on RDs on Vancouver Island, implications of the findings may be applied by readers, local governments, and decision-makers who identify similar climate change stressors and planning and policy related challenges. This study has emphasized the heightened vulnerability of coastal locations and distinct challenges created by contemporary climate impacts, demonstrating the need for climate action. Examination of institutional elements on Vancouver Island has highlighted the importance of prioritizing adaptation efforts, developing a robust institutional framework, and integrating climate adaptation within strategic planning frameworks. Moreover, this research has identified key adaptation planning challenges frequently found within climate literature with unique barriers also emerging. For instance, this study demonstrates how a lack of political will, limited capacity, overwhelming focus on mitigation within provincial policy, and limited authoritative powers of RDs can hinder effective adaptation planning. To enhance the applicability of this research and contribute to knowledge, resilience theory was used to not only identify challenges to local adaptation planning, but to examine how these challenges arise and can be overcome. The recommendations of this research have been developed in a manner that promotes efficient application by decision-makers on Vancouver Island, however, because Vancouver Island is not unique in its need to adapt, the recommendations can also have far reaching effects and apply to local governments across the globe who face similar climate and policy related challenges. In general, local governments of all sizes and in various locations are vulnerable to climate impacts to varying degrees, with the urgency of adaptation becoming increasingly clear to decision-makers. The findings, insights, and recommendations of this study can thus, advance our understanding of local climate adaptation planning processes and have the potential to be utilized to enhance resilience and preparedness for climate change.

8.4 Areas for Further Research

There are several areas for further research that would build upon this study and contribute to existing climate scholarship:

- First, given that this research did not include the perspectives of provincial interviewees, it would be highly beneficial to explore in greater detail, the role of the province in influencing local climate adaptation planning. Scholars often suggest that while adaptation in practice is viewed to be a local government responsibility, higher levels of government play a key role in their provision of policy guidance, implementation tools, and funding (e.g. Nalau *et al*., 2015). Research that explores the perspectives of provincial levels of government, as it relates to influencing local climate action, would thus expand our understanding of multi-level governance approaches to climate adaptation planning.
- Second, the perspectives of First Nations was also absent from this study design and represents an interesting case to examine the viewpoints of First Nations in relation to climate stressors and the process of local climate adaptation planning. It is important to note that Indigenous populations are acutely aware of climate impacts, enhanced vulnerabilities, and general environmental changes as a result of their strong connection to the natural resources and landscapes (Pearce *et al*., 2015). Climate literature stresses the importance of traditional ecological knowledge and cooperation with First Nations in climate adaptation planning (e.g. Pearce *et al*., 2015).
- The effect of Bill 27 was a key theme emerging from the results of this study and spurred the development of a recommendation for the Province of B.C to consider the development of a climate adaptation mandate. The design and implications of a climate adaptation mandate is thus a critical area for further research, particularly knowing that climate related mandates are innovative and minimal across North America.

References

Adams, H. (2016). Why populations persist: mobility, place attachment and climate change. *Population and Environment*, 37(4), 429-448.

Adger, W. N., Huq, S., Brown, K., Conway, D., & Hulme, M. (2003). Adaptation to climate change in the developing world. *Progress in development studies*, *3*(3), 179-195.

Agrawala, S., Bosello, F., Carraro, C., De Cian, E., & Lanzi, E. (2011). Adapting to climate change: costs, benefits, and modelling approaches. *International Review of Environmental and Resource Economics*, 5(3), 245-284.

Alberti, M., Marzluff, J.M., Shulenberger, E., Bradley, G., Ryan, C., & Zumbrunnen, C. (2003). Integrating humans into ecology: Opportunities and challenges for studying urban ecosystems. *BioScience*, 53(12), 11.

Alexander, K. S., Ryan, A., & Measham, T. G. (2012). Managed retreat of coastal communities: understanding responses to projected sea level rise. *Journal of Environmental Planning and Management*, 55(4), 409-433.

Andersson, E. (2006). Urban landscapes and sustainable cities. *Ecology and Society*, 11(1), 7. Retrieved from http://www. ecologyandsociety.org/vol11/iss1/art34/

Artibise, A. (2015). Vancouver Island. *The Canadian Encyclopedia*. Retrieved from https://www.thecanadianencyclopedia.ca/en/article/vancouver-island

Baker, I., Peterson, A., Brown, G., & McAlpine, C. (2012). Local government response to the impacts of climate change: An evaluation of local climate adaptation plans. *Landscape and urban planning*, *107*(2), 127-136.

Barbour, E., & Deakin, E. A. (2012). Smart growth planning for climate protection: Evaluating California's Senate Bill 375. *Journal of the American Planning Association*, *78*(1), 70-86.

Baynham, M., & Stevens, M. (2014). Are we planning effectively for climate change? An evaluation of official community plans in British Columbia. *Journal of Environmental Planning and Management*, 57(4), 557-587.

BC Flood and Wildfire. (2018). A Report for Government and British Columbians. Addressing the New Normal: 21st Century Disaster Management in British Columbia. Retrieved from https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/bc-flood-and-wildfire-review-addressing-the-new-normal-21st-century-disaster-management-in-bc-web.pdf

Betzold, C., & Mohamed, I. (2017). Seawalls as a response to coastal erosion and flooding: a case study from Grande Comore, Comoros (West Indian Ocean). *Regional Environmental Change*, 17(4), 1077-1087.

Biesbroek, G. R., Klostermann, J. E., Termeer, C. J., & Kabat, P. (2013). On the nature of barriers to climate change adaptation. *Regional Environmental Change*, *13*(5), 1119-1129.

Binder, S. B., Baker, C. K., & Barile, J. P. (2015). Rebuild or relocate? Resilience and postdisaster decision-making after Hurricane Sandy. *American Journal of Community Psychology*, 56(1-2), 180-196.

Birchall, S.J. (2014). New Zealand's abandonment of the Carbon Neutral Public Service program. *Climate Policy*, 14(4), 525-535.

Birchall, S.J, Murphy, M, & Milne, M. (2015). Evolution of the New Zealand voluntary carbon market: An analysis of CarboNZero client disclosures. *Social and Environmental Accountability Journal*, 35(3), 142-156.

Birchall, S. J., Murphy, M., & Milne, M. (2016). Mixed Methods Research: A Comprehensive Approach for Study into the New Zealand Voluntary Carbon Market. *The Qualitative Report*, *21*(7), 1351-1365.

Birchall, S. J., Murphy, M., & Milne, M. (2017). An investigation into the early stages of New Zealand's voluntary carbon market. *Carbon Management*, *9*(1), 71-81.

Birchall, S. J., & Bonnett, N. (2019). Local-scale climate change stressors and policy response: the case of Homer, Alaska. *Journal of Environmental Planning and Management*, 1-17.

Birchall, SJ., & MacDonald, S. (2019). Climate Change Impacts and Resilience: An Arctic Case Study . In WL. Filho, PG. Özuyar, PJ. Pace, U. Azeiteiro and L. Brandli (Eds.), Climate Action, Encyclopedia of the UN Sustainable Development Goals. London: Springer. https://doi:10.1007/978-3-319-71063-1_79-1.

Bird, R. M., & Slack, N. E. (1993). *Urban public finance in Canada*. J. Wiley.

Bonnett, N., Birchall, SJ. (2019). Vulnerable communities: The need for local-scale climate change adaptation planning. In WL. Filho, PG. Özuyar, PJ. Pace, U. Azeiteiro and L. Brandli (Eds.), Climate Action, Encyclopedia of the UN Sustainable Development Goals. London: Springer. https://doi.org/10.1007/978-3-319-71063-1_87-1.

Borquez, R., Aldunce, P., & Adler, C. (2017). Resilience to climate change: from theory to practice through co-production of knowledge in Chile. *Sustainability Science*, 12(1), 163-176.

Borsje, B. W., van Wesenbeeck, B. K., Dekker, F., Paalvast, P., Bouma, T. J., van Katwijk, M. M., & de Vries, M. B. (2011). How ecological engineering can serve in coastal protection. *Ecological Engineering*, 37(2), 113-122.

Bosello, F., Carraro, C., & De Cian, E. (2010). Climate policy and the optimal balance between mitigation, adaptation and unavoided damage. *Climate Change Economics*, 1(02), 71-92.

British Columbia Ministry of Environment. (2015). Indicators of Climate Change for British Columbia 2016 Update. Retrieved from https://www2.gov.bc.ca/assets/gov/environment/research-monitoring-and-reporting/reporting/envreportbc/archived-reports/climate-change/climatechangeindicators-13sept2016_final.pdf

Bronen, R., & Chapin, F. S. (2013). Adaptive governance and institutional strategies for climate-induced community relocations in Alaska. *Proceedings of the National Academy of Sciences*, 110(23), 9320-9325.

Broto, V. C., & Bulkeley, H. (2013). A survey of urban climate change experiments in 100 cities. *Global Environmental Change*, *23*(1), 92-102.

Bruneau, M., Chang, S.E., Eguchi, R.T., Lee, G.C., O'Rourke, T.D., Reinhorn, A.M., & von Winterfeldt, D. (2003). A framework to quantitatively assess and enhance the seismic resilience of communities. *Earthquake Spectra,* 19(4), 733– 752.

Bukvic, A., Smith, A., & Zhang, A. (2015). Evaluating drivers of coastal relocation in Hurricane Sandy affected communities. *International Journal of Disaster Risk Reduction*, 13, 215-228.

Bulkeley, H., and R. Tuts. (2013). "Understanding urban vulnerability, adaptation and resilience in the context of climate change." *Local Environment,* 18(6), 646–62.

Capital Regional District. (2015). Coastal Sea Level Rise Risk Assessment. Retrieved from https://www.crd.bc.ca/docs/default-source/climate-action-pdf/reports/coastal-sea-level-rise-risk- assessment-report.pdf?sfvrsn=c09757ca_0

Capital Regional District. (2017). Capital Regional District Regional Climate Action Strategy: Taking Action on Climate Change. Retrieved from https://www.crd.bc.ca/docs/default-source/crd-document-library/plans-reports/climate/2017-04-12_regionalclimateactionstrategy_final.pdf?sfvrsn=da2e32ca_18

Capital Regional District. (2018). Capital Regional District Regional Growth Strategy Bylaw No. 4017. Retrieved from https://www.crd.bc.ca/docs/default-source/crd-document-library/bylaws/regionalgrowthstrategy/4017--capital-regional-district-regional-growth-strategy-bylaw-no-1-2016.pdf?sfvrsn=ecb611ca_4

Carmin, J., Anguelovski, I., & Roberts, D. (2012). Urban climate adaptation in the global south: planning in an emerging policy domain. *Journal of Planning Education and Research*, 32(1), 18-32.

Cheong, S. M., Silliman, B., Wong, P. P., Van Wesenbeeck, B., Kim, C. K., & Guannel, G. (2013). Coastal adaptation with ecological engineering. *Nature climate change*, *3*(9), 787-791.

