

CAN 4D VISIONING FOSTER COMMUNITY RESPONSES ON CLIMATE CHANGE?

by

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Abstract

This research addresses the need for processes at the local government level that can effectively move communities towards taking meaningful action on climate change. It evaluates the long-term impact of one such process – the Local Climate Change Visioning Project (LCCV): a community engagement and decision support process in two case study communities: Delta and North Vancouver. The LCCV process uses landscape visualization tools integrated with participatory modeling and future scenario development to illustrate to local government staff, stakeholders, and the broader public what their community could look like under various future scenarios of climate change adaptation and mitigation. Through a document analysis and 12 semi-structured interviews with stakeholders who participated in the LCCV, this research project attempts to discover if the process can facilitate the adoption of climate change mitigation and adaptation responses at the municipal level. While the LCCV was not able to shift the development path of the local communities, the LCCV did help to facilitate action on climate change.

Preface

This research was completed by Laura Cornish, in part to fulfill the requirements of the Master of Arts at the Institute for Resources, Environment, and Sustainability. The interviews, transcription, interview analysis, document analysis, and writing were completed by Laura Cornish, with the exception of the transcription of four interviews. Feedback and methodology were developed in collaboration with Stephen Sheppard, Ellen Pond and Olaf Schroth, under the guidance of the Supervisory Committee. A paper, based on Chapter 4, is currently in the process of publication, and is co-authored with Stephen Sheppard, Olaf Schroth and Ellen Pond. Some sections of Chapter 2 are based on research completed by the author for the Pacific Institute for Climate Solutions and released as a Literature Scan in draft format for a workshop. This research project was approved by the University of British Columbia Behavioural Research Ethics Board, certificate number H09-01390.

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List of Abbreviations

APA	American Psychological Association
ALR	Agricultural Land Reserve
B.C.	British Columbia
CALP	Collaborative for Advanced Landscape Planning
CEEI	Community Energy and Emissions Inventory
CEEP	Community Energy and Emissions Plan
DNV	District of North Vancouver
FCM	Federation of Canadian Municipalities
GDP	Gross domestic product
GEOIDE	GEOMatics for Informed Decisions
GHG	Greenhouse gas
GIS	Geographical Information System
ICLEI	International Council for Local Environment Initiatives
IPCC	Intergovernmental Panel on Climate Change
LCCV	Local Climate Change Visioning
MOU	Memorandum of Understanding
NGO	Non-governmental Organization
OCP	Official Community Plan
PIA	Participatory Integrated Assessment
RAC	Regional Adaptation Collaborative
TdR	Transdisciplinary research
UBCM	Union of British Columbia Municipalities
UK	United Kingdom
US	United States

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1 Introduction

1.1 Overview

The purpose of this thesis is to understand the long-term impact of a community engagement and decision support process that uses 4D spatial models and mapping to localize, spatialize and visualize climate change impacts and possible futures. This thesis explores if, how, and why the Local Climate Change Visioning Project (LCCV) impacted individual participants' attitudes and local government policy in two communities: Delta and North Vancouver. This is done through a document analysis and semi-structured follow-up interviews with stakeholders and staff who participated in the LCCV projects. Specifically, this thesis aims to: (a) provide an in-depth understanding of the long-term impact of the LCCV with a focus on individual knowledge, attitudes, and behaviour and organizational impacts (b) highlight what was effective about the LCCV and provide recommendations for future practice, and (c) identify priorities for future research.

This project is defined by the following research questions:

- a) What was the long-term impact of the LCCV on individual participants?
- b) What was the long-term impact of the LCCV on local government partners?
- c) Why was the LCCV effective (or not)?

For the purpose of this project, long-term impact has been defined as the ability of the LCCV to foster support and action on climate change for both the individuals and local governments who participated. Chapter 1 introduces the research objectives and provides context for the study. Chapter 2 presents a review of the literature on transdisciplinary research evaluation, the barrier breaking components of the LCCV, and the rationale for the scales of research and the selection of the evaluation criteria. Chapter 3 describes the methodology for the research project. Chapter 4 presents the findings from the document analysis. Chapter 5 presents the findings from the semi-structured interviews. Chapter 6 concludes the thesis with a discussion of the findings, the implications of the research findings, and possible directions for future research.

1.2 Local Engagement on Climate Change

Responding to the urgency of climate change is an immense, collective challenge (Bateson, 2007). Reducing greenhouse gas emissions on the scale necessary to avoid catastrophic climate change will require fundamentally reshaping our energy systems and other vital infrastructure, which will in turn, require fundamental changes in how we live, work, eat and play (Pachauri & Reisinger, 2007).

Climate change thus presents a serious challenge to 21st century civilization. The problem exists across all scales, and we therefore must respond to the challenge at all scales: international, national, regional/territory, municipal, neighbourhood and individual. The opportunities and obstacles to action on climate change at all these levels are different, and we must concurrently pursue action at all these scales as synergistically as possible. To a large degree, we already know many of the policies, actions and technologies that need to be implemented to gain significant emissions reductions at all these scales (e.g. Pacala & Socolow, 2004). However, we do not know how to get those necessary actions and measures implemented, especially in the context of significant barriers to change. The greatest challenge to addressing climate change is not technology, but societal change.

These barriers to climate change action include individual psychology, institutional inertia, and powerful vested interests in the status quo (such as the oil and gas industry and suburban developers) who are using their significant financial resources and political capital to successfully sow public scepticism and denial of the science of climate change (Hoggan & Littlemore, 2009; McCright & Dunlap, 2010; Powell, 2011). So far, there has been little progress in implementing measures to address climate change in the face of an entrenched economic and political system tied to increased gross domestic product (GDP), which is currently directly linked to GHG emissions. Effectively responding to climate change is a social, not a technical problem, requiring us to overcome these powerful barriers to change. Indeed, there is an increasing recognition "of the role that the human dimension of institutions, cultures, and perceptions play in determining the type and extent of response option that is chosen by both decision-makers and the public" (Burch, 2011, p.180).

Given the transformational change necessary and the significant barriers to change, including at the local government level, there is a critical need for processes that can empower decision-makers to radically shift planning, decision- and policy- making at the local level, while creating and maintaining

public support for those change (Picketts et al., 2012). We need effective public processes at the local level that can “build awareness, capacity, and agency on climate change, and support planning and decision-making” (Sheppard et al., 2011, p. 400). Moreover, frameworks, tools and processes are needed “to help communities and local agencies make sense of and organize emerging information on climate change, to become more informed on local impacts and policy choices related to climate change, and to feed into planning processes” (Sheppard et al., 2011, p.401).

In North America, conventional community, land-use, and resource management planning has, until recently, been silent on climate change. Indeed, historically, municipalities have not recognized climate change as a local concern (Betsill, 2001; Bulkeley & Betsill, 2003). However, municipalities have started to seriously respond to the challenge, on an individual level as well as through associations such as the: US Mayors for Climate Protection (The U.S. Conference of Mayors, 2011), the B.C. Climate Charter (*British Columbia Climate Action Charter*, 2009), World Mayors Council on Climate Change (“World Mayors Council on Climate Change,” 2011), and the C40 Cities Climate Leadership Group (“C40 Cities Climate Leadership Group,” 2011).

There are already many climate action programs in place at the community level, both formal and informal (community-led), such as the Federation for Canadian Municipalities’ Partners for Climate Protection (“Partners for Climate Protection,” 2011), UBCM’s Climate Action Toolkit (“BC Climate Action Toolkit,” 2011), and Transition Network (“Transition Network,” 2011). These programs provide best practices, toolkits and some funding, but most of them simply suggest that municipalities create action plans with stakeholder input, with little guidance on how this can be done effectively. Regardless, toolkits are not a substitute for capacity, experience, and resources. Even with toolkits, most communities do not have the capacity to respond to the Green Communities Act (Government of British Columbia, 2008) and the Climate Action Charter (*British Columbia Climate Action Charter*, 2009) and are struggling with how to meet these targets. Communities generally do not have a good understanding of the requirements and lack sufficient guidance of how to meet the reduction targets (Royal University & HB Lanarc, 2011).

The lack of sufficiently resourced, robust climate change programs is additionally problematic as many solutions to climate change, such as renewable energy technologies, transit lanes, and increased density, are expensive and may not initially be supported by the public. Local climate solutions will need

grassroots support in order to provide a constituency for change so that politicians can be supported in making climate friendly decisions.

Where they exist, community-level climate action programs are being implemented with varying amounts of academic involvement, and official government integration. To effectively use society's limited resources, we need to learn from our mistakes and improve our strategies and actions to respond to climate change on an ongoing basis. This requires taking stock of our tactics, strategies, plans, and evaluating what has been working and what has not. It is essential that we better understand, and then scale-up the processes that are working. Despite the advantages of local, place-based approaches to fostering climate solutions, this scale is often ignored in climate change and behaviour change practice and literatures (Sheppard, 2012). Evaluation of local decision support and community engagement processes is needed to understand whether these processes are actually effective (Moser, 2009).

Landscape visualization has been proven as a useful tool in decision support and community engagement processes (e.g. Sheppard & Meitner, 2005; Tress & Tress, 2003), with encouraging early results on its application to changing attitudes on climate change (Burch, Sheppard, Shaw, & Flanders, 2010; Sheppard, Shaw, Flanders, & Burch, 2008); however, there is as yet very limited evidence on the in-depth and longer-term behavioural and policy impacts of landscape visualization (Al-Kodmany, 2000; Sheppard, 2005; Sheppard & Meitner, 2005). We have yet to understand whether, over the long-term, there are sustained policy changes or shifts as a result of the process, either at small experimental scales or if broadened and replicated.

1.3 The Local Climate Change Visioning Project

The LCCV is a participatory process that uses 4D visioning tools to provide decision support for planning and community engagement on climate change at the community and neighbourhood scale (Pond, Schroth, et al., 2010). The LCCV is a new prototype research process that uses realistic 3D imagery and spatial modelling of alternative climate change futures at the neighbourhood scale to create scenarios which translate global scientific information and make alternative futures explicit at the local level (Shaw et al., 2009). The realistic 3D imagery of communities visualized at future points in time, usually 2020 and 2050, makes the process 4D: spanning time in addition to the three physical dimensions.

Through a participatory planning process, the LCCV provides an integrated treatment of climate change causes, impacts, adaptation and mitigation in distinct scenarios to educate the community and better inform decision-making on climate change options. The process moves through two iterative phases to produce a final visioning package (Pond, Schroth, et al., 2010).

Phase one involves the construction of “frameworks and methods for downscaling climate change impact information and visualizing alternative futures at the local scale” (Shaw et al., 2009; Tatebe, Shaw, & Sheppard, 2010, p. 14) using a participatory process with multiple stakeholders, and drawing on “available socioeconomic modeling, GIS mapping and spatial analysis, local expertise and climate change scientists in working groups, to develop and integrate alternative land-use and climate change scenarios” (Tatebe, Shaw, & Sheppard, 2010, p.15).

In phase two, visioning packages are compiled and presented to local community members, stakeholders, municipal government staff and decision-makers to test the influence of these “visualizations on awareness, emotional responses, and motivation for behaviour change of the local community participants”(Tatebe, Shaw, & Sheppard, 2010, p.14). The visualized scenarios include representations of specific climate change impacts, such as levels of sea-level rise and snowpack elevations. There is a risk that participants may not fully understand levels of uncertainty in depicting those impacts, although the use of multiple scenarios showing different levels of impact partly address this uncertainty issue. In each testing session, LCCV facilitators explain the issues of uncertainty.

After each testing session, a questionnaire is given to each participant prior to the presentation to assess their baseline level of knowledge on climate change, and the identical questions with a few new additions are provided in a second questionnaire after the presentation. These questionnaires include open-ended questions, and time is also provided for discussion between researchers and stakeholders.

This process to inform local climate change planning processes has now been tested in Delta, North Vancouver, and Kimberley, B.C. and has more recently been tested in adapted form in the Elbow River Watershed in Alberta, Toronto, and Clyde River, Nunavut (Schroth, Pond, Cornish, & Sheppard, 2011; Sheppard, 2012). These projects differ in their respective challenges and potential benefits as some projects, such as Kimberley and the Elbow River Watershed are embedded in official planning processes,

while other projects, such as Delta, North Vancouver, Toronto and Clyde River were implemented outside any local official processes.

When it was first implemented as a research project in Delta and North Vancouver in 2006, the decision support goal was not explicit. It was intended as an exploratory research process to test with local governments whether this type of process could influence individual members of the public and practitioners - their attitudes' towards climate change, level of concern with climate change, sense of urgency and understanding.

Preliminary evidence from the research suggests that LCCV has the capacity to effect change in a community's response to climate change. Initial research results show that the LCCV can achieve impressive results including: making "complexity of climate change comprehensible" (Schroth, Pond, Muir-Owen, Campbell, & Sheppard, 2009, p.30), raising participants' awareness of climate change, level of concern, and sense of urgency of climate change (Schroth, Pond, Muir-Owen, Campbell, & Sheppard, 2009; Sheppard, Shaw, Flanders, & Burch, 2008), and increasing the participants' willingness to support climate change policies (Sheppard, Shaw, Flanders, & Burch, 2008).

These impressive results, along with the innovative and holistic approach of the LCCV piqued my interest in studying the LCCV process. I thought it was the most promising of the approaches I had seen that were attempting to accelerate community responses to climate change. As an employee of the provincial government in British Columbia I was familiar with the challenges the Province was encountering in compelling local governments to act on climate change. I was similarly familiar with the shortcomings of a provincial government rolling out an aggressive climate action plan and supporting policies with minimal outreach and local engagement efforts. Given the importance of finding solutions that can accelerate action on climate change at the local level and then scaling up these efforts, this project presented a rare opportunity to discover the long-term impacts of the LCCV and fill in the gap in our knowledge of long-term effects.

2 Literature Review

The aim of this literature review is to:

- set the context for the research project through an examination of existing efforts to evaluate transdisciplinary research projects,
- review the theories for why the approaches and individual components of the LCCV might be effective in facilitating climate action,
- explore the potential scales of effects and rationalize the choice of scales for further study, and
- determine what impacts to look for based on the literature.

2.1 Transdisciplinary Research Evaluation

Given limited resources, and the urgent problem climate change presents, we need to know what works and what does not work to appropriately assign those limited resources. We need to know whether investments of people, time, and financial resources results in the implementation of projects, programs and policies (Doble & King, 2011). Unfortunately, few such evaluations have been carried out to date. Over the last few years research groups have started to develop tools and methods for “improving the translation and communication of scientific understanding of global climate change processes, impacts and responses down to the local level”(Sheppard et al., 2011, p. 402). The LCCV falls into this broad category of participatory sustainability research that involves collaboration between scientists and non-scientists on complex, real-world problems such as sustainability and climate change. This type of work has a number of definitions in the academic literature. This research will define the LCCV as a transdisciplinary research project (TdR): a project on a specific problem that “incorporates a temporary transdisciplinary process of knowledge integration and mutual learning between and among stakeholders and researchers” (Walter et al., 2007, p.326). This type of research has a number of definitions. Broadly speaking, transdisciplinary research is implemented to effect real-world decision-making on complex place-based issues (Thering, 2011; Walter et al., 2007). Within the sustainability and climate change literatures, more specifically this means decision-making that increases sustainability and resilience, and reduces the emission of greenhouse gases. This definition of transdisciplinary research is very similar to Robinson's definition of issue-driven interdisciplinarity: research that is problem-based, interactive, reflexive, integrative and collaborative (Robinson, 2008). The LCCV process also fits within this definition.

Despite becoming more common, there has generally been a lack of progress in evaluating the effectiveness of transdisciplinary research, particularly its societal effects (Blackstock, Kelly, & Horsey, 2007; Moser, 2009; Walter et al., 2007). Despite its purported societal benefits, there are relatively few frameworks for evaluating the impacts of such research (Moser, 2009; Rowe & Frewer, 2000; Salter et al., 2010). However, there are some. Research on effectiveness evaluation acknowledges both the difficulty of defining effectiveness sufficiently to create adequate criteria and indicators to measure effectiveness and the lack of clear frameworks for evaluation or standardized measurement instruments (Rowe & Frewer, 2000).

In the literature, effects are loosely categorized into: process, outputs and outcomes, where outputs represent the results of the research process and the outcomes represent the long-term effects of the research results (Moser, 2009; Walter et al., 2007). Overall, the literature has mostly focused on the effectiveness of the research process (cf. Fung & Harbage, 2007; Mastop, 1997; Moser, 2009; Sheppard, 2005a; Walter, Helgenberger, Wiek, & Scholz, 2007). The literature on measuring effectiveness in terms of outputs and outcomes is much smaller (Rowe & Frewer, 2000; Talwar, Wiek, & Robinson, 2011).

There are quite a few reasons for the dearth of research measuring the effectiveness of TdR. One of the main reasons is that such evaluations are "notoriously difficult to interpret, measure, track and evaluate (Moser, 2009, p.11). Evaluation is difficult for a number of reasons: it is expensive, often not initially planned and budgeted for, requires a specific skill-set, can surface uncomfortable truths for project sponsors and partners, and often, goals with which to evaluate the project against are unclear, vague or nonexistent (Laurian & Kouwenhoven, 2010). In addition, attribution is extremely difficult as many environmental, social, and political factors not related to the project will often affect the outcomes of complex, issued based projects focused on sustainability.

The LCCV is an interdisciplinary process that includes elements of community planning, participatory integrated assessment (PIA), community engagement, and landscape visualization. Within each of these disciplines, some research on evaluation has been conducted, though evaluation of outcomes is rare in all. While considered the true test of the effectiveness of planning, attempts to evaluate the outcomes of land-use planning are actually very rare (Laurian & Kouwenhoven, 2010). To date, PIAs have mostly been focused on research aiming to improve the PIA process, as opposed to research to evaluate the outcomes of the PIA process on participants or decision-makers. Salter et al., (2010) provides an

excellent summary of the outcomes of various PIA processes. While there is an extensive literature on the benefits of community engagement, formal evaluations are still limited in quantity and quality (T.C. Beierle & Cayford, 2002; Fritze, Williamson, & Wiseman, 2009; Reed, 2008). Lastly, within the field of landscape visualization, evidence of the positive impacts of landscape visualization impacts exist widely, but findings on responses to landscape visualization in planning and design are often not scientifically documented or comprehensive (Sheppard & Salter, 2004). Historically, visualizations have only been evaluated in terms of response equivalence (Bishop & Rohrmann, 2003; Daniel & Meitner, 2001; Lewis & Sheppard, 2006; Sheppard, 1989; van Lammeren, Houtkamp, Colijn, Hilferink, & Bouwman, 2010; Wergles & Muhar, 2009). Indeed, there is little hard evidence on behavioural or longitudinal impacts of landscape visualization (Sheppard, 2005a).

Even though there are few frameworks and examples of outcome-oriented evaluations of transdisciplinary research, it is still very valuable research that this project will attempt to add to. This type of evaluation research work is important because it increases the accountability and transparency of the funders, the researchers and the stakeholders, and allows researchers to learn from mistakes and improve future TdR projects. Though long-term effectiveness evaluations of transdisciplinary research is difficult, expensive, and time-consuming, there is really no alternative to this type of rich, corroborated information, garnered through detailed analysis of planning documents and interviews with participants. Less rich data could potentially be obtained through the use of a survey given to LCCV participants. It is hoped that this research project will help provide an adaptable framework and lessons learned for future long-term evaluation research projects.

2.2 Could Processes Such as the LCCV Have a Long-Term Impact?

Having established that evaluating the outputs and outcomes of transdisciplinary research is important, this section will look at the theoretical basis and the existing evidence for why the LCCV might have long-term effects on participants and partner local governments. The focus of this section is on how the specific components of the LCCV process may be able to break the barriers to action on climate change that currently exists at the individual and community level.

What would an effective place-based participatory process look like? Based on what we know about social and environmental psychology and best practices in communication about what is required to communicate effectively, it needs to be an engaging and accessible process that provides:

- understandable information;
- affective responses that are personally relevant, inspiring, and motivating;
- salient information for local public and decision-makers (i.e. linked to things that people can identify with and which they care about).

These criteria are based on: Beierle & Cayford, 2002; Kollmuss & Agyeman, 2002; McKenzie-Mohr, 1999; Moser & Dilling, 2007; Nicholson-Cole, 2005; Slovic, Finucane, Peters, & Macgregor, 2003; Stermann & Sweeney, 2007; and Stern, 2000; all cited in Sheppard et al., 2011. Successful place-based processes of social mobilization have been able to operationalize lessons from social psychology, such as the creation of narratives, focusing on a desirable future, making information local and salient, and creating the sense of working together towards a common future (cf. Robinson, Carmichael, et al., 2006).

Ideally, to facilitate climate action at the community level, we need processes that can:

- increase awareness and understanding of climate change,
- dispel myths about climate change science, mitigation action, and potential impacts,
- motivate individual support for climate policy,
- empower local government staff to advocate for climate action,
- convince decision-makers that climate change is urgent and the public supports action, and
- overcome conventional planning process problems (such as: limited participation, lack of long-term planning, siloed thinking).

2.2.1 LOCAL

The LCCV is explicitly local, which provides unique advantages for its ability to address challenges and barriers to acting on climate change for both individuals and local governments. Firstly, local information can increase a participant's level of concern by overcoming perception that climate change is remote in space and time. Shackley and Deanwood assert that "there is a better prospect for mobilizing stakeholder interest and concern if climate change impact can be demonstrated 'on the ground', in familiar locations, and upon landmarks and businesses, etc." (2002, p. 381). This research is affirmed by Leiserowitz, whose research has shown that "local threats are generally perceived as more salient and of

greater urgency than global problems” (2007, p. 53). Indeed, to make an issue of personal concern it needs to affect one’s own well-being or that of their family (Schultz, 2001, cited in Moser & Dilling, 2007). The links between an individual's normal daily life and climate change need to be made explicit, and the LCCV's provision of climate change visualizations at the community level achieves this (Vermeulen & Kok, 2002; APA, 2009; Lorenzoni et al., 2007; Norgaard, 2009 citing Brechin, 2008; Lorenzoni, Leiserowitz, & Doria, 2006; Nisbet & Myers, 2007; Norgaard, 2006). Moreover, illustrating climate change in the context of known landscapes increases participant comprehension (Pettit, Raymond, Bryan, & Lewis, 2011; Sheppard, 2012; Vervoort, Kok, van Lammeren, & Veldkamp, 2010). Local is a scale that matters. It is the community or neighborhood-level that is most important to decision-makers and the community (Moser & Dilling, 2007). Furthermore, feedback from participatory integrated assessment processes has indicated a strong appetite from participants for more local information to use in their deliberations on futures (Dahinden et al., 2003; Holman et al., 2005; Robinson, et al., 2006; Salter, Robinson, & Wiek, 2010). Moreover, local approaches to facilitating action on climate change are supported because "citizens have local knowledge, understand local conditions, can practice direct democracy, and can help develop solutions” (Halvorsen & Carr, 2001, p.107).

Local governments need local information. Much of the data for projected impacts of climate change is only available at a global, or, at best, regional level, and the information at a local level is unavailable or too coarse to be of much use. Indeed, downscaling climate data is a very technical process, and planners understandably often struggle to acquire the necessary climate science knowledge to effectively respond to climate change (Bassett & Shandas, 2010). Uncertainty about the scale and type of climate impacts are a significant barrier for local governments to make decisions and take appropriate response measures (Bedsworth & Hanak, 2010). For example, the range of estimates of projected sea-level rise provides a very wide range that makes it extremely difficult for planners to decide on an appropriate level of protection. Given all the positive impacts attributed to the provision of local information, we can expect the LCCV's inclusion of community-scale information on climate change to increase its effectiveness.

2.2.2 SPATIAL

The primary tools of the LCCV are spatial, including visualizations and GIS, for example, of potential futures of neighbourhoods and maps of renewable energy potential in GIS and/or Google maps. Using spatial tools in community-based participatory processes has a number of benefits including: increasing

user interactivity, legitimizing multiple points of view on an issue, facilitating the input of local knowledge on an issue, making the issues more tangible, and increasing participant ownership of the process (Dias, Van de Velde, Nobre, Esteveao, & Scholten, 2003; Shaw et al., 2009; Talwar, 2008). Indeed, interactivity through place-based activity can empower participants to share their perspective where they may otherwise not consider themselves qualified to have an opinion (Talwar, 2008). Importantly, communicating spatial, temporal and uncertainty aspects of climate change helps participants recognize the capacity for collective actions to lead to different futures (Dahinden, Querol, Jager, 2003; cited in Salter et al., 2010). Including spatial tools in a local, participatory process enhances legitimacy of the process and the potential for outcomes. If people are interested enough to participate and feel heard through the process, they are more likely to feel positively toward the process and more open to the information being presented.

2.2.3 FOCUSED ON SOLUTIONS

While the LCCV does involve visualizing the impacts of climate change on the local community, the process also involves visualizing potential solutions - both in terms of adaptation and mitigation. This is potentially powerful. We know that the feeling of having no control over climate change facilitates defence mechanisms, such as denial of climate change (Gifford, Iglesias, & Casler, 2009). Many other efforts to educate people about climate change and in turn, encourage them to change their behaviour and increase their support for climate policy, such as Al Gore's "The Inconvenient Truth," often only focus on the science of climate change and the potential impacts. This can simply turn people off. Indeed, strong emotional responses, such as fear, despair, sense of powerlessness, guilt or sense of manipulation, can end any further thinking (Moser & Dilling, 2007). One study found that "people stopped paying attention to global climate change when they realized that there is no easy solution for it, and many people only judged problems as serious if they thought they could be effectively acted upon" (Norgaard, 2009, p.22 citing Krosnick, Holbrook, Lowe, & Visser, 2006). By focusing on solutions and making them seem real and possible, the LCCV could potentially encourage behaviour change and policy support much more effectively.

2.2.4 VIVID VISUALS & INTEGRATED INFORMATION COMMUNICATION

The LCCV includes realistic and compelling visualizations of climate impacts, and climate solutions in local neighbourhoods. People remember vivid images (Lester, 2006; Marks, 1973). The literature of imagery and recall suggests that a person's ability to remember an item is better when it is vivid and

encoded with reference to the self rather than with reference to another person (Brown, Keenan, & Potts, 1986; Lester, 2006). Currently, most citizens lack personally relevant affective images of climate change that are vivid and concrete (Leiserowitz, 2007; Sheppard, 2012)

Landscape visualisation is a subset of geographic visualization that communicates "existing conditions and alternative landscape scenarios, past and present, for educative and consultative purposes" (Pettit, Raymond, Bryan, & Lewis, 2011, p.231). The LCCV translates climate change information on impacts and responses down to the local level through the integration and visualization of that information. Using largely data-driven landscape visualizations, the LCCV process integrates diverse data sets, including: models (such as energy and water models), risks, current development plans, and sources of GHG emissions, potential climate change impacts, as well as potential mitigation and adaptation strategies.

A number of researchers have explored the impact of using visualizations to show stakeholders, decision-makers and the general public what their neighbourhoods or communities could look like under future scenarios where certain mitigative and adaptive actions have been taken. Indeed, there is considerable evidence for the perceived communications effectiveness of visualization (Al-Kodmany, 2000; Appleton & Lovett, 2003; Sheppard & Meitner, 2005) as well as for the effectiveness of visualization as a planning tool (Salter, Campbell, Journeay, & Sheppard, 2009; Sheppard & Meitner, 2005; Tress & Tress, 2003).

