PATHWAYS TO CLIMATE CHANGE RESILIENCE

A GUIDEBOOK FOR CANADIAN FOREST-BASED COMMUNITIES

February, 2011

DRAFT for COMMUNITY PILOTS

This Guidebook and the accompanying Community Resource Collection has been crafted based on the idea that Canadian rural communities in forest settings want guidance in understanding and acting to reduce community impacts from the changing climate. Collecting information and existing tools into a useful framework has been the first step for this initiative.

The next step is to test and pilot this idea with Canadian forest-based communities. After these pilots, the Guidebook will be refined, with investments in graphics, pictures and possibly worksheets.

Feedback Invitation

We encourage feedback on this Draft. Please send comments or additional resources to the Lead Author – Cindy Pearce at cindypearce@telus.net.

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Dedication

We dedicate the Guidebook to Mike Walgram, a past manager for the Manitoba Model Forest. Early on Mike had the foresight to envision how climate change would create challenges for Canadian forest based communities and championed this initiative. We hope he would take pride in what has come from what he started.

Acknowledgements

The authors appreciate the leadership of the Model Forest Network of Canada in championing the need to support rural forest-based Canadian communities as our climate changes. This guidebook is founded on the scientific work on climate change adaptation in Canada done by Natural Resources Canada. We are grateful for this foundation work.

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Getting to Know the Guidebook

This chapter tells you about:

- The general challenges and opportunities climate change creates for rural forest-based communities
- What makes a community a climate resilient community
- The main activities along the climate change adaptation trail
- The Guidebook's approach and the community-based information in the Guidebook

1. Climate Change and Rural Forest – Based Communities: Challenges and Opportunities

Most residents of Canadian rural forest-based communities have experienced recent changes in the local climate. Some of these changes include:

- warmer winters;
- hotter summers with longer dry periods;
- more frost-free days and a longer growing season; and
- more intense and more frequent storm events, often with higher winds.

Residents of forest-based communities have also seen changes in the natural environment and local ecosystems. These changes often include:

- higher stream flows earlier in the year and lower summer flows that start earlier and last longer into the fall;
- increase in the number, size and intensity of wildfires;
- shifts in plant and animal distribution with plants dying in some areas and showing up where they have not been seen in the past, and animals roaming where they are not usually seen; and
- unusual insect and disease outbreaks.

These changes are expected to increase in the future with a wide variety of environmental, economic and social effects on rural communities. Climate change is likely to create unique challenges for rural forest based communities because:

- these communities are often located near waterways with increased flood potential;
- the increased occurrence and scale of wildfires may subject residents to greater risk of property loss, crop loss, job disruptions, travel disruptions, health impacts, and/or evacuation;
- residents are closely connected to forests and the environment through recreational, cultural and economic activities which may be impacted;

A Climate Resilient Community

- Considers a range of potential local climate futures in all decisions and plans.
- Has a high level of tested emergency preparedness.
- Invests in public awareness, community technical capacity and adaptive capacity of systems to respond to climate change.
- Has strong partnerships which can swiftly come together to make decisions and take action to address new challenges and opportunities.
- Frequently (every 3-5 years) checks for new conditions, information or techniques to update their actions.

- where the forest industry is the foundation of the local economy, pest outbreaks and wildfires may affect wood supply and change economic opportunities.

Rural Canadian communities have always contended with weather related challenges. The often isolated location of forest –based communities has meant that they have had to cope with disruptions by relying on their own resources. Rural Canadians know how to pull together to support one another through these kinds of difficulties. The climate changes we are now experiencing, and will experience in the future, will test our ability to adapt, calling for new and different ways of coping with the new conditions.

There are also a number of potential opportunities for forest-based communities as the climate changes:

- warming temperatures may increase the wood supply or expand the diversity of timber species that can be grown for local and other potential timber markets;
- warming temperatures with longer growing seasons may expand agriculture and tourism activities with opportunities to diversify the local economy;
- a warmer climate may enhance the recreational and cultural activities enjoyed by local residents; and
- other opportunities not imagined yet by the community may become possibilities as the climate changes.