City of Nanaimo. (2008). City of Nanaimo Official Community Plan 2008 Bylaw No. 6500. Retrieved from https://www.nanaimo.ca/docs/property-development/community-planning-and-zoning/officialcommunityplan.pdf

Comox Valley Regional District. (2015). Comox Valley Regional District Rural Areas Community Climate Action Plan: Partners for Climate Protection Milestone 3. Retrieved from https://www.comoxvalleyrd.ca/sites/default/files/docs/Projects-Initiatives/cc_cvrd_electoral_areas_community_climate_action_plan.pdf

Comox Valley Regional District. (2010). Comox Valley Regional District Regional Growth Strategy Bylaw No. 120. Retrieved from https://www.comoxvalleyrd.ca/sites/default/files/uploads/bylaws/bylaw-120_comox_valley_regional_district_regional_growth_strategy.pdf

CTV Vancouver Island. (2018). Cluster of fires on northern Vancouver Island is abnormal: climate scientist. Retrieved from https://vancouverisland.ctvnews.ca/cluster-of-fires-on-northern-vancouver-island-is-abnormal-climate-scientist-1.4070496

Davoudi, S., Brooks, E., & Mehmood, A. (2013). Evolutionary resilience and strategies for climate adaptation. *Planning Practice & Research*, 28(3), 307-322.

Davoudi, S., Shaw, K., Haider, L. J., Quinlan, A. E., Peterson, G. D., Wilkinson, C., ... & Davoudi, S. (2012). Resilience: a bridging concept or a dead end? "Reframing" resilience: challenges for planning theory and practice interacting traps: resilience assessment of a pasture management system in Northern Afghanistan urban resilience: what does it mean in planning practice? Resilience as a useful concept for climate change adaptation? The politics of resilience for planning: a cautionary note: edited by Simin Davoudi and Libby Porter. *Planning theory & practice*, *13*(2), 299-333.

Diaz, D. B. (2016). Estimating global damages from sea level rise with the Coastal Impact and Adaptation Model (CIAM). *Climatic change*, 137(1-2), 143-156.

Donner, S. D., & Webber, S. (2014). Obstacles to climate change adaptation decisions: a case study of sea-level rise and coastal protection measures in Kiribati. *Sustainability science*, 9(3), 331-345.

Duvat, V. (2013). Coastal protection structures in Tarawa Atoll, Republic of Kiribati. *Sustainability science*, 8(3), 363-379.

Eisenack, K., Moser, S. C., Hoffmann, E., Klein, R. J., Oberlack, C., Pechan, A., & Termeer, C. J. (2014). Explaining and overcoming barriers to climate change adaptation. *Nature Climate Change*, 4(10), 867-872.

Fink, A. (2005). Conducting research literature reviews: From the internet to paper. *Sage Publications*.

Ford, J. D., & King, D. (2015). A framework for examining adaptation readiness. *Mitigation and Adaptation Strategies for Global Change*, 20(4), 505-526.

Ford, J. D., Berrang-Ford, L., & Paterson, J. (2011). A systematic review of observed climate change adaptation in developed nations. *Climatic change*, 106(2), 327-336.

Füssel, H. M. (2007). Vulnerability: A generally applicable conceptual framework for climate change research. *Global Environmental Change*, 17(2), 155-167.

Gasper, R., Blohm, A., & Ruth, M. (2011). Social and economic impacts of climate change on the urban environment. *Current Opinion in Environmental Sustainability*, 3(3), 150-157.

Geisler, C., & Currens, B. (2017). Impediments to inland resettlement under conditions of accelerated sea level rise. *Land Use Policy*, 66, 322-330.

Goff, M. (2010). Evaluating Habitat Enhancements of an Urban Intertidal Seawall: Ecological Responses and Management Implications (Doctoral dissertation, University of Washington).

Gómez-Baggethun, E., & Barton, D. N. (2013). Classifying and valuing ecosystem services for urban planning. *Ecological Economics*, 86, 235-245.

Gunderson, L.H., & Holling, C.S. (Eds.). (2002). Panarchy: Understanding transformations in human and natural systems. Washington, DC: Island Press.

Hamin, E. M., Gurran, N., & Emlinger, A. M. (2014). Barriers to municipal climate adaptation: Examples from coastal Massachusetts' smaller cities and towns. *Journal of the American Planning Association*, 80(2), 110-122.

Harman, B. P., Heyenga, S., Taylor, B. M., & Fletcher, C. S. (2013). Global lessons for adapting coastal communities to protect against storm surge inundation. *Journal of Coastal Research*, 31(4), 790-801.

Hauer, M. E., Evans, J. M., & Mishra, D. R. (2016). Millions projected to be at risk from sea-level rise in the continental United States. *Nature Climate Change*, 6(7), 691-695.

Heang, C, and Birchall, SJ. (2019). Community planning opportunities: Building resilience to climate variability using coastal naturalisation. In WL. Filho, PG. Özuyar, PJ. Pace, U. Azeiteiro and L. Brandli (Eds.), Climate Action, Encyclopedia of the UN Sustainable Development Goals. London: Springer. https://doi.org/10.1007/978-3-319-71063-1_83-1.

Henstra, D. (2016). The tools of climate adaptation policy: analysing instruments and instrument selection. *Climate Policy*, 16(4), 496-521.

Hino, M., Field, C. B., & Mach, K. J. (2017). Managed retreat as a response to natural hazard risk. *Nature Climate Change*, 7(5), 364.

Holling, C. S. (1973). Resilience and stability of ecological systems. *Annual review of ecology and systematics*, 4(1), 1-23.

Holling, C. S. (1996). Engineering resilience versus ecological resilience. Pages 31-44 *in* P. C. Schulze, editor. *Engineering within ecological constraints*. National Academy Press, Washington, D.C., USA.

Horney, J., Nguyen, M., Salvesen, D., Dwyer, C., Cooper, J., & Berke, P. (2017). Assessing the quality of rural hazard mitigation plans in the Southeastern United States. *Journal of Planning Education and Research*, 37(1), 56-65.

Hughes, S., Chu, E. K., & Mason, S. G. (2018). Climate change in cities. Innovations in Multi-Level Governance*. Cham: Springer International Publishing (The Urban Book Series)*.

IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational researcher*, 33(7), 14-26.

Jones, H. P., Hole, D. G., & Zavaleta, E. S. (2012). Harnessing nature to help people adapt to climate change. *Nature Climate Change*, 2(7), 504-509.

Kim, D., and Lim, U. (2016). Urban resilience in climate change adaptation: A conceptual framework. *Sustainability*, *8*(4), 405.

Kittinger, J. N., & Ayers, A. L. (2010). Shoreline armoring, risk management, and coastal resilience under rising seas. *Coastal Management*, 38(6), 634-653.

Klein, R. J., Schipper, E. L. F., & Dessai, S. (2005). Integrating mitigation and adaptation into climate and development policy: three research questions. *Environmental science & policy*, 8(6), 579-588.

Kolbe, R. H., & Burnett, M. S. (1991). Content-analysis research: An examination of applications with directives for improving research reliability and objectivity. *Journal of consumer research*, 18(2), 243-250.

Krellenberg, K., & Barth, K. (2014). Inter-and transdisciplinary research for planning climate change adaptation responses: the example of Santiago de Chile. *Interdisciplinary Science Reviews*, 39(4), 360-375.

Labaree, R. (2013). Organizing Your Social Sciences Research Paper: Theoretical Framework. *USC Libraries, University of Southern California.* Retrieved from: http://libguides. usc. edu/content. php.

Labbé, J., Ford, J. D., Araos, M., & Flynn, M. (2017). The government-led climate change adaptation landscape in Nunavut, Canada. *Environmental Reviews*, *25*(1), 12-25.

Leichenko, R. (2011). Climate change and urban resilience. *Current opinion in environmental sustainability*, 3(3), 164-168.

Lorenz, S., Dessai, S., Forster, P. M., & Paavola, J. (2017). Adaptation planning and the use of climate change projections in local government in England and Germany. *Regional Environmental Change*, 17(2), 425-435.

Lyles, W., Berke, P., & Smith, G. (2014). A comparison of local hazard mitigation plan quality in six states, USA. *Landscape and urban planning*, *122*, 89-99.

Marchand, M. (2010). Concepts and Science for Coastal Erosion Management. Concise report for policy makers. *Deltares, Delft*.

Marolla, C. (2016). Climate Health Risks in Megacities: Sustainable Management and Strategic Planning. CRC Press.

Mays, N., & Pope, C. (1995). Qualitative research: rigour and qualitative research. *Bmj,* 311 (6997), 109-112.

McGill University. (2019). About Urban Planning. Retrieved from https://www.mcgill.ca/urbanplanning/planning

McInerney, L. A. (2016). Library Resource Guides: Literature Review: Systematic literature review.

Meadows, D.H. (1999). Leverage points: Places to intervene in a system. Hartland, VT: *Sustainability Institute.*

Measham, T. G., Preston, B. L., Smith, T. F., Brooke, C., Gorddard, R., Withycombe, G., & Morrison, C. (2011). Adapting to climate change through local municipal planning:

barriers and challenges. *Mitigation and adaptation strategies for global change*, 16(8), 889-909.

Mitchell, J. F. (1989). The "greenhouse" effect and climate change. *Reviews of Geophysics*, 27(1), 115-139.

Moench, M. (2014). Experiences applying the climate resilience framework: linking theory with practice. *Development in Practice*, 24(4), 447-464.

Morecroft, M. D., Crick, H. Q., Duffield, S. J., & Macgregor, N. A. (2012). Resilience to climate change: translating principles into practice. *Journal of Applied Ecology*, 49(3), 547-551.

Morse, J. M. (2016). *Mixed method design: Principles and procedures* (Vol. 4). Routledge.

Mukheibir, P., Kuruppu, N., Gero, A., & Herriman, J. (2013). Overcoming cross-scale challenges to climate change adaptation for local government: a focus on Australia. *Climatic change*, 121(2), 271-283.

Nalau, J., Preston, B. L., & Maloney, M. C. (2015). Is adaptation a local responsibility?. *Environmental Science & Policy*, 48, 89-98.

Nicholls, R. J., Wong, P. P., Burkett, V., Woodroffe, C. D., & Hay, J. (2008). Climate change and coastal vulnerability assessment: scenarios for integrated assessment. *Sustainability Science*, 3(1), 89-102.

Noble, I. R., Huq, S., Anokhin, Y. A., Carmin, J., Goudou, D., Lansigan, F. P., ... & Villamizar, A. (2014). Adaptation needs and options. *Climate change*, 833-868.

Norton, W. (2013). *Human Geography*. 8th Ed. Oxford University Press.

Oliver, K. L. (1998). A journey into narrative analysis: A methodology for discovering meanings. *Journal of Teaching in physical Education*, 17(2), 244-259.

Olsson, L., Jerneck, A., Thoren, H., Persson, J., & O'Byrne, D. (2015). Why resilience is unappealing to social science: Theoretical and empirical investigations of the scientific use of resilience. *Science advances*, 1(4), e1400217.

Onwuegbuzie, A. J. (2012). Introduction: Putting the MIXED back into quantitative and qualitative research in educational research and beyond: Moving toward the radical middle. *International Journal of Multiple Research Approaches*, 6(3), 192-219.

Palmer, M. A., Lettenmaier, D. P., Poff, N. L., Postel, S. L., Richter, B., & Warner, R. (2009). Climate change and river ecosystems: protection and adaptation options. *Environmental management*, 44(6), 1053-1068.

