

ECONOMIC ADAPTATION TO CLIMATE CHANGE: AN EVALUATION OF
SUSTAINABILITY PLANS IN BRITISH COLUMBIA

by

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Executive Summary

The purpose of this project is to assess how municipalities and regional districts in British Columbia (BC) are incorporating economic adaptation to climate change in their sustainability plans. A literature review of the economic impacts of climate change in BC is used to inform an evaluation protocol for assessing the 26 local government sustainability plans in BC. Each item in the protocol is assigned a score of 0 if it is absent from the plan, 1 if it is mentioned in the plan, and 2 if it is included with depth in the plan. The protocol has four categories: facts, goals, policies, and actions.

Results of the evaluation reveal areas of both strength and weakness. Analysis of the 26 sustainability plans, as a whole, shows that the highest scoring areas are all found in the policy categories: building and infrastructure, food security, land use and zoning, natural resource management, and sustainable energy. The weakest areas in the plans come from various categories: economic development, not growth; internal workplace engagement; green collar jobs; financial commitment; and consequences of climate change.

The protocol evaluation results show that 18 out of 186, 10% of the municipalities and regional districts in BC, are planning well for the economic impacts of climate change, in at least one category. It is not surprising that the strongest areas of the plans fall in the policy category, as these are typically addressed in the well-established Official Community Plan (OCP) planning process. The weakest areas are typically either new aspects of planning not well established in practice (e.g. internal staff engagement on climate change actions), or controversial (e.g. economic development, not economic growth).

This research project is limited by some constraints. There is a degree of subjectivity to differentiating between a score of 1 and a score of 2 — most often, the difference between brevity and depth. This subjectivity is partially overcome by double coding, that is, two people code the same plan independently and compare scores. Double coding with a minimum consistency of 80% helps establish reliability. Framing can also present challenges: for example, some plans include initiatives with a climate change adaptation effect, but do not cite climate

change as the motive for the action. Finally, since sustainability planning is such a new endeavor for BC municipalities and regional districts, the range of plan types — frameworks, strategies, visions, charters — makes it somewhat difficult to compare plans by a single measure in the protocol, as each plan type has a slightly different purpose.

In conclusion, the results of this study can be grouped into two types of recommendations for local governments in BC. First, there are weaknesses in the plans that are politically palatable to improve upon. These include: engage staff on climate change actions, focus on green collar jobs, research the climate change consequences particular to the specific municipality or regional district. Second, there are weaknesses in the sustainability plans that will likely be difficult to act upon because they are politically controversial. These include: pursue only economic development and not economic growth, and make a firm financial commitment to sustainability. Notwithstanding, great gains can be made in preparing BC local governments for the economic impacts of climate change if they at least act upon the politically palatable set of recommendations resulting from this project.

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Section 1. Introduction

1.1 Context

Human health, safety and quality of life are jeopardized by an over-abundance of greenhouse gas (GHG) emissions in the atmosphere. These growing concentrations of GHG emissions trapping heat in the atmosphere result in climate change — an average global temperature increase over time (Environment Canada, 2010). There is wide scientific consensus that GHG emissions generated by human activities are the chief source of average global temperature increases since the mid-20th century (IPCC, 2007). The Intergovernmental Panel on Climate Change (IPCC) affirms that, “warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising average sea level” (IPCC, 2007, p. 5). Furthermore, worst-case scenarios, predicted by the IPCC, are beginning to occur (Copenhagen Climate Science Congress, 2009), prompting scientists to suggest that GHG concentrations should be reduced to under 350 parts per million to avoid “runaway” climate change.

Mitigation and adaptation are two key strategies for responding to climate change. Climate mitigation refers to actions that aim to eliminate or decrease the hazards and risks posed by climate change, by reducing GHG sources (e.g. burning fossil fuels) and increasing GHG sinks (e.g. protecting rainforests). By contrast, climate adaptation refers to actions that aim to increase the capacity for adjusting to and coping with the inevitable consequences of climate change. Moreover, mitigation and adaptation are complementary but distinct strategies.

The bulk of municipal responses to climate change in British Columbia (BC) have focused on mitigation. Bill 27, for example, requires municipal Official Community Plans (OCPs) to set targets and create policies for GHG reduction. Yet, given that “warming of the climate system is unequivocal” (IPCC, 2007, p. 5), adaptation is simultaneously needed to increase human and ecosystem resilience as well as reduce vulnerabilities. While the Province of BC has published an adaptation strategy, it has not yet required municipalities to take action in climate adaptation. While municipal climate change adaptation in BC is equally important to climate change

mitigation, adaptation has received less provincial attention thus far. This project contributes to the research gap in climate change adaptation in BC by examining whether local governments are *voluntarily* taking climate change economic adaptation actions through sustainability planning.

The government of BC loosely refers to a need for research in “climate sensitive sectors” (Province of BC, 2010, p.2) in their adaptation strategy, but the local government role in effectively responding to climate change impacts on regional economies remains relatively unexplored. The adaptation strategy gives examples of how BC’s economy has been affected by climate change: the mountain pine beetle’s affect on the forest industry, drought intensity increases affecting the agricultural sector, as well as unprecedented rates of wildfire affecting property values and the forest industry (Province of BC, 2010). Many climate change impacts take place outside municipal jurisdictions, but nonetheless affect local governments. For example, residents of BC municipalities and regional districts who work in agriculture or forestry sectors may face job uncertainty or job loss due to climate change impacts on these sectors. Other climate change impacts, such as increased flooding risk affecting agricultural areas or sea level rise affecting costal communities, occur directly within local government jurisdictions.

1.2 Purpose

The 26 local government sustainability plans in BC are non-binding public documents created by local governments that provide a framework, vision, strategy and/or charter for defining and working towards sustainability. They are a fairly new development in planning practice within BC; the first sustainability plans were written in 2007. Sustainability plans are distinct from, but may complement, OCPs. The practice and process for developing OCPs, by contrast, is not as recent and OCPs’ contents cover a wider scope than sustainability plans — OCPs strive to comprehensively address the various roles and responsibilities within the jurisdiction of local government.

Although OCPs are comprehensive and broader in scope than sustainability plans, they do not eclipse the need for sustainability plans. The specific and unique scope of sustainability planning — distinct from OCP planning — is to take an *integrated* approach to planning social, economic

and ecological systems, linking global issues (e.g. climate change) to local actions (e.g. mitigation and adaptation). While non-binding in their current form, BC sustainability plans can be important for strategic planning, accountability, citizen engagement, collaboration, and policy guidance. They declare to the public that the local government is concerned about and planning for sustainability — defining the common values that compel citizens to participate in community planning. The sustainability plan is long-term in its vision and objectives, but may include short- and long-term goals, targets, and timelines. Strategically, it provides an overarching direction and framework for incorporating sustainability principles into decision-making, policy creation and other plans. The sustainability planning process may also serve as an impetus for collaboration between the public, private and non-profit sectors — that share similar sustainability concerns, interests and objectives. Moreover, this project focuses on sustainability plans because planning for the economic impacts of climate change requires the *integrated* and *collaborative* approach that the word sustainability most often implies, combining economic, ecological and social objectives.

Through evaluating sustainability plans, this project contributes to answering the following questions: (1) How many municipalities and regional districts in BC have sustainability plans? (2) How well do these sustainability plans address the economic impacts of climate change? The purpose of this project is to assess whether and to what extent municipalities and regional districts in BC are incorporating economic adaptation to climate change in their sustainability plans.

Section 2. Detailed Project Description

2.1 Research Problem and Premises

Four sets of concepts and assumptions underpin this project. These are: (1) climate change and ecological limits, (2) peak oil and globalization, (3) economic development versus economic growth, and (4) ecological economics and economic resilience.

