ICLEI
Local Governments for Sustainability

CHANGING CLIMATE, CHANGING COMMUNITIES:

Guide and Workbook for Municipal Climate Adaptation

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Local Governments for Sustainability

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PREFACE

Adapting to climate change is the new reality. Despite genuine efforts to mitigate climate change, leading scientists tell us that a changing climate is inevitable and we can expect increasing temperatures, more frequent storms and sea level rise. Many local governments are already at the centre of this reality; dealing with the effects of thawing permafrost, damaged infrastructure and heat waves. As practitioners of good governance, local governments must develop responses that protect their local citizens, environment and economy.

ICLEI is an association of local governments that are committed to sustainability. ICLEI works with its members to build the capacity of municipal staff and elected officials to fulfill this commitment. We develop process-based frameworks and build practical tools and resources to support implementation. This guide provides a milestone framework that leads local government practitioners through a process of initiation, research, planning, implementation and monitoring for climate adaptation planning. The workbook is filled with practical tools and exercises to support the milestone process, and the information annexes summarize a variety of policy and scientific resources that can be used to compliment your activities. The multifunctional nature of these resources is in response to the fact that while adaptation planning can be a long-term and complex process, there are exercises that can be done in the short term to support a longer-term process.

I encourage you to bring this guide to your community and put it to use. Tailor it to your needs. And, please share your experiences with ICLEI so we can ensure that the lessons you've learned on the ground in your community are shared with your peers across the country.

Megan Meaney
Director, ICLEI-Canada

Ten years ago, Delta started to think seriously about climate change and what we could do to mitigate and adapt to the impacts on our community and environment. We knew we had to look inward and so began a series of changes. We have promoted discussion, sometimes at the risk of ridicule, encouraged our staff to put their sound ideas into practice, and participated in national programs, like ICLEI Canada's adaptation toolkit pilot, when few others were interested.

But now the science is in and all sectors of government and private industry are rising to the climate change challenge. The timing couldn't be better. In the past few years, Delta has experienced climate change first hand with several severe weather events like storm surges and flooding in Boundary Bay Village. As a coastal community, Delta may be on the frontline of vulnerability, but it's certainly at the forefront for change.

We are privileged to have worked with ICLEI Canada to produce this very useful toolkit for communities across the nation. Congratulations to ICLEI Canada for completing *Changing Climate, Changing Communities*. The toolkit is relevant, practical and useful.

At the Corporation of Delta, we've shown that small changes result in huge dividends. The time for debate is over. Please join us now as we all do our best to meet the climate change challenge.

Mayor Lois Jackson
Municipal Corporation of Delta, BC

ABOUT THIS GUIDE

Today, the effects of climate change are being felt in communities across the country. These effects are set to become so pervasive that all levels of government and all sections of society will have a responsibility to become informed and to take appropriate action within their mandates to prepare for and adapt to them.

Changing Climate, Changing Communities: Guide and Workbook for Municipal Climate Adaptation is a compendium of resources that provide a milestone based framework to assist local governments in the creation of adaptation plans to address the relevant climate change impacts associated with their communities. Although climate change adaptation is a complex process, this guide aims to provide a straightforward methodology to adaptation planning using a five-milestone approach. Each milestone represents a fundamental step in the adaptation planning process, starting with the initiation of adaptation efforts (by building an adaptation team and identifying local stakeholders) and culminating with a monitoring and review process that analyzes the successes and reviews the challenges of the adaptation plan and its implementation.

Though presented sequentially, the milestone framework is not necessarily linear; rather, it can be an iterative process whereby adaptation goals and actions are continuously monitored based on new local conditions and information. Likewise the distinction between planning and implementation may be blurred so that actions that are already underway or may be implemented easily can be undertaken while other elements of planning are still ongoing.

Changing Climate, Changing Communities is a compendium of three distinct elements: a main guide, a workbook for practitioners, and a set of information annexes.

MAIN GUIDE

The main guide outlines the five milestones for climate adaptation and outlines how to implement each one. The guide can be used on its own or in coordination with the workbook and annexes which provide additional tools to assist in moving through the Milestone process.

WORKBOOK

Though the workbook is a non-compulsory component of the guide, it contains seventeen tools that operationalize the adaptation methodology identified in the main guide. The tools range from basic conceptual mappings to more complex matrices on adaptive capacity and risks associated with climate change impacts, each tool can be used to facilitate moving through the milestones.

INFORMATION ANNEXES

The third component of the compendium are the information annexes which supplement the main guide and includes information on regional climatic changes, adaptation options, and a synthesis of other resources, organized by topic, that can assist communities in planning for climate change.

Changing Climate, Changing Communities is aimed at municipal staff interested in working on climate change adaptation strategies. Staff from across all municipal departments can be involved in the process outlined in this resource; as it encourages an integrated approach to planning that requires examination of the environmental, economic, social, and health implications of climate change.

Although the need for adaptation planning is clear, it is important to recognize that there is no one way to approach planning for climate change. Adaptation planning, by its definition of responding to local impacts, requires a certain degree of 'right-sizing' or localizing, as any plan must be tailored to the community. This guide offers a methodology which can be tailored to any local government as dictated by the resources, capacity and priorities of the community.

Principles for Working on Climate Change Adaptation

As your community engages in a climate change adaptation planning process, the following principles[1] should be considered to help guide your work:

- **Balance of immediate and long-term needs:** Acknowledge that climate change impacts will continue to take shape over the long-term based on our actions today, but many impacts are already emerging. Communities must, therefore, ensure their approach is one that finds a balance between immediate and long-term needs.

- **Interaction must be supplemented with action:** Acknowledge that the complexity and transboundary nature of climate change impacts means that many stakeholders will need to act to develop a truly holistic response to those impacts, yet the coordination of such a large number of actors can be daunting. Communities must, therefore, commit to driving this initiative by identifying and following-through on the actions they can undertake themselves or directly influence without getting side-tracked or held back by the inaction of other stakeholders.

- **Commitment to act in the face of uncertainty:** Acknowledge the reality that human beings constantly have to act in the face of uncertainty and that acting on climate change is no different. The lack of certainty about how our climate is changing should not be seen as an impediment to taking action. Therefore, municipalities must commit to an approach that enables staff to make decisions in the face of uncertainty.

- **Recognizing existing work:** Acknowledge the work that your community is already doing which addresses climate change impacts (but which may not be labeled as "adaptation"). Where there is such work, it is important to incorporate any future adaptation planning with those existing efforts to ensure an integrated and comprehensive plan.

Approaches to Climate Change Adaptation Planning

There are a variety of approaches to adaptation planning that can be taken, each with its own focus and purpose. Exhibit 1 offers a brief overview of possible approaches and examples of where such an approach was used.

The methodology presented in this guide uses a hybrid approach which touches on elements from each of the approaches listed below and represents a widely applicable methodology. This approach was chosen to acknowledge the differences in how communities will proceed with this planning process as it would be the most relevant across the country.

The Changing Climate, Changing Communities Guide

This guide offers a five milestone methodology that local governments have become familiar with through the Partners for Climate Protection (PCP) program. The purpose of the guide is to convey a straightforward approach for how municipalities can investigate climate change impacts at a general level and devise strategies for addressing those impacts. There are many other guides available which take various approaches to adaptation planning. For instance, there are guides specific to risk and infrastructure (i.e. A Risk-Based Guide for Local Governments in British Columbia), climate change and health (i.e. Human Health in a Changing Climate), or profession specific (i.e. Engineers Canada or the Canadian Institute of Planners). This guide does not intend to supplant those resources, rather it is intended to provide a holistic process for how local communities can address the array of impacts likely to occur as a result of climate change. ICLEI encourages users of this guide to also utilize existing sector or impact specific resources to further advance their adaptation efforts.

Though this guide will be particularly valuable to local government staff, it is important to acknowledge the importance of involvement at the political level. By exposing locally elected officials to key elements of the guide, and including them at key points, staff can ensure that their adaptation planning and implementation efforts will have the political support, in the short- and long-term, that is necessary to successfully undertake an adaptation planning process.

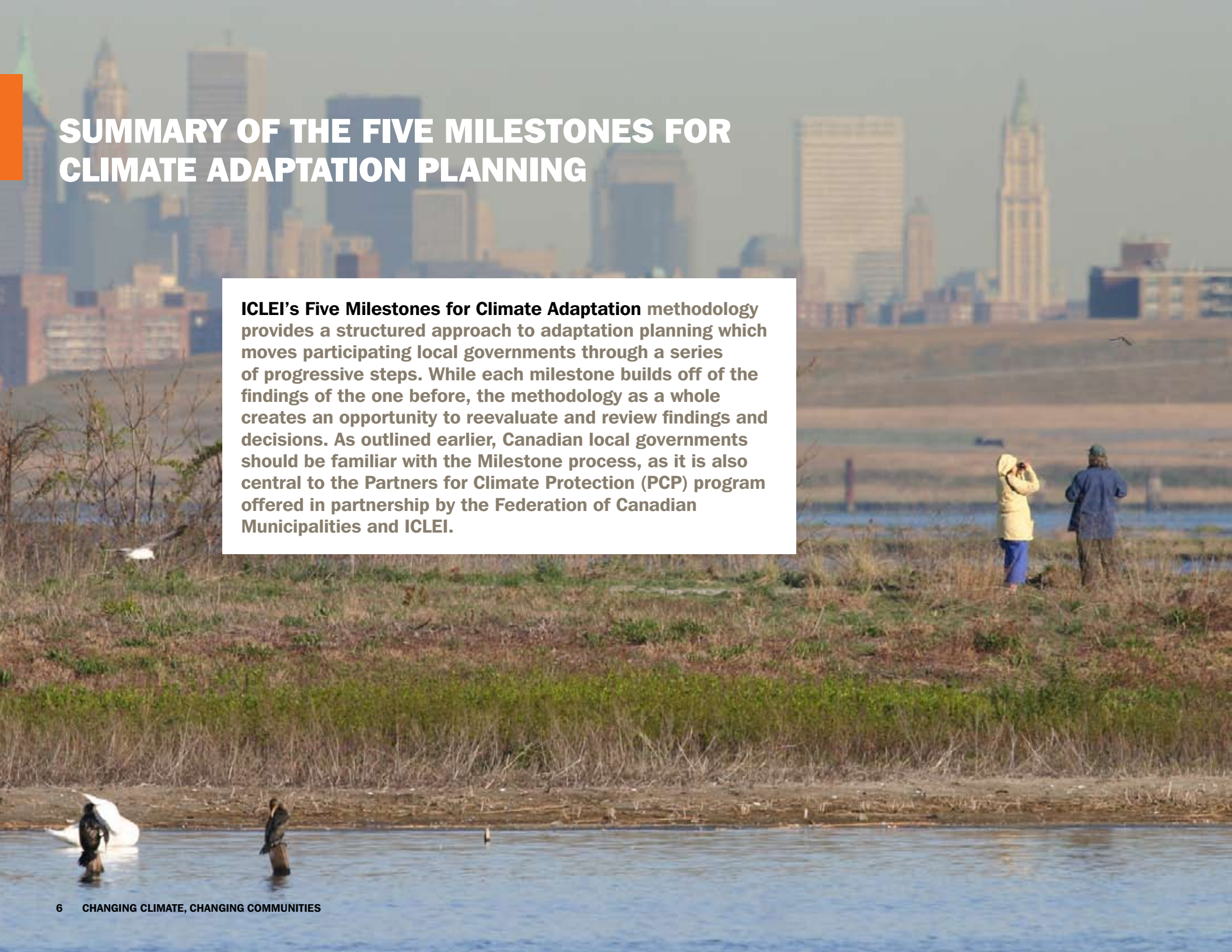
EXHIBIT 1

Approaches to Climate Change Adaptation Planning

SCOPE	KEY FEATURES	EXAMPLES
Sectoral/Department Specific	• Initiated by a single department or sector • May spark a city wide municipal plan	• Quebec City, QC *Environmental Services Adaptation Plan*
Municipal Operations Plan	• Municipal operations plan for all departments • Top down	• King County, WA (USA) *2007 Climate Plan*
Community Wide	• Community involvement • Multi-stakeholder	• Keene, NH (USA) *Climate Resilient Communities Action Plan*
Hybrid	• May be led by a single department but planned for the municipality • Expanded one department at a time • Community driven (i.e. resident from a flooded area) pushes community into action • May be driven by a weather event (i.e. flooding)	• Delta, BC *Climate Change Initiative* • Toronto, ON *Ahead of the Storm*

SUMMARY OF THE FIVE MILESTONES FOR CLIMATE ADAPTATION PLANNING

ICLEI's Five Milestones for Climate Adaptation methodology provides a structured approach to adaptation planning which moves participating local governments through a series of progressive steps. While each milestone builds off of the findings of the one before, the methodology as a whole creates an opportunity to reevaluate and review findings and decisions. As outlined earlier, Canadian local governments should be familiar with the Milestone process, as it is also central to the Partners for Climate Protection (PCP) program offered in partnership by the Federation of Canadian Municipalities and ICLEI.



MILESTONE ONE: INITIATE

The first milestone is meant to start the process of planning for adaptation. Within this milestone communities will identify possible internal and external stakeholders that should be part of a climate change adaptation team. From here they will assess their existing knowledge on how regional climate is changing and begin to brainstorm anticipated climate change impacts, positive and negative, relevant to their community. As part of this milestone, it is important to establish political support for the process and identify a climate change champion to lead your community's efforts and/or help keep momentum for the process.

MILESTONE TWO: RESEARCH

The second milestone is meant to further develop your community's understanding of climate change impacts and the major service areas which are likely to feel these impacts most acutely. Within this milestone you will scope the climate change impacts for your region and conduct both a vulnerability and risk assessment.

MILESTONE THREE: PLAN

Based on the impacts previously identified, the third milestone provides guidance on how to establish a vision and set adaptation goals and objectives, identify adaptation options, and examine possible constraints and drivers to action. From there you will begin drafting your Adaptation Action Plan, within which you will establish baseline data, address financing and budget issues, create an implementation schedule, determine who is responsible for implementation, and estimate how implementation progress will be measured and evaluated. With this information you will then finalize your Adaptation Action Plan.

MILESTONE FOUR: IMPLEMENT

In the fourth milestone, you will work to ensure that you have the approval and support of council, municipal staff and the community. You will also make sure that you have the appropriate implementation tools to ensure your success.

MILESTONE FIVE: MONITOR/REVIEW

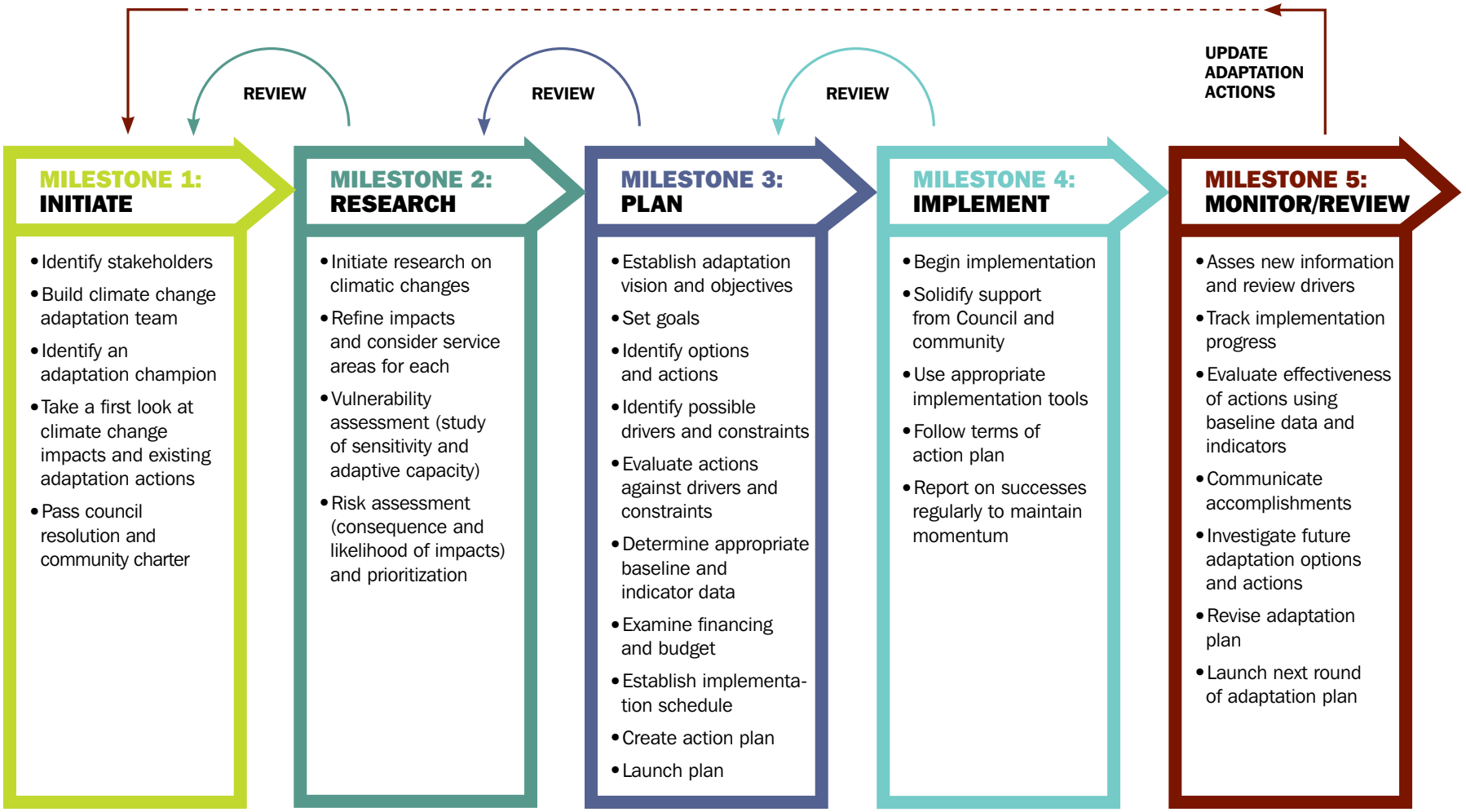
The fifth and final milestone serves to assess whether the goals and objectives previously set by your community have been achieved, identify any problems that have been encountered and develop solutions. Additionally, the fifth milestone helps you to communicate progress to the general public.

EXHIBIT 2

Basic Milestone Framework

EXHIBIT 3

Milestone Framework



GLOSSARY [2]

TERM	DESCRIPTION
Adaptation	Includes any initiatives or actions in response to actual or projected climate change impacts and which reduce the affects of climate change on built, natural and social systems.
Adaptive Capacity	The ability of built, natural and social systems to adjust to climate change (including climate variability and extremes), to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.
Climate Change	Climate change refers to a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural internal processes or external forces, or to persistent anthropogenic changes in the composition of the atmosphere or in land use.
Extreme Events	Extreme events refer to meteorological conditions that are rare for a particular place and/or time, such as an intense storm or heat wave and are beyond the normal range of activity. They can be the result of sudden and drastic changes in temperature, precipitation and sea-level or they may be the result of a more gradual, but prolonged, shift in temperature or precipitation that is beyond the normal range. Such events include severe thunderstorms, heat waves, floods, droughts, ice storms, fires etc. *Extreme Weather Event* is an event that is rare within its statistical reference distribution at a particular place; it would normally be as rare as or rarer than the 10th or 90th percentile. *Extreme Climate Event* is an average of a number of weather events over a certain period of time, an average which is itself extreme (e.g. rainfall over a season).
Impact	The effects of existing or forecasted changes in climate on built, natural, and human systems. One can distinguish between potential impacts (impacts that may occur given a projected change in climate, without considering adaptation) and residual impacts (impacts of climate change that would occur after adaptation).
Maladaptation	Any changes in built, natural, or human systems that inadvertently increases vulnerability to climate stimuli; an adaptation that does not succeed in reducing vulnerability but instead increases it.
Mitigation	The promotion of policy, regulatory and project-based measures that contribute to the stabilization or reduction of greenhouse gas concentrations in the atmosphere. Renewable energy programs, energy efficiency frameworks and substitution of fossil fuels are examples of climate change mitigation measures.
Resiliance	The capacity of a system, community or society exposed to hazards to adapt, by resisting or changing in order to reach and maintain an acceptable level of functioning and structure.
Risk	Risk can be considered as the combination of an event, its likelihood and its consequences – risk equals the probability of climate hazard multiplied by the consequence of that event.
Sensitivity	The degree to which a given system is directly or indirectly affected (either adversely or beneficially) by climatic conditions (i.e. temperature increases) or a specific climate change impact (i.e. increased flooding).
Systems	The built, natural and human networks that provide services or activities within a municipality.
Vulnerability	The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of both the sensitivity and the adaptive capacity of a given sector.

CLIMATE CHANGE PRIMER

INTRODUCTION TO ADAPTATION

Climate change is already being felt in towns and cities across the country. Canadian communities are becoming increasingly vulnerable to a range of impacts including rising temperatures, more frequent and intense storms and sea level rise. Municipal services and infrastructure are increasingly being affected by these events.

The Intergovernmental Panel on Climate Change (IPCC) has concluded that the evidence for climate change is now "incontrovertible" and that most of the observed temperature increases since the middle of the 20th century have been caused by increasing concentrations of greenhouse gases resulting from human activity such as the burning of fossil fuels and deforestation.[3] There is much evidence of this rapid warming around the world: retreating glaciers; thinning sea-ice; decreased snow cover; melting permafrost; changing growing seasons; and rising sea levels.[4]

Across Canada, warmer temperatures have supported the rapid spread of invasive animal and plant species, melting of arctic and glacial ice, and increased heat stress among vulnerable populations. While at the same time exacerbating Canadians concern about extreme weather events, including ice storms, floods, and forest fires.

Within only a handful of decades the climate in Canada is expected to experience more significant changes, including increased temperatures, increased risk of flooding, drought, forest fires, disease and various other impacts. While these are some of the national changes, it is important to note that each region of the country will be impacted differently by climate change.

"ADAPTATION to climate change can include any activity that reduces the negative impacts of climate change and/or takes advantage of new opportunities that may be presented. This includes activities that are taken before impacts are observed (anticipatory) and after impacts have been felt (reactive). Both anticipatory and reactive adaptation can be planned (i.e. the result of deliberate policy decisions), and reactive adaptation can also occur spontaneously. In most circumstances, anticipatory adaptations will incur lower long-term costs and be more effective than reactive adaptations. Successful adaptation does not mean that negative impacts will not occur, only that they will be less severe than would be experienced had no adaptation occurred."

NRCan. (2009) *Adaptation 101: What is Adaptation?* <http://adaptation.nrcan.gc.ca/101/adapt_e.php> [accessed January 9, 2010]

Mitigation measures are designed to reduce the emission of greenhouse gases (GHGs) that contribute to climate change and are meant to offer long-term benefits. Recognizing that current GHG concentrations in the atmosphere are already having an impact on the Earth's climate, climate change adaptation is necessary to moderate harm and take advantage of opportunities.[5] Hundreds of Canadian municipalities have already undertaken climate change efforts with mitigation work and have successfully reduced their emissions. However, with the increasing effects of climate change becoming apparent, municipalities are beginning to assess their vulnerability to the changes that are already underway, and to develop responses that protect their citizens and their economies. While neither adaptation nor mitigation actions alone can prevent significant climate change impacts, taken together they form a comprehensive climate change response strategy that will prepare communities for the climate impacts underway while working to avoid even worse future affects.

Mitigation is necessary to reduce the rate and magnitude of climate change, while adaptation is essential to reduce the damages from climate change that cannot be avoided.

NRCan. (2009) *Adaptation 101: What is Adaptation?* <http://adaptation.nrcan.gc.ca/101/adapt_e.php> [accessed January 9, 2010]

GLOBAL CLIMATE CHANGE

During the past century, the global climate has gotten warmer. Increased temperatures have been accompanied by a number of other observed changes in the global climate (Exhibit 4). Experts indicate that the average Northern hemispheric temperature during the past 50 years has been higher than at any other time during at least the past 1300 years.[6]

EXHIBIT 4

Observed changes in climate and weather conditions [7]

INDICATOR	CHANGE	COMMENTS
Air temperature	Increased 0.74°C Increased 0.13°C per decade	1906-2005 Rate (last 50 years)
Ocean temperature	Increased to depths of 3000 m	
Sea level	Rose 1.8 mm/annually Rose 0.17 m	Rate (1961-2003) Total (1900-2000)
Snow cover	Declined	Northern Hemisphere
Mountain glaciers	Widespread retreat	Since 1900
Arctic sea-ice extent	Decreased 2.7% per decade	Rate (1978-2005)
Permafrost extent	Decreased by roughly 7%	Since 1900
Heavy precipitation events	Increased in frequency	
Droughts	Increased in intensity and duration	Since 1970s
Heat waves	Increased in frequency	
Topical cyclones	Increased in intensity	Since 1970s

During the next two decades, the IPCC estimates that average global temperature will increase by 0.2°C per decade.[8] Even if the atmospheric concentrations of all GHGs were to be kept constant at year 2000 levels, a further warming of about 0.1°C per decade would be expected globally.[9] The greatest warming is expected to occur over land and at high northern latitudes, in places such as Canada.[10] Higher temperatures will be accompanied by continued reductions in snow cover, sea ice, and an increase in permafrost thaw.[11] Based on increasing evidence, scientists have projected that days of extreme heat in the summer will also become more common, winter temperatures will be significantly warmer than current temperatures and heavy precipitation events will occur more frequently.[12]

CLIMATE CHANGE AND CANADA

In Canada, over the past fifty years, climate change has resulted in increases in temperatures across much of the country, changes in precipitation patterns, reduced sea-ice cover, shifting hydrological conditions and changes in extreme weather events.[13] The changes on many physical and biological systems, such as ice and snow cover, river, lake and sea levels, and plant and animal distributions are unequivocal.[14] In addition, increases in the occurrence of heat waves, forest fires, storm-surge flooding, coastal erosion and other climate related hazards are the result of changes in the climate.[15]

To Find Out More...
- **Information Annex One and Two**
- ***From Impacts to Adaptation: Canada in a Changing Climate,*** Natural Resources Canada

Temperature

On average, Canada has warmed by more than 1.3°C since 1948, a rate of warming that is approximately twice the global average.[16] All regions of Canada have experienced warming however the greatest temperature increases have been in the Yukon and Northwest Territories.[17] Under a medium emissions scenario, Canada is expected to warm 2°C by 2050 and 4°C by 2080.[18] Seasonally, Canada is expected to experience summertime warming of at least 2.5°C but this may be as much as 3.5°C, with the exception of the Arctic coast (at 1°C) where the absence of summertime sea ice will greatly moderate this summertime warming.[19] Winter warming is expected to be most pronounced in the Hudson Bay and high Arctic regions. In Northwestern Canada, winter temperatures already have increased more than 3°C between 1948 and 2003.[20]

Precipitation

Canada has, on average, become wetter during the past half century, with the average precipitation across the country increasing by about 12%.[21] When averaged annually, the largest percentage increase in precipitation has occurred in the high Arctic (25-45%), while parts of Southern Canada (particularly in the Prairies) have seen little change (~5%) or even a decrease in precipitation in some areas.[22] With winter precipitation, most of southern Ontario, except the western part which has seen an increase in lake effect snow, has experienced a significant decline in summer and winter precipitation.[23] In contrast, Southern British Columbia and Southeastern Canada have regions with significant increases in precipitation in spring and autumn.[24]

Changes in Freshwater Levels

Due to recent declines in the volume of glacial melt water in Western Canada, precipitation change and increased evaporation, water resources across much of Canada have been altered.[25] In the Great Lakes areas, for example, a 1°C increase in mean annual temperature has been associated with a 7-8% increase in the actual evaportranspiration (AET) rates, resulting in a decrease in water availability.

Changes in Seawater Levels

The magnitude of sea-level rise along Canadian coastlines also varies.[26] For example, in some parts of Canada, such as Hudson Bay, land has continued to emerge despite rising global sea levels whereas along most of the Atlantic coastline, the rate of sea level rise has doubled.[27] Relative sea-level changes will continue to exhibit similar patterns to those observed in the twentieth century. Therefore, those areas which are currently subsiding (e.g. Beauford Sea coast, Atlantic coastlines and Fraser River Delta) will experience the most impacts.[28]

Extreme Events

In general Canada has seen a change in the frequency of extreme temperature and precipitation events from 1950 to 2003. Such changes include fewer cold days, more extreme warm days, and more days with extreme precipitation.[29] Many of the most severe and costly impacts will be associated with projected increases in the frequency and magnitude of extreme events and the associated natural disasters such as flooding due to high-intensity rainfall and storm surges, ice and wind storms, heat waves and drought.[30] Flooding in particular is among the most prominent climate hazards Canadian communities face, and has been responsible for some of Canada's worst disasters.[31] Exhibit 5 lists examples of extreme events, and their associated costs, from across Canada between 1991 – 2005. More rapid and extensive snowmelt associated with rising temperatures and increasingly intense rainfall associated with summer storms could heighten the flood risk in many Canadian communities. In addition, serious disruptions to critical municipal infrastructure such as transportation, water treatment and distribution, and energy transmission have already occurred as a result of severe ice storms and are expected to occur more frequently in the future.[32]

Globally, the number of severe damage-causing storms has increased from an average of 150 per year in the early 1980s to between 250 and 300 per year in the period from 2000 to 2004.[33] In Canada, scientific models show shorter return periods of extreme weather events – that is, the estimated interval of time between occurrences – in the future.[34] Although there is some debate as to the connections between extreme events and climate change, it is important to consider the consequences of these events and their implications for communities across Canada.

EXHIBIT 5

Some observed impacts of changing climate on physical and biological systems in Canada [35]

PICTURES (shown on p. 13)	EVENT AND DATE	REGION	ESTIMATED COSTS	DEATHS	INJURIES	EVACUATIONS
1	**Ice storm, 1998**	Ontario, Quebec, Atlantic Canada	$5.4 billion	28	945	17,800
2	**Saguenay flood, 1996**	Quebec	$1.7 billion	10	0	15,825
3	**Calgary hailstorm, 1991**	Prairies	$884 million	0	0	0
4	**Red River flood, 1997**	Prairies	$817 million	0	0	25,447
5	**BC/Alberta wildfires, 2003**	British Columbia	$700 million	3	unknown	45,000
6	**Toronto extreme rain, 2005**	Ontario	Greater than $500 million	0	0	0
7	**Southern Alberta floods, 2005**	Prairies	Greater than $400 million	4	unknown	>2000
8	**Calgary hailstorm, 1996**	Prairies	$305 million	0	0	0
9	**Hurricane Juan, 2003**	Atlantic Canada	$200 million	8	unknown	unknown

IMPORTANCE OF LOCAL GOVERNMENT ACTION

Local governments need to begin adapting by taking steps to prepare for the existing and future impacts associated with a changing climate. These impacts can already be felt across the country – in large urban centres, in small-rural communities, and everywhere in between. Municipal decision makers have a unique opportunity to begin preparing for a changing climate as they will be on the front lines of responding to its impacts and therefore, have an interest in preparing for them.

As local governments are responsible for key service areas that will be affected by climate change: infrastructure, parks and recreation, health, and transportation. They are on the front lines of preparing for climate change impacts and have a responsibility to respond through strategic adaptation planning.

There are many reasons that local and regional governments are well positioned to plan for climate change:

- As climate change will affect a broad range of municipal assets and government services, operations and policy areas, preparing for climate change is a matter of risk management and good governance. Municipal governments have the responsibility of ensuring the safety, health and welfare of their communities both now and in the future.[36]

- Local and regional governments are in a position to tailor climate change adaptation strategies to their local circumstances and to the unique set of climate change impacts they expect to face.

- Anticipatory adaptation planning can increase future benefits and reduce future risks associated with climate change. Being proactive in planning for climate change can create opportunities for modifying present policies that can decrease vulnerability while also creating opportunities for capitalizing on some of the benefits of climate change.

"... As responsible public leaders, we cannot afford the luxury of not preparing. We know now that some impacts are inevitable and we know that these impacts will affect many of the essential services and functions that our governments are expected to provide. We must prepare for the impacts underway while we work to avoid even worse future effects."

Ron Sims, Executive, King County, WA

Local Government Action Mechanisms

There are five key mechanisms available to local governments to utilize and drive local action on climate change adaptation.[37] These are:

Land use and urban planning

A key role of local government is to manage local places in a coordinated, planned way that reflects the community's shared vision adapting to climate change.

Licensing and regulation

Local governments can utilize their powers to set the local regulatory environment through assessment and approval processes, the use of surcharges and rebates, and through the enforcement of local laws, to implement and enforce adaptive policies.

Facilitation, advocacy and leadership

Local government is in close contact with community organizations, businesses, residents and other stakeholders at the local level. This influence can be used to develop shared understandings and encourage whole community responses to climate change.

Community service delivery, community development and civic engagement

Local governments are committed to preserving the safety, health and wellbeing of residents and visitors, and to ensuring active civic participation.

Workforce development

As responsible corporate citizens, local governments can lead the way in ensuring good occupational health and safety systems including through the reduction of workplace risks.

Through these mechanisms local governments can use direct and indirect influences to support and foster communities that can adapt to a changing climate.

Legal Liability

Climate change awareness is strengthening the discussion into the prospect of legal liability related to adaptation. A growing number of legal professionals are looking at how failure to adapt to known and expected climate change realities may expose communities and governments to legal actions by individuals or others for property damage and personal injury.[38] Beyond financial compensation, the implications of this heightened exposure to legal liability include investor risk aversion, decreased confidence in governments, and backlogs in infrastructure projects.

Legal liability for failure to adapt infrastructure to climate change derives from the common law principles of negligence, nuisance, strict liability, and occupier's liability legislation. For example, a local government may be found negligent if it demonstrated awareness of a particular climate risk, such as the risk that decreased lake levels will result in the failure of an above-ground water system and affect water quality, but did not address the risk.[39] For infrastructure practitioners, reliance on existing codes, standards and related instruments would likely prove an insufficient defense against negligence, particularly if it is known that the codes or standards were inadequate under changing environmental conditions.[40] As the impacts of climate change intensify, infrastructure practitioners also need to be aware of potential changes in professional liability insurance.

Although Canada does not have legislation that specifically addresses obligations or responsibilities on climate change adaptation, it may not be reasonable for infrastructure decision-makers to seriously dispute the significance of climate risks, but ignoring the risks may not guarantee immunity to legal liability. In some communities, the prospect of legal liability will likely be a significant driver of climate change adaptation responses in the future.

EXHIBIT 6

Benefits and Challenges of Adaptation Planning

BENEFITS OF ADAPTATION PLANNING	CHALLENGES OF ADAPTATION PLANNING
• Insurance against future risk • Reducing vulnerability • Creating opportunities • Lower long-term costs • Reduced risk	• Degree of uncertainty • Nature of scientific information (constantly changing) • Benefits of advance planning may only appear when impact occurs • Limited resources and/or political support

LOOKING AHEAD

It is clear that climatic changes are affecting communities across Canada. The unique position of municipalities as the level of government closest to residents along with their specific action mechanisms, allows for the development of locally tailored and integrated adaptation plans that can have measurable results in improving local adaptive capacity. Taking practical steps early, with the best information available, enables your community to reduce future climate change related risks.

The remainder of this compendium of resources is focused on helping your local community undertake a climate adaptation process. Use these resources as needed to help increase your community's capacity to prepare for climate change.

ENDNOTES

1. ICLEI Oceania (2009): Local Government Climate Change Adaptation Toolkit. Melbourne, Australia: ICLEI Oceania.
2. Glossary terms have been adapted from Bizikova, L., Neale, T., Burton, I. (2008). *Canadian Communities' Guidebook for Adaptation to Climate Change: Including an approach to generate mitigation co-benefits in the context of sustainable development*. First Edition. Environment Canada and University of British Columbia, Vancouver.
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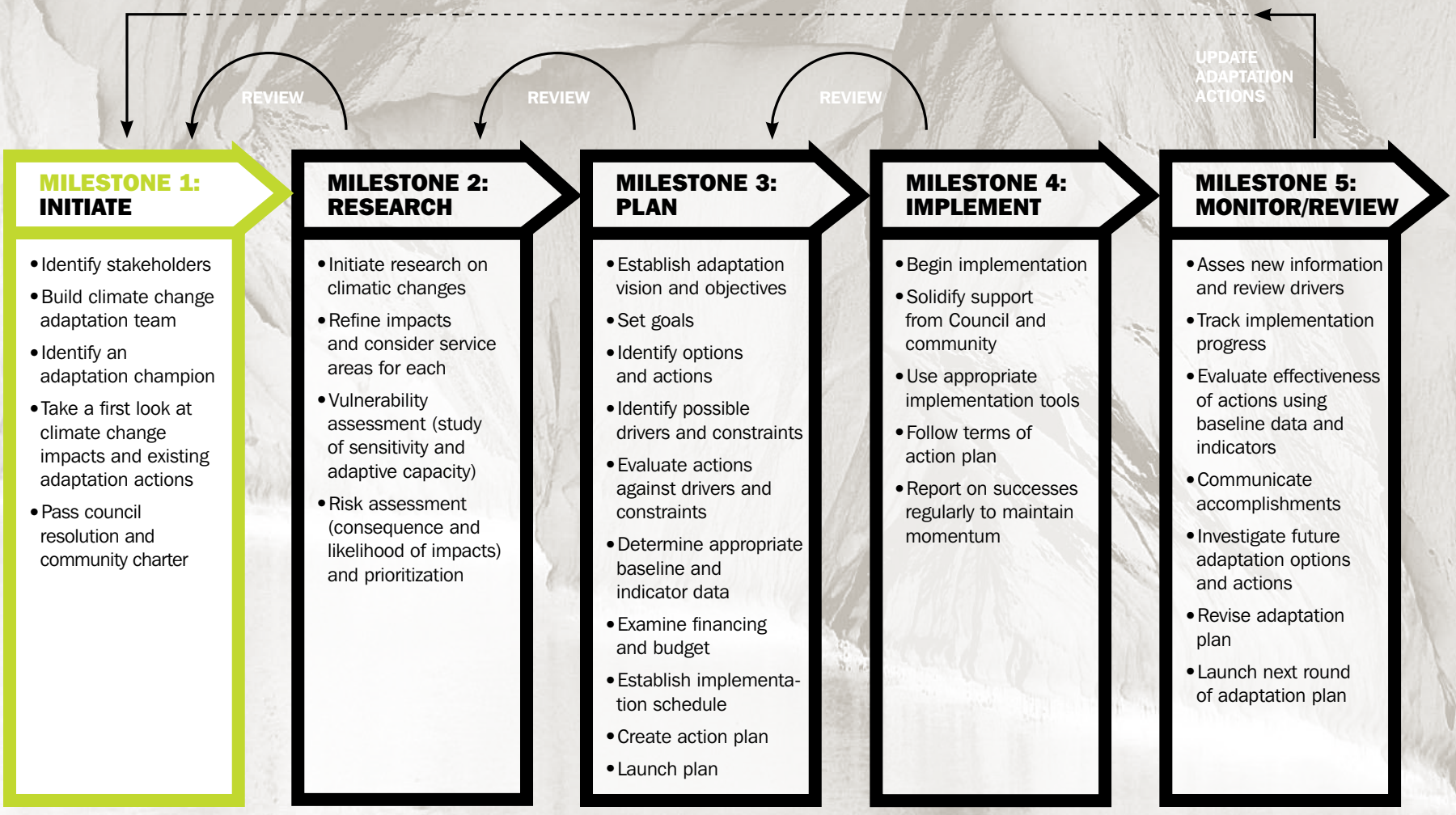

REVIEW
REVIEW
REVIEW
UPDATE ADAPTATION ACTIONS
MILESTONE 1: INITIATE
• Identify stakeholders
• Build climate change adaptation team
• Identify an adaptation champion
• Take a first look at climate change impacts and existing adaptation actions
• Pass council resolution and community charter
MILESTONE 2: RESEARCH
• Initiate research on climatic changes
• Refine impacts and consider service areas for each
• Vulnerability assessment (study of sensitivity and adaptive capacity)
• Risk assessment (consequence and likelihood of impacts) and prioritization
MILESTONE 3: PLAN
• Establish adaptation vision and objectives
• Set goals
• Identify options and actions
• Identify possible drivers and constraints
• Evaluate actions against drivers and constraints
• Determine appropriate baseline and indicator data
• Examine financing and budget
• Establish implementation schedule
• Create action plan
• Launch plan
MILESTONE 4: IMPLEMENT
• Begin implementation
• Solidify support from Council and community
• Use appropriate implementation tools
• Follow terms of action plan
• Report on successes regularly to maintain momentum
MILESTONE 5: MONITOR/REVIEW
• Asses new information and review drivers
• Track implementation progress
• Evaluate effectiveness of actions using baseline data and indicators
• Communicate accomplishments
• Investigate future adaptation options and actions
• Revise adaptation plan
• Launch next round of adaptation plan

MILESTONE 1:

INITIATE

MILESTONE 1: INITIATE

Milestone One, *Initiate*, involves the first steps of your climate change adaptation effort. In this chapter you will go through the process of establishing the context for your adaptation plan, building your adaptation team, identifying an adaptation champion, and solidifying the adaptation planning process through a political commitment.

PURPOSE	OUTPUTS
To initiate your climate change adaptation planning process and build political as well as community support for the process.	✔ List of possible stakeholders ✔ A climate change adaptation team ✔ A climate change adaptation champion ✔ A first look at how climate change will affect your community ✔ List of existing municipal actions that improve adaptive capacity ✔ Identification of municipal plans and activities that could include adaptation components ✔ Council resolution which entrenches your communities' commitment to the adaptation planning process

COMMUNITIES AND ADAPTATION

There are a variety of reasons motivating communities to pursue adaptation planning. Some communities are motivated by events, such as flooding or wildfires that have occurred or are expected to occur, while others have a history of proactive community leadership and are building on that footing when it comes to adaptation planning. What will drive an adaptation effort in your community will be based on some combination of political will, financial resources, personnel, and public support. Exhibit 7 offers a list of possible drivers and corresponding questions to consider for moving forward with adaptation planning.

As you consider these questions, it may be helpful to use the answers to start identifying an initial list of adaptation goals that are relevant to your community. You will go through a formal process of identifying a vision and goals for your adaptation plan in Milestone Three, however, having a sense of where you would like the community to be in terms of climate change response may help to move forward through the initiation phase.

EXHIBIT 7

Possible drivers for adaptation planning

DRIVER	QUESTIONS TO CONSIDER
Past [extreme] events (i.e. flooding, fire where there was damage to people or infrastructure)	What extreme weather events has your community already experienced? What happened? What were the damages and associated costs? How has the climate changed in your experience?
Anticipated events (i.e. increased frequency and more extreme events)	How well prepared is your community if an extreme event occurs? Especially if such an event becomes more frequent or severe as a result of climate change.
Identified vulnerability (i.e. study which examines the vulnerability of the community to climate change impacts and/or anecdotal evidence of changes in the community)	What climate change impacts are the most likely to impact your community? How has the climate changed in your experience?
Funding opportunities	Are there any federal or provincial funding opportunities available to your community? Can you leverage existing funding?
Co-benefits	What are some existing sustainability priorities your community has? How can adaptation planning help meet these priorities? Are there any opportunities associated with climate change that could arise for your community (i.e. job creation)? Are there ways in which your community can address both climate change adaptation and mitigation in the same plan?
Political Pressure	Are there residents or community groups that are pushing the municipality to act on climate change?
Work in other areas that also address vulnerability, resilience or adaptation	What adaptation initiatives exist in your community that may not be labelled as such? What actions has your community taken thus far to prepare for changes in climate? What about changes to infrastructure (specifically technology)?

IDENTIFYING POTENTIAL STAKEHOLDERS

Although this exercise will inform the building of your adaptation team, it is also an exercise in surveying those individuals and groups which will likely be needed more broadly throughout your community's adaptation initiative. The list of potential stakeholders that you identify in this exercise will include more than those that can reasonably be included on your team, however, it is important to engage in a stakeholder identification process to establish a foundation for communication and input with a wide-net of internal and external stakeholders.

Involving a variety of stakeholders is an important component to securing widespread support for the implementation of adaptation actions. Many of the challenges of adapting to climate change can be overcome by developing working relationships with both internal and external stakeholders. Relationships between and among local governments, utilities, universities, non-governmental organizations, community-based entities and business organizations are helpful in turning the abstract idea of planning for climate change into concrete joint activities. Identifying stakeholders will also help to further establish the context of your adaptation plan by refining how far reaching your adaptation activities will be.

Gathering a few key colleagues to determine who your potential stakeholders are is a good way to ensure that you are drawing from a broad spectrum of departments, working areas and the community. If you are working in a smaller community, it may be that a single or pair of individual(s) will be conducting this activity.

Regardless of your approach, be sure to consider stakeholders that may be outside of your immediate working area (for example, if you generally work with environmental groups and a university partner, it will be important to consider including developers, Chamber of Commerce representatives, etc. which may be outside of your immediate sphere of influence). When identifying potential stakeholders either for your adaptation team, or to be involved in key communication and input points along the way, it is important to be as specific as possible and identify:

- Internal stakeholders with responsibility for management of climate change impacts such as infrastructure, public communications, natural resources, economic development and emergency services (this will help later on when identifying potential adaptation team members).

- Existing relationships with external stakeholders, such as regional alliances of local governments, environment or community groups, universities, local businesses, industry associations, insurers, utilities, scientific research bodies and other levels of government.

- External stakeholders with whom you do not have an existing relationship but which may be valuable to your community's adaptation process.

Once you have brainstormed a list of all possible stakeholders, discuss with your colleagues which stakeholders will be the most relevant to the adaptation planning process. You may also want to use this refined list of stakeholders to help inform the make-up of your climate change adaptation team.

1 *Worksheet 1 uses the idea of spheres of influence to assist in identifying stakeholders and their relationship to your community.*

CASE STUDY

ENGAGING STAKEHOLDERS

Raising awareness and engaging stakeholders in Boston, MA

In the City of Boston, their adaptation planning research team contracted the Metropolitan Area Planning Council (MAPC), a regional planning agency, to coordinate stakeholder involvement across the 101 towns and cities that make up the Boston Metropolitan area. MAPC prepared a brochure which invited stakeholders to get involved and highlighted several extreme weather events. Resulting from the success of the brochure, Boston had approximately 30 stakeholders participate in their Stakeholder Advisory Group which met several times throughout the five-year adaptation planning project.

Penney, J. and Wieditz, I. (2007). *Cities Preparing for Climate Change: A study of six urban regions*. Clean Air Partnership: Toronto, Canada.

BUILDING YOUR CLIMATE CHANGE ADAPTATION TEAM

When forming your adaptation team, try to ensure a diversity of expertise which draws on all relevant departments or programs. This process can draw from the stakeholder identification activity done previously and can include as many or as few individuals as is appropriate for your community. The team can be any mix of stakeholders (internal or external) that you, as a community, are comfortable with. Where possible, try and draw on the expertise within your municipal network. Keep in mind that the more people there are on the team, the more comprehensive your dialogue and resulting adaptation plan will be, however, the logistics of scheduling and managing meetings can become increasingly difficult with more participants.

There are both pros and cons to having a team that is made up of only staff or one that is a mix of both internal and external individuals. It may be the case that working internally allows for more frank and open discussions and it may be more efficient as members are likely to be familiar with each other and common processes. On the other hand, having a team that is made up of both internal and external members may result in a more comprehensive mandate and show members of the public that your local authority is keen to engage with the community and work together.

The number and background of your team members will vary. The team makeup that is appropriate for your community will depend on the specific impacts likely to occur in your region; the infrastructure and policies that will be affected; and how your local government intends to interact with other stakeholders and the public to prepare for climate change.[41] As such, it is important to take a first look at impacts at the beginning of your adaptation process, so as to bring on additional members to your adaptation team as your community's needs may change and evolve over time.

Consider This…

If you are a small community your staffing capacity may be limited. In such cases it might be necessary to involve individuals outside of your organization including scientific authorities, business community leaders, and/or provincial or federal agencies as participants of your adaptation team.

EXHIBIT 8

Potential Participants in a Climate Change Adaptation Team

DEPARTMENTS		
Agriculture	Environment	Police
Coastal Zone Management	Finance and Administration	Port and Harbour Management
Communications	Fire Services	Public Health
Economic Development, Culture and Tourism	Housing	Transportation
Emergency Management	Legal Services	Water
Energy	Parks and Recreations	Waste
Engineering	Planning and Zoning	

CASE STUDY

Building a Team – An Interagency FireSmart Committee in Kamloops, BC

In response to a growing concern about the frequency and severity of wildfires in Kamloops, the City established the Interagency FireSmart Committee, a multi-stakeholder team to coordinate wildfire responses. Drawing from a variety of stakeholder groups, team members include individuals from the City of Kamloops Fire Rescue Services; City of Kamloops Parks, Recreation, and Cultural Services Department; Ministry of Forests and Range; Thompson-Nicola Regional District; City of Kamloops Development and Engineering Services Department; and the British Columbia Office of the Fire Commissioner.

In addition to the participation of these stakeholders, the City of Kamloops also created a Community Wildfire Planning Group which consists of additional subject experts. The purpose of the FireSmart Committee is to recommend and support initiatives in order to reduce the risk of wildfire losses within the City boundaries. In 2007, the Committee produced a *Community Wildfire Protection Plan* which outlined the City's actions to date and contains a number of future recommendations to reduce the risk of life, property and environmental losses directly or indirectly related to wildfires within the City. The Kamloops inter-agency FireSmart Committee will collectively and collaboratively monitor and evaluate the Plan on a regular basis. For more information on Kamloops approach to adaptation or to get a copy of the *Community Wildfire Protection Plan* visit http://www.kamloops.ca/firerescue/wildfire/wildfireoverview.shtml

Developing a Mandate

Working with your team, you will need to develop a mandate for the adaptation team. The following questions are intended to help guide the development of the mandate:

- Is your adaptation team being established as a permanent working group?
- What are the ultimate deliverables the team is responsible for?
- How much time does the team have to accomplish these deliverables?
- What resources are available for the team to accomplish its work?
- What authority does the team have?
- To whom is the team accountable?

A clear and strong mandate will not only help the team with its work but will also give legitimacy to the work that is being carried out from an outside perspective.

Selecting a Team Leader

With your adaptation team and mandate in place, your next step is to designate someone as the team leader. This person will have the responsibility of assembling the team and leading its efforts. Given that your adaptation team will cross a variety of departments, it is important that the team leader have a strong understanding of municipal operations, be centrally located, have a good grasp of the community's concerns, and should be able to communicate well with colleagues from other departments or divisions. The team leader should also have authority to work with staff members from all departments; though they will not be the direct manager of all team members they should ideally have authority to require deliverables from the departments represented on the team. With the help of the team mandate and the appropriate authority, the team leader should be able to count on the willingness of departments to contribute.

Consider This…

It may be helpful to kick-off your community's adaptation efforts with trainings for staff, the community and other stakeholders on relevant climate science and predicted impacts. This also provides an opportunity to begin to think about sectors that would be most impacted by a changing climate. You can look to external organizations to conduct this training or, if the resources are available to you internally, you could have municipal staff do it.

2 *Worksheet 2 offers additional guidance on creating your adaptation team.*

Now that you've created your adaptation team you may want to revisit your list of stakeholders to ensure that the list is still relevant and there aren't any key stakeholders missing.

Selecting a Climate Change Adaptation Champion

Outreach will play a major role in building and maintaining support for your adaptation effort; therefore it is a good idea to identify an adaptation champion to lead outreach activities. In some cases you will have existing support from individuals for your climate change work, while in other cases you may have to develop a new champion. Selecting an appropriate champion will help solidify the awareness and long-term commitment from your local government to the planning process. Your adaptation champion should commit to this process and the responsibility of being the public spokesperson on adaptation to the community.

Potential champions include, but are not limited to, current (or former) elected officials, key business leaders, long-range planners, or other respected members of the community. It will generally be the case that your champion and team leader will be different individuals.[42] If, however, you feel that it is most appropriate for your community to have one individual that is both your adaptation team leader and champion this can also work.

Consider This…

Your community may want to hold a press event to introduce the Adaptation Champion. The event can kick off your adaptation effort and showcase publicly your commitment to the planning process.

CASE STUDY

Selecting an Adaptation Champion – A Climate Change Adaptation Champion in Toronto, ON

"While stopping the release of greenhouse gases remains our first priority, it's apparent that some degree of climate change has already begun. In developing an adaptation strategy, the City of Toronto is taking steps to prevent negative impacts associated with the realities of a changing climate while proceeding with actions designed to combat further change."

Mayor David Miller, Spring 2008

Ahead of the Storm: Preparing Toronto for Climate Change **is the City's adaptation plan which outlines a series of actions to improve Toronto's resilience to climate change including:**

- **A series of short-term actions beginning in 2008 that will help prevent and/or minimize the impacts of climate change in Toronto;**
- **A series of actions that will guide the City's development of a comprehensive, long-term strategy to adapt to climate change.**

Ahead of the Storm **was unanimously endorsed by City Council in July, 2008. Mayor David Miller has been a champion for the City's adaptation planning and the on-going implementation that it will involve.**

CASE STUDY

Championing Adaptation – An Advocate in Homer, AK

In September 2006, Mayor James Hornaday returned from a national convention on climate change which emphasized the critical role of local governments in reducing greenhouse gas (GHG) emissions and helping communities to begin preparing for unavoidable changes in the climate. Subsequently, in an effort foster leadership in climate protection, the Homer Global Warming Task Force (GWTF) was formed thanks to Mayor Hornaday's commitment to reduce the impact of climate change on the community. With further support from the Mayor, City Council approved the mandate of the task force via a council resolution in January 2007 which commissioned the GWTF to research and make recommendations to City Council on how to reduce GHG's and the impact of climate change on Homer's environment, economy, infrastructure and future development.

The resulting report, the Homer Climate Action Plan (CAP), was produced involving a number of stakeholders including the Alaska Marine Conservation Council, Sustainable Homer, Homer Chamber of Commerce, Alaska Conservation Solutions, Alaska Islands and Ocean Visitor Center, and ICLEI. To review the report visit **www.ci.homer.ak.usCLPL.pdf**

A FIRST LOOK AT CLIMATE IMPACTS

Once your adaptation team is formed, it is important to assess what common understanding exists about climate change and how it affects your community. As part of Milestone Two, *Research*, you will complete a more in-depth analysis of the effects of climate change on your region; however it is important to look at these questions at the beginning of the process so that you can ascertain what is already known about climate change and its impacts. Take this opportunity to brainstorm how climate change is impacting (or how it will impact) your community, what you already know about climate change, and how your community currently addresses climate change impacts via informal adaptation actions or existing policies that might include adaptation components. This will be a good opportunity to gather your adaptation team to brainstorm with, you may also want to consider bringing in additional people from various departments as this will help ensure that a broad spectrum of potential impacts is covered.

This initial brainstorming session is where you will lay the groundwork for identifying areas which will require further research and what resources are easily available to you now. You may wish to look at the basic question of *"How could climate change affect my region, and do these impacts pose a risk for my community?"*

Climatic Change:
Refers to the changes in climate variables including precipitation and temperature, as well as changes in sea and lake levels and the frequency and intensity of extreme events.

Impact:
The effects of existing or forecasted changes in climate on built, natural, and human systems.

IMPACTS AND SYSTEMS THINKING

Climate change impacts will be cumulative and often synergistic. As such, it is important to look at climatic changes and their impacts on a range of systems – physical, social, economic, and ecological. By looking at the variety of systems that are being affected, impacts on one system can be understood in the context of their relationships with other systems rather than in isolation (i.e. the effects of sewage system failures both on the physical sewer infrastructure and on the wider ecological system).

By examining the linkages and interactions between impacts and the entirety of the municipal system, the effect and nature of the climatic change will be better understood. Acknowledging that a change in one area of a system can adversely affect another area of the system, promotes organizational communication at all levels in order to avoid the silo effect.

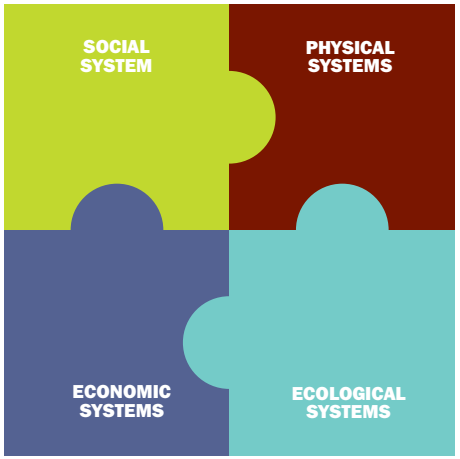
It is important to recognize that repeated or continued stresses, such as those posed by climate change impacts, can increase vulnerability, particularly when they occur in combination with other stress-inducing factors (such as population growth) and at high enough frequencies to prevent recuperation.[43]

Physical Systems

Climate change presents a variety of challenges for the physical infrastructure of communities. Expected climate changes will increase maintenance and protection costs, replacement costs and the loss of assets across the country.[44] Physical systems can include: dykes, culverts, roadways, bridges, buildings, sewer systems, and levees.

EXHIBIT 9

Impacts and Systems



Social Systems

Expected changes in precipitation, water levels, and temperatures will affect the complex social systems in communities across the country. Some impacts include: the health of individuals and particularly vulnerable populations; incidents of environmental refugees and displaced persons; limitations in the livelihoods of certain populations while improving the livelihoods of others; and increases in the need for (and alteration of) emergency response plans. These impacts focused on social systems will also be exacerbated by non-climate related phenomenon (i.e. economic downturn, civil conflict, etc.).

Economic Systems

Economic systems will be affected by climate change in a variety of ways: extreme events will cause significant economic losses; changing climate conditions will affect the production, price, and demand for goods and services; costs related to public health and safety will also result from climate change impacts.[45]

Climate change will also have a profound impact on the insurance industry.[46] The cost of insurance for homes and businesses, for example, has increased in recent years in regions where new research shows that the expected future damage is higher than historical damage.[47]

Consider This…

More than 1600 communities in Canada obtain 30% or more of their employment income from agriculture, forestry, fishing and hunting. The vulnerability of resource dependent communities to climate change reflects the high climate sensitivity, limited economic diversification and restricted access to services of many natural resource based industries.

Ecological Systems

Ecological systems will be profoundly affected by climatic changes. The impacts can range from: changes in abundance and/or distribution of species, large shifts in species ranges, increased fragmentation of habitats, and wildfire frequency and severity. Temperature and precipitation fluctuations will affect growing seasons, plant productivity, as well as animal habitat, migration patterns, breeding and survival rates, the incidence of insect infestations, and habitat diversity.[48]

In particular, ecological consequences will not be felt in isolation and should be considered in tandem when looking at climate change impacts. For example, vegetation and insects will shift in response to climate change and as a result, tourism and other recreational activities, such as bird watching, will be affected along with sectors such as agriculture, forestry and urban park management.[49]

Part One: A first look at climate change impacts

Having looked at the relationship among systems, Worksheet 3 *A First Look* is meant to assist your adaptation team with determining a preliminary understanding of climate change impacts and their effects on a variety of systems (physical, ecological, social, etc.) in your community, prior to having conducting research.

Some questions to get your team started include:

- What extreme weather events has your community already experienced? What were the impacts of those events?
- How well prepared is your community if such an event occurs again? Especially if such an event becomes more frequent or severe as a result of climate change?
- Based on your existing knowledge what climatic changes are the most likely to impact your community?
- Are there any opportunities associated with climate change that could arise for your community?

Part Two: First look at existing municipal actions

Before delving into the research stage in Milestone Two, it is helpful to take stock of existing actions that improve the adaptive capacity of your community; keep a list of actions that are already underway and even planned actions that might be relevant to the adaptation planning process. This will help your team evaluate where there are existing actions addressing weather related impacts, how these actions can be revised to accommodate for climate change and where there is a need for more action. Where actions exist that already address some aspect of climate impacts, consider how that impact is likely to change in the future and how the action might be revised to accommodate further climatic changes. For example, consider emergency management and response work, infrastructure maintenance, and public health actions. As you look at these existing actions, keep the impacts you've brainstormed previously in mind: Do any of these existing actions address the impacts you've identified? Can the actions be amended to account for climate changes?

Adaptive Capacity: Describes the ability of the built, natural and social systems to adjust to climate change (including climate variability and extremes), to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

Part Three: First look at existing plans and policies

As with actions, there may be existing plans and policies within your community that already address adaptation but perhaps aren't labelled as such; likewise there may be plans and policies that should include adaptation provisions in the future. Look into the variety of plans that exist across departments (i.e. Transportation Master Plans, Cycling Master Plans, Environmental Master Plans, etc.), as well as any other strategic policy documents (i.e. Official Community Plans, Long-term Sustainability Visions, Strategic Plans, etc.) and take stock of the way these plans may already include some elements of adaptation and which of these plans should in future iterations, include climate change adaptation components.

3 *Worksheet 3 will assist your team with a preliminary scan of existing knowledge on climate change impacts, actions which are already address elements of adaptation and look at the policies, plans, or other municipal decisions that pertain (or could include) adaptation elements.*

The information from Worksheet 3 will be the basis for communicating how climate change impacts will affect various service areas in your community to both internal and external audiences.

ISSUE BRIEFS

It is important that staff and decision makers from all departments within your local government are made aware of the importance of adaptation planning. Since adaptation actions will be required across most (if not all) departments, informing staff and managers from these departments early on in the process about projected climate change and the related impacts will help build support for the planning process. It will be helpful to the process if decision makers and individuals with influence are made aware of the importance of climate impacts within their spheres of responsibility and understand that there are realistic and practical measures that can be taken to reduce vulnerability.[50]

Issue briefs (as outlined in Worksheet 4) are a way in which various departments can communicate with each other. They may go by another name in your community, such as framework documents, memos or interdepartmental communications, however they all accomplish the same goal of interdepartmental communication.

Likewise, issue briefs can be used to communicate to the key stakeholders identified in Worksheet 1. They can help in communicating that the community is undertaking an adaptation planning process and offer information on how individuals or organizations can become involved.

4 *Worksheet 4 provides a sample issue brief which can be used to communicate both internally with other municipal staff and externally with stakeholder groups.*

PASSING A COUNCIL RESOLUTION

Though this guide will be particularly valuable to local government staff, it is important to acknowledge the importance of political level involvement in adaptation planning. By exposing local elected officials to key elements of the guide, and including them at significant points, staff can ensure that their efforts will have political support in the long-term. In this way, solidifying the adaptation planning process through a political commitment is an important component of Milestone One.

In making a political commitment to the adaptation planning process, you are ensuring that this process will continue in spite of possible political changes in the community. This commitment is not specific to particular impacts or corresponding actions, rather the council resolution is simply committing the community to examine climate change impacts and move forward with preparing a climate response plan. This kind of political declaration can provide a useful foundation to which your government, your future adaptation team and your successors will be able to refer. Passing a resolution highlights the importance elected officials place on climate change and serves as another opportunity to educate the public and local government staff on impacts, while also securing a path towards action and implementation far into the future.

CASE STUDY ***Passing a Resolution - Establishing the Miami-Dade Country Climate Change Advisory Task Force***

Through the adoption of Ordinance 06-113, the Board of County Commissioners established the Miami-Dade County Climate Change Advisory Task Force (CCATF) in July, 2006. The CCATF acts as an advisory body to the Board of County Commissioners recommending both mitigation and adaptation measures in response to potential climate change impacts. Through these recommendations the CCATF is working with the Board and the Mayor to solidify Miami-Dade's commitment to climate change adaptation planning and greenhouse gas reduction measures.

As your team develops a resolution for your community you may also want to consider:

- The provincial or territorial position on climate change and adaptation planning;
- How existing plans address climate change impacts and adaptation planning; and,
- How to involve internal and/or external stakeholders.

5 *Worksheet 5 provides a sample council resolution which will help in drafting your community's own climate change adaptation council resolution.*

WHERE SHOULD YOU BE NOW?

Upon finishing Milestone One you should have formed an interdepartmental (and possibly external) climate change adaptation team with a clear and transparent mandate; the team should be spearheaded by a team leader and likewise an Adaptation Champion should be identified who will build support and advocate for your adaptation planning efforts. Through the first steps of this milestone, you will have a sense of what the perceived climate change impacts are for your community (and how you may already be responding to some of these). Moving onto Milestone Two, *Research*, your adaptation team will delve deeper into the specific climatic changes that will affect your region and accordingly will refine the climate change impacts associated with these.

SUMMARY OF OUTPUTS

- **List of identified stakeholders**
- **A climate change adaptation team**
- **A climate change adaptation champion**
- **A first look at how climate change will affect your community**
- **List of existing municipal actions that improve adaptive capacity**
- **Identification of municipal plans that could involve adaptation components**
- **Council resolution which entrenches your communities' commitment to the adaptation planning process**

ENDNOTES

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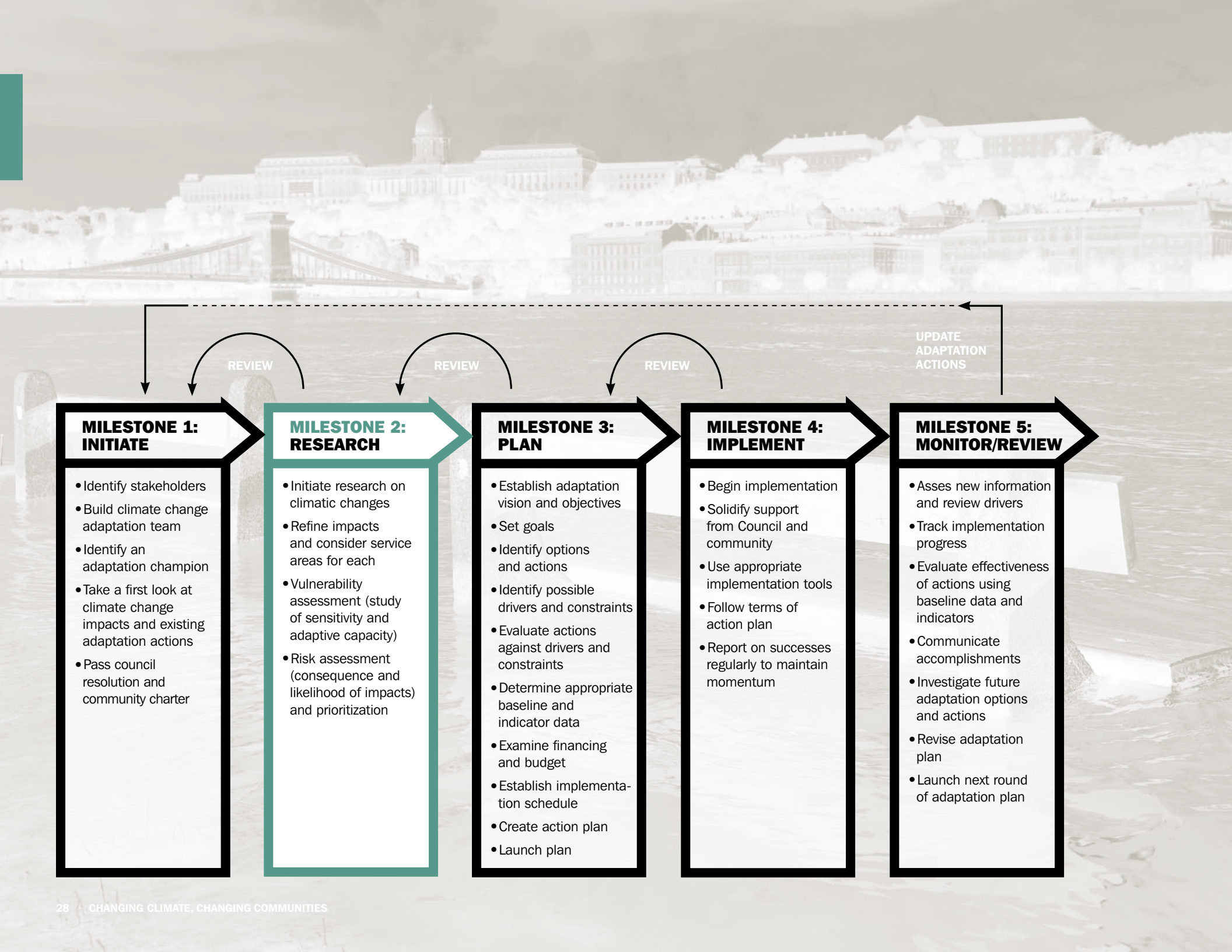
REVIEW
REVIEW
REVIEW
UPDATE ADAPTATION ACTIONS
MILESTONE 1: INITIATE
• Identify stakeholders
• Build climate change adaptation team
• Identify an adaptation champion
• Take a first look at climate change impacts and existing adaptation actions
• Pass council resolution and community charter
MILESTONE 2: RESEARCH
• Initiate research on climatic changes
• Refine impacts and consider service areas for each
• Vulnerability assessment (study of sensitivity and adaptive capacity)
• Risk assessment (consequence and likelihood of impacts) and prioritization
MILESTONE 3: PLAN
• Establish adaptation vision and objectives
• Set goals
• Identify options and actions
• Identify possible drivers and constraints
• Evaluate actions against drivers and constraints
• Determine appropriate baseline and indicator data
• Examine financing and budget
• Establish implementation schedule
• Create action plan
• Launch plan
MILESTONE 4: IMPLEMENT
• Begin implementation
• Solidify support from Council and community
• Use appropriate implementation tools
• Follow terms of action plan
• Report on successes regularly to maintain momentum
MILESTONE 5: MONITOR/REVIEW
• Asses new information and review drivers
• Track implementation progress
• Evaluate effectiveness of actions using baseline data and indicators
• Communicate accomplishments
• Investigate future adaptation options and actions
• Revise adaptation plan
• Launch next round of adaptation plan

MILESTONE 2:

RESEARCH

MILESTONE 2: RESEARCH

This chapter begins the research phase of your climate adaptation planning efforts. This segment of the planning process will provide a critical foundation on which all later stages of your adaptation effort will rest. An important part of assessing climate change impacts is not only obtaining information about changes in basic climatic variables such as temperature and precipitation, but also gathering information on what these changes will mean for the resources, infrastructure and residents of your community.

In Milestone Two, you will delve deeper into climatic changes and their impacts, how these impacts affect the service areas in your community, and the vulnerability and level of resulting risk your community faces.

PURPOSE	OUTPUTS
To research the climatic changes and impacts for your region and identify the main service areas that will be impacted by those changes.	✔ A list of impact statements and the service areas that will be directly or indirectly affected ✔ A vulnerability assessment ✔ A risk assessment ✔ A prioritized list of impacts – based on vulnerability and risk assessment

CHECKING BACK

Adaptation planning is an iterative process which requires a degree of continuous assessment. As you progress through Milestone Two, be sure to keep track of how new conditions within your community as well as new data on how the climate may be changing might affect the decisions you've taken in Milestone One. Examples of conditions that might influence your decisions include:

- Changes in staff (additions or decreases);
- New positions that have been created; and
- New stakeholders that might be of interest.

Maintaining the relevance and accuracy of your information throughout the planning process is extremely important as the information you collect informs the decisions you will make in the future. Monitoring and review will be articulated more formally in Milestone Five; however it will help down the road to establish a process of reflecting on the outcomes of the previous Milestone at each phase of the adaptation planning process.

CLIMATE CHANGE

As Exhibit 9 demonstrates, Canada is expected to get hotter, wetter and experience more instances of extreme events. Many of the most severe and costly climate change impacts will be associated with projected increases in the frequency and magnitude of extreme climate events and associated natural disasters. These events include flooding due to high-intensity rainfall and storm surges, ice and wind storms, hail, heat waves and drought. An understanding of future extreme events is particularly important for the design and maintenance of infrastructure, emergency management, and community health and safety and should be integrated into your adaptation planning efforts.[51]

In addition to increasing the intensity and frequency of impacts already being observed, a changing climate will bring new risks to some areas, including the introduction of vector-borne diseases into areas where climate conditions have inhibited survival of vector hosts in the past.[52]

The cumulative nature of impacts, and the associated uncertainties, makes it likely that climate change will produce some 'surprises'. However, as is the case for all human and managed natural systems, the magnitude of impacts can be reduced through adaptation.[53]

To Find Out More...
- **Information Annexes**

> **"Extreme weather events can become natural disasters when they strike vulnerable communities that are unable to manage the risk and are unprepared to cope with the hazard. People in Canada can be affected by natural disasters in other countries through indirect impacts on the availability and cost of goods and services, changes in financial markets, and requests for donations of money, clothing and food. An example was the spike in oil and gas prices in Canada following Hurricane Katrina in 2005, and the storm's impact on Gulf oil production."**
>
> Bruce, J.P. and Haites, E. (2008). *Canada in an International Context – From Impacts to Adaptation: Canada in a Changing Climate 2007*, edited by D.S. Lemmen, F.J.Warren, J. Lacroix and E. Bush; Government of Canada, Ottawa, ON, p. 387-424.

EXHIBIT 9

Summary of Projected Climatic Changes for Canada [54]

NATIONAL	PAST CLIMATE	EXPECTED CLIMATE (MEDIUM EMISSIONS SCENARIO)	LOW EMISSIONS SCENARIO	HIGH EMISSIONS SCENARIO	DEGREE OF CERTAINTY (DATA RETRIEVAL)
Annual Average Temperature	Annual temperature increase of 1.1°C from 1950-2000	Projected increase of 2°C by 2050 and 4°C by 2080	Projected increase by 2050 of 1°C and 2°C by 2080	Projected increase by 2050 of 5°C and 8°C by 2080	The values that are used for medium, low and high emissions scenarios reflect the average median projected change in temperature across six Canadian cities.
Annual Average Precipitation	Average precipitation increase of 29 mm from 1950-2000	Projected increase of 138 mm by 2050 and 171 mm by 2080	Projected increase of 46 mm by 2050 and 29 mm by 2080	Projected increase of 271 mm by 2050 and 333 mm by 2080	The values that are used for medium, low and high emissions scenarios reflect the average median projected change in precipitation across six Canadian cities.
Extreme Weather	There is evidence to suggest that extreme weather events, such as winter cyclonic storms, summer heat and drought, and flooding are increasing in intensity and frequency. These rapid rates of change may exceed certain coping thresholds.	N/A	N/A	N/A	Note: Not all extreme events can be linked to climate change however extreme weather events, such as flooding, wind storms, drought, ice storms, tornados and wild fires, highlight the vulnerability of Canadian communities and critical infrastructure to climate change.
CHANGES IN WATER LEVELS Rivers and Lakes	Water levels in Canada vary considerably over space and time.	N/A	N/A	N/A	N/A
Prairies	N/A	Projected decrease of ~9% in winter and spring stream flows by 2050.	N/A	N/A	N/A
Great Lakes	A 1°C increase in mean annual temperature is associated with a 7-8% increase in the evapotranspiration rates (AET) resulting in decrease water availability in the Great Lakes.	Water levels in the Great Lakes are generally projected to drop in the future.	N/A	N/A	N/A
CHANGES IN WATER LEVELS Sea	N/A	N/A	N/A	N/A	N/A
Atlantic Canada	Between 1911-2000 sea level has risen ~30cm	2000-2100 sea level is projected to increase 50-70cm	N/A	N/A	N/A
Pacific Canada	Average sea levels have risen 4-12 cm along pacific coast (E.g. high water sea levels in Vancouver increased by 16-34 cm) [55]	N/A	N/A	N/A	N/A

INITIATING YOUR RESEARCH

Having taken a first look at the climatic changes that your community has already experienced in Milestone One, it is now important to carry out research into the specific ways in which you region's climate may change. There are many sources of information on climate change, ranging from national and regional reports to basic fact sheets. Begin by collecting information on key climatic variables such as precipitation, temperature, changes in water levels and extreme weather events.

Exhibit 10 provides a list of organizations that collect or produce climate data, specific to each region of Canada. The information annexes also include resources ranging from regionally-focused climate change reports, to fact sheets and websites, which can help your team with researching projected changes in regional climate.

Note: At the time of publishing, only British Columbia, Prairies, and Atlantic Canada's Regional Adaptation Collaboratives had been announced. For more information on Regional Adaptation Collaboratives see the Natural Resources Canada website: http://adaptation.nrcan.gc.ca/collab/index_e.php

EXHIBIT 10

Sample Organizations with ClimateData by Region

REGION	ORGANIZATIONS	WEBSITE
International	• Intergovernmental Panel on Climate Change (IPCC) • Pew Center of Global Climate Change • Red Cross/Red Crescent Climate Centre • UK Climate Impacts Programme	http://www.ipcc.ch/index.htm http://www.pewclimate.org http://www.climatecentre.org/ http://www.ukcip.org.uk
National	• Canadian Climate Change Scenario Network • Canadian Institute of Planners • Centre for Indigenous Environmental Resources • Engineers Canada • Environment Canada • Environmental Systems Research Institute Canada • The Federation of Canadian Municipalities • International Association of Emergency Managers Canada • Natural Resources Canada's National and Regional Assessments • Ouranos • Policy Research Initiative	http://www.cccsn.ca http://www.cip-icu.ca http://www.cier.ca http://www.engineerscanada.ca http://www.ec.gc.ca http://www.esricanada.com/english/955.asp http://www.fcm.ca http://www.iaem-canada.ca/html/home/html/ http://www.nrcan.ca http://www.ouranos.ca http://www.policyresesarch.gc.ca
Atlantic Canada	• Atlantic Climate Adaptation Solutions • ClimAdapt	http://adaptation.nrcan.gc.ca/collab/index_e.php http://www.climadapt.com/aboutus.html
British Columbia	• British Columbia Regional Adaptation Collaborative • Pacific Climate Impacts Consortium • Pacific Institute for Climate Solutions • Professional Engineers and Geoscientists of BC (APEGBC) • Provincial Emergency Program	http://adaptation.nrcan.gc.ca/collab/index_e.php http://pacificclimate.org/ http://www.pics.uvic.ca/research/details.php?id=13899 http://www.apeg.bc.ca http://www.pep.bc.ca/index.html
Northern Canada	• Arctic Change • Canadian Polar Information Network • Northern Climate Exchange • Taiga Net	http://www.arctic.noaa.gov/detect/ http://www.polarcom.gc.ca http://www.taiga.net/nce/index.html http://www.taiga.net
Ontario	• Emergency Management Ontario • Ontario Centre for Climate Impacts and Adaptation Resources (OCCIAR) • Professional Engineers Ontario	http://www.emergencymanagementontario.ca/english/home.html http://www.climateontario.ca http://www.peo.on.ca
Prairies	• Alberta Emergency Management Agency • Prairie Adaptation Research Collaborative (PARC)	http://www.aema.alberta.ca/ http://www.parc.ca
Quebec	• Climat Municipalités • Ouranos	http://www.mddep.gouv.qc.ca/programmes/climat-municipalites/ http://www.ouranos.ca

One place to begin your research is with department heads and staff from your within your municipal government. By drawing on the expertise that exists internally, you can determine the type of information that is currently available and where there are gaps that require more research. Other options include collecting information through more formal staff meetings, special workshops, or informal discussions. Interviews with long-time residents, examining government records, and reviewing media archives (i.e. newspapers and magazines) are also effective ways of gathering more information on the impacts of notable past climate and weather events.[56]

The range of information available will vary from one community to another and can depend on where the community is located. Unfortunately, it may be difficult to find information on projected climatic changes by region that is sufficiently detailed for planning. One option for dealing with such limited information is to look at how sensitive your community was to past climate and weather events. Observed impacts can help a community assess their historic ability to respond and can inform adaptation planning in the future. This information can also be helpful in determining what type of climatic changes the community has been vulnerable to in the past and how important it is to plan for those changes in the future.

Consider This…

Some communities are already seeing climatic changes. For example in 2005, Toronto experienced the hottest summer on record where temperatures exceeded 30°C for a total of 41 days. The City had to issue 8 heat alerts, 18 extreme heat alerts and 48 smog advisories. Extreme temperatures are expected to continue as the frequency of hot days (above 30°C) in Toronto is expected to increase from 12 to 35 by 2050. Observed changes can be a good resource for communities as they help indicate adaptive capacity.

McBean, Gordon and Henstra, Dan (2009). *Background Report Climate Change and Extreme Weather: Designing Adaptation Policy*. Available for download at http://www.sfu.ca/act/documents/05_09-EWE_Background_Report_WEB.pdf

Anecdotal evidence may also be helpful if your community is faced with limited information. For example, memories of Aboriginal elders in the Arctic can help to supplement archeological records and ethno-historical accounts to provide more detailed information of how periodic, irregular and often dramatic ecosystems changes, triggered by periods of warming or cooling and extreme weather events, have influenced human life in the Arctic.[57]

CASE STUDY

Creating Partnerships to Increase Local Adaptive Capacity in Annapolis Royal, NS

Annapolis Royal, situated below sea level, has been flooding in certain key areas. The community, concerned about the risks associated with flooding during extreme weather events and notably spring tidal surges, went to the Town to explore the risks. Town staff in turn looked to the citizen-based group, Clean Annapolis River Project (CARP), to assess the Town's vulnerability to storm surges. The limited resources at the Town's disposal made this partnership mutually beneficial; and highlights a successful way to integrate other stakeholders into the land-use planning process. By knowing the risks, the Town was able to take preventative measures, and produce a set of initiatives that increase infrastructure stability, increase emergency preparedness and involve members of the public with emergency scenarios. After the risk assessment was complete, it became clear that adaptation action cannot remain isolated to one town/community, but rather, adopted by an entire region. Various surrounding communities were contacted to administer a large-scale risk assessment.

Partnerships

Partnerships (with local NGOs, non-profit organizations, local businesses and universities) are also valuable strategies that have been used by numerous communities across Canada in their adaptation efforts. See Exhibit 11 for a list of community's that have partnered with citizen-based groups, universities, other levels of government and neighbouring communities in their adaptation efforts.

EXHIBIT 11

Community Partnerships on Adaptation Planning

COMMUNITY	PARTNER	PARTNERSHIP
Annapolis Royal, Nova Scotia	Clean Annapolis River Project (CARP)	Annapolis Royal partnered with CARP, a citizen-based group, to conduct an assessment of the Town's vulnerability to storm surges.
Delta, British Columbia	University of British Columbia	Delta partnered with the University of British Columbia to create visualizations of how the community might look under alternative climate futures. Different scenarios of sea level rise and changing land and energy use were projected out to the year 2100. Workshops were then held to explore residents' reaction to the scenarios and to different response strategies.
Halifax Regional Municipality, Nova Scotia	The Federation of Canadian Municipalities Green Municipal Funds; Natural Resources Canada; Environment Canada; Nova Scotia Department of Energy; select members of ClimAdapat; community groups and local businesses	Halifax Regional Municipality launched ClimateSmart, a collaboration between public and private sectors that helps to mainstream climate change mitigation and adaptation into municipal planning and decision-making.
Kamloops, British Columbia	Thompson Rivers University	Kamloops partnered with Thompson Rivers University on a pilot project involving integrated approaches to surface fuel management and alternative noxious weed management in the hopes of mitigating wildfires in the surrounding area of the community.
London, Ontario	University of Western Ontario	Researchers at the University of Western Ontario conducted a preliminary analysis of London's rainfall intensity, duration and frequency curves in the context of a changing climate. The study formed the basis for revised engineering standards for the City's storm water management system and London's Adaptation Strategy.
Le Goulet, New Brunswick	University of Moncton	Le Goulet partnered with the University of Moncton to produce a comprehensive local plan to adapt to the impacts of climate change and specifically rising sea levels.

Working with Limited Information

Working with limited information, may require you to extrapolate relevant data from more general or nationally based sources. Much of the data on climate change impacts is presented within ranges (i.e. range of increases in temperature, precipitation, etc.) as it is difficult to determine absolute numbers when using climate models. It is important to remember that the idea of adaptation planning is to plan for various scenarios. Therefore, try and formulate high, medium, and low emissions scenarios to work from for each climatic change and adjust your potential responses according to the different scenarios.

It may also be the case that you are faced with too much information. In this case, use the questions below to refine your research and determine the most relevant information:

- What is the most basic information necessary to make an educated decision?
- How trusted is each source of information? Consider if the information presented has been peer-reviewed; did it emerge from a scientific study; does it come from an organization with a particular agenda; how recent is it; what is the level of certainty assigned to the information, etc.
- How closely does the information relate to your specific context? (region, ecosystem, community, etc.)
- Who is producing the information and are they regarded as an expert?
- Which organizations conduct research in your community or region pertinent to climate change?
- Who is the intended audience for the information?

Determining how much information is necessary will depend on your community and your experience with climate change. Also keep in mind that for some topics, your community may need more detailed information before actions can be derived.

RECORDING RESEARCH FINDINGS

Once you feel comfortable with the information you have collected and have determined that it is sufficient to base your adaptation plan on, you should make a commitment to monitoring the science that supports your climatic change scenarios to ensure that your planning process is drawing upon the most relevant and up to date information available.

Throughout your research you may also encounter reports on specific areas or topics of interest. Keep track of this information as it will be important later in the process.

As your team conducts research, track the information you collect and record:

- the source of information;
- the timeframe of any future projections (e.g. 2020s);
- the date ranges for any historical data;
- the range of expected change (e.g. 1.5°C-2.5°C annually); and,
- the extent of seasonal variability.

6a *Worksheet 6(a) can be used to record your research and other information on relevant climate changes.*

CASE STUDY ***Using Local Knowledge to Plan for a Changing Climate in Dawson, YT***

Northern Canada is due to experience rapid climatic changes, and this poses many challenges for the isolated communities that depend on specific resources and sound infrastructures. The northern community of Dawson, Yukon Territory acknowledged the strong need for adaptation planning and the residents played a key role in the production of the final community adaptation plan. In response to data gaps in the community, the City's activities shifted as local community members and their knowledge provided the informational resources to account for previous climatic changes. Local knowledge formed the basis of building a community-based climate change scenario. From such changes, they set out five different adaptation projects that respond to problems, such as infrastructure collapse, limitation of resources, changing resources and cultural shifts. As a result, the community is aware of the changes in their region and had an invested stake in the adaptation planning process.

REFINING IMPACTS AND IDENTIFYING SERVICE AREAS

Once you have identified how climate change is likely to affect your community, you should start thinking about how those changes will impact your community's services areas.

Also note that while it is important to emphasize that climate change will have negative impacts that community's need to plan for, it is also relevant to consider the positive impacts and subsequent opportunities that are associated with climate change. For example, one such opportunity might be longer shipping seasons due to decreased sea, river and lake ice cover, however lower lake and river levels could have other negative impacts on transportation which should be considered in tandem.[58] While it is likely that there will be some common impacts for Canadian communities, it is important to understand how climatic changes will uniquely affect local conditions.

Service areas are the areas in which a government or community manages, plans, or makes policy affecting the services and activities associated with built, natural, and social systems.

Whether positive or negative, impacts should be recorded consistently and should each address a similar scale. A description of an impact should include an identification of the 'someone' or 'something' that will be impacted, the specific way it will be impacted, and the reason the impact may occur. For example, "summer drought" is not a strong impact statement; but "increased demand on water supply due to summer drought" would be. Notice how the latter description answers all of the "what", "why" and "how" questions, and that the impact is a result of changes to climatic conditions, namely precipitation. Get as specific as possible, including whatever level of detail the reports you are consulting can provide.

Exhibit 12 provides a variety of sample impacts and identifies which service areas will be affected either directly (with an "X") or indirectly (with an "O"). This is not an exhaustive list; rather this table is meant to provide a few examples and should act as a starting point to get your team thinking about how climate change impacts will affect your operations and how to document impact statements.

Consider This…
Documenting assumptions and key information within your records is important as it will help to minimize inconsistent treatment of scientific data, incomplete transparency and poor archiving or protection of information. By carefully documenting sources (both written and verbal) you will help to ensure that other and future staff are able to understand your work.

6b *Worksheet 6(b) offers more instruction on refining impact statements and identifying relevant service areas.*

EXHIBIT 12

Impacts on Service Areas

CLIMATIC CHANGE Increased Temperatures in Summer	Agricultural Services	Biodiversity	Corporate Services	Economic Development	Culture and Tourism	Energy Services	Emergency Management	Fire Services	Environment	Forestry and Forestry Services	Housing	Parks and Recreation	Police	Public Health	Water Supply	Waste Management
Increased demand on energy due to increased cooling needs in summer			X	O	O	X	X				X		O	X	O	
Longer growing seasons which increases agriculture potential	X	X	X	O	O				X	X		X			O	
Decreased tourism in snow industries				X	X											
Loss of native plant and animal species (extinction or migration)	O	X			O				X	X		X				
Increased incidences of water and food borne illnesses due to warmer weather	O	O		O	O		O		O	O		O	O	X	X	
Increase in invasive species due to more favourable climate	X	X	O	O	O				X	X		X		O		
Increases in frequency and intensity of fires due to hotter and drier seasons	O	X	O		O		O	X	X	X	O	O	O	O	O	
Increased frequency of insect outbreaks due to warmer weather	X	X		O	O		O		X	X		X		X		O
Spread of infectious disease/ vector borne illnesses in summer			O	O	X		O		O	O	O	O		X	O	O
Increased demand on water supply due to summer drought	X	O	X	O	O			O	O	O	O	X		X	X	

VULNERABILITY ASSESSMENT

Vulnerability refers to the susceptibility of a given service area to harm arising from climate change impacts.[59] Vulnerability is a function of a service area's sensitivity to climate change and its capacity to adapt to climate change impacts (or adaptive capacity). A vulnerability assessment can be one of the more intensive components of Milestone Two: however it is important to spend the time conducting a thorough assessment so you are integrating an external dimension, namely sensitivity to climate, into your examination of your service areas. A vulnerability assessment also necessitates an understanding of both biophysical and socioeconomic implications as the focus is more on understanding the processes involved with climate change impacts and the factors that influence sensitivity and adaptive capacity.[60] This understanding will assist with the development of suitable adaptation actions later in Milestone Three.

While conducting your vulnerability assessment, consider the following questions:

Is the service area already able to accommodate existing weather patterns and changes in climate? For example, emergency response and fire services already have methods for addressing changes in climate (i.e. increased or decreased precipitation).

Are there barriers to a service area's ability to accommodate changes in climate? For example, the number of competing uses of a service area; the number of organizations involved in managing a service area; or the service area's biological, geographic or physical barriers might limit its flexibility.

Is the service area already stressed in ways that will limit its ability to accommodate changes in climate? An example is a community that has recently experienced economic downturn and does not have the resources to replace existing road culverts.[61]

It is important to note that the perspective on vulnerability assessment presented here, is one methodology looking at sensitivity and adaptive capacity; other methodologies exist which touch on these and other themes (i.e. exposure) and can offer a more quantitative approach for analyzing vulnerability.

Sensitivity Assessment

To determine how sensitive a service area is to projected changes in climate, consider the following questions:

- How exposed is the service area to the impacts of climate change?
- Is the service area subject to existing stresses?
- Will climate change cause the demand for a resource or service to exceed its supply or current abilities?
- Does the service area have limiting factors that may be affected by climate change?
- Are there measures that are presently in place that are able to provide a buffer against expected future changes?
- With regard to ecological sensitivity – is there a plant and animal species of concern in your service area that is currently located near the limits of its range?

The table to the right (Exhibit 13) assesses the sensitivity of water supply (sample service area) to the increased demand on water supply due to summer drought (impact). In order to: assess the service area's sensitivity to an impact first determine which climatic changes affect the impact in question and next identify how the service area is affected by these changes. The first step is to assess whether the service area is subject to any existing stress and whether the impact will exacerbate that stress. The final step is to assign a value (out of 5) representing the sensitivity of the service area to the climate change impact. See Exhibit 14 for the 1 – 5 Sensitivity Scale.

Adaptive Capacity

In addition to sensitivity, assessing vulnerability requires consideration of the main stressors, both climatic and non-climatic, as well as the socioeconomic influences on adaptive capacity.[62] Adaptive capacity describes the ability of built, natural and human systems to accommodate changes in climate with minimum disruption or additional cost.[63] To measure adaptive capacity, consider the projected impacts for your community and assess how those impacts will affect the systems in your service areas. Think about how the key determinants listed could affect your community's adaptive capacity. Also consider the extent to which current plans, policies and regulations account for the indentified set of climate variables and their future changes? By increasing adaptive capacity, a systems vulnerability to current and future climate is reduced.

Consider This…

ADAPTIVE CAPACITY AND RESILIENCE

Resilience refers to the capacity of a system, community, or society potentially exposed to hazards to adapt by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. Although similar to adaptive capacity, resilience also refers to the degree to which a community or society can organize itself and learn from past disasters.

(United Nations Inter-Agency Secretariat of the International Strategy for Disaster Reduction [UN/ISDR] [2004] Living with Risk: A global review of disaster risk reduction initiatives. United Nations Publication: Geneva.)

EXHIBIT 13

Sensitivity Assessment for Water [64]

IMPACT	INCREASED DEMAND ON WATER SUPPLY DUE TO SUMMER DROUGHT
SERVICE AREA	**WATER SUPPLY**
Which climatic changes affect the functioning of this service area?	1. Temperature (warmer temperatures expected across all seasons under all climate change scenarios, especially during summer months) 2. Precipitation (less rain in summer and snow in winter)
How is the service area affected by these changes today?	1. Warm winter and spring temperatures lead to lower snowpack and earlier snowmelt, increasing summer drought 2. Warmer summer temperatures increase evaporation rates and demand on water 3. Lower winter precipitation lowers winter snowpack, reducing water supply
Is the service area subject to any existing stress?	Water shortages have occurred in the past during particularly hot summer months.
If so, how will the impact exacerbate that stress?	More frequent hot spells with no rain may result in more shortages.
If the impact occurs, will it affect the functionality of the service area?	Yes – Functionality will become unmanageable (S5)

EXHIBIT 14

Sensitivity Scale

If the impact occurs, will it affect the functionality of the service area?				
No – Functionality will stay the same (S1)	Unlikely – Functionality will likely stay the same (S2)	Yes – Functionality is likely to get worse (S3)	Yes – Functionality will get worse (S4)	Yes – Functionality will become unmanageable (S5)

There are several key determinants of adaptive capacity:[65]

- **Economic resources:** Wealthier individuals, communities, regions, and nations are likely to be better able to bear the costs of adaptation to climate change than poorer ones.
- **Technology:** Lack of technology can impede adaptation.
- **Information and skills:** Information and trained personnel are required to assess and implement successful adaptation options.
- **Social Capital:** Connections between and within social networks improve the capacity of individuals and groups to prepare for and withstand impacts.
- **Institutions:** Nations with well-developed social institutions are believed to have greater adaptive capacity than those with less effective institutions.
- **Equity:** Some believe that adaptive capacity is greater where there are government institutions and arrangements in place that allow equitable access to resources.

Consider This…

In Canada adaptive capacity is generally high, owing to high levels of education, access to technology, and strong and effective institutions. As a result, Canada is well positioned to take action on adapting to climate change. However, there are significant differences in the ability to adapt among different sub-regions and population groups, resulting in differing vulnerabilities to climate change.

Lemmen, D.S., Warren, F.J. and J. Lacroix. (2008). *Synthesis – From Impacts to Adaptation: Canada in a Changing Climate 2007*, edited by D.S. Lemmen, F.J. Warren, J. Lacroix and E. Bush; Government of Canada, Ottawa, ON, p. 1- 20.

Keep in mind that due to the difficulty in measuring adaptive capacity, proxy indicators, such as per capita income, education level and population density, can also be used for some of the determinants.[66]

Although local governments often have similar determinants, it is important to recognize that there are differences in the adaptive capacity of urban centers and rural communities. Exhibit 15 provides a quick look at some of the strengths and limitations of both urban and rural communities.

EXHIBIT 15

General Differences in Adaptive Capacity between Urban and Rural Communities [67]

URBAN CENTERS	RURAL COMMUNITIES
STRENGTHS	**STRENGTHS**
• Greater access to financial resources • Diversified economies • Greater access to services (e.g. health care, social services, education) • Easier access to technology • Higher education levels • Well-developed emergency response capacity • Highly developed institutions	• Strong social capital • Strong social networks • Strong attachments to community • Strong traditional and local knowledge • High rates of volunteerism
LIMITATIONS	**LIMITATIONS**
• Higher costs of living • More air quality and heat stress issues • Lack of knowledge of climate change impacts and adaptation issues • Larger dependant populations (e.g. elderly and poorer residents) • High dependence on critical, but aging, infrastructure • Issues of overlapping jurisdictions that complicate decision-making processes	• Limited economic resources • Less diversified economies • Higher reliance on natural resource sectors • Isolation and limited access to services • Lack of knowledge of climate change impacts and adaptation issues • Lower proportion of population with technical training

Assessing Adaptive Capacity

Exhibit 16 provides a sample adaptive capacity assessment. Use the information from the sensitivity assessment completed earlier to frame the linkages between the climatic change, the effect on the service area and whether that service area can adapt to those changes. Based on that information, your team can assess the ability of the service area to accommodate these changes with little or no cost or disruption. Using the 1 – 5 Adaptive Capacity Scale in Exhibit 17, assign a value to represent the adaptive capacity of the service area and be sure to explain the reason for that assigned value.

EXHIBIT 16

Assessing the Adaptive Capacity of a Service Area [68]

IMPACT	INCREASED DEMAND ON WATER SUPPLY DUE TO SUMMER DROUGHT
SERVICE AREA	**WATER SUPPLY**
Can the service area adjust to the projected impact with minimal cost and disruption?	No - Will require substantial costs ($$$$$) and staff intervention (AC1)
Explain Response	Unable to “adapt” snowpack to warmer temperatures; limited options for expanding water supply and summer demand has already been greater than supply at times.

EXHIBIT 17

Adaptive Capacity Scale

Can the service area adjust to the projected impact with minimal cost and disruption?				
No – Will require substantial costs ($$$$$) and staff intervention (AC1)	No – Will require significant costs ($$$$) and staff intervention (AC2)	Maybe – Will require some costs ($$$) and staff interven-tions (AC3)	Yes – But will require some slight costs ($$) and staff intervention (AC4)	Yes – No to little costs ($) and staff intervention are necessary (AC5)

7 *Worksheet 7 provides tables for conducting both sensitivity and adaptive capacity assessments.*

With both assessments complete, the vulnerability of each service area can be determined. Those service areas with high sensitivity and low adaptive capacity are highly vulnerable; those with low sensitivity and high adaptive capacity have low vulnerability; and those service areas that have both high sensitivity and high adaptive capacity have a medium vulnerability.

CASE STUDY ***Assessing Vulnerability – A Analysis of Climate Change Impacts in Toronto, ON***

The City of Toronto conducted a *Scan of Climate Change Impacts* (2006) to determine which systems within the City are the most vulnerable to climate change impacts. The report concluded that the City's infrastructure systems – such as water supply, transportation of people and goods, health services and energy supply – are key points of vulnerability. The vulnerability assessment was followed by an assessment of initiatives in other cities which are adapting to climate change to determine the best course of action for the City of Toronto. Both reports can be found at http://www.cleanairpartnership.org/reports_cities_preparing

RISK ASSESSMENT

Risk is the combination of an event's likelihood and its consequences – risk therefore equals the probability of a climate hazard multiplied by the consequence of that event.

Risk = Likelihood x Consequence

CONSEQUENCE	LIKELIHOOD
What are the known or estimated consequences (economic, ecological, social, and legal) of a particular climate change impact?	How likely is it that a projected impact will occur? Some climatic changes, such as increasing average temperatures and seal level rise, have more certainty while the frequency of extreme events has less.

Use the results from the vulnerability assessment (those impacts labeled as having high vulnerability) along with research on projected climatic changes to estimate the consequence and likelihood of specific impacts. The likelihood assessment, together with the consequence evaluation, will constitute the risk score for each impact.

Exhibit 18 and 19, along with the exercises found in Worksheet 8 will guide you through assessing risk [Note: this risk assessment cannot be conducted without using the information found in Worksheet 8].

EXHIBIT 18

Risk Score for Impacts

		INCREASED DEMAND ON WATER SUPPLY DUE TO SUMMER DROUGHT	**INCREASED DEMAND ON ENERGY** DUE TO INCREASED COOLING NEEDS IN SUMMER	**CONTAMINATION OF STREAMS AND/OR LAKES** DUE TO SEWER OVERFLOW
CONSEQUENCE RATING	PUBLIC SAFETY (OUT OF) /5	3	4	3
	LOCAL ECONOMY AND GROWTH (OUT OF) /5	2	2	2
	COMMUNITY AND LIFESTYLE (OUT OF) /5	3	3	4
	ENVIRONMENT AND SUSTAINBILITY (OUT OF) /5	3	3	4
	PUBLIC ADMINISTRATION (OUT OF) /5	3	3	3
	CONSEQUENCE TOTAL (OUT OF) /25 (A)	14	15	16
LIKELIHOOD RATING	(OUT OF) /5 (B)	4	4	3
RISK SCORE	= A X B (OUT OF) /125	56	60	48

Note: the scale used in Exhibit 18 and Worksheet 8 assigns a low score of 1 and a high score of 5.

8 *Worksheet 8 provides more detailed instructions for assigning risk ratings for the impacts identified earlier.*

EXHIBIT 19

Risk Spectrum

Once you have completed Worksheet 8 you will have the risk score for each impact. The final step in Milestone Two is to organize the impacts according to the risk score from extreme to low; this will prepare your team to assign actions to each of the impacts that were assessed.

To prepare you for Milestone Three, begin considering the following questions:

- What are the extreme risks? Do they revolve around one specific climatic change?
- What are the lower risks?
- Are all of the extreme risks very costly to address?
- Which risks require political support?
- Which risks have dire consequences if not acted upon?
- Are we already considering these as risks within the community?

Consider This...

The Public Infrastructure Engineering Vulnerability Committee (PIEVC) Protocol developed by Engineers Canada is another risk assessment tool that is being used to assess the vulnerability of individual facilities or types of infrastructure (buildings; storm water and wastewater systems; water resources; roads, bridges and other transportation infrastructure). The protocol along with a variety of Canada-wide assessments can be accessed at http://www.pievc.ca/e/index_.cfm

WHERE SHOULD YOU BE NOW?

Upon completing Milestone Two, you will have undertaken research on the climatic changes that will affect your community and subsequently developed a list of impacts. You will also have conducted a vulnerability and risk assessment and should now have a list of impacts which have been prioritized by their risk score.

In Milestone Three, *Plan*, you will establish a vision, set goals, and identify both short and long terms actions to tackle the impacts that you have indentified.

SUMMARY OF OUTPUTS

- **A comprehensive understanding of climatic changes and impacts for your community**
- **A list of impact statements and the primary and secondary service areas affected**
- **A vulnerability assessment**
- **A risk assessment**
- **A prioritized list of impacts – based on vulnerability and risk assessment**

ENDNOTES

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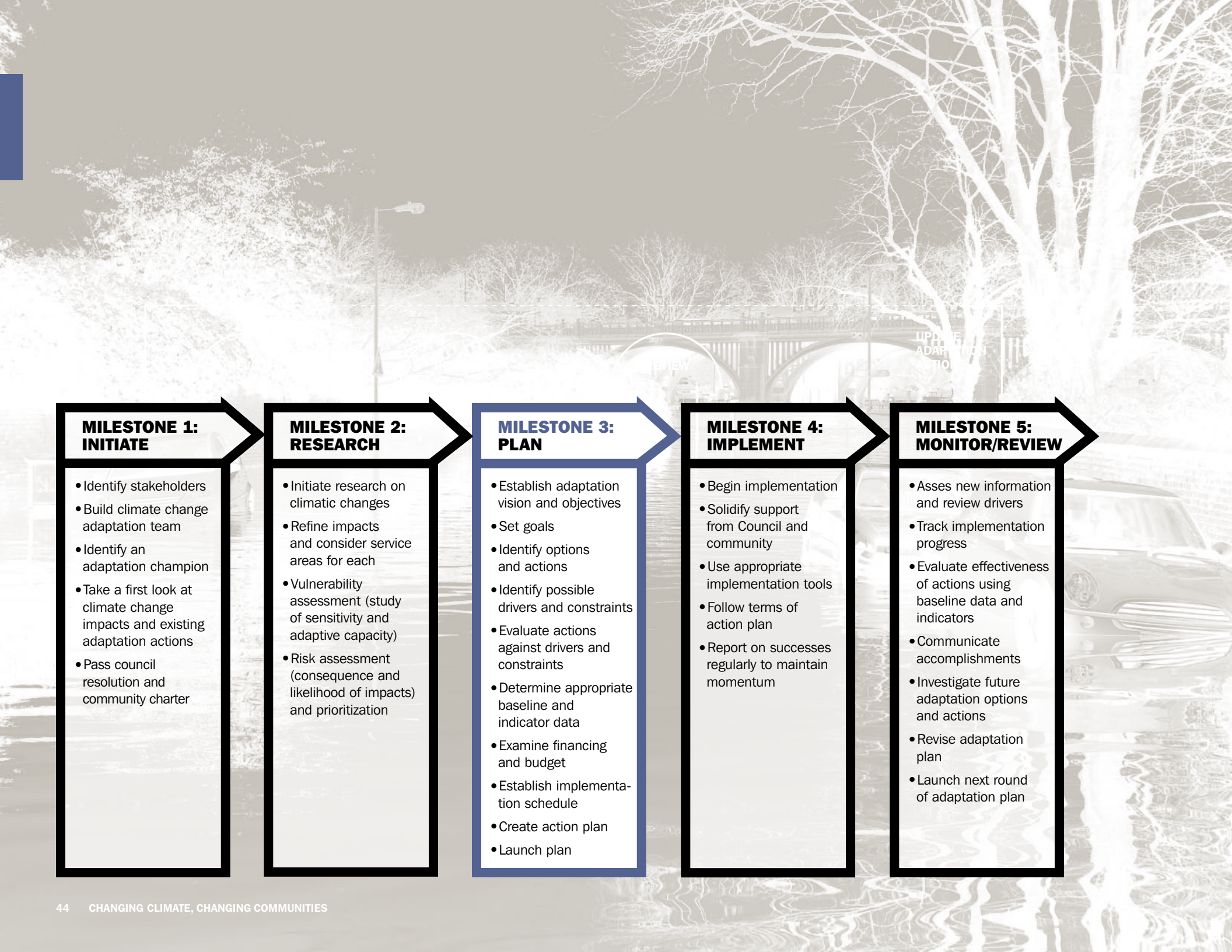

MILESTONE 1: INITIATE

- Identify stakeholders
- Build climate change adaptation team
- Identify an adaptation champion
- Take a first look at climate change impacts and existing adaptation actions
- Pass council resolution and community charter

MILESTONE 2: RESEARCH

- Initiate research on climatic changes
- Refine impacts and consider service areas for each
- Vulnerability assessment (study of sensitivity and adaptive capacity)
- Risk assessment (consequence and likelihood of impacts) and prioritization

MILESTONE 3: PLAN

- Establish adaptation vision and objectives
- Set goals
- Identify options and actions
- Identify possible drivers and constraints
- Evaluate actions against drivers and constraints
- Determine appropriate baseline and indicator data
- Examine financing and budget
- Establish implementation schedule
- Create action plan
- Launch plan

MILESTONE 4: IMPLEMENT

- Begin implementation
- Solidify support from Council and community
- Use appropriate implementation tools
- Follow terms of action plan
- Report on successes regularly to maintain momentum

MILESTONE 5: MONITOR/REVIEW

- Asses new information and review drivers
- Track implementation progress
- Evaluate effectiveness of actions using baseline data and indicators
- Communicate accomplishments
- Investigate future adaptation options and actions
- Revise adaptation plan
- Launch next round of adaptation plan

MILESTONE 3:

PLAN

MILESTONE 3: PLAN

Milestone Three, *Plan*, will help you establish a vision, goals and objectives for your community's adaptation effort. In addition, in this chapter you will use the impacts you identified as well as the results of the vulnerability and risk assessment that you conducted in the previous milestone to help you prioritize the impacts your community faces. Based on these priorities you will develop both short and long term actions to address significant impacts. As you develop your actions, you will also examine the constraints and drivers which may affect your ability to implement your actions. From there you will address the financial aspects of these actions. Finally, using this information you will create and finalize your climate change adaptation action plan.

PURPOSE	OUTPUTS
To establish your short and long terms adaptation actions and finalize your climate change adaptation plan.	✔ Vision ✔ Goals and Objectives ✔ List of Adaptation Actions ✔ Financial implications of your plan

CHECK BACK

As you proceed through Milestone Three, be sure to keep track of how new conditions within your community might affect the decisions you've taken in the preceding milestones. One way to ensure that your research stays up-to-date is to make a commitment to monitoring the information that you've used to identify the climate change impacts in your community. As future climate projections change, for example, you may find that you need to reassess the vulnerability and risks associated with those changes for your community – be sure that the projections are significant enough to warrant the reassessment. Likewise be sure to consider any internal changes with the community that might affect the make-up of your adaptation team, larger stakeholder network, or political support for your effort.

ESTABLISHING A CLIMATE ADAPTATION VISION

Establishing a vision for you adaptation plan provides an opportunity to integrate your adaptation goals into the broader vision of your entire community. This is not a necessary step; however it is a useful exercise and will help your community set your adaptation goals and objectives a little later on. Engaging the community in visioning exercises may help to solidify their support and commitment to climate change adaptation (be careful to not let the visioning process slow your community down in the overall development of your adaptation plan).

An adaptation vision is a statement on where you want your community to be in the future with regard to climate change adaptation. For local governments embarking on the adaptation planning process a vision will help to: establish what a climate resilient community looks like; articulate where you'd like to see your community in the future; and will be something to refer back to throughout the planning process and while implementing adaptation actions.

A vision statement also acts as a call to action and can be a catalyst to inspire change; as such it is an important element to include in your adaptation plan. Ideally, it should incorporate the values that are important to your community while also communicating the purpose and intended outcome of your climate adaptation plan.

Key questions to consider while establishing your vision:

- What are you trying to accomplish with your climate change adaptation plan?
- What does a well adapted community look like?
- What sort of climate change impacts will affect your region?
- Who is your target audience: council, stakeholders, and/or citizens?
- Will the Adaptation Plan be a key public document?

Consider This…

There are both pros and cons to community engagement; specifically as to the types and frequency of such engagement (for example: asking for input too frequently may lead to stakeholder burnout, however, not including the public in various stages can result in aggravation and loss of interest). It is important to consider these factors as you seek public input throughout the planning process.

EXHIBIT 20

Sample Vision Statements

COMMUNITY	VISION
Keene, NH	"The impacts associated with a changing climate are already being felt in Keene. From more frequent and severe flooding, to changes in annual snowfall amount, to the infestation of non-native plant and animal species, to increases in the total number of high heat index days and more numerous poor air quality days, the City has come to recognize that these changes are ultimately impacting the community's built, natural, and social environments. To address these changes, the City of Keene has committed to the Climate Change Adaptation Plan to help make the community resilient to the effects of climate change. The City of Keene strives to be a protected and sustainable community which prioritizes public safety and climate protection."
North Vancouver, BC	"The City of North Vancouver's vision is to be a vibrant, diverse, and highly liveable community that strives to balance the social, economic and environmental needs of our community."
St. John, NB	"Our Saint John, Canada's first city, leads the nation as an example of a sustainable community. Our Saint John was born of the water. Like the tides we live by, we are responsive to the constant changes in our environment, economy and society. Our Saint John is a liveable city designed for people where everyone can feel at home. We are diverse in cultures, rich in arts, full of exciting entertainment and recreational activities. Our Saint John provides educational excellence and life-long-learning opportunities to help people reach their full potential. Our dynamic economy is built on creativity, innovation and entrepreneurial spirit. Our Saint John is a population of problem solvers where each individual and organization has a vital role to play. It is a place where leadership is based on transparency, integrity and trust. Our Saint John is a place where we overcome our challenges and live our dreams. This is our Saint John."
Toronto Environment Office, City of Toronto, ON	"The Toronto Environment Office works to be a recognized centre of environmental excellence for the City, providing the leadership and building the partnerships to ensure a clean, green and sustainable future for all."

Remember that your vision is meant to inspire, energize and help create a picture of your resilient community.

SETTING YOUR ADAPTATION GOALS AND OBJECTIVES

Goals

Once you have completed your vision, your team can now develop adaptation goals. Goals should be phrased in reference to the climatic changes that are threatening your community. They will act as high level intentions which a community will strive towards. Goals are general statements about the expectations of a program or plan, for example:

- Increasing public awareness of climate change and its projected impacts on our community.
- Increasing technical capacity to prepare for climate change impacts.
- Increasing adaptive capacity of built, natural and human systems in our community.

CASE STUDY

Setting Goals – Climate Resilient Community Goals and Objectives in Keene, NH

Based on their top ranking risks, Keene, New Hampshire's Climate Resilient Communities Committee members divided into three teams (one per service area) and developed a set of goals and objectives for each impact. The goals and objectives were identified as ways in which the City government could begin efforts to adapt to climate change.

For example, one goal was to "reduce the likelihood of structural damage resulting from predicted increases in severe weather events." The objectives (or targets) which accompanied that goals included: a) encourage more pitched roofs and incorporate design standards that consider snow stacking and ice falling zones; b) identify a 200-year floodplain and prevent future development in these areas; and c) Investigate design standards for buildings that currently handle weather conditions similar to the climate forecast New England can expected in the future.

For more information on Keene's goals and objectives see *Adapting to Climate Change: Planning a Climate Resilient Community (2007)* at http://www.ci.keene.nh.us.

Objectives

Now that you have identified community goals, you can set specific objectives. Objectives refer to the ways in which your community intends to overcome the impacts that have been identified (in Worksheet 6b) and represent the path towards achieving your vision. Some objectives might be specific, while others might be broad and thus more challenging to measure.

Remember that adaptation objectives will vary from one community to another based on a variety of factors, including: types and magnitude of projected climatic changes and impacts; level of support for adaptation efforts; and service areas on which your community has direct influence. Some examples of objectives include:

- Expand and diversify water supply
- Increased drought preparedness
- Reduce shoreline erosion
- Reduce the impact of extreme heat events
- Reduce flooding and erosion impacts on infrastructure
- Improving energy conservation
- Lower the ecological footprint of existing buildings
- Engage energy providers to enhance local renewable energy generation opportunities
- Support the local agricultural economy
- Protect local habitats and migration routes

9 *Worksheet 9 offers guidance on visioning and setting goals and objectives.*

IDENTIFYING ADAPTATION OPTIONS

Based on your high priority impacts (identified through the risk assessment in Milestone Two) and your community's objectives, your team can now begin the process of developing adaptation options for how to overcome the impacts of climate change. These options should be broken down into short- and long-term time frames, and should reflect your community's vision and the objectives that you have identified previously.

Adaptation options include a wide range of actions or activities and will likely involve some combination of the following:

- **Modifying policies, plans, practices and procedures:** Existing by-laws, codes, regulations, policies, development plans, and operating practices may have to be modified in order to adapt for climate change impacts.

- **Building new or upgrading existing infrastructure:** Examples of this include expanding stormwater collection systems, expanding wastewater treatment capacity, increasing bridge heights or strengthening levees.

- **Improving community awareness and public education:** To generate support for adaptation efforts your municipality will likely need to use outreach and education actions. These can also be useful to effect voluntary change at the individual level, such as water or energy conservation.

- **Varying and/or diversifying your options:** By developing "safeguards" against climate change impacts you can increase the preparedness of your community. Examples can include: diversifying your community's economic base to move away from sources that will be negatively affected by climate change (i.e. coastal recreation); developing new groundwater sources to expand water supply; or diversifying your energy supply to include renewable energy to both help mitigate climate change impacts and reduce demand from the electric grid during heat waves.

10 *Worksheet 10 will help you identify adaptation options and relevant departments.*

These options will be refined later through an assessment of drivers and constraints in Worksheet 11.

SELECTING OPTIONS

There are many factors that will affect the type of actions your community includes in your final adaptation plan, including the resources that are available and the extent of your community's vulnerability to specific climate change impacts.

As you develop your adaptation options, keep in mind that these should not only address the climate change impacts which your community is facing, but should do so in a sustainable way. Specifically, they should not impede any wider sustainability efforts.

For example: if not given proper consideration, adaptation actions can increase local greenhouse gas emissions unless they are considered together, and likewise mitigation measures can actually increase a community's vulnerability to climate change impacts.[69]

For that reason it may be relevant to consider adaptation actions which have co-benefits i.e. those that benefit both adaptation and mitigation efforts. For more information on adaptation-mitigation co-benefits see the Drivers section below. In addition, the *Canadian Communities' Guidebook for Adaptation to Climate Change* produced by Environment Canada helps to identify those actions that support sustainability efforts while at the same time improving resilience.

Alternatives... It is likely that there will be actions that can be carried out now. Although it is important to include these actions within your final plan, it is not be necessary to wait for a formal plan before implementing them. In such cases, it may be valid to go ahead with the action before more formal planning has occurred.

CASE STUDY

Leading By Example – Department of Environmental Services Adaptation Plan in Quebec City, QC

In 2006, Quebec City decided to create an adaptation plan for its Environmental Services department. This proactive approach was driven by the desire to reduce both the costs and negative effects of a changing climate on the City's operations and infrastructure. During the development of the plan, it was recognized that many actions existed in management plans that could be considered adaptation actions as they serve to reduce vulnerability to climactic changes. Therefore, throughout the planning and consultation process, staff was encouraged to identify both existing and new adaptation measures. Both were included in the final adaptation plan which commits the Environmental Services department to consider the impacts of a changing climate in all of its operations, projects, plans and bylaws. However, the majority of adaptation actions included in the plan target the aquatic environment and drinking water in Quebec City as these are areas of high vulnerability.

DRIVERS

Similarly to the drivers that influenced you to begin adaptation planning, there are also factors that can drive the implementation of an action. In many cases, the drivers of action will be the co-benefits and opportunities which result from the implementation of that action. Co-benefit strategies are those which aim for the win-win options and have multiple benefits and which often build the most momentum and support. For example, a co-beneficial action may be one that addresses both adaptation and mitigation goals, or it might be an action which is both cost effective and will increase local adaptive capacity.

Other possible drivers include:

- Externally identified vulnerabilities – an academic study which examines the vulnerability of the community may spur interest and action on climate change impacts;
- Funding opportunities – funding becomes available to develop and implement adaptation actions;
- Economies of scale – it may be more cost effective to split the cost of implementing an action over many departments as the issues are cross-boundary and results can be valuable across many departments, therefore interest from multiple departments may drive implementation;
- Co-benefits – strategies which aim for the win-win options and have multiple benefits;
- Fear of inaction – the fear of being adversely affected by climate change impacts;
- Damage to infrastructure – damaged infrastructure due to a climatic change might spur the implementation of actions to replace or update inadequate infrastructure; and
- A localized weather event that drew attention to the need for preparedness actions.

Constraints

In addition to drivers for the implementation process, there are also a variety of constraints which may affect your community's ability to implement adaptation actions. Whether or not to include constraints in your formal adaptation plan will be the decision of your adaptation team, however, considering these constraints while drafting the plan is necessary for both setting timelines and allocating staff responsibilities.

Constraints may be scientific, social, operational, environmental or financial. To identify any applicable constraints consider the following questions:

- Do you have enough scientific information to act?
- How much support (financial, personnel, infrastructure) do you have? How much do you need? Where or with whom might you find what you don't currently have?
- Is the identified option possible within your community's policy context – does your government have the power to change the policies that are influenced by climate change?
- Who has the authority in your local government to enact adaptation actions? Are they already involved in the planning process?
- Do you have sufficient support from council to carry out an option?
- How would a change in political leadership alter the implementation of an option?
- Who will you need to convince that action needs to happen now?
- How much time do you need to develop and implement each option?
- What resources do you have already? What else might you need? Are these internally or externally available?
- How will the environment be impacted? Is this impact positive or negative?
- Will the option have implications for mitigation activities?

Constraints that may influence implementation:

- Lack of available information
- Cost
- Staff capacity
- Number of departments involved
- Silo thinking
- Lack of messaging
- Need for external resources
- Lack of agreement on severity and timing of climate change impacts
- Political will
- Competing or short timelines
- Effects on mitigation activities
- Provincial or territorial legislation

Worksheet 11 provides more detailed information on drivers and constraints and how to identify them. The worksheet will also assist in identifying possible ways to overcome them.

CREATING A BASELINE

While developing your adaptation plan, you will develop a set of indicators that can be used as a baseline against which the effectiveness of your community's adaptation actions can be gauged. These indicators can also help assess how your community's vulnerabilities are changing based on implemented actions and whether these actions increase or decrease your community's adaptive capacity or sensitivity to climate change impacts.

Collecting Baseline Data

Adaptation baseline data provides a record of a community's current condition as it relates to vulnerability and risk. In order to create a baseline your team will need to identify a set of indicators which can be used to record your community's current conditions.

The process of establishing baseline data can range from exhaustive (touching on sensitivities, adaptive capacity, exposure, etc.) to cursory (selecting only one or two sample indicators). Keep in mind that the more information that is gathered at this stage, the better equipped your community will be to communicate the successes of your adaptation actions later in Milestone Five. Collecting baseline data is also a good opportunity to utilize the help of students, volunteers and/or interns.

Consider This…
Collecting baseline data can also be used as an entry point to your community's adaptation work. The City of Boston took this approach and created a baseline prior even to their first look or vulnerability assessment.

Indicators

Indicators should be precise, clear and easy to understand. The specific indicators for your community will vary based on the actions that you have indentified but can include quantitative data (e.g. the quantity of infrastructure that has been replaced, the amount of cooling centers that have been opened, etc.) or more qualitative data on the activities that have been carried out by city staff (e.g. number of reports on the effects of climate change creation of opportunities for collaboration, public awareness on the issue of climate change, etc.).

For example, if your objective is to increase public awareness of climate change and its projected impact on your community there are a variety of indicators that can be used to measure public awareness including:

- Attendance sheets from public meetings on climate change;
- Tracking "hits" on community-sponsored or community-run web-pages; and
- Surveys examining whether elected or public officials understand how climate change impacts relate to major decision making and how those decisions either reduce or increase climate change vulnerabilities or risks.

Such indicators will help your community assess the effectiveness and success of your adaptation plan over time and determine areas which require further planning and/or action.

12 *Worksheet 12 offers more guidance on how to establish baseline data using indicators and provides sample indicators that can be used to track changes in sensitivity and adaptive capacity.*

DRAFTING YOUR CLIMATE ADAPTATION PLAN

After having considered drivers and constraints, the actions that you have identified will make up your climate adaptation plan. In order to move from a general list of adaptation actions to a more formalized plan you will need to identify, for each action: when it can be implemented; sources of funding for its implementation; and assign responsibilities for implementation to relevant departments.

Short-term or immediate actions might include ones that can be done quickly, for a low cost or as part of routine operations; whereas long-term or ongoing actions might require changes to by-laws, planning documents, or a dramatic increase in a departments operating budget. To determine timelines for short-and long-term actions, your adaptation team should consider the specific circumstances in your community and the specific impacts you've identified. Likewise, in the action plan, you will want to include actions which have already begun but will be expanded to address the impacts that have been identified.

Whether or not action is required immediately can often be determined by the imminence of the impact the action is meant to address. If the impact requires immediate action, due to safety concerns for example, than it will likely require immediate and short term actions. Keep in mind that such short term actions may also have to be supplemented by longer term and ongoing actions. One example would be the replacement of a specific culvert or storm drain where the short-term action is the physical replacement and the longer term action being changes to the policies regarding the frequency of infrastructure replacement or the sizing of all new culverts.

Consider This...

Consider that certain low consequence impacts may be easily addressed in the short term and may give the community a success to celebrate. For example, changes in animal and bird migration patterns may be addressed through a public awareness and education campaign that promotes the protection and maintenance of these species migratory path and creates awareness around the importance of bird habitats. Such a short-term action (such as a public event on the species) is both low cost and low resource intensive but gives the community an accomplishment to celebrate and report against, without any significant expenditure.

For each action it is important to identify:

- A responsible department – this will be the department charged with implementing the action;
- Other relevant department (s) – any other departments that should be involved with planning and/or implementation;
- Timeline – is this action ongoing, immediate, future – when should it start and how long will it take to complete;
- Costs – what are the anticipated costs of an action – this can be represented with symbols (i.e. $, $$, $$$, $$$$) or with words (i.e. negligible, variable/fixed, significant) this estimate is not meant to act as a budget but rather an estimate of the expected costs;
- Funding – can this be funded by an existing budget, through third-party funding, future budgets, etc.;
- Benefit – what will be the environmental, social, or environmental benefit associated with implementing this action;
- Target - what are your community's objectives and actions striving to accomplish within a defined timeframe? What are the numerical standards to measure progress against?

- Indicators - what is the baseline information required to measure the effectiveness of the action against (i.e. the amount of existing permeable surface, number and size of urban hot spots, number of policies that include climate change adaptation considerations, etc.). [Refer to Worksheet 12 for more information]
- Pre-cursors to action – what steps need to be taken to enable the implementation of an action (i.e. research studies, establishing partnerships, etc); and
- Other factors – what other factors are important to consider for this action (pre-planning needs, major sub-tasks, potential barriers, etc.).

In some cases there may be existing municipal actions or measures which lesson a community's vulnerability to climate change. In Milestone One, your adaptation team would have done a preliminary scan of such actions. If appropriate, this list of existing actions can also be included in your community's final adaptation plan.

Sub-tasks should be developed where necessary and should include a relevant order for implementation if one task depends upon the successful implementation of another task.

It is also important to build in a certain degree of flexibility into the plan. As new information becomes available you may find that actions or timelines need to be revised. Adaptation planning is an ongoing process as climate change science is constantly evolving. As social, economic, and environmental conditions change your original assumptions may also need to change. There is more detail on the process of monitoring and review in Milestone Five.

Alternatives... Some community's are addressing adaptation without formalizing their process via the creation of a Preparedness Plan. If this approach suits your community better, it is possible to create a list of adaptation actions to share with relevant stakeholders.

Financing

Financing adaptation actions is an important element to your adaptation plan, however as stated earlier, it cannot be the sole reason for pursuing or postponing action. When budgeting for climate change adaptation it will be important to consider the following questions:[70]

- Which actions can be incorporated into existing projects or expenditures?
- Which actions will require new expenditures?
- Is there a payback period for the action? (e.g. an action with a mitigation co-benefit may have a payback period associated with it)
- What are the potential savings over the lifetime of the improvement? Will replacing a piece of infrastructure with better technology save costs over the use of the older technology?
- What are the project's life cycle costs?
- Is funding available in the existing municipal budget?
- What alternative funding sources exist?
- Are there legal or insurance costs associated with inaction? How do these compare to the costs of building or replacement?

Your adaptation team will likely have to seek the input of senior management and department heads to find specific answers to the questions above. Making a detailed financial plan, or at least considering the financing mechanisms in as much detail as possible, will make your adaptation plan much more comprehensive and will ease with the implementation phase in Milestone Four.

Setting Targets

Although your community may already have mechanisms which can help to determine whether you are meeting your goals and objectives, it will be important to set specific targets to measure the progress and success in meeting your adaptation objectives and actions. These targets should be included within your adaptation plan as they will provide a benchmark for your community's successes and challenges.

To the extent possible, identify what your community's objectives and actions are striving to accomplish within a defined timeframe (e.g. develop a downtown food co-op by 2015 or designate reliable shelters for extreme heat events by 2012) and any numerical standards to measure progress against (e.g. improving energy conservation by 25% or increase local food production by 20%). Numerical standards will only be possible in cases where baseline data is available (i.e. energy use prior to an adaptation action). In some instances, baseline inventories from Milestone One of the *Partners for Climate Protection* program can be used to supply this information.

Estimate How Progress will be Measured and Evaluated

A method to monitor the progress and effectiveness of your community's actions should be included in the action plan in preparation for the fifth and final Milestone, *Monitor and Review*. Building monitoring and review activities into your plan can contribute to its long-term success. How frequently your community assesses the progress towards your adaptation objectives will depend on a variety of factors including the nature of your planning processes, your community's budget cycle, and the implementation timeline for associated actions. The indicators that are established are a natural starting point for monitoring and review; add to these by outlining the specific times at which progress will be measured.

Building in measuring points on an annual basis can act as a mechanism to build and continue momentum for the adaptation process as your community moves through the implementation phase in Milestone Four.

Identify Possible Funding Sources

Where funding does not exist within existing budgets, there may be other options to securing funding for adaptation activities. Seeking external or third-party funding can be an excellent way to start off any adaptation action. The following table (Exhibit 21) provides an example of possible funding sources and the types of actions that they can help to finance:

EXHIBIT 21

Possible Funding Sources

SOURCE	FUNDING POSSIBILITIES
Green Municipal Funds	Available for municipalities with innovative environmental projects – GMF grants and below-market loans directly support municipal initiatives.
Partnerships	Opportunities for funding through partnerships with local universities and/or non-profit groups particularly for research and public outreach.
Federal government departments	Infrastructure Canada (gas tax funding), Natural Resources Canada Climate Change Impacts and Adaptation Division, and Federal Government EcoAction Fund are some examples of federal funders.
Revolving funds	Using the savings from existing mitigation work to help fund the expansion of adaptation actions. This can be particularly useful where the action is being instituted as part of the adaptation plan but will also have an economic payback via budgetary savings. See the City of Edmonton case study in the case study box below.
Carbon trading	Once you've met your council's commitment to emissions reductions, any surplus emissions reductions you make could be traded and the income from these could be used to support your adaptation actions.

CASE STUDY

Securing Funding – Energy Management Revolving Fund in Edmonton, AB

The City of Edmonton has a revolving fund aimed at financing energy retrofits for City facilities. The benefits of a revolving fund include: it reduces operating costs, projects are not competing for limited capital funds, and due to the internality of the fund there is flexibility to address changing conditions. This or similar revolving funds can be used to fund adaptation actions.

It is important that your adaptation team realistically looks at the costs associated with the actions that it identifies. However, as stated earlier, costs should not inhibit adaptation actions from being included in the plan. Where applicable, actions can be timed around the investigation of future funding opportunities or partnerships to seek funding for a given action.

Create an Implementation Schedule

The creation of an implementation schedule is the backbone for the implementation milestone (Milestone Four). Note that although it is included here as part of the planning process, it could also be used as an implementation tool and be created as the first steps of Milestone Four.

Earlier your adaptation team identified an estimated time to implement and/or complete each action; these timelines should now be finalized and compiled to create an overall implementation schedule. This schedule will track each action and associated tasks/sub-tasks, and will include a calendar of when each action is to be implemented (including the lead department, financing requirements, etc.). A comprehensive implementation schedule will help later to monitor what progress is being made on the adaptation plan. Keep in mind that the purpose of the implementation schedule is not to prioritize or rank adaptation actions but rather provides a tool for planning the implementation of each action. Also note that the implementation schedule will likely cover an extensive period of time as all adaptation actions, from immediate to ongoing, should be included.

13 *Worksheet 13 will assist your community with drafting your adaptation plan, providing guidance on how to identifying timelines, associated costs, responsible persons, other resources (external support, tools, financing), pre-cursors and sub-tasks for each of the actions that have been identified as well as an implementation schedule.*

FINALIZING YOUR ADAPTATION ACTION PLAN

The work your community has done to this point will make up the majority of your adaptation plan. The more thorough your adaptation team has been in identifying goals and objectives, categorizing actions, assigning responsibilities, and identifying funding mechanisms, the easier it will be to compile those items into a formalized adaptation plan.

Drafting the plan may be a good task to assign to the adaptation team leader, as writing by committee can often lead to delays, miscommunication, and aggravation. One person, or at most a small group, should be assigned the job of turning the various components into a larger document for review by the adaptation team. Once a draft of the adaptation plan has been written by the core writing group this should be circulated to the wider adaptation team for review, comments, and editing. By circulating a draft to a wider audience than the drafting group, you are creating a more consensus built document rather than one that is 'owned' by a small group. Elements that should be included in the final adaptation plan include:

- **Acknowledgements** – Thank you to stakeholders, adaptation team, Mayor, Council, etc.
- **Mayors/Council Commitment**
- **Executive Summary**
- **Glossary** – Key terms that may assist the reader.
- **Introduction**
- **Background and Context** – What is climate change? Why was this process undertaken? Why is it important
- **Impacts & Issues** – What impacts are projected for the community? What are the risks?
- **Vision Statement** – A call to action for your community
- **Goals and Objectives** – What are the objectives for achieving the vision? What are our targets for measuring these?
- **Actions** – Actions, costing, financing, responsibilities, timeline, monitoring & review
- **Implementation schedule** – A timeline by action with a defined date and responsible departments.
- **Additional Information** – References, sources of information, etc.

Integration with other Municipal Planning Activities

In addition to having a stand alone adaptation action plan, it is good practice to interweave adaptation planning into existing municipal planning documents such as master/strategic plans (transportation, cycling, etc.), official plans, community visions and/or your community's Integrated Community Sustainability Plan (ICSP). By integrating adaptation into existing policy documents, your community's adaptation plan will not become a stand alone stagnant document but rather will make up part of the way your community operates. This sort of integration will not necessarily be done quickly, but the process should be initiated upon the completion of an adaptation plan.

Worksheet 14 provides a template for a press release which can be used in two ways; firstly to outline your community's adaptation plan and secondly to communicate how far your community has come in increasing its adaptive capacity as well as any next steps.

Ensure You Have the Approval and Support of Council, Municipal Staff and the Community

In Milestone One, you secured the support of council for your adaptation planning efforts. It is important to maintain that support, as such it is suggested to bring your adaptation plan to Council at this stage in the process. Having the support of Council, municipal staff and the community will help in moving plan implementation forward.

Your community's final Adaptation Plan will likely need to pass through Council in order to ensure that each action will be implemented in Milestone Four. Your climate change champion may be a good choice to present the plan to Council as they will be able to speak to the importance of the plan and also provide a stirring call to action.

The completion of the formal adaptation plan and its passing through Council is a success that your adaptation team will want to communicate both internally to staff (using issue briefs), and externally to stakeholders and the community at large (use the press release template in Worksheet 14). It will likely be an occasion to celebrate as it marks your community's first steps in becoming more adaptive to the impacts of climate change. Use this to build momentum for the implementation phase as well as to mark the achievements of your adaptation team to date.

Alternatives... If it is not possible to pass the completed adaptation plan through Council, one alternative is to take the plan to Council in sections or even divide up the larger plan into smaller plans which address a given impact.

Once you have a finalized adaptation plan which has been passed through Council, be sure to reconnect with relevant departments as to their roles and responsibilities. Some departments will have been involved throughout the process, however for those who have not been involved recently this information should be (re)communicated.

As you engage internal and external stakeholders it is important to focus on action and emphasize local benefits. Be sure to identify the importance of adaptation efforts while still emphasizing the necessity of mitigation as you engage stakeholders.

It is also important to address the fact that there are costs associated with delaying action, most importantly the increased risks and possible danger to the community. Take the time to communicate both the objectives of your adaptation plan and the implications of the plan to the key stakeholders that were identified in Milestone One. This communication may also extend more widely to other municipalities, local government associations, and provincial or federal governments. You can use Issue Briefs (See Worksheet 4) to communicate internally. You can also use Worksheet 14 to announce the completion of the adaptation plan to external stakeholders.

Note that in many cases there are steps in Milestone Three that could be done in Milestone Four and vice versa. This happens because both planning and implementing are conceptually linked. Although we have recommended a certain progression of activities, it may make more sense for your community to conduct certain elements of each stage out of sequence. Often, Milestone Three and Milestone Four will be done simultaneously with constant revision and modification. This iteration demonstrates the cyclical nature of adaptation planning and the importance of monitoring and reviewing.

CASE STUDY ***Collaborative Planning – Urban Forest Management Plan in Edmonton, AB***

Due to an urban forest that is threatened by drought and invasive pests, the City of Edmonton created an *Urban Forest Management Plan* (UFMP) that guides the City's future urban forest management over a 10 year horizon. The plan was developed collectively, with regular input from a multi-stakeholder advisory group and consultation with the public. This collaborative approach has been a key strength of the UFMP and demonstrates how adaptation planning can be incorporated into a municipal plan for managing urban forests.

CASE STUDY

Planning Across Council – Ahead of the Storm: Preparing for Climate Change in Toronto, ON

In 2008, the Toronto Environment Office, in collaboration with the City of Toronto's Climate Adaptation Steering group and the Clean Air Partnership, developed *Ahead of the Storm: Preparing Toronto for Climate Change*. As part of the actions contained within the City's Climate Change, Clean Air and Sustainable Energy Action Plan, this adaptation plan includes programs that will reduce the effects of various climate change impacts such as heat waves, flooding from intense rainstorms, high winds, the expanding range of insect pests, and changes in lake levels. A few examples of adaptation actions that are currently in place in Toronto include: Toronto's Heat Alert System and Hot Weather Response Plan; Flood Warning Forecasting; the Deep Lake Water Cooling (Enwave), Peaksaver and Keep Cool Programs (Toronto Hydro); and their Emergency Plan. Within the City's Adaptation Plan they've also included a number of recommended actions for developing and implementing their climate change adaptation strategy including actions specific to establishing a strong ongoing adaptation process and enhancing capacity within the community.

WHERE SHOULD YOU BE NOW?

At this point you should have a finalized action plan, which includes an outline of adaptation actions, costing, financing, responsibilities, implementation timeline, and a basis for monitoring and reviewing your implementation success. With your community's adaptation plan finalized, you can start putting your plan into action in Milestone Four, *Implementation*.

SUMMARY OF OUTPUTS

- **Vision and guiding principles**
- **Adaptation options**
- **Specific actions (where applicable)**
- **Financial implications of your plan**
- **Draft and Final Adaptation Plan**

ENDNOTES

69. Bizikova, L., Neale, T., Burton, I. (2008). *Canadian Communities' Guidebook for Adaptation to Climate Change: Including an approach to generate mitigation co-benefits in the context of sustainable development*. First Edition. Environment Canada and University of British Columbia, Vancouver.
70. Partners for Climate Protection (2008). *Five-Milestone Framework for Reducing Greenhouse Gas Emissions*. Available for download at http://www.sustainablecommunities.fcm.ca/files/Capacity_Building_-_PCP/PCP_Resources/PCPFiveMilestoneFramework-e.pdf


REVIEW
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UPDATE ADAPTATION ACTIONS
MILESTONE 1: INITIATE
• Identify stakeholders
• Build climate change adaptation team
• Identify an adaptation champion
• Take a first look at climate change impacts and existing adaptation actions
• Pass council resolution and community charter
MILESTONE 2: RESEARCH
• Initiate research on climatic changes
• Refine impacts and consider service areas for each
• Vulnerability assessment (study of sensitivity and adaptive capacity)
• Risk assessment (consequence and likelihood of impacts) and prioritization
MILESTONE 3: PLAN
• Establish adaptation vision and objectives
• Set goals
• Identify options and actions
• Identify possible drivers and constraints
• Evaluate actions against drivers and constraints
• Determine appropriate baseline and indicator data
• Examine financing and budget
• Establish implementation schedule
• Create action plan
• Launch plan
MILESTONE 4: IMPLEMENT
• Begin implementation
• Solidify support from Council and community
• Use appropriate implementation tools
• Follow terms of action plan
• Report on successes regularly to maintain momentum
MILESTONE 5: MONITOR/REVIEW
• Asses new information and review drivers
• Track implementation progress
• Evaluate effectiveness of actions using baseline data and indicators
• Communicate accomplishments
• Investigate future adaptation options and actions
• Revise adaptation plan
• Launch next round of adaptation plan

MILESTONE 4:

IMPLEMENT

MILESTONE 4: IMPLEMENT

In the fourth milestone, *Implement*, you will be working to ensure that you have the appropriate implementation tools as well as the approval and support of Council, municipal staff and the community to enact your adaptation plan. Though your community has made strides towards becoming more adaptive by planning, it is through the implementation phase and beginning to put the adaptation plan into action that it will improve its adaptive capacity.

PURPOSE	OUTPUTS
Secure the support of Council and the community and implement the actions identified in your adaptation plan.	✔ Support and Approval from Council ✔ Implementation Tools ✔ Community Engagement and Partnerships

CHECK BACK

As you progress through Milestone Four, be sure to keep track of how new conditions within your community might affect the decisions taken in Milestones One, Two and Three. Maintaining the relevance and accuracy of information throughout this adaptation process is important as the information collected will continue to inform decisions in the future. By periodically scanning the sources you've used in Milestone Two, you will be able to make changes as per any new information. You will also want to ensure the actions you've identified in Milestone Three remain appropriate for each impact, especially as local conditions may change. Throughout this Milestone be sure to take note of the measuring and monitoring elements that have been included in your adaptation plan to prepare you for Milestone Five on monitoring and review.

GETTING STARTED

While the scope of activities and steps in Milestone Four may seem less time consuming than the activities from previous milestones, the implementation phase can be one of the longest milestones in this process. The work that the adaptation team has done to this point in ensuring that the adaptation plan is as comprehensive as possible will help to ease any difficulties with implementation. The duration and resources needed for implementation will vary, sometimes considerably, from one community to the next; however, several elements will be consistent including: a comprehensive implementation schedule (from Milestone Three), identification and use of implementation tools, and partnerships for delivery.

While your adaptation team and other municipal staff are responsible for putting your adaptation plan into motion and maintaining momentum, non-governmental organizations and private-sector contractors can contribute to the implementation of specific projects.[71] Approval from both internal stakeholders (Council and municipal staff) and external stakeholders (vendors, residents and community groups) will contribute to the plan's success.

As actions are developed, it may be the case that certain elements are implemented prior to the more formal implementation process outlined in this milestone. This will likely be the case for many communities and is common in most planning processes. It is good practice to take a quick survey of the implementation status of actions before delving further into the implementation milestone; this will assist in documenting what has taken place already and allow you to identify appropriate implementation tools for remaining actions.

The implementation tools identified below will help to secure support from the departmental staff that will, in effect, be charged with carrying out the actions and precursors to actions contained within the plan.

If your team was not able to establish a baseline or identify indicators in Milestone Three, you may find that you are able to now. It will be helpful later in Milestone Five to have some indication of the pre-existing levels of adaptive capacity prior to the implementation of adaptation actions in order to assess the progress and effectiveness of each action. If your team was able to establish a baseline and identify indicators in Milestone Three, ensure that that information is still representative and current before moving on.

Consider This…

Your community may decide to solidify its implementation commitments through political declarations. Alternatively, if the political will is not present, your community may drive implementation through stakeholder feedback from the community or from departmental staff.

ENSURE YOU HAVE APPROPRIATE IMPLEMENTATION TOOLS

Identification of the appropriate tools for implementation will help to drive the implementation process. These tools will be used at various times throughout this stage and represent the way in which your adaptation team will reach out to the responsible staff and wider community as identified in Milestone Three.

Training

Throughout implementation, training of staff, elected officials, and key community stakeholders is a key tool for the execution of adaptation actions. Some examples of training topics that may be required include:

- New standards or codes of practice;
- Benefits of a given adaptation action (i.e. increasing tree cover in the community);
- New technologies (i.e. engineered materials or machinery) that may be used in infrastructure replacement; and
- Rationales behind policy changes and or amendments to departmental strategic plans.

Additional training workshops may also be required on specific technologies that are being adopted by various departments; these may require the hiring of external experts or consultants who may be most familiar with the given technology. Trainings need not be long formal sessions, brown-bag *lunch'n'learns* are an excellent example of a small, informal training session that can help to educate key individuals on a given action or policy initiative.

Workshops and other training exercises will both add to your community's skill set and contribute to the successful implementation of your adaptation plan overall.

Pilots

Piloting is a way to implement adaptation actions through small scale initiatives. By conducting a pilot, you can assess the strengths and weaknesses of specific actions, as well as associated costs and whether it produces both desired and measurable results. This analysis will allow you to determine if your identified adaptation action is the most appropriate action to pursue on a larger scale.

For example, if your community decided to replace aging infrastructure, your adaptation team may decide that before a full scale project is undertaken it may be relevant to conduct a pilot by replacing the infrastructure of a particular site and assessing the benefits of that action. Such a pilot would help to determine the associated costs and find out whether the action produces the desired results. Likewise, replacing impermeable paving materials with permeable ones at the neighbourhood level would be a great way to determine if the measure should be scaled up to cover the entire community. Pilots can help to secure the commitment of smaller groups of residents who can then help to spread the message about the need and benefit of a given action.

Internal Communication

Along with training, communication will play a significant role in the implementation of your actions. In addition to those stakeholders which have been involved throughout the process, there are likely other teams, departments, individuals with whom information on the adaptation plan and specific actions will need to be communicated. Depending on the specific actions in your adaptation plan, a variety of information should be communicated both to Council and municipal staff including:

- Emergency service updates and preparedness plans;
- Changes to Council priorities and objectives;
- Changes to by-laws, zoning requirements, and codes;
- New plans or guides; and
- New land-use regulations.

Much of this information will also need to be relayed to the public and should be included in relevant external communication.

This sort of internal communication can be done in a variety of ways; options include regular updates to Council, inclusion in departmental annual reports, internal memos or informal means of communication within the corporation (i.e. lunch and learn sessions, information posters, etc.). Coupling internal communication activities with more rigorous training exercises can be an effective way to ensure that staff and Council are well appraised of not only the actions that are taking place but also the reasons and motivation behind adaptation actions.

External Communication

In addition to communicating specific changes that will affect municipal staff and residents, it will be important to communicate more generally on the impacts of climate change and the risks associated with those impacts to the wider community. For example, increasing public awareness and education about the public health implications of climate change and the need for emergency preparedness, may be an action you've identified in your adaption plan, and you will need to utilize communication tools to achieve it.

As you carry out the implementation phase of this process be sure to continue to include public input, involvement, and engagement. Volunteers are also a powerful resource and can help enhance public awareness on these issues and can be helpful to target larger groups such as youth, specific community groups, etc.

There is also opportunity for partnerships with other communities throughout implementation. Partnerships provide a chance to share resources, experiences and lessons learned. It is often helpful to know how other similar communities have progressed through implementation and what methods they employed during the process which may also be valuable to your community.

CASE STUDY

Engaging the Community – Encouraging Residents to Prepare for Emergencies in New York, NY

As a way to engage the community with emergency planning, New York City implemented *Get Prepared: Ready New York*. *Ready New York* is an educational campaign which encourages preparedness planning for residents. *Ready New York*'s resources now includes 11 multilingual publications, numerous public service announcements, multimedia advertising campaigns, extensive web content, a speakers' bureau, a reprinting program, corporate partnerships, and continuous community outreach.

For more information on this program visit New York City's Office of Emergency Management website at http://www.nyc.gov/html/oem/html/get_prepared/ready.shtml

Marketing

Given that public involvement and awareness is such an important element of implementation, marketing is a helpful tool through which communication with wider audiences can be carried out. Of course, your community will want to market its accomplishments and successes, but it is similarly important to inform the public about adaptation efforts, more generally, and of where there might be opportunities for public participation. By encouraging residents to participate in adaptation activities at the household level, your municipality is broadening its adaptation efforts from tackling only those issues that are under municipal control to those which are within the wider realm of the community.

There are a variety of marketing tools that are available to you. A few possibilities include:

- Awareness raising campaigns or events;
- Tips for home adaptation (e.g. downspout disconnecting, emergency preparedness kits, or rain barrels);
- Incentives for participation in City led programs (e.g. installing backwater valves, disconnecting downspouts, etc.)
- Guides, brochures, and pamphlets on climate change threats and risks; and
- Public challenges and contests relating to climate change adaptation and preparedness.

Community based social marketing (CBSM) is another tool which can be used to assist with the implementation of particular actions. CBSM is marketing that emphasizes direct, personal contact among community members and the removal of barriers (i.e., "road-blocks" to more sustainable actions and behaviours).

CASE STUDY

Implementing Action – Using Community Based Social Marketing in the Town of The Blue Mountains, ON

As part of their Integrated Community Sustainability Plan (ICSP), and with funding from the Ontario Ministry of the Environment's Community Go Green Fund, The Blue Mountains created *Your Community, Your Planet: A Guide to Reducing Greenhouse Gas Emissions*. The guide emphasizes the importance of individual actions and seeks to animate the community on what they can to do about climate change whether it be joining one of the EcoAction teams or implementing simple actions to reduce energy use. Using community based social marketing; the guide stresses the importance of bringing a global issue to the local culture through real people, real stories and real situations. For more information on The Blue Mountains program visit http://www.thebluemountains.ca/sustainability-plan.cfm

Other Resources

There are also other implementation tools that you may find applicable to your community. For instance other planning guides or documents from communities that have already implemented an adaptation plan may be helpful during implementation. Through such resources your community will have access to best practices, information sharing, and knowledge exchange.

Also recall the local government action mechanisms that are available to your community (See *Background*, p. 14). Consider how these mechanisms can be used to aid the implementation of your adaptation actions. Such mechanisms include land use and urban planning, licensing and regulation, facilitation, advocacy and leadership, community service delivery, community development and civic engagement, and workforce development. Through these action mechanisms, local governments can use direct and indirect influences to support and foster behaviour that furthers adapting to a changing climate.

Whatever means your community uses to implement its adaptation plan, ensure that it remains transparent and includes stakeholders from the community (especially those that can be considered vulnerable populations or groups at risk).

15 *Worksheet 15 will help you to allocate tools to aid in the implementation of identified adaptation actions.*

Follow the Terms of the Adaptation Action Plan

Be sure to check-in to your wider plan as implementation progresses. Your team will want to ensure that implementation is following the terms that have been outlined in the adaptation plan. Though the implementation phase does require a degree of flexibility, your adaptation team will want to ensure that this process remains consistent with the vision, goals and objectives that you have outlined in Milestone Three.

WHERE SHOULD YOU BE NOW?

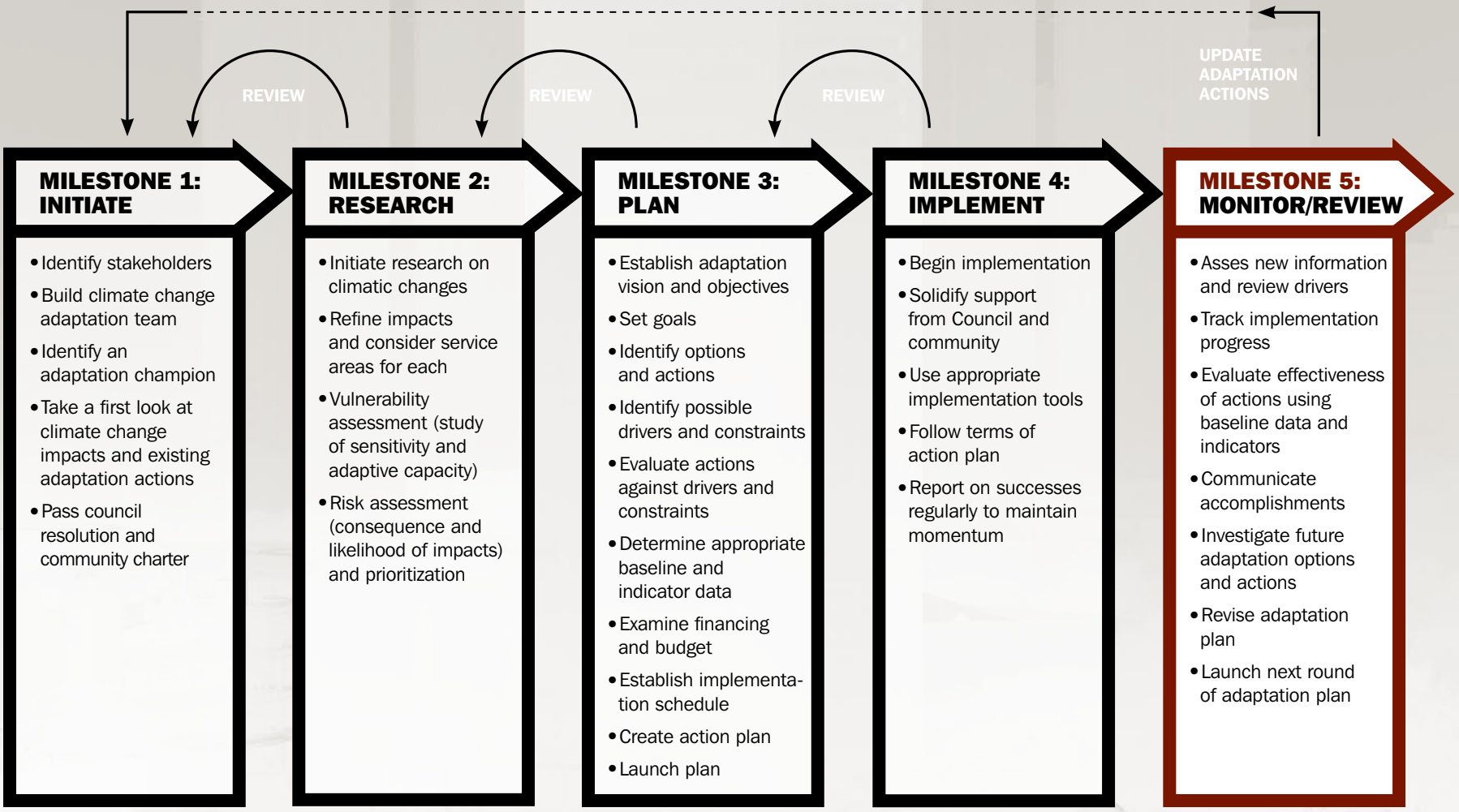
Your community should now be underway with the implementation phase of the adaptation process. Do not get discouraged if implementation is slower or more challenging than you anticipated; the work to get to this point took many months (or years) therefore the results cannot be expected to take place instantly. Also remember that planning does not end with implementation — be sure to revisit your plan on a regular basis to account for new changes and to review the appropriateness of identified measures (more on this in Milestone Five). Building ongoing renewal into your plan is a key element to long-term success.[72]

SUMMARY OF OUTPUTS

- ✔ **Support and approval from Council**
- ✔ **Identified implementation tools**
- ✔ **Strong community engagement and ongoing partnerships**

ENDNOTES

71. Partners for Climate Protection (2008). *Five-Milestone Framework for Reducing Greenhouse Gas Emissions.* Available for download at http://www.sustainablecommunities.fcm.ca/files/Capacity_Building_-_PCP/PCP_Resources/PCPFiveMilestoneFramework-e.pdf
72. *Ibid*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UPDATE ADAPTATION ACTIONS
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• Refine impacts and consider service areas for each
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• Identify possible drivers and constraints
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• Use appropriate implementation tools
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• Report on successes regularly to maintain momentum
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• Track implementation progress
• Evaluate effectiveness of actions using baseline data and indicators
• Communicate accomplishments
• Investigate future adaptation options and actions
• Revise adaptation plan
• Launch next round of adaptation plan

MILESTONE 5:

MONITOR/REVIEW

MILESTONE 5: MONITOR AND REVIEW

The fifth and final milestone, *Monitor and Review*, serves to assess whether the goals and objectives previously set by your community have actually been achieved, and to identify any problems that have been encountered with an aim of developing solutions. An internal review of your community's adaptation plan should be conducted to look at whether planned actions have been implemented, and if so, what has been achieved, what barriers were encountered, and to begin identifying potential solutions.

This milestone should also be an opportunity for communicating progress to the outside world, thereby helping to raise general awareness about climate change adaptation and celebrate your community's accomplishments.

PURPOSE	OUTPUTS
Assess progress towards the goals and objectives that were set out in Milestone Three and to reassess the scientific information upon which vulnerability and risk were evaluated.	✔ Review of scientific information ✔ Progress on implementation ✔ Effectiveness of actions ✔ Updated action plan ✔ Communication of accomplishments

GETTING STARTED

Since Milestone One, the process of monitoring and reviewing progress on climate change adaptation has been built into this guide. This process should be ongoing and happening on multiple levels (political, staff, budgetary) and for multiple audiences (from your adaptation team to your community at large).

Monitoring, as set out in your community's adaptation plan, should enable your team to examine lessons learned throughout implementation in order to identify if the context of your risks and vulnerabilities have changed or if any of the underlying research is now out of date, in which case a review should be triggered (and potentially revision) of the plan.

In addition to ongoing monitoring and review, Milestone Five offers a specific opportunity to focus efforts on tracking your community's progress against its adaptation goals and objectives and to update your adaptation plan based on this information and analysis.

Lastly, though your adaptation team has likely been reporting back to Council and other staff its key findings, informing Council, municipal staff and the community on the progress that has been made to date and any changes that need to be made to the planning process is an important part of this milestone.

TRACKING YOUR PROGRESS

Tracking results is an important part of the adaptation process; it requires following up on the goals and objectives that were set as part of Milestone Three; looking at the indicators of progress that were identified earlier; and interpreting whether or not the actions taken have improved the adaptive capacity of the chosen service areas within your community. Looking at the progress made to-date is important as it:[73]

1) Gives your adaptation team an opportunity to assess whether you are continuing towards your adaptation vision and goals;

2) Enables your community to know more accurately where, to what extent, and against which impacts it is most vulnerable;

3) Allows your adaptation team to know whether the actions in your plan are producing the results that were anticipated (and if not, giving the opportunity to modify and/or replace them with more appropriate ones); and

4) Will likely be an occasion to celebrate your first steps in becoming more adapted to the effects of climate change.

Fundamentally, tracking your community's progress is meant to gauge the implementation status of the adaptation actions your team has developed, and to identify whether these actions are helping to improve your adaptive capacity and achieve the climate adaptation vision established in Milestone Three.

Exhibit 22 offers a set of questions that can be used for this purpose. The questions have been divided into two distinct areas: **tracking progress on implementation** and **tracking effectiveness of actions**. These questions are meant to help your community examine how successful your actions have been in achieving your community goals and the lessons you have learned in the process.

EXHIBIT 22

Tracking Progress and Effectiveness

PROGRESS ON IMPLEMENTATION: Are actions being implemented as per the adaptation schedule in your adaptation plan?	**EFFECTIVENESS OF ACTIONS:** How are your actions increasing or maintaining the adaptive capacity of service areas in your community? Are individual actions producing the intended results?
• How many actions have been undertaken by various departments? • How many departments/staff have been involved in implementing adaptation actions? • How have you engaged stakeholders in the development and implementation of your adaptation action plan? • Are community partnerships in place to enable robust decision making with regard to adaptation planning? • To what extent have you increased the general and technical capacity of your community to prepare for climate change impacts? • How is climate information being considered in decision making processes within your community? • How much support is there among your government, your community, and stakeholders to prepare for climate change impacts? • How have drivers or constraints changed? Are there new opportunities available which might aid the implementation of your community's actions now and in the future?	• Refer to the specific indicators established in Worksheet 12 and reassess your baseline. How have the conditions in your community changed? • How effectively is your community's technical capacity being used to evaluate risk and vulnerability? • How effective have the measures been in achieving your community's vision and goals? • Are there any formal mechanisms in place that "mainstream" or otherwise facilitate climate change adaptation planning? If not, what has prevented this from happening? • How has awareness about climate change and its projected impacts on your community increased?

Reflecting on progress made throughout the process is a cornerstone of Milestone Five; be sure to allocate enough time to do this thoroughly.

ASSESSING NEW INFORMATION

Keep in mind that climate change adaptation is an ongoing process. As natural, economic, social and political conditions change, the research that was conducted as part of Milestone Two may also need to be updated. When assessing new information, important questions to consider include:

- To what extent has there been a change in political leadership since the adoption of the adaptation plan?
- Has there been a shift in public opinion that has led to a shift in priorities?
- How have economic factors changed? Has this driven or constrained implementation (i.e. budgetary cuts, lack of third-party funding, delayed pay-back into revolving funds, etc.)?
- Has there been societal shifts which might influence your communities adaptation efforts (i.e. increased unemployment, increase in violence and/or crime, decrease in interest in environmental issues, etc.)

As your team likely found while completing the research phase of the adaptation planning process, the range of information available varies depending on the location of your community. Recall that one option for dealing with limited information was to look at how sensitive your community was to past and present-day climate and weather events. This method of research is highly applicable in Milestone Five as your team can begin to interpret the data from the period covered by your adaptation plan to identify any significant changes or impacts.

Your team will want to ensure that it considers all of the factors that may affect policy-making and the planning processes over all. These considerations will help to shape updates to your adaptation plan, as discussed in the next section of this Milestone.

Use the following considerations to help review the assumptions that underlie your adaptation plan:[74]

- **What non-climate related changes (societal, economic or political) were important in the creation of a climate adaptation plan? Have any changes to these assumptions occurred that might affect the successful implementation of your community's adaptation actions?** Take note of how these changes will affect your ability to address climate change (i.e. funding, public perception, and/or political support?) and whether these factors are a short-term concern or an ongoing issue. Also consider whether such changes have eliminated constraints thereby creating an opportunity to implement an action.

- **Have new scientific findings improved or changed the understanding of your community's vulnerabilities to climate change?** Maintaining the relevance and accuracy of information throughout this process is important as the information collected will continue to inform decisions in the future. Make a commitment to monitoring the science that you've used to base the climate change impacts for your community on by periodically scanning the data sources you've used in Milestone Two and making changes as per any new and applicable data. One possible way to do this is to plan for a scientific review every few years. In cases where you find new (and sometimes seemingly conflicting) scientific reports, it may be useful to work with the academic community to determine how relevant new findings are to your work and whether they should influence a change in the direction of your adaptation plan. It is important to keep in mind that climate change science will not stay static. Science is constantly evolving and it is likely that your adaptation plan will experience a similar evolution.

- **Based on changes in scientific information, have your community's vulnerabilities or high risk areas changed?** A re-evaluation of scientific information may lead your community to change the focus of its adaptation plan. For instance, though your initial research (in Milestone Two) led you to assign a high risk factor to particular impacts, your current evaluation has found that your original assessment assigned a higher risk than what is currently needed and/or other impacts have become a more pressing concern. In such instances your updated adaptation plan will need to reprioritize certain actions, based on the higher risk factor, to account for the changes in scientific information.

- **Are your vision and goals still relevant to the information and results from the first milestones?** Though the adaptation vision and corresponding goals that were originally set will likely be broad enough to account for new scientific information and conditions, these might need to be narrowed or expanded to account for the most relevant and current data.[75]

- **Have you collected enough information about the success or failure of your adaptation actions?** Tracking the progress that your community has made towards its adaptation goals may reveal that a given adaptation action is not improving the adaptive capacity of your community and may in fact be amplifying your community's vulnerability.[76] Conversely a given measure may be so successful that additional funding is necessary to replicate that measure in another department. The information collected as part of your tracking therefore can be useful for critical review of the plan and later for updates to public reports, budget requests and policy decisions.[77]

- **Are you able to address the lower vulnerability impacts that you identified in Worksheet 7?** The purpose of conducting a vulnerability assessment in Worksheet 7 was to identify which impacts your community is the most vulnerable to and proceed with a risk assessment of those impacts. For the impacts that ranked lower, it may be valuable to re-evaluate whether your vulnerability has changed and whether your community is now equipped to address these impacts. You may also want to consider conducting a risk assessment of those lower vulnerability impacts at this point.

UPDATE YOUR ADAPTATION PLAN

Once you have tracked progress against your community's adaptation plan and reviewed new information, your community is ready to tackle the second part of Milestone Five, updating your adaptation actions and plan. In some cases you may need to update a specific action while in others you may have to adjust the implementation schedule of the entire plan. For example, an economic crisis which results in major industry cuts may have an impact on your ability to carry out your adaptation plan and should be taken into consideration when you review your implementation schedule.

Be sure to incorporate the most urgent and specific information in short-term decision making or budgetary processes. As you progress through your plan, external factors will not remain static. Depending on the length of time in between Milestone Four and Milestone Five, you may find that the factors which influence the effectiveness of your plan have changed. Many of these immediate and unforeseen changes cannot be adequately addressed in your regular policy making and planning cycles. Some of these changes may require immediate attention, and although they may not have been integrated into your original plan, will need to be incorporated into decision making and budgetary processes now. Due to the likelihood of such unforeseen factors, it is important to re-evaluate the relevance of your plan in the short term and determine whether it adequately addresses the most pressing concerns.

Incorporate new climate change information into your regular planning and policy updates.[78] While some new information is urgent and requires immediate attention, other information can be integrated into your regular policy making and planning processes. Building new climate change information into, comprehensive land use plans, official plans, shoreline management plans, and other such planning documents can be a useful policy mechanism to address and integrate climate change information on a ongoing basis.

Try to think about the opportunities that this juncture offers to share your knowledge and lessons learned in order influence climate change adaptation efforts beyond your immediate adaptation team. The plan updating process is an ideal time to communicate with a larger audience on the successes and lessons learned from the initial adaptation planning process – specifically how new research may necessitate expediting or strengthening your adaptation efforts.

16 *Worksheet 16 is a checklist which should be referred to as your team updates your adaptation plan.*

COMMUNICATING ACCOMPLISHMENTS

The completion of your implemented action plan is a success that your adaptation team will want to celebrate and communicate both internally to Council and staff, and externally to stakeholders and the community at large. Use this occasion to build momentum for ongoing implementation as well as to mark the achievements of your adaptation team to date.

Your team may want to use similar implementation tools as those used in Milestone Four to communicate the accomplishments of your adaptation team to the wider community. These communication tools include annual progress reports, press releases, issue briefs, website updates, workshops, awareness campaigns, celebration events and advertisements.

A communication strategy that reaches out beyond your adaptation team to the wider community will help to foster adaptive behaviour outside of municipal operations. Engage those external stakeholders from citizen groups, local NGOs, universities or businesses that you identified in Milestone One as you develop a communications strategy to convey the accomplishments of your community's adaptation efforts. Make an effort to consider a broad range of the community population, in particular those populations which are particularly vulnerable to the effects of climate change. By targeting vulnerable populations and groups that tend to be disengaged from municipal politics, your local authority can further expand its adaptation work beyond its own operations through individual actions and behaviour changes.

Communicating your successes will be a testament to the countless months (and years) that your adaptation team has put into the process of creating, implementing and monitoring your community's adaptation plan. It is important that both elected officials and senior managers take time to acknowledge the commitment of the adaptation team and its stakeholders to secure the community's future against the impacts of climate change. A public celebration of this work (through an "adaptation week" or an awards ceremony for instance) could serve as an open and appreciative gesture towards the dedication of the adaptation team.

17 *Worksheet 17 suggests a variety of options for communicating successes and assists with the development of a communications strategy.*

WHERE SHOULD YOU BE NOW?

Your community has now gone through the full cycle of the adaptation planning milestones, from initiating your adaptation effort through implementation and now monitoring and review. Recall that this is an iterative process; the cycle of adaptation planning should be maintained by following your implementation schedule and adding to it any new action items that have arisen as a result of Milestone Five.

DELIVERABLE

- **Assessment of progress on implementation**
- **Review of effectiveness of actions**
- **Updated action plan**
- **Communication on accomplishments and successes**

ENDNOTES

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FINAL THOUGHTS

Climate change is already being felt in towns and cities across the country. There are many indications that these changes are already underway: temperatures are increasing, snowpack is disappearing, spring is arriving earlier, and seas are rising. Across Canada, warmer temperatures have supported the rapid spread of invasive animal and plant species, melting of arctic and glacial ice, and increased heat stress among vulnerable populations. While at the same time exacerbating Canadians concern about extreme weather events, including ice storms, floods, and forest fires. Municipal services and infrastructure are increasingly being affected by these events.

Hundreds of Canadian municipalities have stepped up to the climate change challenge and are doing their part to control emissions by undertaking successful climate change mitigation activities. However, with the increasing effects of climate change becoming apparent, municipalities are beginning to see the need to assess their vulnerability to the changes that are already underway, and to develop responses that protect their communities. Mitigation is necessary to reduce the rate and magnitude of climate change, while adaptation is essential to reduce the damages from climate change that cannot be avoided.

Changing Climate, Changing Communities: **Guide and Workbook for Municipal Climate Adaptation** is a collection of resources that provide a milestone based framework to assist local governments in the creation of adaptation plans to address the relevant climate change impacts associated with their communities. Although climate change adaptation is a complex process, this guide aims to provide a straightforward methodology to adaptation planning using a five-milestone approach. Each milestone represents a fundamental step in the adaptation planning process, starting with the initiation of adaptation efforts (by building an adaptation team and identifying local stakeholders) and culminating with a monitoring and review process that analyzes the successes and reviews the challenges of the adaptation plan and its implementation.

This guide is aimed at municipal staff interested in working on climate change adaptation strategies. Staff from across all municipal departments can be involved in the process outlined in this resource; as it encourages an integrated approach to planning that requires examination of the environmental, economic, social, and health implications of climate change.

In moving forward with your community's adaptation planning efforts, consider the following key messages to municipalities on adaptation:

Understand what adaptation is.

Adaptation to climate change can include any activity that reduces the negative impacts of climate change and/or takes advantage of new opportunities that may be presented. Climate change, unlike most other public priorities, will directly or indirectly affect a broad range of resources and activities in the public sector (from water resources and land use planning to public health and emergency management). As climate change will affect a broad range of community assets and government services adapting to climate change is a matter of "good government" and risk management in an effort to ensuring the safety, health and welfare of communities now and into the future. In order to reduce your communities' vulnerabilities public decision-makers must ensure a positive lasting influence on their communities' so that future generations do not bear the worst effects of climate change.

Realize that adaptation and mitigation are not mutually exclusive

Mitigation efforts, or efforts to curb greenhouse gas emissions, have become widespread among local governments. However, scientific evidence indicates that even if we could halt greenhouse gas emissions today, the world would still experience a changing climate for decades to come.

Many of the impacts (changing temperature and weather patterns, drought, flooding, erosion, and sea level rise) will be felt directly at the local level. Local governments have the greatest ability to prepare for these changes, and many are now embracing climate adaptation as a co-strategy to their climate mitigation efforts. While neither adaptation nor mitigation actions alone can prevent significant climate change impacts, taken together they form a comprehensive climate change response strategy that will prepare communities for the climate impacts underway while working to avoid even worse future affects.

Know what you are adapting to

The old management adage – *you cannot manage what you don't measure* – is accurate when looking at adaptation planning. Developing your community's understanding of climate change impacts and the major service areas which are likely to feel these impacts most acutely is crucial to know what climatic changes and impacts you will need to adapt to. Conducting both a vulnerability and risk assessment are crucial first steps in becoming more adaptive to a changing climate. There are many sources of information on how climate change will affect Canada and its various sub-regions. These sources can all be used to some degree to develop a better understanding of how climate change will affect your community even when information specific to your location is not available. Knowing the impacts on your municipality will not only help you plan for adaptation but will also help build support among stakeholders for your planning efforts.

Prepare for those impacts

As practitioners of good governance, local governments must develop responses that protect their local citizens, environment and economy. Preparing for the impacts that will face your community will be the fundamental action you must take. It is important to remember that as your community engages in a climate change adaptation planning process, it should consider the balance of immediate and long-term needs, that community interaction must be supplemented with municipal action, and the need for commitment to plan for impacts despite facing uncertainty. Communities must, therefore, commit to driving this initiative by identifying and following-through on the actions they can undertake themselves or directly influence without getting sidetracked and delayed.

Realize there is no 'one size fits all' approach

Although the need for adaptation planning is clear, it is important to recognize that there is no one way to approach planning for climate change. Adaptation planning, by its definition of responding to local impacts, requires a certain degree of 'right-sizing' or localizing, as any plan must be tailored to the community. The methodology presented here is not intended to be a one size fits all approach nor is it intended to supplant the many other resources that are available to Canadian municipalities. Rather it is meant to provide a high-level framework for how local governments can address the array of impacts likely to occur as a result of climate change. The Guide encourages the use of existing sector or impact specific resources to further advance and/or refine municipal adaptation efforts.

Adaptation planning is not a new process and should be integrated with existing efforts

Acknowledge the work that your community is already doing which addresses climate change impacts (but which may not be labelled as "adaptation"). Where there is such work, it is important to incorporate any future adaptation planning with those existing efforts to ensure an integrated and comprehensive plan. In many cases, climate change will exacerbate existing high priority management concerns rather than creating completely new challenges. It is likely that your community will find that efforts to address existing management concerns affected by climate change may simultaneously reduce vulnerability to project climate impacts, particularly in the projected impacts are included in the scope of current decision making.

Anticipatory planning is more effective than reactive planning

Taking proactive steps to be flexible and to anticipate and address expected impacts can save money and protect the well being of communities. This includes activities that are taken before impacts are observed (anticipatory) and after impacts have been felt (reactive). In most circumstances, anticipatory adaptations will incur lower long-term costs and be more effective than reactive adaptations. Successful adaptation does not mean that negative impacts will not occur, only that they will be less severe than would be experienced had no adaptation occurred. Taking practical steps now with the best information available enables you to reduce your future risk and also realize possible near-term benefits.

As stated in the preface to this guide, *adapting to climate change is the new reality*. Many local governments are already at the centre of this reality; dealing with the effects of thawing permafrost, damaged infrastructure and heat waves. Adaptation will require an integrated approach as it is a long-term, continual process which will touch all sectors of society; however, local governments have a unique opportunity to begin preparing for a changing climate as they will be on the front lines of responding to its impacts and therefore, have an interest in preparing for them. While higher levels of government can and must provide funding and support for climate change adaptation strategies on the ground, local and regional governments have an equal or even greater responsibility to plan proactively as well.

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