Pasquini, L., Ziervogel, G., Cowling, R. M., & Shearing, C. (2015). What enables local governments to mainstream climate change adaptation? Lessons learned from two municipal case studies in the Western Cape, South Africa. *Climate and Development*, 7(1), 60-70.

Pearce, T., Ford, J., Willox, A. C., & Smit, B. (2015). Inuit traditional ecological knowledge (TEK), subsistence hunting and adaptation to climate change in the Canadian Arctic. *Arctic*, 233-245.

Pew, K. L., & Larsen, C. P. S. (2001). GIS analysis of spatial and temporal patterns of human-caused wildfires in the temperate rain forest of Vancouver Island, Canada. *Forest ecology and management*, 140(1), 1-18.

Preston, B. L., Westaway, R. M., & Yuen, E. J. (2011). Climate adaptation planning in practice: an evaluation of adaptation plans from three developed nations. *Mitigation and adaptation strategies for global change*, 16(4), 407-438.

Province of Bristish Columbia. (2008). *Bill 27-2008: Local Government (Green Communities) Statutes Amendment Act, 2008.* Retrieved from: https://www.leg.bc.ca/pages/bclasslegacy.aspx#/content/legacy/web/38th4th/3rd_read/gov27-3.htm

Regional District of Mount Waddington. (2015). Regional District of Mount Waddington Regional Plan Bylaw No. 890. Retrieved from http://www.rdmw.bc.ca/media/Regional%20Plan%20Bylaw%20No.%20890(1).pdf

Regional District of Nanaimo. (2011). Regional District of Nanaimo Regional Growth Strategy Bylaw No. 1615. Retrieved from https://www.rdn.bc.ca/dms/documents/regional-growth-strategy/bylaw-no.-1615,-2011/regional_growth_strategy_text.pdf

Rhodes, C. J. (2017). World Meteorological Organisation (WMO) Report: Global Greenhouse Gas Concentrations Highest in 800,000 Years. *Science Progress*, 100(4), 428-433.

Rodenhuis, D. R., Bennett, K. E., Werner, A. T., Murdock, T. Q., & Bronaugh, D. (2009). Climate Overview 2007: Hydro-Climatology and Future Climate Impacts in British Columbia. Pacific Climate Impacts Consortium, University of Victoria, Victoria, BC. *British Columbia*.

Scrieciu, S. Ş., Belton, V., Chalabi, Z., Mechler, R., & Puig, D. (2014). Advancing methodological thinking and practice for development-compatible climate policy planning. *Mitigation and adaptation strategies for global change*, 19(3), 261-288.

Shaw, A., Burch, S., Kristensen, F., Robinson, J., & Dale, A. (2014). Accelerating the sustainability transition: Exploring synergies between adaptation and mitigation in British Columbian communities. *Global Environmental Change*, 25, 41-51.

Shenton, A. K. (2004). Strategies for ensuring trustworthiness in qualitative research projects. *Education for information*, 22(2), 63-75.

Shi, L., Chu, E., & Debats, J. (2015). Explaining progress in climate adaptation planning across 156 US municipalities. *Journal of the American Planning Association*, 81(3), 191-202.

Sovacool, B. K. (2011). Hard and soft paths for climate change adaptation. *Climate Policy*, 11(4), 1177-1183.

Statistics Canada. (2017). *Vancouver Island and Coast [Economic region], British Columbia and British Columbia [Province]* (table). *Census Profile*. 2016 Census. Statistics Canada Catalogue no. 98-316-X2016001. Ottawa. Released November 29, 2017. https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E (accessed February 5, 2019).

Stevens, M., & Senbel, M. (2012). Examining municipal response to a provincial climate action planning mandate in British Columbia, Canada. *Local Environment*, 17(8), 837-861.

Stults, M., & Woodruff, S. C. (2017). Looking under the hood of local adaptation plans: shedding light on the actions prioritized to build local resilience to climate change. *Mitigation and Adaptation Strategies for Global Change*, 22(8), 1249-1279.

Tang, Z., Wang, Z., & Koperski, T. (2011). Measuring local climate change response capacity and bridging gaps between local action plans and land use plans. *International journal of climate change strategies and management*, 3(1), 74-100.

The Editors of Encyclopaedia Britannica. (2018). Vancouver Island. Retrieved from https://www.britannica.com/place/Vancouver-Island.

Thorne, K. M., Elliott-Fisk, D. L., Freeman, C. M., Bui, T. V. D., Powelson, K. W., Janousek, C. N., & Takekawa, J. Y. (2017). Are coastal managers ready for climate change? A case study from estuaries along the Pacific coast of the United States. *Ocean & Coastal Management*, 143, 38-50

Tschakert, P., & Dietrich, K. A. (2010). Anticipatory learning for climate change adaptation and resilience. *Ecology and society*, 15(2).

Turner, N. J., & Clifton, H. (2009). “It's so different today”: Climate change and indigenous lifeways in British Columbia, Canada. *Global Environmental Change*, 19(2), 180-190.

Tyler, S., Moench, M. (2012) A framework for urban climate resilience. *Climate and Development*, 4(4), 311-326.

UNFCC. (2015). Paris Agreement to the United Nations Framework Convention on Climate Change adopted at COP3 in Paris, France, on 12 December 2015.

Urry, J. (2015). Climate change and society. In *Why the social sciences matter* (pp. 45-59). Palgrave Macmillan, London.

Vancouver Island Economic Alliance. (2015). State of the Island Economic Report. VIEA, 2015. Retrieved from http://viea.ca/wp-content/uploads/2016/04/StateoftheIslandEconomicReportVIEA2015.pdf

Van Stigt, R., Driessen, P. P., & Spit, T. J. (2015). A user perspective on the gap between science and decision-making. Local administrators' views on expert knowledge in urban planning. *Environmental Science & Policy*, 47, 167-176.

Wenger, C. (2015). Better use and management of levees: reducing flood risk in a changing climate. *Environmental Reviews*, 23(2), 240-255.

Wilson, E. (2006). Adapting to climate change at the local level: the spatial planning response. *Local Environment*, 11(6), 609-625.

Windle, G. (2011). What is resilience? A review and concept analysis. *Reviews in Clinical Gerontology*, 21(2), 152-169.

Wise, R. M., Fazey, I., Smith, M. S., Park, S. E., Eakin, H. C., Van Garderen, E. A., & Campbell, B. (2014). Reconceptualising adaptation to climate change as part of pathways of change and response. *Global Environmental Change*, 28, 325-336.

Appendix A

Results from Semi-Structured Interviews for each Regional District (Policy Sub-themes)

Adaptation: Level of Priority

Alberni-Clayoquot Regional District

In the Alberni-Clayoquot RD, it is apparent that adaptation is prioritized only when it needs to be. This is supported by comments from ACRD1 who described that "…we're adapting as we need to." In general, mitigation still outweighs adaptation and climate change itself, is not held as a high priority. This was highlighted by ACRD2 who stated that not only is adaptation not prioritized as a regional strategic goal, "climate change is still not a really big political issue, and it should be, but it is really, truly not a big political issue."

Strathcona Regional District

The finding from Alberni-Clayoquot RD are similar to those from Strathcona RD where both RD's are unique in the fact that not only is adaptation not being prioritized, climate change itself, is not a priority. The interviewee from Strathcona RD highlights that action is being taken to reduce the region's GHG however, "…not with enthusiasm, or with a lot of energy" (SRD1). In this sense, mitigation significantly outweighs adaptation as a result of the region's requirement to set emissions reduction targets. However, the region is merely complying with Bill 27 with little consideration given to climate change in general.

Comox Valley Regional District

Greater understanding of the reasons as to why mitigation tends to outweigh adaptation for most RDs emerged from the findings from Comox Valley RD. Here, it is clear that mitigation outweighs adaptation in terms of the actions undertaken and public understanding. CVRD2 highlights that the residents of the region are interested in mitigative actions with little interest shown for adaptation. Moreover, the region's planning documents embody a mitigation focus. For example, the Comox Valley RGS was between 2008 to 2010 when mitigation was being prioritized by the province. As a result, the document is "a product of its time.." (CVRD1) with little consideration given to adaptation. These findings shed light on the importance of provincial direction where if mitigation is prioritized at the provincial level, it is likely to filter down to

local levels of government. Although climate actions are largely focused on mitigation in Comox Valley RD, the interviewees speak of their own understanding of the necessity of adaptation, describing it as a critical endeavor if the region is to protect residents and assets.

Mount Waddington Regional District

Interviewees from Mount Waddington RD also reveal insights into why adaptation is largely not prioritized on Vancouver Island. Both interviewees recognize the need for adaptation, stressing that it is "…part of the solution" (MWRD1). However, while the necessity of adaptation is understood, this has not translated into council's priorities, which focus predominantly on mitigative efforts. MWRD2 speaks to temporal aspects by describing that adaptation "won't be prioritized probably until we (the region) see more immediate effects up from it." The interviewee then states that "you have to convince politicians that they need to change their priorities and focus their shift in use of tax dollars". In this sense, the need for adaptation may not be recognized until climate change impacts become devastating or more visible. This concept sheds light on the driving forces of adaptative efforts where, often times, adaptation is not prioritized until an overwhelming event is experienced.

Cowichan Valley Regional District

Cowichan Valley RD stands out in terms of interviewee responses to questions regarding whether adaptation is prioritized and if mitigation outweighs adaptation at the local level. It is apparent that climate change adaptation is not yet a priority, however, the interviewees emphasize that the region is beginning to devise a strategy to deal with the lack of adaptation interest with progress being made. Moreover, the interviewees describe that both mitigative and adaptative efforts are occurring and both responses to climate change are recognized as important.

Regional District of Nanaimo

Similar findings emerged from the interviews conducted in the RD of Nanaimo. However, this RD is the only one involved in this study where both interviewees state that adaptation is prioritized. Moreover, both interviewees describe that mitigation outweighs adaptation at this stage. Despite the focus on mitigation, action has been taken to improve the region's preparedness through the conception and implementation of adaptive efforts (e.g. SLR Adaptation Program, Emergency Preparedness Protocols, etc.).

Capital Regional District

Lastly, the findings from the Capital RD show great uncertainty among interviewees. The interviewees have highly contrasting viewpoints when it comes to whether or not adaptation is held as a priority. Both interviewees agree that mitigative efforts outweigh adaptative efforts at the local level and one interviewee places greater weight on the need for mitigation. Where the interviewees disagree, is on the strategic priorities of the region. While CRD1 described that no real action has been taken on mitigation or adaptation due to a lack of political will, CRD2 states that adaptation is prioritized by both staff and council. These contrasting opinions hint to a lack of communication between different departments, showcasing the need for transparency and cooperation within local governments.

Nature of Climate Change Responses

Alberni-Clayoquot Regional District

The interviewees from Alberni-Clayoquot RD characterize the region's actions as largely "being reactionary to what is happening" (ACRD1). While the region's climate responses are reactionary at this point in time, it is clear that there is work being done to become more preparatory. For instance, the RD shows proactivity in the case of mitigative efforts. ACRD2 describes that some anticipatory action has occurred:

> ACRD2: "We're being proactive; we're planning for the future. Four years ago, I started an official city committee called the Climate Change and Food Security Committee, specifically to help to address these very issues (climate change threats)."