The opportunities and challenges experienced by individual communities will depend on the climate changes that occur, how the local environment changes and adjusts, and how each community adapts to these changes. Individuals, families, organizations and governments will need to view climate as an ongoing changing factor, and consider how a changed climate will influence their day to day lives as well as over the long term. The purpose of this Guidebook is to assist rural forest-based communities in Canada to become more climate resilient.

2. Acting to Strengthen Resilience

The exact nature of the climate and environmental changes that will be experienced over the long term cannot be defined with complete certainty at this time. In fact, it is likely that some of the changes will not have been expected or planned for, or they may occur earlier than expected. Therefore it is not possible to 'climate proof' any community. However, it is possible to become more 'climate resilient'. This is the purpose of this Guidebook.

Some may say we don't know enough yet to decide how to respond to climate change. The summary from the 2007 Canadian assessment *Impacts to Adaptation: Canada in a Changing Climate* urges us to think differently:

> *'Although further research will help to reduce uncertainties and to address specific knowledge gaps and adaptation planning needs, existing knowledge is sufficient to start undertaking adaptation activities in most situations.'*

The complete summary from this report is provided at the end of this chapter.

3. Who is this Guidebook for?

This Guidebook is designed for small (less than 15,000 population) rural Canadian communities located in forested areas. These communities are especially exposed to the impacts of climate and climate change, and in some situations, there are unique opportunities for these communities to benefit from climate change.

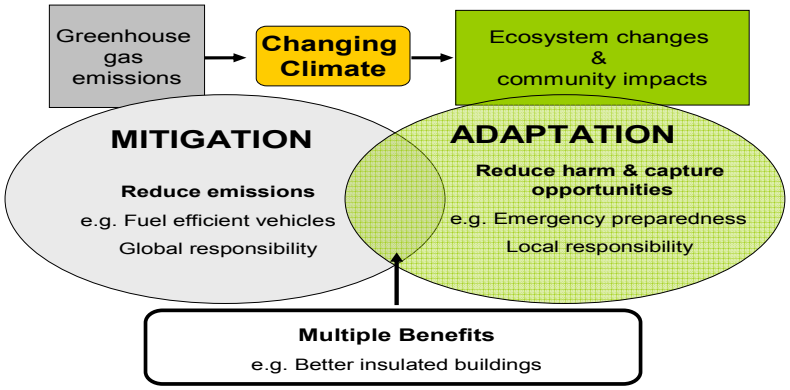
Many rural community residents and senior governments are turning to municipal, First Nations and other forms of local government to take leadership in responding to climate change. While it is essential that local governments be involved in strengthening local climate resilience, it isn't essential that they lead the process. This Guidebook can be used by any community organization or individual who seek to better understand local climate changes and take actions to strengthen their community's resilience or the resilience of different parts of the community (e.g. their workplace, or community organizations they are involved with)

Climate change is likely to touch the lives of every resident in more than one way in Canadian forest-based communities. Flooding may damage property and roads, blocking travel and supply routes; hot summer days may tax older residents without air cooling; and workers in forestry, tourism, agriculture and mining may experience work disruptions from wildfire risks, droughts or unstable snow conditions. Over time, most residents will need to change some of their actions to adjust to climate changes.

As a result, it is important that information about climate change be 'mainstreamed' to as many community members and organizations as possible. Regardless of who leads a climate change adaptation initiative, opportunities should be created for the broader community to share their views and learn about local climate changes in the past and to learn about possible future changes and potential adaptation actions. The next chapter provides more guidance on who should be involved in a climate change adaptation and resilience initiative.

Two Sides of Climate Change

Climate change is usually discussed in terms of greenhouse gases, and how we can reduce or "mitigate" our emissions. We seldom hear about climate change "adaptation" – the need to adjust as the climate changes. These concepts are linked, as shown below.



