

MAINSTREAMING CLIMATE CHANGE TOOLS FOR THE PROFESSIONAL PLANNING COMMUNITY



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# INTRODUCTION

## INTRODUCTION

The Canadian Institute of Planners (CIP) adopted a Climate Change Policy in 2008. The policy's declaration reads:

“The Canadian Institute of Planners believes climate change is real and immediate. The impacts of climate change affect and will continue to affect all aspects of our mission to ensure a sustainable future and to shape better communities.”

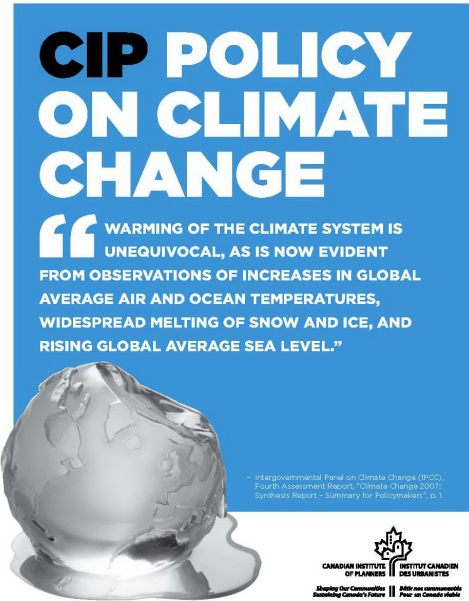
Further, at CIP's international conference on climate change in Montreal in 2010, the policy's declaration was expanded by the conference delegates to clarify that climate change is a result of human activities and to suggest future actions that CIP should undertake. The opening of the conference declaration reads:

“Climate change, caused by the excessive consumption of energy derived from hydrocarbons, is a reality. The overwhelming evidence around the world is that human action is driving rapid and unprecedented global climate change.”<sup>1</sup>

CIP is committed to action to help communities respond to climate change. Over the past several years CIP has been working with its members to mainstream climate change in the professional planning community and provide a suite of tools to address its impacts. This suite of tools includes climate change training modules, benchmarking surveys and focus groups,

<sup>1</sup> The entire declaration can be found in Plan Canada, Vol. 50, No. 4, Winter 2010, Pages 16 – 17.

a Standard of Practice and a climate change report card<sup>2</sup>. The work, especially the benchmarking surveys, indicates that planners are very aware of climate change and are prepared to assume a leadership



role within their communities to promote an understanding of climate change impacts and commence adaptation planning.

The need to adapt to climate change will face communities for at least the next century, regardless of what is accomplished on the mitigation front. To prepare Canada's communities for this challenge, CIP has completed a series of pilot climate change adaptation plans. This document "Climate Change Adaptation Planning: A Handbook for Small Canadian Communities", referred to throughout as the Handbook, is a result of CIP's initiatives and supports CIP's leadership role in shaping Canadian communities through the efforts of its members, Canada's professional planners.

<sup>2</sup> All these tools can be found at [www.planningforclimatechange.ca](http://www.planningforclimatechange.ca) in the Library. The 2-day climate change training workshop is available through CIP's Affiliates.

The Canadian Institute of Planners would like to acknowledge the assistance of Natural Resources Canada, who generously provided financial support through the Climate Change Impacts and Adaptation Program. The Atlantic Planners Institute (API) assisted through the preparation of four pilot climate change adaptation plans in Atlantic Canada. The evaluation of these pilot plans by API planners aided in the development of the Handbook.

### **Purpose of the Handbook**

The purpose of the Handbook is to help small Canadian communities to prepare and implement a Climate Change Adaptation Plan (CCAP). The Handbook focuses on small Canadian communities<sup>3</sup>, as CIP has learned from its surveys and focus groups that there is a pressing need in these communities for assistance to address the impacts of climate change.

The Handbook helps community planners take the key steps required to plan for climate change adaptation and decision makers determine what strategic actions need to be taken. It is especially useful for small communities without “in house” planning resources. While the Handbook is aimed at small communities, other larger municipalities may benefit from it. It is a free resource, and CIP encourages its use by any planner or municipality that feels the Handbook is appropriate for their circumstances.

### **What is a Climate Change Adaptation Plan?**

A Climate Change Adaptation Plan enables communities to deal with the impacts, risks and opportunities posed by a changing climate. It does not reduce the need to mitigate the causes of climate change.

<sup>3</sup> For the purposes of this Handbook, “small” is considered to be a community of 25,000 and under.

However, scientific evidence indicates that, no matter how successful mitigation efforts are, the impacts of climate change will be felt for a long time, possibly for the next century. Therefore, adaptation planning and actions are needed now.

A CCAP does not compete with a community official plan. It has a different focus. It addresses the climate change impacts, risks and consequences faced by a community as well as opportunities and prospects. The CCAP prioritizes the consequences and prospects and suggests adaptation actions.

Climate change affects the entire municipality and will continue to affect it over the long term. Adaptation planning is not the domain of any specific department or agency but requires considerable cooperation. Implementation actions are similarly spread over the entire municipality. The recommendations of the CCAP will find their way into other municipal planning documents, such as the emergency measures plan, the energy strategy, the transportation plan, the strategic plan, the community land use plan, the economic development strategy, the public works plan, etc.





### **How to Use the Handbook**

The Handbook is designed to be used by a professional planner, either individually or as part of a climate change adaptation planning team, to prepare a community adaptation plan. It is based on community planning principles and a planner works with the community and facilitates the preparation of the CCAP. This Handbook is made available to the community and becomes an educational tool during the preparation of the plan. It is written to facilitate community understanding of climate change adaptation planning. Ideally, the municipality's planner prepares the CCAP. Often small communities do not have planners on staff, so several other options can be pursued. The community may be part of a county or region with a planning department that provides planning services. If this is the case, a planner from the county or region can work with the community to prepare a CCAP. Planning consultants may undertake the plan preparation. Also, it may be that a nearby university, through the planning school or another department with an interest in climate change planning, can assist the community's work on a CCAP.

The Handbook lays out a 6-step process for the preparation of a Climate Change Adaptation Plan. Any planner can use this step-by-step process to prepare a CCAP.

### **Public Engagement**

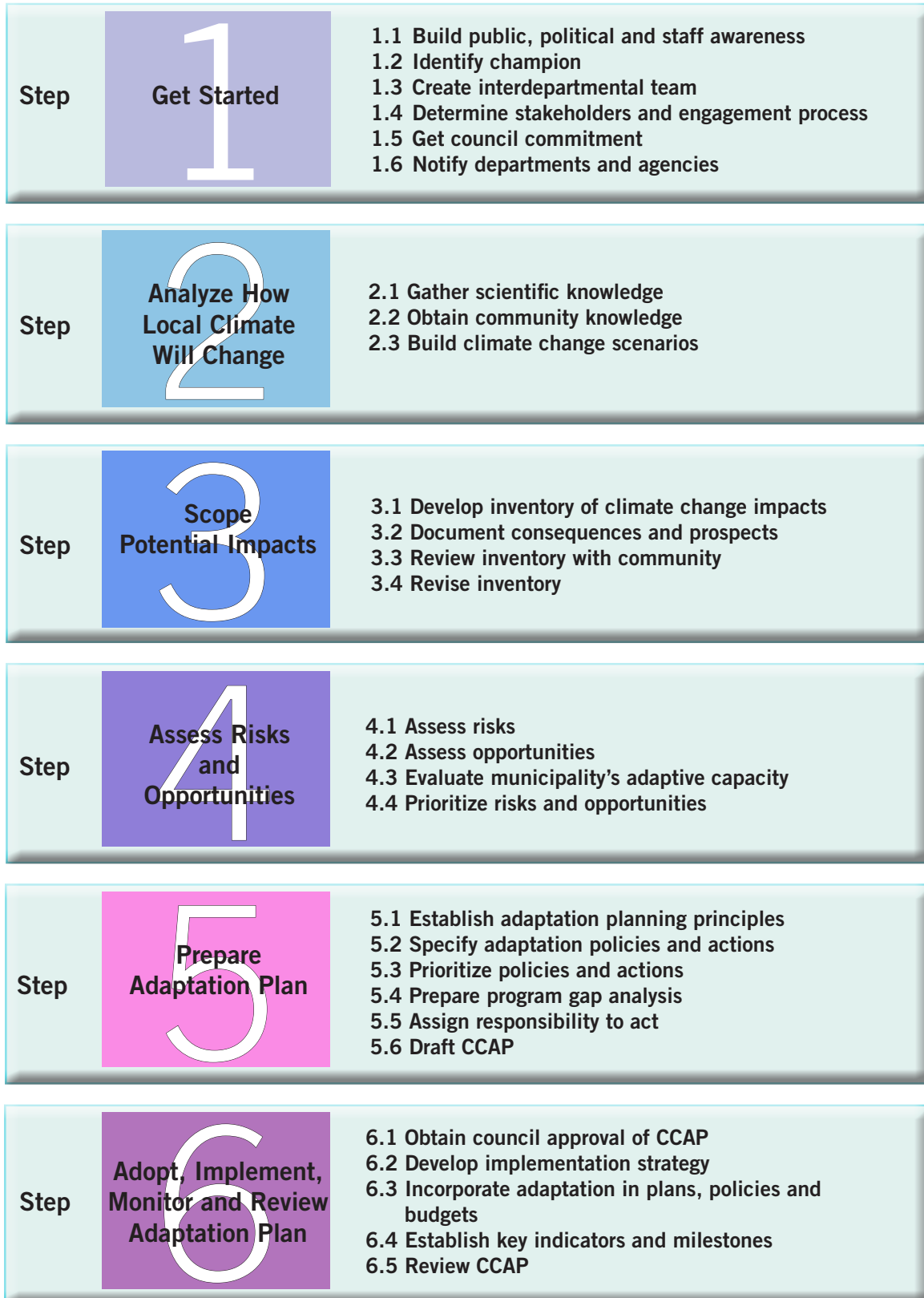
Throughout the Handbook various public engagement techniques are recommended. They range from open houses, public meetings and community workshops to stakeholder meetings, community walks, discussions with key informants and the arranging of special events like story-telling and climate change projects in schools. During each of the steps of the CCAP process the public can be encouraged to offer comments and suggestions through the municipality's website. Initially, the material posted will be mostly informative, but as parts of the CCAP advance, the public can provide feedback on specific sections and proposed actions.

### **How the Handbook is Organized**

A CCAP is developed through the 6-step process shown in Diagram 1. Each step contains several components and Diagram 1 lays out all the components of each step. Each step and its components are presented in detail in a separate section of the Handbook. Also, each section contains useful techniques, a checklist to confirm the step has been completed, helpful hints, assigned responsibility and possible information sources, where appropriate.

At the end of the Handbook is a Glossary of Techniques, a Table summarizing the responsibilities for each of the 6 steps and an extensive list of resources that the planner can refer to in preparing a CCAP.

**Diagram 1**  
**THE 6 STEPS OF CLIMATE CHANGE ADAPTATION PLANNING**







# 1

## GET STARTED

- 1.1 Build public, political and staff awareness
- 1.2 Identify champion
- 1.3 Create interdepartmental team
- 1.4 Determine stakeholders and engagement process
- 1.5 Get council commitment
- 1.6 Notify departments and agencies

## STEP 1 – GET STARTED

*The climate change adaptation planning process charted in this Handbook is led by a professional planner or a team of planners. The planner(s) may be employed inside or outside of the municipality and, for the purposes of this Handbook, are referred to as “the planner”.*

### **1.1 Build Public, Political and Staff Awareness**

If a Climate Change Adaptation Plan (CCAP) is to be developed in a community, a certain amount of time and resources have to be invested at the outset to raise awareness of climate change and adaptation planning. Building on municipal mitigation actions or recent extreme weather events may provide opportunities to establish support for adaptation planning among the general public, politicians and fellow staff members.

#### *Mitigation and Adaptation*

It is important to distinguish between climate change mitigation and adaptation, so that the purpose of a CCAP is clear.

Mitigation focuses on reducing the use of fossil fuels, thereby curtailing the release of greenhouse gases into the atmosphere and slowing the future rate of climate change. For example, a municipality may make its buildings more energy-efficient or invest in alternative energy like solar panels for traffic signs or wind turbines to heat its buildings. Adaptation allows municipalities to deal with the negative impacts of climate change and exploit opportunities that may present themselves. Adaptation actions may involve updated emergency measures plans or raising bridge pylons to cope with expected river flooding.

Some municipal actions can contribute both to mitigation and adaptation, like implementing a comprehensive tree planting program and/or regulating trees

being cut down on private and public property. Trees absorb greenhouse gases (mitigation) and provide respite from excessive heat (adaptation).

The costs of mitigation actions are borne locally, while the long-term benefits are global, even though there may be some local savings. The costs of adaptation actions are borne locally as well, but the benefits accrue locally also.

Planning for both mitigation and adaptation is necessary. However, adaptation actions are required now, since the climate has changed significantly already. This Handbook focuses on adaptation planning.

#### *Building Political and Staff Awareness*

It is likely that local politicians and staff have some general awareness of climate change based on media coverage during the past few years. To reinforce this knowledge and deal with questions and concerns, the planner may want to engage council members and staff further in a workshop using CIP’s introductory module on “Climate Change for Planners”. This module is interactive and can be delivered within 2-3 hours. It is important that staff from all relevant departments participate to set the stage for their involvement in the adaptation planning process.

The planner can also reference climate change adaptation plans that have been completed in other communities. Examples are the four CCAPs in Atlantic Canada,

which were developed during 2009 – 2010. CIP's introductory module and the four CCAPs are available at [www.planningforclimatechange.ca](http://www.planningforclimatechange.ca).



### *Building Public Awareness*

The general public will also have some general knowledge of climate change and its implications, especially if the municipality has experienced more extreme weather events lately. The planner may want to organize one or more public meetings, where expert panels can present regional and/or local climate change information, appropriate videos or movies can be shown and questions and concerns can be answered. The municipality's website can also be used to introduce the project.

### **1.2 Identify Champion**

A community may already have a local champion who is passionate about climate change. However, if such a person is not yet obvious, the planner has to comb the community to find him or her. The local champion may be a citizen or a local politician, but must have the time to shepherd the project through its various stages. The local champion can also assist with suggestions for handling process logistics.

### **1.3 Create Interdepartmental Team**

To support the adaptation planning and implementation process, the planner needs a link to colleagues in other municipal departments. Most likely, many of them will already have experienced the effects of climate change on their operations. Or they will have gone through the awareness raising process together with the politicians. After canvassing relevant municipal departments, the planner establishes an interdepartmental team of senior officials.

While municipalities differ greatly in how they organize their service delivery, representatives from planning, public works, transportation, health and parks and recreation are likely candidates for this interdepartmental team. Once the CCAP process has started, the interdepartmental team reports to council on the progress of the CCAP as appropriate.

### **1.4 Determine Stakeholders and Engagement Process**

Every municipality is different and has its own unique makeup of community leaders and organizations. If the planner works in the municipality, he or she knows the individual stakeholders and stakeholder groups from previous experience. If not, these individuals and groups have to be identified. In either case stakeholders have to be briefed in order to prepare for the climate change adaptation planning process.

Stakeholders may include community leaders such as a teacher, local businessperson or health professional. Large and small stakeholder groups can range from local service clubs, historical societies, conservation authorities and sports organizations to the Women's League, the local garden club, church groups and other NGOs.

From these meetings the planner is in a position to establish a community reference group. This reference group will be helpful during the plan-making and implementation stages of the adaptation planning process. It gives advice and acts as a link between the planner and the groups its members represent. The community reference group can also provide a link between the community and the interdepartmental staff team.

With the help of the community reference group the planner designs a community engagement process, establishing approximate timelines and mapping out a preliminary number of public meetings, workshops and community events.



### 1.5 Get Council Commitment

The municipality has to make a formal commitment to the adaptation planning process to enable local staff and other resources to be employed for this purpose. The planner submits a report to municipal council outlining the following:

- Rationale for developing a CCAP
- Expected timelines
- Work plan
- Community reference group
- Local champion
- Engagement process
- Budget indicating required financial and staff resources

A council resolution confirms that the municipality is committed to developing a CCAP, that the requested funds are available for this purpose and that council approves the proposed community reference group. The resolution is also an indication that this work will be a priority for its planning staff (if applicable) and staff of other relevant departments.

### 1.6 Notify Departments and Agencies

Once municipal council has approved the adaptation planning process, appropriate departments and agencies are notified. During stakeholder identification some groups may have been missed and a general notification will bring them into the CCAP process. Other organizations may only have a peripheral interest, but may become essential during the CCAP implementation. The groups that should be notified include the following: all relevant regional departments; any housing authority; other regional organizations; the provincial climate change coordinator (if applicable), the provincial Department of Environment and other relevant provincial agencies; and appropriate university programs.

**////// Step 1 Checklist //////////////////////////////////////**

- ✓ Local champion
- ✓ Interdepartmental team
- ✓ Stakeholders
- ✓ Engagement process
- ✓ Community reference group
- ✓ Work plan
- ✓ Council resolution
- ✓ Notification of organizations/agencies

**////// Helpful Hints: //////////////////////////////////////**

- ❖ The CCAP process can be completed within 12-18 months
- ❖ The community reference group will be invaluable during the CCAP implementation
- ❖ Reports to council keep the interdepartmental team focused



**////////// STEP 1 RESPONSIBILITY: THE PLANNER AND MUNICIPAL COUNCIL //////////**



# 2

## **ANALYZE HOW LOCAL CLIMATE WILL CHANGE**

- 2.1 Gather scientific knowledge
- 2.2 Obtain community knowledge
- 2.3 Build climate change scenarios

## STEP 2 – ANALYZE HOW LOCAL CLIMATE WILL CHANGE

*During Step 2 of the adaptation planning process the planner focuses on the climate change predictions for the geographic area in which the community is located. In order to get a comprehensive picture, the planner has to gather scientific information and insights from the community. The knowledge gained is then integrated to outline a set of climate change scenarios. From this set a “most appropriate” scenario for the municipality can be chosen.*

### 2.1 Gather Scientific Knowledge

To complete a CCAP, the planner has to know how the main climate “drivers” will change in a municipality or region over time. The planner examines projections for temperatures, wind patterns, precipitation and the frequency of severe weather events. All of these variables inform the types of adaptation measures that will have to be adopted.

Sources for the scientific knowledge about climate change in any given region or municipality span both the “hard” and social sciences. A provincial climate change strategy, government reports, published and unpublished university research and historical data will all be helpful.

Most importantly, the planner needs to identify climate change scientists, who are working in the region or municipality, through a provincial or federal government department or through a university, to solicit their assistance. These scientists can become significant partners not only during this component of Step 2, but also during the later stages of the adaptation planning process.

Scientific projections are never definitive. Scientists have to point out that their projections are based on certain assumptions and will change, if one or more of these assumptions are modified. This is not a serious problem, since the planning profession is used to planning

with incomplete information. Planners are interested in general trends and are not so concerned with some of the details underlying climate change projections. The “precautionary principle” in planning does not require complete certainty.



### 2.2 Obtain Community Knowledge

The community also holds extensive knowledge on changing weather patterns. In many instances, their livelihood depends on being able to predict the weather. Community discussion may focus on “the environment” or recent disastrous events, if awareness of climate change and its implications is low at the beginning of the process.

To obtain individual input on the changing climate in the municipality or region, the planner may use a technique called “Key Informants”. It involves asking people who they think are knowledgeable on the topic. Once one person has been identified, that person can suggest other names of people to talk to. In addition,



community knowledge is gained through workshops involving scientists and stakeholders and through general public meetings. The planner may also organize community events such as story-telling, community walks, art contests and climate change projects in schools. As well, the municipality's website can be used to obtain feedback from the public on changing weather patterns.



It is likely that the collection of community knowledge on changes in weather will generate information on specific climate change impacts in the community, the risks they pose, as well as suggestions for actions. Some of that information is useful for building climate change scenarios, and the other data is collected and used later.

### **2.3 Build Climate Change Scenarios**

The scientific and community knowledge gained informs the building of regional and/or local climate change scenarios. Scenarios usually work in longer timeframes such as 25, 50 or 100 years. They take the predictions for each of the main climate change drivers and construct models which forecast impacts on a region. For example, predictions for rising temperatures may be shown to affect crop yields, require more irrigation or result in sea level rise. A forecast of more frequent extreme weather events may suggest flooding of low-lying areas or wind damage to commercial logging operations.

Multiple scenarios reflect conservative (low), average (medium) or catastrophic (high) assumptions. For adaptation planning purposes climate change scenarios should consider a 50-year timeframe and use average assumptions regarding impacts.

Information on Canadian climate change scenarios and how to tailor them to regional or local circumstances is available from Environment Canada, the Canadian Climate Change Scenarios Network and Ouranos. Natural Resources Canada and the Department of Fisheries and Oceans also have information on regional climate change impacts. In British Columbia and Quebec detailed scenarios exist for specific municipalities. In addition, many climate change scientists have done extensive work on specific climate change impacts in various regions of Canada.

At the end of Step 2 the planner, in consultation with the community reference group and the interdepartmental team, selects a “most appropriate” climate change scenario for a region or municipality, which reflects the range of climate change impacts that can be expected. This scenario becomes the base from which to scope specific impacts during Step 3 of the adaptation planning process.

**////// Step 2 Checklist //////////////////////////////////////**

- ✓ Background climate change information
- ✓ Scientists working in the region
- ✓ Key informants
- ✓ Regional/municipal climate change scenario

**////// Helpful Hints: //////////////////////////////////////**

- ❖ Climate change scientists know each other. Tap into their network!
- ❖ Ask nearby university for help developing a local climate change scenario



**Real Estate View**



**Planning View**

**////////// STEP 2 RESPONSIBILITY: THE PLANNER //////////**

# 3

## SCOPE POTENTIAL IMPACTS

- 3.1 Develop inventory of climate change impacts**
- 3.2 Document consequences and prospects**
- 3.3 Review inventory with community**
- 3.4 Revise inventory**

## STEP 3 – SCOPE POTENTIAL IMPACTS

*Step 3 contains four separate components that take the climate change scenario from Step 2 and develop an inventory of expected consequences and prospects for the community.*

*Before considering potential impacts it is important to be clear on the language used in discussing climate change impacts and, in Step 4, climate change risk assessment. In climate change discussions the terms impacts, risks, vulnerabilities and consequences are often used to mean the same thing. This is not a problem in general conversation, but in adaptation planning these general terms need to take on very specific meanings to avoid confusion. The sequence, from general to specific, is: climate change has impacts; these impacts lead to risks and opportunities; the risks result in consequences; and the opportunities result in prospects.*

*Examples that affect all of Canada help to clarify this terminology. One of the most common climate change impacts is an increase in “extreme weather events” such as intense rainstorms, hurricanes, tornadoes, etc. The climate change impact is “extreme weather event”. One risk may be flooding. One consequence of flooding is washed out roads, another is backed-up sewers. As can be seen, a climate change impact can lead to several risks and each risk can have numerous consequences. In assessing the effects of climate change on a community, it is the consequences that are significant and the risk is really a way of getting to potential consequences.*

*The other side of the “risk” equation is the “opportunity” that may be created by climate change. The same three-fold approach applies, but some of the wording changes. Here, the sequence is: a climate change impact leads to an opportunity that results in a prospect. One climate change impact is increasing temperatures. The opportunity is a longer growing season and the prospect may be the ability to grow new crops. Again, it is the prospects that need to be assessed and the opportunity is really a way of establishing the potential prospects.*

*While the focus on terminology may seem a little academic, the distinctions become significant when trying to determine priorities and to implement action programs.*

### 3.1 Develop Inventory of Climate Change Impacts

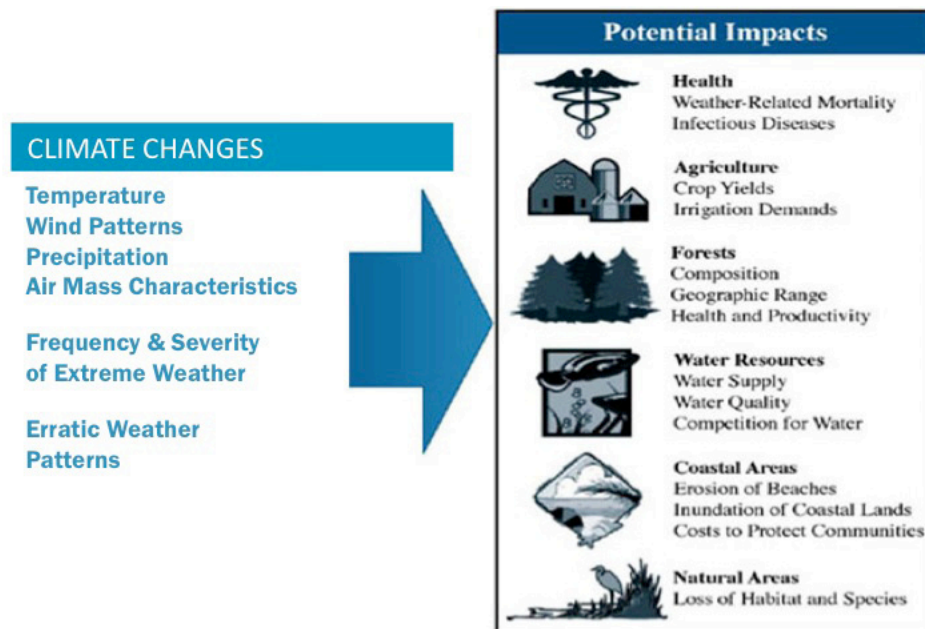
The climate change scenario developed in 2.3 indicates the potential impacts that face the municipality. Climate change can touch on numerous aspects of a community's life. Diagram 2 shows the breadth of potential impacts.

Depending on the municipality's location in Canada, the climate change impacts could be extreme weather events, sea level rise, temperature increases, decreasing precipitation or loss of sea ice, to name a few.

The next task is to scope the impacts and determine if they constitute risks or opportunities at the community level. Sometimes an impact can be both a risk and an opportunity, such as increases in precipitation. More rain can extend the growing season, while too much rain may result in flooding.

For every climate change impact that is predicted by the scenario, a list of risks and/or opportunities is compiled. A simple Table can help. In Table 1 a few examples are outlined to show how the Table can be used.

**Diagram 2  
Breadth of Impacts**



**Table 1**  
**Climate Change Risks and Opportunities**

Climate Change Impact	Risks	Opportunities
1. Extreme weather events	a) Flooding b) Property damage from wind c) Ice storms d)	a) b) c) d)
2. Sea level rise	a) Wave uprush damage b) Increased shore flooding c) d)	a) More harbour draught b) c) d)
3. Increase in summer temperature	a) More evaporation b) c) d)	a) Longer growing season b) c) d)

The planner and the interdepartmental team, assisted by the champion and the community reference group, fill in the Table and should follow the two-step process used in brainstorming. First, any risks and opportunities that could possibly affect the community are listed. Then they are refined. To assist in the refinement, a “walk-about” with climate change scientists is a helpful technique. Combining local and scientific knowledge in the field helps the scoping process immensely. If a walk-about can be arranged, it should include the local champion and interested stakeholders, as well as the planner and scientists. Besides scoping the climate change impacts, the Risks and Opportunities Table provides a ready-made educational occasion for all involved.

The output of 3.1 is a scoped list of specific risks and opportunities that flow from the various climate change impacts fine-tuned to the community.

### **3.2 Document Consequences and Prospects**

Risks and opportunities are often quite general. Now the more exacting task of considering the consequences of the risks and the prospects that arise from the opportunities can begin.

Each risk and opportunity is considered in detail by the planner and the interdepartmental team and consequences and prospects are identified. Again, sample Tables (Table 2 and Table 3) provide some examples.

**Table 2  
Climate Change Risks and Consequences**

Climate Change Risk	Consequences
1. Flooding	<ul style="list-style-type: none"> <li>a) Washed out roads</li> <li>b) Basement flooding from sewer back-ups</li> <li>c) Property destruction in flood plain</li> <li>d) Weakening of bridge embankments</li> <li>e)</li> </ul>
2. Increased shore flooding	<ul style="list-style-type: none"> <li>a) Damage to harbour facilities</li> <li>b) Destruction of cottages</li> <li>c) Loss of beaches</li> <li>d)</li> <li>e)</li> </ul>
3.	<ul style="list-style-type: none"> <li>a)</li> <li>b)</li> <li>c)</li> <li>d)</li> <li>e)</li> </ul>



**Table 3  
Climate Change Opportunities and Prospects**

Climate Change Opportunity	Prospects
1. Longer growing season	a) Expanded range of crops b) Introduce market gardening c) Longer harvesting season d) Reduced heating and drying cost e)
2. More harbour draught	a) Larger boats can land b) Improved shipping contracts c) Reduced transportation costs d) e)
3.	a) b) c) d) e)

**3.3 Review Inventory with Community**

Steps 3.1 and 3.2 have scoped the climate change impacts into risks and opportunities. Then the risks and opportunities have been further scoped into consequences and prospects. All of this work has brought the larger effects of climate change down to the community level. It is now time to involve the community-at-large. The Tables developed in 3.1 and 3.2 are used as a starting point and to keep the terminology straight. Also,

where possible, it helps to map the location of the risks and opportunities throughout the community.

A workshop arranged so people can work at separate tables functions well for the task at hand. The public can make a significant input in two areas. First, they can expand on the risks and consequences that have been identified. Similarly, the opportunities and prospects can be refined. Distributing enlarged copies of Tables 1 to 3 allows the



public to provide direct feedback by making changes right on the various Tables. Secondly, when the individual tables report back, community members can add new risks and opportunities and their associated consequences and prospects in a comfortable town hall meeting format. The local champion and members of the community reference group can be helpful in this setting.

During this component of Step 3, Tables 1 to 3 can also be posted on the municipal website for comment and suggestions.



### 3.4 Revise Inventory

The work of compiling the inventory of risks and opportunities has been completed in three stages. The initial inventory was developed by the planner and the interdepartmental team with input from the local champion, the community reference group, scientists and selected stakeholders. Then the planner and the interdepartmental team identified a preliminary list of consequences and prospects for each risk and opportunity respectively. After that the inventory was reviewed and refined by the community at a public workshop and through the municipal website.

The planner takes all this input and develops the final scoping of climate change impacts through risks and opportunities to consequences and prospects. This revised inventory is checked with the interdepartmental team.

Step 3 of the adaptation planning process scopes general climate change impacts and moves them down from the regional to the community level. It is a major task and reveals where adaptation actions need to be focused.

////// **Step 3 Checklist** //////////////////////////////////////

- ✓ Map of risks/opportunities
- ✓ Inventory of risks/opportunities
- ✓ Inventory of consequences/prospects

////// **Helpful Hints:** //////////////////////////////////////

- ❖ Community walk-about are a valuable information sharing tool
- ❖ Comfortable workshop settings encourage discussion and build consensus
- ❖ The municipal website attracts people who cannot attend meetings



/// **STEP 3 RESPONSIBILITY: THE PLANNER, INTERDEPARTMENTAL TEAM AND COMMUNITY** ///

# 4

## **ASSESS RISKS AND OPPORTUNITIES**

- 4.1 Assess risks
- 4.2 Assess opportunities
- 4.3 Evaluate municipality's adaptive capacity
- 4.4 Prioritize risks and opportunities

## STEP 4 – ASSESS RISKS AND OPPORTUNITIES

*Step 4 contains four separate components. It takes the climate change impacts with their opportunities and risks and prioritizes them, based on the municipality's capacity to adapt.*

*The assessment and prioritization of risks and opportunities is central to the adaptation planning process. Step 4 takes general ideas about risks and opportunities and makes them actionable. There are numerous approaches to “risk assessment”, some of which appear highly technical and seem to produce precise measures of risk. This Handbook uses a straightforward approach recognizing that, at its base, risk assessment is very subjective. It doesn't matter how many numbers or scores are added later in the risk assessment process, it is the initial subjective evaluation that sets the tone.*

*At the outset of this step in the adaptation planning process, it needs to be accepted that the perception of risk is a value judgment that varies with individuals. The best way to approach risk and opportunity assessment is to involve a range of people both from among municipal staff and the public. Multiple views improve accuracy and implementation ability.*

*As with the scoping process, the assessment of risks and opportunities is completed separately and each one uses its own terminology.*

### 4.1 Assess Risks

While the general term is “risk assessment”, in reality the consequences of the risk are assessed. Three variables are employed – frequency, damage and adaptation cost. Each of these variables is rated as high, medium or low. This rating is applied to each consequence of a specified risk. This type of rating is best accomplished through the use of a series of Tables. Table 4 provides a template for assessing risks and their associated consequences.

Each identified risk from Step 3 requires a separate Table to be assessed appropriately. All the consequences for the specific risk are listed. Then for each consequence the frequency, damage and adaptation cost are rated as high, medium or low. Table 5 shows an example of the template in use.

**Table 4  
Risk Assessment Template**

Risk	Consequence	Frequency	Damage	Adaptation Cost
Name of risk	Name of consequence	High - H Medium – M Low - L	High - H Medium – M Low - L	High - H Medium – M Low - L

**Table 5  
Risk Assessment**

Risk	Consequence	Frequency	Damage	Adaptation Cost
Flooding	Washed out roads	M	H	M
Flooding	Basement flooding from sewer back-up	H	H	L
Flooding	Property destruction in flood plain	H	H	H
Flooding	Weakening of bridge embankments	L	M	H

The assessment is undertaken initially by the planner and the interdepartmental team. Later it is used as a starting point for a community discussion on priorities. Once all the risks and their consequences have been assessed using this Table, a preliminary ranking can be achieved by placing the consequences in order. At the top of the list are consequences that are high in frequency and damage but low in adaptation cost, at the bottom of the list are consequences that are low in frequency and damage but high in cost.

There are many ways of ranking the various possible priorities that arise from the three variables in Table 5. Priorities vary by community, based on how each sees the importance of the combination of frequency, damage and cost. There is no correct order. Each community will determine priorities for itself.

#### **4.2 Assess Opportunities**

Opportunities are assessed in the same fashion as risks by using a Table. For prospects the assessment variables are economic value and ease of implementation. Again, these are assessed as high, medium or low, with a high ease of implementation indicating that implementation will be easy to accomplish and not too expensive. Table 6 provides the template for assessing opportunities and their associated prospects.

Each identified opportunity from Step 3 requires a separate Table to be assessed appropriately. All the prospects for each opportunity are listed. Then for each prospect the economic value and ease of implementation are rated as high, medium or low. Table 7 shows an example of the template in use.

**Table 6**  
**Opportunity Assessment Template**

Opportunity	Prospect	Economic Value	Ease of Implementation
Name of opportunity	Name of prospect	High - H Medium – M Low - L	High - H Medium – M Low - L

**Table 7**  
**Opportunity Assessment**

Opportunity	Prospect	Economic Value	Ease of Implementation
Longer growing season	Expanded range of crops	M	L
Longer growing season	Introduce market gardening	H	L
Longer growing season	Longer harvesting season	M	H
Longer growing season	Reduced heating and drying costs	H	H

Again, this assessment is undertaken initially by the planner and the interdepartmental team. Later it is used as a starting point for a community discussion on priorities. Once all the opportunities and their prospects have been assessed using this Table, a preliminary ranking can be achieved by placing the prospects in order. This ranking is easier with opportunities and prospects, as there are only two variables. At the top of the list are prospects that are high in economic value and high in ease of implementation, that is they have a high economic return and are easy to implement. At the bottom of the list are prospects that are low in value and hard to implement (low ease of implementation).

There are fewer ways of ranking the various possible priorities that arise from the two variables in Table 7. Priorities vary by community, based on how each sees the importance of the combination of economic value and ease of implementation. Again, there is no correct order and each community will determine priorities for itself.

### **4.3 Evaluate Municipality's Adaptive Capacity**

Steps 4.1 and 4.2 assess the risks and opportunities and develop a preliminary ranking of consequences and prospects. These are now weighed against the adaptive capacity of the municipality. The capacity to adapt is the ability of the municipality's built, natural and human systems to accommodate changes in climate with minimal disruptions or reasonable additional costs. Based on past development decisions and location, some communities have a higher adaptive capacity than others.

Evaluating adaptive capacity is done by asking a series of questions, such as:

- Do current plans and programs consider climate change
- Have past design standards included excess capacity
- Are additional resources available
- What is the current capital budget of the municipality
- Has the municipality already acted to adapt to various natural disasters

The planner and the interdepartmental team provide initial answers to these questions.

### **4.4 Prioritize Risks and Opportunities**

Components 4.1 to 4.3 of Step 4 have assessed risks and opportunities and then looked at the municipality's capacity. This work was completed by the planner and the interdepartmental team. Now it is time to involve the community.

Assessing climate change risks and opportunities in a community is difficult and very subjective, since people have different views and priorities. The materials prepared by the planner and the interdepartmental team, the various Tables outlined above, become the starting point for the community to understand and prioritize risks and opportunities.

The best way to do this is through a two-stage community workshop. The first stage reviews the two sets of Tables that scope the risks and opportunities and evaluate the consequences and prospects. These Tables were based on the templates displayed in Tables 4 and 6. The public provides additional perspectives both on

the range of risks and opportunities and on their consequences and prospects. The second stage assigns priorities.



In the workshop participants are seated in small groups (6-8) around separate tables. To make the endeavour manageable, each table works on one set of risks and consequences and/or opportunities and prospects. The initial task for each group is to review the evaluations (high, medium, low) and make suggestions for change and possible additions. Following this, they examine and revise, if applicable, the ranking of the consequences and prospects they were assigned. Each group reports its findings back to the larger meeting. In this way everyone is aware of the range of risks and opportunities, and their associated consequences and prospects, facing the community as a result of climate change.

Once all the consequences and prospects have been listed, evaluated and ranked, the workshop determines potential priorities. This may occur at the same workshop, if time permits, or at a subsequent workshop. Discussion from the floor does not work for judging community priorities. Rather, a process call “Dotmocracy” works better and involves everyone. With all of the risk/ consequences and opportunity/prospects listed in ranked order on large paper and taped to the walls each person “votes” their

choices. Each person is given a number of sticky, coloured dots, usually 10. Then each person places their dots beside the consequences and prospects that represent their priorities for action. They can place as many dots as they want beside any item, but usually spread them around their multiple priorities. In other words, they vote with dots, hence the term “Dotmocracy”.

Adding up the dots provides a rough indication of the workshop’s priorities. This is not the final word on priorities, but offers a starting point for Step 5 of the adaptation planning process, the preparation of the actual Climate Change Adaptation Plan. This component of Step 4 does not lend itself to feedback via the municipal website, since workshop participants have gone through a learning process that cannot be replicated electronically. There will be other opportunities for electronic feedback during Step 5.

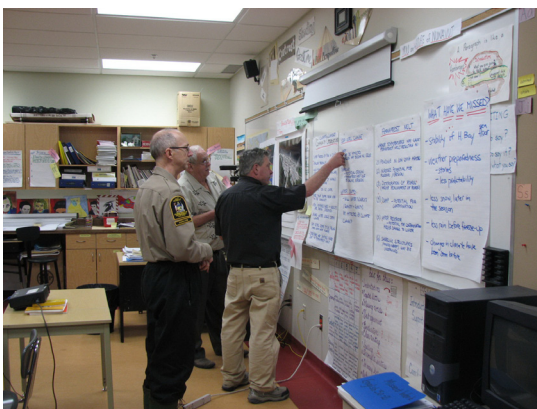


////// **Step 4 Checklist** //////////////////////////////////////

- ✓ Consequences assessed
- ✓ Prospects assessed
- ✓ Municipal capacity exists
- ✓ Preliminary priorities

////// **Helpful Hints:** //////////////////////////////////////

- ❖ “Who’s afraid of risk assessment?” Nobody!
- ❖ Don’t underestimate the fun and power of Dotmocracy



/// **STEP 4 RESPONSIBILITY: THE PLANNER, INTERDEPARTMENTAL TEAM  
AND COMMUNITY** ///



# 5

## PREPARE ADAPTATION PLAN

- 5.1 Establish adaptation planning principles
- 5.2 Specify adaptation policies and actions
- 5.3 Prioritize policies and actions
- 5.4 Prepare program gap analysis
- 5.5 Assign responsibility to act
- 5.6 Draft CCAP

## STEP 5 – PREPARE ADAPTATION PLAN

*Step 5 of the adaptation planning process has six components and results in the preparation of a Draft CCAP. During this step, planning principles are developed, policies and actions recommended and the responsibility to act is assigned to the appropriate department, agency or to the community.*

### 5.1 Establish Adaptation Planning Principles

Planners commonly use a set of principles when engaging in a community planning process. Often these principles are inherent in a planner's approach to their work and are not acknowledged formally. Since climate change adaptation planning is a relatively new field, it is useful to specify the planning principles that inform the development of a CCAP at the beginning of the process.

Local circumstances may dictate specific adaptation planning principles, but generally a CCAP should be based on the following:

- Work in partnership with other professionals and the community
- Work closely with climate change scientists
- Employ the “precautionary principle” in the face of uncertainty
- Focus on adaptation actions that respond to priority risks and opportunities
- Strive for actions with multiple benefits
- Consider phased implementation to deal with uncertainty
- Reject actions that limit capacity for future actions
- Avoid actions that “shift the problem” to other jurisdictions
- Eschew actions that are “bad planning”

The planner reviews a draft set of adaptation planning principles with the community reference group, the local champion and the interdepartmental team, clarifies any ambiguities, and gets everyone's agreement on a final set. The adaptation planning principles are then incorporated into the Draft CCAP.

### 5.2 Specify Adaptation Policies and Actions

This component of Step 5 begins to develop the heart of the Draft CCAP. Based on the priority risks and opportunities identified in Steps 3 and 4, the planner and the interdepartmental team devise a preliminary list of recommended adaptation policies and actions.

Adaptation policies will affect a number of municipal plans, such as a strategic plan, a community land use plan and various sector strategies like economic development, transportation, emergency measures, energy, etc. Policy intervention may also be required at the provincial or federal level.

At the same time, recommended adaptation actions are likely to permeate virtually all municipal operations. They may range from enlarging culverts, raising bridges and creating eco-buffers for low-lying areas to instituting new programs like advice on new crops for farmers or a municipal tree planting initiative.



The community reference group, the local champion and any other key stakeholders vet the preliminary list of proposed adaptation policies and actions. This list can also be posted on the municipality's website for feedback and comment by the public-at-large. The interdepartmental team may use the opportunity to submit a progress report to council, including the preliminary list and describing the remainder of the CCAP work plan.

### 5.3 Prioritize Policies and Actions

The preliminary list of recommended adaptation policies and actions and any feedback received are now taken to a community workshop for comment and prioritization. It is important that members of the community reference group and other key stakeholders attend this workshop. The workshop proceeds in two stages. First, workshop participants are asked to comment on the preliminary list. This may result in additions, clarification of wording, etc. If the list is long, individual tables are assigned the commenting function for certain policies and/or actions.



When they have completed their work, people at the tables share their results with the larger workshop, so that everyone present experiences the complete list of recommended policies and actions. Secondly, as in Step 4, workshop participants use the Dotmocracy process to establish priorities.



The result of this component of Step 5 is a refined list of adaptation policies and actions with clear priorities for implementation. This list is now incorporated into the Draft CCAP.

### 5.4 Prepare Program Gap Analysis

During this component of Step 5 the planner, in consultation with the interdepartmental team, completes a "gap analysis" to determine where recommended policies may fit and how

recommended actions can be funded. The work begins with an inventory of existing municipal, provincial and federal programs that may be appropriate for adaptation purposes. Funding may also be available through the private sector. The net has to be cast wide, since there will be virtually no programs with titles related directly to climate change adaptation.

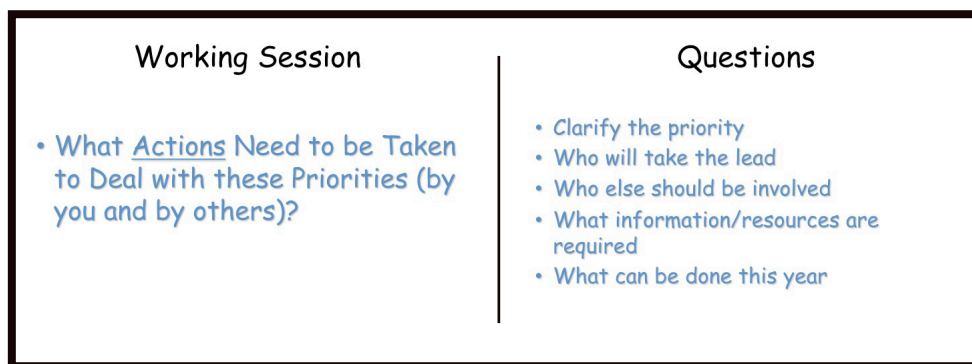
It quickly becomes apparent which programs are useful, which programs have funding criteria that need to be amended and/or where new programs have to be created. The gap analysis forms the base for more detailed work during the implementation stage in Step 6. The information gained from the gap analysis in this component of Step 5 is incorporated into the Draft CCAP.

### 5.5 Assign Responsibility to Act

The list of recommended priority adaptation policies and actions achieved in 5.3 is incomplete without assigning responsibility for leadership in their implementation. Some policies and actions are clearly the responsibility of the municipality, others fall obviously within the ambit of the provincial or federal government, and still others may rest with the private or NGO sector. In all cases specific individuals, departments, organizations or agencies are named as the “implementation lead”.

If, as is likely, certain adaptation actions can be implemented in the community, rather than by the municipality or other levels of government, the planner leads a separate “action planning” workshop in the community. These recommended actions may relate to activities such as the creation of community gardens, a volunteer tree planting program or raising local awareness of how to prepare for extreme weather events. Members of the community reference group and the local champion should participate in this workshop.

For each of the recommended actions workshop participants confirm who should take the lead and specify which additional individuals and organizations should be involved, what information has to be collected, what can be accomplished within a certain timeframe and what, if any, resources are required. This demonstration of community commitment to climate change adaptation is a very powerful tool in achieving the implementation of recommended actions by others. The “lead implementation responsibility” assigned and the results of the action planning workshop are incorporated into the Draft CCAP.



### Action Planning

## 5.6 Draft CCAP

The planner is now in a position to pull together a Draft CCAP. While every municipality is different and may have a slightly different focus, a typical Draft CCAP has the following elements:

- Community profile which includes background information
- “Most appropriate” regional/ municipal climate change scenario
- Scoped local climate change impacts
- Prioritized consequences/prospects of risks and opportunities
- Maps showing priorities
- Adaptation planning principles
- Table of recommended adaptation policies and actions indicating priority, lead responsibility and fit with existing program (if applicable)
- Action plan for tasks to be accomplished in the community
- Community engagement process (Appendix)
- List of key stakeholders (Appendix)
- Inventory of risks and opportunities (Appendix)
- Inventory of consequences and prospects (Appendix)
- Gap analysis of programs useful for adaptation actions (Appendix)

Together with the community reference group, the local champion and the interdepartmental team, the planner takes the Draft CCAP to a final open house/ public meeting before the plan is submitted to council. Care is taken to notify all of the people who have been involved in the adaptation planning process.

During the open house portion of the meeting the public is able to view the plan components on display boards and have one-on-one discussions with the planner,

the local champion and members of the reference group. During the more formal public meeting the draft CCAP is outlined and those present are invited to comment. At this point suggestions for change should be minimal, since the public engagement process has been so extensive. Comments are recorded and appropriate revisions are made.

At the same time the Draft CCAP should be posted on the municipality’s website for one last round of comments from the general public, before the CCAP is submitted to council.



**//// Step 5 Checklist //**

- ✓ Draft CCAP

**//// Helpful Hints: //**

- ❖ Community commitment to local adaptation actions paves the way for government action
- ❖ Extensive community engagement pays off at the end!



**/// STEP 5 RESPONSIBILITY: THE PLANNER, INTERDEPARTMENTAL TEAM  
AND COMMUNITY ///**



# 6

## **ADOPT, IMPLEMENT, MONITOR AND REVIEW ADAPTATION PLAN**

- 6.1 Obtain council approval of CCAP
- 6.2 Develop implementation strategy
- 6.3 Incorporate adaptation in plans, policies and budgets
- 6.4 Establish key indicators and milestones
- 6.5 Review CCAP

## STEP 6 – ADOPT, IMPLEMENT, MONITOR AND REVIEW ADAPTATION PLAN

*Step 6 contains five separate components. These move the CCAP from being just a plan to initiating action in the community.*

*Approving, implementing and monitoring the CCAP are difficult steps and need to be given as much thought and consideration as developing climate change scenarios or preparing the plan. Indeed, the seeds of effective implementation need to be sown in the CCAP as it is developed. If a plan can't be implemented, it sits on the shelf.*

### 6.1 Obtain Council Approval of CCAP

A Climate Change Adaptation Plan lays out a long-term vision, a road map for adapting to climate change. Resources from within the municipality, the private sector and from senior levels of government determine what can actually be accomplished and within what timeframe. The CCAP provides priorities and these must be harmonized with available resources and programs.

The first step on the road to implementation is adoption. The CCAP is approved by a resolution of council. Councils have various procedures for community notification, meetings and approvals. The plan has been widely circulated and discussed with the public through the various stages of its development. Formal approval indicates to the community that council stands behind the CCAP. This is the start, but just the start, of the task of implementing the plan.

### 6.2 Develop Implementation Strategy

Climate change has sweeping implications for communities and impacts numerous departments and agencies, so a joint adaptation response is required. Following approval of the CCAP, a detailed implementation strategy and time schedule is prepared. The municipality sets up an implementation team composed of the various municipal departments

most affected by climate change and, hopefully, some regional and provincial representatives. The team considers:

- Funding for priorities set out in the CCAP
- Actions the community can take
- Actions that promise quick results
- Impacts on various departments
- Role of other agencies and NGOs
- Role of the private sector
- Gap analysis of programs funding climate change adaptation
- Accessing new funding
- Appropriate timelines for various actions



Implementation of the CCAP occurs at several levels and over various timeframes. Not all implementation actions require new resources. The community can carry out some and others can be built into existing municipal and senior government programs. New federal and provincial infrastructure programs can have climate change adaptation initiatives built into their design.

Many actions necessitate cooperation among several departments and/or agencies. It can be a difficult task to get different departments to coordinate their budgets, but climate change adaptation demands no less. It is always less expensive to prepare in advance than to react after the emergency has struck.

Resources are limited in small municipalities. This is one reason why only a cross-department implementation team can determine what is feasible within the context of the municipality's budget and what are reasonable expectations for future capital funding. Partnerships with the private sector and NGOs are also part of the mix. The team produces an implementation strategy with a projected budget and a timeline for achieving the agreed upon actions. Once completed, that strategy becomes an appendix to the CCAP.

### **6.3 Incorporate Adaptation in Plans, Policies and Budgets**

The CCAP is developed as a “stand alone” plan. This does not mean it is an island unto itself. In fact, portions of the CCAP will find their way into other municipal documents – strategic plans, emergency measures operations, community land use plans, maintenance schedules, capital works plans, recreation strategies, etc. As noted, climate change affects the entire

municipality, not just one department. Roles and responsibilities need to be established and clarified. Most departments will have a role in implementation. Climate change brings new challenges that lie outside current operations and mandates. The plan lays out adaptation actions, but all players must sign on to deliver on their part of the implementation strategy. One of the opportunities of climate change adaptation planning is the chance to break down silos and encourage innovative thinking.



To be effective the implementation team must create a meaningful budget that council can adopt and stand behind. This may require new funds or the reassignment of existing departmental budgets. Budget integration is the hardest part of action and it is also the most crucial to the success of the Climate Change Adaptation Plan.



#### **6.4 Establish Key Indicators and Milestones**

The implementation team completes the work of charting the implementation schedule, coordinating budget integration and determining roles and responsibilities. These are essential to the ongoing monitoring of the plan's implementation. A vital part of monitoring is the development of key indicators and the scheduling of milestones.

Key indicators specify the expected progress of the plan's implementation and reflect the stages of each implementation action. Milestones refer to timing. Key indicators are planned to occur at certain times. The implementation strategy lays out these indicators and milestones to allow the municipality and the public to monitor the progress of the plan.

Some of the CCAP's proposed actions may take considerable time. It may not look like anything is being accomplished, while in reality considerable preparation

work is underway. This is often the case with infrastructure projects. It is helpful to institute regular reporting to the community through public meetings and press releases. An annual report and public meeting to chronicle the progress of the CCAP is suggested. Following the public meeting the report together with comments from the public can be submitted to council. This is the responsibility of the implementation team.

#### **6.5 Review CCAP**

Plans are dynamic and change is expected. Gaps in original information will be filled and new climate change information will become available. Climate change science is in flux and new information may require that some of the impacts, risks and opportunities be re-evaluated. New government programs may open opportunities that did not exist before. Also, implementation may move faster or slower than expected.

The CCAP should be revised every five years to ensure that it is up-to-date and that the implementation schedule is still relevant. This review starts with a community meeting to examine current progress and get input from scientists on changes in climate change scenarios. From this review meeting the status of the CCAP is determined. Does it need a few minor adjustments or should a new climate change adaptation plan be done? Major changes or a new adaptation plan will, of course, trigger the various steps of climate change adaptation planning again.



## Summary of Responsibilities

Throughout this Handbook responsibility for completing the 6 Steps of Climate Change Adaptation Planning has been assigned to one or more individuals, the community and/or the municipal council. The information is summarized in the chart below.

STEP	PLANNER	INTERDEPARTMENTAL TEAM	COMMUNITY	MUNICIPAL COUNCIL	IMPLEMENTATION TEAM
1	X			X	
2	X				
3	X	X	X		
4	X	X	X		
5	X	X	X		
6				X	X

## GLOSSARY OF TECHNIQUES

The Handbook suggests various techniques for accomplishing the tasks outlined in the 6-step adaptation planning process. Most are quite common and need no elaboration. However, some may not be so well known. A brief explanation of those is outlined in this Glossary. More detailed discussions of these techniques can be found in a variety of facilitators' handbooks. One useful handbook is: Sam Kaner, *Facilitator's Guide to Participatory Decision-Making*, New Society Publishers, Gabriola Island, BC, 1996.

### **Action Planning**

When working with the community this technique is used to transform general recommendations for action into a step-by-step work plan. Workshop participants identify the lead for each action, specify which additional individuals and/or organizations should be involved and determine what information is still needed. They then lay out a preliminary timetable and estimate the resources required, if any, to implement the recommended action.

### **Brainstorming**

This technique is used to generate innovative ideas and involve all group members. It moves through three basic stages of idea generation, evaluation and selection. At the outset all ideas, no matter how "off-the-wall" they may seem, are accepted and recorded. No criticism is allowed at this stage. In the next stage ideas are evaluated and combined to produce a limited number of viable ideas. Finally, the viable ideas are ranked in priority order.

### **Dotmocracy**

This technique is used to prioritize issues or actions and involve all group members. It is very useful in large groups or workshops. First, a list of issues or actions is compiled on flip chart paper and taped to the wall. Each participant is given a number of coloured sticky dots, usually ten. Participants "vote" by sticking their dots beside the ideas they like the best. In effect they vote with dots, hence dotmocracy. When the dots are added up a priority list of issues or actions has been created.

### **Gap Analysis**

Gap analysis begins with an inventory of existing municipal, provincial and federal programs that may be used for climate change adaptation purposes. Private sector programs are also included. Based on this inventory suitable programs are identified, programs for which eligibility criteria may be adjusted are targeted and visible gaps are highlighted.

### **Key Indicators**

This technique is used to assist in monitoring implementation of a plan or action. It sets out specific and measureable items that indicate progress towards completion. For example, in building an arena some indicators might be plans finalized, contractor hired, foundation poured, walls erected, etc.

### **Key Informant Process**

This technique is used to identify members of a community with specific types of knowledge that is valued by many. It starts by asking a few community members chosen at random who they would talk to, if they wanted to know about or seek advice on climate change. Certain names will be suggested by several people. These become the key informants. The initial key informants may also suggest further names.

### **Milestones**

This technique is used to monitor the time required to implement recommended actions. For each of the key indicators a timeframe is estimated. The completion of a key indicator then becomes a milestone. What is monitored is whether or not the key indicator was completed on time.

### **Risk and Opportunity Assessment**

This technique is used to evaluate priorities for action in adapting to climate change impacts. There are various approaches to risk and opportunity assessment, some of which appear highly technical and seem to produce precise measures of risk. This negates the fact that, at its base, perception of risk involves a value judgment that varies with individuals. The Handbook uses a straightforward assessment process that can be employed at the community level.

Risks are identified and their consequences are evaluated by **frequency** (high, medium, low), **extent of damage** (high, medium, low) and **adaptation cost** (high, medium, low). Risks can then be ranked in order of priority, based on the assessment of these three variables.

Opportunities and their prospects are evaluated by **economic value** (high, medium, low) and **ease of implementation** (high, medium, low). Opportunities can then be ranked in order of priority, based on the assessment of these two variables.

### **Scenario Building**

This technique is used to paint a picture of what the climate will be like in an area at various points in the future. Climate change scenarios usually work in longer timeframes, possibly 25, 50 and 100 years. General climate data on temperature, precipitation, wind and ice conditions, etc. are used in models to suggest future climate conditions. These future climate conditions for the community become the base information for determining impacts.





# Planning For Climate Change Adaptation

## Information Resources

March 2010



## Key Resources & Links

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### Climate Change Assessments

#### Intergovernmental Panel on Climate Change (IPCC)

Created in 1988 by the World Meteorological Organization and the United Nations Environment Programme, the IPCC provides decision-makers with scientific, technical and socio-economic information about climate change, and is generally considered the authority on the subject. The IPCC does not do research of its own, but bases its reports on the peer-reviewed work of thousands of scientists of many disciplines from around the world.

The IPCC and Al Gore Jr. were awarded the Nobel Peace Prize in December 2007. Hundreds of Canadian scientists contributed to the IPCC's award winning work.

The IPCC completed its Fourth Assessment Report "Climate Change 2007" and commonly referred to as AR4. The report, including a Summary for Policy Makers, is available at <http://www.ipcc.ch/press/index.htm>. Some of the key findings include:

- given current mitigation policies and sustainable development practices, GHG emissions are expected to continue to grow over the next few decades;
- continued GHG emissions, at current rates or higher, would induce changes during the 21<sup>st</sup> century that are very likely to be larger than those experienced during the 20<sup>th</sup> century;
- global warming and sea level rise are projected to increase even if GHG emissions stabilized;
- global average temperature is projected to rise anywhere from 1.1 – 6.4 °C over the next century;
- sea level is projected to rise from 0.18m to 0.59m over the next century.

For a summary of this report, see the Frequently Asked Questions document at: <http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-faqs.pdf>

#### Canada's National Assessment of Impacts and Adaptation

Natural Resources Canada (NRCan) coordinated a nation-wide scientific assessment of climate change impacts and adaptation called *From Impacts to Adaptation: Canada in a Changing Climate*. This report is complementary to the IPCC's 2007 Assessment Report, and discusses current and future risks, and opportunities that climate change presents to Canada. The report's national co-coordinator emphasized three important points from the report:

- Warming of the climate is unequivocal;
- Adaptation is necessary, not an option; and
- Even those regions that are characterized by high incomes will be impacted.

The report highlights key issues facing each region of the country, and is intended to inform adaptation decision-making and policy development. It also provides examples of recent and ongoing adaptation initiatives. [http://adaptation.nrcan.ca:80/assess/2007/index\\_e.php](http://adaptation.nrcan.ca:80/assess/2007/index_e.php).

## The Stern Review on the Economics of Climate Change

Sir Nicholas Stern wrote The Stern Review on the Economics of Climate Change for the British Prime Minister and Chancellor in 2006. The report assesses the impacts and risks arising from uncontrolled climate change, and the costs and opportunities associated with action to tackle it. Indicating that there is still time to avoid the worst impacts of climate change if we take strong action now, Stern estimates the costs of stabilizing the climate as roughly equal to 1% of world GDP, but warns that if we do not act now, climate change will cost the world the equivalent of 5% - 20% of GDP every year, in perpetuity. at [http://www.hm-treasury.gov.uk/sternreview\\_index.htm](http://www.hm-treasury.gov.uk/sternreview_index.htm).

## Resources For Mitigation Planning

- FCM's Partners for Climate Protection Program at <http://www.sustainablecommunities.fcm.ca/Partners-for-Climate-Protection/>
- This US Mayors' climate change site provides a comprehensive understanding of what levers communities they have at their disposal to achieve the commitments associated with the US Mayors' Climate Protection Agreement. View this tool at <http://usmayors.visiblestrategies.com/>

## Climate Information & Climate Change Scenarios

- **The Canadian Climate Change Scenarios Network (CCCSN)** is a good starting point for climate data and climate change scenario information. It has links to historical climate data from Environment Canada. It provides background information on climate scenarios and their construction including a page for those just starting out (see the bottom of the main page). Under contacts you will find names, phone numbers and emails for contacts across the country who can help answer your questions. The network also provides training from time to time. <http://www.cccsn.ca/index-e.html>
- **The Pacific Climate Impacts Consortium (PCIC)**, located in Victoria BC, provides climate information and climate change scenarios. The site contains a regional analysis tool that helps users develop climate scenarios for BC. <http://pacificclimate.org>
- **Ouranos** is a consortium located in Quebec whose mission is to acquire and develop knowledge on climate change, its impact and related socioeconomic and environmental vulnerabilities, in order to inform decision makers about probable climate trends and advise them on identifying, assessing, promoting and implementing local and regional adaptation strategies. It's Climate Sciences program provides information and scientific support required for impact and adaptation projects. <http://www.ouranos.ca/en/scientific-program/climate-sciences/>

## Addressing Misleading Arguments about Climate Change

*Ten Popular Myths perpetuated in Canada about the science of Global Climate Change*  
<http://www.earthembassy.ca/national/programs/atmosphere-energy/climate-change/ten-myths.html>

*The Royal Society – A Guide to Facts and Fictions about Climate Change.* Examines twelve misleading arguments put forward by the opponents of urgent action on climate change  
<http://royalsociety.org/Facts-and-fictions-about-climate-change/>

*DeSmogBlog – Clearing the PR Pollution that Clouds Climate Science*  
A Canadian source for accurate, fact-based information regarding Global Warming misinformation campaigns. <http://www.desmogblog.com>

## Municipal Resources for Adapting to Climate Change

### ICLEI – Local Governments for Sustainability

An international organization of over 470 member cities, towns and counties, that have made a commitment to sustainable development. ICLEI-Canada partnered with NRCan to pilot test one of the first adaptation planning guides entitled *Preparing for Climate Change: A Guidebook for Local, Regional and State Governments* that was produced in conjunction with the University of Washington and King County, Washington. They are working with Canadian municipalities to develop a supplement to the guide that addresses Canadian-specific issues. For more information, go to: [www.iclei.org/canada](http://www.iclei.org/canada).

### The Federation of Canadian Municipalities (FCM)

FCM has partnered with ICLEI – Local Governments for Sustainability to develop The Partners for Climate Protection (PCP) program. The PCP is a network of over 150 Canadian municipal governments that have committed to reducing greenhouse gases and acting on climate change with an emphasis on mitigation responses to climate change that reduce greenhouse gas emissions. PCP is the Canadian component of ICLEI's Cities for Climate Protection (CCP) network comprising more than 800 communities worldwide. For more information, go to: <http://www.sustainablecommunities.fcm.ca/Partners-for-Climate-Protection/>

*Note:* Much of the following was adapted from the Federation of Canadian Municipalities. 2009. *Municipal Resources for Adapting to Climate Change*. (available at [http://gmf.fcm.ca/files/Capacity\\_Building\\_-\\_PCP/PCP\\_Resources/Mun-Re-\\_Adapting-Climate-Change-e.pdf](http://gmf.fcm.ca/files/Capacity_Building_-_PCP/PCP_Resources/Mun-Re-_Adapting-Climate-Change-e.pdf)). This is an excellent resource developed to provide information to Partners for Climate Protection (PCP) members and other municipal officials about municipal adaptation initiatives and to provide resources for municipal officials who wish to undertake adaptation planning.

## Organizations Working With Canadian Communities On Adaptation Planning

Listed in the table below are a number of organizations that have strong links to municipalities, are looking to serve municipalities or are working on climate change risk assessment or adaptation planning.

Alliance for Resilient Cities  
[www.cleanairpartnership.org](http://www.cleanairpartnership.org)

Clean Air Partnership  
[www.cleanairpartnership.org](http://www.cleanairpartnership.org)

Columbia Basin Trust (B.C.)  
[www.cbt.org](http://www.cbt.org)

EarthCare Sudbury  
[www.city.greatersudbury.on.ca/earthcare](http://www.city.greatersudbury.on.ca/earthcare)

Grand River Conservation Authority  
[www.grandriver.ca](http://www.grandriver.ca)

Indian and Northern Affairs Canada  
[www.ainc-inac.gc.ca](http://www.ainc-inac.gc.ca)

Northern Climate Exchange  
[www.taiga.net/nce](http://www.taiga.net/nce)

Ouranos (Québec)  
[www.ouranos.ca](http://www.ouranos.ca)

Canadian Institute of Planners  
[www.cip-icu.ca](http://www.cip-icu.ca)

Climate Change Impacts and Adaptation Division,  
Natural Resources Canada  
[www.adaptation.nrcan.gc.ca](http://www.adaptation.nrcan.gc.ca)  
Ecology North  
[www.ecologynorth.ca](http://www.ecologynorth.ca)

Environment Canada  
[www.ec.gc.ca](http://www.ec.gc.ca)

Health Canada  
[www.hc-sc.gc.ca/ewh-semt/climat/index-eng.php](http://www.hc-sc.gc.ca/ewh-semt/climat/index-eng.php)

ICLEI Canada  
[www.iclei.org/canada](http://www.iclei.org/canada)

Institute for Catastrophic Loss Reduction  
[www.iclr.org](http://www.iclr.org)

Ontario Centre for Climate Impacts and Adaptation  
Resources [www.climateontario.ca](http://www.climateontario.ca)

PEI Coastal Impact Group

Prairie Adaptation Research Collaborative  
[www.parc.ca](http://www.parc.ca)

Public Infrastructure Engineering Vulnerability  
Committee (Engineers Canada)  
[www.engineerscanada.ca](http://www.engineerscanada.ca)

Walpole Island First Nation  
[www.bkejwanong.com](http://www.bkejwanong.com)

Pacific Climate Impacts Consortium  
[www.pacificclimate.org](http://www.pacificclimate.org)

Pembina Institute  
[www.pembina.org](http://www.pembina.org)

Toronto and Region Conservation Authority  
[www.trca.on.ca](http://www.trca.on.ca)

## Communities undertaking adaptation activities

Municipal government adaptation strategies are at an early stage. More and more municipalities are recognizing the importance of addressing climate change impacts and adaptation, but to date there is no consistent approach, nor are there extensive resources and tools to help municipalities assess their vulnerabilities to climate change. London (U.K.) and Halifax have published detailed investigations into the range of risks that climate change poses for their communities.

**Halifax** is well along in planning for adaptation, having completed a climate change risk management strategy, Climate SMART, which includes adaptation planning ([www.halifax.ca/Climate/index.html](http://www.halifax.ca/Climate/index.html)). The city has launched guides and voluntary programs as part of implementing its adaptation plan.

The **City of Toronto** is one of the first Canadian cities to establish a citywide process to respond to its vulnerability to climate change. In 2008, Toronto developed *Ahead of the Storm*, a climate change adaptation strategy ([www.toronto.ca/legdocs/mmis/2008/pe/bgrd/backgroundfile-12950.pdf](http://www.toronto.ca/legdocs/mmis/2008/pe/bgrd/backgroundfile-12950.pdf)). See <http://www.urs2009.net/docs/papers/Penney.pdf> for a case study describing past, current and potential future impacts of climate change on Toronto, along with the steps taken to develop the adaptation strategy.

**Kimberley & Elkford, British Columbia** (Columbia Basin Trust pilots) <http://www.cbt.org/climatechange/>. The **Communities Adapting to Climate Change** initiative supports communities of the Canadian Columbia Basin to increase their adaptive capacity and resiliency to climate change impacts at a community level. Phase 1 (2008-2009) included two pilot communities, Kimberley and the District of Elkford, a learning network and an advisory committee. All of the tools and resources they used to develop their plans have been put together as a resource kit at <http://cbtadaptation.squarespace.com/this-resource-kit/>. They have also produced a useful **video**:

- *Communities Adapting to Climate Change: A Tale of Two Communities* - City of Kimberley and District of Elkford share their experience in participating in CBT's Communities Adapting to Climate Initiative in this 10-minute video.

**London (U.K.)** <http://www.london.gov.uk/climatechange/strategy> started adaptation planning earlier than any of the other municipalities, and has gone the furthest with its planning to date. London has initiated a community resilience effort, conducted a community resilience or vulnerability study and developed goals and a preparedness (or adaptation) plan. London has also formally incorporated climate change impacts and adaptation into its official plan, and has embarked on a number of pilot projects to test specific adaptation strategies.

**The UK Climate Impacts Programme (UKCIP)** helps organizations to adapt to climate change. The UKCIP website (<http://www.ukcip.org.uk>) is an excellent source for resources on climate projections, impacts and adaptation actions including:

- The Adaptation Wizard that guides users move through a 5-step process to assess vulnerability to current climate and future climate change, identify options to address key climate risks, and help to develop a climate change adaptation strategy.
- The Base for Research, Adaptation, Impacts and News, referred to as the BRAIN, an extensive collection of research activities, adaptation actions, impacts of climate/weather and news of general climate change activities.
- Adaptation actions can be searched in an independent database by region (in UK), by sector or by type of adaptation action at:  
[http://www.ukcip.org.uk/index.php?option=com\\_content&task=view&id=286&Itemid=423](http://www.ukcip.org.uk/index.php?option=com_content&task=view&id=286&Itemid=423)

## NRCan and CIP's Municipal Case Studies

A joint study examined the planning process and climate change in five municipalities across the country. The case studies address a sample of the major climate change impacts facing Canadian communities. These include water resource depletion, coastal erosion due to higher sea levels, and permafrost melting. The plain language summaries are available on CIP's website at: <http://www.cip-icu.ca/web/la/en/pa/FDD921FC64CB4439A096528BFD59E779/template.asp>

The case studies include:

- City of Calgary Municipal Water Supply
- Corporation of Delta Case Study: Sensitivity of the Roberts Bank Tidal Flats to Accelerated Sea Level Rise and Intensified Storminess
- Graham Island Case Study: Impacts of Sea Level Rise
- Southeastern New Brunswick Coastal Communities Case Study: Impacts of Sea Level Rise
- Salluit Case Study: Impacts of Degrading Permafrost

## Resources for impact assessment and adaptation planning

Although resources and tools are still underdeveloped, a few useful resources are available for planners and municipalities. The following resources can help to better understand the major climate changes that are beginning to occur and some of the expected impacts:

- *Impacts, Adaptation and Vulnerability* (Intergovernmental Panel on Climate Change, April 2007) ([www.ipcc.ch/ipccreports/ar4-wg2.htm](http://www.ipcc.ch/ipccreports/ar4-wg2.htm)).
- *From Impacts to Adaptation: Canada in a Changing Climate 2007* (Natural Resources Canada, 2007) ([www.adaptation.nrcan.gc.ca/assess/2007/index\\_e.php](http://www.adaptation.nrcan.gc.ca/assess/2007/index_e.php)).

A number of guides have been produced in recent years to help local governments assess climate change vulnerabilities and risks, and plan and implement adaptation strategies:

- *Preparing for Climate Change: A Guidebook for Local, Regional, and State Governments* (King County, Climate Impacts Group and ICLEI USA, 2007). Four communities — Delta, St. John's, Sudbury and Keene, New Hampshire — served as pilot communities where some of the tools in this guide were tested (<http://cses.washington.edu/db/pdf/snoveretalgb574.pdf>).
- *Climate Change Information for Effective Adaptation: A Practitioner's Manual*. (2009) Kropp, J., and Scholze, M., prepared for Federal Ministry for Economic Cooperation and Development, Germany. (<http://www2.gtz.de/dokumente/bib/gtz2009-0175en-climate-change-information.pdf>)
- *Climate adaptation: Risk, uncertainty and decision-making* (U.K. Climate Impacts Programme (UKCIP, 2003) ([www.ukcip.org.uk/images/stories/Pub\\_pdfs/Risk.pdf](http://www.ukcip.org.uk/images/stories/Pub_pdfs/Risk.pdf)).

- *Preparing for climate change: A guide for local government in New Zealand* (New Zealand Climate Change Office, 2004) ([www.mfe.govt.nz/publications/climate/preparing-for-climatechange-guide-for-local-govt/index.html](http://www.mfe.govt.nz/publications/climate/preparing-for-climatechange-guide-for-local-govt/index.html)).
- *Climate Change Impacts & Risk Management: A Guide for Business and Government* (Australian Government, 2006) ([www.climatechange.gov.au/impacts/publications/riskmanagement.html](http://www.climatechange.gov.au/impacts/publications/riskmanagement.html)).
- Canadian communities' guidebook for adaptation to climate change. Including an approach to generate mitigation co-benefits in the context of sustainable development. By Bizikova L., T. Neale and I. Burton, 2008. Environment Canada and University of British Columbia. (<http://www.forestry.ubc.ca/LinkClick.aspx?fileticket=xsexCSatHjo%3D&tabid=2455&mid=5415&language=en-US>).
- *Chicago Climate Change Action Plan — Adaptation Strategy*. (2008) City of Chicago. (<http://www.chicagoclimataction.org/pages/adaptation/11.php>) Adaptation tactics were prioritized according to: 1) their collateral mitigation benefits; 2) their costs; and 3) their catalytic potential. Five multi-departmental adaptation working groups were formed to develop adaptation actions plans: extreme heat; extreme precipitation events; building, equipment and infrastructure vulnerabilities; ecosystem degradation; and leadership, planning and communication. Over 200 adaptation initiatives are planned and underway across 15 City departments and agencies.
- *Climate Change Planning Tools for First Nations Guidebooks*. 2006. (<http://www.cier.ca/information-and-resources/publications-and-products.aspx?id=412>) These six Guidebooks 'walk and talk' a First Nation through the planning process. Each develops an important part of the planning process and is a precursor to the next guidebook. They contain: suggestions of how a First Nation might plan for climate change, how to involve the community, and activities that a First Nation can use to involve members of the community to set priorities and achieve them.
- *weADAPT* (<http://www.weadapt.org/>) has been collaborating with Google.org to explore ways of improving access to information on climate adaptation using Google Earth. Based on input from users we have created a quick and easy way to find out who is working on what and where. This also allows you to share the work you are doing with a wide audience and raise awareness on important issues.

Municipalities using the King County/ICLEI USA guidebook and the UKCIP guide listed above have described them as useful but lengthy and targeted to larger municipalities. Resources tailored to smaller municipalities still need to be developed.

In addition to these guides, several other resources have been useful to municipalities undertaking climate change vulnerability or risk assessments and adaptation planning:

- *Climate Change Impacts and Adaptation: A Canadian Perspective* (Natural Resources Canada, 2004) suggests a "vulnerability approach" for assessing climate risks and provides suggested adaptation responses for a number of sectors ([www.adaptation.nrcan.gc.ca/perspective/index\\_e.php#toc](http://www.adaptation.nrcan.gc.ca/perspective/index_e.php#toc)).
- *Adapting to Climate Change: A Risk-based Guide for Ontario Municipalities* (Bruce, Egner and Noble, 2006) provides a detailed methodology for assessing the risks of climate change and undertaking climate change adaptation planning for municipalities ([www.adaptation.nrcan.gc.ca/projdb/pdf/176a\\_e.pdf](http://www.adaptation.nrcan.gc.ca/projdb/pdf/176a_e.pdf)).
- *Cities Preparing for Climate Change: A Study of Six Urban Regions* (Clean Air Partnership, 2007) proposes a framework for urban adaptation processes, based on a review of leading cities and urban regions ([www.cleanairpartnership.org/pdf/cities\\_climate\\_change.pdf](http://www.cleanairpartnership.org/pdf/cities_climate_change.pdf)).
- *Planning Response to Climate Change: Advice on Better Practice* (Office of the Deputy Prime Minister, London, 2004) focuses on incorporating climate concerns and adaptation into local government planning ([www.communities.gov.uk/documents/planningandbuilding/pdf/147597.pdf](http://www.communities.gov.uk/documents/planningandbuilding/pdf/147597.pdf)).
- *Adapting to Climate Change: An Introduction for Canadian Municipalities* (Climate Change Impacts and Adaptation Research Network, 2006) provides an introduction to climate impacts, including case studies ([www.c-ciarn.ca/adapting\\_e.html](http://www.c-ciarn.ca/adapting_e.html)). This resource is targeted to elected officials.

- The City of Toronto's Climate Change Adaptation Reference Collection, developed with the help of the Institute for Catastrophic Loss Reduction, may be useful to other communities ([www.toronto.ca/teo/climate\\_change\\_adaptation/index.htm](http://www.toronto.ca/teo/climate_change_adaptation/index.htm)).
- *A Guide for Incorporating Adaptation to Climate Change into Land-Use Planning*. CEF Consultants Ltd and CBCL Limited. (Collins, Smith, and Allen, 2005). A guide aimed at land use planners, engineers, administrators within municipal governments, and planning advisory committees that discusses mitigation and adaptation strategies, climate change impacts and plans, and land use planning. [www.cefconsultants.ns.ca/CCGuideLandUseNov05.pdf](http://www.cefconsultants.ns.ca/CCGuideLandUseNov05.pdf)
- The new climate change adaptation tools and resources developed by Engineers Canada ([www.engineerscanada.ca](http://www.engineerscanada.ca)).

Many of the above resources provide a detailed step-by-step approach to climate change impact assessment and adaptation planning. There is considerable overlap in their approaches.

## Websites with extensive Adaptation Planning Resource Lists

CIP is in the process of building its [www.planningforclimatechange.ca](http://www.planningforclimatechange.ca) site into a significant resource.

Clean Air Partnerships: [http://www.cleanairpartnership.org/arc/resource\\_library/adaptation\\_planning](http://www.cleanairpartnership.org/arc/resource_library/adaptation_planning)  
Extensive list compiled for the Alliance on Resilient Cities.

City of Toronto *Climate Change Adaptation Reference Collection*  
[http://www.toronto.ca/teo/climate\\_change\\_adaptation/index.htm](http://www.toronto.ca/teo/climate_change_adaptation/index.htm) On this site, you'll find links to studies, reports and tools related to climate change adaptation. This material was compiled, in cooperation with the Institute for Catastrophic Loss Reduction (ICLR), in the course of the City's research on climate change adaptation.

## Videos

### **Global Warming 101**

<http://video.nationalgeographic.com/video/player/environment/global-warming-environment/global-warming-101.html> (3 minutes)

Good basic overview. Can be used with accompanying on-line Global Warming Quiz

<http://environment.nationalgeographic.com/environment/global-warming/quiz-global-warming/>

### **Communities Adapting to Climate Change: A Tale of Two Communities**

[http://www.cbt.org/Initiatives/Climate\\_Change/action\\_video.asp](http://www.cbt.org/Initiatives/Climate_Change/action_video.asp) (10 min)

City of Kimberley and District of Elkford share their experience in participating in The Colombia Basin Council's *Communities Adapting to Climate Initiative*.

### **Adapting to Climate Change in the Lower Mainland of British Columbia**

<http://ekoscommunications.com/node/683> (12 min)

As part of the Natural Resource Canada funded project on climate change adaptation in the Fraser Basin of British Columbia, EKOS produced this video designed to stimulate dialogue among local government representatives, scientists and engineers on how to adapt water related infrastructure. The video applies peer-to-peer learning by having mayors, councilors and senior policy advisers as the main deliverers of the message, supported by clips from three highly respect climate research scientists from University of British Columbia (UBC).

### **Climate Action in California with Arnold Schwarzenegger**

<http://www.climatechange.ca.gov/visualization/index.html> (7 minutes)

Visualizing climate change risk and adaptation options in California (via a collaboration with Google Earth), this overview of California's extensive climate action uses impressive impact simulations.

### **The Most Terrifying Video You'll Ever See - The Climate Change Debate**



<http://www.youtube.com/watch?v=zORv8wwiadQ> (10 minutes)

In 2007, high school science teacher Greg Craven posted this video predicting dire consequences without strong measures to stop global warming. That video attracted over five million viewers. He has since written a book entitled *What's the Worst That Could Happen?: A Rational Response to the Climate Change Debate*, where his focus is not "what" to think about global warming, but "how." Using clear language and charts, Craven sketches not just the cost/benefit analysis of over-reacting and failing to act, but the fundamentals of sound science. Training readers to evaluate competing arguments, he points to a number of expert sources for reliable information, takes a measured look at the skeptics and finds that the risk of global climate destabilization outweighs the supposedly prohibitive costs of implementing environmental protection measures. [from amazon.com]

### **BBC Hot Cities**

<http://www.rockhopper.tv/hotcities/index.html>

A series of documentaries produced in partnership with Rockhopper TV. The world's biggest cities are already victims of climate change. "Hot Cities" travels the world from Lagos to Los Angeles, from Shanghai to Surat, from Dhaka to Durban to see if our cities can adapt and survive.

## Risk assessment tools

Halifax has gone through a formal, comprehensive risk assessment process to evaluate climate change risks. Halifax was motivated to begin developing an adaptation strategy following Hurricane Juan, which did considerable damage to the city in 2003. With the help of ClimAdapt, (a consortium of eight Atlantic Canadian private sector environmental firms and two nongovernmental organizations), Halifax was able to secure funds from the federal government to support research and risk assessment related to climate change impacts and strategy development. The city developed a climate change risk assessment tool, drawing on a guide produced by the Canadian Standards Association entitled *Risk Management: Guideline for Decision Makers (CSA-Q850-97 (R2007))*

([www.shopcsa.ca/onlinestore/GetCatalogItemDetails.asp?mat=2005912](http://www.shopcsa.ca/onlinestore/GetCatalogItemDetails.asp?mat=2005912)). This risk assessment tool is described in Halifax's *Climate Change Risk Management Strategy (2007)* ([www.halifax.ca/climate/documents/ClimateChangeRiskManagementStrategyforHRMDecember2007.pdf](http://www.halifax.ca/climate/documents/ClimateChangeRiskManagementStrategyforHRMDecember2007.pdf)).

The Public Infrastructure Engineering Vulnerability Committee (PIEVC) Protocol produced by Engineers Canada is another risk assessment tool being used to assess the vulnerability of individual facilities or types of infrastructure ([www.pievc.ca](http://www.pievc.ca)). The types of infrastructure considered include buildings; roads, bridges and other transportation infrastructure; stormwater and wastewater systems; and water resources. Engineers Canada selected Sudbury to use the protocol to assess the vulnerability of its roads to climate change. Yellowknife used the PIEVC Protocol to assess the threat of thawing permafrost to local buildings.

## Scientific resources

A variety of scientific resources exist to help municipalities learn about climate change, prepare analyses of expected local impacts and, in some cases, begin evaluating adaptation solutions. Some of these resources include:

- The regional offices of Environment Canada, as well as its Adaptation and Impacts Research Group ([www.msc-smc.ec.gc.ca/airg/index\\_e.cfm](http://www.msc-smc.ec.gc.ca/airg/index_e.cfm)).
- The Earth Sciences Sector of Natural Resources Canada ([http://ess.nrcan.gc.ca/index\\_e.php](http://ess.nrcan.gc.ca/index_e.php)).
- The Canadian Hydrographic Service in the Department of Fisheries and Oceans ([www.charts.gc.ca/pub/en/](http://www.charts.gc.ca/pub/en/)).
- The Pacific Climate Impacts Consortium (<http://pacificclimate.org/resources/climateimpacts>).
- Data from the Atlas of Canada (<http://atlas.nrcan.gc.ca/sites/english/maps/climatechange>) and Natural Resources Canada's CoastWeb ([http://gsc.nrcan.gc.ca/coast/index\\_e.php](http://gsc.nrcan.gc.ca/coast/index_e.php)).
- Projections from the Canadian Climate Change Scenarios Network ([www.cccsn.ca](http://www.cccsn.ca)).

- Individual scientists such as Norm Catto at Memorial University and David Pearson at Laurentian University.
- Researchers doing presentations on Alliance for Resilient Cities ([www.cleanairpartnership.org/arc](http://www.cleanairpartnership.org/arc)) and FCM's Green Municipal Fund™ webinars ([www.fcm.ca/gmf](http://www.fcm.ca/gmf)).

It is important to note that although Canada has an array of research and scientific resources on climate change, cities are not yet drawing on many of these resources. One reason for this is limited staff time and resources.

## Helpful Resources by Region

### British Columbia

- [BC Climate Action Toolkit](#). A climate action resource for local government by local government in collaboration with UBCM, Smart Planning for Communities & the Province of BC.
- [Climate Change Adaptation: Planning for BC](#). (2008) Harford, D., Pacific Institute for Climate Solutions, University of Victoria, British Columbia
- (Capital Regional District) [Capital Region Climate Change Adaptation Study Phase 1: Project Scoping](#). (2008) The Sheltair Group. Prepared for Environmental Services Department, Capital Regional District
- (Corporation of Delta) [Delta's Climate Change Initiative: A Corporate Framework for Action](#). (2008) Climate Change Working Group, Corporation of Delta

### Quebec

- Ouranos is a consortium that brings together 250 scientists and professionals from different disciplines. It focuses on two main themes: *Climate Sciences* and *Impacts & Adaptation*. <http://www.ouranos.ca/>

### Atlantic Region

- (Halifax Regional Municipality) [HRM Climate SMART: Community Action Guide to Climate Change and Emergency Preparedness](#). (2006) Halifax Regional Municipality, Naturally Green, Government of Canada, Federation of Canadian Municipalities, Government of Nova Scotia
- (Halifax Regional Municipality) [Climate Change Risk Management Strategy for Halifax Regional Municipality](#). (2007) Halifax Regional Municipality
- (New Brunswick) [New Brunswick Climate Change Action Plan 2007-2012](#). (2007) New Brunswick Climate Change Secretariat Department of Environment
- (Nova Scotia) [Toward a Greener Future: Nova Scotia's Climate Change Action Plan](#) (Adapting to Climate Change Actions 53-66). (2009) Nova Scotia Department of Environment
- (Prince Edward Island) [Prince Edward Island and Climate Change: A Strategy for Reducing the Impacts of Global Warming](#). (2008) Department of Environment, Energy and Forestry, Government of Prince Edward Island

### Ontario

- (City of Toronto) [Ahead of the Storm... Preparing Toronto for Climate Change: Development of a climate change adaptation strategy](#). (2008). Toronto Environment Office, City of Toronto Climate Adaptation Steering Group, Clean Air Partnership
- (City of Ottawa) [City of Ottawa White Paper: Climate Change and the Official Plan Review](#). (2008) Planning, Transit and the Environment Department, City of Ottawa
- (Ontario) [Adapting to Climate Change in Ontario: Towards the Design and Implementation of a Strategy and Action Plan](#) (2009) The Ontario Ministry of the Environment has released a report titled Adapting to

Climate Change in Ontario: Towards the Design and Implementation of a Strategy and Action Plan, authored by Ontario's Expert Panel on Climate Change Adaptation. The report lists a broad range of recommendations to help Ontario understand climate change impacts, reduce risks and take advantage of beneficial opportunities resulting from climate change.

## North

- (Northwest Territories) [Northwest Territories Climate Change Impacts and Adaptation Report](#). (2008) Department of Environment and Natural Resources, Government of the Northwest Territories.
- (City of Yellowknife) [Creating a More Resilient Yellowknife: Climate Change Impacts and Municipal Decision Making. Final Project Report](#). (2007) Pryor, J., and Cobb, P., Pembina Institute.
- (Yukon) [Yukon Government Climate Change Action Plan](#). (2009) Environment Yukon, Yukon Government.

## Regional Climate Resources

To understand climate impacts in a specific location, in more detail and/or in a particular sector, e.g., coastal erosion or water supply, it may be advisable to bring in specialized expertise. There are hundreds of scientists, researchers and others working in regional climate centres, governments, universities and organizations across the country. Currently, there is no centralized agency that facilitates access to these individuals or institutions. Below you will find a list of organizations and institutions that might be working in your region. Also investigate local provincial and university departments that are working on climate change.

- Canadian Forest Service, NRCan – <http://cfs.nrcan.gc.ca/?lang=en>
- Institute for Catastrophic Loss Reduction – <http://www.iclr.org>
- Natural Resources Canada (NRCan), in particular the Climate Change Impacts and Adaptation Division [http://adaptation.nrcan.gc.ca/index\\_e.php](http://adaptation.nrcan.gc.ca/index_e.php)
- Ouranos Consortium – [http://www.ouranos.ca/intro/intro\\_e.html](http://www.ouranos.ca/intro/intro_e.html)
- Pacific Climate Impacts Consortium – <http://pacificclimate.org/>
- Prairie Adaptation Research Collaborative (PARC) – <http://www.parc.ca/>
- Water & Climate Impacts Research Centre (W-CIRC) – <http://w-circ.uvic.ca/english/index.php>

## Resources for Planners as Sustainability Champions

- The *Sustainability Champion's Guidebook*, by Bob Willard, outlines how internal leaders can transform their organisation to sustainable enterprises. <http://www.sustainabilityadvantage.com/products/suschamps.html>
- The International Society of Sustainability Professionals (ISSP) is a non-profit, member-driven association for professionals who are committed to making sustainability standard practice. <http://sustainabilityprofessionals.org/>
- The Natural Step Canada is a national non-profit organization that provides training, coaching and advice to communities and businesses on how to integrate economic, environmental and social priorities into their decision making and planning. Their website includes good case studies and guides on how to do integrated community sustainability planning. <http://www.naturalstep.org/>