Mount Waddington Regional District

Like the findings from Alberni-Clayoquot RD, when asked if the region is being proactive or reactive in terms of their responses to climate change, the interviewees from Mount Waddington RD emphasize that both reactive and proactive efforts are occurring. Here, the region is reacting to impacts in some instances but is working on anticipating climate impacts. Because proactive strategic planning takes time and resources to pursue, RD's that are currently working on their anticipatory actions will be forced to react to impacts until they have an anticipatory framework in place.

Regional District of Nanaimo

A combination of reactive and proactive actions is also seen in the RD of Nanaimo. The interviewees go into great detail to describe how the region's nature of climate change responses can be characterized as both reactive and proactive:

> RDN1: "I think it's a combination of both. When we think about our infrastructure planning side of things, we are at the beginning stages of looking at doing vulnerability assessments but that doesn't mean that site-specific requirements are not being met, but those are kind of reactionary as they come up. And the same sort of thing is when we are looking at new projects, especially for infrastructure, they are evaluated through the lens of climate impacts, so that's kind of integrated into the systems already. And then the longer range is the type of work that I'm working on as well as emergency planning services is working towards an actual climate change strategy that will, hopefully, bring those different components together at a higher up level."

> RDN2: "I think we are doing the long term planning. We're learning about the flood mitigation, like, exactly studying how the water moves throughout in those kind of changes to anticipate where flooding areas will occur in more of a, you know, regular basis."

Comox Valley Regional District

The nature of climate change actions in Comox Valley RD are characterized as reactive and "not very aggressive" (CVRD2) by both interviewees. The region is primarily responding to climate impacts as they arise rather than employing anticipatory climate change planning. The interviewees provide some explanation as to why Comox Valley RD has tended towards reactionary action:

> CVRD1: "I think though, having worked in a municipality and in a regional district, the whole nature of a regional district is more hands-off than a municipality…. But I guess my piece is that it's really not about not being interested, it's just not."

In this sense, the authoritative powers and jurisdiction of RDs may act as a barrier to proactive adaptation planning. While the staff may be interested in anticipatory efforts, a lack of a

framework, tools, and authority have hindered the ability of RDs to do so. Similar barriers are also noted in Cowichan Valley RD and Strathcona RD.

Cowichan Valley Regional District

The interviewees from Cowichan Valley RD highlight that the nature of climate actions varies within the local government with staff embracing proactivity while the political body as a whole, is generally reacting to events as they occur. COWRD2 highlights that senior management is encouraging the region to think strategically and build preparedness, however, elected officials appear to be conflicted with other priorities, which acts to prevent proactivity. This case brings to light the influence of champions and elected officials in spurring anticipatory actions. Scholars frequently find that climate change champions are critical to the process of initiating anticipatory adaptation (XX).

Strathcona Regional District

The interviewee from Strathcona RD raised a similar case highlighting the influence of authoritative powers and elected officials. Overall, the nature of climate change actions in Strathcona RD is overwhelmingly reactive. SRD1 describes that the region is ill prepared and reacting to climate impacts despite staff being "so aware and so eager to do far more than what [they] are allowed to do." Here, the lack of authoritative powers and political will is serving as a barrier to proactive climate adaptation planning. This trend is apparent for many RDs who struggle to strategically plan for climate change impacts without a clear direction and support from higher levels of government and elected officials.

Capital Regional District

The Capital RD presents a unique case where in theory, the region is exhibiting proactivity through the adoption of high-level strategic climate policies, but in practice, "…there's very little real action on climate change" (CRD1). Moreover, CRD2 stated that "our council has been more proactive…", which enabled a strategic framework to be devised for the region. This suggests that the nature of climate actions in the Capital RD is primarily proactive. However, this anticipatory planning is seldom translated into on the ground action. This lack of implementation in practice speaks to the need for strategic priorities to be adopted into bylaws which have greater teeth. If anticipatory actions remain as high-level visions, it is highly unlikely that they are to truly advance the resilience of local governments.

Level of Preparedness

Alberni-Clayoquot Regional District

Interviewees from Alberni-Clayoquot RD share similar perspectives that suggest that the region is working on it's preparedness through education and emergency planning but is still not yet entirely prepared. ACRD2 stresses that the region is "not even remotely" on top of climate change impacts hinting to a heightened level of vulnerability in the Alberni-Clayoquot RD. Because of the high frequency and intensity flood and wildfire events, the interviewees note that the region is feeling slightly overwhelmed by climate impacts. It is most vulnerable to overland flooding and interface fires that tend to highlight areas in need of preparatory work. To increase their preparedness for these climate impacts, the interviewees describe a number of critical actions needed to bolster the region's resilience including widespread education measures, the development and implementation of strategic plans, removal of underbrush to reduce interface fire likelihood, and the development of structural adaptations to cope with flooding. However, the region has struggled with advancing their preparedness because of a number of factors, including a lack of capacity and guidance from senior levels of government. For example, ACRD1 stresses the role of the province by stating that "…we're trying to be prepared and react as you would when the unexpected happens, but you can't be prepared for everything. And so, it takes more than just the local preparation. It stems from the province as well.."

Comox Valley Regional District

Like the Alberni-Clayoquot RD, Comox Valley RD's preparedness for climate change impacts can be described as "mediocre" (CVRD2). Work has been done to advance the region's preparedness in terms of implementing adaptive measures and through the emergency preparedness program, however, the interviewees emphasize that the region is not yet ready for climate change. Moreover, they speak to the fragmented approach used to build preparedness and subsequently raise the need for a more holistic and systematic approach:

> CVRD2: "Probably creating that more systematic approach, like developing a service… and developing an adaptation plan and having specific actions identified in that plan, and directing resources to implementing those. Having a more of a holistic reaction to it, rather than just kind of piecemeal, when it fits somewhere else, maybe we'll try and address it here and there."

In addition to the need for a more organized response to climate change impacts, the interviewees further elucidate the barriers to building preparedness by describing the function of RDs and the role played by senior levels of government. Here, it is noted that the region needs a "stronger provincial role" (CVRD1) in order to ensure political support is received on the part of adaptation and preparedness planning. For example, mitigative actions are widespread across the island largely due to a strong provincial push for climate change mitigation. Thus, in order to advance regional preparedness and adaptation planning, there must also be strong provincial direction focused on climate change adaptation.

Cowichan Valley Regional District

Interviewee responses from Cowichan Valley RD differ from most other RD's in terms of their emphasis on anticipatory thinking. Overall, the region's preparedness for climate change impacts is described as "poor" (COWRD2), however, both interviewees speak to the strategic planning currently being undertaken and past emergency responses. The region experienced an overwhelming flood in recent years and successfully coped with and recovered from the event. Having experienced a significant natural disturbance and showcasing successful emergency responses to the event has shed light on the region's ability to respond to climate impacts. Where their preparedness suffers, is from a deficit of resources and policy direction. The interviewees highlight that the region is aware of the climate change impacts coming and in order to advance their preparedness, strategic plans must be developed and implemented, and resources must be devoted to adaptive efforts.

Capital Regional District

Like many other RDs, the preparedness of the Capital RD for climate impacts is described as poor. The region is moderately vulnerable to the impacts of sea level rise, storm events, drought, and intense precipitation. While it is susceptible to these impacts, the interviewees highlight that the region is not being overwhelmed. Rather it is challenged by the gradual and "creeping increase in these impacts" (CRD1). Because climate change impacts are gradually becoming more prominent threats for the region and not having an overwhelming effect, the Capital RD has more time to advance their preparedness for a changing climate. To increase regional preparedness, the interviewees highlight the need to upgrade their stormwater system, intensify their rainwater programme, and move personnel in charge of climate change

policy implementation into a senior leadership role. These actions would ensure the region is resilient to flooding events and better positioned to implement adaptive strategies.

Mount Waddington Regional District

Interviewees from Mount Waddington RD note that the region is not yet overwhelmed by climate change impacts but will likely need to implement adaptive efforts in the near future, particularly in response to drought and wildfire. The region is highly vulnerable to these climate impacts as revealed by both interviewees who outline the significant challenges of being located in an interface zone, surrounded by dense forests. Despite this vulnerability, MWRD2 describes that the region is relatively prepared for further impacts as they have "…quite a few resources and people.." including emergency response personnel, coordinators, and strategic plans in place. In contrast to this viewpoint, MWRD1 describes the regions preparedness as "…fairly poor" as a result of their heightened vulnerability to wildfire. In general, it is evident that Mount Waddington RD is highly vulnerable to drought and wildfire impacts and is not yet entirely prepared for continued climate change.

Regional District of Nanaimo

Findings from the semi-structured interviews conducted in the RD of Nanaimo point to a greater level of preparedness than seen in many other RDs. The interviewees outlined that the region has integrated climate adaptation and mitigation into various operational plans, has access to different streams of funding, and has not yet been overwhelmed by climate change impacts. As a result, the region has built up its preparedness and resilience. RDN2 highlighted that the region is "not fully prepared but we [the region] are getting better year after year" and RDN1 states that the region is not overwhelmed as climate adaptation has "become part of operations, another kind of component of any sort of planning/operational processes." In this sense, the region has prioritized efforts to expand their preparedness for climate change impacts, which is evident in the fact that adaptive actions have become an integral component in day to day operations.

Strathcona Regional District

Strathcona RD presents a unique case but not because it is "ill prepared" (SRD1) for climate change, but because of the factors contributing to this poor preparedness. When asked why the region is ill prepared, SRD1 explains that "this is a tough question to answer, because on

the staff level, we are so aware and so eager to do far more than what we are allowed to do." The interviewee then adds that the region is "not overwhelmed because they're in denial, and they're certainly not on top of things because they are not being proactive." A lack of political awareness and will to act on climate change is a significant barrier for Strathcona RD in their attempts to prepare for climate impacts, however, some progress has been made in direct response to a local champion. The interviewee emphasizes the critical role of this champion describing that the protective service coordinator has been a key actor in moving the region towards a greater level of preparedness through their efforts to apply for grants, public education, and adaptive actions. Despite this local championing, the region is still not prepared and SRD1 speaks to a number of actions that must be undertaken in order to advance the region's resilience:

> SRD1: "They could make it a priority and provide funding, free up staff time, ask for regular updates, what improvements has been done. Build momentum and keep the momentum going. Without the political will, it's very difficult to do anything. And yet [the champion] has shown that regardless of political will, he just moves forward slowly and does his thing. In my department, we could for example, change the language in our bylaws, preventing variances when it's evident that it shouldn't be approved."

Capacity to Act

Alberni-Clayoquot Regional District

Within the Alberni-Clayoquot RD there is a clear lack of climate change data, expertise, and financial resources. The interviewees reveal that the region does not "have an abundance of resources to deal with environmental or climate action issues" (ACRD1). Although the region has sufficient personnel to undertake climate adaptation planning, they are in need of climate related knowledge and greater funds. Both interviewees explain that the region does not have the financial capacity necessary to adapt to climate change. Moreover, they highlight that the province has not provided enough financial support, despite growing access to various funding streams. Where the region has received provincial funding is in the area of climate change mitigation projects. For example, the Alberni-Clayoquot RD received a $6 million grant in relation to their organic's diversion program.