More specifically, landscape visualizations enhance participatory community planning processes by:

- engaging users (Robinson, Carmichael, et al., 2006),
- providing a common language for all participants in a planning process and facilitate better communication among participants (Al-Kodmany, 1999, p. 45),
- powerfully and persuasively communicating well both to the public and to planning experts (Tress & Tress, 2003),
- enhancing the communication of participatory scenarios (Vervoort et al., 2010),
- providing focus for a community's discussion of design ideas by guiding community members through the design process, and raising their design awareness (Al-Kodmany, 1999),
- helping "empower residents to plan and design for the future of their community" (Al-Kodmany, 1999, p. 45),

- attracting people and engaging them in a collaborative learning process (Sheppard & Meitner, 2005),
- stimulating positive or negative emotional reactions in observers (e.g. Daniel & Meitner, 2001),
- enabling “planners, decision-makers, researchers, and stakeholders to grasp the possible impact of alternative developments,” when combined with scenario techniques (Tress & Tress, 2003, p. 173), and
- Leading to significant action by decision-makers on policy changes to planning strategies and approvals” (Sheppard, 2005a; Sheppard & Cizek, 2009).

Moreover, we know that realistic landscape visualizations can: “condense complex information, convey strong, salient messages quickly and memorably, arouse emotional feelings, make experiences more meaningful, and motivate at least the intent of personal action on sustainability issues such as climate change” (Nicholson-Cole, 2005; Sheppard, 2005a; cited in Sheppard, 2006, p. 85).

2.2.5 FUTURE SCENARIO-BASED

The LCCV process relies heavily on future scenarios as a vehicle to present complex climate change information in a meaningful and understandable form. In the LCCV process, the tools for future visioning generally includes the use of models through participatory, facilitated or interface-driven methods. Other tools include collages, construction of narrative storylines, sketch artists, and charettes (Salter et al., 2010). Using future scenarios to present information has a number of advantages for effectively communicating information and also breaking through barriers to action on climate change.

To break out of entrenched development paths (Levin, Cashore, Bernstein, & Auld, 2010), communities need a mechanism to recognize what development path they are currently on, and to think through the "consequences and characteristics of alternative development paths" (Robinson, Bradley, et al., 2006, p. 6). In addition, policies are more likely to change if there is a political constituency lobbying for that change. Visioning future scenarios can help create political constituencies by facilitating the recognition of alternative development paths and the realization that those alternative development paths are possible (Robinson, Bradley, et al., 2006). By making local impacts clear and showing trade-offs, the LCCV can help participants become "aware of the contradictions in current trends, and can manifest their values in more effective ways than limited individual actions" (Aylett, 2011 citing Robinson, 2004; Robinson, Carmichael, et al., 2006)

Integrated Assessment research has also shown that future scenarios can overcome the barrier of flawed individual mental models by enabling “the ‘making explicit’ of mental maps in collective processes of deliberation involving both experts and other stakeholders” allowing them to serve as “vehicles for binding together the mental maps and futures discourse of disparate individuals” (Berkhout, Hertin, Jordan, 2002, p. 87). This is important because the most commonly cited barrier to understanding climate change is “flawed cognitive and mental models that limit people’s ability to grasp what is going on” (Norgaard, 2009, p.17). Numerous studies have shown that people hold various mental models about climate change, some of which mislead people in understanding the causes and solutions to climate change, and can also lead to counterproductive responses (Bostrom, & Lashof, 2007; Kempton, 1991).

If using scenarios can help change mental maps, they can potentially facilitate the adoption of new policies: at the local government level, new policy proposals are more likely to be accepted if they reinforce pre-existing values and/or mental models (Kingdon, 2003; Sabatier, 2007; Morgan, Fischhoff, Bostrom, & Atman, 2002). Moreover, the narratives generated within scenario exercises serve an important role in creating “shared pictures of socio-economic futures which bind together communities of decision-makers and enable them to change behaviour in response to changed images of the future” (Berkhout, Hertin, Jordan, 2002, p. 87).

2.2.6 PARTICIPATORY

The LCCV is explicitly participatory. The process includes the creation of working groups of local experts, key stakeholders and local government staff who are instrumental in the collection of local climate change information and the creation and approval of the scenarios used in the public workshops. There is a significant body of research on the study of methods of engagement (cf. Reed, 2008; Rowe, 2005; Marjolein van Asselt & Rijkens-Klomp, 2002). Engaging, well-designed, and participatory planning processes can help local planners and elected officials to overcome the significant challenge of making radical changes without antagonizing local residents (Aylett, 2011). The benefits of broad-based community involvement in planning and design are widely documented and significant, they include:

- improved quality of decisions through the “broader representation of knowledge and values” (Salter et al., 2010)

- integrating knowledge of an environmental problem to provide useful information to stakeholders, the public, and decision-makers (Downing, Moss, & Pahl-Wostl, 2000),
- enhancing the “capacity of citizens to cultivate a stronger sense of commitment, increasing user satisfaction, creating realistic expectations of outcomes, and building trust” (Al-Kodmany, 1999, p. 37 citing),
- creating a more equal distribution of power between the public, staff, and decision-makers (Robinson et al., 2011)
- engaging diverse stakeholders (Swart, Raskin & Robinson, 2004),
- increasing the likelihood that policy changes or calibrations may occur (Sabatier, 1988),
- engendering a sense of collective efficacy (Lorenzoni et al., 2007; Roundtable, 2006; Stamm, Clark, & Eblacas, 2000), and
- increasing the “likelihood that people will accept decisions that are made, find the solutions valuable, and actually implement the new rules” (Tribbia, 2007, p.246).

Participatory processes include benefits both for government actors, such as increased legitimacy of programs, and for citizens, such as increased government transparency and an opportunity to exercise their rights (Aylett, 2011). Moreover, it is increasingly recognized that in efforts to resolve sustainability issues, simply providing one-way information is insufficient (Talwar et al., 2011). There is now a large literature on the procedural, normative, and substantive reasons for having participatory citizen engagement processes in local planning (Aylett, 2011; Bendor, Lyons, & Robinson, 2012; Robinson et al., 2011; Salter et al., 2010; Stirling, 2006; Talwar et al., 2011). The instrumental reasons are most important here: that including participation on climate change improves trust and support for action (Robinson, Carmichael, et al., 2006; Bendor, Lyons, & Robinson, 2012). Well known applications that focus on public participation and collective action include Participatory Integrated Assessment and community planning charrettes (Girling, Kellett, & Johnstone, 2006; Salter et al., 2010). On the other hand, failings of and limitations of public involvements are well documented, for example, not hearing the silent majority, expert domination of process, and lack of credibility and equity in the process (Forest Practices Board, 2000; Hamersley Chambers and Beckley, 2003; De Marchi and Ravetz, 2001; Sheppard & Meitner, 2005).

2.2.7 FOSTERS SOCIAL LEARNING

Overall, place-based participatory decision-making processes such as the LCCV are thought to have value by encouraging social learning (cf. Lorenzoni, Jordan, Riordan, Turner, & Hulme, 2000; Pahl-Wostl et al., 2008; Salter et al., 2010; Schlumpf, Pahl-wostl, Schönborn, Jaeger, & Imboden, 2001; Siebenhuner, 2004; Pahl-Wostl, 2002; Pretty & Ward, 2001; Ridder, Mostert, & Wolters, 2005). This is a somewhat vaguely-defined, but important concept. In general, social learning “implies learning about the dynamics of change of the human system and the ecosystem, about the mental frames that shape decision making, and the biophysical and social consequences of change as triggered reciprocally in one system by the other through their interconnection” (Pahl-Wostl, 2002, p.401). By facilitating social learning, these place-based processes have benefits for decision-making on local and regional issues, particularly those that are complex, involve multiple stakeholder groups and high levels of uncertainty, such as local adaptation and mitigation to climate change (Robinson et al., 2011).

Social learning that occurs as a result of place-based participatory processes benefits decision-making in a number of ways. In particular, these processes can facilitate the development of a "shared understanding of the problem among different societal groups" (Schlumpf, Pahl-wostl, Schönborn, Jaeger, & Imboden, 2001, p.208). This shared understanding is partly due to the ability of such processes to integrate the different "frames" of stakeholders (such as between engineers, ecologists and farmers) (Mostert et al., 2007). Social learning processes also involve the “development of trust... the development and assessment of different alternatives, joint decision making, and joint planning for implementation” (Mostert et al., 2007, p. 20, citing Gray, 1989; Ridder et al., 2005). Furthermore, the development of trust is integral to the process of social learning, by learning about each other, developing new relationships, building on existing relationships and transforming adversarial relationships, individuals learn to trust each other and appreciate the legitimacy of each other's views (Reed, 2008).

On controversial issues such as local responses to climate change, this shared understanding and trust is critically important to a changed agenda and successful implementation of that agenda. Moreover, for change to occur that addresses a highly complex and pervasive issue like climate change, it “must be recognized as necessary, feasible, and advantageous to a broader range of actors and institutions” than are involved in traditional decision-making (Berkhout, Hertin, & Jordan, 2002). Based on previous research, the integrated, holistic, participatory and interactive components of the LCCV suggest that it

may be able to accomplish the difficult task of fostering a shared understanding of the problem and learning about trade-offs, combining knowledge from different sectors and groups, and integrating different frames and perspectives, and especially, to increase trust.

2.2.8 SUMMARY

Overall, based on the literature and previous experiments in place-based participatory processes, we can expect that the LCCV might be able to facilitate climate action at the community level because it includes some key components, including: local information presented spatially in a visually compelling format, future scenarios, focus on solutions, participation of scientists, decision-makers, policy-makers, and stakeholders, and can foster social learning. Despite the complex and deep obstacles to facilitating action on climate change at the local level, this review suggests that the LCCV has many characteristics that may help overcome many of the barriers to action for both individuals and local government partners. This review established the theoretical basis for why the LCCV would be able to affect participants and local government partners. This research project will attempt to understand whether these characteristics are in line with what participants thought was effective about the LCCV. The literature reviewed in this section included some evidence from practical applications of theory, but there is still a real need for more testing.

2.3 Scale of LCCV Effects

The LCCV involved participation from the public as well as local government stakeholders, staff, and decision-makers. The LCCV thus has the potential to facilitate change at an individual level and, indirectly, the local government level by influencing staff and decision-makers. Individuals who attended the public testing sessions might think that climate change was a more serious, urgent problem and behave differently as a result of seeing impacts in their neighborhoods. Local government staff and decision-makers who participated in the workshops and saw the final visualizations might change their individual behaviour and attitudes, and they might also take this changed attitude towards climate change to work and effect change at their place of work - the local government. We know that the personality and culture of the staff in senior leadership positions within a municipality will either serve as barriers or as catalysts to action on climate change (Burch, 2010). These scales are inter-related, and they are both important to facilitate action on climate change.

Local governments are a significant source of GHG emissions, and they have policy levels to control the sources of these GHG emissions. Globally, more than 75 per cent of GHG emission can be attributed to cities and urban areas (Grimm et al., 2008). In British Columbia, local governments control almost of half of the province's GHG emissions (Condon, Cavens, & Miller, 2009) from the provision of transportation infrastructure, waste management, utility provision, and land use planning (Betsill, 2001; Bulkeley & Betsill, 2005; Government of Canada, 1998; Sancton, 2009). In addition to policy levers, local governments play an important role in influencing social “values, attitudes and behaviour change” (Robinson et al., 2008, p.30). Local governments can transform themselves into low-carbon communities by facilitating changes in our collective choices about these critical sources of local GHG emissions.

However, effective solutions in any community will require the “combined efforts of all levels of government, business sectors, individuals, and the collective citizenry acting together” (Sheppard et al., 2011, p. 401). Even if local governments choose to take action, "action can be held back by institutional inertia, a lack of resources and personnel, or the active opposition of important actors in the local economy" (Aylett, 2011, p. 195). Municipalities may want individuals to change light bulbs, but, more importantly, they need to focus on processes that can effectively communicate the broader challenge and possible solutions to climate change, so that there is public engagement and support, and even lobbying for government-led action on climate change that will provide the enabling infrastructure for low-carbon resilient communities and regions (Sheppard, Pond, & Campbell, 2008). To achieve significant GHG emissions reductions at the local government level, individuals would need to change their behaviour, but more importantly, we need them to support neighbourhood and community-level solutions such as district energy, density, and transit (Robinson et al., 2008; Bendor, Lyons, & Robinson, 2012).

This is an alternative framework for viewing behaviour change, emergent dialogue, that is articulated by Robinson and colleagues in response to the extensive critiques of the information deficit model of behaviour change (Robinson, 2004, 2008; Salter et al., 2010). In this model, public engagement is not about educating the public, but about motivating "people to generate their own views about the type of world they want to live in (Tanenbaum, Antle, & Robinson, 2011, p. 6). By creating visualizations of potential future scenarios through participatory sessions and having conversations based on those scenarios with the public, the LCCV is not telling participants what to do, but inviting them to think about the future they want for their community. The LCCV fits into this framework by using a

combination of approaches including compelling and persuasive information on the need to act and facilitating a dialogue about how to respond.

Unsurprisingly, the availability of facilities and infrastructure to support changed behaviour are critical to changed behaviour e.g. the availability and quality of public transit (Lorenzoni et al., 2007). The poorer the services supporting the environmentally-sustainable behaviour, the less likely people are to use them (Kollmuss & Agyeman, 2002; Tribbia, 2007). We cannot incentivise people to get out of their cars without gaining support for the larger changes necessary for a low-carbon community, such as transit and bike infrastructure.

Moreover, we need support for the collective policy and investment decisions that are "required to achieve urban sustainability" (Robinson, Bradley, et al., 2006 p. 6). Recent research on pro-environmental behaviour has focused on lower barrier, collective actions, such as willingness to bear costs, support for policies, and voting (Stern, Dietz, Abel, Guagnano, & Kalof, 1999). However, there are a number of barriers to all types of individual behaviour change that must be acknowledged and addressed, and the means to influence behaviour change and willingness to support changed policy understood.

Overall, given the importance of both the local government scale and the individual scale, their inter-relationship, and the potential ability for the LCCV to have long-term effects on both of these scales, this research project seeks to understand if the LCCV was actually able to have long-term impacts on both scales. This research project therefore seeks to answer the following questions:

1. What was the long-term impact of the LCCV on individual participants?
2. What was the long-term impact of the LCCV on local government partners?

Additionally, this research aims to understand why the LCCV was effective, if it was. What are the possible, attributed reasons for the impact observed? Was it because it was spatial, visual, or participatory, or was there another reason not covered in the literature review? Thus this project also asks the following question:

3. Why was the LCCV effective (or not)?

2.4 Indicators of Effectiveness

For the purpose of this project, effectiveness has been defined as the ability of the LCCV to foster understanding of, support for, and action on climate change for the individuals and/or the local governments who participated. This project uses a document analysis and semi-structured interviews to determine whether the LCCV was able to cause changes in the indicators of effectiveness outlined below. Finding an effect means finding changes in the indicators of effectiveness, but not necessarily attribution. This project looks for effect and attribution to evaluate the effectiveness of the LCCV.

Designing a method of effectiveness evaluation requires deciding on the measures. For this research project, the measures are called the indicators of effectiveness. Keeney and Gregory outline three different types of measures: natural measures, proxy measures, and constructed metrics (2005) . All indicators chosen for this research were constructed metrics because there were no available natural or proxy measures for qualitatively understanding the long-term impact of the LCCV. In this research, the measures are operationalized through a filter for deciding whether or not there was effect and attribution – outlined in Section 3.9.

For this project, the indicators of effectiveness selected to understand the long-term impact of the LCCV were chosen with input from:

- a broader set of indicators to measure the effectiveness of transdisciplinary research evaluation based on the evaluation literature discussed in section 2.1 (Blackstock et al., 2007; Moser, 2009; Walter et al., 2007, Robinson & Wiek, unpublished),
- internal discussions at the Collaborative for Advanced Landscape Planning,
- the questions used to evaluate effectiveness at the LCCV public testing sessions (Tatebe et al., 2010)
- the goals of current LCCV projects, and
- the criteria for selection of indicators developed by Walter, Helgenberger, Wiek and Scholz, 2007.

Out of the long list of potential effectiveness indicators, those relevant to long-term outcomes were favoured over short-term indicators such as immediate products and outputs (Moser, 2009). Given the rarity with which concrete outcomes occur as a result of transdisciplinary projects (Salter et al., 2010),

the indicators of effectiveness were expanded beyond concrete behaviour change and policy outcomes to look for shifts other than direct policy impacts such as awareness and understanding, support for climate policy, network effects, and changed profile of climate change, to acknowledge that:

1. There are important intermediate shifts that will likely occur before we can expect actual emissions reductions and new construction to occur.
2. The LCCV projects in Delta and North Vancouver were essentially pilot projects, and not specifically designed as decision-support or behaviour change tools, but to test whether the visualizations resonated with participants.

Current LCCV goals

The current LCCV goals informed the selection of indicators. The LCCV was initially designed “to integrate the best available science at global, regional, and local scales, local GIS mapping, and stakeholder knowledge to visualize potential climate change impacts in a clear and compelling way, and to present possible policy and behavioural choices for communities” (Sheppard et al., 2011, p. 403). In short: is the process feasible? The goals of current LCCV projects are to (Tatebe et al., 2010):

- integrate the best available science and knowledge into policy and decision-making,
- bring the future climate scenarios “home” to the public and local governments,
- build awareness and capacity for behaviour change, policy development, and decision-making, and
- build a constituency for change in the wider community.

Despite the fact that these goals were not explicitly in place at the time of the Delta and North Vancouver projects, the current goals have been used to help derive a wide suite of possible outcomes for the initial projects.

Criteria for selection of indicators

Lastly, the broad suite of potential indicators for effectiveness was run through the following criteria for selection of indicator to select the final 11 indicators (based on Walter, Helgenberger, Wiek, & Scholz, 2007):

- a) Is it useful to understand the project outcomes?
- b) Does it relate to the goals of the LCCV project?
- c) Is the indicator scientifically and consistently designed?
- d) Can it be measured via an interview and/or document analysis?
- e) Does it provide relevant information?

f) Is it realistic for the effect to have occurred within the timeline?

Given the highly experimental and exploratory nature of the research project, the value of understanding the impact at the individual and local government level, and the wide-range of possible effects, it was considered necessary to trawl across a wide range of possible indicators of effectiveness to discover possible impacts. The following indicators therefore range from knowledge, attitude and behaviour change impacts on individuals to organizational and policy changes at the local government level. Only some of the chosen indicators of effectiveness were intended outcomes of the LCCV. These include: knowledge transfer, understanding of climate change, level of concern, and support for climate policy. The LCCV was not designed to foster behaviour change, an increased willingness to consider radical policy, or any organizational changes, though these outcomes might be hoped for. These were included because it would be significant if the LCCV was able to affect these outcomes, and because it is theoretically possible for the LCCV to affect these outcomes. Recall was added as an indicator of effectiveness as this was a longitudinal study and this is an important outcome on its own.

Section 2.1 discussed some of the distinctions between evaluating projects based on process, outputs, and outcomes. The reality is that these are often blurred; however, strictly speaking, according to the literature, the selected indicators span outputs and outcomes (Faludi, 2000; Moser, 2009; Sheppard, 2005b; van der Waals & Vermeulen, 2002). Indicators to measure the effectiveness of the LCCV process itself were not included.

2.4.1 KNOWLEDGE

Recall

This indicator was chosen as a very simple measure of how much participants could remember about the LCCV process. Given that this was long-term evaluation, what participants can remember is a finding in itself about how influential the LCCV was in their lives (Mayer et al., 1996).

Knowledge transfer

This indicator was selected to measure the LCCV's effectiveness in terms of participants' use of the knowledge, LCCV visualizations and/or tools from the LCCV such as the use of scenarios to help participants communicate climate change to their family/friends, colleagues or the public and/or to inform their decision-making at work. A lack of local information on climate science is a significant

barrier to climate action (Bassett & Shandas, 2010). This indicator partially helps to understand whether the LCCV helped to overcome this barrier.

Understanding of climate change

This was included to test participants' understanding of climate change, and to probe whether the LCCV had an effect on this understanding. The public's awareness of climate change (Kempton, 1997; Lorenzoni & Pidgeon, 2006) and perception of the risk from climate change (Lorenzoni et al., 2006) influences their willingness to support action by their governments. Public understanding of the need to respond to climate change and support for that action can be an important impediment to action for local governments (Robinson & Gore, 2005). Indeed, individual attitudes, beliefs, values, and emotional reactions can “affect organizational and collective actions in firms, communities, and governments and have been shown to affect acceptance of policy measures and technologies” (APA, 2009, p. 148-9)

2.4.2 ATTITUDE AND BEHAVIOUR CHANGE

Level of concern

Participants' level of concern with climate change was chosen as an indicator to measure the effectiveness of the LCCV in influencing participants' to be more concerned about climate change, and therefore potentially more likely to change their individual behaviour, and support action on climate change (APA, 2009; Lorenzoni, Nicholson-Cole, & Whitmarsh, 2007).

Behaviour change

This indicator was chosen as a measure of the LCCV's effectiveness in terms of encouraging participants to engage in pro-environmental behaviour and to overcome many of the complex and significant barriers to behaviour change (e.g. APA, 2009; Kollmuss & Agyeman, 2002). The LCCV was not designed to facilitate behaviour change, and, more importantly, we know that that the provision of information is insufficient to encourage pro-environmental behaviour change (Hines, Hungerford, & Tomera, 1987; Stern, 2000; Chess & Johnson, 2007). After decades of dominating research and practice (cf. Ajzen & Fishbein, 1980; Gardner & Stern, 1996), the information deficit model as an explanation for the lack of action on climate change has been debunked. This would be an interesting finding, if an effect is found, but it is unlikely.

Support for climate policy

This indicator was chosen to test whether the LCCV process was capable of encouraging participants to adopt more favourable opinions towards government action on climate change. Mitigation and adaptation responses at the local level are often unpopular, such as increased infrastructure for alternative modes of transit, pricing to encourage modal shifting, and zoning to encourage increased density. As mayors and council members are responsible to the public and must face re-election, they are sensitive to public opinion. Indeed, research suggests that policymakers are attentive to public preferences (Robinson, Carmichael, et al., 2006; Soroka & Wlezien, 2005). The ability of LCCV to influence individual's support for climate policy would signify that it could help facilitate local governments implementing climate change action and policy.

Willingness to consider radical policy

This indicator was included to capture interim changes within an organization. The willingness of local government staff to consider options is an important pre-cursor to implemented policy change as local government staff have a strong influence on the range of policy options presented to politicians for consideration. It is also a proxy measure of whether the LCCV is able to help facilitate community responses to climate change by helping local governments break out of traditional planning processes that are ill-equipped to respond to climate change (Bedsworth & Hanak, 2010; Berke & Conroy, 2000).

2.4.3 ORGANIZATIONAL AND POLICY CHANGE

Network effects

Effectively responding to climate change will often require, making new forms of inter-agency coordination and wider geographic scales necessary for decision-making (Bedsworth & Hanak, 2010; Berke & Conroy, 2000). Network effects was included as an indicator as it was posited that the LCCV could have helped to facilitate climate action at the local level by helping to create, expand or strengthen participant networks and alliances, increasing the connectedness between staff members, scientists and stakeholders. Greater connectedness both between allied staff in local governments and between staff and supportive scientists and stakeholders could help local governments overcome some of the barriers to action on climate change such as a traditional lack of coordination between siloed departments and a lack of necessary information (Burch, 2010; Betsill, 2001).

Profile of climate change

To help evaluate the effectiveness of the LCCV, this evaluation sought to understand if the LCCV had played a role in changing the priority and importance of climate change within the participant local organizations. An increased profile of climate change within a local government was posited as an interim indicator and a potential pre-cursor for changed policy and action on climate change.

Organizational structure

This indicator was selected to measure the ability of the LCCV to influence decision-makers to direct more organizational resources towards climate change and to change organizational structure to more effectively respond to climate change. How well a community will respond to the threat of climate change is partially determined by "institutions, organizational structures, and the cultures that characterize them" (Burch, 2009, p.103). As climate change is a relatively new problem, municipalities may not yet have re-organized their departmental hierarchies, job descriptions, performance standards or inter-departmental methods of collaboration to best adapt and mitigate to climate change (Burch, 2010; Betsill, 2001). The specific indicator was a shift in organizational structure (including number of staff dedicated to climate change, location of climate change in hierarchy).

Climate policy & projects

This indicator was selected to understand whether the LCCV was able to help facilitate a community response to climate change in the form of changes in policy, actions, or projects to mitigate or adapt to climate change. The LCCV may have been able to contribute to changed policy and action on climate change by providing information, ideas and shifting understanding of staff and decision-makers. In the policy sciences, the "social variables commonly identified as contributing triggers of change include various combinations of the role and history of ideas, beliefs, technology, the interests of key actors, institutions, market forces, learning, and scientific information" (Hagerman, Dowlatabadi, Satterfield, & McDaniels, 2010, p. 193 citing Hajer, 1995; Kingdon, 2003; Sabatier & Jenkins-Smith, 1993; Sabatier, 2007). In some cases scientific information may be an important contributor to policy change (Ingram & Fraser, 2006).

3 Methodology

3.1 Introduction

This research was carried out as part of a larger research project at the Collaborative for Advanced Landscape Planning at UBC: *Local Climate Change Visioning Tools and Process for Community Decision-Making*. The full research project is an exploratory multiple-case study: an in-depth, mixed-method investigation of the effectiveness of the LCCV process in communities across Canada. Data sources for the larger research project include pre/post questionnaires, observations and anecdotal evidence, semi-structured longitudinal interviews, and archival documents.

This is a multiple case study research design to evaluate the long-term impact of a transdisciplinary research process using a document analysis followed by semi-structured interviews with key decision-makers and stakeholders in two case study communities: Delta and North Vancouver. Given that the ability of the LCCV to successfully support climate change action at the local level is a real-life, contemporary phenomenon, an experimental design is not possible; however, qualitative evaluation is still a valuable research goal because it can answer why and how questions about real world processes that an experimental, controlled designed with quantitative data cannot. Case study methods are considered adequate for the analysis of contemporary phenomena in their real world context (Yin, 2003).

A multi-case comparison research design was chosen to allow for the completion of a credible longitudinal evaluation of a previous multi-case comparison design project. This research design is not intended to provide sufficient basis for scientific generalization. The case study sites were not chosen primarily for the purpose of comparison, the focus was instead on understanding the specifics of the cases and the impact of the LCCV process in these two communities.

3.2 Research Questions

This research seeks to add to our understanding of what can influence individuals and local governments to act on climate change by carrying out a long-term impact evaluation of the LCCV, a transdisciplinary research project. This research project will help us understand if (and why) the LCCV was effective and

act as a test evaluation framework for future evaluations of TdR project. The following research methodology is designed to answer the following questions:

- 1) What was the long-term impact of the LCCV on individual participants?
- 2) What was the long-term impact of the LCCV on local government partners?
- 3) Why was the LCCV effective (or not)?

The indicators chosen to answer these research questions are outlined and discussed in Section 2.4. The specific method of measurement for each indicator is outlined in Table 3.2.

3.3 Case Selection

The Corporation of Delta and the District of North Vancouver were chosen as the case study sites mostly for practical reasons. LCCV processes were first carried out in these two communities six years ago and the research team at the University of British Columbia is responsible for the evaluation of these two communities. Similarities between the cases may also have reduced the variability between the cases. Delta and North Vancouver are both contained within a common regional district, subject to the Canadian parliamentary system, and the same regulatory framework, provincial policies and climates, and have similar levels of economic development. However, there is some cultural and environmental variation between Delta and North Vancouver; in particular, they are facing very different climate change issues.

3.4 Context: British Columbia

The province of British Columbia (B.C.) provides an excellent region to study responses to climate change. In brief, B.C. is already experiencing many of the impacts of climate change, has made significant attempts to implement climate change policy, and is already experiencing difficulty in effectively implementing their climate change agenda.