2.1.1 Climate Change and Ecological Limits

If municipalities and regional districts in BC are to adapt to the economic impacts of climate change through sustainability planning, the nexus between economic development and ecological systems must be scrutinized. A consensus of scientists around the world link the generation of GHG emissions by humans to climate change (Union of Concerned Scientists, 1992) — and these emissions are commonly linked to large-scale industrial economic growth. To halt the degradation of ecosystem services that are essential to human well-being (Union of Concerned Scientists, 1992; Rees, 2008) will require a new way of thinking about municipal and regional planning. This project’s qualitative evaluation of economic adaptation to climate change in BC sustainability planning provides a baseline and framework upon which municipalities and regional districts can build. Understanding the relationship between economic development and climate change is essential if we hope to create local government policies helping us to live sustainably within ecological limits.

In the context of economic sustainability, it is important to acknowledge that neoclassical economics¹ does not account for ecological limits—the notion that the earth has a finite set of natural resources and waste assimilation capacity, performing functions that are irreplaceable by human-made capital. As Rees (1991) notes, neoclassical economics assumes “that human made and natural assets are substitutes and that biological assets (e.g. forests) can rationally be liquidated through ‘development’ as long as subsequent investment in manufactured capital (e.g. machinery) provides an equivalent endowment to the next generation” (p. 1325). The question of capital substitutability — whether manufactured and natural capital can be substituted for one another in the assets handed on from generation to generation — is imperative to economic development policy decisions because it influences the allocation, distribution, and scale of resource throughput. This project takes the position that all natural and human-made capital must be maintained *separately* and without substitution (Victor et al., 1995).² Whereas the neoclassical economics view is that the *aggregate* of manufactured and natural capital should

¹ Neoclassical economics is an approach to the study of economics that focuses on the relationship of rational individuals to market supply and demand — ways in which people maximize profit and utility. Neoclassical economics is relevant to a discussion of sustainability planning because it does not account for ecological limits and is incompatible with many of the principles guiding sustainability.

² Natural capital refers to the ecosystem goods and services necessary to sustain human life. Human-made capital refers to manufactured and technological goods and services that generate economic activity.

remain constant between generations. The prevalence of neoclassical economics is relevant to this project because it underpins the industrial growth paradigm. This paradigm supported vast industrial and manufactured capital creation throughout the 21st century, which also generated large quantities GHG emissions, contributing to climate change.

2.1.2 Peak Oil and Globalization

Petroleum is used to power many of the amenities on which municipalities and regional districts depend and the services they provide. However, the widening gap between supply and potential demand for oil globally (Hall & Day, 2009) may create considerable supply and price challenges. Even the International Energy Agency (IEA), which denied peak oil for many years, has now publicly acknowledged that the global rate of conventional oil extraction is in decline, having peaked in 2006 (IEA, 2010). Declining fossil fuel reserves will likely constrain energy use. In the words of Peter Victor (2008), “not only is suburbia threatened by the prospect of much higher energy prices, [but] entire economies are at risk, particularly those dependent on energy imports to keep going” (p. 33-34). Recognizing physical limits to resource availability (e.g. fossil fuels) and waste absorption capacity (e.g. carbon sink forests) emphasizes the need for municipal economic development policy makers to critically examine energy sources, efficiency, supply and demand. Sustainability plans are the means by which policy makers can both acknowledge and respond to these issues through developing climate change mitigation and adaptation action plans, goals and targets — coupled with economic resilience strategies.

2.1.3 Economic Development Versus Growth

In neoclassical economics, the economy is abstracted from the natural world. This is a common assumption. As Peter Victor (2008) points out, “we are accustomed to talking about the economy as a separate, identifiable component of our society” (p.34). The separateness assumption reflects the neoclassical economics’ “circular flow of exchange value” (Daly, 1991, p. 195), in which income is circulated between producers and consumers in the form of goods, services, wages, rent and dividends (Sloman, 1999). However, as Rees (2002) highlights, the circular flow model completely fails to include the energy and material throughput that requires ecological resources input and waste output. It is impossible to examine the relationship between the economy and ecosystems using the circular flow model because it is self-referencing and isolated (Daly, 1991).

Missing from the circular flow model is the economy's dependence on a linear flow of material and energy: the economy's function rests upon resource extraction and waste assimilation from the ecosphere. Indeed, while the ecosphere can function perfectly well without the economy, the economy is inextricably dependent on the ecosphere.

Acknowledging both the economy's dependence on the ecosphere and ecological limits are the starting points from which we can distinguish economic development from economic growth. Economic development refers to becoming qualitatively better (without necessarily getting bigger); whereas economic growth refers to becoming quantitatively bigger (without necessarily getting better) (Victor, 2008). As Victor (2008) explains, economic growth "occurs when an economy is increasing its use of materials, and economic development occurs when the same quantity of materials is used to achieve more desirable [i.e. quality of life] goals" (p.26). The difference between economic development and growth can be a somewhat counter-intuitive concept: quality of life, for example, is often related to economic growth at a local, isolated scale. However, taking into account global ecological limits, the quality of life increases associated with economic growth are only short-term and limited to a certain number of people — ultimately sacrificing the global ecosystem services on which human life depends (i.e. clean air, water, land). As such, a premise of this project is that adapting to the economic impacts of climate change means pursuing economic *development*, as opposed to growth.

2.1.4 Ecological Economics and Resilience

This project takes an ecological economics approach, as an alternative to a neoclassical economics framework. As such, the focus is on the interdependence between BC's economies and natural ecosystems. In the context of climate change adaptation, it is also useful to introduce the concept of economic resilience. Sharing a definition with Briguglio et al. (2009), economic resilience is here defined as "the policy-induced ability of an economy to withstand or recover from the effects of [climate change] shocks" (p.229). If economic resilience is the goal, this project advances the idea that sustainability planning — because of its integration of economic, ecological and equity objectives — is a useful policy-making process for achieving that goal.

2.1.5 Summary and Relevance of Premises

The preceding premises inform this project's evaluation protocol for BC sustainability plans in numerous ways. Sustainability plans with an effective economic adaptation strategy for climate change acknowledge both the planet's ecological limits and distinguish human-made capital (most often associated with GHG emission generation, contributing to climate change) from natural capital (the ecosystem life-support services upon which we depend). These plans should take into account peak oil and offer a strategy for decreasing the economic dependency on a finite and diminishing supply of fossil fuels. Likewise recognizing the economy's dependence on the ecosphere, it is important for sustainability plans to acknowledge the difference between economic development and economic growth — and plan for the former. Finally, BC sustainability plans should plan to adapt to the economic impacts of climate change by defining what economic resilience means to their specific local government and how they can increase their capacity to withstand and bounce back from potential impacts.

2.2 Literature Review

Two bodies of literature are relevant to the topic of how BC municipalities are addressing the economic effects of climate change in their sustainability plans. These inter-related subjects are literature on: (1) the anticipated economic effects of climate change in BC and (2) the appropriate planning strategies for responding to these climate change effects.

2.2.1 Climate Change and the Economy

The Province of BC's Adaptation Strategy (2010) outlines many of the effects climate change has had on the BC economy. The strategy emphasizes three main economic effects likely related to climate change that have been experienced to date: (1) the mountain pine beetle's impact on forestry, (2) the impact of seasonal droughts on agriculture and water use, and (3) the impact of extensive wildfires on safety and forestry. These three key impacts are supported by academic literature on climate change in BC—with the additions of changes to Pacific salmon production and increased flooding risk.