Comox Valley Regional District

Like the results from Alberni-Clayoquot RD, interviewees from Comox Valley RD speak to the focus of provincial grants towards mitigative endeavors. Comox Valley RD also experiences a deficit of financial resources and climate data, however, the interviewees also state that the region does not have sufficient personnel. CVRD1 describes that while the region has been able to access funding through Emergency Management BC, much more financial support is required in order to conduct the detailed flood risk studies needed.

Cowichan Valley Regional District

Cowichan Valley RD is in a similar position with respect to a lack of financial resources, climate change expertise, and personnel. In this case, the interviewees describe that the province has funded some of their projects with the region having a long history of receiving provincial grants. The region is in need of climate related data and studies, particularly related to their watersheds, and exhibits a willingness to utilize external experts in order to accumulate the necessary climate knowledge needed to move forward in their climate change planning. Like many other RD's, Cowichan Valley RD interviewees emphasize the awareness and eagerness of their personnel to expand their knowledge and plan for climate change. This concept was raised in almost all interviews conducted and speaks to a recognition of the need to plan for a changing climate.

Capital Regional District

In the Capital RD, a reoccurring theme was withdrawn from the interview findings where despite there being a slight lack of capacity, there is also a lack of political will. The region appears to be more fortunate than others in terms of their climate data, personnel, and greater financial resources. This inference is backed by CRD1 who points out that the region has a fairly diversified tax base, adequate climate knowledge, and sufficient personnel. The interviewee then states that the region's ability to plan for and respond to climate change is not impacted by their capacity but rather, "it's a lack of political will" (CRD1). This theme is also prevalent in the interview findings from Strathcona RD. In this case, however, Strathcona RD has far fewer resources.

Strathcona Regional District

The interviewee describes the region as being reliant upon grants given its small tax base and limited financial resources. Strathcona RD has leveraged the opportunity to access various funding streams and as a result, has attained several provincial and federal grants. SRD1 speaks to the status of provincial support by referring to the gas tax funds:

> SRD1: "It is great, and those gas tax funds have enabled RD to really improve their resiliency and infrastructure. But it's still by far inadequate to really address the funds that is needed in getting totally prepared and proactive, let alone in a reactive situation. We will be very dependent on provincial or federal funds."

Mount Waddington Regional District

Mount Waddington RD also relies upon financial support from senior levels of government although the interviewees highlight that recently, time has been an issue preventing the region from exploring streams of funding. There appears to be a lack of personnel and subsequently, time, which has significantly influenced Mount Waddington RD's ability to prepare for and cope with climate change. The interviewees speak to a lack of internal financial resources, expertise, and personnel:

MWRD1: "We're fairly limited in our staff resources. It's a small regional district. We have a low population. We don't have very many services. In terms of local government, our jurisdiction is also fairly limited."

MWRD2: "…if I was told that [climate change] was my priority and everything else could take a backseat, that would be great, I could sure focus on it. But that's not going to happen. You have to keep the day-to-day flowing, so, no, we don't have the capacity. We really do need some support staff here to be able to help us out."

Regional District of Nanaimo

Nanaimo RD stands out from the others in terms of their staff resources and climate change data base. While the region suffers from a lack of financial resources, the interviewees emphasize their availability of climate expertise and skilled staff:

RDN1: "We're actually quite lucky in terms… We always have a very full workload. I don't feel that I'm doing my project, the sea level rise adaptation project, on the corner of my desk. But we're also fortunate that we have a very skilled GIS department. Not everybody has three GIS divisions and that could make a big difference. Capacity-wise, I would say we're doing pretty good for staff resources. And then with the addition of being able to access different funding streams, that really helps us to advance a lot of the projects that we would like to do. Generally, we require consultants, especially when we're talking about things like climate adaptation with certain speciality areas that we as staff don't have."

RDN2: "… we have a lot of expertise here, and then when we don't we get the funding or apply for it to get studies and bring in the extra help that we need."

The interviewees also speak to the importance of cooperation with municipalities and other regions with respect to the concept of staff and data sharing. Studies and data collected by one regional district can easily be shared with other RDs, which would significantly reduce the financial burden associated with gathering climate related information. Moreover, cooperation and communication between local governments can be highly beneficial to the process of climate change planning by way of learning what worked for others and what didn't.

Appendix B

Municipal Official Community Plan Content Analysis Scores and Justification

District of Central Saanich Official Community Plan (Score of 20/34)

Within its overarching vision and guiding principles, the plan explicitly recognizes climate change as a threat and describes intentions to adapt to the impacts of climate warming. There are 17 guiding principles where climate change is directly mentioned in one. Here, both adaptation and mitigation are referred to, given that the guiding principle speaks to addressing both the causes and impacts of climate change. Because adaptation is directly mentioned in various areas of the goals section and is described in great detail, a score of 2 for adaptation integration was received. The plan goes so far as to outline the importance of adapting to new conditions such as sea level rise, increased storm surge, and more intense weather events within the guiding principle addressing climate change. Importantly, climate change is also its own section within the context chapter of the plan. The plan highlights the need for action with adaptation embedded in the climate change section. Notably, adaptation receives almost as much attention as mitigation.

There are no policies directly considering climate change however, climate change mitigation and adaptation are woven into almost every section of the plan. In some instances, climate adaptation is mentioned as part of a side effect of policies. For example, in the section relating to ecosystem protection and preservation, policies aimed at protecting certain ecosystems are said to also contribute to natural adaptation efforts such as storm water management. The plan makes use of committing language such as “ensure and must”. With respect to the fact base section, it is clear that the plan has used reliable climate information and projections. The projections are not focused on, however, and the information is not directly scaled to the region as impacts are not outlined for the province or municipality.

The plan does not contain an implementation section, however, it is clear that the policies within the OCP will be implemented through specified development permit areas and guidelines. Importantly, there is a statement identifying that achieving the policies of the plan will be

determined by future decisions of Council with respect to priorities, funding, and implementation. While this is true, it does not reflect a rigorous implementation plan.

City of Colwood Official Community Plan (Score of 21/34)

The Colwood OCP has established 8 community sustainability goals. Climate change is directly considered in one goal which is intended to address energy, climate protection, and adaptation. Here, the plan describes objectives to promote energy efficiency in an attempt to reduce GHG emissions and contribute to clean air. Adaptation is only briefly mentioned where the plan outlines the municipalities desires to plan for climate change adaptation. Climate change is referenced as a key driving force behind the development of this OCP, which influenced the plan score of 2/2 for the concept of climate change indicator. Because adaptation is directly mentioned in the overarching goal but is not detailed, a score of 1 for adaptation integration was received.

Policies addressing adaptation and risk reduction are largely absent, however, the plan indirectly includes adaptation policies. This includes wildfire interface policies, policies relating to natural hazards and development regulations, and ecosystem health. Mitigation dominates the climate change considerations within this plan and adaptation appears to be an afterthought despite adapting to climate impacts being recognized as important. Climate data is clearly used for some sections of the plan however, climate change impacts are not detailed, appropriately scaled or forecasted. It is noted for example, that wetter winters, dryer summers, and severe weather events will increase infrastructure demand. This hints to some degree of scaled climate information and predictions.

Despite the plan not containing and implementation section, there are several sections describing how established goals and policies will be implemented. Ultimately, the municipality of Colwood will use its regulatory and non-regulatory powers to implement its vision. For instance, the Land Use Strategy will serve as a key tool to ensure policies and actions are implemented. Moreover, in many policy areas, the OCP specifies partners it will work with to implement objectives. With respect to climate change related policies, alternative financing strategies will be considered and implemented in order to address financial barriers associated with additional costs for green buildings, energy efficiency and/or use of renewable energy.

Town of Esquimalt Official Community Plan (Score of 13/34)

Although this OCP was recently updated in 2017, its consideration of climate change alone is poor. Climate change is only truly mentioned very briefly in a policy section considering the natural environment. This section includes environmental objectives and mentions GHG emission reduction targets as required by Bill 27. It notes that the Act requires that an OCP include targets for the reduction of community GHG emissions, as well as policies and actions for achieving those targets. To adhere to the Act, the OCP includes a statement describing its commitment climate science.

Climate change adaptation is not mentioned once and the consideration of climate change is minimal throughout the entirety of the plan. Because climate change is considered solely to adhere to the provincial mandate, climate data is related to emissions only. Climate impacts are not considered and risk assessments are not present. Lastly, this plan does have an implementation plan with individual actions and a timeline identified. Funding is considered in some instances and responsible parties are identified in certain policy areas. However, implementation of climate policies is not considered.

Highlands Official Community Plan (Score of 18/34)

The highlands OCP has recognized climate change as a significant topic by integrating climate considerations in various policy sections and establishing GHG reduction as its own objective. Climate adaptation, however, is not mentioned once in the document and mitigation is the sole focus. Climate impacts are only considered with respect to drought conditions and water efficiency and flooding. For example, the plan details how the District discourages development in floodplains due to its negative impact on their capacity to withstand flood events. Moreover, the OCP specifies that regions vulnerable to flooding should be left in their natural state and designated as open and green space.

With respect to the fact base category, the plan makes use of reliable climate data relating to GHG emissions and projections. Information on climate impacts, however, is nonexistent. For example, in many other OCPs a section dedicated to climate impacts of concern for the region is present and used as justification for climate action. This is not present in the Highlands OCP. An implementation plan is developed and includes individual actions where goals and policies are largely implemented using tools such as the land use bylaw and development permits.

Responsible parties are broadly identified (private business owner, other levels of government) and financial sources are mentioned.

Langford Official Community Plan (Score of 24/34)

Within the OCP introduction, the plan outlines that although development is associated with various benefits, climate protection is a priority. It is also noted that this plan is used as a tool to organize responses to challenges such as climate change. Like several other OCPs, the Langford plan includes a statement on how climate change will result in wetter winters, dryer summers, severe weather events, rising sea levels and how this has an impact on infrastructure demand. It is important to note that this exact statement was seen in other OCPs, suggesting that climate data sharing and cooperation is occurring. Climate change is part of its own goal with mitigation detailed and adaptation on briefly considered.

The plan has a very thorough climate action section where mitigation is the main focus. Adaptation is only indirectly considered through the preservation of ecosystems, development of resilient infrastructure, and sustainable food production. Despite the plan describing its intent to plan for adaptation, there are no policies directly related to this. Development regulations are specified in order to protect residents and development from natural hazards (flood plain, steep slope, etc.)

Scaled climate impacts are highlighted and the plan outlines the effects of climate change in British Columbia with climate risks mainly focused on wildfire susceptible regions. Implementation actions are identified for the climate action section with individual steps. Responsible parties and financial sources are not addressed to the extent necessary to receive a score of 2.

Metchosin Official Community Plan (Score of 18/34)

Climate change is directly mentioned within the overarching environmental policy area but is not part of its own goal/objective. The climate change and GHG emissions policies focus on mitigation for the most part with adaptation only indirectly referenced in other environmental policies. For example, the OCP describes that when ideal, lands susceptible to flood should be used for green and open space. In this sense adaptation is considered but not to the extent needed to receive a score of 2. Moreover, unlike many other plans, climate change is not referenced as a driving force for establishing an OCP and climate impacts are not outlined at all. It appears that

climate change is incorporated solely to adhere to Bill 27 as mitigation is the main focus and is incorporated in a fragmented manner.