Since 2007, B.C. has introduced a significant suite of legislation, plans and policies to respond to climate change, including enabling a cap and trade system and a low carbon fuel standard, implementing an economy-wide tax on carbon, establishing aggressive emission reduction targets and some considerable spending on climate change actions, though the budget has been significantly reduced due to the

economic recession (Government of British Columbia, 2007). The provincial government has also made some efforts with regards to public outreach and education on climate change through the LiveSmart BC initiative, though this remains fairly limited (Government of British Columbia, 2011).

With regards to community action specifically, the government has enacted the *Green Communities Act* (Government of British Columbia, 2008), which requires all official community plans and regional growth strategies to include greenhouse gas emission reduction targets, policies and actions. Similarly, the government has created a Climate Action Charter, which over 180 communities have signed so far, committing municipal operations to being carbon neutral by 2012, to measure and report their GHG emissions, and to set benchmarks for community development (*British Columbia Climate Action Charter*, 2009). Taken together, the initiatives launched by the Government of BC on climate change in 2007 mark a significant departure from previous policy and a dramatic shift for expectations of local governments. In combination with the Community Charter in British Columbia, municipalities now have relatively significant powers and some freedom to enact climate action policies (Smith & Stewart, 2009).

The landscape of support for climate action in British Columbia is mixed. Polling done in June of 2011 shows that 69% of British Columbians are worried about global warming, 70% support the "province being a leader in taking action to solve the problem, and 49% want to see at least some carbon tax revenue being invested in clean energy projects (Pembina, 2011). Despite initial opposition to the carbon tax, recent polling done by Environics shows that public support for the carbon tax was at an all-time high in 2011, with 57% expressing support and 41% opposed (Environics, 2011). Despite this support, competition between different public values and priorities, means that there is no widespread agreement on how British Columbia should be tackling climate change, as evidenced by the large controversy that surrounded the proposed run-of-river energy projects in 2009 (Kimmitt, 2009). This is one area where the rubber hits the road in terms of translating provincial targets into action on the ground at the community level.

DELTA

The Corporation of Delta is a district municipality of approximately 100,000 residents that forms part of Metro Vancouver. Delta encompasses about 365 square kilometres located south of Richmond. It is a low-lying community surrounded by water on three sides - the Fraser River, Boundary Bay, and the Strait of Georgia. It is comprised of three relatively distinct communities: Ladner, Tsawwassen and North Delta

that are comprised of a mix of industrial operation, suburban-style residential development, and protected farmland.

NORTH VANCOUVER

North Vancouver is also a district municipality of approximately 86,000 residents that is also part of Metro Vancouver. It encompasses a large area - 160 square kilometres - ranging from 0 to 1400 metres above sea-level. The District has two reservoirs: Capilano and Seymour that are an important source of drinking water. The District is bounded by the Capilano River, the Indian Arm, Burrard Inlet and the Coast Mountains. The District is dominated by large single-family housing with a few commercial centres.

3.5 Context: North Vancouver and Delta LCCV Projects

LCCV projects were undertaken by the Collaborative for Advanced Landscape Planning in both Delta and the District of North Vancouver. In both of these communities, CALP proposed the project to the local governments who agreed to participate. While the overall format of the LCCV was the same in both communities, the extent and time period of the involvement of CALP in the two communities varied, as illustrated in Table 3.1.

In Table 3.1, workshops refer to events held with LCCV staff, local stakeholders, municipal staff and climate change researchers to develop the scenarios and visualizations used in the LCCV testing sessions. Testing sessions refers to the three hour public sessions held to show the developed visualizations and evaluate their impact on the audience.

Table 3.1 Summary of LCCV processes in Delta and North Vancouver

	Delta	North Vancouver
Time period	2005-2006	2007
Number of LCCV working group workshops held	Three: mapping, climate, mapping, and preliminary visualization.	Three: mapping, climate, mapping, and preliminary visualization.
Local government staff involvement in the LCCV (beyond working group members)	Delta staff participated in working group workshops as well as a final testing session, similar to the workshop done with the public. At that time, they also received a	North Vancouver staff were involved in the LCCV working group process, but did not participate in a final staff workshop, though they did

	Delta	North Vancouver
	presentation on the early results from the public sessions.	receive summary presentations of results.
LCCV testing sessions held with public	Four testing sessions held. Two with visualizations and two without.	Yes, but they were not very well-attended, despite advertisements in paper.
Number of LCCV participants in the public testing session	One hundred thirty members of the public, out of a population of one hundred thousand in six public testing sessions.	Approximately twenty five members of the public out of a population of fifty thousand in one public testing session.
Dissemination of results to public	Two articles were published in the <i>Delta Optimist</i> , an exhibition in the Delta Museum, and one presentation to a local school.	Two articles were published in the <i>North Shore News</i> , and several presentations to local schools.
LCCV Results presented to Council	CALP staff made two presentations to the Environment Advisory Committee, a sub-committee of the Council, and included the final visualizations and results from the public testing sessions.	CALP did not present the results to Council at the District of North Vancouver.
CALP Involvement in later official local government planning.	At a public meeting hosted by the Corporation of Delta on the Tsawwassen Area Plan, CALP staff presented climate change-related issues were informed by the LCCV.	CALP was not involved in later official government planning in North Vancouver.
Post-Study Follow-up	<p>Significant follow-up.</p> <ul style="list-style-type: none"> • A Final Technical Report of the LCCV process and results was given to staff (Tatebe et al., 2010). • Study into methods to retrofit existing neighbourhoods (Pond, Cavens, Miller, & Sheppard, 2010) • New climate adaptation project started through the Regional Adaptation Collaborative (“BC Regional Adaptation Collaborative,” 2011). • Future Delta videogame project (Malcolm, 2012). 	<p>Some follow-up.</p> <ul style="list-style-type: none"> • CALP conducted a Renewable Energy Capacity Study for the North Shore (Flanders & Sheppard, 2010). • A draft report of the study was prepared with input from District of North Vancouver. • A final report has not been published to date.

3.6 Effectiveness Indicators

Table 3.2 outlines the selected indicators of effectiveness developed for this project as well as the method of measurement.

Table 3.2 Selected indicators of effectiveness and method of measurement

Indicators	Method of measurement	
	Interview	Document analysis
Recall	Open-ended questions at the beginning of the interview, with very limited prompting, about what participants remembered when they thought of the LCCV process	Not measured.
Knowledge transfer	Participants were explicitly asked whether they had used any of the products or tools from the LCCV in their everyday life or work.	Documents were reviewed for any explicit or implicit evidence that the knowledge, tools or concepts from the LCCV (such as scenarios, visualizations, or information including risks of flooding and threats to water supply) were used after the LCCV process. This included looking for references to the LCCV process or products as well as usage of the outputs.
Understanding	Participants were asked to talk about their thinking on climate change and whether it had changed in the last few years, and whether the LCCV had affected their views towards climate change.	Not measured.
Level of concern	After the first question on whether participants' thinking on climate change had changed, participants were prompted as to whether their level of concern with climate change had altered as a result of the LCCV.	Documents were reviewed for the language used to describe the problem, impacts or solutions, and for their explicitly stated rationale for implementing the action, policy or plan being discussed in the document, including explicit reference to the LCCV.
Behaviour Change	Participants were asked whether the LCCV had motivated them to change their behaviour, and whether they had changed their behaviour had changed since the LCCV process.	Not measured.

Indicators	Method of measurement	
	Interview	Document analysis
Support for climate policy	Participants were asked whether their support for climate change policies and planning had increased in the last three years, and, if so, whether this was a result of the LCCV process. Participants were also asked whether their support had manifested this support in the form of voting, letters to the editor, or communication with their elected representatives.	Not measured.
Consider radical policy	Local government staff was asked whether they became more willing to consider policy options they previously might not have considered because of their experience in the LCCV.	Not measured.
Network effects	Participants were asked about the frequency and nature of their continued relationship with contacts they had met through the LCCV process.	Not measured.
Profile of Climate Change	Local government staff participants were asked whether climate change was discussed more frequently within the organization after the LCCV process.	Documents were reviewed for the prominence of climate change within the document, including how often it was mentioned and whether it was included in any executive summaries, highlights or conclusions, and any mention of the LCCV
Organizational Structure	Local government staff was asked whether their organization had directed more resources towards planning for climate change as a result of the LCCV process, and prompted regarding job descriptions, departments and number of staff.	Not measured in document analysis due to time and resource constraints.
Climate Policy & Projects	Local government staff participants were asked whether their organization had adjusted its planning, policies, targets, procedures, or tools for responding to climate change and whether that change was a result of the LCCV process	Documents were reviewed for any evidence of: the adoption of LCCV recommendations*, the creation of specific climate change plans, or incorporation of climate change into plans, and the implementation of mitigation or adaptation strategies.

* In Delta, the recommendations were based on the Delta Technical Report and the PowerPoint presentation made to Council (Tatebe, Shaw, & Sheppard, 2010, p.27, 36-37). In North Vancouver, the recommendations were based on the PowerPoint presented to North Vancouver staff.

3.7 Document Analysis

The first phase of the research consisted of a document analysis. The purpose of the document analysis was to:

- Find evidence of effectiveness for the indicators outlined above in Table 3.2
- Prepare for the semi-structured interviews by looking for effects of the LCCV that could be attributed to the LCCV in interviews with local government staff and elected officials,
- Contextualize the state of climate change action or inaction in the community,
- Confirm information from the semi-structured interviews, and
- Screen for potential long-term impacts of the LCCV process.

The document analysis consisted of a review of the climate policies, actions and plans specifically related to climate change in the two case study communities. Documents were included in the analysis if they were: publicly available official government documents, published between 2004 and 2011, related to climate change, and in English.

The availability of public documents in the Corporation of Delta and the District of North Vancouver varies significantly. Delta has a searchable database of all its public documents, while the District of North Vancouver does not. To achieve some consistency in the analysis and limit the scope of the document analysis to a size that could be completed within the time frame of this research, the following steps were taken to choose which documents were analyzed:

1. Major documents, including Annual Reports, OCPs, and Mayor's inaugural speeches were systematically reviewed. References to other documents that focused on climate change within these documents were included in the analysis.
2. Staff at Delta and North Vancouver were contacted (before the interviews) to provide guidance on the specific documents that were relevant to the research.
3. The Technical Report written by CALP (Tatebe et al., 2010) and the doctoral dissertation of a UBC student that had completed similar research in Delta and North Vancouver (Burch, 2009)

were reviewed. Relevant documents mentioned in these documents were included in the analysis.

4. The official websites of both local governments were systematically reviewed for relevant information and documentation.
5. The news releases available in the online archive on both official government websites were reviewed.
6. "Climate change Delta" and "Climate change District of North Vancouver" were used in a Google search. Relevant documents found in the search were included in the analysis.
7. Keywords based on CALP recommendations were used in Google searches to find documents relevant to the CALP recommendations. Relevant documents found in the search were included.
8. After the interviews were completed, Google was used to find documents that related to policy and/or decision changes interviewees suggested had been influenced by the LCCV. These documents were analyzed using the same filter as the rest of the documents.

Overall, 43 documents from the Corporation of Delta were reviewed, and 32 documents were reviewed for the District of North Vancouver. The analysis was completed without an expectation that there would be explicit evidence that the LCCV had a direct impact on any of the indicators. Once the document analysis was completed, a simple trend analysis was conducted to find any obvious patterns in the indicators over time.

3.8 Semi-structured Interviews

The second phase of the research consisted of twelve semi-structured interviews with key stakeholders, staff and decision-makers in the District of Delta and the District of North Vancouver. The purpose of the semi-structured interviews was to understand more fully what (if any) changes with regards to climate change responses the community had undergone since the LCCV process, and more specifically, to explore the nuances of the role that the LCCV may or may not have played, and why. Moreover, the semi-structured interviews were used gather data on all the indicators in Table 3.2, informing the effectiveness evaluation. Importantly, the interviews were used to determine if the effects detected in the document analysis were a result of the LCCV.

A qualitative method of data collection, and especially semi-structured interviews were chosen for a few reasons. Firstly, the chosen indicators for effectiveness chosen are not easily quantified. Secondly,

expert interviews are effective in retrieving contextual knowledge (Merton, Lowenthal, & Kendall, 1990). Thirdly, 'how' and 'why' questions are better asked through a flexible and open method for the collection of qualitative data, allowing for the capture of nuance, as well as contextual knowledge, and information that might not otherwise be revealed in a survey. Moreover, the increase in response validity from doing interviews instead of surveys was deemed worthwhile, despite the increased difficulty of coding and analyzing more open-ended interviews (Aberbach & Rockman, 2002).

Overall, a semi-structured protocol was chosen instead of structured or focus interviews as a compromise between eliciting the nuance encouraged in less rigid interview protocols and the need to elicit information on all the selected indicators of effectiveness. Face-to-face interviews were chosen to elicit more in-depth responses and to observe the interviewee. To limit bias, the interviews were conducted, transcribed and analyzed by the author, who was not part of the original LCCV projects in Delta and North Vancouver.

3.8.1 CRITERIA FOR INCLUSION OF PARTICIPANTS

Participants for the semi-structured interviews were recruited based on the following criteria:

- Age (at least 19 years of age), and
- Participation in the LCCV process, and
- Employment (members of the municipal planning/engineering department staff, and council members, including mayors), or
- Membership of the LCCV working group (an advisory committee, which included members of community subcommittees such as Environment and Planning, as well as informed members of the public and stakeholders).

Members of the LCCV research team were excluded as they are not truly unbiased participants and actively contributed to building the scenarios and presentations used in the LCCV. A potential list of participants was developed by reviewing the meeting agendas and participant lists for the original LCCV workshops held in 2006. Those participants who met the selection criteria and for whom an email address could be found were contacted through an email letter of invitation to participate in the research study (see Appendix C for the Letter of Recruitment). Thus the criteria for inclusion were both substantive and practical: participation in the LCCV process and ability to contact by email.

Nineteen participants in Delta and eighteen participants in North Vancouver were invited to participate in this study. In Delta, five participants accepted, one participant declined, and 13 did not respond. In North Vancouver, seven participants in agreed and 11 did not respond. The total number of interviews ultimately completed was 12. In total, four of the participants were members of the working group and are not local government staff, and 8 participants are local government staff or decision-makers and also members of the working group. In North Vancouver, one participant was a stakeholder member of the working group but not staff, and the other six interview participants were members of the working groups and local government staff. In Delta, three participants were stakeholder members of the working group but not staff, and two participants in the interviews were local government staff.

As described in earlier in this chapter, the extent and time period of the LCCV in each community differed slightly, as did the level of involvement of the participants.

Table 3.3 Level and type of involvement in the LCCV

	# Working Group Meetings Attended	Attended Final Public Testing Session
North Vancouver		
Elected Official (1)*	One	No, saw final versions of the visualizations at a presentation at a later date.
Staff (2)*	One	No, saw final visualizations at staff presentation.
Stakeholder (3)	One	No, saw final versions of the visualizations at a presentation at a later date.
Staff (4)	Two	No, saw final visualizations at staff presentation.
Staff (5)*	Approximately ten	No, saw final visualizations at staff presentation.
Staff (6)	Two	No, saw final visualizations at staff presentation.
Staff (7)	Two	No, saw final visualizations at staff presentation.
Delta		
Staff (8)*	Approximately ten	Yes.
Stakeholder (9)	Three	No, saw final visualizations at staff presentation.
Staff (10)*	Did not attend working group meetings, became Delta staff right at end of the process and was very involved in the follow-up	No, saw final versions of the visualizations at a presentation at a later date.
Stakeholder (11)	Two	Unclear whether saw final visualizations.
Stakeholder (12)	Six	Yes.

Participants with asterisks are those participants identified by the participants as local climate change champions through the interview process, where local climate change champion is defined as a staff

person in the local government who is concerned about climate change and is interested in moving climate action plans and policy forward within the local government. Other staff look to these local for support and guidance as to how move climate-friendly policy forward within their own departments.

3.8.2 INTERVIEW PROTOCOL

The interview protocol was developed to answer the research questions, and probe for effects for the specific indicators of effectiveness selected in this study (see Table 3.2). In addition, it was designed to be open-ended enough to allow for the interviews to be open to new themes and effects not necessarily related to the pre-defined indicators of effectiveness, but also structured enough so that the interviewer could elicit information on the pre-defined indicators of effectiveness.

At the beginning of the interview, the interviewer:

- Introduced themselves as a Masters student at UBC doing research on the effectiveness of landscape visualization tools and visioning process who was not a member of the original research team,
- Reminded participants of the purpose of the project and the project funders,
- Reviewed the consent form, and
- Reminded participants that they were being asked their personal opinions about the project, so there were no right or wrong answers, and both positive and negative feedback would be helpful for the purposes of the research.

The interviewer followed a protocol containing questions regarding the participant's individual learning, behaviour change and institutional and policy change (see Appendix D for the interview protocol). For each category of potential effects, the interview protocol began with more open-ended questions, such as: "How do you regard topic X?" As the conversation flowed, clarifying questions were asked, such as "How does this relate to X?" or "Why do you think Z happened".

Before the final section of the interview when participants were asked their opinion of the benefits and limitations of the visualizations that were used, participants were shown select examples of visualizations from the LCCV (see Appendix E).

Given participants' varying time constraints, level of involvement with the LCCV, and role (local government staff, council or mayor vs. a local citizen who was on the LCCV working group at the time), some interviews went more into depth into various aspects of the interview protocol than others, particularly the section on institutional and policy change. Interviews were conducted between January 2011 and March 2011 and lasted from 45 to 70min. They were conducted at the participant's venue of choice (either their office or local coffee shop).

3.8.3 QUALITATIVE DATA ANALYSIS

All interviews were audio-recorded and transcribed verbatim with the permission of the participant. Notes were taken during and following every interview to provide extra context to the transcripts, including facial expressions, intonation, body language and pauses (Poland & Pederson, 1998). These notes were later added to the transcript and included with the text of the interview during coding and analysis. The interview text was systematically coded using the qualitative data analysis software (Atlas Ti). The coding scheme was developed through an iterative process informed by the literature presented above, the research questions, selected indicators of effectiveness (see Table 3.2) and some themes that emerged that during the interviews. The coding structure did evolve as the analysis progressed, reflecting new information provided by the interviewees (Strauss & Corbin, 1998). Quotes were organized and clustered according to common pre-defined themes based primarily on the indicators of effectiveness.

3.9 Effect and Attribution

One of the main weaknesses of this research design is how to separate effect and attribution, where effect means finding changes in the indicators of effectiveness, and attribution means being able to relate that change to the LCCV. Given the aim of the research, and the research design, it is very difficult to definitively attribute any changes made with regards to climate action in Delta and North Vancouver to the LCCV. Nonetheless, a high standard was set in order to determine effect and attribution for this research project. For the document analysis, an effect was only attributed to the LCCV if it was explicitly referenced. In the interviews, an effect was only attributed to the LCCV if the interviewee explained that the effect was a result of the LCCV. Thus, triangulation was built into the research design to mitigate the attribution problem. The document analysis was an attempt to find both effect and attribution for the effectiveness indicators through explicit reference to the LCCV. The interviews helped to attribute any effects found to the LCCV with some degree of confidence. However, definite attribution is still difficult.

Interviews are still a very imperfect measure for attributing the effect of the LCCV as it relies on the self-reporting of the staff participants. This is problematic as it relies on their memory and understanding of events, as well as the memory of those staff that chose to participate in the interview.

Moreover, definitely determining the effect of the LCCV is very hard, if not impossible. There are many multiple possible causes for the action, or inaction, of the individual and local government participants in the LCCV and any of the causes on their own would be sufficient to account for the effect. It is possible to see influences in the broader complex ecosystem of change, but not to determine linear causality. Since this is not an experimental design, establishing causal relationships between a project and all of its direct and indirect effects, and correctly identifying intervening factors is "extremely difficult" (Laurian & Kouwenhoven, 2010, p. 745). It is not possible to tell, for example, whether the LCCV would have had a larger influence if there had not been staffing changes at the local government and an economic downturn; or conversely, whether the LCCV would have had a smaller influence had the *Local Government Act* not been introduced by the Provincial Government in 2007. Lastly, given the nature of the research design, it was not possible to separate out the influence of the various aspects of the LCCV process, such as, the visualizations versus the visioning process.

Overall, however, the methodology used in this research to determine when an effect could be attributed to the LCCV was conservative: either the participants said an effect was due to the LCCV in the interviews, or the LCCV was explicitly referenced in the document analysis. As this evaluation was not carried out by an independent research group and it was a test of a new evaluation framework, it was considered necessary to have a high standard for determining attribution.

4 Document Analysis

4.1 Introduction

This chapter presents the findings from the document analysis conducted for the Corporation of Delta and the District of North Vancouver. While this was a limited document analysis, the interviews provided insight into how much the organizations used LCCV concepts or tools, how influential the LCCV was in terms of changing the organization's level of concern with climate change, the profile of climate change within the organization, and in organizational and policy changes potentially related to the community's participation in the LCCV. Chapter 3.7 describes the detailed methodology for the document analysis. The full list of documents reviewed can be found in Appendix B.

4.2 Timeline of Key Climate Actions & Plans

As illustrated in Table 4.1, both communities have made significant commitments to act on climate change. While they both had some planning for climate change in place prior to the passing of the *Local Government Act* and the creation of the Climate Action Charter in 2007, both communities significantly increased their climate action policy and planning in 2007.

DELTA

Climate change was not explicitly addressed in official policy by Delta until the 2007 Climate Change Initiative, though issues related to the environment and sustainability were generally referred to in Delta's Official Community Plan (before the amendments in 2010 to explicitly address climate change issues).

Overall, the focus of climate action in Delta to date is on reducing corporate emissions. Since 2008, the Corporation has undertaken retrofits for two recreation and leisure centres, hired an energy manager with BC Hydro funding, implemented a solar hot water system for the Municipal Hall, and achieved Gold level in the Fraser Basin Council E3 Fleet initiative. This focus on corporate emissions is reflected in the level of milestone achievements within the Partners for Climate Protection Program: Delta has achieved corporate milestone 4 in 2011, but only milestone 1 for the community ("Partners for Climate Protection," 2011). Moreover, Delta has received recognitions for its corporate leadership on climate action, including the Energy and Climate Action Award for corporate action from the Community Energy.

NORTH VANCOUVER

The community has been interested in sustainability since at least 2002, as demonstrated in the 2002 Maplewood Plan (District of North Vancouver, 2004). The District adopted the Natural Step framework in 2004; however, there was little focus on GHG reduction until 2008 when a Sustainability Action Plan was completed through the Natural Step framework, though this still focused on reducing corporate GHG emissions. It was not until 2009 that the District started serious planning for measuring and reducing community GHG emissions.

In the Partners for Climate Protection Program, the District has achieved milestone 4 by 2009 in both the corporate and community category. After a two-year public engagement process, in June 2011, the District replaced their 20 year-old OCP with a new OCP that includes significant action and policies for mitigating and adapting to climate change in the community. The District of North Vancouver is now considered a leader in climate action (“BC Climate Action Toolkit,” 2011).

Table 4.1 Highlights of climate action in Delta and North Vancouver

	Year	Delta	North Vancouver
LCCV Process ongoing in both cases.	2005	Became a member of Federation of Canadian Municipalities Partner's for Climate Protection program.	Corporate building energy audit completed.
	2005	Mayor declares climate change a priority. Environment Advisory Committee reinstated as a standalone entity.	District committed to becoming among world's most sustainable communities by 2020 (Burch, 2009) .
	2005	OCP reviewed. Issues related to the environment and sustainability considered.	
	2006		Sustainability Framework established.
	2007	Dike and Drainage Advisory Committee created.	Became a Gold member of the Community Action on Energy and Emissions Initiative. Natural Hazards Task Force established.
Provincial Government Legislation Implemented	2007	Signed BC Climate Action Charter. Committed to become carbon neutral in operations, to inventory GHG emissions, and to create strategies to reduce community GHG emissions.	
	2007	Climate Change Initiative adopted by Council and launched across 9 departments; Inter-departmental Climate Change Working Group created.	Baseline greenhouse gas inventory completed using The Natural Step.
	2008	Funding for dike upgrades; Flood Risk and Consequence Study complete.	The Natural Step Sustainability Action Plan (draft) completed.
	2008	Environmental Services department renamed the Office of Climate Action and the Environment.	First Low Carbon Cafe held - a grassroots engagement initiative.
	2009	Municipal Precinct Renewable District Energy Study completed.	Community Climate Change Action Report completed.
	2010	OCP amended to comply with <i>Local Government Act</i> (Government of British Columbia, 2008). GHG reduction targets adopted.	Forest Ecosystem mapping and a Framework for Ecosystem-Based Management adopted.
	2010	Amendments to Tsawwassen Area Plan that included plans for densification abandoned due to negative public response.	
	2010	Mexico Pact signed. One of seven Canadian signatories.	
	2010	CEEI Completed for 2007 GHG emissions, as required by the Province of British Columbia.	
	2010	Partnered with Climate Smart to offer climate and energy training to small and medium-sized businesses.	
	2011	By provincial mandate, new homes are required to be solar hot water ready.	
	2011	Study to model sea-level rise and possible adaptation options completed.	Joined the BC Mayors Climate Leadership Council.
	2011		OCP amended to comply with <i>Local Government Act</i> . GHG reduction targets adopted.
	On-going	Creation of a Community Energy and Emissions Plan	Drafting a Community Action and Climate Change Plan.

4.3 Findings

The complete table of findings for the document analysis can be found in Appendix A. This section highlights the findings from the document analysis for Delta and North Vancouver for the selected effectiveness indicators: knowledge transfer, level of concern, climate change profile and organizational and policy changes.

4.3.1 DELTA

The document analysis conducted of Delta's official documents showed, overall: some evidence of knowledge translation, particularly with regards to flood planning, an overall increased level of concern and profile of climate change, especially after 2007, and some implementation of the recommendations that came out of the LCCV, but no indication that any of these effects were attributed to the LCCV.

KNOWLEDGE TRANSFER

There is no evidence of any effect of LCCV on knowledge transfer. Of the 43 documents reviewed, only four documents showed some indirect evidence of knowledge translation, and the effect cannot be attributed to the LCCV. These documents are summarized in Appendix A and are mostly related to the inclusion of planning for the increased risk of flooding due to climate change. None of the documents referenced the LCCV process or used the visualizations or scenarios. Based on the interviews, there was anecdotal evidence that some local government staff were using visualizations in their presentations to other staff and with the public, but a comprehensive review was not conducted to get a complete view of the frequency that this occurred.

LEVEL OF CONCERN

There was no discernible increase in the level of concern between 2007 and 2011 based on the language used to describe the problem and the language used to rationalize action or policy changes. The LCCV was not referenced. When a rationale was given for why a particular action was taken in the documents, it was most often the government's own commitment to act on climate change whether it was Delta's *Climate Change Initiative*, the Climate Action Charter or the GHG emission targets in the OCP (a requirement of the BC *Local Government Act*). Other rationales for action given included the need to reduce Delta's contribution and vulnerability to climate change, to demonstrate Delta's leadership, and

to reap the benefits of action such as local economic development (though this latter reason is only given once - on Delta's website).

Interestingly, the 2006 storm advisories issued by Delta never mention climate change and the news releases announcing actions on climate change do not mention the vulnerability of Delta to climate change or importance of acting. The need to act on climate change was not mentioned as a rationale for the legalization of secondary suites, or the promotion of community gardens, which are both policy suggestions from Delta staff (Tatebe et al., 2010).

CLIMATE CHANGE PROFILE

The document analysis suggests climate change is clearly an important issue for the Corporation of Delta, but there is no evidence of any direct influence of the LCCV. The timing is consistent with the LCCV process, as well as the introduction of provincial legislation requiring action on climate change. Climate change is included as a separate, relatively prominent, section of the official Delta website. Furthermore, Delta was the first municipality in the Lower Mainland to release a high profile document addressing climate change in 2007. In defining policy documents for Delta, such as the Mayor's inaugural addresses, the annual reports and the OCP, climate change has a high profile. Within the annual reports, between four and five departments every year list actions on climate change as one of their highlighted accomplishments.

Overall, there is clearly an increase in the number of documents that address climate change. A search for "climate change" within the Corporation of Delta document database returns thousands of documents that appear to be legitimate and related to climate change; however, time constraints prevented further analysis and testing of the timing of all the documents. Moreover, the document analysis suggests an increase in the profile of climate change within Delta over time, with a significant increase after 2007 and continuing until 2011 with actions such as the signing of the Mexico Pact and the creation of a Community Energy and Emissions Plan.

ORGANIZATIONAL AND POLICY CHANGE

The document analysis revealed that action had been taken on a number of recommendations from the LCCV process, but no direct evidence of LCCV's influence in the actions and policy changes.

Overall, significant progress was made in the implementation of some recommendations, such as: developing a more comprehensive climate action plan, continuing research partnerships, and implementing demonstration projects. Some implementation has been achieved with regards to reducing domestic energy use, changing to a renewable energy supply, investing in alternative transportation, planting trees, promoting sustainable land use, training staff on climate change policy, and integrating staff working on climate change. Less progress has been made in other areas, such as: maintaining strong policies to protect agriculture, updating flood proofing requirements, creating a capital plan for policy changes related to climate change, and improving public education on climate change. A complete summary of the status of implementation of the LCCV recommendations is in Appendix A. These changes are consistent with the LCCV, but not proof of the LCCV's effect.

4.3.2 NORTH VANCOUVER

The document analysis for the District of North Vancouver revealed some evidence for knowledge transfer in the increased use of visioning, GIS and spatial tools, a high degree of concern with sustainability in the community, an increased focus and a higher profile for climate change after 2007, and overall, many policy and actions undertaken that match the recommendations made by CALP through the LCCV process; however, there was no direct evidence in the documents that any of this was attributed to the LCCV.

KNOWLEDGE TRANSFER

There was no evidence of any use of LCCV knowledge, concepts or tools. Of the 32 documents reviewed, only eight showed some indirect evidence on knowledge translation. These eight documents are reviewed in Appendix A and relate to the use of scenarios, GIS and spatial planning - all tools in the LCCV process. None of the documents explicitly referenced the LCCV process or used the visualizations or scenarios. Most of the knowledge translation was in the area of GIS, spatial planning and future visioning, though not necessarily supported by visualization.

LEVEL OF CONCERN

The document analysis revealed no significant increase in the level of concern, and no reference to the LCCV. The overriding rationale for action on environmental issues in the District's official documents is sustainability. Going back to 2004, this is the most cited reason for the need to change a policy, in about one third of the documents analyzed for North Vancouver. Starting in 2007, the need to mitigate and

adapt to climate change is cited as a rationale for action, with a few documents also specifically citing the *Local Government Act* and the Climate Action Charter as the impetus for action. Interestingly, the news releases in 2006 regarding the heavy rains do not mention climate change and nor do the news release headlines listed on the North Vancouver website back to 2004 - the rationale for action is to mitigate the risk of flooding and landslides due to heavy rainfall.

CLIMATE CHANGE PROFILE

Based on the prominence of climate change within the documents analyzed for the District of North Vancouver, climate change is an important issue for the District and increased in importance over time, though it is seen primarily under the umbrella of sustainability. The LCCV is not referenced.

In the 2005 Annual Report, climate change is mentioned once, in the 2007 and 2008 Annual Reports, climate change is mentioned a few times. In 2009, the goals and vision for the new OCP are set, featuring climate change very prominently, including the statement that responding to climate change is "one of the greatest environmental challenges the community faces" (District of North Vancouver, 2009a). In the 2009 and 2010 Annual Reports, climate change issues continue to be highlighted, though the problems the District faces in the context of a recession and aging population receive more of a focus. Finally in the new OCP, passed in June 2011, climate change has a very profile: in the main goals and strategies, in a separate section on climate action, and throughout the report as it ties into other areas.

While climate change features quite prominently in official government documents, there is no easily available section on climate change on the District of North Vancouver website. There are sections of the website that provide information about various District policies and initiatives that are related to climate action, but no dedicated section that covers what climate change is, why it is a concern for North Vancouver, and a summary of what North Vancouver is doing to respond to climate change. However, overall, there is a big lift in the profile of climate change within the District after 2007 given the increase number and profile of the documents on climate change.

ORGANIZATIONAL AND POLICY CHANGE

As with North Vancouver, the document analysis revealed that action had been taken on a number of recommendations from the LCCV process, but no direct evidence of LCCV's influence in the actions and policy changes.

The district has made significant progress in implementing a comprehensive community climate action and energy plan, facilitating renewable energy systems, increasing sustainable transportation infrastructure, reducing energy and emissions from new and existing buildings, and reducing vulnerability to climate change. Some implementation has been made with regards to: protecting against forest fires, facilitating higher density neighbourhoods, investing in demonstration projects, reducing ecosystem vulnerability, supporting grassroots initiatives, and undertaking better public outreach on climate change. The District has made less progress on a few of the recommendations, such as: reducing the District's vulnerability to water reservoir/supply shortages, increasing sustainable stormwater runoff infrastructure, and increasing local food production. A complete summary of the status of implementation of the LCCV recommendations is in Appendix A.

4.4 Summary

The document analysis revealed some effects for the four indicators of effectiveness measured in the document analysis, but there was no explicit reference to the LCCV or use of any of the outputs from the LCCV process such as the scenarios or visualizations in any of the documents, so this effect cannot be attributed to the LCCV based on the document analysis. The interviews were used to discover whether any of these effects were a result of the LCCV.

5 Longitudinal Interviews

5.1 Introduction

This chapter presents the findings from the interviews conducted with staff and stakeholders who participated in the LCCV processes in the Corporation of Delta and the District of North Vancouver. The document analysis provided a foundation for understanding the context and the current climate action policy and plans in these two communities. The interviews provide insight into: how much the organizations used LCCV concepts or tools, how influential the LCCV has been in terms of changing the organization's level of concern with climate change, the profile of climate change within the organization, and the organizational and policy changes potentially related to the community's participation in the LCCV. Chapter 3.8 describes the detailed methodology for the document analysis.

While the small sample size necessarily limits quantified frequencies, the tables in this section provide a coarse summary by indicating how many participants indicated a positive or negative result for the selected effectiveness indicator. Quotations from the transcripts of the interview are included where they help to convey the results. The quotations selected do not represent a comprehensive list of all the relevant quotations for a given effectiveness indicator. The findings from the interviews presented in this chapter are reported anonymously. The numbers in parentheses at the end of excerpted interview quotes indicate the response of a specific interviewee. The findings from the interviews are organized by: (1) individual impacts of the LCCV (2) organizational and policy impacts, and (3) effective attributes of the LCCV. Practical and theoretical implications of these findings are discussed in Chapter 6.

5.2 Individual Impacts

This section on individual impacts includes the findings for the knowledge and attitude and behaviour change effectiveness indicators including: recall, knowledge transfer, understanding, level of concern, behavior change, support for climate policy, and willingness to consider radical policy.

5.2.1 KNOWLEDGE

This first section of results includes the interview responses with regards to recall, knowledge transfer, and understanding, as defined in Section 3.6. Table 5.1 summarizes the number of participants who

indicated: they could recall information from the LCCV process without prompting beyond the initial open-ended question as to what they could remember about the LCCV process. This includes describing the visualizations, indicating they had used knowledge or concepts from the LCCV in their work and expressing that their understanding of climate change increased as a result of the LCCV.

Table 5.1 Summary of responses to knowledge indicators

(✓) indicates a positive effect, (×) indicates no effect, (-) indicates ambivalent effect, () boxes without any marker indicate the absence of expressed view for the effective indicator in that column., The total number of participants who expressed a given view on a particular topic is summed along the bottom row for each location. Non-local government staff are in greyed-out boxes.

Participant	Recall	Knowledge transfer	Understanding
North Vancouver			
1	✓	✓	✓
2	✓	✓	✓
3	✓	✓	✓
4	✓	×	✓
5	✓	×	✓
6	✓	×	×
7	✓	✓	✓
Total	7 (100%)	4 (57%)	6 (86%)
Delta			
8	✓	✓	✓
9	✓	✓	✓
10	✓	✓	✓
11	✓	✓	✓
12	✓	✓	✓
Total	5 (100%)	5 (100%)	5 (100%)
TOTAL FOR BOTH	12 (100%)	9 (75%)	11 (92%)

RECALL

None of the participants needed to be reminded what the LCCV was. Recall was partly tested through the recruitment process: none of the participants who received the invitation and replied to schedule an interview needed to be reminded of what the LCCV was. Participants' recall of the LCCV was tested in the interview by asking an open-ended question at the beginning of the interviews. They were asked:

"What comes to your mind right now when you think of the visioning process?" All of the participants were immediately able to describe the project.

North Vancouver

(4) A lot of maps.

(5) I thought at the time they were ahead of their time in attempting to this, that's going back to the Delta time and then on to the District of North Van because as far as I knew, and I'd done a little bit of research and I don't think that this had been attempted, to actually take a local visual effect and show locally what possibly could happen based on scientific data. So I was impressed.

Delta

(8) Um, the images that were created definitely come to mind, I think um, I was impressed by how the researchers were able to create visual images of the future.

(9) First thing that comes to mind *is* the visualizations, right the representations were pretty cool. I was impressed with that process.

(10) Um, well I think of an innovative way of communicating local climate change impacts in a community, and a novel way.

(11) I guess I was impressed with the work that had been done in terms of the modelling; I didn't realize there were those kinds of programs out there at that time, which was good.

(12) Well of the things that come to mind, the look into the future and the scenarios of do nothing and you know the moderate changes that could be made, the more severe changes that could be made.

When prompted about what participants could remember about the use of scenarios, all of the participants remembered that they had been used, and with some prompting, most participants started describing the "Four Worlds" used in the LCCV, and describing them in general terms. Participants did not remember the names of the scenarios, but remembered that the scenarios represented the long-term consequences of different choices that would be made now in terms of adaptation and mitigation. There was little difference in the ability to recall the use of scenarios between stakeholder participants in the LCCV working groups and staff at Delta and the District of North Vancouver.

North Vancouver

(3) Yes, uh, and that was the basis of the 4 breakouts I believe that we had – the varying degrees of intervention. You know, if you did nothing, if you did a little bit, if you did a little bit more, and if you walked on water.

(6) Now that you mention, I remember that we talked about future scenarios, but I don't have - I would have to think more whether anything would come back to my mind what - what, what a difference was in between the future scenarios.

Delta

(8) I remember there was 4 worlds and each one was the scale of, I can't remember what they call them, status quo, do nothing, to deep sustainability or something like that.

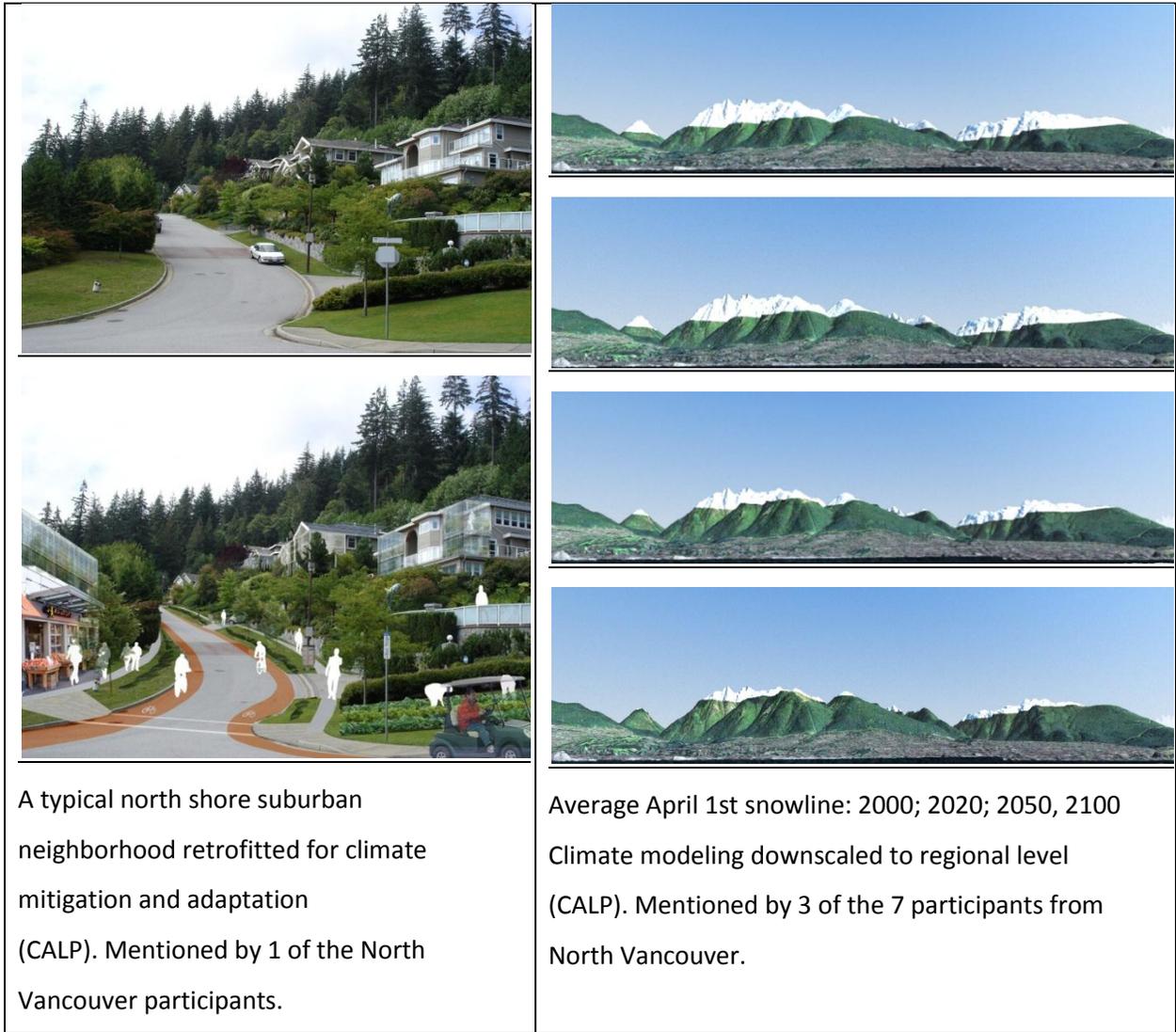
(9) What I recall is that the scenarios were linked to whether adaptation happened or we tried to mitigate or anything and that it was the different things that would unfold as a result of the actions were taken now. If we did nothing, made adaptations or mitigated, there would be different futures - that's what I recall.

(10) Like the 4 worlds, and that they were based on our level of response to mitigating greenhouse gas contributions to the community and that depending on our mitigation choices, then you would have this result, and potentially, this adaptation response.

Resonant Images

After the initial open-ended question, participants were prompted as to whether they could recall any of the images used in the LCCV process. Eleven of the twelve participants began describing two or three images they remembered in detail. Interestingly, one participant did not initially talk about any specific visuals, but discussed that there were a lot of maps, and that it seemed to be a very linear scientific-oriented process. The most resonant images, judged by the frequency and intensity that interviewees discussed them are included below.

Figure 5.1 Resonant North Vancouver images



(1) Yep – it was the – looking at the band of snow along Grouse Mountain – talking about in the future that there would likely be a higher freezing level – at the higher levels there would be more precipitation. I always think of like a haircut you know where the haircut creeps up the head with a lot of hair at the top, not a lot at the sides.

(5) Ya initially it was the flooding of the Delta, what's that neighbourhood down there? Beach Grove I think it was. Off of Centennial Beach down there. When I saw the visualizations of that, and some of the still photography of the actual storm surges that were occurring that year were quite remarkable.

(6) Well, certainly the images are – they did remain in my mind. And I remember the changes in the snow levels in the North Shore mountains. And I also recall some housing documents and opportunities as they were depicted by the model.

Figure 5.2 Resonant Delta images



View of Beach Grove community in 2000, and in 2100 with flooding, following a dike breach due to sea level rise and storm surge coinciding with high tide (no adaptation or mitigation action taken). Mentioned by 2 of the 5 participants from Delta.

Adaptation to sea-level rise due to climate change. View from a backyard in Beach Grove of seawall raised with enough freeboard to accommodate maximum projected water levels. Mentioned by 3 of the 5 participants from Delta.

(8) I remember, um, one, that was a bit controversial which was the image showing single-family housing sprawling out into Tsawwassen in the ALR. I remember the image that they did early on that they didn't up in the final one because we didn't feel it was accurate where they show downtown Tsawwassen with high-rises, it was like Shanghai and we told them it wasn't going to fly.

(9) Well I remember the 4 shore areas in Tsawwassen and Delta Port comes to mind, and thinking about the number of houses, the community that we have built there and how that would be significantly impacted.

(10) The flooding of um, the visuals of the first street in Boundary Bay village. Um, and just showing that flooded, and then, like, the different adaptation responses – the big berm, or low impact design, alternative energy, the business as usual images, and the adaptive ones.

(11) Um, just [pause] just a bunch of squares and stuff that was on there, I haven't gone back to review anything.

During the interviews, participants also described other visualizations from the LCCV process. In North Vancouver, one participant described the images of the impact of climate change on the forests. In Delta, participants described: the visuals of the different adaptation responses in Delta including: the berm, low impact design, alternative energy, houses on stilts, the controversial images such as the single-family housing sprawling out into Tsawwassen in the ALR and “Shanghai-like” development in Tsawwassen, and the photos of the storm surge and high tide in Beach Cove.

KNOWLEDGE TRANSFER

Participants' use of the tools and concepts from the LCCV was quite strong. Nine of the twelve participants, both government staff and citizens, indicated they had used either the tools or concepts from the LCCV after the research project, and all of the participants in Delta had. Three participants (two staff, one stakeholder) indicated that they found the LCCV products useful and used them in presentations and projects both within the organization and with other municipalities, as well as in materials for the public. Two other participants indicated that they had used the concepts to inform their work and they thought others had as well. Two North Vancouver participants indicated that they intended to use the LCCV materials in their public outreach around the Official Community Plan chapter specifically on climate change. Three staff participants (Delta and North Vancouver) mentioned that the LCCV work is referenced and discussed when relevant issues came up in meetings such as dykes, infrastructure, and forestry.

(3) The visualization actually played a huge role in our communications efforts within the community at large.

(8) We have used them. We did a public newsletter, something that we've done once or twice a year. And we did one that was focused specifically on climate change and we had permission from Stephen to use some of the images. We've also had some of those images on display when we've had Environment Week or other events, and we've also used them when we were doing a Tsawwassen Area plan public process... We have used them in other areas, we've been looking at flood by-laws, we were looking at that before, and we're still looking at it, but that work is certainly part of that and supports our research into that.

(10) I've referenced it in presentations to staff and to colleagues and so I've used it as a visual tool, and I've also used it as a talking point, or a point of reference. Um, because people seem to remember the 4 worlds, oh okay, oh, the flood of Delta, oh ok. So it's been a good point to start a conversation on. When people talk about adaptation -if it really will happen or what it will look, when I use that or show that, they're like, oh I see what you mean, it's kind of like it justifies our conversation, or legitimizes it I guess to a certain degree... when issues do come up of a planning nature, dyking, infrastructure, we do reference the visioning work.

(12) LCCV comes up occasionally when Council projects are discussed. People remember it and talk about it.

The participants whom had not used any of the tools, knowledge, or concepts from the LCCV, indicated that might have had the products been made more readily available. One staff participant in North Vancouver indicated that they likely would have used more of the LCCV products in a climate outreach initiative if the OCP process had not started just then and taken up all the staff resources.

(4) I think if they'd, if they'd followed up or one of our staff members had sort of spearheaded it and brought it into our system more consciously through workshops and this and that we probably would have looked at it more.

Another staff member in North Vancouver indicated that their involvement with the LCCV directly encouraged them to organize and implement a project on the urban-fire risk interface. They used the concepts of spatial mapping and risk contours used in the LCCV and mapped out and categorized the levels of fire-risk, incorporating climate change science.

(2) We're actually mapping, assessing the level of risk and then applying a climate change factor, to help us make sure we're making the right decisions now, when we make important decisions regarding land use and planning and/or development.

Grouse Mountain, partly through the LCCV process, recognized the power of visualization and thought about the important role visualization could play in getting through the development permitting process for the wind turbine. They ran computer model simulations and created posters based on these models for outreach to the public and to staff members and councillors in order to dispel myths about wind turbines and effectively communicate what the visual impact of the wind turbine would be.

UNDERSTANDING OF CLIMATE CHANGE

All of the participants were aware of climate change as a phenomenon before the initial LCCV. Some participants described the LCCV as giving them a greater understanding of climate change and confidence in the science behind it. All but one of the participants already believed in climate change

before the LCCV. Most of the participants described the LCCV project as firmly reinforcing their belief in the science and convincing them that it was real.

(2) It's more of a reinforcement, I mean, I'm pretty aware of what climate change is going to bring to us and why it's so important.

(3) It just, more reinforced it, as opposed to gave use the idea that this was something we should do.

(5) When the visioning came, it was the beginnings of the science behind it that started to solidify it for me. And of course I'd been doing other reading and research along the way as well so it was sort of all coming together.

(9) It truly convinced me of the reality of it.

(10) This really could happen.

One participant did not believe in climate change before the LCCV and he remained very muddled about the science of climate change after the LCCV process. They believe there is a "shift" happening, but is very sceptical that the scientific community understands climate change and are sceptical that climate change is really happening.

(11) there are ways that mankind could mitigate to a point and I recognize that we are obviously into something different in this world that what we used to see for climate years ago, I know, but we still , but scientifically, I don't know if we really understand totally what's happening yet.

Specific examples of learning included a better understanding of the difference between mitigation and adaptation and what options there were to mitigate and adapt locally, and the interaction between infrastructure and geography in a flooding event.

(10) I understood mitigation, but I didn't have a full appreciation for adaptation. So it definitely did. It clarified that definition.

While the research team initially thought that the LCCV would result in "aha" moments for the participants where they reached a new level of understanding or clarity about the issue, participants did not think there had been aha moments. Many participants simply said that they had not, or gave examples that were not particularly "aha" moments in the way the question was intended. Moreover, the LCCV reinforced existing views, and in some cases, fleshed them out.

Local Impacts

When asked whether the LCCV increased the participant's understanding of climate change, eleven of the twelve participants described how the LCCV project made them aware (or more aware) of the extent, time-scale and severity of the potential local impacts of climate change. The LCCV made

participants think about the local implications of climate change and realize it was a local, not just a global problem.

North Vancouver

(2) Wow, a local government is responsible for managing land-use, this is a very big deal for us, right?

(3) I think it was just a much more scientific approach and allowed you to get a greater understanding as to what the mechanics may be behind a changing snowpack. And, I remember too, as well, not thinking through the whole module to say, ok, if you've got a reduced snowpack, what impact that has on run-off, and in terms of the temperature of the water and the cycles for fish, and all the rest of that.

(5) Well the Delta project and sea level rise, that was interesting because I didn't realize at that time that it was actually occurring as fast as it really was.

Delta

(8) I think it made me realize how important local policy [is].

(9) Some of the information did have an immediate impact on me in terms of wow, if this all were to be true, the impact on Delta would be, wow...this isn't the future, this is now.

(10) It really crystallized the local impacts... instead of worrying about polar bears, I should be worried about actual flooding in the community I grew up in. Climate change until then was really global, really global and this was the first time that these senior staff and mayor and council could really see the local application of it, or the impact, that was huge.

The same question on whether the LCCV increased participants' understanding of the science of climate change also elicited five participants' explaining that the LCCV had showed them specific local impacts they had not thought about before, and understanding the trade-offs that would need to be made to respond to impacts. These impacts and trade-offs mentioned included:

- the Delta seawall (size of wall vs. risk of actual impacts),
- the size the berm would have to be in Ladner (amount of frontage that would be lost),
- seeing the dikes over-topped,
- coastal squeeze,
- seeing the snowline disappear on the North Shore (and resulting impacts e.g. food system, fish),
and
- environmental refugees.

Overall, the LCCV process reinforced existing views and provided more detail.

5.2.2 ATTITUDE AND BEHAVIOUR CHANGE

This section of results includes the interview responses with regards to level of concern, behaviour change, support for climate policy and willingness to consider radical policy as defined in Section 3.6. Table 5.2 summarizes the number of participants who indicated, as a result of the LCCV: an increased level of concern with climate change, a motivation to learn more about climate change, some behaviour change, an increase in support for climate policy, and/or an increased willingness to consider radical policies.

Table 5.2 Summary of responses on attitude and behaviour change

(✓) indicates a positive/increased effect, (x) indicates no effect, (-) indicates ambivalent effect () boxes without any marker indicate the absence of expressed view for the effective indicator in that column. The total number of participants who expressed a given view on a particular topic is summed along the bottom row for both locations. Non-local government staff are in greyed-out boxes.

Participant	Level of concern	Behaviour change	Support for climate policy	Willingness to consider more radical policy
North Vancouver				
1	✓	x	-	✓
2	✓	x	✓	✓
3	x	x	-	✓
4	✓	x	✓	✓
5	✓	x	✓	✓
6	✓	x	-	-
7	✓	x	✓	✓
Total	6 (86%)	0 (0%)	4 (57%)	6 (86%)
Delta				
8	x	x	✓	
9	✓	x	✓	
10	✓	✓	✓	✓
11	x	x	x	x
12	x	x	-	✓
Total	2 (40%)	1 (20%)	3 (60%)	2 (40%)
TOTAL FOR BOTH	8 (67%)	1 (8%)	6 (50%)	8 (67%)

LEVEL OF CONCERN

Eight of the twelve participants indicated that the LCCV helped to convince them that climate change was more serious than they had previously thought, especially regarding the local impacts. While six participants in North Vancouver indicated their level of concern had increased, only two did in Delta. Three participants who said the LCCV did not contribute to their sense of urgency as they were already concerned, and one participant was not more concerned - he asserted that farmers would just need to adapt and we need to manage.

(2) I don't think [increased concern with climate change] was directly as a result of the visioning process but the visioning process was one of those reinforcing moments to basically, say look, the information is coming from credible sources all around us, so we need to look at it and start making some account into what is happening, what these reliable sources are telling us is going on in the world around us.

(4) I had a better understanding of okay this is really something we have to address.

(5) I think it was the beginning of solidifying the fact that climate change was a serious issue, both to me and all the participants at the workshops that we had.

(9) I had that visceral response of, wow this is really serious.

(10) I have a pretty high sense, or high urgency about [climate change], but I think it tweaked it to local.

BEHAVIOUR CHANGE

The LCCV had minimal impact on the participants' behaviour in either Delta or North Vancouver. In response to the question about whether the LCCV had encouraged them to change their behaviour, all of the respondents indicated that they had already made some changes to their behaviour, such as turning off the lights, changing their mode of transit, and recycling. One respondent did indicate that as a result of the workshop, she was advising her friends to consider climate change when deciding where to buy a home.

(5) No [didn't change my behaviour] because I was well into it already.

(7) No, [LCCV didn't motivate me to change behaviour] just to continue changes already made.

(9) Probably do what everyone else does - by driving less, by practicing sustainable practices, but I can't say that it had a direct impact.

(10) I think I was on the path already to change, I'm already, I try to practice sustainability. It made me tweak me to talk more about it to my friends - to say, hey, when you purchase in these areas like Ladner, you're susceptible to sea level rise and flooding.

However, while participants did not directly change their behaviour as a result of the LCCV, two participants indicated that it did give them a sense of the collective responsibility we have to change our behaviour.

(4) I think I really understood that we all have a role to play, whatever level you're operating from. And prior to that it hadn't really occurred to me.

(12) My thinking has changed in terms of recognizing that we as people on this planet have got to change on the one hand.

Despite overall thinking that LCCV had helped them understand climate change better and realize the severity of the local impacts, two home-owners moved to Beach Grove following the project. Beach Grove is the community that was shown being flooded in the visual material shown during the LCCV. One participant did not think the data would show that for their particular area that they would actually be at risk, and that the risk was manageable. Another participant said that she "probably wouldn't move" to Boundary Bay after the LCCV.

SUPPORT FOR CLIMATE POLICY

Seven participants did indicate that the LCCV increased their support for climate change policy in general. The number of participants who indicated this was roughly proportional for Delta and North Vancouver. Overall, participants were very supportive of climate change policy, but this support was not directly linked to participation in the LCCV.

(8) I felt more inclined to push for support for local governments to do more as opposed to get more funding for the scientists in the province and the federal government.

(9) Until we disconnect from our love affairs with cars, which our community can't really control, but a community can look at their buildings and their services and really make some changes.

(10) Um, yeah it did [increase my support for climate policy]. Um, I would say on a local and provincial scale, especially, and federal, well I wish for more support.

Three local government staff said they specifically felt empowered, and even responsible, to bring up climate change issues and solutions at their local government, given what they now knew of how serious the local impacts would be.

(2) [The LCCV] reinforced my motivation for me to start injecting myself into policy, planning and decision-making processes that say I normally would have just stood back.

(4) I had a better understanding of okay this is really something we have to address...It really needs to be attended to in our policies and it's going to be something that I have to incorporate in how I do business.

(8) I think it made me realize how important local policy and wanting to kind of be part of the

solution at a local policy level.

Two participants described their support for climate change staying the same.

(12) I would say probably about the same in that because I was very aware of what was going on before.

While one participant, the participant who did not believe in climate change, did not support climate policy as a result of the LCCV, he did support more study into climate and what the right actions were to mitigate climate change.

(11) I support planning, I support a need to understand it better, to find out what will the real things be that will mitigate it, I don't think we've done that yet.

When prompted regarding their activism on climate change, a few participants mentioned that they had written, emailed or phoned decision-makers (locally and federally) regarding climate change, but this activism was not related to participation in the LCCV, although one participant said it reinforced their decision to vote based on climate change when prompted if their decision had anything to do with the LCCV. Otherwise, the participants were not politically active and did not have plans to be.

WILLINGNESS TO CONSIDER RADICAL POLICY

Eight participants indicated they would be more willing to consider supporting or implementing radical solutions. In this instance, based on the evidence, it is hard to connect a staff member's willingness to consider more radical options to mitigate and adapt to climate change to the LCCV. The staff members who participated in the LCCV and also, for the most part, those that chose to be interviewed are very supportive of climate change policy and would be considered "champions" within their organization.

(2) Yeah, definitely willing to look at things. That's what I see as my role - lobbying those balloons into the arena for consideration.

(4) Absolutely. I think we're very open-minded.

(5) Yeah we did. That whole paradigm shift on densification of town centres and village centres is a very new concept in the district.

(10) Talking about electric vehicles a couple of years ago wouldn't have happened and now we're seriously consider about buying one and putting in infrastructure. Talking about raising the dikes in Ladner and obstructing people's views or taking out a lane of River Road wouldn't have happened, we wouldn't have thought of that, but we're able to talk about it, and we're able to show the images to senior staff and mayor and council.

5.3 Organizational and Policy Change Impacts

This section of the findings focuses on the four effectiveness indicators related to organizational change including: network effects, the profile of climate change, organizational structure, and climate policy and actions.

5.3.1 NETWORK EFFECTS

When asked whether they were still in contact with anyone they had met during the LCCV, none of the non-staff participants indicated they were still in contact with anyone they met throughout the LCCV process. However, four staff described the LCCV has having opened up new contacts both within their municipalities with staff in other departments, and with outside NGOs, municipalities and research organizations. These staff members were all local climate champions.

(3) I benefited from the process in terms of being exposed to more facts in the dialogue, probably made some connections with some very informed people should I ever have questions or challenges should I ever need expert's opinion on, I don't think I'd hesitate to ask for their assistance in the same way that they has asked for mine along the way.

(4) [LCCV] was the next step. I think the Natural Steps process for staff was an effort to get all parties involved and thinking at something with the same framework because what was happening is that I had one view, Utilities would have another view, Fleet, Planning, all the various Fire Department, Rec Commission, all these people had a different take on it. So it was trying to get staff to work within a framework that would help us all to develop common. Language, common understanding of where the Districts' objectives were and relating it to what Council wanted, who represent the public.

(8) A lot of the participants are people that we do work with, not all of them, and I think there were some people that we were able to network with or bring in to the discussion that we might not have before.

(10) It definitely has opened up new contacts, and who to talk to... That's one of the really good things that I like about this whole experience is that it has enhanced our network...and has provided us access to important information and to people and allowed us to like leverage our experience here to other projects so that we can improve our knowledge and standards on dikes for the most part since flooding is our main concern.

Delta now works with CALP on a large follow-up project on climate change adaptation, as well as with ICLEI on an adaptation program, and with Metro Vancouver on regional climate policy, which one participant directly attributed to the LCCV:

(10) because of all of our work with UBC CALP and adaptation in general, it paved the way for this broader project which will take a greater look at all of our operations and services and vulnerabilities to climate change.

North Vancouver is not still in close contact with CALP. While the staff in North Vancouver did not say directly that they thought the LCCV had helped create new contacts, during other parts of the interview, North Vancouver staff mentioned that the LCCV prompted a staff workshop on what the low-lying fruit for climate action – what could be done within existing budgets, and a discussion of how they could work more collaboratively. This discussion then prompted the creation of a buildings group that is looking at ways to improve how the District manages buildings from an energy perspective. North Vancouver has since also implemented energy audits interdepartmentally.

Interestingly, the three staff participants who are not local climate change champions did not think the LCCV had created any new contacts for them, but continually referred throughout the interviews to the other staff - the climate champions - as people to ask about what was currently happening within the municipality on climate change.

(4) I think you'll see that all levels, whether it's Engineering Department, Transportation, Planning, Forestry, we all have a piece of it and we've all been plugging away at it within our own knowledge base. But planning, I keep referring back to planning because they've kind of been sort of the spearhead of it all and then a lot of it then takes it through the various departments.

(6) No I don't think [it helped identify allies]. [Engineering was] pretty much on board already. I think it was good that we had Engineering involved. And I think for them it was maybe a bit of an eye opener, not that they weren't on board. I think it just helped with, the staff that aren't like immersed in it like I am, it was helpful.

One staff participant suggested that the LCCV both helped to create the local climate change champions, and also identified them as such to other staff:

(10) It marked them as key people to implement climate change strategies. It was kind of like going through the visioning project, yeah, just, it got them familiar with the subject, it made them comfortable talking about it, it kind of renewed the interest in it, so they were able to be forces of nature for climate action in Delta, and be major contributors to this group.

5.3.2 PROFILE OF CLIMATE CHANGE

Generally speaking, the participants indicated that the LCCV contributed to raising the profile of climate change within the organization both in terms of being an issue that needed to be taken seriously and in the number and frequency of conversations on climate change within the local governments. Nine participants reported that it had triggered discussion within the staff groups in both municipalities.

(2) Wow, a local government is responsible for managing land-use, this is a very big deal for us, right?

(4) I think it filtered through a number of mechanisms including the Natural Steps and those other frameworks that we were working within. My impression of it is that it really just triggered more discussion around it as opposed to us literally taking that information into all of our departments. I think some departments may have utilized it more than others. But without a doubt it definitely triggered a great deal of discussion and some follow-up...there are a lot of big things that came out of the whole climate change discussion that are still emerging.

(8) I think we've always recognized that there is a need to make decisions now and I don't know if that really changed as a result of the research, or if it just hammered in the point.

(9) I think as a result of that participation, I went to the community planning committee that I'm on, and reported out on my experiences, the results of that project as well and so...we were able to, when decisions came before us, we would make an effort to think about how does relate to information we know and is there something we can do right now? Whatever the circumstance was, and I would imagine that would have spread out throughout all the committees- that they all had the benefit of that information. I think it did help us to take it seriously and immediately.

5.3.3 ORGANIZATIONAL STRUCTURE

With prompting, all eight of the staff participants mentioned some changes made to the municipality's organizational structure, but these were not described as being changes directly related to the municipality's participation in the LCCV.

North Vancouver

Every staff participant referred to the Natural Step Process the municipality went through as an important pre-cursor to the current work being done on climate change.

(5) This whole sustainability framework that we were working on, and it started with the Natural Step process.

Two staff participants in North Vancouver reported that as a result of the discussions following the LCCV, an inter-departmental buildings team was created to look at ways to reduce energy use in buildings. Two new two new job positions - energy manager and an assistant energy manager - were also eventually created. One staff participant reported that the section of the planning department responsible for climate change had not had an increase in resources, but a "realignment of staff into this planning realm."

Delta

One staff participant reported that, in 2007 (after the LCCV), Delta created a climate change working group that meets regularly to discuss climate issues, and adaptation is a key component of that. In 2008, the Environmental Services section was renamed Climate Action & Environment to "highlight the emphasis that climate change plays, or the importance in the municipality." After this change, the participant's job was re-classified and climate change was officially added to their job description. Overall, the staff in Delta suggested that, since the LCCV, there are increased expectations and reporting mechanisms that staff need to respond to climate change, and that overall, more staff time has been spent and allocated, but that there's still a shortage of capacity and staff are still working on climate change off the corner of their desk.

5.3.4 CLIMATE POLICY CHANGE & PROJECTS

When prompted, staff participants outlined policy actions and changes their municipality had undertaken in response to climate change. Staff were asked whether the changes were related to the municipality's participation in the LCCV. The only policy actions reported here are those that participants reported were a result of the LCCV.

North Vancouver

Participants reported the following as being a result of participating in the LCCV:

- New planning policy documents/development permit hazard areas that apply a climate change factor.
- Forest managed on a "stand" basis, and not a single tree (following the LCCV, a staff participant presented a report to council recommending that that forests should be managed on a "stand" basis not as single tree, Council supported the recommendation).
- New ideas for storm stormwater management.
- Climate-focused "reconnaissance" studies including a forest eco-inventory study, a transportation and building energy and carbon audit, and a recycling and waste study.

Evidence was found for all of these changes in the document analysis (Appendix A).

Examples of specific comments in response to the question of attribution:

- (1) Actually as a result of listening to this, I came up with the idea of having [all the water] flowing downhill and having lateral connections along the bottom, pumping stations and talked about the

idea of having seven pumping stations all along the bottom on the North Shore and the integrated resource management.

(7) Yes, in terms of urban forestry and parks. I presented a report to council back in October or November 2009 following the project stating that we should be thinking about stand management rather than a single tree, and Council supported the recommendations.

An example of a specific comment in response to the question of attribution in the context of the questions:

"So, if you think back to the visioning project, is there anything in particular that comes to mind?"

(2) um, well the one thing that struck me was how interested I became on the integrated nature of the project. Um, I'm pretty passionate and I'm pretty involved with watershed restoration and its one of the things we've been reaching for in that realm is a more integrated approach. And, the thing that I found interesting was that it wasn't a bunch of homely meteorologists getting together and saying this is, you know, we're going to have this much more rain. It was my recollection that it was a much more integrated approach where the project was looking to say, okay, if, say this is forecast, what would it mean for you as a planner, what would it mean for you as an engineer, as an urban forester for example. That kinda stuff was, was one of the things that I recall, and it's certainly what we and myself have taken from the project.

Could you go into that in a bit more detail?

(2) Well, for example, um, we are working now on an extensive list of new planning policy documents development permit areas. From everything to urban interface fire hazard to um, local and/or more widespread flood risk and so these are geohazards that we're actually mapping, assessing the level of risk and then applying a climate change factor to then, to help us make sure we're making the right decisions now, when we make important decisions regarding land use and planning and/or development, right."

Delta

Participants reported the following as being a result of participating in the LCCV:

- Delta flood by-laws - new flood construction levels for planning for vulnerable areas like Boundary Bay, Beach Grove. These by-laws are part of the Flood Management Action, but have not yet been passed due to political sensitivity and legal concerns with flood protection.
- A flood risk study where the contractor was asked to including climate change scenarios.

Evidence was found for all of these changes in the document analysis (Appendix A).

Examples of specific comments in response to the question of attribution:

(2) [Another LCCV participant] contracted out a flood risk study, because of the work with UBC and RAC, he put in to have them look at climate change scenarios in that – so with the sea-level rise projects, storm surge, all that stuff.

(8) We've been working on the flood by-law for some time and the researchers were really keen on that and wanted to provide some assistance to us, but we've backed off a little on that just because of legal concerns having to do with whether we rely on provincial programs or policies on flood protection or whether or the municipality sets their own. While we had been talking about developing a flood by-law during the CALP process we haven't really pursued that for those reasons. (10) It has been gradual, but it did take off in 2006 when we had flooding issues, and then in 2007, Council endorsed a climate change initiative, of which adaptation to flooding was a big component. The mayor has been very supportive and top of mind with the work done with UBC CALP, especially the visioning so that definitely kicks things into gear - I think you could say that was a turning point, definitely... In 2005, it was the visioning and from there on, stuff started happening and staff just started doing stuff and they just did it...and then it added to like, the list of oh, wow, look at this work. They did all this stuff for climate change, maybe we should think about it, maybe we should do something about it, and then the visioning, um, it was great, but it was also a feather in the cap for mayor and council, like, they got to show it off and that's important.

While there were not that many direct implemented policy impacts, staff participants did mention that the LCCV caused them to think through the secondary climate impacts on infrastructure such as sewage, agriculture, water cycles for fish, and what policies would need to change, and what actions would need to be taken as a result. A few participants talked about how the LCCV helped them "connect the dots" and to "kind of step back and look at a much more macro view of what's going on."

5.4 Effective Attributes of LCCV

This section is based on participant responses; however, participants were never directly asked what they thought the effective attributes were.

Table 5.3 Summary of responses to effective attributes of LCCV

(✓) indicates that attribute was mentioned as effective, () boxes without any marker indicate the absence of expressed view for the effective indicator in that column. The total number of participants who expressed a given view on a particular topic is summed along the bottom row. Non-local government staff are in blue font.

Participants	Science-based	Trusted Third-Party	Integrated & Holistic	Innovative	Optimistic	Thought-Provoking	Local information	Visualizations
1	✓				✓	✓		✓
2	✓		✓		✓	✓	✓	✓
3	✓	✓				✓	✓	✓

4	✓	✓	✓			✓	✓	✓
5	✓	✓	✓	✓		✓	✓	✓
6	✓					✓		✓
7	✓	✓	✓	✓		✓	✓	✓
8	✓							✓
9	✓	✓						✓
10	✓	✓		✓		✓	✓	✓
11	✓	✓				✓	✓	✓
12	✓	✓					✓	✓
TOTAL	12 (100%)	8 (67%)	4 (33%)	3 (25%)	2 (17%)	8 (67%)	8 (67%)	12 (100%)

SCIENCE-BASED

The results from the interviews suggest that because the visualizations were supported by scientific research, participants trusted the information and were more willing to believe and engage with the information presented. This attribute of the LCCV was mentioned as being important by every participant.

- (1) The science is built behind it, so it's defensible, and the science is there.
- (2) I was impressed with the work that had been done in terms of the modelling... I gathered a lot of information went into it and I recognize that.
- (3) Their guys, I thought, did a really good job, just saying, here's the research that I've been working on, and here's the research that I've found through the various years and here's what I think the outcomes may be, and so it added nicely to the scenarios... I really like that, kind of, fact-based analysis, as opposed to the subjective stuff that you would typically get exposed to in the media.
- (5) The whole interrelationship of the science that was involved and the background of this. It was really good.
- (6) This is the result of a credible process.
- (8) When we're talking to community groups about climate change, it's good to be able to rely on scientific information.
- (9) Good, research-based scientific information.
- (10) Oh, scientists someone in a position of authority is telling me, oh they must be right.
- (12) It put the statistics into some perspective when you start, when you see them, those models were particularly impressive.

TRUSTED THIRD-PARTY

The fact that the project was led by a research institution at a trusted university, and run by staff that participants and citizens trusted meant that:

- 1. citizens trusted and participated meaningfully in the process,
- 2. citizens did not use the time to air grievances , and

3. staff could use the opportunity to get quality feedback on controversial topics.

(3) The number of initials behind people's names, that it was clear this was a highly skilled group of people that were very focused on specific aspects of the climate change challenges.

(9) I was impressed with the team of people that were presenting the information and doing the project. Their knowledge base and the way they presented the information.

(10) [The LCCV is] something that me, as staff, I couldn't do that. I couldn't do that. People don't trust staff or the government, so that's an important thing actually, another value added from this whole experience is that staff were able to glean information and responses from, through this process because it wasn't the District of Delta.

(10) Rarely do we get an opportunity to test those on the public and in a way that we get honest feedback, because so often, it's just I don't trust you, you're the government, you have an angle. And talking about climate change, you spend half the time getting angry about transportation issues.

(10) It was a way to show, to see what people thought or how they felt about the seawall and to communicate the trade-offs and to see what they were ok. It was very preliminary, but from that, we were able to say, ok, people still hate the seawall, and when we say seawall, they think of a concrete structure, but does it have to be straight and concrete. So it kind of made us think, if and when we pitch this idea, then we can kind of change our approach. Like maybe we can make it an artistic, or make it out of a different material.

INTEGRATED AND HOLISTIC

The LCCVP provided an opportunity for staff to think long-term and holistically about responding to climate change, and broke down silos within the municipalities, especially between planners and engineers.

(2) The thing that I found interesting was that it wasn't a bunch of homely meteorologists getting together and saying this is, you know, we're going to have this much more rain. It was my recollection that it was a much more integrated approach where the project was looking to say, okay, if, say this is forecast, what would it mean for you as a planner, what would it mean for you as an engineer, as an urban forester for example. That kinda stuff was, was one of the things that I recall, and it's certainly what others and myself have taken from the project.

(3) It was very informative, it gave you one more opportunity to discuss the issue of climate change and the impacts on your local environment, and very relevant.

(4) I think the value of what you guys did is that typically we're so busy doing the real day-to-day things, we don't always the luxury of that big picture.

(5) It was helpful. Like I'd come back and it was - not that our Director or Engineering wasn't on board but I know that he was impressed because he was attending all the workshops and so on. 'Cause he's interested from that infrastructure 'what's it going to cost' point of view.

(7) It was great because it was an opportunity to, you know, break out of our silos that we get in, to break down barriers.

(10) [The LCCV was] maybe one of the first examples, for me, of where a local government, academia and residents came together to think about the issue in a meaningful way, and actually get demonstrated the impacts in real life as much as they could.

INNOVATIVE

The LCCV was considered by participants, and the local mayors and council to be new and innovative.

This had a few effects:

1. Local government staff were given time to work on the LCCV project.
2. It impressed participants, who were more open to receiving the information.
3. The local decision-makers wanted to be supportive of a project that was thought of as innovative and cutting-edge.
4. It marked the communities as doing innovative work, and paved the way for future collaborative work with other climate change organizations.

(4) It really to me was very new and it was being packaged differently than I'd seen it before.

(5) I don't think that this had been attempted, to actually take a local visual effect and show locally what possibly could happen based on scientific data. So I was impressed.

(10) It was innovative, it was super progressive, you could see it, it was getting attention, and mayor and council were like, wow, ok, this is for real, this is actually something that people are interested in... It was also a feather in the cap for mayor and council, like, they got to show it off and that's important... It was very rare. There's not a lot of times where you can get mayor and council, you get their attention, and they were able to get their attention.

(10) If we weren't doing such high profile, if we weren't involved in such interesting work with Stephen and with others that was being shared at conferences and things, we might not have had others contact us to say hey, that seems interesting, can we work with you on certain projects too.

OPTIMISTIC

While only one participant mentioned the importance of the optimism embedded within the LCCV, it is possible that this was in fact a big contributor to the effectiveness of the process. However, this attribute was not considered in advance and did not inform the interview protocol. This attribute emerged during the interview.

(1) The thing I liked about the approach, is that it's interesting, and thoughtful and yet, far enough out that the feeling was, you know, we can do stuff. We can do stuff. As opposed to the world is coming to an end.

THOUGHT-PROVOKING

Nine participants mentioned that the LCCV process had caused them to think about what they could do with regards to climate change, even after the process was over.

(3) Like thought-provoking I think is the best term that I'd use.

(7) It made you reflect, and concentrate. Like, it was a good reminder of what could be. Makes you reflect.

LOCAL INFORMATION

The fact that the LCCV was translating global and local climate change science into understandable, local, visual information was, arguably, the most important factor for its effectiveness. Participants repeatedly mentioned the importance of the relevant, local information being presented in a format they could understand and easily process how it applied to their work. The LCCV was seen as playing an important role in bridging the information gap between academic science and policy-makers at the municipal level.

- (1) Well I think people need to connect the dots and I think the work that Stephen is doing at UBC, people need to see, they need to see the public policy connections.
- (3) The local relevance was the other one... I remember that being impactful because, you know, you can relate to what's happening there as I'm sure you could for some of the landmarks in your neighbourhood.
- (4) It's nice to have almost someone translating that for you and giving you some guidance on how to frame this information. Because someone just sends me a big technical document, I don't always know what to do with it... If it's too academic, people aren't going to deal with it, they're not going to respond because they're not, that's not where their head is. And operations people tend to look at academics with kind of like 'ya whatever.' So I think to bridge that gap is really, really important. So present the information in a way that's meaningful and it's not just 'here's my great sort of science.'
- (5) When [the LCCV staff] were presenting their data both on worldwide basis and a local basis, I found that quite interesting and enlightening... It was helpful when we were going through all the workshops and those iterations for staff to actually see it locally.
- (7) Specific and local images make people sit-up and take notice because they can relate.

VISUALIZATIONS

The visualizations themselves played a significant role in convincing LCCV participants that climate change impacts were real. Almost all of the mentioned specific visuals from the project first when asked about what they remembered about the LCCV process. When asked about the benefits of the visualizations, the participants all responded that the visuals were great and important, but some had difficult pinpointing why and required prompting.

- (1) The visual work... is far more effective than words and reports.
- (2) The message doesn't come across nearly as powerfully without these kinds of or that type of picture, right... [they are a] powerful tool to reach out to people.
- (3) It did have a personal impact on me. I remember how powerful those visuals were.
- (11) This type of visualization and the way it was used, is great.

Specific ways the visualizations were discussed as being useful:

1. Communicating information in a meaningful way.
 - (6) Not really new information. What was new to me was that I could actually see it.

- (9) I had that visceral response of, wow this is really serious.
- (10) So I guess that was like, oh, I've read it, but I haven't seen it in a visual - this really could happen.
- (11) Definitely to get the understanding out there that this is serious stuff, very serious stuff.

2. Providing a shared point of reference

- (2) I've related a lot to it, I relate back to you know, discussions that I have with people.
- (10) I've also used it as a talking point, or a point of reference. Um, because people seem to remember the 4 worlds, oh okay, oh, the flood of Delta, oh ok. So it's been a good point to start a conversation on. When people talk about adaptation –if it really will happen or what it will look, when I use that or show that, they're like, oh I see what you mean, it's kind of like it justifies our conversation, or legitimizes it I guess to a certain degree.

3. Making the project interesting

- (1) Pure science, unfortunately, it doesn't translate. It's boring.

4. Making the project memorable

- (6) By visualizing it, it's going to sink into more people's mind...a lot of people have visual minds, so you can talk about it, but if you show it that's, that's different. That's going to stick perhaps more so than just saying it... the images are sharper than the words in my mind.

5. Illustrating the consequences of various actions (or inaction)

- (4) I think that's, it can be a nice planning tool when you're trying to look at different options quickly to guide you in making decisions.
- (8) A good way to let people that if they lived near the shores, if they really wanted to be protected, they would have to give up their views, and I thought that it showed it quite well.
- (10) It was a way to... communicate the trade-offs... the residents were like, well we have to think about how much we value our view, and how much we're worried about the risk of actual impacts of climate to make a decision.

6. Providing local information participants could relate to

- (1) The visualizations are real. Anybody who's looking back on the north shore will recognize that scene.
- (3) [Local images were] impactful because, you know, you can relate to what's happening there as I'm sure you could for some of the landmarks in your neighbourhood...You can relate to the specific area or what's going on.

7. Providing relevant, local spatial information

- (4) So I remember, you can definitely see the advantage of looking at different layouts and development styles based on the topography and the landmass that we have. Like we're not

Richmond where everything's flat. We're on a slope and so our development sort of criteria needs should reflect the sort of complexity of living on the side of, a mountainside.

8. Providing information that visual people can process

(1) I catch mental images and graphs far more quickly than I do words.

(9) A visual representation can really bring things to life for people, who looking at the written word, they may not get it... I think it's an additional way to communicate information. ..It brings it to life, more real.

9. Telling a story

(6) Like you can talk about climate change until the cows come home, but you can show - you did show it on the screen how it will change. So, I mean, that tells you a whole story and it's, it's very, very impressive.

While much research has focused on the role of visualizations, this research did not attempt to separate the role of the visualizations from the entire LCCV process for methodological reasons. Nonetheless, the participant responses do suggest that, while the visualizations were important to the effectiveness of the process, it was the fact they were embedded in the LCCV process that made them effective.

6 Discussion & Conclusions

6.1 Summary and Discussion of Findings

This research project evaluated the long-term impact of the Local Climate Change Visioning process. The LCCV process is run by researchers at the Collaborative for Advanced Landscape Planning at UBC. It is a community engagement and decision support process that uses landscape visualization tools integrated with participatory modeling and future scenario development to illustrate to local government staff, stakeholders, and the broader public what their community could look like under various future scenarios of climate change adaptation and mitigation. This research used a document analysis and 12 semi-structured interviews with stakeholders who participated in the LCCV to understand what long-term impact (if any) the LCCV had on two case study communities: Delta and North Vancouver. The discussion of these findings is structured by the research questions that defined the project:

1. What was the long-term impact of the LCCV on individual participants?
2. What was the long-term impact of the LCCV on local government partners?
3. Why was the LCCV effective (or not)?

LCCV local working group participants refers to the elected official, local government staff and stakeholders who were all participants in the original LCCV working groups in Delta and North Vancouver. They participated in a varying number of working group meetings as part of the LCCV process, as outlined in Table 3.4. Public participants refer to the participants in the LCCV from the general public who did not participate in working group meetings but did participate in the LCCV workshops. This research project only interviewed members of the LCCV local working group.

6.1.1 EFFECT AND ATTRIBUTION

This research project was challenged by issues of causality and attribution that are worth reviewing in light of a discussion of the findings. In order to show the LCCV had an impact for the various indicators, the research needed to find both effect and attribution in the document analysis and/or the interviews. Table 6.1 summarizes the findings based on whether effect and/or attribution was found for each effectiveness indicator. This table does not clarify the level of effect, just if there was one, and if it can be attributed to the LCCV.

Table 6.1 Summary of effect and attribution findings for each indicator

A (-) indicates that the indicator was not measured in the document analysis, as outlined in Table 3.2.

	Indicators	North Vancouver		Delta	
		Document Analysis	Interviews	Document Analysis	Interviews
Knowledge	Recall	-	Effect Attributed	-	Effect Attributed
	Knowledge transfer	Effect Not attributed	Effect Attributed	Effect Not attributed	Effect Attributed
	Understanding	-	Effect Attributed	-	Effect Attributed
Attitude and Behaviour Change	Level of concern	No effect	Effect Attributed	No effect	Effect Attributed
	Behaviour Change	-	No effect	-	No effect
	Support for climate policy	-	Effect Attributed	-	Effect Attributed
	Willingness to consider radical policy	-	Effect Attributed	-	Effect Attributed
Organizational and Policy Change	Network effects	-	Effect Attributed	-	Effect Attributed
	Profile of Climate Change	Effect Not attributed	Effect Attributed	Effect Not attributed	Effect Attributed
	Organizational Structure	-	Effect Not attributed	-	Effect Not attributed
	Climate Policy & Projects	Effect Not attributed	Effect Attributed	Effect Not attributed	Effect Attributed

This table outlines that any effects found in the interviews were attributed to the LCCV. The effects found in the document analysis could not be attributed to the LCCV but some effect was still found in the interviews both by information local staff participants raised without prompting in the interview process, and by specifically asking local staff participants whether the effects found in the document analysis were a result of the LCCV. Interestingly, no effect was found for level of concern in the

document analysis but an effect was found in the interviews. This is likely due to the fact that the effects mentioned in the interviews did not translate into official, written documents or that these effects existed in documents that were not part of the document analysis.

6.1.2 RESEARCH QUESTION #1: WHAT WAS THE LONG-TERM IMPACT OF THE LCCV ON INDIVIDUAL PARTICIPANTS?

This section will summarize the study findings for the indicators selected to answer the first research question: what, if any, was the long-term impact on the knowledge, attitude, and behaviour of the LCCV on individual participants? The effectiveness indicators were chosen before the interviews, and determined the interview protocol. After the interviews, the indicators continued to be a useful way to understand and group the findings.

KNOWLEDGE

Recall

Participants in the LCCV remembered the project. It is significant that all participants demonstrated an ability to describe the LCCV project, remembered that scenarios had been used, and that eleven of the twelve participants could describe one or more visualizations from the workshop in detail. This research design was not designed to isolate the impacts of the different aspects of the LCCV, such as the visualizations, the process, or the quality of the facilitators, but it does suggest that the project was memorable, and that the visuals were vivid and compelling. Interestingly, some of the photos that had the highest level of recall were the same visualizations that had the highest level of engagement with the public during the actual LCCV process (Sheppard, Shaw, et al., 2008). Best practices of communication involve using visual, vivid and compelling images as they are more likely to elicit an emotional response and are more memorable (Lester, 2006; McKenzie-Mohr, 2011). In addition, it is possible that the use of vivid local images allowed the participants to encode the material with reference to themselves. Thus, instead of associating climate change with polar bears and melting ice caps, it is associated with their local beach, or their backyard. This finding reinforces existing research on literature of imagery and recall that a person's ability to remember an item is better when it is encoded with reference to the self (Brown et al., 1986).

Overall, the fact that almost all of the participants could describe a picture almost 4-5 years later suggests the LCCV is able to capture participants' attention and provide "vivid, concrete, and personally relevant affective images of climate change" (2007, p.50), what Leiserowitz argues most Americans

currently lack in his explanation for inaction on climate change in the US. This is one barrier the LCCV seems well suited to overcome.

Knowledge transfer

Participants in the LCCV used knowledge and concepts from the process in their work or at home. As tested through interviews and the document analysis, the evidence suggests there was knowledge transfer from the LCCV to the everyday context of the participants. In the interview, nine of the twelve participants indicated they had used the tools, knowledge or concepts from the LCCV after the research, including in official government communications and local government staff presentations to internal and external stakeholders. In the interviews, the participants stressed that they likely would have used the materials more had there been more follow-up from the LCCV project team. The North Vancouver staff missed a large opportunity to include concepts and visualizations from the LCCV in their Official Community Plan Process.

It appears that the LCCV helped to overcome another barrier to climate action at the local government level: lack of information (cf. Adger et al., 2007). The evidence suggests the information and the concepts were used, and that they helped to seed and spur further conversations about climate change with local governments. The face-to-face interaction increased trust and helped the science to sink in. The process also spurred new research, such as a Flood Risk and Consequence Study in Delta (Corporation of Delta, 2008a). Overall, it appears that the LCCV helped the local governments to overcome the barrier of a lack of information, and to provide some structure for analyzing decisions in the context of uncertainty.

Understanding of climate change

Although participants in the LCCV were already aware of climate change, the process served to reinforce their belief in the science, and increased their understanding of the local impacts. It is unlikely that the participants in this research, who were members of the working groups that participated in the creation of the climate change scenarios, would have misunderstood the levels of uncertainty associated with the scenarios presented in the LCCV due to iterative process of generating and reviewing scenarios and visualizations. The results from the interviews revealed that all of the participants were aware of climate change before the LCCV and that, for most of the participants, the LCCV served to reinforce their belief in the science of climate change and to add to their pre-existing understanding. There was clearly a self-selection effect with the LCCV participants who agreed to be interviewed, and I am not able to conclude

whether the LCCV would have a stronger impact on understanding if the participants did not already believe in climate change. The results from the initial post-testing session survey similarly suggest that the participants from the general public in the LCCV processes were already informed about climate change (Cohen et al., 2011; Tatebe et al., 2010).

ATTITUDE & BEHAVIOUR CHANGE

Level of concern

Participants reported leaving the LCCV process with an increased level of concern with climate change. Eight of the twelve participants indicated the LCCV helped to convince them climate change was more serious, especially with regards to local impacts. These findings line up with the post-testing session surveys of the public. In Delta, public participants registered a substantial increase in their sense of urgency in responding to climate change (Sheppard, Shaw, et al., 2008). In North Vancouver, participants registered an increased level of concern, though it was not statistically significant (Cohen et al., 2011). Despite the methodological challenges of this evidence due to potential issues of recall, this does suggest the LCCV can be effective in increasing the level of concern of participants.

One interviewee was not more concerned, indicating that farmers would continue to adapt as they have always done. The result from this participant's interview suggests a potential shortcoming of the LCCV: that the LCCV may not be able to change someone's interpretation of the facts, when their pre-existing beliefs and opinions are to be skeptical of climate change. Numerous studies have now shown that facts are interpreted through a person's pre-existing worldview and beliefs, and that facts presented counter to this do not necessarily change those beliefs, but can, in fact, harden them (Gaines, Kuklinski, Quirk, Peyton, & Verkuilen, 2007; Kuklinski & Quirk, 2000; Nyhan & Reifler, 2010; Taber & Lodge, 2006). Currently, little is known about how to present facts so that people who disagree with them will be more open to them to changing their mind.

Behaviour change

Participants did not report changing their behaviour as a result of participating in the LCCV. The participants indicated that the LCCV had not motivated them to change their behaviour anymore than they already had prior to the workshop. This does not align with the post-testing session public survey. Right after the public workshops, participants indicated in the survey that they were motivated to change their behaviour (Sheppard, Shaw, et al., 2008). This suggests that, by itself, without sustained

follow-up, the LCCV, as conducted, was not the right tool for changing behaviour with more informed participants. These results are not surprising given the significant barriers to climate change action and the level of effort required to overcome them (APA, 2009; Kollmuss & Agyeman, 2002; Lorenzoni et al., 2007; McKenzie-Mohr, 1999). We know that sustained support and positive reinforcement can encourage the maintenance of effective environmental behaviour (Lorenzoni et al., 2007). The LCCV was not designed as a behaviour-change mechanism: there was generally little follow-up and no extra materials were provided.

Numerous years of research and case studies have shown that behaviour change programs that follow principles from Doug McKenzie Mohr's community-based social marketing are more likely to be successful (2011). This program entails carefully selecting a specific behaviour, researching the barriers and benefits for your intended audience, and selecting a specific intervention from a toolkit to motivate and/or remove the barriers to the desired behaviour.

Interestingly, one interviewee stated that he moved to Beach Grove after the workshop. This was one of the focus communities of the LCCV process: visualizations looked at how this community would be affected by various scenarios, including one where Delta would be flooded. This was not the interview participant who reported that their level of concern with climate change had not increased. In addition, another participant who currently lived in Beach Grove and did not want to move questioned the impacts of climate change on their specific community a few times throughout the interview. This participant thought climate change was a problem and that Delta as a whole should mitigate and adapt to climate change by extending the seawall, but that the seawall in front of their house did not need to be raised as they believed a more careful review of the science would find that flooding would not be a problem in their section of the coastline.

These research findings also further debunks the information deficit model as an explanation for the lack of action on climate change (Hines, Hungerford, & Tomera, 1987; Stern, 2000). Under the information deficit model, one would expect that a project that increased participants' understanding and level of concern would translate into behaviour change. Research has found that a correct understanding of the causes and consequences of global warming has been found to be a key determinant of stated behavioural intentions (Bord, Connor, & Fisher, 2000). However, this research reaffirms that information alone does not generally translate into actual behavioural change.

This research further affirms the difficulty of communicating climate change in a way that will motivate people to change their behaviour when they are predisposed to justify their existing or planned status quo behaviour. Indeed, research also shows that that people are particularly resistant to changing individual behaviors and habits that they see as impacting their quality of life (Bord et al., 2000; Shove, 2003). Moreover, we know that the relationships between the barriers and motivators to individual action on climate change are complex and multifaceted (APA, 2009). On the other hand, it is also possible that this effect is not related to quality of the information or LCCV experience provided, but more related to the participants who were interviewed seeing themselves as more sustainable given their career paths in environmental issues and their interest in climate change.

Overall, the evidence from this project suggests that given the LCCV's ability to increase awareness, understanding, and concern for climate change, it could form part of a behaviour change program, but significant extra resources, planning, and follow-up would need to be included in order to achieve this objective.

Support for climate policy

Participants of the LCCV process interviewed in this study stated that the process led them to more strongly support climate change policy. This aligns with the post-testing session public surveys which found an increased willingness on the part of participants to support climate change policy (Cohen et al., 2011; Sheppard, Shaw, et al., 2008). Seven of the twelve interviewees indicated the LCCV had increased their support for climate change policy, suggesting that the LCCV does show promise as a process that can build support for policy, and be useful to decision-makers when making decisions and policies to mitigate and adapt to climate change. In addition, three local government staff indicated they felt empowered to include climate change in their work, especially given the seriousness of the local impacts. Despite this support, no participants indicated that they had contacted a decision-maker regarding climate change as a result of the LCCV. As with behaviour change, no extra resources or follow-up was included to facilitate this, such as the contact information for decision-makers or a template letter, the provision of which would likely have significantly increased follow-up. This result can be compared to the *CaliforniaSpeaks* project. This event aimed to educate the public about the policy options for health reform, after which 40% of participants contacted a public official about health care reform (Fung & Harbage, 2007).

As with the aim of facilitating behaviour change, it is likely that the LCCV could translate increased support for climate policy into engagement with elected officials by including this as an explicit goal and providing resources and material to support it.

Willingness to consider radical policy

Local working group participants were more willing to support more radical climate change policy. Eight of the twelve participants indicated that they would be more willing to support, or consider supporting more radical climate change solutions. This is useful for facilitating policy change given the literature's understanding of policy change where new policy proposals are more likely to be accepted if they fit with how a person thinks the world works (Kingdon, 2003; Sabatier, 2007). Thus, a public servant will be more likely to suggest a more radical proposal if it fits both with their idea of what they think should happen, and if they think the decision-maker will agree. The ability for the LCCV to encourage local climate champions to more frequently include climate change in their work and to include more radical options in their presentations to senior staff and decision-makers is an important possible effect of the LCCV.

SUMMARY

Overall, except for behaviour change, the results from the LCCV on individual participants, including results for indicators of knowledge, and attitude track closely with results found with public and practitioner testing at the time of the public testing sessions, including multiple positive effects on cognition, attitudes, and policy (Cohen et al., 2011; Sheppard et al., 2011; Tatebe et al., 2010). These findings are also consistent with other studies using visualizations that evaluated their impact, such as Sheppard & Meitner (2005) and Tress & Tress (2003).

6.1.3 RESEARCH QUESTION #2: WHAT WAS THE LONG-TERM IMPACT OF THE LCCV ON LOCAL GOVERNMENT PARTNERS?

This section will summarize the findings for the indicators selected to answer the second research question: what, if any, was the long-term impact of the LCCV on local government staff and partner organizations - the Corporation of Delta and the District of North Vancouver. The responses of the four interviewees who were stakeholders were not included in this analysis.

Network effects

The local government staff participants in the LCCV process did somewhat increase their network for moving climate change policy forward. For this indicator, participants were asked about the frequency and nature of their continued relationship with contacts they had met through LCCV process. Staff participants who were not local champions did not indicate that their network had expanded or strengthened, but continually referred to the importance of the local champions for furthering action on climate change within the local government, suggesting that the LCCV process served to identify local champions to allied staff. Thus, the evidence from the interviews does point to the ability for the LCCV to create a sense of slightly greater connectedness between allied staff within the local government and between staff and supportive scientists, potentially contributing to overcoming one of the barriers to action on climate change - a lack of coordination between siloed department and a lack of necessary information (Bedsworth & Hanak, 2010). This finding reaffirms previous findings of the importance of local climate champions within local government staff for facilitating action on climate change (Cohen et al., 2011; Tatebe et al., 2010). This research did not find that the LCCV connected non-local staff participants as none of these interviewees were still in contact with anyone from the LCCV.

Profile of climate change

It is not clear that the LCCV process by itself raised the profile of climate change within the local governments. This indicator was selected to understand if the LCCV was able to increase the profile of climate change within the local government, potentially a pre-cursor to changed policy and action. In the interviews, nine participants reported that the LCCV had resulted in discussions with other staff members after the workshop in both communities. The document analysis suggests an increase in the profile of climate change within Delta and North Vancouver, especially after the provincial government legislation was introduced in 2007. There is sufficient evidence to say that the LCCV did cause an increase the number of discussions about climate change at the local government level, but not enough to attribute the observed increase in profile of climate change detected in the document analysis to the LCCV. The LCCV may have contributed to raising the profile, but this research project cannot conclude that the LCCV was the primary or even a partial cause of raising the profile of climate change.

Organizational structure

The LCCV process did not impact the organizational structure of the local governments. This indicator was selected to measure the ability of the LCCV to influence decision-makers to direct more organizational resources towards climate change. When asked, all eight of the staff participants

indicated that their municipality's organizational structure had changed with respect to climate change since the LCCV. This included new inter-departmental working groups, new staff positions, re-named departments, and changed job descriptions. However, the staff participants explicitly asserted that these changes were not a direct result of the LCCV.

Climate policy & projects

Planning for climate change occurs within a complex set of local government institutions and practices (Roberts, 2008; Burch, 2010a and 2010b; Bassett et al., 2010). Recognizing this, and the difficulty of linking a decision or policy change to a specific project (Walter et al., 2007), this indicator reviews the evidence for whether the LCCV was able to facilitate a community response to climate change in the form of policy change, actions, or projects to mitigate or adapt to climate change. This was measured by examining local government documents and explicitly asking staff at the local government staff participants in the LCCV what they thought the impact of the LCCV was, if any. As both communities have been taking action on climate change, the interviews were also an opportunity to ask first-hand what the local staff thought the reason for action was.

Delta

In Delta, the following reasons were all mentioned by local government staff in the interviews for why they thought the municipality was acting on climate change:

- In late 90s, becoming part of ICLEI's Cities for Climate Protection Program,
- Flooding in 2006 in Boundary Bay and Beach Grove communities,
- Provincial government legislation in 2007,
- A supportive mayor and council who realize climate change is a big issue for the community given vulnerability to sea-level rise,
- A desire to give climate change a higher profile so that provincial and federal governments know it is an important issue for local governments and they need financing, and
- Staff who want to act because they feel strongly about climate change.

These reasons suggest the motivation for the local government to act on climate change increased over time as outside events reinforced the first step Delta had taken. Flooding and provincial government legislation reinforced the local government's initial decision to join ICLEI's program. Mayor and council were also willing to take a leadership position due to Delta's vulnerability to sea-level rise and their desire to raise the profile of the city's vulnerability to climate change at higher levels of government. The

document analysis revealed that Delta was taking action on a number of recommendations made at the conclusion of the LCCV project, but it is not clear from the document analysis, what role, if any, the LCCV had in these decisions. In the interviews, local government staff mentioned two changes that were specifically a result of the LCCV, including new proposed flood by-laws for vulnerable areas like Boundary Bay and Beach Grove and the completion of a flood risk study where the contractor was asked to include climate change scenarios.

In an article in *ClimateWire*, the Mayor of Delta, Lois Jackson, is quoted publicly saying, in reference to the LCCV process: "A picture says a thousand words, as they say. We saw this and said, 'OK, we have to start planning.'" Mayor Jackson said seeing computer models of the coastal and agricultural resources underwater helped kick-start local officials into action. And, Jackson noted, it didn't hurt that some local leaders had property on the seashore where, she noted, "there's some very expensive real estate, as you might expect... Beyond the personal impact, she said, city leaders were able to get an immediate sense of the financial implications for the city" (Friedman, 2008). Based on this interview with the Mayor, the same article explains:

"In the city of Delta, officials said the project had on-the-ground results. In July, officials hammered out a corporate climate change plan that was adopted by the council as its first climate mandate. The visualization — as well as a recent unseasonably high snow pack that kept the region on 24-hour flood watch — helped to bolster a plea to the provincial government for funding to improve the dike" (2008).

Overall, the sense from the interviews and the document analysis is that the LCCV reinforced the local government's effort and commitment to respond to climate change - that it was a "turning point" that provided momentum for the staff to continue to push for action and for mayor and council to feel more comfortable taking a leadership position on the issue.

North Vancouver

In North Vancouver, the following reasons were all mentioned during the discussions of why the municipality was acting on climate change:

- City Council officially adopted The Natural Step framework in 2004,
- Fatal mudslide from heavy rains in 2005,
- Directives from Metro Vancouver, and, in general, Metro Vancouver's work on climate change influencing North Vancouver staff,
- Discussion in the media which triggered discussion with Councillors, who then talked to the Chief Administrative Officer,
- Provincial government legislation in 2007,
- A desire to compete with other municipalities to be the most green,
- Staff who want to act because they feel strongly about climate change, and

- Culture in Council and community of “very strong environmental stewardship” (5).

Similarly to Delta, the sense from the interviews is that initial steps to act on climate change were reinforced by events such as a fatal mudslide linked to climate change, direction from other levels of government, a Mayor and Council who wanted to be seen as green, and staff who felt strongly about the issue. As one participant said: "I think this is a combination of having the kind of political leadership where they feel very strongly about being green, as well as senior staff and other staff members are also equally strongly feel about our environment." (6)

The document analysis revealed numerous climate change initiatives underway to mitigate and adapt to climate change. Indeed, the most recent Official Community Plan includes comprehensive measures to mitigate and adapt to climate change. As in Delta, it is very difficult to tell from the document analysis alone how much these decisions and initiatives were influenced by participation in the LCCV. The interviews helped to provide some indication of the role of the LCCV.

With regards to the OCP, two staff described, without prompting, that the increased discussions of climate change and the LCCV within the municipality contributed to climate change receiving its own chapter in the OCP. "[The LCCV] became a point of discussion and as a result when we started to work on the OCP revisions, it became its own entity and realized that that would have to be addressed." (4) Another staff participant indicated later that climate change would not have gotten its own chapter in the Official Community Plan if the BC Government had not implemented a suite of climate change legislation, including the Community Climate Charter in 2007. The high profile inclusion of climate change in the OCP was likely influenced by both. Another staff member indicated that the OCP was including quite radical changes, including measures to increase densification in village centres was as result of "Bill 27, climate change and the realization that we have a really strange demographic shift happening." (5)

Staff in North Vancouver also mentioned a few projects that were specifically a result of participating in the LCCV project, including new policy documents related to development permit hazard areas that applied a climate change factor, a change in the management policy of forests, new ideas for storm stormwater management, and a few climate-focused "reconnaissance" studies. Overall, it does not seem that the LCCV is directly related to how seriously climate change was taken in North Vancouver,

but, as part of a longer-term process of thinking on climate change within the municipality, it seems that it did prompt certain policy actions and helped drive changes. In the words of the participants:

- (1) It was a good boost.
- (2) There was definitely some momentum that was gained out of the [LCCV] to help us keep us pushing in some of the things that we're working on now.
- (4) I think it did help to trigger a bit more of an effort and evaluation of resources committed to it.

Summary

The local government staff responses throughout the interviews suggest how the LCCV may have affected the policy process. Staff participants reporting that the LCCV made them evaluate how they incorporate climate change in their work suggests that the LCCV affected the policy process by helping the science of climate change penetrate into the local governments (Ingram & Fraser, 2006), and also by shifting the culture of the staff (Burch, 2010). Overall, the LCCV was a reinforcing agent for action on climate change within the local governments that helped create momentum and accelerate action up to a certain point. On issues where enough barriers were removed and a supporting context or co-benefits existed, significant action on climate change was taken. For example, in North Vancouver, the knowledge that they needed to act on climate change, reinforced by a shrinking tax base and development pressures, led to the introduction of significant densification measures in their OCP - a policy that has traditionally been extremely controversial.

However, where the supporting context or co-benefits did not exist, or where enough barriers were not removed, action on the issue was blocked. For example, in Delta, the new flood by-laws had not yet been passed due to political sensitivity and legal concerns with flood protection at the municipal level, and attempts to zone for denser community in the Tsawwassen Area Plan were met with significant public backlash, and the planned amendments were abandoned (Corporation of Delta, n.d.-a, 2010a).

This finding supports what has been suggested in the literature - that the most effective way to get local governments to plan, and implement policies that deal with the complex problems climate change presents, is to link the climate change solutions to other existing issues to reveal co-benefits and no-regrets options (Van Asselt, Gupta, & Biermann, 2005; Aylett, 2011; Smit & Wandel, 2006). The LCCV project did quite a good job of this by including other ongoing trends in land use, infrastructure, and development such as water treatment and filtration plans. In addition, the experience of the Cities for Climate Protection Initiative further suggests that "localisation requires the prior existence of a local

hook on which to hang the issue of global climate change" (Betsill, 2001)." In the case of Delta, this was flooding, and in North Vancouver, this was a fatal mud slide.

In terms of the barriers to climate action at the local level reviewed in section 2.3, the LCCV process:

- cannot change the authority of local governments regards to provincial and federal governments (Schipper & Pelling, 2006),
- cannot affect the resources a local government has at its disposal, besides re-prioritizing existing budgets and potentially encouraging the adoption of new taxes or user fees,
- can help local governments overcome the limitations of traditional planning processes in responding to climate change by including staff from multiple departments and explicitly addressing scenario planning and trade-offs,
- can help overcome behavioural, but not structural barriers to local governments acting on climate change by increasing the staff's level of urgency with acting, but not in changing job descriptions or performance metrics,
- can significantly help to resolve the problem of the lack of local information by including local information on climate change and addressing uncertainty through scenario planning, and
- can help local governments plan for climate change by increasing public support.

Throughout the interviews, the LCCV process is referred to as a "turning point," "jumpstarter," "reinforcer" and a "contributor" for implementing climate policy. Other encouragement to act was needed however, in the form of local impacts (e.g. flooding in Delta, mudslides in North Vancouver), support from leadership, and direction from regional and provincial governments. Delta is more open to talking about flooding risk and adaptation and deeper changes to their operations. The District of North Vancouver's Official Community Plan includes densification and the creation of village centres - subjects that were so controversial as to not be considered even a few years ago. Moreover, it may be unrealistic to expect any single initiative, such as the LCCV, to lead to distinct effects within a community, even though the initiative may be a key overall contributor. The LCCV may have had a lot of value as part of the larger process for change within the two communities that is difficult to account for through an evaluation of the LCCV on its own.

6.1.4 RESEARCH QUESTION #3: WHY WAS THE LCCV PROCESS EFFECTIVE?

The interviews resulted in a plethora of findings about what it was about the LCCV that participants thought were effective. These results surfaced without prompting during the interviews. According to the participants, the LCCV stood out because it was:

- science-based,
- organized by a trusted third party,
- integrated and holistic,
- innovative,
- optimistic
- thought-provoking,
- based on local information, and
- visual.

Few other studies have tested or demonstrated the degree of recall and visual imagery and process on climate change which appears to be able to stick in people's heads. In developing this research project and the effectiveness indicators, I underestimated the importance of the LCCV being science-based, organized by a trusted-party, and innovative. These turned out to be relatively important factors in the ability of the LCCV to gain participants' trust and allow them to be more open to the information that was presented. I am not certain that the ability to foster social learning was an effective attribute. To the degree that meeting face-to-face with scientists in a facilitated environment allowed the participants and staff to trust the information, I think social learning did occur, but this research project did not discern evidence of the development of "shared understanding of the problem among different societal groups" (Schlumpf, Pahl-wostl, Schönborn, Jaeger, & Imboden, 2001, p.208). These types of questions were not specifically probed for in the interview protocols, which was an oversight.

On the other hand, the importance of the LCCV being integrated and holistic, based on local information, and visual were expected to be effective attributes, as discussed in Section 2.5. There is a significant body of research supporting the importance of local information (cf. Dahinden et al., 2003; Holman et al., 2005; Robinson, et al., 2006; Salter, Robinson, & Wiek, 2010, Halvorsen & Carr, 2001, Moser & Dilling, 2007, Leiserowitz, 2007, Shackley & Deanwood, 2002). A similar body of literature supports the effectiveness of using landscape visualizations to communicate potential changes to a community (cf. Al-Kodmany, 2000; Appleton & Lovett, 2003; Sheppard & Meitner, 2005, Salter,

Campbell, Journey, & Sheppard, 2009; Tress & Tress, 2003). Notably, the fact that the LCCV was participatory was not mentioned by the participants.

Overall, these are important findings for future transdisciplinary projects to consider, and in general, for projects that seek to educate and engage the public, and/or local governments. Few projects to accelerate climate change at the local level have this diversity of attributes.

6.1.5 COMPARISON OF DELTA AND NORTH VANCOUVER

In recognition of the different contexts of involvement with the Corporation of Delta and the District of North Vancouver, the slightly different processes, timing, and level of involvement and follow-up of CALP staff, it would not be appropriate to do a detailed analysis and comparison of the differing effects between North Vancouver and Delta. Nonetheless, this section will provide a brief overall comparison. Overall, the findings for the long-term impacts on participants and the local governments are quite similar.

Table 6.2 Comparison of findings in Delta and North Vancouver

	Indicators	Community	
		North Vancouver	Delta
Knowledge	Recall	7/7 of participants	5/5 of participants
	Knowledge transfer	4/7 of participants	5/5 of participants
		Evidence in 8/32 documents reviewed.	Evidence in 4/42 documents reviewed.
	Increased understanding	6/7 of participants	5/5 of participants
Individual attitude & Behaviour Change	Increased level of concern	6/7 of participants	2/5 of participants
		No evidence in document analysis.	
	Behaviour Change	0/7 of participants	1/5 of participants
	Support for climate policy	4/7 of participants	3/5 of participants
	Willingness to consider radical policy	6/7 of participants	2/5 of participants

Organizational and Policy Change	Network effects	Evidence of effect.	
	Profile of Climate Change	Some evidence of effect.	
	Organizational Structure	No evidence of effect.	
	Climate Policy & Projects	Evidence of one small follow-up study and one large project as a result of LCCV.	Evidence of follow-up studies and projects as a result of LCCV.

Despite significantly more follow-up in Delta by the UBC research team, the results between the two communities are surprisingly similar. Perhaps the higher level of follow-up and interest from local government staff in Delta in continuing research projects on climate change with CALP was because it occurred at a time when there was openness on the part of local government staff to try new things (Kingdon, 2003). Resource restrictions meant that there was little follow up in North Vancouver from either staff or CALP, and unfortunately, nothing specifically from the LCCV process was included in the Official Community Planning process, although one staff person felt the LCCV helped lead to the inclusion of climate change as a separate chapter in the OCP.

6.1.6 CONTEXTUAL UPDATE

In the discussion of the study findings it is important to reiterate, as is mentioned in section 3.5, that there were other contextual factors that influenced why the level of follow-up from the Collaborative for Advanced Landscape Planning with the City of North Vancouver and the Corporation of Delta differed. For example, in Delta, the Corporation of Delta and CALP continued to work collaboratively on a follow-up study through the Regional Adaptation Collaborative. This was due to the interest of the federal government in researching adaptation to sea-level rise and the profile of Delta on studying climate change. A follow-up study on the effect of sea-level rise was an explicit recommendation from the first LCCV process. This follow-up research built off work completed in the first LCCV process (Burch et al., 2010; Shaw et al., 2009). The project focused on combining sea level rise adaptation scenarios with model-driven indicators, and 3D landscape visualizations. The visioning package included adaptation options such as managed retreat, which were previously not considered by Delta staff, the same Delta staff who were involved in the first CALP project in Delta. Comparatively, in North Vancouver, interest by a CALP staff member resulted in a follow-up study in North Vancouver identifying the renewable energy capacity of the region and exploring in depth the mitigation aspects of the LCCV process (Flanders & Sheppard, 2010).

6.1.7 POTENTIAL EXPLANATION OF LIMITED OUTCOMES

While the LCCV processes did facilitate outcomes in both communities, I think it is possible they could have achieved more. This research project suggests the LCCV did achieve impressive "interim" outcomes such as increased support for climate policy, increases in environmental concern, and increased profile of climate change, but lack of tangible outcomes reported by the interviewees, such as behaviour change, environmental activism, and actual changed policy. To a large degree, the policy changes that have occurred in the two communities appear to be a result of provincial legislation that mandated those changes. However, these types of outcomes are subject to a host of barriers that the LCCV does not necessarily address both at the individual and community level.

To contribute to climate action at the local level, the LCCV has to contend with the complex set of institutions, practices, and habits that govern policy and decision-making as well as significant barriers to action including a lack of authority, capacity and resources, traditional planning processes that do not integrate climate change effectively, structural and behavioural barriers, as well as a lack of accurate, local information, and the need for public support to enact policy changes. Despite some impressive results, the effectiveness of the LCCV process was likely limited by larger systemic obstacles to changes to the status quo, such as powerful entrenched interests, institutional rigidities, as well as the broader economic environment (Baber, 2004; Hall & Taylor, 1996; Krasner, 1982). Path dependence may have significantly hampered the policy options available to current decision-makers (cf. Hacker, 1998; Pierson, 2004; Levin et al., 2010; Aylett, 2011). Moreover, new scientific information may not be sufficient to affect policy change, as we have seen with climate change (Oreskes, 2004).

While the provincial government was supportive of climate action, the LCCV process was also followed by a relatively severe economic depression. These are systemic obstacles that the LCCV is not necessarily equipped to overcome as they tightly constrain the ability of the municipality and individuals to act (Burch, 2009), even if decision-makers and participants left the LCCV process intending to act. Decision-makers are also likely to have been impaired by more practical obstacles to implementing the outcomes of the LCCV process such as time, competing priorities, and resources. Even with intention, significant institutional, financial, or technical resources are required to support action on climate change (Adger et al., 2007; Yohe, 2001; Yohe & Tol, 2002). Moreover, both communities had limited exposure to the LCCV processes.

Practically speaking, the LCCV processes in Delta and North Vancouver were the first cut of an experiment. It was a UBC initiative, not a formal, official process. Delta and North Vancouver were invited to participate, but were not asked and made no commitment to implement any of the recommendations as a prerequisite to their participation. In addition, these processes were a one-time, single study and were not embedded in official planning processes.

One of the major limitations of the LCCV process was the limited follow-up from CALP due to a lack of time and resources after the completion of the research. The follow-up projects from CALP are outlined in section 3.5. With funding, CALP could have done more to formally present findings and recommendations to Council and staff in both communities, and perhaps to train staff. In Delta, recommendations were provided to the Council by PowerPoint, and eventually formalized in a report that was sent staff privately (Tatebe et al., 2010). In North Vancouver, CALP never presented the final findings formally to the Council, only to staff. The North Vancouver staff did have access to the images from the LCCV process but CALP could have done more to make these more available and accessible. In Delta, there was no strong GIS staff, and CALP did not do any training, so the methods were not picked up.

In the interviews, the participants who had not used any of the tools, knowledge, or concepts from the LCCV, indicated that might have had the products been made more readily available. One staff participant in North Vancouver indicated that they likely would have used more of the LCCV products in a climate outreach initiative if the OCP process had not started just then and taken up all the staff resources. North Vancouver failed to integrate LCCV methods into the OCP, which was a perfect opportunity; this may have been because the consultants hired to manage the project and had their own methods. There was apparently no call from staff or Council to use LCCV methods in the OCP process. Policy development relevant to the LCCV and subsequent follow-up processes is still underway in Delta.

One of the reasons the two communities did not seem to have adopted the techniques from the LCCV, such as using scenarios and visualizations, may have been because of the lack of capacity amongst the staff, and/or lack of capacity-building within the LCCV process. If this were a lab experiment, it would be interesting to re-run the LCCV projects with more follow-up and capacity-building with local staff, while keeping all other factors the same, to understand the impact the LCCV could have had.

6.2 Discussion of Methodology

This research contributed to the field of long-term effectiveness evaluations of transdisciplinary research. This is challenging research. This section will review the limitations, strengths, as well as reflections on how the methodology used here could be improved.

6.2.1 LIMITATIONS

There were some important limitations in the research design. This research was not a controlled experiment; it was a longitudinal evaluation of a transdisciplinary project conducted in two different communities at somewhat different times, with different levels of involvement among the participants and follow-up by the research group. In addition, the project was not initially designed for a long-term evaluation. This resulted in a number of challenges for conducting the evaluation. Firstly, thorough, organized records of the initial LCCV process were not readily accessible, which made it difficult to properly understand the complexity of the initial LCCV process. Second, this limited the ability to contact the stakeholders who had participated; available information was old, with inaccurate contact information and the stakeholders had not all been asked in the LCCV process if they could later be contacted. Lastly, there were different levels of participation in the LCCV process among the stakeholders who were interviewed. Some interviewees had participated in more than three working group sessions and seen the final visualizations in the public workshops, while others had only been to one working group session and only seen the final visualizations in a different meeting.

In addition, the research was limited by the necessarily partial nature of the document analysis. Given the thousands of committee meeting minutes and reports that could potentially have been included in the document analysis, an exhaustive review was not feasible within the time and resource constraints. The document analysis thus provides an incomplete measure of potential LCCV knowledge transfer, change in level of concern and profile of climate change, and policy changes within Delta and North Vancouver.

The limited number of interviews conducted in both communities is another weakness of the research. This was at least partly due to competing demands for time among the potential interviewees (Miller & Crabtree, 2004). The Project Lead on this research (the researcher's supervisor) was Project Lead of the initial LCCV projects, potentially leading to bias in interpretation of the results, although the project idea came from the student, not the Project Lead. Furthermore, I failed to prompt for specific examples of

knowledge transfer in interview. This was due to my inexperience. It would have been stronger evidence should the interview findings have included specific examples of policy or projects where the staff indicated they had used knowledge or concepts from the LCCV. It is also possible that the effect for level of concern was embedded because I asked if the participant's level of concern had changed after asking them if their thinking on climate change had changed. If they answered that their thinking had changed, it is possible they would also feel inclined to say their level of concern had change. In addition, the research design was also limited by issues of timing, and bias and self-selection, which are elaborated upon below.

LENGTH BETWEEN LCCV PROCESS AND INTERVIEWS

The LCCV process in Delta and North Vancouver occurred throughout 2006-7 and the follow-up interviews with staff and stakeholders who participated in the LCCV processes took place in early 2011. This was the first time these stakeholders and many of the staff had been contacted by the research team since the end of the LCCV process. Four years is a relatively long time to wait to conduct longitudinal interviews (Merton et al., 1990). However, as this research was focused on measuring effectiveness mainly in terms of outcomes, this length of time was deemed necessary to allow enough time for important effects to surface as outcomes, but brief enough for the participants to remember facts about the LCCV process and their involvement (Walter et al., 2007).

While the interviewees could still remember many details about the process, they were sometimes not able to recall the influence and role the LCCV in subsequent events. Some interviewees could remember details about the workshops in surprising detail; however, interviewees still struggled to recall many details and were somewhat confused on the chronology of events, as found by Miller & Crabtree (2004). There was also a limited response from the LCCV participants contacted to participate in the research, potentially because of the length of time between the original LCCV workshop and when they were contacted for the evaluation research. Nineteen participants in Delta and eighteen participants in North Vancouver were invited to participate in this study. In Delta, five participants accepted, one participant declined, and 13 did not respond. In North Vancouver, seven participants in agreed and 11 did not respond.

BIAS & SELF-SELECTION

The original LCCV process post-testing session public survey, as well as this evaluation, are constrained by the problem of self-selection (Bamberger, Rugh, & Church, 2004). Those stakeholders and public who originally chose to participate would very likely already be interested in climate change, especially given that they were willing to invest significant time in the project. Those stakeholders and staff who then chose to invest more time and participate in an interview to evaluate the LCCV process may already have a positive view of the LCCV process, which might have the overall effect of making the evaluation of the LCCV processes more positive. Furthermore, this research project may have found more evidence of effects as there was only one staff member who participated in the interviews that was not a climate change champion within their local government. In addition, it is also possible that the interviews were subject to response bias (Paulhus, 1991) as they knew they were being interviewed by a researcher who worked at CALP, the organization that ran the LCCV process.

6.2.2 STRENGTHS

Despite the existence of significant limitations of the research, the research design also has important strengths. The use of both a document analysis in addition to semi-structured interviews to measure the long-term effectiveness added to the robustness of the research. The LCCV was not referenced in any of the government documents; even in the documents where staff had asserted in the interviews they had been influenced by the LCCV. It is possible that this was due to the slow documentation and reporting process by CALP.

The research was also strengthened by the use of two case studies (Yin, 2003). Despite the differences in the case studies themselves and the LCCV processes in each, it was still helpful in the evaluation to have two cases. Indeed, in one way, the different LCCV processes helped point out a weakness in the LCCV process in the District of North Vancouver – the minimal follow-up. Additionally, the semi-structured interviews provided very rich, nuanced information. The prompting in the semi-structured interviews allowed for the elicitation of information that would not have been possible with a survey.

Overall, this was a long-term, comprehensive evaluation of the outcomes of a transdisciplinary research project that tested a rigorous evaluation framework. This represents a significant contribution to the literature. The selected indicators of effectiveness were appropriate for the research questions and helped to find and document important and interesting outcomes from the LCCV. I would recommend

those indicators be used again for a similar research project. However, the standard set for determining effects and attribution may have been too high. The standard could have been lowered and more effects included and attributed to the LCCV, with justification. As was a conservative methodology for determining effect and attribution, it is also possible that some effects of the LCCV were simply missed.

6.2.3 RECOMMENDATIONS FOR SIMILAR RESEARCH

In reflecting upon the methodology, there are a few changes I would recommend for future research, both to the actual research design, as well as to the interview protocol. First, I would suggest that:

- a) at least one other researcher also code the interviews to limit bias as much as possible,
- b) an independent research team conduct the evaluation, again, to limit bias as much as possible,
- c) two sets of follow-up interviews are conducted, approximately 18 months and four years after the research project, and
- d) long-term evaluation is planned for from the beginning of the research project, and that detailed, organized records are retained in accessible form for future analysis.

In terms of the interview protocol, overall, I would include more open questions, and wait longer before prompting to ensure that I was capturing the effects that the interviewees themselves thought of, before prompting about the effects I was specifically interested in. This is particularly true for organizational impacts. The interview protocol should have included an open-ended question on what, if any, impacts the interviewee thought the LCCV had, at the beginning of the organizational impacts section of the protocol. The interview protocol did include an open-ended question as to whether any organizational impacts were missed, but I think it would have been more effective to ask the open-ended question at the beginning of the section, instead of the end.

In addition, I would have included an open-ended question at the beginning of the organizational impact section of the interview protocol on why the interviewee thought the organization was acting on climate change. I would also have specifically included a question on what the interviewee thought was most effective about the LCCV, and then prompted for whether it was the fact that the information was local, visual or spatial, or other. This information came up in the interviews, but it was not part of the protocol and the data would have been more complete and rich had it been specifically asked. Furthermore, if possible, and where time and budget allowed, I would have looked at the effects on the citizens who

attended the three hour workshops as members of the public. Lastly, and again, where time and budget allowed, I would have included questions in the interview protocol to measure the effectiveness of the of the LCCV process itself.

Finally, I would consider creating a more nuanced or scaled basis for operationalizing the chosen measures to evaluate the long-term impact of the LCCV – the indicators of effectiveness. In this research project, I created a screen through a yes or no filter for effectiveness, but a more nuanced scale (cf. Beierle, 2002) would have helped when it was hard to decide between yes and no for some of the effects in the study.

6.3 Potential Application and Significance of the Research

The findings of the interviews with local stakeholders and staff in Delta and North Vancouver helped to identify an emerging set of key policy-relevant ideas. Understanding processes that are able to effectively move communities to new development paths is useful to community groups and NGOs looking for best practices in mobilizing citizens and communities to act on climate change policy and decision-makers at the local, provincial and federal level, and to other researchers. This research into how and why the LCCV may have (or may not have) stimulated action on climate change supports the ability of governments, businesses, NGOs and other groups to communicate climate change issues at the community level. These organizations could learn from what made the LCCV process effective, reviewed in section 5.2, to design more effectively communications, participatory planning processes and public outreach programs.

Where possible, NGOs and local governments should: partner with trusted organizations; use compelling, verifiable visuals; facilitate a participatory process that is as integrated as possible in terms of looking at impacts, adaptation, and mitigation together with local issues and economic benefits; and plan for a long-term process that includes the public, multiple departments, council and stakeholders.

6.3.1 RECOMMENDATIONS FOR LOCAL GOVERNMENT

This research project suggests numerous avenues of exploration for local governments seeking to act on climate change. To mitigate, and possibly prevent, the risk of public backlashes to climate change policy and projects, local governments should enhance their standard planning and engagement methods. Governments are already being asked to do this for a wide range of reasons. Local governments do

already frequently use town halls and open houses with posters of potential changes, and this research suggests local governments could increase the effectiveness of their engagement by adopting some of the attributes of the LCCV process, including:

- ensuring the work is based on credible science,
- hiring a trusted third party to facilitate,
- taking an integrated view of the issues,
- using local information,
- using compelling visuals, such as 3D visualization in a systematic, structured way, and
- including the public as early as possible.

While this type of engagement would necessarily entail a higher allocation of resources, it would be cheap in comparison to responding to the long-term cost of not mitigating or adapting to the projected impacts of climate change and not engaging communities until conflict arises.

6.3.2 RECOMMENDATIONS FOR CLIMATE CHANGE COMMUNICATION

There is a growing body of literature on climate change communication and an active practitioner's network (Pike, 2012). This research affirms existing literature on how best to communicate climate change impacts and suggest responses: make it local, visual, spatial (cf. Leiserowitz, 2007; Moser & Dilling, 2007; Vermeulen & Kok, 2002, Sheppard, Shaw, et al., 2008, Sheppard, 2012). Organizations, both local governments and NGOs, seeking to accelerate responses to climate change should keenly consider using visual forms of communication that realistically and credibly communicate potential impacts and potential solutions at the "backyard" scale. The evidence suggests that moral appeals based on impacts to humans and species that are remote to the audience will not be effective.

6.3.3 RECOMMENDATIONS FOR THE LCCV

The findings from this research project can be used help strengthen existing and future LCCV processes seeking to improve community climate change planning and to empower community action. This research project suggests the LCCV contributed to important impacts and outcomes that make it a project worth continuing, replicating, and improving. Indeed, every participant said they thought the LCCV process was valuable for their work, would recommend to other municipalities to participate, and thought that it was important that it continues.

Based on the recommendations of the participants in the research, as well as researcher observations, to increase the effectiveness of LCCV processes, future projects should consider:

- a. Including financial information within the scenarios, both for the costs of the suggestion adaptation, and the solutions. This was thought to be valuable information to help the participants evaluate and more fully understand the various scenarios, and their implications.
- b. Focusing on capacity-building with the local staff, as has been done in other subsequent LCCV processes, such as with the City of Kimberley (Schroth et al., 2009). This may increase the likelihood that LCCV products and concepts are more fully utilized and taken advantage of by the partner community.
- c. Embedding the LCCV in the local government planning processes, as in the Kimberley LCCV process (Schroth et al., 2009). Whereas the LCCV processes in Delta and North Vancouver occurred outside any regular planning processes, the LCCV process in Kimberley occurred as part of a local government's adaptation planning process, allowing the process to be more tightly integrated with the local government's decision-making on the relevant issues.
- d. Ensuring there are concrete, easily available outputs from the process. Without concrete deliverables, the outputs are too easy to lose. This should include a formal report to council as well as contextualized media files available in to local government council and staff in a usable format.
- e. Creating direct communication lines to the top decision-makers to pre-empt and avoid filtering of the content and process by staff.
- f. Increasing media outreach and planning for numerous public workshops and numerous follow-up meetings with local government staff to present the final visualizations to larger staff and public audience.
- g. Following up on requested research in as timely a manner as possible. Both communities requested that CALP develop more in-depth information on the feasibility and cost for climate

solutions in their community. This follow-up was eventually completed in both communities, but particularly in the case of North Vancouver, it could have been completed sooner to increase its relevance for the community and likelihood of influencing planning processes (cf. RAC “BC Regional Adaptation Collaborative,” 2011; Flanders & Sheppard, 2010).

- h. Creating a video game or social media friendly online version of the project that participants could interact with outside of workshops.
- i. Designing specific types of follow-up to facilitate any changes in behaviour or increases in political activism among individual participants.
- j. Continuing to focus on translating and integrating climate information outside of the municipal silos such as planners, engineers, and the GIS team.
- k. Striving for budgets to include robust follow-up and training where applicable for local staff, stakeholders, and the public.

In terms of the right avenue to scale up the LCCV process, it is unclear how this can best be done. For resource constrained communities the full LCCV process is likely prohibitively expensive, especially when not integrated into ongoing funded planning. The full LCCV process includes regional modeling and local level scenarios. There are options for scaling up the LCCV process in manner, including:

- a) Conducting the LCCV process on a larger scale, potentially at the regional scale, for example, the Lower Mainland. There are many pros and cons to this. The issue is whether the trade-off in terms of potential cost-saving and number of people reached is offset by the decrease in salience due to the loss of local information (Leiserowitz, 2007; Shackley & Deanwood, 2003).
- b) Training of other organizations to facilitate LCCV processes as part of their normal planning using the Guidance Manual (Pond, Schroth, et al., 2010). This would require a significant level of funding, and interested participant organizations. However, given the unique suite of skills possessed by the CALP team that implemented these LCCV processes, including GIS, landscape architecture, visualization, climate policy, and planning, it is unclear how many other

organizations would be able to facilitate LCCV processes as successfully, without reorganizing teams or potentially hiring new expertise. Another option would be to expand training and skill development in planning degrees and certificate programs.

6.4 Directions for Future Research

This research suggests a number of potentially fruitful avenues for future research. The first is relatively simple. This research project is one of very few long-term effectiveness evaluations yet conducted for transdisciplinary research. More of this type of evaluation work needs to be carried out to assess practice and to fully understand how to do this research well, so that future evaluation efforts can rely on trusted frameworks for evaluation. This is particularly true for evaluation of other long-term transdisciplinary research projects involving academia, government and stakeholder partnerships for impact on policy, practice and/or behaviour. Similarly, further study of the best practices in disseminating the knowledge, tools, and concepts from transdisciplinary projects would be useful so that research projects can be designed, implemented, and evaluated with this in mind. Moreover, there is significant data from the interviews that was not analyzed in this project due to time limitations, such as the suggestions on how to improve the visualizations. This data would be worth reviewing. More research should be conducted to test the effectiveness of the visualization compared to the process. Additionally, a longitudinal evaluation of the effect of the LCCV on the general public, the original intended target of the audience of the LCCV, could potentially yield interesting results that would further illuminate findings from this study.

Another worthwhile avenue of research would be to explore the social aspects of the LCCV and its impact on individual participants (APA, 2009; Fehr & Falk, 2002; Festinger, 1954; Heath & Gifford, 2002; Schultz, Nolan, Cialdini, Goldstein, & Griskevicius, 2007). Peer norms are also a strong influence in encouraging action to mitigate climate change or in justifying lack of action. How did LCCV allow for or encourage social factors, such as social norms, to affect individual-level thinking? This could be explored by asking participants about their perception of norms, possibly influenced by the LCCV process.

Finally, it could be a very interesting avenue of research to understand the role of optimism in transdisciplinary projects. A number of interviewees raised the importance of optimism in the LCCV process. Current research is mixed as to whether optimism is helpful or not in terms of promoting pro-

environmental behaviour (Fischhoff, 2007; Pahl, Harris, Todd, & Rutter, 2005; Sharot, Korn, & Dolan, 2011).

6.5 Conclusions

Insight into how communities can evaluate desirable futures and create plans to achieve such a future is critically important, if we are to succeed in fundamentally changing how we vote, live, eat, work and play in order to reduce our carbon footprint and stabilize the level of climate-forcing pollutants in the atmosphere. This study, in its breadth, depth, and combination of methods, evaluated whether the LCCV process is capable of facilitating community learning and action on climate change, by following up on the policies, plans, and other actions of case study communities.

This type of research is necessary to ensure we can scale up and invest in effective processes. Given the scale and the short time period necessary to avoid catastrophic climate change, this is extremely important (Anderson & Bows, 2011). The recent World Energy Outlook from the International Energy Agency tells us that, without transformational change, the world will build so much carbon-based infrastructure in the next *5 years* that it will be impossible to avoid catastrophic climate change (2011). In 2008, more than half the world's population was living in urban areas, for the first time in history (UNFPA, 2007). We need new or improved, and more effective processes that can reach further into the community, improve uptake by the community, and accelerate action.

In brief, the LCCV was part of a broader process of change within the two communities as they woke up to the local impacts of climate change, and started planning how to respond. The LCCV facilitated the pre-cursors to action on climate change, by creating local champions and networking them and other local staff, by reinforcing for local government staff that climate change was something they should take on, by creating a profile for the issue that made the Mayor and Council give staff direction to pay attention and dedicate resources, and by contributing to a culture for change. The LCCV process did not get the two local communities to a new development trajectory, or open the door to more radical change. The results of this study suggest it is worth continuing to test, adapt, and incorporate into current practice in order to potentially accelerate climate action.

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APPENDICES

Appendix A: Findings from the Document Analysis

DELTA

SUMMARY OF KNOWLEDGE TRANSFER FINDINGS IN DELTA

Year	Document	Evidence of Knowledge Transfer
2007	Delta Dike and Drainage Advisory Committee Meeting Minutes	Climate change was included as an issue for the Committee to address. This is consistent with the LCCV process in Delta, where a major theme was the importance of including climate change planning in the planning for Delta's dikes.
2007	Annual Report	In the Annual Report, flooding is recognized as a major risk for Delta. Again, this is consistent with the LCCV process which raised the issue of flooding as a significant risk, and a risk that was exacerbated by climate change.
2008	Council Report: Flood Management Strategy Workplan	The report cites the need for long-term planning for flooding to include climate change. This is consistent with the LCCV processes focus on the need to this.
2011	Official website: section on Community Energy and Emissions Plan	Mention of a plan to undergo a process to describe where the community wants Delta to be in 25 years. This is consistent with visioning process used in LCCV, but not direct evidence of LCCV influence.

STATUS OF IMPLEMENTATIONS OF ORGANIZATIONAL AND POLICY CHANGES IN DELTA RELATED TO LCCV RECOMMENDATIONS

Recommendations from CALP (based on Delta Technical Report)	Status of Implementation
Strengthen existing planning and outreach methods by incorporating proven visioning and visualization tools more systematically.	<p>Some implementation:</p> <ul style="list-style-type: none"> Some public outreach has used the visioning materials (e.g. the Delta Museum and Archives). Existing planning and outreach, such as the Area Flood Protection Plans, the Area Plan review processes, and the OCP, do not use the visioning materials, concepts or process. CALP invited to present in public meeting on climate change related issues in the Tsawwassen

Recommendations from CALP (based on Delta Technical Report)	Status of Implementation
	Area Plan.
Develop a more comprehensive Climate Change and Energy Action Plan for Delta.	Significant implementation: <ul style="list-style-type: none"> Comprehensive 2007 Climate Change Initiative (Corporation of Delta, 2007a). Delta is also currently completing a Community Energy and Emissions Plan (Corporation of Delta, n.d.-b, 1986a; Jackson, 2011).
Maintain strong policies to protect and support the viability of local agriculture.	Some implementation: <ul style="list-style-type: none"> The OCP Schedule A includes the objective to protect the agricultural land base and lands included in the Agricultural Land Reserve and the 2011 Agricultural Plan reflects this commitment (Corporation of Delta, 1986a, 2011a).
Consider development of a program to encourage and catalyze urban agriculture at the parcel and block scale.	Potential implementation: <ul style="list-style-type: none"> The OCP Schedule A includes a policy to encourage appropriately scaled farm dwellings (Corporation of Delta, 1986a).
Use the new powers granted by Bill 27 to dedicate Development Permit Areas for climate action for both new development and retrofit of existing neighbourhoods.	Some implementation: <ul style="list-style-type: none"> The 2008 amendments to the OCP Schedule E - Development Permit Areas requires new development permit areas to maximize sustainable design opportunities through energy saving fixtures (Corporation of Delta, 1986b).
Use a decision-support tool to assist adaptation and mitigation decision-making.	Not yet implemented.
Continue research partnerships and initiate studies to fill key data gaps in future planning (e.g. soil salinity modeling with sea level rise; renewable energy potential modeling for farm/industry/residential areas; ecosystem adaptation planning; local urban food production and intensive cultivation feasibility; costs and feasibility of neighbourhood retrofits)	Some implementation, based on personal communication with Angela Danyluk, (January 10, 2012): <ul style="list-style-type: none"> Delta staff are aware of the implications of a changing freshet/salt wedge and sea level rise scenarios but this has not been modeled. Delta is in process of completing a study on renewable energy potential as part of the Community Energy and Emissions Plan (CEEP) (due to be completed in late spring of 2012). The CEEP will likely also investigate costs and feasibility of neighbourhood retrofits. Delta has made plans to plan for a comprehensive adaptation initiative and have plans to complete an overarching document. Some ecosystem studies have been completed e.g. coastal squeeze and waterfowl. The Agricultural Advisory Committee of Delta has just completed an agriculture viability study that is expected to have adaptive/sustainability outcomes when implemented.
Build on ongoing GEOIDE Phase IV work, dike breach studies conducted by previous consultants, and recently updated studies on sea level rise in the Delta region (Hill et al, 2008) to provide more detailed and updated flood risk visuals from the LCCV	Significant implementation: <ul style="list-style-type: none"> Delta and CALP have continued their partnership to use a visioning approach to explore adaptation options to sea-level rise through the Regional Adaptation Collaborative (Collaborative for Advanced Landscape Planning, 2011) In addition: <ul style="list-style-type: none"> The 2007 Meeting Minutes of the Delta Dike and Drainage Advisory Committee, the 2008 Delta

Recommendations from CALP (based on Delta Technical Report)	Status of Implementation
project.	<p>Council Report on the Flood Management Strategy Workplan and the 2011 Dike & Drainage Advisory Committee Work Program all include the need to explicitly consider climate change in flood management planning (Corporation of Delta, 2007b, 2008b, 2011b).</p> <ul style="list-style-type: none"> • In 2008, Delta contracted a Flood Risk and Consequence Study in order to better understand Delta's flood risk and potential impacts (Corporation of Delta, 2008a).
Test decision-support framework on a case-study application to planning	Not yet implemented.
Model projected carbon emissions based on land use and increased employment in Tsawwassen.	Not yet implemented.
Extend visioning presentation to other parts of Delta.	Not yet implemented.
Recommendations from CALP (Based on CALP Presentation to Delta Council)	Status of Implementation
<p>Reduce domestic energy use:</p> <ul style="list-style-type: none"> • Conservation initiatives/incentives • Integration of energy efficient by-laws for retro-fits, rebuilds • Full-cost accounting of embodied energy in goods (i.e. food) 	<p>Some implementation:</p> <ul style="list-style-type: none"> • The 2008 Council Report on a Corporate Electrical Energy Policy promotes corporate energy conservation (Corporation of Delta, n.d.-c). • The 2009 Council Report on Community Action on Energy and Emissions Gold Program Application highlights Delta's actions on promoting and incentivizing conservation and energy efficiency (Corporation of Delta, 2009a). • The 2010 Annual Report includes a summary of actions taken to promote energy conservation through retrofits and public outreach (Corporation of Delta, 2010b). • The OCP Schedule A includes the objective, with supporting policies, of improving energy efficiency among residents and businesses (Corporation of Delta, 1986a).
Change to renewable energy supply (e.g. Hydro-electric generation, Wind, solar, tidal).	<p>Some implementation:</p> <ul style="list-style-type: none"> • The 2010 Delta Annual Report mentions changed zoning to allow for solar energy systems (Corporation of Delta, 2010b). • Delta is also partnering with SolarBC to promote solar energy, and has initiated a district energy study for the North Delta civic precinct (Corporation of Delta, 2009b).
Invest in transportation planning and options.	<p>Some implementation:</p> <ul style="list-style-type: none"> • Delta is making some investments in sustainable infrastructure, as outlined in the 2009 Council Report on Delta's Climate Change Initiative Annual Report and 2008 and 2009 Action Plans (Corporation of Delta, 2009b). • The OCP Schedule A includes the goal of increasing transportation choice, which is supported by

Recommendations from CALP (based on Delta Technical Report)	Status of Implementation
	<p>a numbers of commitments, including encouraging Translink to develop an efficient local transit service (Corporation of Delta, 1986a).</p> <ul style="list-style-type: none"> • In addition, the OCP Schedule B and D encourage the creation bicycling and pedestrian paths (Corporation of Delta, 1986c, 1986d).
Sequester carbon using trees.	<p>Some implementation:</p> <ul style="list-style-type: none"> • Suggested as a mitigative action in the Delta Council Report on the South Fraser Perimeter Road(Corporation of Delta, 2007c) • Planting trees is listed as a highlighted action in the 2007, 2008, 2009, 2010 Delta Annual Reports (Corporation of Delta, 2007d, 2008c, 2009c, 2010b) • The OCP Schedule A includes the objective to plant more trees as opportunities arise (Corporation of Delta, 1986a).
Update flood proofing requirements based on climate change information.	<p>Not implemented.</p> <ul style="list-style-type: none"> • The floodproofing requirements in OCP Schedule E - Development Permit Areas have not changed since 1993 (Corporation of Delta, 1986b). • The Official Community Plan Schedule D - the Tsawwassen Area Plan requires that developments on the floodplain only need to be built to provincial standards (Corporation of Delta, 1986d).
Recommendations from Delta Staff (summarized in Delta Technical Report (Tatebe et al., 2010))	Status of Implementation
A local community climate change plan is needed for Delta with indicators and regular monitoring.	<p>Significant implementation:</p> <ul style="list-style-type: none"> • The 2007 Delta Climate Change Initiative requires update reports be sent to Council every 6 months (Corporation of Delta, 2009b, 2010c, 2011c). The only indicator is greenhouse gas emissions.
<p>Sustainable land use, including:</p> <ul style="list-style-type: none"> • densification (multi-use buildings, different housing forms, etc.), • planning for live-work relationships (community economic development, etc.), and • more efficient use of land (e.g. community gardens) and infrastructure 	<p>Some implementation:</p> <ul style="list-style-type: none"> • Secondary suites have been legalized (Corporation of Delta, n.d.-d). • The Delta Green Growth Index recommends sustainable land use (Corporation of Delta, 2009d). • Some community gardens have been established (Corporation of Delta, 2011d). • A "complete" community is listed as one of the goals of the OCP Schedule A. This is supported by a number of commitments, including supporting a wide range of housing types, home-based businesses, and medium density housing near transportation, jobs and amenities (Corporation of Delta, 1986a). • However, attempts to zone for denser communities in the Tsawwassen Area Plan met with significant public backlash, and the planned amendments were abandoned (Corporation of Delta, n.d.-a, 2010a). In addition, the 2011 Request for Expression of Interest on the Seven Seas

Recommendations from CALP (based on Delta Technical Report)	Status of Implementation
	Building, a relatively large plot of land directly adjacent to the water, does not include requirements for sustainable land use or flood-proofing that reflects climate change (Corporation of Delta, 2011e).
Better understanding is needed among staff of Delta's current commitment to climate change and climate policies (e.g. energy efficiency in capital projects).	Significant implementation: <ul style="list-style-type: none"> • The 2009 Council Report on Delta's Climate Change Initiative Annual Report 2008 and 2009 Action Plans lists climate training for staff as an action taken (Corporation of Delta, 2009b). • The OCP Schedule A includes a policy of educating Delta employees on climate change (Corporation of Delta, 1986a). • Further outreach and engagement with Delta staff is currently being planned, with help from CALP (Ellen Pond, personal communication, December 16, 2011).
Development of community alternative energy systems is needed.	Not yet implemented. <ul style="list-style-type: none"> • The 2011 Council Report on Community Energy and Emissions Plan - Community Engagement discusses better outreach on community energy and to develop community alternative energy systems (Corporation of Delta, 2011f).
Better integration between different groups of Delta staff is needed to develop comprehensive policy.	Some implementation: <ul style="list-style-type: none"> • The 2011 Workshop on Integrated Environmental Strategy attempts to provide clarity to staff on the overall environmental strategy (Corporation of Delta, 2011g). • Delta has also created an inter-departmental Climate Change Working Group.
A commitment to achieving climate change targets that factor in the triple bottom line.	Not yet implemented.
Need for a real capital plan to commit to policy changes related to climate change.	Not yet implemented.
Improved public education and engagement with residents and developers is needed, with direct assistance provided to residents.	Some implementation: <ul style="list-style-type: none"> • The OCP Schedule A includes a policy of requiring development applicants to complete a "sustainability" checklist" (Corporation of Delta, 1986a).
Need for demonstration projects (e.g. green roofs, lighting and heating alternatives, community gardens, etc.).	Significant implementation: <ul style="list-style-type: none"> • Numerous visible retrofits of community buildings (e.g. solar roofs) and establishment of community gardens (Corporation of Delta, n.d.-e, 2011c, 2011h).

NORTH VANCOUVER

SUMMARY OF KNOWLEDGE TRANSFER FINDINGS IN NORTH VANCOUVER

Year	Document	Evidence of Knowledge Transfer
2007	Annual Report	Using GIS for risk and hazard mapping, informed by climate science. This is consistent with the LCCV use of spatial mapping to map risks from hazard, informed by localized climate science.
2008	Stepping Out: The Natural Step Sustainability Action Plan (Draft)	Thinking ahead to what future the community wants. This is consistent with the LCCV process of visualizing possible futures for the community.
2009	Community Climate Change Action Report (HB Lanarc)	Use of four scenarios similar to those used in LCCV, as well as spatial analysis. The scenarios were similar, but different, and did not reference the LCCV scenarios.
2009	Report to Council: Community Energy and Climate Change Action Planning	Use of future scenarios to inform planning. This is consistent with the use of scenarios in the LCCV process.
2009	City of North Vancouver 100-Year Sustainability Vision (District participated)	Imagining a possible, desired future, as well as spatial planning. This is consistent with the LCCV process of visioning the future.
2010	Report to Council: Forest Ecosystem mapping and a Framework for Ecosystem-Based Management	Use of GIS and spatial planning. This is consistent with the use of spatial mapping in the LCCV process.
2011	Parks & Open Space Strategic Plan: Draft Report	Use of GIS and spatial planning. This is consistent with the use of spatial mapping in the LCCV process.
2011	Webpage: North Vancouver District receives Solar Community of the Year Award	Yes, GIS-based solar application. This is consistent with the use of spatial mapping in the LCCV process.

STATUS OF IMPLEMENTATIONS OF ORGANIZATIONAL AND POLICY CHANGES IN NORTH VANCOUVER RELATED TO LCCV RECOMMENDATIONS

Recommendations from CALP (based on LCCV Presentation to North Vancouver Staff)	Status of Implementation
Comprehensive community climate action and energy plan.	<p>Significant implementation:</p> <ul style="list-style-type: none"> • The recently amended OCP includes comprehensive measures to mitigate and adapt to climate change throughout the OCP and a dedicated section on climate action (District of North Vancouver, 2011a) • Community indicators established to track climate action implementation: <ul style="list-style-type: none"> ○ # new buildings complying with Green Building Strategy ○ # of town and village centres and developments with alternative energy systems

Recommendations from CALP (based on LCCV Presentation to North Vancouver Staff)	Status of Implementation
	<ul style="list-style-type: none"> ○ % fossil and renewable energy in the community ○ % reduction in corporate emissions ○ Waste diversion rate ○ # of solar applications <ul style="list-style-type: none"> ● The District is also drafting a Community Action and Climate Change Plan (District of North Vancouver, 2011b). ● Completion of a community GHG baseline analysis (Corporation of Delta, 2008c)
Install, facilitate and promote renewable energy systems (e.g. micro-hydro, biomass, solar photovoltaic and solar thermal).	<p>Some implementation:</p> <ul style="list-style-type: none"> ● One of the main goals of the new OCP is to reduce dependency on non-renewable fuels, and includes supportive policies to meet the goal (District of North Vancouver, 2011a) ● Completed an assessment of alternative energy sources (District of North Vancouver, 2009b). ● The District has created an interactive website (http://www.geoweb.dnv.org/applications/solarapp/) that allows residents to view the solar potential of their homes (District of North Vancouver, 2011c). ● Since 2008, the District has actively encouraged the use of solar hot water at both the community and corporate levels (District of North Vancouver, 2011c). ● An MOU has been signed supporting a feasibility study of energy production from waste hydrogen utilizing industrial heat output in district energy system (District of North Vancouver, 2011b). ● The District is reviewing feasibility of connecting District buildings to district energy system (District of North Vancouver, 2011b).
Increase sustainable infrastructure, including public transit, pedestrian and bicycle paths.	<p>Significant implementation:</p> <ul style="list-style-type: none"> ● One of the main goals of the new OCP is to provide viable alternatives to cars with a goal of 35% of District resident trips by walking, cycling or transit. The OCP includes numerous supportive policies to meet the target (District of North Vancouver, 2011a) ● The District partnered with the Cooperative Auto Network to provide a sustainable alternative to owning a car for residents and District Staff (District of North Vancouver, 2007a) ● Spirit Trail bicycle route constructed (HB Lanarc Consultants, 2009) ● Bicycle & Pedestrian Master Plan and Transportation Plan drafted (District of North Vancouver, 2011b). ● Completed Safes Routes to School Study (District of North Vancouver, 2011b) ● The Parks & Open Space Strategic Plan (draft) places the completion and maintenance of greenways and trails as a high priority (District of North Vancouver, 2011d)
Reduce energy demand through higher efficiency and density neighborhoods.	<p>Some implementation:</p> <ul style="list-style-type: none"> ● One of the main goals of the new OCP is to develop an energy efficient community with nodes of higher density, and includes supportive policies to meet the goal (District of North Vancouver, 2011a). ● The new OCP includes a 2030 target for 75-90% of new residential units to be located in 4 key centres, and

Recommendations from CALP (based on LCCV Presentation to North Vancouver Staff)	Status of Implementation
	<p>supportive policies to meet the target (District of North Vancouver, 2011a).</p> <ul style="list-style-type: none"> • The District established an Urban Containment Boundary protecting 2/3 of DNV land base (District of North Vancouver, 2011b) • Zoning bylaw was amended providing floor space incentive commensurate to energy performance and regulating alternative energy equipment (District of North Vancouver, 2011b).
<p>Reduce emissions from and energy use in new and existing buildings, both corporate and community.</p>	<p>Significant implementation:</p> <ul style="list-style-type: none"> • Ambitious and comprehensive Green Building Strategy implemented that includes new Development Permit Area for Energy and Water Conservation and Greenhouse Gas Emission Reduction including design guidelines (District of North Vancouver, n.d.-a). • The District is participating in Climate Smart Program for businesses (District of North Vancouver, 2010a). • Implementation of a Building Retrofit Program for District buildings (District of North Vancouver, 2010b).
<p>Reduce vulnerability to climate change (including: high elevations, steep slopes, sensitive recreation and water resources, high rainfall, extensive forest areas, fragile salmon habitat/riparian ecosystems, critical stream flows and high run-off, low-lying shoreline areas).</p>	<p>Significant implementation:</p> <ul style="list-style-type: none"> • One of the main goals of the new OCP is to adapt to climate change (District of North Vancouver, 2011a). • The new OCP includes the goal of reducing and mitigating the risk associated with natural disasters, and supportive policies to meet the goal (District of North Vancouver, 2011a) • The District is participating in Metro Vancouver's Integrated Resource Recovery Project (Fidelis Resource Group, 2011). • The 2007 Annual Report indicates that some operating reserves were increased to reflect the reality of natural hazards including snow removal and climate change (District of North Vancouver, 2007b). • Natural Hazards Task Force established and Landslide Assessment Studies completed (District of North Vancouver, 2007b). • Hazard database created (District of North Vancouver, 2007b). • Risk tolerance criteria applied, setting "clear requirements for applicants for subdivisions, development approvals and building permits in terms of landslide and debris flow risk management" (District of North Vancouver, 2009c, p.6).
<p>Reduce vulnerability and protect against forest fires.</p>	<p>Some implementation:</p> <ul style="list-style-type: none"> • Temporary smoking ban in local forests and trails (District of North Vancouver, 2007c) • The Parks & Open Space Strategic Plan includes the recommendation to "manage the urban forest interface to improve the species mix and mitigate risk of disease or hazards such as wildfire and windfall" (District of North Vancouver, 2011b, p.45). • Community Wildfire Protection Plan established (District of North Vancouver, 2007b). • A fuel treatment pilot project was undertaken to explore risk reduction strategies (District of North Vancouver, 2007b).
<p>Invest in demonstration projects.</p>	<p>Some implementation:</p>

Recommendations from CALP (based on LCCV Presentation to North Vancouver Staff)	Status of Implementation
	<ul style="list-style-type: none"> • Solar hot water systems installed on five district buildings: Northlands Golf Course, Parkgate Community Centre, and three fire halls (District of North Vancouver, 2011c). • Council approved the Development Permit application for Grouse Mountain to build a wind turbine (The Natural Step Canada, 2009).
Reduce vulnerability to water reservoir/supply shortages: raise dam at Seymour, restrict water use, and/or increase storage in alpine lakes.	<p>Little implementation:</p> <ul style="list-style-type: none"> • The new OCP includes a commitment to promote water conservation (District of North Vancouver, 2011a)
Reduce ecosystem vulnerability to extreme weather: thin forest to reduce fuel loading and blow-down risk, and manage forest health; slope stabilization, and/or creek bed stabilization.	<p>Some implementation:</p> <ul style="list-style-type: none"> • The new OCP includes the goal of protecting the forested character of the District and enhancing the health of the trees, and includes supportive policies to meet the goal (District of North Vancouver, 2011a) • The Parks & Open Space Strategic Plan includes the recommendation to mitigate tree hazards such as wind throw and wildfires (District of North Vancouver, 2011d). • The Parks & Open Space Strategic Plan includes the recommendation to "adopt an ecosystem-based approach to park planning and management that enhances and protects the natural resources, while supporting sustainable recreational use and stewardship" (District of North Vancouver, 2011b, p.44).
Increase sustainable stormwater run-off infrastructure.	<p>Some implementation:</p> <ul style="list-style-type: none"> • The Parks & Open Space Strategic Plan includes the recommendation to plant more trees in the urban environment and better manage the tree inventory and manage stormwater run-off (District of North Vancouver, 2011d)
Increase local food production.	<p>Some implementation:</p> <ul style="list-style-type: none"> • The District provided a \$15,000 grant to establish a large-scale community garden (District of North Vancouver, n.d.-b).
Support grassroots initiatives to green the District of North Vancouver.	<p>Some implementation:</p> <ul style="list-style-type: none"> • Low carbon diet started by Legacy North Shore, and officially supported by the District (HB Lanarc Consultants, 2009).
Undertake better outreach, planning and visioning processes on climate change.	<p>Some implementation:</p> <ul style="list-style-type: none"> • Significant public outreach and engagement done on climate change through the OCP consultation process (District of North Vancouver, 2011e). • The OCP includes significant commitments to community engagement (District of North Vancouver, 2011a).

Appendix B: List of Documents Reviewed for Document Analysis

Delta

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Appendix C: Letter of Recruitment to Participate in Project



The University of British Columbia
Faculty of Forestry, Forest Resources Management
2ndFloor, Forest Sciences Centre
2045 - 2424 Main Mall
Vancouver, B.C.V6T 1Z4

Letter of Recruitment for UBC Research Project Evaluation of the Local Climate Change Visioning Project

Dear Local Climate Change Visioning Project Participant,

I am inviting you to participate in a follow-up evaluation of the Local Climate Change Visioning Project in Delta and North Vancouver, carried out by the Collaborative for Advanced Landscape Planning (CALP) and the University of British Columbia in 2007. Your invitation is based on your previous participation in the Local Climate Change Visioning project which used mapping and visualization to show future scenarios and responses to climate change in Delta and North Vancouver. Led by Professor Stephen Sheppard, researchers at CALP/UBC are now conducting a Canada-wide project to evaluate the long-term impacts of Local Climate Change Visioning.

As part of the ongoing research project, we are interested in interviewing earlier Delta and North Vancouver participants to understand their experience of the Visioning Project and to assess any impacts the Project may have had on them personally and/or within the organizations they represent. We would like to conduct the interviews in December 2010 and January 2011. We expect the interviews to take approximately 45-60 minutes.

If you would be willing to participate in an interview, contact Laura Cornish by email: laura.m.cornish@gmail.com or phone: (604) 771-2893 to set up an interview time. The interviews may be conducted in a location of your choice. We would ask you to please read the attached consent form and bring any questions you have about it to the interview. Your participation in an interview will greatly help CALP in conducting a successful evaluation.

We sincerely apologize if you have received this letter in error, and were not a participant in the Local Climate Change Visioning Project. If so, we would appreciate if you could let us know so that we no longer follow up with you.

Sincerely,

Laura Cornish
Masters Student, UBC
Dept. of Forest Resources Management,
2424 Main Mall, UBC, Vancouver BC, V6T 1Z4
(604) 771-2893

Appendix D: Semi-Structured Interview Protocol

INTERVIEWEE Name: _____

Interview Code: _____

Introduction and Permission

- I'm a Masters student at UBC doing research on the effectiveness of landscape visualization tools and visioning process in helping a community respond to climate change.
- My research is being funded by the GEOIDE research network (GEOmatics for Informed Decisions), Social Science and Humanities Research Council and the Pacific Institute for Climate Solutions
- For this project, I am evaluating any long-term effects of the Local Climate Change Visioning process held in Delta and North Vancouver in 2007 by interviewing people who were involved in the LCCV process
- Recognizing that there may not be direct effects of the project, we are still interested in getting a sense of the role (or not) of the LCCV in the "broader ecosystem for change"
- Review consent form, any question, and sign
- It will likely take about one hour, but we can stop anytime.
- The interview questions will focus particularly on:
 - First: your initial memories and impressions from of the project
 - Your individual learning from the project
 - Any changes related to climate action that may have occurred within your organization
 - Lastly, a very brief quantitative survey to help us follow-up from the last survey conducted
- The questions deal with your own personal opinions. There is no wrong or right answer, and all comments, whether positive or negative, will be helpful.
- Do you mind if I use a tape recorder? I have 2 as a back-up. You can ask to press the pause button on the recorder at any time. I will also be taking notes.
- Any questions in general before we begin?
- Okay, let's get started, have some quick questions on your current job and your involvement with the LCCV process to start

Anonymized information about the interview partner

Affiliation and role _____

Description of Role _____

Previous involvement in CALP work:

- Member of the LCCV working group
- Delta Council member at time of LCCV
- Municipal staff member
- Participation in final testing sessions
- Other: _____

Number of meetings, workshops or other visioning sessions attended: _____

Opening Prompts

I want to begin with your general impressions or recollections, realizing the visioning project was a while ago.

1. **What comes to your mind right now when you think of the visioning process?**
Memorable images? Concepts? Moments?
Why were they memorable?
Are there any specific words or phrases that come to mind when you think of the visioning process?
2. **If you recall, we used some future scenarios during the visioning process, can you tell**

Individual learning, capacity and behaviour change me what you remember about them?

1. *Do you use the idea of scenarios in your work or thinking?*
3. **Do you remember any specific moments during the visioning process where you (or the group) reached a new level of thinking or awareness of climate change?** *such as an “aha” moment)*

Okay, in this next section, I would like to ask you about your own experience of the LCCV and any impact it may have had (or not)

4. **In the last few years, has your thinking on climate change changed?**
 1. *Whether or not you think climate change is happening and humans are causing it?*
 2. *Do you feel more / less concerned?*
 3. *Why?/Why not?*
 4. *Did the LCCV play a role in this change?*
5. **Has your support for climate change policies and planning increased in the last 3 years?**
 1. *[Why not?]*
 2. *If so, locally, provincially, or nationally?*
 3. *Any specific policies?*
 4. *How have you demonstrated your support? Eg. Voting, letter to editor, phone/email to MP?*
 5. *Why, what was the main influence? Did LCCV play a role?*
 6. *Have you proposed any climate change actions or policy changes at your work? Please explain, e.g., what you did or didn't propose; what your reasons were for taking or not suggesting action.*
 7. *Did the visioning process help you propose the action in terms of knowing who to talk to and/or, gaining allies?*
 8. *Are there any policies or action you wanted to propose, but didn't, or haven't? If so, why not, any particular reason?*
6. **Did the visioning process increase your understanding of climate change, such as the science of climate change, and/or what actions can be taken to prepare for and prevent climate change?**
 1. *How? In what ways?)*
7. **Did the visioning process motivate you to learn more about climate change?**
 1. *[If not, why not?]* *If yes, why?*
 2. *Into which topic have you been looking?*

3. *What are your other main sources of information on climate change?*
8. **Did the visioning process motivate you to change your own behaviour?**
 1. *When you left the visioning process, did you intend to change your behaviour?*
 2. *If yes, why?*
 3. *If not, why not?*
9. **Have you noticed your behaviour change in the last 3 years?**
 1. *Please provide examples, e.g., less air travel, buying carbon offsets etc.*
 2. *Why, or why not?*
 3. *If yes, what influenced your decision to change your behaviour? LCCV?*
10. **In the work you do, have you used any of the knowledge, concepts or visualization tools or images you learned about in the visioning process?**

Organizational and policy change

In this next section, I would like to ask you a few questions about climate change action within your organization and its relation, if any, to the LCCV process

1. *Please elaborate...how? Why? in what ways?*
2. *Have you noticed anyone else using them? Who?*
11. **Did the visioning process help you to educate others about climate change?**
 1. *If yes, how?*
 2. *If not, why not?*
12. **How would you characterize the way your organization [or local community] regards the issue of climate change?**
 1. *Has this changed since the visioning?*
 2. *How aware is it of global impacts / local impacts / adaptation / mitigation response options?*
 3. *If more/less aware, why do you think the perception has changed?*
 4. *Has the sense of urgency increased? Concern level? Or other factors/changes in perception?*
 5. *Role of LCCV?*
13. **Are you still in contact with participants (or staff) you met throughout the visioning process?**
 1. *If yes, with whom, how often do you meet, about what?*
 2. *Do you discuss climate change?*
 3. *Have you collaborated with new departments or individuals as a result of the visioning process?*
 4. *For staff only: Worked with CALP since? What are your hopes for the emerging relationship between CALP and the District of Delta, where could you see relationship going? Do you see any potential problems in working with CALP or UBC?*
14. **In the last three years, has there been an increase in the frequency of discussion of climate change in your organization?**
 1. *Elevator talk, concepts, ideas, proposals?*
 2. *And/or a difference in how climate change is discussed?*
 3. *How does it come up – news, events, etc?*

4. *Were any of the discussions related to actions or concepts discussed during the visioning process?*
 5. *Did the LCCV play a role in increased frequency?*
15. **Has the organization you work for adjusted its planning, policies, targets, procedures, or tools for responding to climate change in the last 3 years?**
1. *Climate action can take place in plan documents/programs, in operational decisions or agreements, or in informal discussions and working groups.*
 2. *Why do you think these actions or concepts were implemented? [watch for Bills 44 and 27 "signal"])*
 3. *Did you play a role?*
 4. *Can you think of any policies, actions or other changes that were proposed but not implemented?*
 5. *Why not implemented?*
 6. *Were any of these actions related to actions or concepts discussed during the visioning process?*
16. **Has your organization directed more resources towards planning for climate change internally, such as increase in budget allocation, changed job descriptions to include climate change, increased number of staff to work on climate change or the creation of new departments.**
1. *Why do you think these changes were (or were not) implemented?*
 2. *Did the LCCV play a role? [watch for Bills 44 and 27 "signal"])*
17. **Over the last 3 years, are you, or other staff, more willing to consider more "radical" solutions to climate change?**
1. *If yes, why*
 2. *If not, why not?*
18. **Has your organization initiated any public outreach measures on climate change?**
1. *Why were measures initiated?*
 2. *Why not, if none?*
 3. *Were LCCV processes, techniques or ideas used?*
19. **Has the organization you work for felt increased public pressure to take climate action during the last 3 years?**
1. *If yes, from whom?*
 2. *What action(s) is the public asking for?*
 3. *What format does [did] the pressure take? Letters? Phone calls? Petitions? Events? Participation in consultation? Noticeable shift in general attitude amongst public?*
 4. *Do you think this pressure was related to the visioning process?*
 5. *[For staff/decision-makers: if you were at the testing session, did you notice the public's reaction to the visualizations at the testing session?]*
 6. *[For working group members: did you notice the response and behaviour of the government representatives throughout the visioning process?]*

20. **Can you identify the top three institutional barriers that you feel prevent decision-makers in your organization from addressing climate change more effectively?**
 1. *Did the visioning process help overcome any of these barriers?*
 2. *How? Why?*
 3. *Why not?*

21. **I want to be careful not to be over-controlling of the interview, so I want to check whether you have any other thoughts about effects and outcomes of the visioning process?**
 1. *This may include policies and plans that increase the community's adaptive capacity but are not necessarily climate change planning, such as municipal infrastructure projects and wildfire risk reduction*
 2. *If so, briefly describe these effects*

Closing questions

I realize that that the visioning process was a long time ago, but we would really appreciate any feedback or information you can give on:

22. **What you think are the potential benefits and/or limitation of using photo-realistic 3-D visualization such as this example in planning with climate change?** *(show relevant visualizations for Delta and North Vancouver)*

23. **How the LCCV could be improved? What follow-up might have made it more effective** *(e.g. show to more people, integrate more into formal planning processes?)*

24. **Do you think that overall, the visioning process in 2007 was valuable for you and your work?**
 1. *(Would you recommend it to others? Why?)*

25. **Is there anything else you'd like to add, in general, before the brief quantitative portion of the interview**

Would you be willing to have a brief follow-up phone conversation by email or phone if you (or we) want to clarify anything?

Solicit help – remember who else was there?

Thank you very much!

Appendix E: Interview Prompt

The following images were shown to participants from Delta and North Vancouver, respectively, as a prompt before the final section of the interview that asked participants about the benefits and limitations of using these types of visualizations.

Delta



North Vancouver