PINE BEETLE: The mountain pine beetle infestation has affected over 14.5 million hectares of forest from 1990 to 2008 (Province of BC Adaptation Strategy, 2010). The climate change

trigger is believed to be warm winters. Effects include ecosystem changes and job losses in forestry-dependent local economies and BC's economy as a whole. Carroll et al. (2003) use climactic modeling and extensive mapping to confirm that the rapid spread of the mountain pine beetle in BC is due to changes in climate, most notably a continued warming. If the warming trend continues, the pine beetle will be able to expand to the north and east and in higher elevations within BC. Kurz et al. (2008) highlight that the cumulative affect of the mountain pine beetle in BC will have a significant impact on BC's carbon sink capacity, due to loss of forest. Kurz et al. (2008) estimate that 270 mega tonnes (Mt) of carbon will lack a carbon sink because of the forest depletion from 2000-2020, due to the mountain pine beetle. (270 mega tonnes of carbon is equivalent to the annual emissions of "52.8 million passenger cars" [EPA, 2011].) Unanticipated impacts of climate change, such as insect outbreaks, have a significant affect on the ability of forests to absorb and store carbon in the atmosphere. Moreover, the pine beetle infestation is an example of how climate change, in combination with low economic diversity, can result in job losses, lost provincial economic activity and lost carbon sink capacity. Carbon sinks are also relevant to economic resilience. For example, local governments can help create a low-carbon-emitting local economy through balancing industrial land-use zoning (often carbon creating) with zoning for increased vegetation and green space in the city (carbon sinks).

DROUGHTS: Extreme seasonal droughts—experienced most notably in 2003 and 2009—are the second key climate change impact affecting the BC economy (Province of BC Adaptation Strategy, 2010). The economic impact is primarily felt in the BC agricultural sector, dependent on irrigation supplies. The challenge is in both ensuring residents have access to basic water needs, as well as maintaining viability of agricultural production. Janmaat (2010) notes that climate change will affect the timing as well as the mix of precipitation patterns, requiring flexible adaptation. Gayton (2008) cites climate predictions that show average annual BC temperatures increasing by 1-4° C by 2100, as well as average annual precipitation rising by approximately 20%. The BC Agriculture Climate Change Plan (2010) states that "it is likely that climate change will increase uncertainty and the [financial] costs associated with weather damage of BC's agricultural operations ... many farms [in BC] are experiencing increasing input costs and pressure from global commodity prices" (p.13). Agricultural adaptation strategies have not been researched as thoroughly as strategies for other sectors in BC (BC Agriculture and

Climate Change Plan, 2010). Local governments can include food security and water resource management strategies in their sustainability plans to foster adaptation to increased drought likelihood.

WILDFIRE: The most expensive and dangerous wildfire seasons recorded—in 2003 and 2009—are connected with an ongoing trend of intense, long wildfire seasons in BC (Province of BC Adaptation Strategy, 2010). Economic impacts include damages to public infrastructure and private property. Climate change is predicted to spur synergistic effects between insects (such as the pine beetle); dry, hot climate; and wildfire (Fleming et al., 2002). A variety of changes in forest management are called for to deal with expected synergistic climate change effects on wildfire. These include: prioritizing forest protection, based on economic and social value (Stocks et al., 1998); changing the structure of the forest (increasing spacing of trees, limiting number of dead trees and debris) to decrease fire damage (Dale et al., 2001); creating landscapes that reduce fire risk through methods such as harvesting and regeneration; and promoting the recovery of forests after wildfires (Wheaton, 2001). Local governments can use zoning strategies — articulated in their sustainability plans — as well as education and outreach to account for and decrease the risk of wildfire damage to residential, private, and public property in the municipality or regional district.

FISHERIES: Gayton (2008) notes that climate predictions show there will likely be significant hydrological changes in BC, affecting numerous ecosystems — in particular, fish production. A study by Mantua et al. (1997) confirms that changes in the Pacific Basin climate correspond with striking variations in salmon production in the same region. Nelitz et al. (2007) claim that climate change brings a unique set of challenges for Pacific salmon survival that necessitates action by governments and local communities. Nelitz et al. (2007) emphasize adaptive management for fisheries, due to the difficulty in accurately predicting climate change impacts. The economic impact of uncertain fishery production may impact employment and First Nations with strong cultural and sustenance dependency on salmon. Municipalities and regional districts that are dependent on a fishery industry can and should create strategies, in their sustainability plan, for diversifying their economy.

FLOODING: Flooding occurrences are likely to increase with climate change due to more frequent extreme weather and sea level rise (Province of BC Adaptation Strategy, 2010). Gayton (2008) notes that earlier spring thawing, due to warmer average annual temperatures, will likely also increase the risk of flooding in BC. Many strategies are needed to accommodate a rise in flooding risk, including amending building codes and public infrastructure, based on climate predictions, to ensure any current or future infrastructure investments will withstand future environmental conditions. A study by Loukas & Quick (1999) found that the timing, magnitude, volume, frequency, and duration of flooding in BC will likely vary significantly from watershed to watershed, emphasizing the need for localized planning. To decrease risk of damages due to flooding, local governments can conduct comprehensive flood risk analyses and apply their land use zoning appropriately (deterring development in these areas). A local government sustainability plan would ideally articulate flooding risk related to climate change and the avoidance strategies in place.

2.2.2 Planning Strategies

Academic literature on municipal and regional district planning strategies for economic adaptation to climate change covers four main areas. These are: (1) the planning tools available to local governments in adapting to climate change, (2) the optimal opportunities for creating change, (3) how to create resiliency to the economic impacts of climate change, and (4) the barriers that local governments face in adapting to climate change.

PLANNING TOOLS: Dodman (2009) examines GHG emissions in cities by sector and the associated tools available to municipalities for responding to climate change. These include: land use zoning, public transportation, setting emission reduction targets and enforcing industry regulation. Dodman (2009) notes that density in cities also creates economies of scale that open opportunities for clean technology development, waste management, and cost-effective mass transit. Benefits of responding to climate change include: cost savings, better health and safety and economic opportunity. For example, local governments can plan for economic adaptation to climate change in the energy sector by collaborating with education and research institutions to develop transportation infrastructure and clean energy technology that reduce dependency on fossil fuels and help diversify a resource-based economy. Collaboration and research is also

needed at the municipal level to ensure infrastructure is capable of handling increased stresses — such as reservoirs’ capacity for changes in weather patterns or transmission lines’ ability to withstand power surges and shortages.

OPPORTUNITIES: In their guidebook for how Canadian communities can adapt to climate change, Bizikova et al. (2008) suggest that local governments should focus on planning opportunities to integrate climate change adaptation and mitigation strategies. These key opportunities include: “when infrastructure is upgraded; when development plans or other plans come up for regular review; when assessments are undertaken as part of a wider sustainability review; and before service providers are forced to act by a sudden event or mounting maintenance costs” (p.7). Bizikova et al. (2008) further emphasize how climate change’s effect on infrastructure should be a major economic concern for local government: the 2003 North American power outage, for example, cost approximately \$10 billion US.

Mazza (2002) emphasizes a growing need for regional strategies in creating economic opportunities for adapting to and mitigating climate change. He claims that clean energy technology spurs economic development because it is attractive to potential investors. The clean energy market, including generation and efficiency developments, is estimated to be \$3.5 trillion over the next two decades (Mazza, 2002) — creating opportunities for both urban and rural communities, since many technologies require a large landscape (e.g. wind turbines).