The plan has developed a rigorous implementation strategy which directly identifies funding opportunities and responsible parties. Among many other financial dedications, the plan also highlights that it will use the parkland acquisition reserve to purchase lands. What is missing however, is a detailed implementation plan/timeline.

North Saanich Official Community Plan (Score of 12/34)

The North Saanich OCP, passed in 2007, is clearly in need of update to comply with recently passed regional strategies and provincial legislation. Climate change for example, is only mentioned once in the document and indirectly referenced minimally. There are no goals or objectives directly referencing climate change and there is one objective addressing environmental concerns. Environmental policies ultimately aim to protect and preserve environmentally sensitive areas and to ensure sustainable development. The reduction of emissions is considered within the building and transportation sectors with targets for emissions reduction in place. To reach its targets, the plan has established actions to assign a senior staff position the role of implementing, monitoring and reporting of GHG reduction and policies. The municipality also identifies its intentions to develop a GHG Action plan with responsible parties identified. The plan indirectly considers adaptation through several development regulations and permit areas. For example, the protection and preservation of riparian areas is justified by describing that these ecosystems may assist in flood protection and prevention of erosion. Like most OCPs, implementation of this plan largely occurs through the specified development regulations and other related bylaws.

Oak Bay Official Community Plan (Score of 32/34)

Early in the document, it is noted that while the plan uses a ten year planning time frame, many of the goals, objectives and policies have broader implications for a much longer term. An example is then used where the OCP specifies that climate mitigation and adaptation strategies, for example, address changes anticipated over an undefined time frame. The plan highlights that it serves as a key tool for addressing many challenges including climate change and directly incorporates climate change into its overarching goals. A climate change and energy goal includes a statement describing Oak Bay's intentions to work towards climate change mitigation

and adaptation to address the diverse impacts of climate change. Within the climate change and energy section, data from the IPCC is used to highlight the greenhouse effect and justify setting emission reduction targets. Importantly, the plan explicitly recognizes that adaptation and mitigation are related, and both are important for local government responses. In contrast to other communities, Oak Bay has established a dedicated section for climate adaptation where it defines adaptation, uses scaled climate impacts, and describes the potential implications of said impacts. The plan goes so far as to list primary climate change adaptation strategies that can address the potential impacts. These strategies include protecting the quantity and quality (ecological health and biodiversity) of natural areas, rainwater management to slow runoff, decrease erosion and mitigate reductions in creek base flows, protecting and enhancing the tree canopy, and conserving water and energy.

Climate related polices are incorporated in almost every policy area of the plan and of particular relevance, property risk management and sea level rise is addressed through two detailed development permit areas. Two important climate change objectives consider conducting climate change adaptation planning and making property owners aware of the risks of climate change while encouraging measures to reduce risks. The plan then establishes 11 climate change policies and actions which reflect both mitigation and adaptation and identify partnerships and responsible parties.

Unlike a majority of other OCPs in the area, the Oak Bay OCP highlights risk assessments conducted for natural hazards such as tsunamis and includes several actions aimed at conducting future risk assessments and vulnerability analysis'. It is noted that Oak Bay is most vulnerable to natural hazards that include earthquake and severe weather incidents.

Lastly, the plans implementation section is exemplary with a thorough table listing actions, level of effort required, phasing and district responsibility. Financial considerations are also present, influencing the plans high score in this category.

Saanich Official Community Plan (Score of 21/34)

Climate change is directly considered in the overarching goal that considers environmental integrity. Here, the OCP has dedicated a section to climate change with important statements describing that large-scale impacts are expected in the form of increased precipitation,

higher temperatures, rising sea levels, increased extreme weather events. The plan then recognizes the importance of local governmental preparedness for expected climate impacts and the urgency of adaptation. Adaptation is thus integrated into the climate related goal, but is not part of its own goal. In this case however, it is noted that Saanich has its own Climate Action Plan. Moreover, one of the OCPs climate policies is to prepare and implement Saanich's Climate Change Adaptation Plan, highlighting the municipalities dedication to adaptation planning. Long term goals are evident with respect to climate change actions and policies relating to climate adaptation and land use/development are present. Additionally, within the plans infrastructure section, policies that consider the impacts of climate change on long-term infrastructure planning and regulation are included. Although adaptation policies are integrated within the OCP, they appear vague and lack strict direction, resulting in a score of 1/2 for adaptation policies.

The fact base informing the plan appears reliable with climate impacts noted. This section is very brief however and climate impacts may not be scaled to the extent necessary. Knowing that Saanich has developed a climate action plan, risk assessments were likely undertaken yet are not present in the OCP to inform actions.

Sidney Official Community Plan (Score of 14/34)

Within its overarching vision, the OCP clearly considers climate change by describing its commitment to reducing corporate and community ghg emissions. Climate change is not part of its own broad goal but is rather mentioned within the environmental goal section. Furthermore, climate adaptation is not mentioned alongside the community's goal to reduce ghg emissions. While this is the case, climate change is addressed to a greater extent within the objective and policies section. The Sidney OCP has established a section within its policy objectives chapter dedicated to environment and climate action. Interestingly, within this policy section, the OCP notes that setting targets and taking action to reduce GHG emissions will help the municipality fulfill its role as a signatory to the Climate Action Charter help to meet the requirements regarding climate action set out in Bill 27. This hints to the incorporation of climate change solely for the purpose of complying with the provincial mandate, particularly knowing that this is the only statement on climate action. There are no adaptation policies within this section outside of indirect adaptive objectives such as minimizing hazardous conditions including flood. The lack of specific climate policies, however, may be because Sidney has a separate climate action

plan. The OCP established a policy noting that climate change will be addressed by implementing the actions set out within the CAP. Unlike many other plans, climate action is not woven into transportation, building, and energy objectives. Emissions reduction is the clear focus of the plan although it is minimally considered.

The climate information used is largely from the province and the plan does not include information on climate impacts, risks or vulnerabilities. Long term projections are only included when dealing with emission reduction targets. With respect to the implementation of the policies within the Sidney OCP, the plan primarily relies on implementation through development regulations and permit areas. Funding is considered less than five times and responsible parties are mentioned only in a few policies.

Sooke Official Community Plan (Score of 21/34)

Climate change is only indirectly considered within the plans overarching vision and goals. The OCP has, however, directly addressed climate change within its energy and climate change policy area. Here mitigation is the main focus and the District of Sooke acknowledges that climate change is a significant challenge and threat. Adaptation to SLR is directly considered through a policy describing that Sooke will plan for rising sea levels as a result of climate change. Proactivity is reflected within the objectives of the plan and directly referenced alongside climate change where the OCP specifies its intent to work proactively to better understand the local effects of climate change. Climate change is also integrated within development regulations with several statements showing strict language used within the OCP.

With respect to the fact base category, the plan uses climate knowledge from the IPCC primarily relating to broad climate facts and GHGs. Climate impacts are not detailed in the plan but are considered (e.g. SLR). The Sooke OCP does not have a specific implementation plan but rather establishes action items within each policy area. These items detail how the policies and objectives will be implemented. Funding is rarely considered and responsible parties are somewhat identified.

Victoria Official Community Plan (Score of 27/34)

Within the introduction of the plan, climate change is listed as one of the four major challenges facing the city. Resiliency is a major focus of this plan as it is highlighted within the community vision and goals. The plan sets out 13 key values guiding the policies and objectives

of the OCP. An important value is to be adaptive and responsive. Climate change is directly addressed within the plan goals as seen in the policy area climate change and energy. Here, there are five broad goals and the first identifies that Victoria and its residents are more resilient to climate change and energy scarcity. Additionally, within the emergency management policy area, the OCP has developed a goal reflecting the municipalities commitment to enhanced preparedness for climate hazards.

Adaptation is directly mentioned within environmental policies aiming to preserve ecosystems and is also embedded within the infrastructure section. Climate change adaptation is woven throughout the climate change and energy policy area through various statements outlining the city's efforts to prepare for climate change through adaptation planning. In working towards greater preparedness the plan sets an objective to develop and maintain a risk and vulnerability assessment of local impacts of climate change, which will be used to inform policies, targets and actions.

Reliable climate data from the IPCC is utilized and importantly, the plan has outlined climate impacts scaled to Victoria. While the plan has an implementation plan, it is very broad with high level goals and objectives.

View Royal Official Community Plan (Score of 24/34)

Within its introductory vision statement the plan specifies that View Royal is aware of the impacts of climate change and plans to respond by actively promoting energy efficiency, sustainable development, and environmental protection. The OCP has established nine guiding goals, one of which is outlines desires to become a more sustainable place through planning for global climate change. The plan thus has a strong recognition of the significance of climate change and has incorporated climate planning within its goals.

Within the environment and climate change policy area, adaptation is indirectly referenced through policies aimed at addressing and responding to natural hazards such as flood and wildfire. The plan also directly describes intentions to plan for both climate change mitigation and adaption. Within this objective area, underlying policies related to climate impacts include considering the impacts of climate change as a key determinant in community planning. Adaptation is part of its own policy where the plan establishes that View Royal will use

cooperation to identify and plan for the long-term impacts of climate change. The municipality intends to develop adaptation strategies to manage impacts caused by sea-level rise, increased fire risk, and variable seasonal temperatures and precipitation.

Interestingly, the plan recognizes the importance of updated, reliable scientific information. The plans fact base, however, appears vague where climate impacts are rarely detailed and scaled. With respect to the OCP's implementation, a very thorough implementation plan has been established. This plan has individual actions, a timeframe, and responsible parties identified. Funding however is not detailed enough to receive a score of 2/2.

Duncan Official Community Plan (Score of 20/34)

Climate change is not mentioned within Ducnan's OCP goals section. Rather, environmental stewardship is listed as an overarching goal. Climate mitigation and adaptation are only indirectly referenced within this goal through the preservation of key ecosystems and the encouragement of compact growth. Climate change is only addressed in the policy area environmental stewardship, and within this section, climate protection is listed as its own subsection where the major focus is mitigation. Interestingly, the climate related goal describes intentions to minimize the city's impact on climate change and subsequent policies describe that the municipality should consider the impacts on climate change as an important factor in decision-making related to land use and site planning. It is clear then, that mitigation is the focus while climate impacts affecting the region are not prioritized. All policies within this section address climate mitigation in a variety of sectors (building, energy, transportation, etc.). With respect to risk reduction and adaptation, Duncan has a section dedicated to its dykes where the city plans to develop a long-term proactive and strategic approach for the effective management of the dykes.

The OCP likely uses reliable climate data which has been scaled to describe impacts to the region. Here the plan describes that climate Change is producing ecological shifts favouring invasive species, sea levels are rising, changes in rainfall patterns are amplified and increases in the frequency of flooding are likely to occur. Moreover, flood risk assessments have clearly been undertaken as noted in several sections of the plan. Flooding is a key threat as hinted to throughout the OCP. Lastly, the OCP has an implementation section with funding discussed, parties broadly identified and a vague timeline in place.

Ladysmith Official Community Plan (Score of 16/34)

Climate protection is directly addressed within the plan vision statement and climate mitigation is considered as part of its own guiding principle. GHG reduction is a standalone section where the plan details its emissions reduction targets and establishes policies to reduce emissions within building, energy, and transportation sectors. Despite climate protection being incorporated in the OCP's vision statement, it is not adequately addressed in any other section of the plan with minimal climate policies. Moreover, climate adaptation is not mentioned once throughout the entirety of the plan. Adaptation is only indirectly addressed through policies aimed at protecting environmentally sensitive regions and preventing developing in hazard prone locations. The plan scored low in the fact base category as only one or two sentences were used to describe climate change, no climate impacts were considered or scaled, and climate information only related to emissions. Lastly, the Ladysmith OCP does have an implementation section which is relatively thorough. Major actions are listed with a timeline, financial mechanisms identified, and responsible parties broadly assigned.

Lake Cowichan Official Community Plan (Score of 17/34)

Climate change is not part of the community's vision but is addressed within its own goal that deals with climate protection. However, all background information relates to the Bill 27 mandate and the only policy considering adaptation involves the towns intentions to encourage landowners to retain and plant trees and other vegetation to improve air quality and manage storm water runoff. Within the plans environmental policy area, it is noted that the town is characterized by rocky bluffs, steep slopes, and many water bodies which require special attention. This is addressed through several development permit areas which are intended to protect residents and infrastructure from natural hazards thus indirectly referencing adaptation. Moreover, flooding is considered when assessing development permits to minimize risk. Interestingly, the OCP describes a development permit area which relates to climate protection. This development permit area specifies that subdivisions are subject to the approval of a GHG Reduction Development Permit. Site planning and building guidelines are outlined which largely consider energy efficiency as opposed to adaptive planning. For example, site density should be maximized and buildings should be energy efficient (no guidelines related to setbacks to protect against flood). The plans fact base and climate info are largely absent and the implementation plan simply specifies tools available to implement the policies within the OCP. Financial

considerations are addressed by highlighting the towns financial plan and responsible parties are not specifically identified.

North Cowichan Official Community Plan (Score of 29/34)

The OCP includes a section outlining North Cowichan's assets and challenges. Here, climate change is listed as a challenge with a detailed description highlighting that climate change is a complex issue requiring both adaptation and mitigation strategies. Adaptation is also said to have economic opportunities, including the potential to create more liveable and sustainable communities. The OCP has established a number of overarching goals, one of which is to adjust to climate change. Within the introduction of this goal, climate impacts are detailed and scaled to the region. The associated challenges are then outlined and mitigation and adaptation are differentiated. Adaptation is thus woven into the climate change policy area and considered as important as mitigation. Progress on this goal will be measured through a number of indicators including the number and type of climate change adaptation measures undertaken in municipal operations. There are developed policies that directly incorporate adaptation and within the natural hazards policy area, the plan notes that climate change is anticipated to result in dramatically rising sea levels over the coming years, which will have implications for the placement of new developments along the waterfront.

The plan clearly uses reliable climate data and policy guidance from the province. Climate impacts are scaled and detailed and projections of sea level rise for example, are included. Additionally, the OCP uses provincial risk assessments in a number of policy areas including the hazard lands development permit area. Lastly, the plan has a detailed implementation section, which includes individual actions, a timeline, financial considerations and hints to responsible parties.

Nanaimo Official Community Plan (Score of 20/34)

The Nanimo OCP works off of seven broad goals where climate change is not part of its own goal but is instead addressed within environmental goals. Sustainability is a major guiding principle for the plan where it is noted that climate change and a diverse array of impacts is a major challenge. Climate change is considered in a number of different policy areas including food security, transportation, and environment and is directly addressed within the environmental goal section. However, mitigation is the main focus with all policies and background information

geared towards emissions reduction with only one policy incorporating adaptive action. Climate adaptation is also indirectly considered in the protection and preservation of environmentally sensitive areas, the regulation of development in hazardous areas, and food systems. Adaptive benefits are only partially recognized, however. For example, the OCP established a natural hazard policy describing that the city discourages filling and development in floodplains because of its negative impact on the capacity to withstand flood events.

The climate data used only relates to mitigative efforts and climate impacts are not detailed, scaled or used to inform related policies. Nanaimo has a rigorous implementation strategy which identifies actions, timing, and responsibilities of the city and other agencies of various governments, organizations and groups. This strategy does not identify funding tools which is instead mentioned minimally throughout other sections of the plan.

Lantzville Official Community Plan (Score of 12/34)

Within the introduction of the OCP, climate change is completely absent and unlike many other OCP's, it is not considered a key challenge facing the municipality nor is it listed as an important concept to be addressed. While climate change is not a listed goal, it will be addressed as noted in the regional context statement. Here the OCP describes that in order to align with regionally set goals, the OCP supports the reduction of GHG emissions. Within the environmental protection goal, adaptation is indirectly referenced through objective intended to restrict development in hazardous areas, such as steep slopes, the marine foreshore and environmentally sensitive areas. Moreover, adaptation is considered within natural hazard policies. Interestingly, the only section specifically dealing with climate change is located within the plan implementation section. This is because specific policies and actions regarding climate change mitigation and the reduction of GHG emissions are considered as part of a future review of the OCP. It is also noted that the plan will support efforts and policies to help the community adapt to climate change impacts. The current OCP was passed in 2005 and is therefore outdated. Climate data and information is absent and the implementation plan is adequate while not addressing climate policies.

Parksville Official Community Plan (31/34)

The Parksville OCP is a comprehensive plan that has considered a vast array of challenges including climate change. In describing its alignment with regional goals, the plan

goes beyond simply setting GHG reduction targets and considers adaptation. For instance, it is highlighted that the OCP contains new development permit areas and guidelines to address climate change adaptation. The OCP intends to incorporate new knowledge on sustainability into policies for climate change adaptation and integrated stormwater management, for example.

As part of the overarching sustainability principle, adaptation forms its own goal and the OCP's section on climate change alone, spans seven pages. Climate adaptation is differentiated from mitigation and given its own section. Climate impacts are detailed and specifically scaled to the town itself where vulnerability to flooding is stressed. Risks and challenges are then described to justify the regulation of development in hazardous areas. In general, climate change mitigation and adaptation are embedded in nearly all plan sections.

The OCP uses reliable climate data that is scaled and includes future projections relating specifically to climate impacts. Unlike many other OCP's, this plan leverages risk assessments to inform policies. Potential Hazards for the City of Parksville include earthquake, fire (structure, interface and wildfire), epidemics (human / animal), flood, extreme weather, storm surge, etc. With respect to the plan's implementation, it was noted that the city intends to develop an implementation strategy that outlines the key priorities, timelines, and budgetary considerations. There is an implementation plan with individual actions and a timeline at this time, however, responsible parties and funding is only broadly considered.

Qualicum Beach Official Community Plan (19/34)

Climate change is not specifically addressed or considered within the OCP's broad goals and policy areas. However, adaptation and climate impacts are clearly considered within several sections. Adaptation to SLR and flood appear to be a priority for the town with several objectives and actions aimed at addressing these climate stressors. For example, the plan describes the municipality's desires to prepare for rising sea levels by implementing policies for adaptation in vulnerable areas.

Climate change is considered in relation to the OCP's commitment to sustainability. Moreover, where climate change is addressed, mitigation is the focus knowing that the only established policies are found within a climate emissions planning section, which is a schedule part of the sustainability plan. The fact base relating to climate change is minimally considered within

sustainability statements, however, climate impacts such as SLR, flood, drought, and altered rates of precipitation are described throughout some of the plan sections.

Port Alberni Official Community Plan (Score of 12/34)

Climate change is not mentioned once in the Port Alberni OCP nor is it considered, indirectly, in environmental goals. Rather the plan has a clear focus on sustainability and hints to adaptation through flood, water, and food security policies. For example, the OCP includes statements, highlighting that to minimize property damage associated with flooding events park and open space recreational uses of flood susceptible lands will be encouraged. This is a non-structural adaptation and represents the only policy addressing flood outside of a Tsunami Floodplain Management Strategy. Interestingly, mitigation is rarely considered as well, which is inferenced from few statements that consider the use of alternative forms of energy to reduce or eliminate environmental pollution. The term "environmental pollution" is used rather than "reduce the greenhouse effect" or to "mitigate climate change". Moreover, policies related to transportation and mitigation are vague.

In terms of the fact base category, there is no climate related data base, climate impacts are not considered, and projections related to emissions alone are not present. With respect to the implementation category, the OCP includes an implementation plan, which highlights how development permit area's and additional plans will be used to implement policies. Moreover, the plan includes a section for further work and study which uses an action chart to ensure certain topics receive attention.

Tofino Official Community Plan (Score of 20/34)

Within the introduction section outlining challenges to the municipality, climate change is listed as a key environmental concern. Climate change is not, however, a guiding goal of the OCP. Climate change is present within the environmental goal section where it is noted that low-lying areas are susceptible to storm surges and the effects of sea level rise will exacerbate these hazards. In this case, adaptation to climate impacts, primarily sea level rise and storm surge, appear to be considered as much as mitigation. There is one objective describing the municipality's intentions to reduce community GHG emissions while several objectives are aimed at addressing adaptation with a focus on preparedness and risk reduction. The OCP

includes a section on GHG emissions policy in order to comply with the provincial mandate. This section only includes four policies, however.

The fact base for climate change topics is largely non-existent although the plan clearly demonstrates an understanding of climate impacts, going so far as to list SLR projections. Risks to low lying areas were identified in relation to SLR, however, it is unclear if a risk assessment was conducted. The plan also includes and implementation strategy which is not as rigorous as many other plans. Responsible parties are broadly identified, a vague timeframe is listed, and in some instances, funding is highlighted.

Official Community Plan (Score of 20/34)

Unlike the other two municipalities within the Alberni-Clayoquot RD, the Ucluelet OCP has included a lengthy section dedicated to GHG emission targets, policies, and actions. Moreover, climate change is woven into other policy areas such as the parks and open space objectives and several land use policy objectives. The section on climate change highlights the importance of both mitigation and adaptation. While adaptation is listed as a critical component to addressing climate change, there are no subsequent policies or actions relating to adaptation. Adaptation is only indirectly considered in other policy areas such as environmental and natural hazard guidelines.

The fact base is focused on emissions with no climate impacts listed or scaled. Further, risk assessments are not used to inform the plan and projections solely relate to GHGs. Finally, the implementation plan is standard while lacking individual actions, a thought-out timeline, and responsible parties. Financial considerations, however, are thorough.

Comox Official Community Plan (Score of 24/34)

Because Comox Valley RD has a RGS that incorporates climate action targets, the Comox OCP specifies that it includes policies relating to climate change to ensure consistency between the plans. The RGS set a goal to minimize regional GHG emissions and plan for adaptation. According to the Comox OCP, these topics are addressed in its environmental policy area. Within the policy area, climate change forms its own section where detailed and reliable climate information is presented. The OCP describes global and local impacts such as warmer temperatures, rising sea levels, more extreme heat events, an increased frequency and intensity of storms, and changes in precipitation. The plan stresses the utility of proactive approaches to

address climate impacts and identifies adaptation strategies. Adaptation is thus, a key component considered within the climate change section of the plan and is addressed through ecosystem preservation, development regulations, and advocacy. Lastly, the OCP has an implementation plan which establishes individual actions and a broad timeframe. However, funding and responsible parties are not directly identified within this plan.

Courtenay Official Community Plan (Score of 23/34)

Climate change is not considered a major challenge facing the municipality within the introduction section, nor is it part of the overarching goals of the OCP. Climate change is only indirectly addressed within the plan's goals relating to sustainability, which intends to employ energy conservation principles and preserve natural ecosystems. Climate change is first mentioned within the regional context statement where the plan specifies how it will align with regional climate goals. Here, it was noted that the OCP was amended in 2010 to include a section on how the municipality intends to plan for climate change. The city has developed and adopted policies consistent with provincial directions and targets and supports the climate change goals in the RGS. They city also amended environmental development permit guidelines to ensure that these regulations take into account the effects of climate change.

The OCP's section on planning for climate change is well informed with a realization that while climate change is complex, the scientific community (represented by the IPCC) is in consensus on a number of points. Climate impacts are scaled to the region where a number of local challenges are listed. It is noted that while mitigation is the focus, adaptive actions are also key to ensure a robust response to climate change and have the potential to contribute to sustainability goals. This section then includes policies dealing with climate adaptation such as strengthening community resiliency to changing resource supplies. The plan also considers the financial cost of addressing climate change. The only policies related to risk reduction are related to fire, flood, and erosion and can be found within the environmental policy area. Lastly, the implementation plan is standard as it focuses on implementation through development regulations and other bylaws, with funding considered for a range of actions, including climate action.

Cumberland Official Community Plan (Score of 28/34)

The OCP has directly considered climate change adaptation as part of a natural environment goal and established in the climate change and adaptability topic area. This OCP aligns with regional goals, including goals to minimize regional GHG emissions and plan for adaptation. The plan describes that the municipality intends to take on a leadership role for the region with respect to sustainability, climate change, and adaptive capacity. Within the overview of this section, local impacts of climate change are identified and primary impacts for the municipality include long term changes in weather and climate variables and a greater frequency of intense weather events. It is then specified that the municipality must adapt to these climate impacts. Adaptation is the first concept highlighted within the section hinting to the prioritization of climate change resiliency for the town. Targets directly considering adaptation are established, the plan sets out adaptation policies, and identifies actions in several sectors which are to be undertaken in order to implement the policies and objectives. Many actions focus on adaptation and building resilience through awareness, research, and development/planning that considers climate impacts such as severe weather. The scaled climate impacts are not detailed/encompassing enough to receive a score of 2 and the implementation plan does not identify responsible parties for each action or set a specific timeline for actions.

Campbell River Official Community Plan (Score of 24/34)

Within the introduction of the OCP, the plan highlights some key topics that are addressed within the OCP and justifies why the town is planning. Within this section climate action and planning and SLR adaptation are listed as important topics to be covered in the plan. The plan is grounded in principles of sustainability and showcases a number of sustainability priorities, including climate and energy. The plan includes a section intended to describe climate action in Campbell river within which, mitigation is differentiated from adaptation. The section on adaptation highlights the urgency of adaptation, need to develop climate action plans, and the significance of climate impacts on Vancouver Island. A number of actions are then listed with several focused on the management and protection of areas susceptible to coastal inundation. Climate adaptation planning is also woven into several other priority areas including the natural environment, infrastructure, and food sections. Further, adaptation is also incorporated into development permit area's aimed at preserving natural ecosystems and responding to natural hazards.

While the plan does not include an implementation strategy it is outlined that the city will leverage regulations pertaining to land use and utilities and municipal operations such as facilities, roads, parks, and community programs, to implement the vision and policies within the OCP. It is important to note that this plan showed great potential to receive a high score and effectively integrate adaptation, particularly knowing that climate adaptation was a priority guiding the plan. However, this was not reflected within policies and actions to the extent indicated.

Gold River Official Community Plan (Score of 15/34)

Climate change is not mentioned within the OCP's overarching values and goals. Rather, sustainability is a large focus and mitigation is indirectly considered through energy, building, and transportation goals. Climate change is not directly mentioned once in the plan until the last section, dealing with energy and climate change, which was only integrated in the plan during the most recent amendment. Climate change is then considered in a standalone section and is not woven throughout the rest of the plan, reflecting a fragmented approach to addressing climate variability. Within the energy and climate change, section mitigation is the major focus with adaptation only indirectly considered in few policies and objectives. Adaptation is hinted to within the environmental policy area through the protection of natural ecosystems and regulating of development in hazardous lands. The fact base for this plan stems from provincial climate information, which relates only to emissions and mitigation. Lastly, while an implementation plan is present, it is very outdated and does not meet best practice for implementation indicators.

Sayward Official Community Plan (Score of 9/34)

The Sayward OCP, last amended in 2005, is 25 pages long with four goal/policy areas. Climate change is not mentioned once within the plan, which may be explained by the fact that it was passed before Bill 27 and because there is no RGS for the Strathcona RD. The plan does include a section on environmental goals, which focuses on the protection of environmental features and the regulation of development within hazardous areas. Important to note, is that a floodplain study was completed and delineates elevation construction levels and setbacks. This is used to inform policies regarding development in flood prone areas. Adaptation is thus, considered indirectly within the environment policy area. Interestingly, compact development and efficient transportation is not encouraged within the plan which explains the low score for the policy category given that mitigation is not indirectly referenced at all. The implementation

plan is two pages long and includes individual actions, briefly considers responsible parties and funding sources.

Tahsis Official Community Plan (Score of 22/34)

Like the Sayward OCP, Tahsis' plan is very short in length (42 pages) and was last updated in 2011. Within its broad objectives, the plan establishes a sustainability and green house gas reduction policy area. Climate change is also considered within its environmental objectives. There are several environmental values linked to a changing climate, including objectives aimed to ensure that all new developments occur in a manner that minimizes impermeable surfaces and decreases harmful run-off. The plan also outlines policies that guide development away from high risk hazard land areas. Further, the environment policy area includes an introduction statement that details how climate change resulting from GHG emissions, is a global issue that will need to be addressed through the long term planning process.

The fact base for the plan is comprised of only a few sentences with no consideration of climate impacts. The town did, however, conduct a hazard land assessment study that identified regions subject to natural hazards. It also relies on studies, which suggested that implementation of the diking system, would help the community adapt to river flooding. Adaptation is thus a clear component of the plan but is only indirectly considered. The plans implementation strategy is one page long and includes 11 actions. However, these actions vaguely identify responsible parties and sources of funding.

Zeballos Official Community Plan (Score of 7/34)

This OCP is 19 pages long and is very outdated as it was passed in 1996. The community is, however, in the process of updating its OCP. As expected of a plan passed in the 20th century, climate change is not mentioned once. The plan does indirectly address adaptation through development guidelines that encourage buffers/setbacks for water bodies. Compact development and the intensive use of land is promoted, environmentally sensitive areas are protected, and hazardous lands are regulated. Flooding is a clear threat, which is addressed in the natural hazard section. It is important to note that this section includes a policy to carry out a risk assessment to identify hazard from rock fall and includes policies which identify setbacks from the Zeballos

river. There is no climate information directly presented within the plan and the OCP does not include an implementation strategy.

Alert Bay Official Community Plan (Score of 16/34)

The Alert Bay OCP dedicates a large portion of the plan content to describing the area in terms of economy, demographics, climate, infrastructure, and other contextual factors. Within the description of the town's infrastructure, a paragraph is included to outline the sea wall. It is noted that a majority of the seawall is between two to three meters high with a few sections around four meters. The OCP establishes 11 central goals, one of which involves the consideration of the potential impacts of global warming and climate change. Adaptation is indirectly considered within environmental policies through objectives that seek to minimize the risk of damage to property and life resulting from extreme natural conditions by managing development in hazardous locations. The plan has set policies aimed at protecting the sea wall infrastructure to ensure continued protection and climate change is directly addressed within the environmental policy area where mitigation forms the major focus. Moreover, within the sustainability goal, the plan sets out actions to increase awareness of the potential impacts of climate change. Awareness appears to be a key topic encouraged throughout the plan. While climate change is woven throughout a number of plan sections, discrete policies to address climate impacts are absent. Rather the plan sets actions that use terms like "consider" the impacts of climate change in various aspects of planning. This suggests that, unlike many other plans, the language used is vague. There is no climate information presented and the implementation plan is standard. To receive a higher score, the plan should have established specific climate policies that go beyond "considering" climate impacts.

Port Alice Official Community Plan (Score of 18/34)

In noting the opportunities and challenges facing the area, the plan includes a section on sustainability. Here, the plan specifies that climate change is no longer a topic of debate and that the extent and impact of climate change depends on the robustness of how communities adapt and adjust their global footprint. Adaptation is thus recognized as a key element for responding to climate change. The Port Alice OCP has eight broad goals guiding the plan. While climate change is not part of its own goal, there are two goals that relate to climate change, including goals associated with the protection of the natural environment and encouragement of sustainability. Within the environmental goal, adaptation is considered through policies that

designate the coastline as a development permit area, hinting to the regulation of development in flood prone areas. The sustainability goal includes a detailed description of climate change, however, climate impacts are not considered and there are no subsequent polices/actions directly considering climate adaptation. Adaptation is only indirectly referenced through polies that encourages the use of pervious materials, the attainment of green space by the town, and green building design. Within the coastal protection area, the plan highlights that there is a strong probability of higher water levels as a result of climate changes and more extreme weather events. This is used to justify the requirement for coastal and shoreline protection. Further, climate adaptation is also addressed within natural hazard development permit area's, which specify flood construction levels. Climate adaptation is then recognized despite not being directly referenced. Lastly, the implementation plan is standard in that it uses tools such as zoning bylaw, financial plans, and development permit areas to implement policies.

Port Hardy Official Community Plan (Score of 28/34)

The Port Hardy OCP is grounded in sustainability principles with four broad goals. The goals are largely guided by sustainability within economic, environmental, and social and cultural areas. Within the environmental sustainability goal, the plan describes intentions to decrease the energy demands and GHG emissions. Before getting into specific policies, the plan highlights trends and challenges. Here, climate change and environmental awareness is described in great detail. Mitigation and adaptation are differentiated and both recognized as important elements in responding to climate change. Climate impacts are listed and rising sea levels are focused on. Here information from the British Columbia Ministry of Environment is used to describe SLR and its potential impacts on communities in British Columbia.

In the introduction statement for the environmental sustainability section, climate information from the IPCC is used to highlight climate threats and impacts to the area. Importantly, climate change action and energy management is its own policy area under the environmental goal with the first objective stressing the municipalities desire to pursue climate change adaptation measures. Six subsequent adaptation policies are then listed and include strategies to conduct assessments, identify vulnerabilities, and ensure that coastal development accommodates expected rises in sea levels. The climate objectives are vast and many are linked to adaptation. The plans fact base is reliable, scaled, and includes predictions related to climate impacts

directly. The implementation plan, however, is standard and does not consider responsible parties and funder to an extent necessary to receive a high score.

Port McNeill Official Community Plan (Score of 7/34)

The Port McNeill OCP appears to be very outdated as it was passed in 1997. As expected, and as a product of its time, climate change is not mentioned once in the plan. The plan highlights that the protection of the natural environment and development from hazardous areas is addressed through development permit areas. Compact growth and sustainable transportation modes are not encouraged, and as a result, policies indirectly related to climate mitigation are absent. Adaptation is only considered through development regulations that protect residents and property from natural hazards. There is no implementation plan but rather, development regulations and other bylaws are used to implement the objectives and policies of this OCP.