4. How this Guidebooheak Can Help

Learning about possible local climate conditions in the future, understanding impacts on the community and choosing how to adapt can seem overwhelming. This Guidebook provides a simple framework or Trail Map that rural Canadian forest-based communities can

follow as they assess and decide on actions to strengthen local resilience as the climate changes.

The **Climate Resilience Trail Map for Canadian Forest-Based Communities** on the next page shows the major activities along the Climate Adaptation Trail'. It is important to understand that this is an ongoing community journey. Climate and environmental conditions are changing and we are always learning more about climate change and local effects. Communities also change over time. Each community will occasionally need to loop back on the Trail to reassess their decisions as new observations, information and knowledge become available.

The Guidebook includes one chapter for each activity on the climate adaptation Trail, with the following information:

- tools and techniques for using information include:
  - the types of information that will be needed
  - information sources (people, reports and websites)
  - alternative ways to organize, present and evaluate the information
- advice from communities that have created climate change adaptation plans
- alternative approaches to inform and involve community members, technical specialists, managers and community sectors (e.g. forest industry, emergency services, municipal governments, First Nations,etc.)
- definitions for important terms; and
- references to example forest-based communities who have done climate change adaptation planning.

A glossary of terms is included at the end of this Guidebook for quick reference.

A separate **Community Resource Collection** document has been compiled with lists of useful references, example community planning approaches and samples of community learning materials and information. Readers are encouraged to read this Guidebook with the Community Resource Collection close at hand to refer to frequently.

5. Following the Trail Map and Selecting Pathways

Communities who embark on the climate adaptation journey quickly discover it is a new adventure for Canadian communities, and particularly so for small communities with no long-term examples to follow. Although there is an overwhelming amount of information about climate change and adaptation, information specific to rural forest-based communities is sparse. As well, every community is different and will need to take the climate adaptation journey in their own way, and on their own time.

The Resource Reference section of the ***Community Resource Collection*** lists useful, relevant resources for rural climate change adaptation

Climate Resilience Trail Map for Rural Canadian Forest Based

1. Get Prepared

- Link with current plans
- Start the discussion
- Purpose, goals
- Create a team & workplan

2. Learn about Climate Change

- Observations
- Historical changes
- Future projections

3. Chart & Scan Impacts & Opportunities

- Environmental responses
- Potential community impacts
- Global climate factors
- Non-climate factors

4. Decide Priorities

- Adaptive capacity
- Assessment approaches

5. Plan and Take Action

- Possible actions
- Action priorities
- Adaptation plan
- Implement actions

6. Watch, Learn & Refine

- Watch for changes & new information
- Refine plans & actions

A More Climate Resilient Community

Alternative Pathways

Revisit as needed

This Guidebook doesn't provide one specific way to become more climate resilient. Rather, it offers a map of the usual activities - *the Trail Map* - with a number of alternative tools, techniques and approaches – *Pathways* - for each activity along the way from which communities can choose the best ways to meet their needs.

Supporting wise adaptation actions	Adaptation action example
This Guidebook supports rural citizens to include climate change information in their day-to-day decisions and actions. Adaptation Action Examples, like the one on the right, are included throughout the Guidebook to keep the focus on action.	**Potential Impact:** ***Road damage***
	Due to: • Ditches overflow and culvert/bridges washout from higher spring stream flows during heavy rainfall and rain-on-snow or frozen ground events that happen more often • Washboarding and rutting from more freeze/thaw events as winter temperatures warm and hover near 0°C more often
	Potential actions: *Act now* - Keep culverts & ditches clear of debris. Deepen ditches and over time replace undersized culverts/bridges. - Reduce road loads, go to early shift use or stop use to avoid freeze/thaw damage. *Watch* – Step up monitoring and clearing of ditches and stream crossings during heavy rain & rain-on snow/frozen ground events. *Plan* - Build new roads with bigger ditches, culverts and bridges.

For example:

- One municipal government might be starting a new community-wide strategic planning process. They may decide to include climate change adaptation along with other pressing issues such as a growing number of aging residents and failing water and sewer systems. The Pathways they choose might include gathering climate information as part of a community profile, along with the usual demographic, economic and social data. Then throughout the planning process, climate change impacts are discussed and considered when priority community actions are chosen. In this case, any water system upgrades would account for changes in local streamflows or ground water levels, and anticipated use as summers become drier. Community members would learn about climate change, impacts and actions during community engagement activities for the planning process.

- In another community, the tourism sector might decide the possible impacts and opportunities from climate change warrant their attention. The local Chamber of Commerce may lead the action planning process. They might start by hosting a community presentation and discussion about local climate changes. This could be followed by working only with the tourism sector in the decision-making phase. The action plan that is created and other information can then be communicated to the broader community.

This Guidebook is designed to support these example Pathways, as well as a wide variety of other Pathways that a community might decide to take.

Key messages:

- **Climate has begun to change** - Canadian rural forest-based communities are already experiencing climate changes and related environmental, economic and social challenges and opportunities.
- **It's not possible to 'climate proof' communities** – Climate resilience can be strengthened by considering local and global climate futures in all decisions and actions, being prepared for emergencies and promptly responding to changing conditions.
- **Climate change adaptation planning can include six activities** – The activities on the climate resilience trail map are:

  1. Get prepared
  2. Learn about climate change
  3. Chart and scan impacts and opportunities
  4. Decide priorities
  5. Plan and Take Action
  6. Watch, Learn & Refine

- **This is the beginning of a journey** – It is essential to regularly consider new observations, information and learning to update decisions and actions.
- **There are many ways to complete each step** - For each activity on the trail map, the Guidebook provides a number of potential Pathways other communities have used at this step in the process. Definitions of key terms and advice from communities are also provided.
- **Each community is different** – Each will need to chart their own pathway along the climate change resilience trail, selecting the best tools, techniques and approaches to meet their needs, or inventing new Pathways.

http://adaptation.nrcan.gc.ca/assess/2007/synth/sumsom_e.php

Summary from *Impacts to Adaptation: Canada in a Changing Climate 2007*

Adaptation involves making adjustments in our decisions, activities and thinking because of observed or expected changes in climate, in order to moderate harm or take advantage of new opportunities. It is a necessary complement to the reduction of greenhouse gas emissions in addressing climate change. Adaptation in Canada will be informed by knowledge of current and projected impacts of, and vulnerability to, changing climate, as well as lessons learned from practical adaptation experiences. The following bullets represent key conclusions arising from this national-scale assessment of climate change impacts and adaptation, and are discussed in the subsequent sections of this synthesis.

- The impacts of changing climate are already evident in every region of Canada.
- Climate change will exacerbate many current climate risks, and present new risks and opportunities, with significant implications for communities, infrastructure and ecosystems.
- Climate change impacts elsewhere in the world, and adaptation measures taken to address these, will affect Canadian consumers, the competitiveness of some Canadian industries, and Canadian activities related to international development, aid and peace keeping.
- Impacts of recent extreme weather events highlight the vulnerability of Canadian communities and critical infrastructure to climate change.
- Adaptive capacity in Canada is generally high, but is unevenly distributed between regions and within populations.
- Resource-dependent and Aboriginal communities are particularly vulnerable to climate changes. This vulnerability is magnified in the Arctic.
- Some adaptation is occurring in Canada, both in response to, and in anticipation of, climate change impacts.
- Integrating climate change into existing planning processes, using risk management approaches, is an effective approach to adaptation.
- Barriers to adaptation action need to be addressed, including limitations in awareness and availability of information and tools.
- Although further research will help to reduce uncertainties and to address specific knowledge gaps and adaptation planning needs, existing knowledge is sufficient to start undertaking adaptation activities in most situations.

1. Get Prepared

This chapter tells you about:

- Alternative ways to integrate climate resilience thinking and planning in decisions and actions in your community
- What sources of local knowledge, external information and expertise might be needed
- Identifying community organizations and individuals who should be involved in the climate resilience journey
- Ideas from other communities for starting the discussion and moving forward

1.1 Climate Resilience Action Planning and your Community

In the past, climate could be thought of as fairly stable over the long-term. Communities expect the natural seasonal shifts with the odd extreme event from time to time. Until recently a changing climate has not been a factor that needs to be understood and considered in community plans and decisions. Forest-based communities in Canada can no longer think of climate this way because climate change is already altering the environment, economy and life in these communities.

Deciding how to include changing climate conditions in community decisions will largely depend on:

1. **The types and severity of climate changes and impacts the community is experiencing, or is expected to experience -** If extreme weather events are already challenging the community, focusing on these situations to identify and take actions to reduce risks may be most important. If less extreme climate changes are being observed, the community may decide to understand the broader consequences of these changes and identify the best decisions and actions for the community.

2. **The planning and decision approaches the community is familiar with** - Most Canadian forest-based communities have some experience with completing plans to improve community conditions. For example, the communities may have prepared and implemented economic development plans, municipal land use plans, or strategic plans for specific sectors of the community. There are also communities who will not have any experience with community planning and may or may not be keen to get going.

Climate Resilience Trail Steps

1. GET PREPARED
2. Learn about Climate Change
3. Chart & Scan Impacts & Opportunities
4. Decide Priorities
5. Plan & Take Action
6. Watch, Learn & Refine

Advice from other communities

- **Locally initiated and 'owned' approaches are more likely to result in action** – The commitment of local governments and community organizations (such as the Chamber of Commerce) is essential to create and maintain the momentum through the learning and planning, then into the action phase.
- **Design for 'mainstreaming' climate information in all decisions and actions** – This can be done by distributing public information and by hosting events to support all community members to include new climate conditions in their day to day and long term decisions. There will also be broader understanding of why local governments or other organizations are making specific decisions to account for the changing climate.
- **Adaptation planning takes time** – Completing a thorough, community-wide assessment and action plan will take at least a year and require significant resources.
- **Consider a 'quick start' option** - Some communities have started by raising awareness through newspapers, newsletters, workshops and local information events that encourage mainstreaming. Priority risks can be quickly identified and actions taken to reduce these risks (e.g. stronger emergency readiness, creating wildfire buffers around schools and homes) until more thorough assessments can be completed, if needed.

3. The best ways to implement climate resilience at the community level will depend somewhat on the community's experience with and approaches to community planning. For example:

    - If the community has a comprehensive community planning process, the best Pathway may be to review the plan with a climate resilience lens. The community could learn more about past and possible future local climate changes and evaluate how these might affect the community and the plan. This will build on and enhance the guidance in the community plan by bringing in climate resilience.

    - If plans already exist for some aspects of community life, the best Pathway may be the development of a community-wide learning project about local climate changes and possible impacts. This could then be followed by separate processes to decide on actions for specific areas of community life (e.g. community infrastructure, forest industry, economic development, etc.).

4. **Other challenges the community may be facing** – Small, rural communities often have limited financial and human resources to address challenges. If an economic crisis or a sudden shift in community leadership is occurring, it may only be possible to engage your community in this topic in a very small way in the beginning. For example, start by making presentations in schools, community events, and with local organizations to build awareness in preparation for later actions.

Resource 1.1 in the Community Resource Collection describes possible **Pathways' for Getting Started** with climate resilience action planning in rural forest-based

communities in Canada. Individual communities will likely identify other ways of getting started.

1.2 Resources

At this first step, interested community members are encouraged to scan Synthesis and the relevant regional chapter of:

- ***From IMPACTS to ADAPTATION - Canada in a Changing Climate 2007.*** Lemmen, F.J. Warren, J. Lacroix and E. Bush (editors). Government of Canada. http://adaptation.nrcan.gc.ca/assess/2007/index_e.php

The **Community Examples** in the Community Resource Collection provide examples of community climate adaptation plans that will be helpful as community members think about whether and how the community might mainstream climate change in daily decisions.

1.3 A Community Effort and Beyond

In most Canadian rural forest-based communities, climate affects almost everyone. Many rural citizens spend several hours of their day outdoors through their work (e.g. forestry, agriculture, land-based tourism) or their hobbies and passions (e.g. gardening, hiking, fishing, hunting, bird watching). Consequently it is possible that a changing climate will impact most citizens in some way. To be effective, climate adaptation often requires committed efforts by many citizens and organizations because many hands make light work. and there will be many opinions about climate change, and what might be done to strengthen resilience.

As well, the topic of climate change can create challenging differences of opinion within rural communities. Given this situation, it may be best if the process is implemented as a partnership with several community organizations or members from a range of perspectives and interests. This way, differences of opinion can be explored and talked through early on.

Who should be involved will also depend on the topics that are included in the climate resilience project.

In most situations, a rural Climate Change Resilience Project should include:

- **Community partners and participants**

  Assessing the potential impacts of climate change on community life, and defining and implementing feasible adaptation actions is most effective when the organizations and individuals most familiar with the topics being examined, and responsible for carrying out the actions are involved in a meaningful way. If a broad community plan is being created, a wide range of community organizations should be involved. If a specific decision is examined, then the small group of individuals who are responsible for deciding and implementing the actions should be involved (e.g. if transportation is being examined, representatives from the government agencies and any businesses providing highway, air and services must be involved). Anyone who will be directly affected by a changing climate or decisions and actions to strengthen resilience should be included.

'Mainstream'
A term with two meanings

- In **community development**, 'mainstream' means engaging as many community members as possible in learning about and providing input on community decisions.
- In **climate change adaptation**, 'mainstream' means integrating climate change information in all decisions on a day-to-day basis, and in ongoing planning.

In this Guide the term is used in both ways, to emphasize how important it is to 'mainstream' information about climate change to all community members, as they are all likely to be affected, so each person can 'mainstream' climate change into everyday decisions and long-term

The table of Possible Community Partners and Participants below lists categories and examples of organizations and individuals who might be involved.

Some of these organizations and individuals will become project partners, working closely with you on the assessment of the potential impacts of climate change on specific parts of the community life, perhaps providing human or financial support. Others will be community participants, sharing their knowledge, ideas and perspectives, and perhaps taking on specific tasks.

Possible Community Partners and Participants

Types	Examples
Governments	Local governments such as municipalities, First Nations, regional governments , provincial agencies, federal agencies Staff with responsibilities who might need to be included: emergency preparedness, fire, transportation, public works/community infrastructure, land use and community planning, energy/utilities, health, natural resources, local economy, education, etc.
Community safety organizations	Search and rescue volunteers, Social Planning Council
Utilities	Water, electricity, oil, gas and telecommunications providers
Transportation providers	Roads, highways, rail, air and water service businesses, particularly for essential links
Businesses	Retail, forestry, tourism, mining, agriculture, trappers
Recreation groups	Rod and gun, fishing, skiing, snow sledding, hiking, gardening
Conservation/ environmental groups	Community organizations

- **Local climate and environmental change observers**

  Individuals and organizations with experience and knowledge about the local climate and environment are essential to involve in climate resilience projects.

  Aboriginal groups with a long history and much experience on the land can be valuable to involve.

  Gardeners, birdwatchers, hunters, fishermen, loggers, farmers and others who have observed local climate and environmental impacts over decades can be especially helpful.

  Local and external organizations such as water stewardship groups and natural resource agencies may also have climate and environmental change data that will be helpful to the community resilience planning process. