



planning
architecture
culture & heritage

1030 - 470 granville street
vancouver bc canada | v6c 1v5
t. (604) 683-1903
f. (604) 683-7494
info@arlingtongroup.ca



CLIMATE ADAPTATION ENVIRONMENTAL SCAN AND GAP ANALYSIS

Prepared for:
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EXECUTIVE SUMMARY

The Arlington Group Planning + Architecture was retained by Metro Vancouver to conduct a Climate Adaptation Environmental Scan and Gap Analysis.

The purpose of the Climate Adaptation Environmental Scan and Gap Analysis was to conduct a scan of the Climate Change Adaptation CCA research, planning, actions and initiatives currently in progress throughout the Metro Vancouver region. The scan reviewed policies, studies, reports and initiatives undertaken by government and non-government organizations (NGOs) to assess climate change impacts, develop CCA policy and implement adaptation actions in the Metro Vancouver region. In addition to the scan a 14 question survey was sent to local governments, non-government organizations (NGOs) and other institutions in the Metro Vancouver region that have a mandate to address climate change. Follow-up interviews were conducted with willing participants in December 2014. The research presented in this report is a snapshot designed to help guide the conversation about how to best facilitate effective action on CCA in Metro Vancouver.

After reviewing CCA-related documents for Metro Vancouver municipalities, a number of approaches stand out as excellent examples of CCA initiatives or demonstrate a novel approach/framework. Areas of particular interest are approaches with a strong focus on climate science, best practices in comprehensive/integrated CCA policies, and expanded implementation/monitoring and evaluation components. Emerging CCA projects at the national, provincial and local level are also included.

Project results show climate change is mentioned with prevalence within most Metro Vancouver member municipality Official Community Plans (OCPs). Climate change is typically addressed in one of three ways within an OCP: 1) a general 'introductory' narrative for the OCP; 2) within the Regional Context Statement section; or 3) integrated throughout the OCP and found in multiple sections.

Recently adopted OCPs frequently include a stronger climate change component. Direct references to CCA were not found consistently within the OCPs reviewed in this study - approximately one third do not contain any direct reference to CCA. In addition, Agriculture Plans, Climate Action Plans, Climate Adaptation Plans, Community Energy and Emission Plans, Integrated Stormwater Management Plans, and Sustainability Checklists/Frameworks were scanned to determine if the specified climate change impacts were identified or addressed outside of the OCP.

With regards to the survey, a total of 88 contacts were identified for the 21 municipalities in Metro Vancouver as well as the Tsawwassen First Nation and Electoral Area A. The number of responses received was 35, representing an overall local government response rate of 40%. This included 86% (19 of 22) of the local governments in Metro Vancouver. The local governments that did not respond included three of the four municipalities with a population less than 4,000.

A total of 13 contacts were identified for seven other public authorities in Metro Vancouver. These public authorities consist of transportation, utility or health agencies. Seven responses were received; a 54% response rate. A total of 34 NGO contacts were identified. They included NGOs working directly with Metro Vancouver on CCA initiatives, as well as others that are primarily advocacy based. Twelve responses were received from NGOs; approximately one third of those contacted.

The surveys were similarly themed in the issues explored, primarily seeking to establish the anticipated impacts of climate change in the Metro Vancouver Region; the current tools being used to adapt to climate change; additional resources desired to advance climate change and barriers to climate change adaptation.

The four most anticipated climate change impacts in order were: more frequent localized flooding; sea level rise; increased intensity and frequency of storms and higher than average rain or snowfall. These impacts are interrelated, water based and for the most part issues already being addressed by local government out of necessity.

In terms of the current tools being used by local government to advance climate change a diverse set of policy documents were identified, with integrated stormwater management plans, emergency management plans and development permit areas (DPAs) being the top three tools identified. The other top ways in which CCA is being advanced by local governments included internal (staff) capacity building and implementation of capital or pilot projects. In addition, participation in regional working groups or committees and organized adaptation programs such as the ICLEI were identified as other ways in which CCA is being advanced.

Our analysis from this research indicates almost all Metro Vancouver municipalities are incorporating considerations of climate change impacts and adaptation in some form within existing policy documents. Primarily OCPs, stormwater management plans, emergency plans and through DPAs.

All survey participants were asked to identify additional resources desirable to address climate change in the Metro Vancouver region. The top two responses were financial resources and intergovernmental coordination (local/regional/provincial/federal). The responses to additional resources were very similar to the barriers to CCA identified by participants. By far, the top barrier identified was financial resources, followed by coordination of CCA initiatives. Both of these represent gaps in the current regional progress toward adaptation to climate change. When participants were asked to rank the top two barriers, financial resources still came out on top, however political support was ranked second. The relationship between public education and political support was acknowledged by a number of participants, particularly in the interviews. Without public support and understanding for the need to take action on CCA, political support can be a challenge.

Additional resources to address climate change were primarily financial resources, although coordination (local/regional/provincial/federal) and political support were, in addition to financial resources, also identified as barriers. In terms of the climate change impacts identified, the biggest gap appears to be within the health aspect of climate change.

Although human health issues could potentially impact many local government operations and departments, it has thus far received very little attention in terms of potential adaptation approaches.

Local governments within Metro Vancouver are, for the most part, incorporating CCA in some form of policy or regulatory document but taking action to varying degrees and at different paces. Larger municipalities such as Vancouver and Surrey have more resources and have also made more progress on integrating CCA into their policies and regulations. The City of North Vancouver has also made significant progress with both direct and indirect references to climate change within their OCP and Climate Change Adaptation Plan, which addresses all of the potential climate change impacts anticipated within the region.

This study has also identified a number of potential opportunities for Metro Vancouver to advance CCA within the region, however further exploration with Metro Vancouver's members is required. Opportunities include facilitation of a CCA-focused information-sharing portal or similar website; regional coordination through facilitation, rather than leadership; advancing existing partnerships and fostering new ones, particularly with NGOs and academic institutions; public education and outreach and advocacy with more senior levels of government.

While the opportunities identified in this study are by no means exhaustive, they do provide a starting point for the conversation. While not completely clarified by this study, it is clear there is potential for Metro Vancouver as an organization to further support its member municipalities in advancing CCA at the local level and to build resilience in the region as whole.

INTRODUCTION

The Arlington Group Planning + Architecture was retained by Metro Vancouver to conduct a Climate Change Adaptation (CCA) environmental scan and gap analysis. The purpose of the project was to present a scan of the CCA research, planning, actions and initiatives currently in progress throughout the region. The research presented in this report is a snapshot designed to help guide the conversation about how best to facilitate effective action on CCA in Metro Vancouver going forward.

The impacts of climate change are becoming evident in subtle yet measurable ways in the Metro Vancouver region. According to climate projections, the effects of climate change are expected to increase in frequency and severity. The specific impacts for each community will vary, depending on local geography, the number of people and assets exposed, and the resources and willingness of the community to plan and adapt to the anticipated impacts. Effective adaptation initiatives will require the cooperation and support of all levels of government, residents and businesses. As the regional government, Metro Vancouver has an interest in ensuring the region is adapting effectively to climate change.

Although there are many important aspects of CCA, the focus of this project was specifically on adaptation measures at the local government level. The project involved a comprehensive scan of the policies, studies, reports and initiatives undertaken by government and non-government organizations (NGOs) to assess climate change impacts, develop CCA policy, and implement appropriate actions in the Metro Vancouver region.

The key climate change impacts identified as the focus of this project are:

- extreme seasonal temperature variations;
- warmer average temperatures;
- changes in precipitation patterns; and
- sea level rise (SLR).

REGIONAL CONTEXT

Metro Vancouver has by far the largest population of BC's 29 regional districts. Metro Vancouver's population of 2,474,000 (2014 BC Stats estimate) comprises over half the provincial population of 4,631,000. Metro Vancouver's coastal location, which includes much of the lower Fraser River valley, has significant vulnerability to climate change.

The Metro Vancouver region consists of 21 member municipalities, one electoral area and the Tsawwassen First Nation (TFN)¹.

Metro Vancouver has statutory responsibilities for the provision of regional water services, regional waste management, regional sewage treatment, air quality management, regional parks and regional planning. Metro Vancouver is also the local government responsible for Electoral Area A.

Metro Vancouver has a significant role to play in providing information, public education, advocacy and coordination with and between Metro Vancouver members.

CCA affects both Metro Vancouver's statutory responsibilities and its more indirect education and coordination role. As a result, every effort was made in this project to have at least one participant from each of the local governments in Metro Vancouver.

¹ Other First Nations are located within Metro Vancouver but the Tsawwassen First Nation is the only Treaty First Nation in Metro Vancouver.

PROJECT METHODOLOGY

Project team personnel from the Arlington Group consisted of Graham Farstad, MCIP, RPP (Lead Consultant), Sally Elford MCIP, RPP and Amanda Grochowich. Erica Crawford, MAP assisted with interviews and subsequent analysis. In addition, the project included input and review from Metro Vancouver staff. Based on the scope of work provided by Metro Vancouver including further clarification via teleconference, the following work program was identified.

BACKGROUND REVIEW

The context for the background review included a brief overview of four types of climatic changes and their impacts as indicated on Table 1. The background review itself consisted of two elements – one was a review of Metro Vancouver member municipalities' CCA policy documents and the second identified relevant NGOs, coordinating organizations and studies applicable to CCA in Metro Vancouver.

The research for the first element consisted of information gathering and a scan of member municipality documentation specific to CCA. The scan focused on OCP policies, ISMPs, Climate Adaptation plans and other guiding or regulatory documents.

STAKEHOLDER IDENTIFICATION

This task was comprised of three elements:

1. Preparing a list of stakeholders (including contact information);
2. Reviewing the list of stakeholders confirming their appropriateness as a local government contact and current contact information; and
3. Preparing an initial online survey targeted to the different stakeholder groups identified.

At least one stakeholder representative from each of the 21 member municipalities and the TFN was identified.

There is wide range of stakeholders interested in and working on CCA at the local government level. Four general groupings of stakeholders emerged:

- Community and policy planners (typically RPP and MCIP credentials);
- Environmental Managers (typically science backgrounds often with RP Bio and BCSLA credentials);
- Sustainability Officers; and
- Professional engineers responsible for structural protection measures such as dikes as well as other local government infrastructure.

The contact list for larger local governments was expanded to include more specialized responsibilities such as sustainability managers, land use planners, municipal engineers, utilities managers and emergency planning personnel.

The list of stakeholders was compiled from publically available sources, project team contacts and Metro Vancouver staff. The resulting contact list is available in Appendix A.

SURVEY AND INTERVIEWS

The initial survey (Appendix B) was tailored to target three stakeholder groups working with CCA or in related areas:

- Metro Vancouver member municipality staff;
- NGOs; and
- Other Organizations (public utilities, transportation agencies and senior levels of government)

The survey was designed to inform interested stakeholders of the project and to invite them to complete a brief survey. The survey consisted of a series of 14 questions, such as identifying the policy documents utilized by local governments to address CCA and the barriers to adaptation. The survey primarily consisted of multiple choice/check-box style questions with opportunities to supply additional commentary. The survey was designed to take 10 minutes or less.

The survey also identified respondents willing to participate in a follow-up interview. The intent of the interviews was to probe survey responses in greater detail. The interviews were loosely structured and were designed for those participating to elaborate on basic topics and for interviewers to probe into unique jurisdictional issues concerning those interviewed. The interviews were conducted by phone by either Erica Crawford or Graham Farstad.

In addition to the information gathering from municipalities, a number of non-government and other quasi-government organizations were surveyed and interviewed with respect to their efforts toward Climate Change Adaptation in general and specifically within the Metro Vancouver Region. Snapshots of the NGOs with an interest in or connection to Climate Change Adaptation in Metro Vancouver are available in Appendix C.

The project had a total of 54 survey responses: 35 from local governments, 12 from NGOs and 7 from other organizations. In addition, 17 follow-up interviews were completed. Survey Responses are included as Appendix D and Interview Notes as Appendix E.

CLIMATE CHANGE ADAPTATION ANALYSIS

This task analyzed information gathered in the background review, online survey responses and phone interview notes. This identified the region's strengths and weaknesses as well as highlighted the gaps in responsibility, expertise and resources.

ENVIRONMENTAL SCAN OF ON-GOING EFFORTS IN OTHER JURISDICTIONS

This task consisted of a high level scan and summary of existing and in-progress Climate Change Adaptation efforts of other jurisdictions with relevance to Metro Vancouver. This scan includes initiatives in BC, other jurisdictions in Canada and some international examples.

PROJECT LIMITATIONS

The purpose of this project was to provide a high level scan of documents, activities and perspectives concerning CCA in the Metro Vancouver region. A limitation of the project was the condensed time frame. The one month time frame included the Christmas holidays, which posed a challenge as the survey was sent out two weeks before Christmas. Despite this the response rate from all local government contacts was roughly 40%. Of the 21 member municipalities, Electoral Area A representatives, TFN and North Shore Emergency Management Offices contacted, one or more persons responded from 88% of these organizations (i.e. 20 out of 24). Only three municipalities, each with a population less than 4,000, and the TFN did not respond.

1: CLIMATE CHANGES AND ANTICIPATED IMPACTS IN THE METRO VANCOUVER REGION

Climatic Change Impact		Effect	Impact
Extreme Seasonal Temperature Variations	Extreme Heat Events	Heat stress on vulnerable populations (homeless, low income, elderly, isolated, sick and outdoor workers) Lack of cooling/excess heat gain in buildings UV Radiation (e.g. skin damage, heat stroke and fainting) Air Quality related respiratory illnesses Unequal distribution of social and health impacts	
	Extreme Cold Events	Cold stress on vulnerable populations (homeless, low income, elderly, isolated, sick and outdoor workers) Infrastructure stress, and related economic impacts	
	Warmer Average Temperatures	Increased risk of wildfires Ecological impacts – changes in biodiversity, changes in forest cover (for both water sheds and urban forestry) new invasive species (in particular pests) Agriculture impacts - increased growing times, changes in farm practices, changes in viable crops and crop yields Health impacts – introduction of new infectious and tropical diseases, effects from too much such exposure (UV radiation) including skin damage, cataracts and heat stroke.	
Changes in Precipitation Patterns	Wetter Winters	Increased risk of flooding, slope destabilization, and storm debris impacts Seasonal Affective Disorder	
	Flooding	Buildings and infrastructure with outdated/under-capacity drainage infrastructure Buildings and road infrastructure built below revised flood construction levels Transportation infrastructure disruptions Increased costs for damage and repair to infrastructure and buildings	
	Destabilizing of steep slopes	Land slides	

Sea Level Rise		Localized flooding Increased costs for damage and repair to infrastructure and buildings
	Extreme Storm Events	Downed power lines and damage to other infrastructure
	Storm Surge	Storm debris Shoreline Erosion / Squeeze on intertidal / marsh areas Infrastructure vulnerability Increased costs for damage and repair to infrastructure (added stress, saltwater corrosion)
	Coastal Flooding	Buildings and road infrastructure built below revised flood construction levels Transportation infrastructure disruptions and increased costs for damage and repair Impacts from shoreline erosion Impacts from salinization of agricultural land (changes in crop yield and viable crops)

These anticipated climate change impacts should not be considered in isolation from one another. Impacts to people, buildings, infrastructure and land will vary depending on the type of climate change as well as such variables as the number of people at risk; the vulnerability of the population at risk due to age related and other dependency factors; the geographical location/elevation of buildings, infrastructure and environmentally sensitive land; and protective measures to reduce vulnerability.

The impacts listed are those anticipated to affect the Metro Vancouver region directly. Additional indirect impacts and stress on the region may be incurred from global climate change effects, such as the effects of increased human migration from other areas of the world due to the risks of sea level rise or desertification.

As an example, the estimated population at risk due to flooding² in Metro Vancouver is 260,860³, 12% of the regional district's 2006 population. This is a snapshot in time subject to several variables. First, the overall population of Metro Vancouver has increased over time. Since 2006, the net population increase has been 275,000, some of which have located on the Fraser River floodplain. Second, several local governments including the Cities of Vancouver and Surrey have indicated a lower risk tolerance than the 1:200 year flood event standard selected by the Province of B.C. when the Flood Damage Reduction Program was established in 1975. Third, the population at risk from flooding in Metro Vancouver will increase over time due to sea level rise. Studies completed by the Province of BC in 2011 recommended that land use planning should anticipate sea level rise of 1.0 metre by the year 2100. Fourth, initiatives have been taken and are ongoing to increase resilience and reduce the vulnerability of people, buildings, and infrastructure.

² Floodplain based on the record flood in 1894.

³ Based on a BC Stats custom tabulation of the 2006 census for the Fraser Basin Council. Similar data for the 2011 census is not available due to cancellation of the long form census.

MUNICIPAL SNAPSHOT

OFFICIAL COMMUNITY PLANS SUMMARY

Climate change is mentioned with prevalence within most Metro Vancouver member municipality OCPs. Climate change is typically addressed in one of three ways within an OCP: 1) a general 'introductory' narrative for the OCP; 2) within the Regional Context Statement section; or 3) integrated throughout the OCP and found in multiple sections. Recently adopted OCPs frequently include a stronger climate change component. Direct references to CCA were not found consistently within the OCPs reviewed in this study - approximately one third do not contain any direct reference to CCA.

Given the provincial requirements of Bill 27, all of the OCPs reviewed include narrative and policies pertaining to climate change mitigation and targets for the reduction of greenhouse gas emissions.

All of the OCPs reviewed contain narratives or policies indirectly referring to or addressing climate change impacts/CCA. The CCA narratives and/or policies work towards addressing the impacts of climate change (e.g. flooding) but are not written with a direct link to CCA - the impact is not stated as a result of climate change. Nine out of the relevant 20 OCPs⁴ contain a direct reference to CCA – either through a substantial reference in the narrative or a specific policy measure found within the OCP. Several municipalities are in the process of revising their OCP, therefore the number is expected to change in 2015.

To determine if the specified climate change impacts are identified or addressed by the member municipalities, additional municipal documents, adopted or endorsed by Council, were examined. Documents include Agriculture Plans, Climate Action Plans, Climate Adaptation Plans, Community Energy and Emission Plans, Integrated Stormwater Management Plans, and Sustainability Checklists/Frameworks.

CLIMATE CHANGE IMPACTS SUMMARY

Very few municipalities (three) refer to both extreme heat and cold events as part of the anticipated climate impacts of extreme seasonal temperature variations. An additional four municipalities acknowledge extreme heat events. These references are often linked with concerns over air quality and regional initiatives (e.g. Metro Vancouver Air Quality Management Plan).

Eleven municipalities have a policy and/or narrative addressing both impacts associated with warmer average temperatures (e.g. warmer summers and wetter winters). Three municipalities do not have a reference to either impact. 'Warmer summers' are not addressed as consistently by policy/narrative as 'wetter winters', which highlights the historic regional focus on having too much water as opposed to too little.

⁴ Exceptions include: City of Vancouver, as it does not have a City-wide OCP (and operates under a different legislative mandate), Electoral District A, and the Tsawwassen First Nation, which has a Land Use Plan.

All municipalities have a policy and/or narrative in place to address changing precipitation patterns – typically focusing on increasing levels of precipitation. These policies/narratives are not necessarily linked with CCA and are often written as general policy statements. Only six municipalities have a narrative/policy covering all three impacts (e.g. flooding, slope stabilization and impacts from storm debris). Storm debris is the least common impact identified.

Sixteen⁵ municipalities have coasts potentially subject to sea level rise and its associated impacts. Of these sixteen, nine municipalities address one of the impacts of sea level rise (e.g. storm surge or coastal flooding); however only seven of the nine municipalities address both impacts of anticipated sea level rise.

For additional details, please see Appendix F.

CLIMATE CHANGE ADAPTATION DOCUMENT SNAPSHOT

After reviewing adaptation-related documents for Metro Vancouver municipalities, a number of approaches stand out as excellent examples of CCA initiatives or demonstrate a novel approach/framework. Areas of particular interest consist of approaches with a strong focus on best practices in climate science, comprehensive/ integrated CCA policies, and expanded implementation/ monitoring and evaluation components.

City of Vancouver - Climate Adaptation Strategy

As part of the Greenest City Action Plan, the City of Vancouver prepared a Climate Adaptation Strategy in 2012 based on the ICLEI adaptation planning framework. The Strategy has been adopted by Council.

Approach Highlights:

- Vulnerability and risk assessments were the primary tools used for the development of the strategy. Current climate science and known impacts of climate change were incorporated.
- States the intention to review and evaluate the strategy annually and update it every 5 years⁶. It includes a detailed implementation and monitoring component as well as a detailed Action Matrix, complete with funding sources (e.g. capital, operational, or other), departmental priorities, who is accountable, and level of effort identified for each action. The Action Matrix is the most detailed of Metro Vancouver local governments.

⁵ Village of Anmore, Village of Belcarra, Bowen Island Municipality, City of Burnaby, Corporation of Delta, Village of Lions Bay, City of North Vancouver, District of North Vancouver, City of Port Moody, City of Richmond, City of Surrey, Tsawwassen First Nation, City of Vancouver, District of West Vancouver, City of White Rock and Electoral District A.

⁶ If the City experiences a significant climate change impact or senior government action or policies change (e.g. change in Provincial regulation related to sea level rise), the 5 year review process could be accelerated.

Key Elements:

One of the initial attempts at addressing CCA in the region and a good start at dealing with action identification, implementation highlights and incorporation of a monitoring and evaluation component.

City of Surrey – Climate Adaptation Strategy

In 2013, the City of Surrey adopted a Community Climate Action Strategy (CCAS), which comprises two complementary plans – the Community Energy and Emissions Plan (CEEP), focused on the reduction of greenhouse gas emissions, and the Climate Adaptation Strategy (CAS), which identifies how the City may be vulnerable to climate change impacts and proposed actions to mitigate risk and cost.

The City of Surrey has many existing initiatives which the CAS builds upon (including the Crescent Beach Climate Change Adaptation Study, Rainfall Trending Analysis for the City of Surrey, Community Wildfire Protection Plan, and the Agriculture Protection and Enhancement Strategy, among others). The CAS intends to help the City anticipate and respond to identified climate change impacts.

Approach Highlights:

- The CAS addresses an extensive list of climate change impacts for the City of Surrey, including:
 - Flood management and drainage
 - Infrastructure
 - Ecosystems and natural areas
 - Urban trees and landscaping
 - Human health and safety
 - Agriculture and food security
- Comprehensive document - including a description of the current state (identifying relevant strengths, weaknesses, and opportunities for adaptation), followed by anticipated climate change impacts, and a summary of the outcomes of the risk assessment. Cross-cutting actions have also been identified in the CAS.
- A series of proposed indicators are included in the CAS in order to compile benchmark data and to track the City's progress over time.
- The CAS takes a risk-based approach and integrates the impact statements and actions into the Enterprise Risk Management (ERM) Framework. Relevant departments can then track the implementation and monitor the situation in a timely and consistent manner.

Key Elements:

It is one of three Adaptation Strategies currently being used in Metro Vancouver municipalities. It is well-put together, with an adequate level of detail and visually appealing presentation.

The CAS addresses adaptation from a risk management perspective – integrating adaptation policies into the existing risk management system. As one of the initial Metro Vancouver

municipalities to take this approach, it is worthwhile to keep an eye on the successful implementation, monitoring and evaluation of the strategy.

City of Burnaby - Environmental Sustainability Strategy (in progress)

The Environmental Sustainability Strategy (ESS) intends to set a vision, range of goals and specify actions that recognize existing environmental challenges while providing opportunities to adapt in a changing climate. It is expected to work towards protecting and enhancing Burnaby's ecosystem and environment.

Approach Highlights:

- The City of Burnaby is following a different approach – implementing an Integrated Sustainability Framework consisting of three elements: Environmental, Social and Economic Development (the Social Sustainability and Economic Development Strategies have already been adopted).
- The ESS is currently in progress - beginning Phase 3, with opportunities for public engagement, in early 2015. The Final ESS is anticipated to be approved in the spring of 2015.
- A draft set of Principles have been articulated - identifying areas of interest such as ecosystem health, system integration and connectivity, resource use, evaluation and monitoring. As the ESS is in progress, the exact CCA impact remains to be determined. However it presents a singular opportunity for the City to integrate CCA into its overall environmental strategy.

Key Elements:

The City is taking a unique approach using triple bottom line analyses in the development of three specific plans. Having the environmental component as the last element to be completed is unsurprising, but does give the City of Burnaby an excellent opportunity to integrate climate change impacts and/or adaptation policies and actions throughout. As an in-progress element, it will be interesting to see how the ESS, given the input from the public engagement process, develops.

City of North Vancouver - Climate Change Adaptation Plan

The City of North Vancouver developed a Climate Change Adaptation Plan (CCAP) in tandem with its 2013 OCP update. This process integrates CCA throughout the OCP as opposed to treating it distinctly. Both the CCAP and updated OCP follow a similar framework, addressing eight key areas, identifying how the City is applying adaptation to their goals, actions and operations. Impacts and objectives for each key area are stated. Action items articulate anticipated deadlines and responsible department(s). The CCAP additionally includes vulnerability and risk assessment results and priority impacts.

Approach Highlights:

- Distinct in the City's approach of concurrently updating the OCP and CCAP development and organizing them along the same Framework. Constructively integrates CCA throughout the OCP as opposed to treating CCA distinctly.
- Utilizes ICLEI BARC five-step program.

- The City's holistic CCA Framework addresses the impacts, objectives, actions and implementation of eight targeted areas:
 - o Land Use (Housing, Population & Employment)
 - o Transportation, Mobility & Access
 - o Community Wellbeing
 - o Natural Environment, Energy & Climate
 - o Parks, Recreation & Open Space
 - o Arts, Culture & Heritage
 - o Employment & Economic Development
 - o Municipal Services & Infrastructure
- In order to achieve the overarching vision and goal, each action has a timeline and responsible city department identified. This is considered as a 'best practice' when dealing with effective implementation.

Key Elements:

Uses the ICLEI framework and provides comprehensive coverage and analysis for major climate change impacts expected on the North Shore. It is thorough yet clear. Integrates adaptation throughout the Plan most influential to land use development, the OCP.

District of West Vancouver - Shoreline Protection Plan

The District of West Vancouver first launched the Shoreline Protection Plan in 2006. The current Shoreline Protection Plan (SPP) includes an outline of short and long term projects with specific and measurable goals for the 2012-2015 timeline.

Approach Highlights:

- Designed to create a workable set of tasks focused on shoreline restoration and protection in order to create a self-sustaining shoreline resilient to impacts from development, climate change and sea level rise in a cost effective manner.
- Approach works towards both strengthening the quality of public amenities found within the District as well as protecting the natural shoreline.
- The SPP is integrated with the District's OCP, meeting policy standards in the following areas: local economic development, social planning, neighbourhood character, natural environment and even government connectivity and finance.
- Anticipates sea level rise of up to 60cm by 2100, increased intensity and frequency of winter storms and El Nino events.
- Acknowledges repair costs will increase with aging infrastructure and increased storm damage.
- Riparian owners have been actively involved in a number of enhancement works and have been an important source of capital funding.

Key Elements:

Currently, the District of West Vancouver is the only municipality framing coastal protection and adaptation to climate change impacts with a Shoreline Protection Plan.

As it began over 7 years ago, the process is indicative of what a long-term approach with community support and buy-in can accomplish. Coordinating efforts with the West Vancouver Shoreline Preservation Society brought about habitat enhancement and an increase in public amenities and community education outreach opportunities. The SPP also cites economic benefits from restoration and increasing productive capacity of the shoreline and is one of the few examples of a habitat enhancement based approach to adaptation within the Metro Vancouver Region.

The District of West Vancouver has a unique management tool in the form of a head lease with the Province of B.C. This head lease has been in place since 1974 and provides for the management of land covered by water from the high water mark extending 1,000 metres into Burrard Inlet⁷. The head lease covers any Community Purposes under the Community and Institutional Crown land policy. This includes public access infrastructure such as walkways, seawalls, boat ramps, piers, wharves as well as utility works, structural protection and Green Shores™ measures to enhance environmental values and dissipate incoming energy from tidal surges.

City of Port Moody - OCP Chapter: Sustainable Resource Use and Climate Change Response

The City of Port Moody framed climate change action related material under the heading Sustainable Resource Use and Climate Change Response in the 2014 OCP update. These policies are not further supported in DPA's, however there are DPAs pertaining to ESAs and hazardous lands and the acknowledgement that DPAs will need to be reviewed in order to incorporate sustainable energy and CCA considerations.

Approach Highlights:

- Uses Partners for Climate Protection program.
- Narrative and policies recognize the link between climate change impacts and future risk of property damage and loss of life. Tailored sections such as Community wide energy and climate preparedness planning and Neighbourhood planning and design to address those areas.
- Highlights the importance of partnerships, including with Metro Vancouver, other member municipalities. Specifically mentions partnerships with senior government programs that address climate change impacts and that may help municipalities adapt to climate change.

Key Elements:

Utilizing OCP policies to direct local CCA intentions is common throughout Metro Vancouver member municipalities, as are attempts to integrate sustainability/CCA efforts throughout an OCP. Currently this is the only municipality to frame its adaptation (and mitigation) efforts under this heading. It's a novel approach to addressing these issues at the local government level. While not yet in place, the Chapter recognizes the role of DPAs to address

⁷ Not including foreshore areas controlled by the Vancouver Port Authority and the B.C. Ferries Terminal in Horseshoe Bay.

energy and CCA. How these policies are incorporated into future DPA revisions will be worth noting.

OTHER CLIMATE CHANGE ADAPTATION INITIATIVES

NATION-WIDE INITIATIVES

Public Safety Canada

A National Disaster Mitigation Program (NDMP) was announced mid-January 2015 by Public Safety Canada. The Program is intended to reduce flood-related costs for all levels of government and to establish conditions for the introduction of a residential flood insurance product in Canada. The Federal 2014 Economic Action Plan listed funds of \$200 million, over a 5 year period, starting in 2015-2016 for this initiative. This funding is in addition to the New Building Canada Fund, announced in the Economic Action Plan 2013 at \$14 billion, which supports significant infrastructure projects, including mitigation infrastructure that helps prevent natural disasters.

Eligible projects for the NDMP can include both non-structural and structural investments and will be selected through a merit-based process based on measurable criteria such as risk assessment, project readiness, and return on investment. Flood-mapping and forecasting have been identified as possible project types, as the NDMP will prioritize measures aimed at identifying the risks and mitigating the impacts of floods, due to a review of national trends on disasters.

Natural Resources Canada (NRCan)

The Climate Change Impacts and Adaptation Division at NRCan has created what it calls an Adaptation Platform. The Adaptation Platform was built to promote collaboration among those who have a collective stake and role to play in making Canada more climate-resilient. The eight working groups were designed to address a wide range of risks and opportunities by cutting across regions, sectors and disciplines. An extensive number of research projects designed to reduce vulnerability, manage risks, and prepare for potential opportunities have been and are currently being funded.

NRCan has funded a wide range of CAC projects including case studies, local government projects, and theme based projects. Some of the more broadly based projects include the following⁸:

- Urban Forests: A Climate Adaptation Guide (2010)
- Adapting to Climate Change: A Risk Based Guide for Local Governments (2010)
- Adaptation Guidelines: B.C. Sea Dikes and Coastal Flood Hazard Land Use (2011)
- Land Use Planning Tools for Local Adaptation to Climate Change (2012)
- Preparing for Climate Change: An Implementation Guide for Local Governments in British Columbia (2012)

⁸ Some of these projects also received funding from the Province of BC. Several Metro Vancouver interviewees specifically mentioned these publications although Survey Question 5 referred generically to federal and provincial sources.

- Sea Level Rise Adaptation Primer (2013)
- Evaluation of BC Flood Policy for Coastal Areas in a Changing Climate (2014)
- Relevant Ongoing Projects with NRCan Funding⁹

City of Vancouver Coastal Flood Risk Assessment. Phase 1 of the study includes a risk assessment of Burrard Inlet, False Creek and the North Arm of the Fraser River under five different scenarios. Included are a 1:500 year storm event, 1:10,000 year storm event under both current conditions as well as anticipated sea level rise of one metre. Economic and social vulnerability assessments are provided using LiDAR with a GIS data base. This study includes the first major application of the US HAZUS flood consequence assessment tool in Canada. The Phase I lead for the \$400,000 study is Northwest Hydraulic Consultants. Study results are expected to be released shortly. The Phase 2 lead will be Compass Resource Management and will include stakeholder consultation to address the Phase 1 flood consequence assessment.

Analysis of Existing and Potential Economic Instruments Designed to Facilitate Adaptation Actions in Canada. The project will explore existing economic instruments used in Canada and internationally, which could be modified and adapted in the local government sector. The \$120,000 project is being undertaken by the Adaptation to Climate Change Team at SFU with application to the City of Vancouver.

Development of Best Management Practices to Address Extreme Precipitation Events that Affect Coastal Regions of Canada. The objective of the project is to fill gaps in existing knowledge of extreme coastal precipitation events that affect the transportation infrastructure in BC. The project will also synthesize findings from British Columbia highway case studies and other assessments to develop a cohesive approach to addressing these issues for the entire British Columbia highway system. The project lead for the \$209,000 study is the B.C. Ministry of Transportation and Infrastructure.

Atmospheric Rivers: A multi-agency risk assessment for British Columbia. This project consists of a high-level risk assessment of atmospheric rivers (i.e. meteorological systems associated with intense rainfall events that can lead to flooding and landslides) in British Columbia. The project will also assess options for detection/warning systems in British Columbia. The project lead for this \$173,000 project is the BC Ministry of Environment.

Transferability of Climate Change Indicators Selected and Reported in the United Kingdom for Application to the Canadian Context. The objective is to review the United Kingdom's selection and use of indicators to measure progress and identify lessons that may be applicable for adaptation in Canada. The \$150,000 project will be completed in February 2015. The project lead is Cathy Cobey, Associate Partner of Ernst & Young LLP.

⁹ Many of these projects have multiple partners to address funding or jurisdictional considerations.

A Comparative Evaluation of Payments for Ecosystem Services and Other Economic Incentives to Encourage Adaptation to Climate Change – Case Studies in OECD Countries. The objective of the project is to analyze the advantages and disadvantages of various economic incentives related to floodproofing in urban areas and maintaining wetland/floodplain environments in rural and urban areas. The \$107,000 project is designed to analyze the costs and benefits of adaptation options for different sectors studied and produce an economic assessment of the cost of climate change impacts, with particular reference to key areas along the St. Lawrence River. The project lead is Jean-Pierre Revéret, of Groupe AGÉCO Courriel in partnership with Ouranos.

Economic Tools to Incent Climate Change Adaptation in Land Use Decisions by Private Actors. The purpose of the project is to identify decision points by private land use actors that could lead to outcomes that are well adapted to climate change hazards and assess how provincial policies interact with these decisions. The \$70,000 B.C Ministry of Environment study includes the Insurance Bureau of Canada as a partner.

Economic Instruments to Advance Adaptation in Natural Resource Management Applications in Forestry. The UBC study is designed to identify economic instruments (financial, behavioural, informational and governmental) currently in use in agriculture, forestry, and land use that have shown success/promise for facilitating adaptation. The project will develop criteria to evaluate their potential for addressing adaptation within forestry, use case studies to show how selected instruments can advance adaptation, and propose where new instruments could be introduced and implemented. The \$70,000 study is being led by Dr. Harry Nelson, Faculty of Forestry, University of British Columbia in partnership with BC Ministry of Forests, Lands and Natural Resource Operations and the BC Ministry of Environment.

Separate cost benefit analyses of climate change adaption options are being undertaken in six harbours and other coastal locations in Atlantic Canada, five coastal areas in Quebec and in the Great Lakes Basin. Although none of the projects are BC based, the results should improve economic analysis and help make better policy decisions with respect to Climate Change Adaptation for infrastructure projects.

Vadeboncoeur, Nathan. Perspectives on Canada's West Coast Region in Canada's Coasts in a Changing Climate: Understanding Impacts and Adaptation, (ed.) D.S. Lemmen, C.M. Clarke and F. Warren; Government of Canada, Ottawa, ON. The book will address scientific and policy aspects of climate change with publication scheduled for the end of 2015.

A more comprehensive list of NRCan funded projects can be found on the following website: <http://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/earthsciences/pdf/adaptation/Project-and-product-descriptions-October-2014.pdf>

AANDC Adaptation Program

Aboriginal Affairs and Northern Development Canada (AANDC) again invited proposals for the Climate Change Adaptation Program (CCAP) 2015-2016 term. The CCAP program is intended to support Aboriginal and northern communities efforts in addressing the risks and challenges of climate change and to build community resilience.

The funded projects for the 2015-2016 term have not yet been released. No projects were awarded to BC for the 2014-2015 term; B.C. projects for the 2013-2014 term included Preparing the Takla Lake First Nation Community (TFLN) for the Impacts of Climate Change Phase 1: Vulnerability and Risk Assessment of our Traditional Lands and the Gitga'at Climate Change Adaptation Plan.

Insurance Bureau of Canada

The Insurance Bureau of Canada (IBC) and related organizations (e.g. Swiss Re and the Institute for Catastrophic Loss Reduction) have funded a number of studies to raise public awareness regarding dramatically increasing cost of floods and other extreme events as well as address mitigation and/or prevent damages. IBC initiatives include the following:

Municipal Risk Assessment Tool (MRAT): A pilot project in three cities in Canada (Coquitlam, Hamilton and Fredericton) was completed in the fall of 2014. The focus of the pilot project was on predicting and mitigating localized flooding including sewer and water back-up. The IBC invested \$2,000,000 in this trial with individual municipal contributions of \$100,000. The IBC considered the pilot project to be very successful.

Mainstreaming across the country will take place in 2015 with a high level of interest being expressed by local governments. The tool will be automated but needs modification to apply to local conditions. The IBC will be looking for partnerships with local governments. The financial incentive for local governments will be the prospect of reduced damage claims by undertaking preventative action to mitigate the risk of flooding.

A Study of the Economic Impacts on the Weather Effects of Climate Change on Vulnerable Communities – The purpose of the study is to conduct an economic analysis of the impacts of climate change at the community level. Case study communities of Halifax and Mississauga will be used to provide an economic analysis of the net costs of climate change at the local level; provide an analysis to make the business case to governments, business and property owners that investments in adaptation measures reduce costs over the long-term; and provide a practical methodology for adapting the economic impact of climate change due to weather for use by local communities.

The \$426,000 project is funded by the ICB and NRCan. Completion is anticipated later in 2015.

Documentation of Earthquake Symposium in Vancouver in October 2014. Conference sponsored by the Insurance Bureau of Canada focused on collaborative earthquake preparedness by building resilient communities that can better withstand and recover from the impacts of natural disasters and other emergencies (Winter 2014-15).

A follow up to Telling the Weather Story (2012) by the IBC will be forthcoming in the summer of 2015. The focus will be to identify the costs if we do nothing to address climate change.

BC-WIDE INITIATIVES

Flood Hazard Area Land Use Management Guidelines

The May 2004 Provincial Guidelines were prepared following a series of legislative changes in 2003 and 2004 that resulted in most aspects of flood hazard management being under local government control. Draft amendments to these guidelines in 2013 were based on three 2011 reports by Ausenco Sandwell. This included a minimum 1:200 annual exceedance probability water level based on joint probability analyses of high tides and storm surge plus storm surge and wave effects as well as a projected 1.0 metre sea level rise by 2100 with adjustments for regional uplift and subsidence. Draft amendments were posted with written feedback requested by the Ministries of Environment and Forests, Lands and Natural Resource Operations in the fall of 2014. A technical working group chaired by Tina Neale was set up to review the comments started meeting in January 2015.

BC Building Code

Legislation is proposed to be introduced by the Minister responsible for Housing in the spring 2015 session to standardize the BC Building Code for all local governments except the City of Vancouver, which has a separate charter. This is in response to concerns of the building industry that a patchwork quilt of different building standards has arisen in different municipalities. The BC Building Code applies to all local governments in BC but an increasing number have imposed additional requirements. The BC Government has indicated that unique additions to the BC Building Code by individual local governments will lead to a regulatory patchwork quilt and is not appropriate.

The form of the legislation has not been released but could affect CCA elements that involve building construction. Examples include requiring the use of flood resistant building materials below flood construction levels and floodproofing of electrical panels and HVAC equipment or their elevation above flood construction levels.

Risk-Based Land Use Guide

Emergency Management BC is developing risk-based land use guide to assist municipal governments in determining:

- if land use will be safe for their intended use;
- whether the risk of the development is acceptable; and
- if not acceptable, how can the risk be mitigated.

The guide includes a six step evaluation process that identifies existing available tools under the Local Government Act and other legislation as well as a series of check lists to assist in the evaluation process. Some case studies such as flood risks relate directly to CCA while other applications such as extreme heat and cold can be added. The guide prepared by

Laurie Pierce and Bert Struik is being revised and will be posted on the Emergency Management BV website when it is finalized.

Climate Action Advisory Committee

BC Agriculture Committee developed the BC Agriculture & Food Climate Action Initiative in 2008 to enable a proactive and pan-agriculture approach to climate change issues. The Initiative develops tools and resources to enhance agriculture's ability to adapt to climate change. Since 2013, the Initiative has been providing strategic guidance and program management for BC agriculture's Climate Change Adaptation programming, and currently manages the Regional Adaptation Enhancement Program and the Farm Adaptation Innovator Fund.

Late 2014 saw the Initiative request proposals for a Delta Climate Change and Agriculture Education and Outreach project, and January saw a request for a Cariboo Region – Wildfire preparedness and mitigation planning and resources. These materials can be expected to be developed over 2015/16 and made available in 2016.

Green Shores¹⁰ for Homes

The Stewardship Centre for British Columbia is working with organizations in British Columbia and Washington State to create a voluntary, incentive based program to help waterfront homeowners restore natural shorelines. The objective is make shorelines more secure against erosion and flooding as an alternative to traditional structural protection such as bulkheads and seawalls, which typically experience high capital and maintenance costs. A pilot program is currently underway in Seattle and the San Juan Islands. Green Shores has projects as well as in the District of West Vancouver, the Sunshine Coast, Gulf Islands and Vancouver Island. Pilot funding sources consist of federal and local governments, foundations and riparian shoreline homeowners.

The Stewardship Centre recently completed a report (June 2014) titled Greening Shorelines to Enhancing Resilience: An Evaluation of Approaches for Adaptation to Sea Level Rise. That project used several case studies to evaluate the effectiveness of soft shore armoring compared to equally appropriate hard protection alternatives. The study found that Green Shores provides a significant cost advantage over hard alternatives like sea walls, proved neutral or better opportunities for ecological resilience of the shoreline, and demonstrated that "soft shore approaches, as outlined in the Green Shores program, can provide effective flood protection against climate change related sea level rise and related issues" in the cases studied.

Green Shores is a BC adaptation of the living shorelines concept, which has been in existence in the U.S.A. since 1972. A unique feature of the Green Shores program is a the

¹⁰ Green Shores is a trademarked program of the Stewardship Centre for British Columbia. The Green Shores program consists of hybrid techniques that promote the sustainable use of coastal ecosystems through planning and design that recognizes their ecological features and functions. Their four principles consist of preserving the integrity of coastal processes, maintaining habitat diversity and function, minimizing marine pollutants to the environment, and reducing cumulative impacts to the coastal environment.

Coastal Development and Green Shores for Homes Rating Systems that are intended for use by designers, builders and owners to guide Green Shores design and assess its performance.

QUASI-REGIONAL INITIATIVES

Integrated Partnership for Regional Emergency Management in Metro Vancouver (IPREM) IPREM will be moving forward with two initiatives from their 2014-2015 Strategic Plan throughout 2015. The focus for the year ahead will be on Regional Concept of Operations and Regional Emergency Communications. IPREM is to provide increased training of the Concept of Operations to Metro Vancouver's REPC, RAAC and other identified key stakeholders as well as presentation and orientation on the draft Regional Emergency Communications Strategy.

Columbia Basin Trust

Since 2008 the CBT has been supporting communities within the Columbia Basin to increase their resilience to climate change impacts through the Communities Adapting to Climate Change Initiative (CACCI). Through the CACCI, the CBT has assisted in the development of adaptation plans for several Basin communities. The CACCI developed a Learning Network for local government staff, elected officials and others interested in CCA that includes online meetings and teleconferences, quarterly e-letters, workshops, study tours and community presentations.

As part of the CBT Environmental Strategic Plan 2014 – 2019, the CBT is working towards developing a climate resilience program, to support Climate Change Adaptation, mitigation and awareness activities within the Basin, over the course of 2015. Phase 1 of the climate resilience program will support CCA projects, GHG emission reductions, improve information and awareness about climate change and monitor and learn from CCA and mitigation efforts in the Basin area.

Capital Regional District – Vancouver Island, BC

Beginning in 2013, the CRD Climate Action Program, in partnership with Natural Resources Canada (NRCan), began to map sea level rise and undertake a risk assessment to better understand the implications for the Capital Region District. The purpose of this project is to increase understanding of coastal vulnerabilities of Capital Regional District of British Columbia due to sea-level rise. This project was undertaken by AECOM and is now completed.

A follow up project is proposed to analyze sea level rise tools and applications with particular reference to local governments. It is anticipated that the project will focus on a maximum of five tools. The CRD is awaiting NRCan approval to proceed with this follow up project as the previously approved deliverable had been the development of a model bylaw.

The CRD supports a selection of public outreach and engagement initiatives around the topics of climate change mitigation and adaptation. One example is The Resilient Region Exchange, which provides monthly opportunities for local leaders from government, business, academia and non-profit agencies to have a dialog on topics central to climate

change and sustainability in their region. It is a free event, designed to encourage idea generation and synergies to develop innovative actions.

LOWER MAINLAND REGIONAL INITIATIVES

Fraser Basin Council (FBC)

Extensive consultation with Metro Vancouver municipalities in 2013 was undertaken by the FBC to determine the potential for a regional collaborative approach to flood hazard management. Based on the support received, the FBC prepared a multi-year business plan for a Regional Flood Management Strategy. The overall goal of the strategy is to increase community resilience and sustainability through strengthened policies to reduce the economic impact and social hardship of a major flood in the Lower Mainland.

The FBC has approached the Regional Flood Management Strategy as a collaborative process consisting of two major phases. The focus of Phase 1 (2014-2015) is to identify research gaps and fill them. The intent of Phase 2 will be to develop a regional strategy including options for funding and implementation based on the work completed in Phase 1. Moving from Phase 1 to Phase 2 will be a major challenge. Unlike the Regional Growth Strategy, the FBC lacks the legislative authority to undertake this initiative; it must rely on suasion, co-operation between local governments with often diverging interests, the collective benefits of regional initiatives, and the financial benefit of undertaken research and other initiatives at minimal cost to the local taxpayer. In meeting this challenge, the FBC has benefitted from strong leadership over many years, is well regarded by senior governments, and by Metro Vancouver municipalities, as is indicated in the survey results.

Primary funding for the following three FBC projects in 2015 will be from provincial and federal sources.

Project 1 consists of an analysis of future flood scenarios and probabilities for Metro Vancouver as well as the areas east to Hope and north to Squamish. Scenarios will range from a 1:200 year coastal storm to a 1:10,000 year coastal storm plus sea level rise of over one metre. The budget for this project is \$35,000. Kerr Wood Leidal will be undertaking this project with completion expected by March 2015.

Project 2 will build on the results of Project 1 using the same geographical area. It will address regional and localized flood vulnerabilities, consequences and costs. U.S. GIS based HAZUS methodology adapted for use by Natural Resources Canada will be utilized to determine economic losses from flooding on a regional, provincial and national scale. The budget for this project is \$125,000. This work will be undertaken by a team led by Northwest Hydraulic Consultants, assisted by the Arlington Group and several economists. This project is scheduled to be completed by October 2015.

The original intent of **Project 3** was to focus on the effectiveness of flood protection (both structural and non-structural), policies and plans. Structural assessment was removed from Project 3 and is now being undertaken through the Provincial Inspector of Dikes as noted in the following paragraph. Project 3B will focus on non-structural approaches / floodplain management such as flood-related bylaws, flood construction levels and other policies. The

consultant will be selected through an RFP process coordinated by the Fraser Basin Council. Although the terms of reference have not been finalized, Project 3B is expected to start in March and be completed by March 2016.

Project 3A - Lower Mainland Dike Assessment (Ministry of Forests, Lands and Natural Resource Operations). This project will be a high level overview of the existing diking system in Metro Vancouver. A key deliverable of the project is to prepare a central database for dikes in Metro Vancouver. The study will include a geotechnical overview assessment and include existing information on dikes such as crest elevation, crest width, slope, dike composition, where available, and other pertinent information. This will enable current dike defenses to be compared with recent studies on recommended standards commissioned by the Province of BC. The \$145,000 study is being undertaken by Northwest Hydraulic Consultants. Completion is anticipated in March 2015.

U.S. INITIATIVE

President's State, Local, and Tribal Leaders Task Force on Climate Preparedness and Resilience

The November 2014 report is a call for action at the national level to address climate change and undertake a comprehensive approach to enhancing resilience. The report is based on a series of overarching principles including the following:

- Require consideration of climate related risks and vulnerabilities as a part of all Federal programs and regulatory activities
- Maximize opportunities to take actions with the dual benefits of increasing community resilience and reducing GHG emissions
- Strengthen coordination and partnerships among Federal agencies and across Federal, state, local and tribal jurisdictions
- Provide actionable data and information on climate change impacts and related tools to support decision making

The report is organized around seven themes of building resilient communities, improving infrastructure resilience, ensuring resilience in natural resources, supporting resilient populations (specifically public health, food system security, and vulnerable populations), strengthening hazard mitigation, using economic levers to reward CCA (such as collaboration with the insurance industry and enhanced use of benefit-cost analysis), and building capacity for resilience. The report also provides numerous examples of Best Practices. It concludes with call for co-ordination across Federal agencies to implement the report's recommendations and to establish implementation benchmarks and monitoring of progress.

SURVEY RESULTS

CONTACT LISTS AND RESPONSE RATE

A total of 88 contacts were identified for the 21 local governments in Metro Vancouver as well as the Tsawwassen First Nation and Electoral Area A¹¹. The number of responses received was 35, which represented an overall response rate of 40%. This included 86% (19 of 22) of the local governments in Metro Vancouver including the UEL. The local governments which did not respond consisted of three of the four municipalities with a population less than 4,000.

A total of 13 contacts were identified for seven other public authorities in Metro Vancouver. These public authorities consist of transportation, utility or health agencies. Seven responses were received, a 54% response rate.

A total of 34 contacts were identified for non-governmental organizations (NGOs). They included NGOs working directly with Metro Vancouver on Climate Change Adaptation initiatives as well as others that are primarily advocacy based. Twelve responses were received from NGOs, approximately one third of those contacted.

The local government response rate is considered high for several reasons. First, many were aware the survey was coming, through advance notice given at the December Metro Vancouver Regional Engineers Climate Protection Subcommittee (REAC-CPS) meeting. Second, others were directly contacted by phone to confirm if they were the appropriate contact and to confirm their email address. Third, the request to complete the survey came directly from Metro Vancouver, which avoided the survey invitation being filtered as spam. Fourth, a follow up request was made with an extended deadline to encourage more responses and personalize the process. All survey responses are contained in Appendix D.

The response rate from other public authorities (Non-NGO's) is also considered high. The three non-responding organizations were provincial agencies, two of which were health authorities. The timing of the survey near the Christmas holidays is considered a significant factor affecting the response rate.

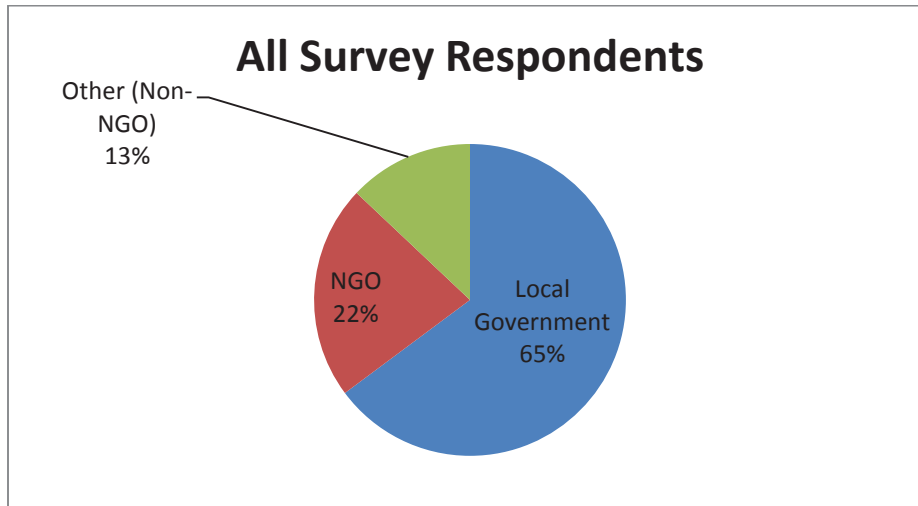
The response rate from NGOs was considerably lower than from local governments and other public authorities. Factors affecting the response rate from NGOs include a lack of advance notice and the fact many NGO's are umbrella organizations where Climate Change Adaptation is a small part of their area of interest. Excluding the umbrella organizations, the NGO response rate is considered good, as it included most of those working directly on CCA within Metro Vancouver as well as pure advocacy organizations.

The majority of the questions were in multiple choice format. Opportunities to submit additional commentary or alternate responses were provided in order to offset the natural survey bias which comes from multiple choice formats.

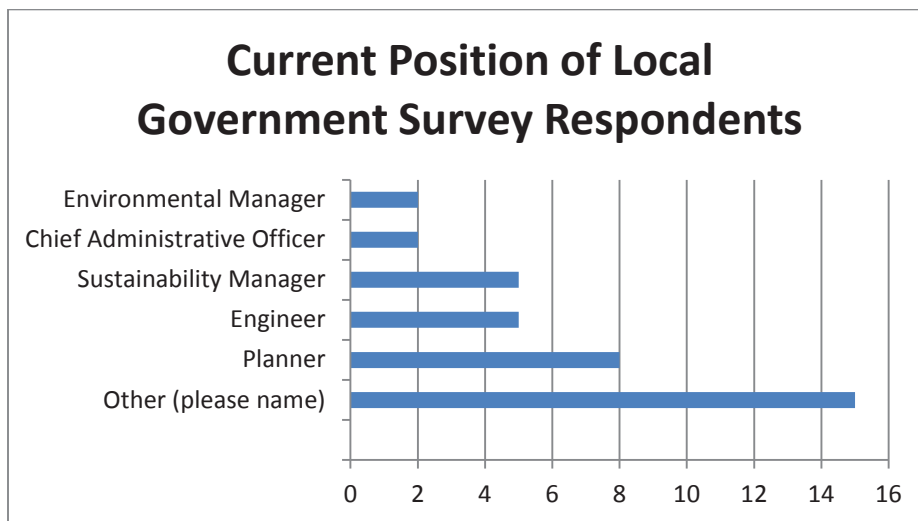
¹¹ Appendix A contains of list of all contacts.

PROFILE OF RESPONDENTS

The following graph shows the proportion of survey respondents from each of the three groups.



Local government respondents were asked to indicate their current position from a given list or to name their position ('other' checkbox). The 'other' box received the highest response rate (42%) followed by planning positions (23%) and then engineering positions and sustainability managers (both 14%).



Analysis of the 'other' responses¹² show a majority listed specific positions which could be grouped within the listed position categories. With this recalculation based on positions provided by respondents, two thirds of the local government responses came from three groupings – engineers (26%), closely followed by planners (24%) and then sustainability managers (16%). Each of the other groupings represented less than 10% of the positions

¹² See Appendix D for raw survey results

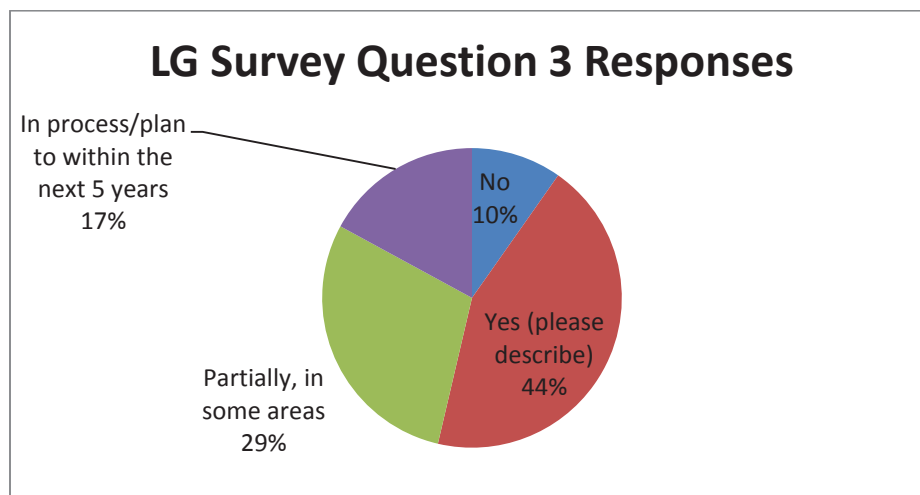
cited. The responses received represent a very diverse group of people with responsibilities concerning climate change adaption.

From another perspective, one half of responses came from the planners and engineers, where there has been a traditional distinction between policy formulation for the former group and management of structural protection (e.g. dikes) and other infrastructure (e.g. stormwater, sanitary sewers, roads) a for the latter group. The remaining responses came from the rapidly expanding fields of sustainability management and environmental management, specialist areas such as risk managers, urban forestry and emergency management and finally, generalists such as chief administrative officers.

The NGO and other organizations were also asked to identify their organization and position. For a list of the organizations and positions identified see Appendix D.

ANTICIPATED CLIMATE CHANGE IMPACTS

Question 3 asked if the respondent's local government had identified how changes to the climate might impact your community. If yes, respondents were asked to describe the process of identifying climate change impacts followed by anticipated climate change impacts (Questions 3 and 4) and if no, respondents were asked to indicate why (Question 5).



A majority indicated how their local government had identified climate change impacts. Nearly 30% indicated this had been partially undertaken and a further one fifth stated this process is on the five year planning horizon. Only 10% indicated this identification process has neither taken place nor is planned.

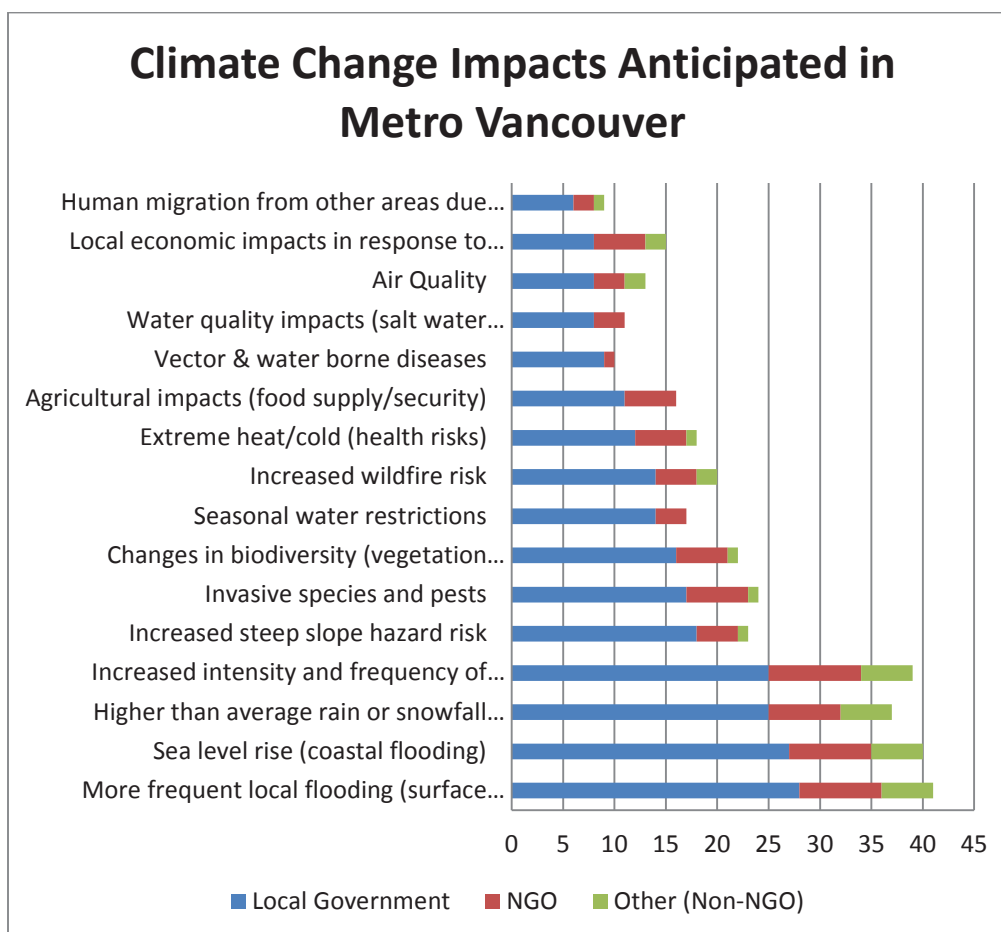
The most common identification process cited was the use of the ICLEI program. Numerous other processes were cited including the following:

- creation of a sustainability manager position
- creation of a climate adaptation strategy
- undertaking a community energy and emissions plan

- undertaking of an integrated stormwater management plan/consideration of climate change when designing services
- multi-departmental working group to identify potential climate effects or internal staff review
- collaboration with academic institutes and government agencies
- completion of coastal flood risk or foreshore assessment

A similar question was asked of NGOs and non-NGOs with respect to whether the organizations have identified climate change changes/impacts in metro Vancouver or not. The NGO response was 82% in the affirmative and the non-NGO response was 100%.

All survey respondents were asked to identify the potential climate changes/impacts their organization is anticipating in Metro Vancouver. The following graph indicates the potential climate change impacts anticipated by local governments that responded yes to Question 3 and those identified by the NGO and other (non-NGO) respondents.



Additional impacts or changes noted by survey respondents included: Higher costs of construction/loss of developable land; Effects of global climate change on travel patterns; and salt water intrusion in assets that are susceptible to salt water; submergence of

electrical systems not designed for overflow of water; and contamination of water treatment systems.

The following four climate change impacts were anticipated by over 75% who answered yes to Question 4:

- Higher than average rain or snowfall (drainage infrastructure impact)
- More frequent localized flooding (surface and/or river)
- Sea level rise (coastal flooding)
- Increased intensity and frequency of storms (storm damage, interruption to supplies & services)

There is a near consensus on these climate change impacts, all of which are water related. The following three climate changes impacts were anticipated by 50% to 60% of respondents who answered Question 4:

- Increased steep slope hazard risk
- Changes in biodiversity (vegetation and/or fauna)
- Invasive species and pests

All of these climate change impacts concern changes in biodiversity, whether directly or indirectly.

The following eight climate changes impacts were anticipated by more than 25% but less than a majority of respondents who answered Question 4:

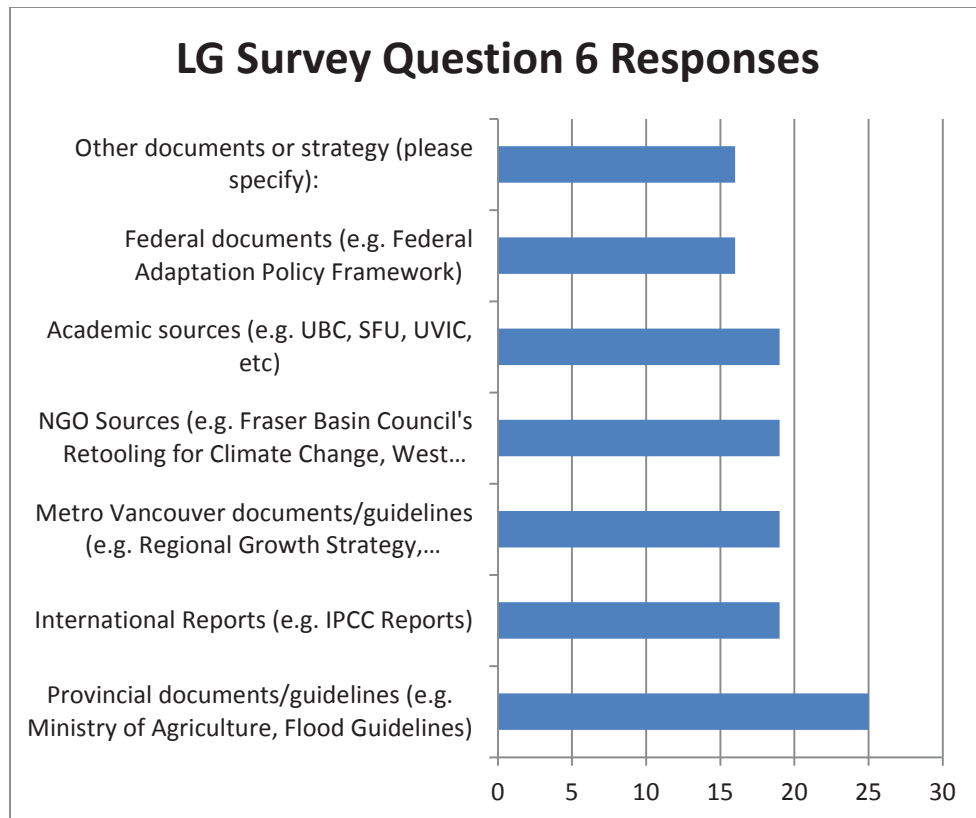
- Water quality impacts (salt water intrusion in aquifer)
- Seasonal water restrictions
- Extreme heat/cold (health risks)
- Increased wildfire risk
- Agricultural impacts (food supply/security)
- Air Quality
- Vector & water borne diseases
- Local economic impacts in response to climate change in other regions (e.g. Californian droughts)

It is noteworthy that one additional climate change impact – human migration from other areas – was identified by less than 20% of respondents.

Officials from four local governments indicated they had not determined how changes to the climate might impact their community. A variety of explanations were provided including a lack of resources, lack of political support, a belief that there is no immediate threat, and a low priority compared to other things to do. None indicated they were opposed to undertaking initiatives to address Climate Change Adaptation. These responses all came from local governments with a population under 25,000.

INFORMATION SOURCES

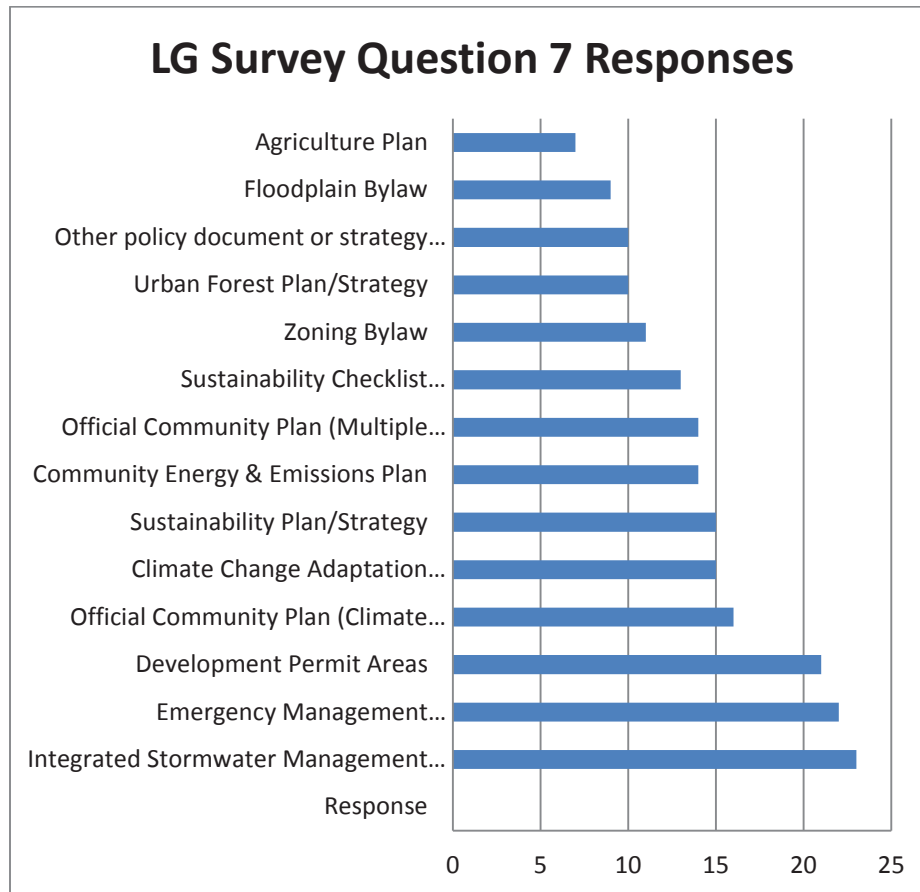
In the survey of local government, a wide range of information sources were cited to assess and plan for climate change impacts in local Metro Vancouver communities. Question 6 results are shown graphically below.



Provincial documents and guidelines are relied on most heavily (74% of responses). This is likely due to several reasons. One concerns those areas of continuing provincial authority such as the requirement for local governments to consider Provincial Guidelines and the authority of the Provincial Inspector of Dikes. Another factor may be the numerous provincial publications concerning Climate Change Adaptation. Other sources cited by a majority of respondents are international reports (such as those of the IPCC); academic sources, which include prominent initiatives by SFU, UBC and UVic; Metro Vancouver documents, such as the Regional Growth Strategy, Air Quality Management Plan, and ISMP guidelines; and NGO sources such as the Fraser Basin Council and West Coast Environmental Law. Numerous other sources were cited, with ICLEI and PCIC mentioned multiple times.

POLICY OR STRATEGY DOCUMENTS UTILIZED TO ADVANCE CLIMATE CHANGE ADAPTATION

Over a dozen policy or strategy documents were cited by local governments as being used to advance climate change adaption. The following graph profiles the responses to Question 7.



This list indicates a diverse set of policies is used by local governments in Metro Vancouver to address Climate Change Adaptation. The percentages reflect individual responses but may underreport those in place for larger municipalities. This is due to the specialization in larger municipalities. Some respondents indicated they would comment on those areas within their expertise and noted that others in their organization would comment on other aspects of Climate Change Adaptation. In other cases, responses were received from some departments but not others. For example, this is expected to have led to some underreporting of Official Community Plans by engineers and ISMPs by planners.

Three documents were cited by 60% or more of respondents:

- Integrated Stormwater Management Plans
- Emergency Management Plans
- Development Permit Areas

The first two documents are mandatory for local governments in Metro Vancouver, although Climate Change Adaptation provisions are not required to be included. Most local governments also have Development Permit Areas for the protection of the environment or the protection of development from various hazards, either in their OCP or Zoning Bylaw.

Five documents were cited by 40% to 50% of respondents:

- Climate Change Adaptation Plan/Strategy
- Community Energy & Emissions Plan (CEEP)
- Official Community Plan (Climate Change Section)
- Official Community Plan (Multiple sections)
- Sustainability Plan/Strategy

Most local governments have OCPs, and many have references to climate change in multiple sections of the OCP or in a specific section to address climate change. A CEEP analysis is available for all local governments and many have prepared plans to reduce energy emissions in the building, transportation and waste management sectors. Climate Change Adaptation and sustainability plans are increasingly occurring in Metro Vancouver's larger local governments.

Five documents were cited by at least 20% but less than 40% of respondents:

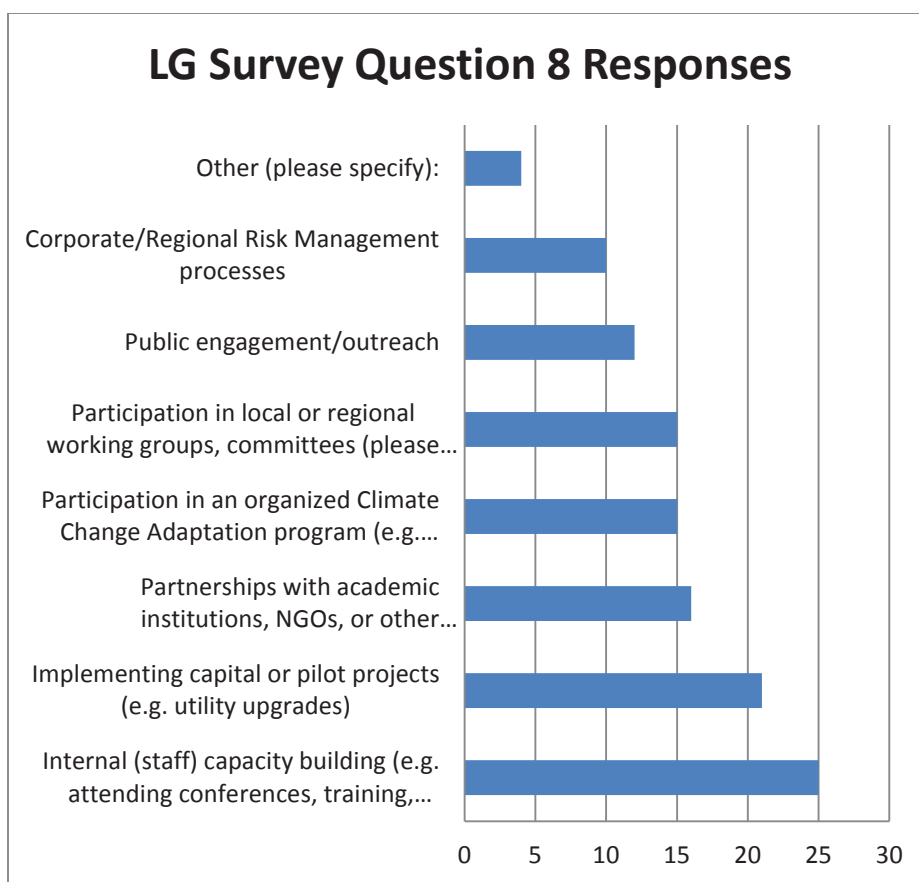
- Sustainability Checklist (Development Applications)
- Urban Forest Plan/Strategy
- Zoning Bylaw
- Floodplain Bylaw
- Agriculture Plan

Other municipal documents cited by less than 20% of respondents were an Engineering Capital Plan, Subdivision and Standards Bylaw, Healthy City Plan, Environmental Strategic Plan, and a municipal risk management system.

OTHER WAYS CLIMATE CHANGE ADAPTATION IS BEING ADVANCED

The following graph indicates other ways Metro Vancouver local governments are advancing Climate Change Adaptation in their communities.

The most commonly cited other ways in which local governments are advancing CCA (over 78%) is internal capacity building such as attending conferences, training and vulnerability assessments. Nearly two thirds cited implementing capital or pilot projects. One half of respondents reported partnerships with academic institutions, NGOs or other organizations.



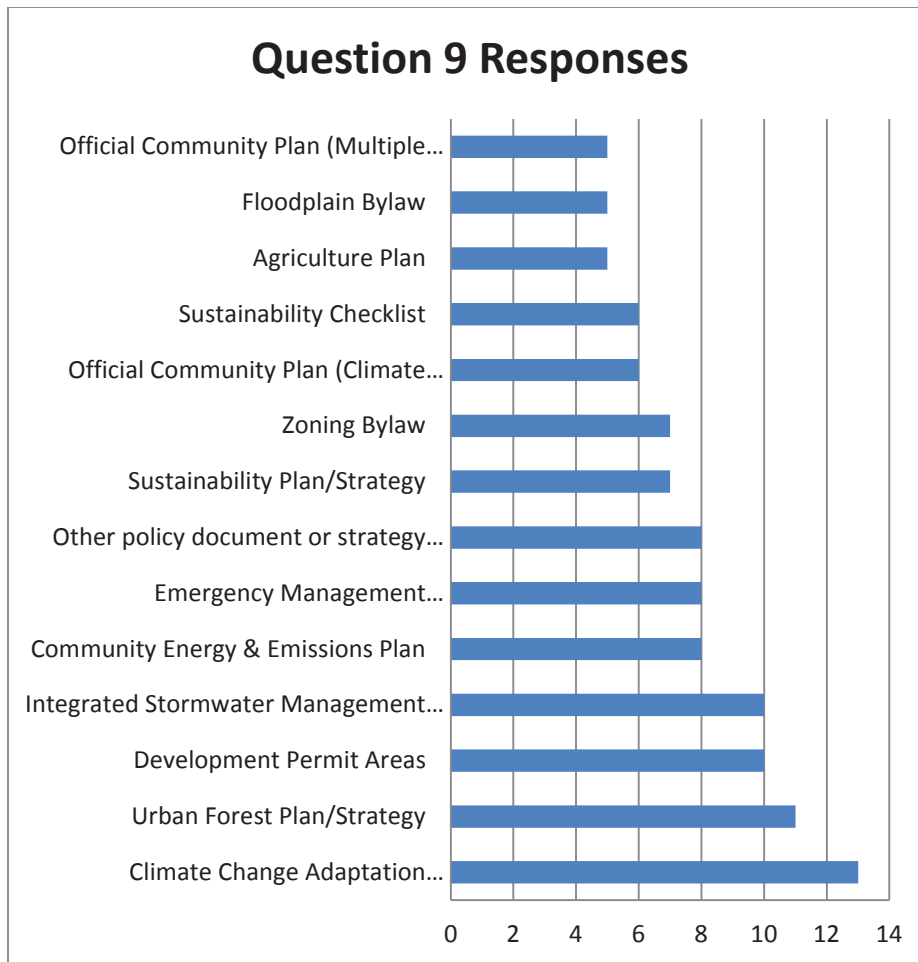
Close to 50% cited participation in an organized CCA program such as ICLEI. Nearly one half indicated their participation in regional working groups or committees. These included the following:

- Fraser Basin Council (Regional Flood Strategy or Joint Partnership Committee)
- Burrard Inlet Working Group
- North Shore Climate Adaptation Working Group
- Regional Engineers Advisory Committee (and subcommittees)
- West Coast Environmental Law engagement
- SFU Coastal Cities at Risk
- Ministry of Agriculture programs and committees

Over one third cited public engagement or outreach initiatives. No other processes were cited by more than one third of respondents.

ADDITIONAL WAYS TO ADVANCE CLIMATE CHANGE ADAPTATION

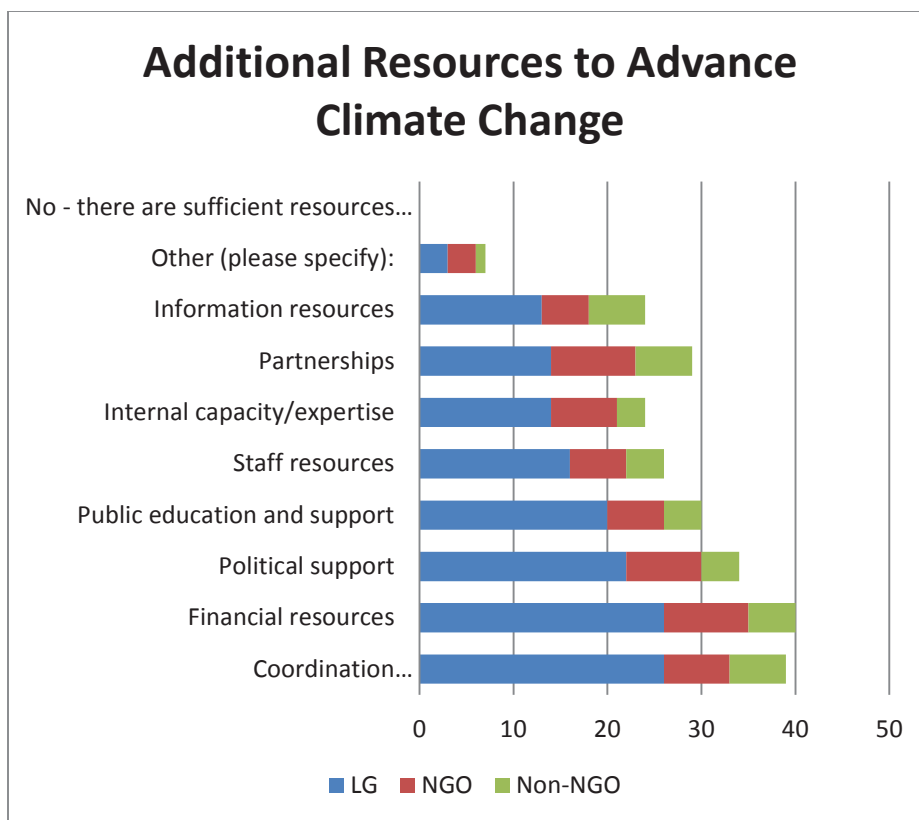
The following table consists of policy or strategy documents that respondents feel should be used in their community. The distinction from the previous question is this identifies documents that are not being used but respondents feel should be used in their community.



The only document identified by 50% or more of respondents is a Climate Change Adaptation Strategy. One other document – an Urban forest Plan/Strategy – was identified by over 40% of respondents. Although numerous other policies or strategy documents were identified, the relatively low support levels may be due to the fact that many are already in place while some others may not be considered needed in their local community.

ADDITIONAL RESOURCES TO ADVANCE CLIMATE CHANGE ADAPTATION

Question 10 in the local government survey asked respondents to indicate what (if any) additional resources would help advance Climate Change Adaption in the Metro Vancouver region. This question was also included in the NGO and non-NGO survey. The combined results are shown on the graph below.

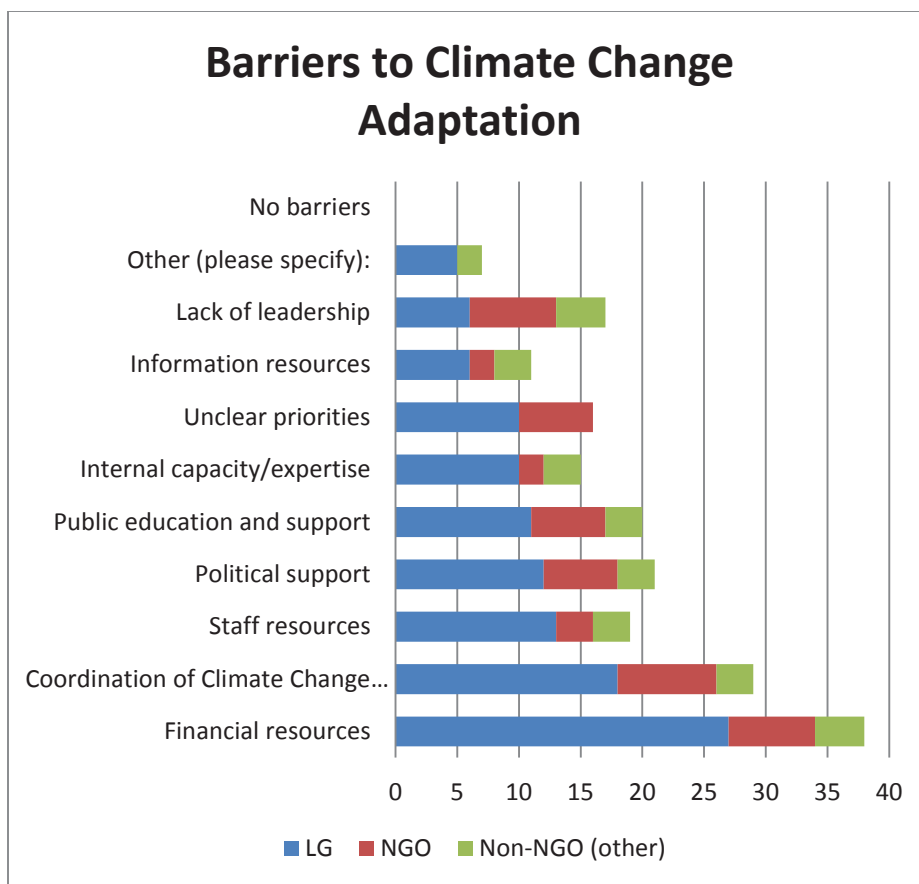


Two responses received over 80% support from respondents – co-ordination (local/regional/provincial/federal) and financial resources. Two other responses received support from 60% to 70% of respondents. Those were political support and public education. Four other areas received support levels of 40% to 50%. They consisted of staff resources, partnerships, internal capacity building/expertise and information resources. These support levels are very high.

BARRIERS TO CLIMATE CHANGE ADAPTATION

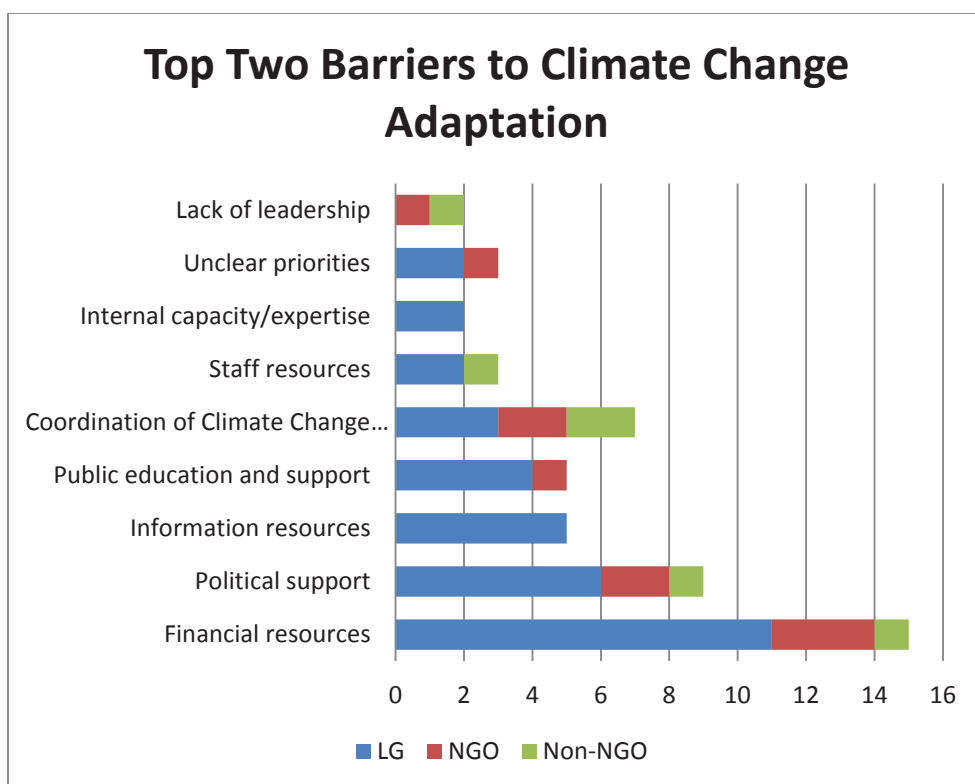
Question 11 in the local government survey asked respondents to identify what they consider the most significant barriers to Climate Change Adaptation to be. A similarly worded question was included in the NGO and Non-NGO (other) survey. The combined results are shown on the following graph.

Financial resources topped the list by a large margin. This constraint was indicated by over 80% of respondents. The only other barrier noted by a majority of those responding (56%) was Coordination of Climate Change Adaptation. Public education and support, political support, staff resources, internal capacity building/expertise and unclear priorities were all cited by just over 30% of respondents. It is interesting to note that relatively few indicated a lack of leadership (19%) or information resources (19%). No one felt there were no barriers to implementing CCA.



Other barriers identified include: no sense of urgency (future issue); legislative mandate (streamlining of Climate Change Adaptation into everyday operations); sharing of information (data, potential local impacts & mitigation methods); implementation challenges; regional and provincial guidelines and documents; and coordinated emergency and recovery plans.

The top two barriers identified by all of the survey respondents do not differ significantly from those of the general barriers identified, financial resources was still the top barrier. Political support however was identified as the second most significant barrier only slightly ahead of coordination of climate change efforts.



FURTHER STEPS TOWARD CLIMATE CHANGE ADAPTATION

A wide range of responses were given to Question 12 in the local government survey, which asked ‘What further steps towards Climate Change Adaptation are planned by your local government or anticipated to occur in your community in the next 2 years?’ A similar range of responses were given to Question 13, which asked ‘In your opinion, what are the most important steps your local government could take to advance Climate Change Adaptation? Why?’ Each of these questions received 25 or more responses, which were tailored to individual local governments. Verbatim responses are contained in Appendix D.

Much of the current and future efforts toward Climate Change Adaptation of the local government respondents focused on flood risk management¹³. Plans and strategies specific to climate change adaptation were also identified as well as OCP updates and ISMP's. In terms of on the ground changes (as opposed to policy, although ISMPs lay the groundwork) infrastructure changes/upgrades (green or otherwise) are being utilized to advance CCA.

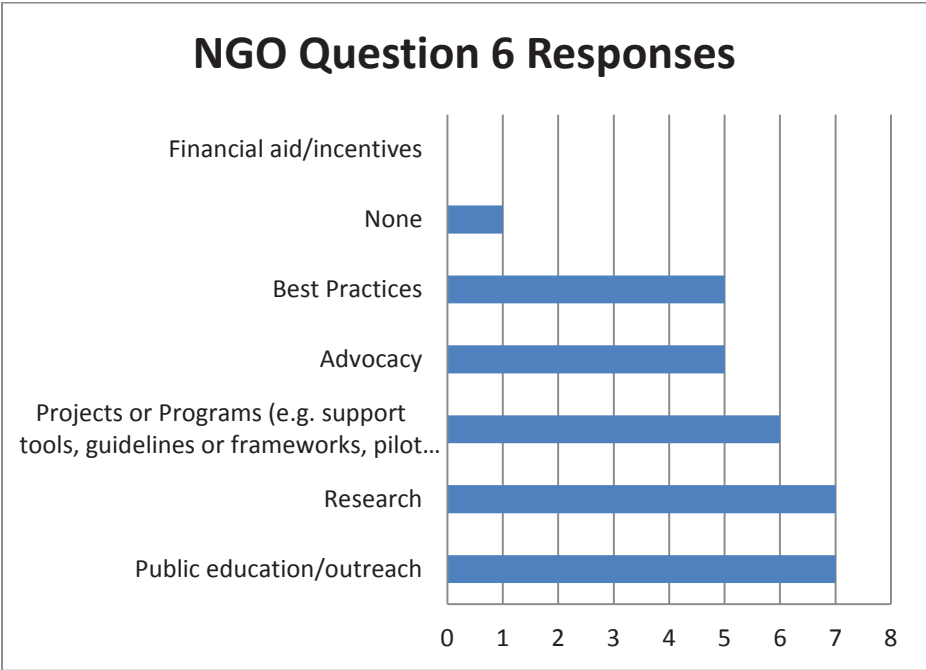
Local government respondents noted a number of steps their local government could be taking to advance climate change. Flood hazard and floodplain management in terms of appropriate land use and building standards was a common theme. The risk of flood is very real for a significant proportion of Metro Vancouver living within floodplains. In addition

¹³ This consists of a variety of flood risks including extreme storm events, storm surge, river freshet flooding, avulsion on alluvial fans, and stormwater overflow.

flooding has been a topical issue of late with advances being made at a provincial level (but not by the Province) to improve floodplain mapping and identify risk.

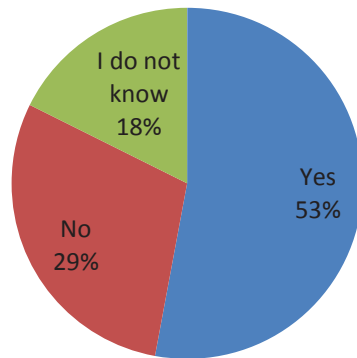
NGO AND NON-NGO ENGAGEMENT WITH CLIMATE CHANGE ADAPTATION

Different questions were put to the NGO and non-NGO participants in this study with respect to their role and engagement with Metro Vancouver municipalities regarding adaptation to climate change. NGOs they were asked to identify the role they play in adaptation to climate change.



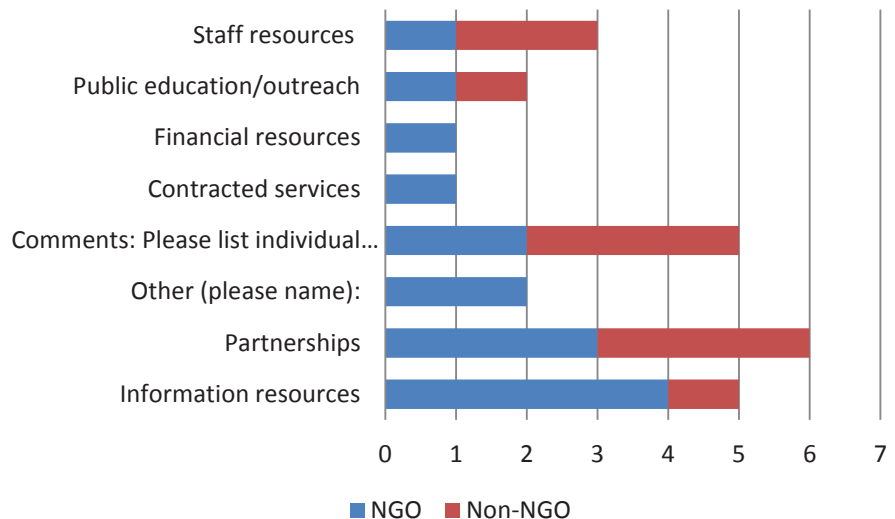
Both the NGO survey and the non-NGO (other) survey requested participants to identify if their organization had worked with any Metro Vancouver municipalities.

Worked with Metro Vancouver or Member Municipalities



The respondents who answered yes to the above question were then asked to specify in what ways they had engaged with member municipalities.

Engagement with Municipalities



Other means of engagement with member municipalities included, dialogue through committee (liaison committees, LMLGA Flood Control & River Management and FBC's Joint Program Committee).

ANALYSIS

CLIMATE CHANGE ADAPTATION PRACTITIONERS

There is a great diversity in the type of local government personnel involved in CCA. This diversity has very limited expression for small local governments where resources are limited and climate change related policies consist of general statements in OCPs. The number and type of personnel involved in CCA increases in relation to the population served by the local government but varies according to geographic conditions, urban density and vulnerability. Specialization of CCA is much more evident in local governments with a population over 40,000, where sustainability positions start to appear in addition to planning and engineering positions. A further degree of specialization occurs in local governments with a population over 100,000. This is evident in engineering positions and environmental managers including specialized functions to address urban forestry and agriculture.

It is important to note that many of the positions that currently exist to address CCA did not exist a decade ago. This applies in particular to sustainability and environmental managers. There is also great diversity in how and where local government personnel involved in CCA fit in organizational charts.

The significance of this is twofold. One is the increasing organizational complexity in addressing CCA. This is primarily a function of the municipal population but is modified by other variables. Personnel involved in CCA ranges from the Chief Administrative Officer as a reference in villages and other small municipalities to half a dozen or more different persons with specialized functions in large municipalities. The specialization of CCA in large municipalities poses challenges. For example, several respondents to the questionnaire were reluctant to comment on the nature of CCA work being undertaken in other departments in their own local government.

Second there are multiple access points addressing CCA in most local governments. This is reflected in a number of ways such as vision statements in OCPs, strategic plans and sustainability plans in which sustainability and CCA go beyond specific topics in municipal plans or are included in the job description of an employee such as a sustainability officer. There is also increasing recognition that CCA cuts across jurisdictional boundaries. This has resulted in the formation of a number of regional or sub-regional working groups and committees to share information and address issues that extend beyond municipal boundaries.

CLIMATE CHANGE ADAPTATION INFORMATION SOURCES

In terms of information sources used by project participants to assess and plan for climate change, the greatest reliance has been on provincial documents and guidelines. Given the guidance the Province has provided in terms of flood hazard management and sea level rise, it may be appropriate for the Province to provide guidance in related fields such as climate change adaptation or risk management. Participants responded positively to the guidance provided thus far from the Province and feel there is a level of credibility and consistency

when direction is provided a higher governance level. This is reinforced when grants and program funding is involved.

ICLEI (Canada) and, in particular the Building Adaptive & Resilient Communities (BARC) program/tool, was identified by some participants as a useful source of information and guidance for climate change adaptation. However there is a significant cost associated with this program which may deter some of the smaller municipalities within Metro Vancouver¹⁴ from participating. However as Metro Vancouver is a member, it may be able as a regional body to assist small municipalities who wish to follow a template or “add-on” to Metro Vancouver’s membership. The potential for this would be best explored in direct communication with ICLEI Canada.

A significant number of Metro Vancouver municipalities have taken advantage of various initiatives of academic institutions working on Climate Change Adaptation. The Pacific Climate Impacts Consortium (PCIC), Simon Fraser University Adaptation to Climate Change Team (SFU ACT) and University of British Columbia were most commonly identified by survey participants. Partnering with academic institutes offers benefits to both parties. Municipalities are able to undertake research and obtain data they might not otherwise be able to do themselves with little or no financial contribution required. Academic institutions are able to provide projects for their students with real world case studies on subjects of public interest.

CLIMATE CHANGE IMPACTS ANTICIPATED IN METRO VANCOUVER

The four top identified climate change impacts anticipated by participants in order were:

- more frequent local flooding (surface¹⁵ and/or river);
- sea level rise (coastal flooding);
- increased intensity and frequency of storms (damage, interruption to supplies & services); and
- higher than average snow or rainfall.

All of these impacts are water related, and for the most part, represent existing interrelated long-standing issues. Extreme rainfall events are not uncommon in Metro Vancouver and frequently lead to surface and, in some cases, river flooding. Such rainfall events are usually part of a storm or front that can cause coastal flooding and damage through storm surge. Because most of these impacts are existing in the sense that many Metro Vancouver municipalities are already having to deal with the consequences, adaptation is proceeding out of necessity. The resilience factor is ensuring changes made to cope with existing conditions can also cope with not just increased intensity (i.e. systems capacity) but frequency. This means building systems that cope not only with a particular event but require little down or repair time in order to be ready for the next event. For sea level rise and more frequent/intensive coastal flooding, this means ensuring adaptation is flexible and

¹⁴ It is noted that five Metro Vancouver municipalities (and Metro Vancouver itself) are members of BARC: Delta, North Vancouver City, Surrey and Vancouver and most recently, the District of North Vancouver: <http://www.icleicanada.org/programs/adaptation/barc>

¹⁵ Surface flooding refers to street flooding (pooling of water in surface depressions) associated with lack or failure of drainage systems.

does not require significant repair works after each event. Green Shores™ and other ecosystem based shoreline adaptation approaches have received increased attention in recent years. Although each application is distinct, an ecosystem based approach that integrates structural elements with environmental considerations, typically provides resilience and protection with lower capital and maintenance costs than structural protection alone.

CLIMATE CHANGE ADAPTATION (CCA) ACTIONS

The most prevalent CCA actions identified in the survey were: Integrated Stormwater Management Plans, Emergency Management Plans and Development Permit Areas.

INTEGRATED STORMWATER MANAGEMENT PLANS (ISMPS)

A majority of municipalities within the region have included or are working on the incorporation of climate change impacts and adaptation at a policy level. Integrated Stormwater Management Plans (ISMP) were the top policy or strategy document identified by survey respondents being currently used to advance adaptation to climate change. A total of 16¹⁶ out of 22 of Metro Vancouver local governments have or are completing stormwater management plans¹⁷. This is hardly surprising given Metro Vancouver municipalities are required to complete ISMPs. Although ISMPs were not specifically envisaged as a climate change adaptation tool, they do address potential impacts/issues associated with climate change in terms of flood, erosion & drainage controls, habitat protection and water quality. ISMPs are increasingly seen as a key climate change adaptation tool. They focus on an aspect of climate change with great potential for damage that can be mitigated or avoided.

EMERGENCY MANAGEMENT PLANS

Under the Emergency Program Act, all municipalities and electoral areas are required to develop local emergency plans that include “preparation for, response to and recovery from emergencies and disasters”. The scope and quality of the plans in place vary greatly. Emergency Management BC is currently developing a risk based land use guide to assist municipal governments in becoming more proactive in managing risk. Although participants identified Emergency Management Plans as a way in which climate change adaptation is being advanced, many emergency management plans are not publicly available and were not included in the scan. The traditional focus of emergency plans has been planning as a reactive tool when a disaster is imminent and for post-disaster recovery, however it seems emergency management plans are increasingly used to reduce the risk of a disaster and to add to the adaptive capacity of a community to bounce back after an event through networks and support functions. This can positively contribute to the capacity of communities to adapt to climate change.

¹⁶ This does not mean that the remaining municipalities are not undertaking ISMPs as some respondents noted they were only commenting on CCA measures within their areas of expertise.

¹⁷ Mostly referred to as Integrated Stormwater Management Plans (ISMP) but also referred to as an Integrated Rainwater Resource Management Strategy (IRRMS).

DEVELOPMENT PERMIT AREAS

Development Permit Areas were identified as the third most frequent way in which municipalities are taking climate change adaptation action. A total of 20 out of 23 Metro Vancouver member organizations¹⁸ have DPAs that either directly or indirectly contribute to or address climate change adaptation. Development permits are a proactive way to approach climate change adaptation and address some of the impacts anticipated with a changing climate. The mandate within the Local Government Act for the designation of development permit areas is specific, area based and can be incorporated into either an OCP or, less commonly, a zoning bylaw.

A development permit area may be designated for any of the following purposes (related to climate change): (a) protection of the natural environment, its ecosystems and biological diversity; (b) protection of development from hazardous conditions; (h) & (i) objectives to promote energy and water conservation; and (j) objectives to promote reduction of GHG emissions. While purposes (h), (i) and (j) are more mitigation focused they also promote resilience, decreasing dependency on fossil fuels and promoting sustainability. It is important to note that DPAs also offer flexibility with respect to timing. DPAs can be put in place without a specific timeline attached. The protection of development from hazardous conditions need not specify whether the hazards currently exist or are anticipated in the future.

OTHER

In terms of on the ground actions, two other areas were mentioned by a significant proportion of survey participants: Flood Hazard Management (including sea level rise) and infrastructure replacement and improvements. Water, a lot of it and frequently, is already a reality for nearly all Metro Vancouver member municipalities. Rain/stormwater management is an area in which resilience is continually tested and systems improvements made, mostly out of necessity. It is something tangible the public can engage with and is aware of and therefore is the least contentious way in which CCA is being implemented. Slightly more contentious but just as important for the region is the issue of river flooding and sea level rise. Of the 21 Metro Vancouver member municipalities, over half (12) share a border with the Fraser River, Pitt River or both and three quarters (16) have coastal exposure (this includes those municipalities bordering Burrard Inlet). Recent momentum has been gained with respect to flood hazard management and there is currently a push to obtain and prepare updated flood hazard maps for the Lower Mainland. Arlington's previous work in this area indicates several local governments have recently or are in the process of updating flood hazard management policy to address sea level rise, more closely follow Provincial Guidelines, or establish a lower risk tolerance (e.g. 1:500 year flood event vs. 1:200 year flood event).

¹⁸ The City of Vancouver, Electoral Area A and Tsawwassen First Nation do not have DPAs concerning, climate change. Vancouver also has different enabling legislation.

ADDITIONAL RESOURCES FOR CLIMATE CHANGE ADAPTATION

Participants indicated that additional financial resources would be the most helpful in order to advance climate change adaptation. However among local government respondents, co-ordination was cited as frequently as financial resources.

In addition to the ways in which local governments are currently advancing climate change adaptation, survey participants were asked to identify what policy or strategy documents they would like to see utilized. The largest response was for the adoption of a specific Climate Change Adaptation plan or strategy. The adoption of these specific plans is currently a gap.

BARRIERS AND CHALLENGES TO AND FOR CLIMATE CHANGE ADAPTATION

Survey participants were asked to identify barriers to climate change adaptation and to rank the top two barriers. Across the participants of the three surveys, financial resources were identified as the top barrier and co-ordination of climate change adaptation as second. Public education and political support which are closely interrelated were also identified by a significant number of survey respondents closely followed by a lack of staff resources.

FINANCIAL RESOURCES

A number of challenges or barriers to climate change adaptation were identified by the surveys with elaboration by interview participants. From the survey results, financial resources were indicated to be the single most significant barrier. However the purposes cited for the need for additional financial resources were quite wide ranging. Based on the open ended answers to Question 11, individual responses can be grouped as follows:

- Staffing to enable more comprehensive CCA to occur (e.g. long range planning, internal capacity building throughout municipal organizations)
- Better planning to address CCA (e.g. updated floodplain mapping, creating action plans)
- Public education (e.g. communicating with the public, building public support to bring senior governments onside, making long term needs a priority)
- Implementation of CCA to improve resilience (e.g. sea dikes, stormwater improvements and other infrastructure upgrades, land acquisition/rights of way)

The lack of financial resources has some similarity to the challenge local governments faced when responsibility for flood hazard management was downloaded in 2003-2004 without compensating funding or resources being provided. Clearly, more can always be done with more money. However, there are important differences. Significant resources are being devoted to addressing the challenge of CCA. Both bottom up pressure and top down incentives have been significant factors. Many larger local governments have dedicated additional resources to sustainability and climate change initiatives. The detailed responses of survey participants indicate they feel very passionate about the need for climate change adaptation and consider this to be an essential activity for their local government to undertake, doing nothing about climate change is not considered an acceptable option.

Nearly all local governments have signed the B.C. Climate Action Charter (182 local governments as of November 2013) which required a commitment to take steps to become carbon neutral and to reduce GHG emissions by 80% by the year 2050. In return the local governments became eligible for reimbursement of carbon taxes through the Climate Action Revenue Incentive Program. Although the thrust of Provincial initiatives has been on climate change mitigation through reduction of GHG emissions, climate change adaptation by local governments quickly followed. If anything, the failure to reduce GHG emissions worldwide has intensified CCA by local governments. CCA is an area where local governments can take action to reduce risk, monitor performance and provide measurable results.

Most local governments in Metro Vancouver also allocated resources in-house or through contracted services to plan in some way for CCA. Inadequate financial resources are a significant irritant. However, the results of this project suggest a lack of financial resources has not deterred most local governments from taking some action toward adapting to climate change. The exception is smaller local governments (e.g. primarily villages). Although Metro Vancouver local governments would welcome more financial and other assistance from senior governments, there is little if any indication that local governments feel CCA should be led or primarily undertaken by senior governments.

COORDINATION

Coordination was identified as the second most significant barrier to Climate Change Adaptation. Local governments are at the bottom of the governance tier but are responsible for on the ground action and implementation. Without guidance at a regional, provincial or even federal level, efforts toward Climate Change Adaptation are varied across the region. Although many municipalities either formally or informally work with neighboring jurisdictions through ad hoc arrangements, NGOs or groups such as the Burrard Inlet Group and the Fraser Basin Council, the policy approaches between local governments in Metro Vancouver can be very different. However these differences do not necessarily conflict. In an emerging field which is rapidly evolving, the best practices for one local government may not be the same for another local government. 'One size fits all' approach does not and should not apply to Climate Change Adaptation.

Co-ordination is seen from two perspectives by local governments. One is information sharing. This is universally supported. The other is co-ordination of activities. This is also supported by most local governments but should be viewed more cautiously. Co-ordination is seen in a negative light if it duplicates other activities, has the objective of creating a standardized approach, or involves a top down approach by Metro Vancouver or the Province. As a result, support for the sharing of information and knowledge has been indicated. Some support for co-ordination of Climate Change Adaptation actions, but not necessarily leadership, has been indicated.

PUBLIC EDUCATION/POLITICAL SUPPORT

There is a role for public education and outreach at the regional level. There is a complex relationship of CCA actions which spans jurisdictional boundaries. Air quality monitoring, stormwater management, and dike elevations all concern CCA yet they have both local and

regional aspects. It is difficult to see how the need for public education can effectively and efficiently be met by local government initiatives alone.

Public education and support are intrinsically linked to advocacy and political support. Both were identified as barriers to Climate Change Adaptation. Although public education and awareness is a significant challenge, this is not insurmountable and may represent an opportunity for a regional approach. This is discussed more in the context of what Metro Vancouver may be able to contribute moving forward.

INFORMATION MANAGEMENT

Another challenge indicated during the interviews and to some degree in the surveys is the issue of information management. Too much information and not enough information are both problems. Although the mainstreaming of climate change adaptation is fairly new, there is a wealth of information available and to sift through it all in order to guide an adaptation process is a challenge. Although there is some sharing of information at a sub-regional level, one interview participant suggested there is hesitation to share information for political reasons. Formal and informal sharing of knowledge, ideas, failures and successes contributes not only to networks but to better policy, implementation and to overall resilience. This issue is discussed more in the opportunities section of this analysis.

SMALLER LOCAL GOVERNMENTS

Villages and some other smaller local governments have lagged behind larger local governments in addressing CCA. This is to be expected. However the limited resources available to the smallest local governments pose a unique constraint. Small local governments lack economies of scale. The cost of LiDAR mapping is one example. The much higher per capita cost of staff dedicated to Climate Change Adaptation or mitigation is another. The cost of developing public education resources is yet another. Both examples have benefits when undertaken at a regional scale. In addition, there is a potential role for Metro Vancouver in assisting smaller local governments which have unique constraints due to their size.

CLIMATE CHANGE ADAPTATION GAPS

Within Metro Vancouver, significant planning has taken place toward climate change adaptation. However from the project research and from our previous work in this field, several gaps have been identified. Research specific to this project indicates gaps with respect to climate change adaptation is in the area of health, the lack of support for smaller municipalities with less resources, public education, and cyclical program funding.

From our previous work on climate change adaptation in B.C and Canada, two other significant gaps are apparent and relevant to the Metro Vancouver region: the lack of up-to-date floodplain mapping and the issue of insurance.

HEALTH

The research in this project has indicated there is a gap with respect to addressing health issues associated with climate change. That is not to say the subject is being neglected. Health impacts of CCA have been addressed by academic based organizations such as PICS

and ACT through the Coastal Cities at Risk Project. For several years, the Federal Government has provided information on how climate change may impact the health of Canadians. Organizations such as BC Healthy Communities and the Canadian Centre for Policy Alternatives are beginning projects pertaining to climate justice within BC. It is anticipated that the distribution of climate change impacts will disproportionately affect vulnerable segments of the population. The City of Vancouver has identified vulnerability population groups as an important element in CCA. Both Vancouver Coastal and Fraser Health have programs pertaining to population and public health; however no responses to the survey questionnaire were received from the two Health Authorities. This leaves an incomplete picture about what the local Health Authorities may be doing about the anticipated health impacts of climate change.

A recent study provides confirmation of this gap in health related CCA¹⁹. The study reported Federal health adaptation initiatives emphasize capacity building and gathering information to address general health, infectious disease and heat-related risks. Provincial adaptation was varied with Quebec being a leader in climate change adaptation, having a notably higher number of adaptation and implementation initiatives than all other provinces. With the exception of Vancouver Coastal Health, the report noted that the six sampled Canadian regional health authorities had not reported any adaptation initiatives. Several health related initiatives by the City of Vancouver were also documented.

There are several factors that may contribute to the gap. One is health issues relate more closely to the provincial than local jurisdictions from both a funding and management perspective. In contrast, regional transportation agencies and utilities are heavily involved in various Metro Vancouver CCA initiatives. The key link is local governments have a primary role in administering land use and physical infrastructure as do regional transportation agencies and utilities. While health issues can impact many aspects of local government operations, they have not yet been integrated within existing activities to adapt to climate change with any prominence, with the exception of a couple municipalities that acknowledge extreme heat. Another factor is many health related aspects of climate change are considered more long-term than looming on the short to medium term horizon.

LOCAL GOVERNMENTS WITH A VERY SMALL POPULATION

The survey indicates a limited response to the survey from those local governments with a very small or small population base and limited initiatives in terms of CCA. This is likely due to a combination of factors such as limited staff resources, lack of economics of scale and lower priority. Nearly all of these local governments have experienced lower population growth than Metro Vancouver as a whole. In some cases the population has declined. The four smallest local governments represent less than ¼ % of Metro Vancouver's population and the smallest eight local governments represent 4% of Metro Vancouver's population. While the consequences of this gap are limited, there is an opportunity for Metro Vancouver to provide assistance in overcoming this gap.

¹⁹ Stephanie E. Austin, Public Health Adaptation to Climate Change in Canadian Jurisdictions, International Journal of Environmental Research and Public Health, January 2015.

CYCLICAL PROGRAM FUNDING

The need for CCA is ongoing yet senior government cost sharing programs are typically cyclical. For example the Flood Protection Program provided for \$100 million in provincial funding intended for a 10 year period from 2007 to 2017. Funding was fully committed in little more than half of this time period and local governments now await a new federal provincial infrastructure program that will start in April 2015.

Funding criteria varies from one program to another. This poses an additional challenge as CCA often requires cumulative investments over an indefinite time. Effective CCA by local government will require long-term program continuity and funding commitments from senior governments.

FLOODPLAIN MAPPING

Floodplain mapping has atrophied in BC and throughout Canada since the turn of the century. Floodplain mapping was introduced as a national program in 1975 as an essential component of the Flood Damage Reduction Program. It was funded 50/50 for several decades by the federal and provincial governments. The federal involvement began to be phased out in the 1990's as did provincial involvement. The last agreement expired in 2000. Limited floodplain mapping has taken place since then through individual municipalities such as the City of Vancouver Coastal Flood Risk Assessment or regional projects such as the FBC's December 2006 updated hydraulic analysis for the Fraser River.

Every other G7 country undertakes comprehensive floodplain mapping on a regular basis on the regional, state or national level. Canada stands out as an outlier. Most existing floodplain mapping in B.C. is now 25 or more years old.

The Federal Emergency Management (FEMA) in the U.S.A. is an instructive example in this regard. FEMA began a risk mapping exercise in 2009 to obtain high quality natural hazard data. The Flood Map Modernization fund called for a congressional allocation of \$220 million supplemented by other partners (state and federal agencies) and insurance fees. This multi-year project was designed to provide updated flood hazard data for 100% of the populated coastal areas in the United States. The intent of the strategy was to deliver flood risk reduction and sustainable community development information as part of an integrated flood management approach to weave together flood hazard data with watershed-based risk assessments into local Hazard Mitigation Plans. The 2014 budget for updated flood hazard mapping and risk analysis was \$95.2 million with \$84.4 million requested for 2015. Prior to this program, 70% of the United States flood maps were more than a decade old, outdated and no longer accurately depicted the flooding hazard. Under the Risk MAP program, 100,000 maps are to be updated every three years (at maximum five) in order to ensure accuracy is maintained. FEMA is on record stating that failure to maintain accurate data leads to unwise decisions that place communities at increased risk.

The 2015 U.S. Budget includes \$400 million for the National Flood Insurance Program Risk Mapping²⁰ efforts, an increase of \$184 million or 85% over current funding levels, to document and update flood risks.

In BC, the BCREA has undertaken a multi-year campaign in co-operation with the FBC and other NGOs for updated flood hazard mapping. Benefits of regular floodplain mapping updates include incorporating changes in sea level rise, improved accuracy through LiDAR, linkage with GIS data bases, more user friendly formatting, improved risk management and more informed decision making.

INSURANCE

The insurance industry through the Insurance Bureau of Canada (IBC) and other large insurance stakeholders (e.g. Swiss Re and the Co-operators) has a particular stake in CCA. It recognizes the significant costs associated with the rapid rise in extreme weather events being experienced in Canada. Environment Canada reports extreme weather events (heavy downpours, flash floods, hurricanes) that previously occurred every 40 years are now happening every 6 years. IBC research indicates rainfall in coastal BC has increased as much as 30% since 1950 and is likely to increase another 10% between now and 2050. As a result, IBC made an early commitment make adaptive changes to reduce vulnerability to adverse climate changes and to undertake such work in collaboration with local governments.

Due to increased rainfall and flooding, insurance claims have risen dramatically in recent years. Historic costs of \$100-\$200 million have risen exponentially. 2013 was the fifth year in a row in which insurance losses from natural disasters were near or above \$1 billion in Canada. In 2013, losses were closer to \$3 billion of which over \$2 billion were due to the Alberta floods.

IBC is taking the lead encouraging communities and consumers to adapt to increasing severe weather by protecting themselves. Industry priorities include municipal sewer and stormwater infrastructure improvements, sound water management policies, effective land use policies, more resilient communities and buildings, and updated building codes. All of these factors can contribute to the prevention of urban flooding. In particular, they can reduce the likelihood of sewer and stormwater infrastructure failure, in turn reducing sewer backups that lead to basement flooding and an increase in insurance claims.

Mitigating flood risk is one area where the insurance industry has a direct interest in CCA. As noted earlier in this report, the Municipal Risk Assessment Tool (MRAT) is one such example of the IBC actively working toward adaptation. The MRAT combines information about municipal infrastructure, current and future climate and past insurance claims to visually identify present infrastructure vulnerability and where infrastructure will be vulnerable in 2020 and 2050. Utilizing MRAT enables municipalities to better forecast and prepare for extreme weather events; prioritize infrastructure repairs; leverage federal infrastructure funding and be proactive in their approach to climate change adaptation.

²⁰ Includes FEMA and other funding sources.

The other area is overland flood insurance. Canada is also the only G7 country which lacks overland flood insurance for single family residential development. Overland flood insurance requires accurate information on flood risks. Up to date floodplain mapping is an essential precondition for overland flood insurance. The other is broad coverage to avoid what is called adverse selection (i.e. where only property owners at risk of flooding buy insurance).

In the U.S.A., flood insurance is mandatory in Special Flood Hazard Areas²¹ but is not sustainable financially due to premiums that are not related to actuarial risk.

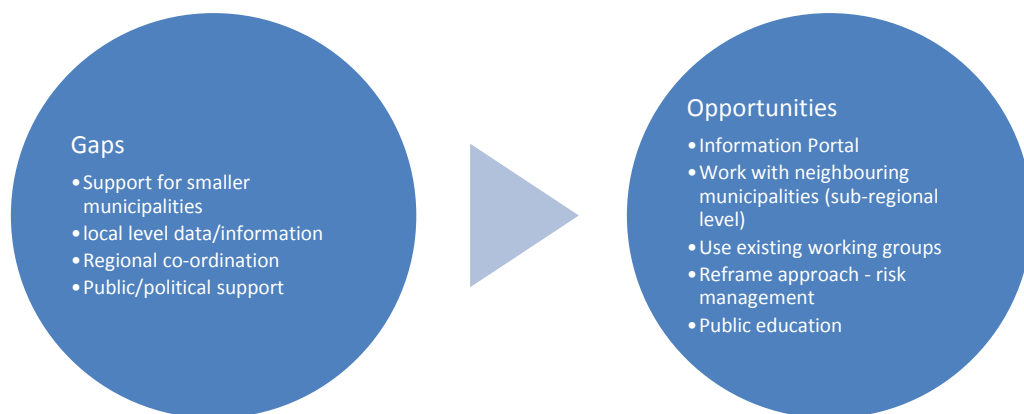
In the U.K, overland flood insurance is bundled with fire and other insurance. Although optional, flood insurance is a requirement when a home is financed with a mortgage.

In Germany, flood insurance is optional but has a penetration rate of 90% for standard building insurance as banks require it as a condition for issuing loans.

France has a public and bundled approach in which natural hazard insurance including flooding is combined with auto, home and business insurance. Insurers may refuse to provide insurance coverage in the highest risk zones and may require mitigation in the moderate risk zones, as determined by floodplain maps.

OPPORTUNITIES

In general participants were positive with respect to potential opportunities and or gaps to be filled within the emerging practice of Climate Change Adaptation. Some of the opportunities with potential for action from Metro Vancouver are indicated as follows:



²¹ Where the risk of flooding is more than 1% in any given year (also referred to a >1:100 year flood event).

ASSISTANCE TO SMALL LOCAL GOVERNMENTS IN METRO VANCOUVER

Small local governments lack the resources and as a result the climate change adaptation actions that larger local governments have achieved. For CCA to move forward, it is anticipated that additional assistance will be required for smaller municipalities in the region, provided either by Metro Vancouver or in the form of a cost sharing program with the Province.

INFORMATION SHARING

Several project participants indicated centralization and co-ordination of information resources and forum in which to share ideas and best practice is an existing gap and would be desirable. There may be an opportunity for a Regional Climate Change Adaptation portal (online) aimed at municipalities (i.e. not public), inclusive of any climate change data Metro Vancouver or other municipalities have. A portal would also be a resource for smaller municipalities gain an idea of successful approaches to climate change adaptation in the region and data and information sharing may prove beneficial in terms of lessening the financial burden. This idea requires further exploration and evaluation due to the number of organizations such as ICLEI which have similar portals/websites. The possibility of a joint portal with the Province also warrants consideration, to provide credibility and consistency.

REGIONAL CO-ORDINATION

Many of the participants in this study expressed a need for more regional co-ordination of climate change adaptation efforts. This is considered a gap; however this is an area where Metro Vancouver should approach with considerable caution. First Metro Vancouver does not have a statutory responsibility in this area as it does for the Regional Growth Strategy. Second some very knowledgeable participants feel Metro Vancouver does not have the expertise or staff to coordinate climate change adaptation regionally. Notwithstanding these constraints, Metro Vancouver can work with local governments to build a big picture with a regional perspective and maintain direction and momentum for CCA through election cycles. Metro Vancouver is the organization best placed to provide a regional perspective although a facilitation role is preferred over a leadership role. Several existing Metro Vancouver working groups were identified as good examples of current initiatives that are working well and could be adapted to advance CCA more broadly. However it should be noted that Metro Vancouver is not present at some of the working groups that are taking a regional approach (e.g. Fraser Basin Council), a gap that could potentially be addressed.

It should be noted that there are numerous instances where YVR, Port Metro Vancouver, TransLink and BC Hydro have worked closely with local governments to co-ordinate efforts and share information to meet common objectives.

PARTNERSHIPS

Existing working groups, academic sources and many NGOs are well regarded by survey participants. Building on these existing networks to address gaps offers a better prospect of success than creating a new organization(s). Opportunities will occur for new partnerships. One is with the insurance industry which developed the Municipal Risk Assessment Tool in order to reduce the risk of localized flooding. Another is BC Hydro, which has provided a strong focus on improving building performance and energy efficiency with homeowners

and commercial building owners. Climate change adaptation work is currently ongoing internally within BC Hydro. When this work is completed, BC Hydro anticipates working with local governments to address climate change adaptation as well as the general public.

Partnerships with academic organizations could be further explored and facilitated by Metro Vancouver, possibly matching municipalities willing to take on pilot projects with academic institutes or programs.

PUBLIC EDUCATION/OUTREACH

Public education/outreach is an opportunity where messaging on a regional level offers economies of scale and provides a potential role for Metro Vancouver. Public education was acknowledged by many participants as very important part of adaptation to climate change. For adaptation to be implemented, there has to be public support for the spending of public monies and an understanding as to why certain actions have to be taken. Participants also acknowledged the need to have solid public support in order to get political support. Building a foundation of solid public understanding not just about adaptation to climate change but to building resilient communities could be approached regionally and an opportunity for Metro Vancouver to play a supportive role in conjunction with its member municipalities. The potential for Metro Vancouver to take a more active role in public education and outreach with respect to Climate Change Adaptation on a regional scale should be explored further with member municipalities.

ADVOCACY

Some aspects of implementing adaptive change will have significant financial consequences. Structural works and related seismic upgrades in particular will be expensive. This will require a strong advocacy role to ensure cost sharing programs give appropriate recognition to CCA needs along Canada's Pacific Coast.

A comprehensive program of updated floodplain mapping is needed on a regional scale. Public Safety Canada announced on January 15, 2015 that floodplain mapping and other non-structural investments would now be eligible for funding under the previously announced 2014 Economic Action Plan. This provides for \$200 million for a National Disaster Mitigation Program over the next five years. With an annual cost of \$40 million, B.C.'s share will be in the range of \$6 million/year. The insurance industry is a potential partner as it has been very supportive of updated floodplain mapping as a means of addressing risk. The inclusion of updated flood mapping could serve to facilitate overland flood insurance for non-strata residential development.

Tentative steps are being taken by the Federal Government to accommodate updated floodplain mapping. This is an area where strong advocacy in support of a comprehensive program of floodplain mapping and vulnerability assessment is needed. This relates closely to traditional advocacy for infrastructure funding from senior governments.

CONCLUSIONS

1. The results of this survey indicate that the Metro Vancouver region is making significant steps toward Climate Change Adaptation (CCA). There are many CCA measures that have been addressed by local governments. There are also many significant differences among municipalities due to a combination of factors such as population size, geographical location, and local priorities.
2. The responsibility for CCA includes a complex mix that involves Federal Departments, Provincial Ministries, Metro Vancouver and municipalities that varies depending on the subject matter. A nuanced approach by Metro Vancouver is called for as it includes both statutory responsibilities (e.g. air quality management) and non-statutory responsibilities where public education and co-ordination can play important roles.
3. The primary focus for Climate Change Adaptation (CCA) is and should be at the local government level. Local governments have the primary and secondary responsibility for determining and managing land use, managing large infrastructure portfolios, emergency management and ecosystem protection which is central to CCA.
4. A large majority of Metro Vancouver local governments have taken steps to address CCA. Nearly all local governments that have not taken steps to address CCA plan to do so in the next five years. Deliverables vary greatly by local government. The survey indicates that future needs are clearly identified subject to the availability of resources.
5. Numerous Metro Vancouver municipalities have enthusiastically embraced CCA and have made major strides in this field. This is a source of considerable pride in these local governments as they believe in the importance of this work.
6. The approaches to CCA taken by local governments in Metro Vancouver are quite varied. This diversity should be encouraged as what is appropriate for one local government may not meet the needs of another. Local governments monitor the initiatives of other local governments and follow, modify or innovate to meet their need assessment. The analysis highlights several leading initiatives in CCA by various Metro Vancouver local governments.
7. Other public agencies are actively engaged in CCA through studies, information sharing, public education, regional co-ordination and other initiatives to enhance resilience. These consist of regionally based transportation and health care providers, and public utilities. Their needs with respect to CCA are unique and are being addressed both internally and with other stakeholders.
8. British Columbia has a number of NGOs, universities, engineering and other consulting firms based in Metro Vancouver and the Capital Regional District that have played leading roles in CCA in the Province, Canada as a whole and internationally. This includes research, public education and advocacy. These relationships are well regarded and include numerous partnerships that benefit each stakeholder.

9. Regional co-ordination and information sharing are critically important elements in CCA. These needs are being partially met, largely through local government and NGO initiatives. Some are program based, others comprise sub-regions in Metro Vancouver and one is a Metro Vancouver committee. The following were cited as providing positive contributions to CCA:
- Fraser Basin Council Joint Program Committee
 - Fraser Basin Council Regional Flood Management Strategy
 - North Shore Emergency Management Office
 - North Shore Climate Adaptation Working Group
 - Regional Engineers Advisory Committee (REAC) Climate Sub-Committee
 - Burrard Inlet Working Group
 - Integrated Partnership for Emergency Management in Metro Vancouver
10. The most important resource gaps cited by a majority of local government officials working on CCA were financial support and co-ordination (over 80% support) followed by political support and public education (70%-80% support).
11. A lack of financial resources was by far the most significant barrier to CCA cited by local government officials. This was indicated by 85% of respondents. However the purposes for financial resources varied widely. The only other barrier cited by a majority of respondents (56%) was co-ordination of CCA.
12. There is broad support for Metro Vancouver to undertake a support role in CCA. This includes information sharing, education, liaison and advocacy with senior governments. There is less support for Metro Vancouver to undertake an increased regional co-ordination role as existing processes are well regarded and there is concern about potential overlap and duplication. One obvious benefit of co-ordination would be the development of some common CCA indicators to measure and compare adaptation efforts across local government boundaries.
13. There is remarkable similarity between the CCA initiatives being undertaken by Metro Vancouver local governments and initiatives in the U.S.A. Issues that are being addressed are similar. The biggest differences are more limited initiatives and a more laissez-faire approach by senior governments in Canada (e.g. no program to undertake floodplain mapping on a regular basis, cyclical cost sharing for infrastructure programs, and limited use of economic tools as incentives to enhance resilience). In addition, insurance²² for overland flooding is not available to the residents of single detached dwellings. Such dwellings comprise more than one third of all residential dwellings in Metro Vancouver and nearly one half in the Province.

²² The role of senior governments in providing overland flood insurance is by the direct provision of services regulation or through suasion.

NEXT STEPS

- Undertake internal sharing of results with Metro Vancouver staff engaged in CCA
- Undertake workshops through RPAC and REAC that include the following elements:
 - Presentation of results by Arlington Group
 - Invitation to Province to attend (e.g. Thomas White from Climate Action Secretariat, Tina Neale from Ministry of Environment)
 - Roundtable discussion on results with focus on addressing gaps

5.5 Attachment 2

Metro Vancouver Regional Climate Change Adaptation Documents Reviewed Summary

Name	Date	Status	Author/Agency	Geographic Scope	Document Type
<u>Towards a Sustainable Future – Official Community Plan</u>	Adopted September 2014	Complete	CitySpaces Consulting Ltd. Village of Anmore	Village of Anmore	Land Use Plan
<u>Village of Belcarra Official Community Plan</u>	Adopted September 2011	Complete	Village of Belcarra	Village of Belcarra	Land Use Plan
<u>Wildfire Interface Management Plan</u>	October 1, 2005	Complete	Sharon Hope Ph.D	Village of Belcarra	Wildfire Management
<u>Bowen Island Municipality Official Community Plan</u>	Adopted September 2011	Complete	CitySpaces Consulting Ltd. Bowen Island Municipality	Bowen Island	Land Use Plan
<u>Green Building Standards for Residential Re-zoning</u>	Policy Drafted March 2007	Draft	Bowen Island Municipality	Bowen Island	Policy Statement
<u>Guiding Principles for Planning and Budgeting Decision-Making</u>	July 17, 2006, Amended February 25, 2008	Complete	Bowen Island Municipality	Bowen Island	Policy Statement
<u>Official Community Plan Burnaby British Columbia</u>	Adopted June 1998; Updated & Revised May 2014	Complete	City of Burnaby Planning & Building Department	City of Burnaby	Land Use Plan
<u>The Burnaby Transportation Plan</u>	Adopted 1995 March Revised 2004 January	Complete	City of Burnaby	City of Burnaby	Transportation Plan
<u>Burnaby Social Sustainability Strategy</u>	June 2011	Complete	City of Burnaby	City of Burnaby	Sustainability Strategy
<u>Integrated Pest Management (IPM) Policy & Program</u>	14 March 1994	Complete	City of Burnaby	City of Burnaby	Policy Statement
<u>Burnaby Economic Development Strategy (EDS) 2020</u>	Adopted 12 March 2007	Complete	City of Burnaby	City of Burnaby	Economic Development Plan
<u>City Wide Official Community Plan¹</u>	Adopted March 2002; Amended 2013	Complete	City of Coquitlam Planning & Development Department	City of Coquitlam	Land Use Plan
<u>Climate Action Revenue Incentive (CARIP) Public Report for 2012</u>	2012	Complete	Trevor Billy, Energy Manager	City of Coquitlam	CARIP

¹ No consolidated document available, split into 12 neighbourhood plans

Climate Action Revenue Incentive (CARIP) Public Report for YEAR 2013 (Interim)	2013	Interim	Mariko Fuchihara, Acting Energy Manager	City of Coquitlam	CARIP
Climate Action Revenue Incentive (CARIP) Public Report for YEAR 2013	July 28, 2014	Complete	Luisa Mora, Energy Manager	City of Coquitlam	CARIP
Austin / Rochester Integrated Watershed Management Plan ²	October 2014	Draft	Urban Systems Dillon Consulting GoeAdvice	Austin Creek and Rochester Creek watersheds	Integrated Watershed Management Plan
The Corporation of Delta Official Community Plan	Adopted 1985; Substantial Update 2005; Amendments Consolidated to January 2014	Complete	Community Planning & Development	Delta	Land Use Plan
Delta's Climate Change Initiative	2007	Complete	Corporation of Delta	Corporation Operations	Corporate Framework for Action
Official Community Plan Bylaw	Adopted April 2006	Complete	City of Langley	City of Langley	Land Use Plan
Strategic Plan 2013 - 2017	2013	Complete	City of Langley	City of Langley	Strategic Plan
A five year Strategic Plan for the City of Langley					
Climate Action Revenue Incentive (CARIP) Public Report for YEAR 2013	September 10, 2014	Complete	Roy M. Beddow, Deputy Director of Development Services & Economic Development	City of Langley	CARIP
2010 Community Energy & GHG Emissions Plan for the 2007 inventory year	25 May 2010	Complete	Hyla Environmental Services Ltd.	City of Langley	CEEP
Corporate Energy & GHG Emissions Plan 2010 for the 2008 inventory year	May 2010	Complete	Hyla Environmental Services Ltd.	Corporate Operations	Corporate Operations CEEP
Corporate Energy & GHG Emissions	March 2012	Complete	Hyla Environmental Services Ltd.	Corporate	Corporate

² There are 11 Integrated Watershed Management Plans covering the City of Coquitlam, however only the most recent one was reviewed and did not contain any reference to climate change, impacts or adaptation

Progress Report 2012 for the 2008, 2009, & 2010 inventory years						Operations Progress Report
City of Langley Sustainability Framework	May 2010	Complete		Stantec Consulting Ltd.	City of Langley	Sustainability Framework
A Checklist for Sustainable Community Development	August 2011	Complete		City of Langley	City of Langley	Sustainability Checklist
Township of Langley Official Community Plan	Adopted 1979; Update Started 2012 ³	In Progress		Township of Langley	Township of Langley	Land Use Plan
Township of Langley Water Management Plan	November 2009	Final Report		Inter-Agency Planning Team: Township of Langley Ministry of Environment Ministry of Agriculture and Lands Compass Resource Management Ltd.	Township of Langley	Water Management Plan
Sustainability Charter "Building a Sustainable Legacy"	Adopted June 23, 2008	Complete		Township of Langley Community Development Division	Township of Langley	Sustainability Charter
Corporate Greenhouse Gas Inventory (& Forecast Report with Recommendations for the Development of a Corporate Action Plan)	September 2004	Complete		Township of Langley	Corporate Operations	Corporate GHG Inventory
Village of Lions Bay Official Community Plan	Adopted April 2009; Substantial Updates 2010	Complete		Village of Lions Bay	Village of Lions Bay	Land Use Plan
Tree Management on Private Land	May 16, 2011	Complete		Village of Lions Bay	Village of Lions Bay	Policy Statement
Lions Bay Land Use Master Plan BACKGROUND REPORT	February 24, 2014	Complete		Rob Barrs & Associates	Village of Lions Bay	Report
Village of Lions Bay Land Use Master Plan	September 4, 2014	Draft		Rob Barrs & Associates	Village of Lions Bay	Land Use Plan
Emergency Plan Bylaw No. 409	15 June 2009	Complete		Village of Lions Bay	Village of Lions Bay	Emergency

³ Due to ongoing legal issues the updated OCP has not proceeded past 3rd reading, which it gained in July 2013

Maple Ridge Official Community Plan Bylaw	2014	Complete	City of Maple Ridge	Ba	Management Plan
Climate Action Revenue Incentive Program (CARIP) Public Report for the year, 2013	2013	Complete	Jacque Bergmann Research Technician	City of Maple Ridge	CARIP
Sustainability Action Plan Implementing Sustainability Principles	November 15, 2007	Complete	The Sheltair Group	City of Maple Ridge	Sustainability Plan
Rainwater Management in Maple Ridge	June 2004	Complete	Smart Growth on the Ground	City of Maple Ridge	Technical Bulletin
Caring For Our Nature Maple Ridge Environmental Management Strategy	April 2014	Complete	Urban Systems	City of Maple Ridge	Environmental Management
The Official Community Plan for the City of New Westminster	Adopted 2011; Update Started 2014	In Progress	City of New Westminster	City of New Westminster	Land Use Plan
Floodplain Management Strategy Feasibility Study	February 2011	Complete	Delcan	City of New Westminster	Flood Hazard Management
Envision 2032	May 27, 2013	Complete	City of New Westminster	City of New Westminster	Sustainability Framework
Green Action Plan for New Westminster	2007	Complete	City of New Westminster	City of New Westminster	Green Action Plan
Community Energy & Emissions Plan	June 20, 2011	Complete	Stantec Consulting Inc.	City of New Westminster	CEEP
Climate Action Revenue Incentive (CARIP) Public Report for year 2013	2013	Complete	Jennifer Lukianchuck, Environmental Coordinator	City of New Westminster	CARIP
City of North Vancouver Official Community Plan	Adopted 2002; Update Started 2014 ⁴	In Progress		City of North Vancouver	Land Use Plan
City of North Vancouver Climate Change Adaptation Plan	October 2013	Complete	City of North Vancouver	City of North Vancouver	Adaptation Plan
Climate Changes & Impacts for the City of North Vancouver	September 4, 2013	Complete	Ben Cross, Research Assistant Engineering, Parks, and	City of North Vancouver	ICLEI Milestone 2

⁴ Public Hearing scheduled for March 3, 2015.

			Complete	Environment		
Our Official Community Plan for a Sustainable Future	Adopted 2011		Complete	Sustainable Community Development	District of North Vancouver	Land Use Plan
Community Climate Change Action Plan: Foundations Report	Final Report July 2009 Minor Revisions April 2010		Complete	HB Lanarc Consultants Inc.	District of North Vancouver	Foundation Report
Pitt Meadows OCP	Adopted 2007; Last Amended 2012		Complete	Development Services Department	City of Pitt Meadows	Land Use Plan
Community Energy & Greenhouse Gas Emissions Plan 2011 For the 2007 Inventory Year	February 2011 Revised June 2011		Complete	Hyla Environmental Services Ltd.	City of Pitt Meadows	CEEP
Corporate Energy & GHG Progress Report 2013 For the 2008, 2009, 2010, 2011 & 2012 inventory years	April 2013		Complete	Russ Haycock	Corporate Operations (City of Pitt Meadows)	Corporate Operations CEEP
Climate Action Revenue Incentive (CARIP) Public Report for 2013	July 25, 2014		Complete	Dave Philp, Acting Director of Corporate and Business Services	City of Pitt Meadows	CARIP
The Future of Agriculture	May 2000		Complete	Jack Reams, Agri-Business Consulting Agriculture Plan Steering Committee	City of Pitt Meadows	Agriculture Plan
POCOPLAN (planning our community) Official Community Plan	Adopted 2005; Substantial Update 2013		Complete	Planning Division, Development Services Department	City of Port Coquitlam	Land Use Plan
Corporate & Community Climate Action Plan For the 2002 & 2007 inventory years	January 2010		Complete	Hyla Environmental Services Ltd.	City of Port Coquitlam & Corporate Operations	Climate Action Plan
Environplan An Environmental Strategic Plan	March 2011		Complete	HB Lanarc	City of Port Coquitlam	Environmental Strategic Plan
Climate Action Revenue Incentive (CARIP)	July 16, 2014		Complete	Brian North, Manager of Revenue and Collections	City of Port Coquitlam	CARIP

Public Report for YEAR 2013						
City of Port Moody Official Community Plan	Adopted October 2014	Complete	City of Port Moody	City of Port Moody	City of Port Moody	Land Use Plan
Climate Action Revenue Incentive Program (CARIP) Public Report For Reporting Year 2012	2013	Complete	Margot Davis, Manager of Sustainability	City of Port Moody	City of Port Moody	CARIP
Sustainability Checklist	No Date	Complete	City of Port Moody	City of Port Moody	City of Port Moody	Sustainability Checklist
2041 OCP – Moving Towards Sustainability	Adopted 2012	Complete	City of Richmond	City of Richmond	City of Richmond	Land Use Plan
Community Energy & Emissions Plan	January 2014	Complete	City of Richmond	City of Richmond	City of Richmond	CEEP
Charting our Path Towards a Sustainable Community	February, 2007	Complete	City of Richmond	City of Richmond	City of Richmond	Sustainability Plan
Sustainability Progress Report	November 2014	Complete	City of Richmond	City of Richmond	City of Richmond	Sustainability Progress Report
Agricultural Viability Strategy	February 18, 2003	Complete	City of Richmond Richmond Farmers Institute	City of Richmond	City of Richmond	Agriculture Plan
PlanSurrey 2013: OCP	Adopted March 2014	Complete		City of Surrey	City of Surrey	Land Use Plan
Climate Adaptation Strategy	2013	Complete		City of Surrey	City of Surrey	Adaptation Plan
Community Climate Action Strategy Reducing Emissions & Adapting to Climate Change	November 2013	Complete	City of Surrey	City of Surrey	City of Surrey	Climate Action Strategy
Community Energy & Emissions Plan	November 2013	Complete	City of Surrey	City of Surrey	City of Surrey	CEEP
Biodiversity Conservation Strategy	Adopted Spring 2014	Complete	Diamond Head Consulting Ltd.; EcoPlan International	City of Surrey	City of Surrey	Adaptation Plan
Agriculture Protection & Enhancement Strategy	April 2013	Complete	City of Surrey Planning & Development Department	City of Surrey	City of Surrey	Agriculture Plan
Surrey Agriculture Plan	October 1999	Complete	Zbeetnoff Agro-Environmental Consulting	City of Surrey	City of Surrey	Agriculture Plan
Corporate Emissions Action Plan	October 2010	Complete	Stantec Consulting Ltd.	Corporate Operations (City of Surrey)	Corporate Operations (City of Surrey)	Corporate Operations Action Plan
Ecosystem Management Study	April 2011	Complete	HB Lanarc	City of Surrey	City of Surrey	Ecosystem

			Complete	Raincoast		Management Study
Sustainability Charter – a commitment to sustainability	Adopted September 2008		Complete	City of Surrey Planning & Development Department	City of Surrey	Sustainability Charter
Sustainability Charter 2013 Annual Report	2013		Complete	City of Surrey Sustainability Office	City of Surrey	Sustainability Charter Annual Report
Tsawwassen First Nation Land Use Plan	2009		Complete	AECOM	Tsawwassen First Nations Lands	Land Use Plan
Development Permit Areas Regulation	December 4, 2013		Complete	TFN Urban Systems	Tsawwassen First Nations Lands	Development Permit Areas
Supplementary Design Guidelines & Construction Specifications	January 2014		Complete	TFN	Tsawwassen First Nations Lands	Design Guidelines
Integrated Rainwater Management Plan	December 19, 2013		Final Report	Urban Systems	Tsawwassen First Nations Lands	IRMP
Neighbourhood Plan - Residential/Commercial Enterprise Area	March 2011		Complete	TFN	Tsawwassen First Nations Lands	Land Use Plan
Climate Change Adaptation Strategy	July 2012		Complete		City of Vancouver	Adaptation Plan
Flood Construction Levels	May 30, 2014		Complete	Deputy City Manager in collaboration with the Chief Building Official, the General Manager of Planning and Development Services and the General Manager of Engineering Services	City of Vancouver	Administrative Report
Flood-Proofing Policies	Adopted January 5, 1988 Amended February 28, 1995, and April		Complete	City of Vancouver Community Services	City of Vancouver	Land Use and Development Policies & Guidelines

	17, 2007						
Flood Plain Standards & Requirements	Adopted September 16, 2014 Effective January 1, 2015	Complete	City of Vancouver	City of Vancouver	Land Use and Development Policies & Guidelines		
Sea Level Rise Strategy (Presentation to Council)	July 9, 2014	In progress	City of Vancouver	City of Vancouver	Sea Level Rise Strategy		
Greenest City 2020 Action Plan	2012	Complete	City of Vancouver	City of Vancouver	Action Plan		
Greenest City 2020 Action Plan 2013-2014 Implementation Update	2014	Complete	City of Vancouver	City of Vancouver	Implementation Update		
A Healthy City for All Vancouver's Healthy City Strategy 2014-2025 Phase 1	October 2014	Complete	Community Services - Social Policy Division, City of Vancouver	City of Vancouver	Health Strategy		
Urban Forest Strategy (Presentation to Council)	April 15, 2014	In progress	City of Vancouver	City of Vancouver	Urban Forest Strategy		
Vancouver Citywide Integrated Stormwater Management Plan (Joint Workshop Background)	March 2014	In progress	City of Vancouver	City of Vancouver	ISMP		
Official Community Plan	June 2004	Complete	District of West Vancouver	District of West Vancouver	Land Use Plan		
Community Climate Action Plan "Towards Fossil Fuel Freedom"	March 2010	Complete	The Climate Action Working Group	District of West Vancouver	Action Plan		
Climate Action Revenue Incentive (CARIP) Public Report for YEAR 2013	July 11, 2014	Complete	David McKee, Energy Manager	District of West Vancouver	CARIP		
Strategic Transportation Plan	March 15, 2010	Complete	HDR, iTRANS. HB Lanarc	District of West Vancouver	Transportation Plan		
Environmental Strategy	May 2005	Complete	District of West Vancouver	District of West Vancouver	Environmental Management		
Parks Master Plan	July 2012	Complete	District of West Vancouver	District of West Vancouver	Parks Plan		
Lighthouse Park Management Plan	June 2004	Complete	Catherine Berris Associates Inc	Lighthouse Park, West Vancouver	Parks Plan		
Shoreline Protection Plan 2012-2015	2012	Complete	District of West Vancouver	Shoreline of	Shoreline		

			West Vancouver Shoreline Preservation Society West Vancouver Streamkeepers Society Balanced Environmental Services Inc Integrated Planning and Consulting Services Inc.	West Vancouver	Management Plan
Community Strategic Plan	Spring 2010	Complete	Strategic Planning Working Group	District of West Vancouver	Strategic Plan
White Rock Community Plan	September 2008; Last Amended April 2013 ⁶	Complete	City of White Rock	City of White Rock	Land Use Plan
Community Climate Action Plan	May 3, 2010	Complete	Stantec The Sheltair Group	City of White Rock	Action Plan
Integrated Stormwater Management Plan	April 2010 Adopted July 26, 2010	Complete	Urban Systems	City of White Rock	ISMP
Environmental Strategic Plan	September 2008	Complete	Jacques Whitford AXYS Ltd.	City of White Rock	Environmental Management
Climate Action Revenue Incentive (CARIP) Public Report for YEAR 2013	July 31, 2014	Complete	Greg St. Louis, Director Engineering and Municipal Operations	City of White Rock	CARIP

⁶ OCP update planned for 2015