The Factor 10 Institute describes the concept of “Factor 10” as a sustainability target for opportunities in clean technology investment. Ten is the average factor by which industrialized countries should dematerialize their economies and increase resource productivity, according to the Factor 10 Institute. These calculations are based on meeting the world-wide per capita consumption allocation in order to live within ecological limits (Factor 10 Institute, 2008). Factor 10 is relevant to economic adaptation to climate change because by helping to create a more *efficient* economy (rather than a bigger economy), local governments can simultaneously work towards decreased dependency on fossil fuels (local economic resilience) as well as increases in jobs and decreases in GHG emissions.

RESILIENCY: Resiliency is the ability to bounce back or recover from shocks, such as those from climate change. Resilient communities share certain characteristics. Newman et al. (2009) suggest that there are seven main aspects of a resilient city. These are: powering urban areas with renewable energy; becoming carbon neutral; converting to small-scale power, waste and water systems; providing food locally and integrating with urban infrastructure; moving from linear to circular closed-loop systems for efficiency in energy and material throughput; creating a broad understanding of renewable energy to foster sense of place; and designing urban areas for sustainable transportation.

Expanding on themes raised by Newman et al. (2009), Bizikova et al. (2008) describe communities best equipped for climate change adaptation. These resilient and prepared communities have strong social networks and cohesion, making them able to support one another in times of change. They are diverse economically and have diverse household incomes, which make them financially resilient to industry fluctuations. They are educated in emergency preparedness, participate in local governance, regularly maintain their local infrastructure collaboratively and have adequate health services in close proximity.

Social capital is imperative to economic resilience. Zeemering (2009) suggests that explicitly including equity and social capital objectives in economic goals is critical to achieving a sustainable economy. Creating a micro-credit program, establishing a living wage, and delivering neighborhood-based services are examples of integrating economic and social objectives. Social capital plays a major role in the job finding process, especially in rural or economically strained communities (Matthews et al., 2009). Creating new jobs close to where residents live helps facilitate social cohesion, as less time is spent in transportation, and reduces GHG emissions from automobile use.

The voluntary sector can be critical in supporting such programs with integrated equity and economic objectives. Bruce et al. (1999) find that most of the voluntary groups they surveyed feel they are making valuable contributions to the local economy as well as to their community's social well being. The voluntary organizations that participated in the study typically provide indirect services, such as Chambers of Commerce or business associations. Some also provide

direct community service such as youth programs, fire protection, senior assistance and ecosystem monitoring. Community based ecosystem monitoring, in particular, is a good strategy for adapting to and mitigating the economic affects of climate change because it builds capacity and leadership skills of community members, which creates flexibility (Pollock & Whitelaw, 2005).

Finally, institutions and organizations that re-invest in the local economy, as well as build social capital, are important for economic resiliency. Dobrohoczki (2006) describes how establishing resident-owned cooperatives can re-localize economic benefits and replace the role of transnational corporations that may not share the same interests as residents. He argues that cooperatives not only foster a sense of inclusion and common identity, but they also balance community needs with market participation.

BARRIERS: Saha & Paterson (2008) examine the degree to which local governments adhere to sustainable development principles. They find that the majority of cities are not committing to sustainable development in an integrated or comprehensive way but, rather, creating initiatives haphazardly that pay lip service to sustainability as a theme. Deeper commitment to sustainability principles is only seen in a few cities and is demonstrated by: developing a sustainability plan and indicators for tracking progress on goals, or committing a designated number of staff to sustainability projects.

If local governments are not making a deep commitment to sustainability principles, it is useful to understand why. Robinson & Gore (2005) examine survey results of the 392 municipalities in Canada (populations of 10,000 or more) on the barriers to municipalities responding to climate change. Their results show that the main barriers faced by Canadian municipalities are in the areas of priority setting for climate change, having the right information to act and being able to dedicate adequate staff and budget. Robinson & Gore (2005) recommend that the federal government take a role in assisting with limited budgets and staff capacity and that local government involve a variety of stakeholders to meet its educational and professional needs, including partnerships with planning schools to influence curriculum.

2.3 Methods

This project's purpose — to assess how municipalities and regional districts in BC are incorporating economic adaptation to climate change in their sustainability plans — is achieved through several methods. A literature review and written synthesis of the economic affects of climate change in BC informs a protocol for evaluating *how* municipal sustainability plans in BC should reflect economic adaptation to climate change. The protocol is grouped into four categories: facts, goals, policies, and actions. Each category includes indicators, with a rating system of 0-2 (0 for inclusion, 1 for inclusion, and 2 for robust inclusion) for assigning a numerical score to each plan. ATLAS.ti qualitative data management software is used to code the plans. (See Appendix for the complete protocol.)

Each plan is double coded — independently assessed by one other person — with a minimum 80% consistency between the two respective ratings, to establish reliability. Before beginning the double coding of BC sustainability plans, however, a number of sustainability plans from outside of BC are double coded. This pre-testing process helps to refine any vague or subjective parts of the evaluation protocol, ensure the difference between a score of 0, 1 or 2 is clear for every item in the protocol, as well as build up to a minimum 80% consistency rate before coding the BC sustainability plan data set for this project.

2.3.1 Data Sources

Twenty-six sustainability plans in BC are selected as data sources. (See Table 1 for the complete list.) The criteria for selecting these plans is that they are from a municipality or regional district in BC and include the word sustainability or sustainable in the title or subtitle. The document may be described as a plan, framework, charter, strategy, vision, or any other format, as long as it is sustainability focused. As of May 13, 2011, there are only twenty-six plans that meet these criteria. All are evaluated. The choice to evaluate sustainability plans for this project is deliberate. It is important to evaluate sustainability plans, and not OCPs or economic development plans, because the term sustainability refers to the integration of economic, ecological and social objectives — which is imperative to the concept of economic resilience to climate change impacts. While OCPs and economic development plans *may* include information

about economic adaptation to climate change, sustainability plans *should* include such information.

2.3.2 Plan Quality Research

Several studies from the United States have examined plan quality as well as the integration of specific issues within these plans, such as disaster mitigation (Nelson & French, 2002), management of ecosystems (Brody, 2003) as well as sustainable development (Berke & Manta-Conroy, 2000). This body of literature shares a convention for developing evaluation protocols. The established convention is that plans should be evaluated according to five main categories: facts, goals, policies, inter-governmental coordination and implementation (Berke & Godschalk, 2009). This project’s protocol includes four categories — facts, goals policies, and actions — by grouping inter-governmental coordination and implementation under actions. Each category is then broken down into indicators based on a review of plans on the specific issue of evaluation (Tang et al., 2010; Bassett & Shandas, 2010) in addition to a review of a wider range of literature (Parry et al., 2005; Smit et al., 2000; Burton et al., 2004; Kane & Shogren, 2000). Moreover, the protocol in this project is developed through the methods established in plan quality evaluation literature.

Table 1. Data Sources: Sustainability Plans in BC*					
Municipality	Sustainability Plan	Primary Consultant	Status	Date	
1	Abbotsford, Municipality	Charter of Sustainability	N/A	Final	N/A
2	Bowen Island, Municipality	Bowen Island 2020 Vision and Sustainability Framework	HB Lanarc Consulting	Draft	2008
3	Esquimalt, Township	Sustainable Development Strategy	HB Lanarc Consulting	Draft	2007
4	Highlands, District	Highlands Sustainability Task Force Final	N/A	Final	2009
5	Kimberley, City	Imagine Kimberley: Integrated Community Sustainability Plan	Centre for Sustainability Whistler	Draft	2011
6	Ladysmith, Town	A Community Vision for a Sustainable West Coast Town	HB Lanarc Consulting	Final	2009
7	Langley, City	City of Langley Sustainability Framework	Stantec Consulting	Final	2010
8	Langley, Township	Sustainability Charter	N/A	Final	2008
9	Maple Ridge, District	Sustainable Action Plan	The Sheltair Group	Final	2007
10	Nelson, City	Path to 2040 Sustainability Strategy	Stantec Consulting	Final	2010
11	North Vancouver, City	100 Year Sustainability Vision	Design Centre for Sustainability, UBC	Final	2009

12	Prince George, City	My PG Integrated Community Sustainability Plan	N/A	Final	2010
13	Qualicum Beach,	Qualicum Beach Sustainability Plan	N/A	Final	2010
14	Rossland, City	Visions to Action: City of Rossland Sustainability Strategic Plan	The Sheltair Group	Final	2008
15	Sooke, District	Sooke Sustainable Development Strategy	HB Lanarc Consulting	Final	2008
16	Sparwood, District	Community Sustainability Plan	AECOM Canada Ltd.	Final	2009
17	Surrey, City	Sustainability Charter	N/A	Final	2008
18	Terrace, City	Terrace 2040 Sustainability Strategy	HB Lanarc Consulting	Final	2009
19	Victoria, City	Victoria Sustainability Charter	The Sheltair Group	Draft	2009
20	Whistler, Resort Municipality	Whistler 2020: Moving Toward a Sustainable Future	Envision Sustainability Tools, The Natural Step Canada, HB Lanarc Consulting, The Sheltair Group, & reSources Inc.	Final	2007
21	Williams Lake, City	Imagine Our Future: Integrated Community Sustainability Planning Framework	N/A	Final	2010
Regional District		Sustainability Plan	Consultant		
22	Comox Valley	Comox Valley Sustainability Strategy	HB Lanarc Consulting	Final	2010
23	Metro Vancouver	Metro Vancouver Sustainability Framework	N/A	Final	2010
24	Okanagan-Similkameen	Strategy for a Sustainable Similkameen Valley	Glorioso, Moss & Associates	Final	2010
25	Powell River	Sustainability Charter for the Powell River Region	HB Lanarc Consulting & Alofii Consultancy	Final	2009
26	Sunshine Coast	Sustainability Policy	N/A	Final	N/A
*Note: The municipality of Abbotsford's "Charter of Sustainability" and the Sunshine Coast's "Sustainability Policy" are included in this evaluation because they meet the criteria of having the word sustainable or sustainability in their title or subtitle. However, these two documents are significantly shorter than the rest of the plans and score 0 with the evaluation protocol.					

Section 3: Findings and Implications

3.1 Findings

This section presents and discusses findings from evaluating the 26 sustainability plans in BC. Findings are analyzed first in each category — facts, goals, policies, and actions — by percent comparisons (as there are varying numbers of protocol items in each category). The next step of analysis is a comparison of the results for the items within each category. The findings are then compared by score of each item (0, 1, or 2). This section concludes with an interpretation of results and discussion of their implications for sustainability planning practice.

3.1.1 Overall Findings

The average double coding consistency rate, without dropping any items in the code, is 81%. However, in this analysis, items in the code with a consistency of less than 70% are removed from data analysis, increasing the average double coding consistency to 86%. The 11 of 54 items that are dropped are: 1D: resiliency assessment (score 1 and 2), 4E: coordination process (score 1 and 2), 4F: roles and responsibilities (score 1 and 2), 4H: monitoring and evaluation (score 1), 4I: planning integration (score 1 and 2), and 4J: public engagement (score 1 and 2).

While no plan scored 100% in all categories, at least one plan scored 100% in the facts, policies and actions categories. The highest score in the goals category — in which no plan scored 100% — is 83%, scored by plans from Qualicum and Surrey. The BC sustainability plans that scored 100% in the facts category are from Comox Valley, Highlands, Kimberley, and Whistler. The plans that scored 100% in the policy category are from Comox Valley, Ladysmith, Prince George and Sooke. Only one plan scored 100% in the actions category — from Surrey. See Tables 2 through 5 for complete category scores. Scores of 100% in at least one category are distributed amongst only 8 of the plans, from Comox Valley, Highlands, Kimberley, Whistler, Ladysmith, Prince George, Sooke and Surrey. For a sense of how the plans score overall, the mean score for the facts category is 52%, for the goals category is 46%, for the policy category is 71% (highest average), and for the actions category is 44%.

Table 2. Facts Score (%)		Table 3. Goals Score (%)		Table 4. Policies Score (%)		Table 5. Actions Score (%)	
Jurisdiction	%	Jurisdiction	%	Jurisdiction	%	Jurisdiction	%
Comox Valley	100%	Qualicum	83%	Comox Valley	100%	Surrey	100%
Highlands	100%	Surrey	83%	Ladysmith	100%	Comox Valley	92%
Kimberley	100%	Langley Town	67%	Prince George	100%	Maple Ridge	83%
Whistler	100%	Bowen Island	67%	Sooke	100%	Victoria	75%
Prince George	88%	Comox Valley	67%	Surrey	94%	Prince George	67%
Rossland	88%	Kimberley	67%	Langley Town	89%	Bowen Island	58%
Okanagan	88%	North Vancouver	67%	Bowen Island	89%	Langley Town	58%
Powell River	75%	Rossland	67%	Maple Ridge	89%	Kimberley	50%
Bowen Island	63%	Sparwood	67%	Rossland	89%	Sparwood	50%
Langley Town	63%	Terrace	67%	Terrace	89%	Whistler	50%
Maple Ridge	63%	Whistler	67%	Victoria	89%	William's Lake	50%
North Vancouver	63%	William's Lake	67%	Whistler	89%	Highlands	42%
Sparwood	50%	Okanagan	50%	William's Lake	89%	Okanagan	42%
Terrace	50%	Esquimalt	33%	Esquimalt	83%	Rossland	42%
Esquimalt	38%	Ladysmith	33%	Okanagan	78%	Esquimalt	33%
Sooke	38%	Langley City	33%	Qualicum	78%	Langley City	33%

Surrey	38%	Metro Vancouver	33%	Sparwood	72%	Metro Vancouver	33%
Ladysmith	25%	Nelson	33%	Metro Vancouver	58%	Nelson	33%
Nelson	25%	Powell River	33%	North Vancouver	50%	Powell River	33%
Qualicum	25%	Prince George	33%	Kimberley	44%	Sooke	33%
Victoria	25%	Sooke	33%	Langley City	44%	Terrace	25%
William's Lake	25%	Victoria	33%	Nelson	44%	Ladysmith	17%
Langley City	13%	Highlands	17%	Highlands	39%	North Vancouver	17%
Metro Vancouver	13%	Maple Ridge	0%	Powell River	39%	Qualicum	17%
Abbotsford	0%	Abbotsford	0%	Abbotsford	0%	Abbotsford	0%
Sunshine Coast	0%						

3.1.2 Specific Findings

The top five strongest areas found in the BC sustainability plans are all in the policy section of the protocol. In descending order, these codes (abbreviated) are: building and infrastructure, food security, land use and zoning, natural resource management, and sustainable energy. All of these top five strongest areas scored either a 1 or a 2 a total of 24 times. The five weakest areas found in the BC sustainability plans are from various sections of the protocol. In descending order, from weakest, they are: economic development, not economic growth (goals section); internal workplace engagement (action section); green collar jobs (policy section); financial commitment (action section); and consequences of climate change (facts section). These areas scored either a 1 or a 2: 4, 5, 7, 10 and 10 times, respectively. See Table 6 for a complete list.

Table 6. Times Coded, Score 1 and 2 Aggregate	
Code Abbreviation	# of Plans Containing Item
3A. POLICY: building and infrastructure for resiliency	24
3C. POLICY: food security for resiliency	24
3E. POLICY: land use zoning for decreasing risk	24
3F. POLICY: natural resource management	24
3G. POLICY: sustainable energy	24
2B. GOALS: resiliency goals/objectives	22
2C. GOALS: risk goals/objectives	22
3I. POLICY: waste management	22
4A. ACTION: advocacy and information sharing	22
3B. POLICY: diversification and local investment	21
3H. POLICY: transportation	21
4C. ACTION: decision lens	21
1A. FACTS: climate change facts	20
1E. FACTS: risk assessment	20
4B. ACTION: climate change position	17
1C. FACTS: economic dependency on natural resources	16
4H. ACTION: monitoring, evaluation and/or revision	13
1B. FACTS: consequences of climate change	10
4D. ACTION: financial commitment	10
3D. POLICY: green collar jobs	7

4G. ACTION: internal staff engagement program	5
2A. GOALS: economic development, not growth	4

When scores of 1 and 2 are taken separately, the top four strongest areas are, from the strongest: land use zoning, score 2 (policy section) at 17 times; sustainable energy, score 2 (policy section) at 17 times; food security, score 2 (policy section) at 16 times; and natural resource management, score 2 (policy section) at 16 times. When scores of 1 and 2 are taken separately, the five weakest areas, in descending order, are: economic development, not economic growth, score 2 (goals section) at 0 times; consequences of climate change, score 1 (facts section) at 1 time; internal staff engagement program, score 2 (action section) at 2 times; financial commitment, score 2 (action section) at 2 times; and green collar jobs, score 1 (policy section) at 2 times. See Table 7 for a complete list.

Table 7. Times Coded, Score 1 and 2 Separate	
Code Abbreviation	# of Plans Containing Item
3E. POLICY: land use zoning for decreasing risk (score 2)	17
3G. POLICY: sustainable energy (score 2)	17
3C. POLICY: food security for resiliency (score 2)	16
3F. POLICY: natural resource management (score 2)	16
1A. FACTS: climate change facts (score 1)	15
3A. POLICY: building and infrastructure for resiliency (score 2)	15
3I. POLICY: waste management (score 2)	15
3B. POLICY: diversification and local investment (score 2)	14
3H. POLICY: transportation (score 2)	14
4H. ACTION: monitoring, evaluation and/or revision (score 2)	13
1E. FACTS: risk assessment (score 2)	12
4C. ACTION: decision lens (score 2)	12
1C. FACTS: economic dependency on natural resources (score 2)	11
2B. GOALS: resiliency goals/objectives (score 1)	11
2B. GOALS: resiliency goals/objectives (score 2)	11
2C. GOALS: risk goals/objectives (score 1)	11
2C. GOALS: risk goals/objectives (score 2)	11
4A. ACTION: advocacy and information sharing (score 1)	11
4A. ACTION: advocacy and information sharing (score 2)	11
4B. ACTION: climate change position (score 1)	10
1B. FACTS: consequences of climate change (score 2)	9
3A. POLICY: building and infrastructure for resiliency (score 1)	9
4C. ACTION: decision lens (score 1)	9
1E. FACTS: risk assessment (score 1)	8
3C. POLICY: food security for resiliency (score 1)	8
3F. POLICY: natural resource management (score 1)	8
4D. ACTION: financial commitment (score 1)	8
3B. POLICY: diversification and local investment (score 1)	7
3E. POLICY: land use zoning for decreasing risk (score 1)	7
3G. POLICY: sustainable energy (score 1)	7

3H. POLICY: transportation (score 1)	7
3I. POLICY: waste management (score 1)	7
4B. ACTION: climate change position (score 2)	7
1A. FACTS: climate change facts (score 2)	5
1C. FACTS: economic dependency on natural resources (score 1)	5
3D. POLICY: green collar jobs (score 2)	5
2A. GOALS: economic development, not growth (score 1)	4
4G. ACTION: internal staff engagement program (score 1)	3
3D. POLICY: green collar jobs (score 1)	2
4D. ACTION: financial commitment (score 2)	2
4G. ACTION: internal staff engagement program (score 2)	2
1B. FACTS: consequences of climate change (score 1)	1
2A. GOALS: economic development, not economic growth (score 2)	0

3.2 Implications

To understand the implications of this study’s results, it is important to return to the research questions: Are municipalities and regional districts in BC planning for the economic impacts of climate change? If so, to what depths do these plans with economic adaptation strategies reach? The answers to these questions are explored below.

3.2.1 Broad Implications

Only 26 out of the 186 municipalities and regional districts in BC (160 municipalities and 26 regional districts) have sustainability plans. Of those 26 — the data set for this study — scores of at least 80% in at least one category are distributed amongst 18 of the plans, applying the economic adaptation to climate change impacts evaluation protocol. These results suggest that 18 out of 186, or 10% of BC’s local governments, are planning well (in at least one category) for the economic impacts of climate change.

It is also worth noting the strengths and weaknesses of the plans at the category level, and their implications for the likelihood that the sustainability plans will be successful in promoting economic adaptation to climate change. The policy and facts categories scored the highest, on average, at 71% and 52% respectively. This suggests that local governments have the knowledge and tools for economic adaptation to climate change planning. However, the actions and goals categories scored the lowest, at 44% and 46% respectively. This suggests that, despite adequate knowledge and tools, local governments lack implementation commitment, and accountability for future performance. Taken together, the category strengths and weaknesses are not surprising given how new sustainability planning is for local governments in BC. As the first 26 out of 186

local governments in BC to create sustainability plans, they may be hesitant to make big commitments in this first iteration of the sustainability planning process. If sustainability planning becomes more mainstream amongst BC local governments, and this first cohort of plans are revised, there may be improvements in the actions and goals sections.

3.2.2 Specific Implications

It is not surprising that the areas in which BC sustainability plans coded consistently the strongest are the policy areas that are typically also addressed in an OCP — building and infrastructure, food security, land use and zoning, natural resource management, and sustainable energy (Kelly, 2010). In this way, many BC sustainability plans successfully address the economic impacts of climate change likely because they build upon a plan process that is standardized and consistent, like the OCP.

When scores 1 and 2 are aggregated for each code, the areas of the BC sustainability plans that could use the most improvement are typically new aspects of planning that are not well established in planning practice, or are more controversial. Internal workplace engagement on climate change actions may have scored low because it is eclipsed by public (external) engagement on climate change actions — possibly because public engagement lends itself to increased credibility in the community (Stoney & Elgersma, 2007), whereas the benefits of internal engagement are less explicitly obvious. The notion of favoring economic development over economic growth likely scored low because it has been highly controversial since the publication of *The Limits to Growth* (Meadows et al.) in 1972 and municipalities likely gravitate to less politically contentious ways to support a sustainable economy. Similarly, the concept of green collar jobs likely scored low because it lacks either popular or academic consensus on a definition. For example, many link green collar jobs with environmental sectors, others suggest it is the “greening” of existing sectors that qualify as green collar jobs (Lee & Carlaw, 2010). Researching and identifying the consequences of climate change that are *specific* to the municipality or regional district in question likely scored low since it is a relatively new area of planning (Province of BC, 2010), which requires additional resources from already tight-budgeted municipalities and regional districts. Finally, financial commitment to plan implementation likely scored low because municipal and regional councils are concerned with

budget fluctuations and the limited term of their leadership (Berman & West, 1995). When scores of 1 and 2 are taken separately, a similar picture emerges. The top and lowest scoring individual codes are all the same as the general areas discussed above.

3.2.3 Limitations and Future Research

The method of coding and use of this study's particular protocol for identifying economic adaptation to climate change has both strengths and limitations. Coding works well to identify the absence or presence of a particular piece of information. However, the differentiation between a score of 1 and 2 — judged by the difference between brevity and detail, for example — is less verifiable. There is often a grey area between brevity and detail, which can make the scoring system subjective in some cases. To reduce subjectivity, all the plans are double coded by another person — with 86% average consistency. The framing of individual pieces of information can also make code application difficult. For instance, the plan may incorporate actions that contribute to climate change adaptation, but not mention climate change. In this sense, it is an interpretive, as opposed to objective or mechanical, process of applying the protocol to a plan.

This project's protocol is effective in identifying a wide variety of indicators that, together, suggest a municipality or regional district is planning for the economic impacts of climate change. However, the “double barrel” nature of having both economic and climate change indicators is also a challenge. Some indicators are climate change focused, while others are economic development focused, while still others combine the two. Thus, a total score does not indicate the weighting or integration of each economic development and climate change. To account for the double barrel issue, this project analyses not only total scores, but also the frequency and scoring of individual code items.

Another challenge involves the BC sustainability plan data set. Since there is no established structure or content of a sustainability plan, the type, length, detail, subject matter, and budget for producing a given plan can differ significantly. This is not to say BC sustainability plans should not be compared, but it is worth noting that because sustainability planning at the municipal and

regional district level is such a new endeavor, there is still a significant amount of variation in the field. Over time, however, it may become a more standardized planning process.

Future research on BC sustainability plans could complement this study. To build upon the topic of economic adaptation to climate change, future studies could apply the protocol in this project to economic development plans to evaluate their integration with sustainability plans. Other qualitative studies could involve interviewing planners from the BC local governments with sustainability plans to assess how well they are being implemented and monitored.

Section 4. Conclusions

Municipal and regional district sustainability plans are very new and evolving in BC, with no standard format, length, or content. Indeed, differences abound in the 26 plans examined in this study. The novelty of this research, on the one hand, is ideal in timing — sustainability planning is an emerging area that requires careful examination and thought to ensure it develops and improves through subsequent iterations. Yet the novelty of this research is also a challenge, prompting the question: Is the comparison of BC sustainability plans akin to comparing apples to oranges? As it turns out, the answer is complex.

4.1 Discussion

Applying a protocol for assessing how BC sustainability plans are addressing economic adaptation to climate change reveals many commonalities among the plans — despite the differences noted above. While the protocol may offer a coarse method for plan evaluation (a close reading of an individual plan may reveal more nuanced detail), it successfully identifies consistently strong and weak areas of the 26 plans. The strongest areas in addressing economic adaptation to climate change are all in the policy section of the protocol, and, not surprisingly, represent areas typically covered in OCPs: building and infrastructure, food security, land use and zoning, natural resource management, and sustainable energy. The five weakest areas are more diverse: internal workplace engagement; economic development, not economic growth; green collar jobs; consequences of climate change; and financial commitment.

4.2 Recommendations

From the consistent weak points in the BC sustainability plans, some areas for improvement are more easily acted upon, if local governments are informed of them. Engaging staff in climate change actions shows that the municipality or regional district is “walking its talk,” so to speak and is thus compelling for publicity reasons. Defining and focusing on green collar jobs when addressing employment issues is also in the best interests of local governments because it attracts investment in sustainability-oriented sectors — another plus for publicity. Lastly, committing research to understand the climate change consequences particular to a municipality or regional district is increasingly important in order to manage risks and plan effectively.

There are many ways to address these weaknesses in the plans that are politically palatable to improve upon. Engaging local government staff on climate change actions can be done by developing incentive programs and reward systems encouraging staff to pursue climate change actions at work, home and in their community. A focus on green collar jobs has many layers. First, local governments should define what green collar means to their jurisdiction — combining employer criteria such as: reports on sustainability performance, pays a living wage, provides good working conditions. Once a definition is established, local governments can pursue strategies for transforming existing jobs into green collar jobs and ensuring as many new jobs are as green collar as possible. For instance, local governments may consider developing land-use zoning for low-carbon economic development to attract sustainability-oriented businesses to the area, foster collaboration between these businesses, and generate green collar jobs. Finally, to build knowledge about the climate change consequences particular to the specific municipality or regional district, local governments can establish partnerships and collaborative relationships with post-secondary and research institutes, commission consultants to study a particular sector, and/or assign existing staff this research role.

Other areas weak in BC sustainability plans are more challenging to improve upon because they are controversial or politically unpopular. Pursuing economic development, not growth, has been viewed as contentious for over 30 years — since *The Limits to Growth* was published in 1972 — and may be slow to change. However, setting measurable indicators for economic development and adopting triple-bottom line accounting (which includes social, economic and ecological

objectives) are all helpful steps in transitioning from growth to development. Making a financial commitment to climate change action in a plan is also typically viewed as politically unpalatable. It is not surprising that politicians are cautious about making financial commitments to sustainability that may stir controversy or jeopardize their re-election. Conversely, however, politicians can also see making a financial commitment as an opportunity for greater support and leadership, rather than a liability for election security.

Moreover, this study presents findings with a range of applicability and probability of implementation. At any rate, the research is well timed and reveals feasible improvements for local governments planning for economic adaptation to climate change in BC. Not only can understanding the strengths and weaknesses of past plans help those who have not yet developed sustainability plans, but it can also aid the 26 municipalities and regional districts examined in this study in advancing revisions and next versions to come.

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Section 6. Appendix: Evaluation Protocol

Plan Evaluation Protocol

General coding guidelines:

To score either a 1 or a 2 in any category, the plan must contain explicit, not implicit, evidence of code criteria. The difference between explicit and implicit evidence does not distinguish a score of 1 from 2 but, rather, qualifies it to be scored. For example, the plan may list many of the major industries in the municipality or regional district, but if it does not explicitly acknowledge an economic dependency on the natural resources and ecosystems that support these industries, it does not qualify to score either a 1 or 2 for code 1C.

1. Facts

Scoring: 0 = absent, 1 = included briefly, 2 = included in depth

1A. Climate change facts

- Score 1 if the plan acknowledges climate change briefly (e.g. word search for “climate change”)
- Score 2 if the plan acknowledges climate change in depth (e.g. the human activities that generate greenhouse gas emissions)

1B. Consequences and risks of climate change

- Score 1 if the plan includes the general consequences of climate change (e.g. average annual temperature increases, sea level rise, increased incidence of extreme weather)
- Score 2 if the plan includes the specific consequences of climate change to the municipality or regional district (e.g. water shortages, compromised air quality, increased flooding hazards)

1C. Economic dependency on natural resources and ecosystems

- Score 1 if the plan acknowledges a connection between the economy and the ecosphere
- Score 2 if the plan recognizes the economic dependencies on natural resources and ecosystems specific to the municipality or regional district (e.g. dependency on forestry, fishing or mining)

1D. Resiliency assessment

- Score 1 if the plan acknowledges the concept of resiliency (e.g. the plan may not use the word resiliency, but it clearly explains the ability bounce back from and successfully adapt to climate change impacts)
- Score 2 if the plan describes how the municipality or regional district is or is not resilient (e.g. a resilient municipality or regional district has a diverse economy, diverse employment opportunities, diverse and self-sufficient agricultural activities, low dependence on non-renewable energy sources)

1E. Risk assessment

- Score 1 if the plan acknowledges the municipality or regional district faces risks due to climate change
- Score 2 if the plan describes the specific economic risks from climate change impacts that will affect the municipality or regional district (e.g. employment uncertainty, food insecurity, dependency on imports or exports, dependency on non-renewable energy sources)

2. Goals

Scoring: 0 = absent, 1 = included briefly, 2 = included in depth

2A. Economic development, not economic growth

- Score 1 if the plan goals acknowledges a difference between economic development (qualitative improvement) and economic growth (quantitative increase)
- Score 2 if the plan goals show evidence of how the municipality or regional district aims to develop, as opposed to grow, economically (e.g. creating green collar jobs, emphasizing quality of life indicators as opposed to gross domestic product)

2B. Resiliency goals/objectives

- Score 1 if the plan identifies goals/objectives to improve and/or develop resiliency (e.g. goal to become carbon neutral, goal to diversify local employment opportunities in service and clean tech industries, goal to increase local food production)
- Score 2 if the plan identifies goals/objectives to improve and/or develop resiliency, as well as targets and/or timelines in support of these goals/objectives (e.g. goals to: become carbon neutral by 2015, diversify local employment opportunities in service and clean tech industries by adding 100 new jobs by 2015, increase local food production by 50% by 2020)

2C. Risk goals/objectives

- Score 1 if the plan identifies goals/objectives to reduce risk (e.g. goal to develop floodplain land use plan, goal to decrease dependency on fossil fuels, goal to reduce residential water use and prepare drought management plan)
- Score 2 if the plan identifies goals/objectives to reduce risk, as well as targets and/or timelines in support of these goals/objectives (e.g. goal to develop floodplain land use plan by 2015, goal to decrease dependency on fossil fuels by 50% by 2020, goal to reduce residential water use by 20% by 2015 and prepare drought management plan within the year)

3. Policies

Scoring: 0 = absent; 1 = suggested direction/recommendation; 2 = commitment/strategy

3A. Building and infrastructure for resiliency

- Score 1 if plan suggests general building and infrastructure policies
- Score 2 if plan makes a commitment to specific building and infrastructure policies (e.g. green building code meets climate predictions, infrastructure is maintained to standards accommodating climate predictions)

3B. Diversification and local investment

- Score 1 if plan suggests general policies for diversifying the economy and investing locally
- Score 2 if plan makes specific policy commitments to diversifying the economy and investing locally (e.g. focusing on establishing a diverse service economy, clean technology industry and establishing resident-owned cooperatives)

3C. Food security for resilience

- Score 1 if plan suggests general policies for working towards food security
- Score 2 if plan makes a specific policy commitment for working towards food security (e.g. increasing knowledge of local food sources and accessibility; supporting urban agriculture, farmer's markets, and food cooperatives; decreasing dependence on exported food)

3D. Green collar jobs

- Score 1 if plan suggests policies for creating employment opportunities in “green collar” sectors (e.g. clean technology; service industry; recycling collection, processing and re-manufacturing)
- Score 2 if plan makes a specific policy commitment creating employment opportunities in “green collar” sectors (e.g. specifies how the municipality or regional district will invest in

clean technology to create green collar jobs and how many jobs will be generated; describes strategy for working with Chamber of Commerce to facilitate jobs in “green collar” sectors)

3E. Land use zoning for risk reduction

- Score 1 if plan suggests general land use policies for reducing risk
- Score 2 if plan makes a commitment to specific land use policies for reducing risk (e.g. disallow development on floodplains, protect agricultural lands for food security, encourage density in development, create cycling and transit infrastructure)

3F. Natural resource management

- Score 1 if plan suggests general policy suggestions for sustainable resource management
- Score 2 if plan makes a specific policy commitment to sustainable resource management (e.g. ensuring harvest does not exceed regenerative capacity; monitoring to assess ecosystem climate change adaptation; creating conservation zones; protecting sensitive vegetation, watersheds and ecosystems; processing natural resources locally; developing a local-employment strategy)

3G. Sustainable energy

- Score 1 if plan gives general policy suggestions for energy conservation and/or converting to renewable energy sources
- Score 2 if plan makes a specific policy commitment to energy conservation and/or converting to renewable energy sources (e.g. through financial incentives, a green building program, energy efficiency standards)

3H. Transportation

- Score 1 if plan makes general policy suggestions for creating a transit system not dependent on fossil fuels and/or encourages active transportation (e.g. walking, cycling)
- Score 2 if plan makes specific commitments to creating for creating a transit system not dependent on fossil fuels (e.g. electric streetcar system) and/or commitments to encourage active transportation, such as walking or cycling (e.g. mixed use and compact land-use development is pedestrian, bicycle, and transit-oriented; parking policies discourage car use)

3I. Waste management

- Score 1 if plan makes general policy suggestions for improved waste management (e.g. liquid and solid waste, composting, recycling, not energy waste)

- Score 2 if plan makes a specific policy commitment to reducing waste and/or creating green collar jobs (e.g. composting program aims to divert 20% more solid waste from landfill, commitment to processing and re-manufacturing recycled waste locally instead of exporting)

4. Actions

Scoring: 0 = absent, 1 = included briefly, 2 = included in depth

4A. Advocacy and information sharing with other levels of government and/or business

- Score 1 if plan briefly includes advocacy and information with other levels of government and/or the business sector
- Score 2 if plan includes, in detail, advocacy and information sharing with other levels of government and the business sector (e.g. initiatives engage business in the municipality in climate leadership; business engagement programs support ecological footprint reduction and climate change adaptation)

4B. Climate change position

- Score 1 if plan briefly mentions adopting a climate change position
- Score 2 if plan describes, in detail, a climate change position that supports innovation in climate change mitigation and/or adaptation, demonstrating climate leadership (e.g. clean technology solutions to meet energy needs)

4C. Decision lens

- Score 1 if plan briefly mentions a way in which decision-making takes into account climate change and/or economic impacts
- Score 2 if plan includes, in detail, ways in which decision-making takes into account climate change and/or economic impacts (e.g. an investment lens supports companies which are reducing their ecological footprint, a purchasing lens incorporates carbon goals)

4D. Financial commitment

- Score 1 if plan briefly acknowledges a general budget and financial commitment to implementation actions (e.g. a word search for “budget” shows actions financially supported)
- Score 2 if plan describes, in detail, specific budgets and financial commitments to implementation actions (e.g. attributes numerical figures to different projects)

4E. Internal and external coordination processes (future-oriented)

- Score 1 if plan briefly lists actions to be coordinated internally (within the municipality and regional district) and/or externally (e.g. within municipality or regional district, and with local businesses, Chambers of Commerce, provincial and federal governments)
- Score 2 if plan describes in depth actions to be coordinated internally, within the municipality and regional district, and externally (e.g. within local government, and with local businesses, Chambers of Commerce, provincial and federal governments)

4F. Internal and external roles and responsibilities

- Score 1 if plan briefly lists its internal and external stakeholders
- Score 2 if plan describes in detail the roles and responsibilities of its stakeholders

4G. Internal workplace staff engagement programs

- Score 1 if plan briefly includes a staff engagement program
- Score 2 if plan includes, in detail, a staff engagement program focused on climate change mitigation and/or adaptation actions (e.g. at work, at home and in the community)

4H. Monitoring, evaluation and/or revision

- Score 1 if plan briefly acknowledges actions are connected with continuous monitoring, evaluation and/or revision processes
- Score 2 if plan describes, in detail, the process by which actions will be continuously monitored, evaluated and/or revised (e.g. reports at least annually on the government's own climate efforts and impacts compared to targets and performance plans; sets bold targets, such as becoming carbon neutral)

4I. Planning integration

- Score 1 if plan references other plans in the municipality or regional district
- Score 2 if plan is integrated with other related plans in the municipality or regional district (e.g. with mutually-supportive objectives, policy cross-over)

4J. Public engagement strategy

- Score 1 if plan suggests general public engagement strategies and/or communications policy for supporting social capital and/or climate change adaptive capacity (applies to current or future engagement strategies)
- Score 2 if plan makes specific public engagement strategies and/or communications policy commitments for supporting social capital and climate change adaptive capacity (e.g. education and participation programs which increase climate change awareness and action)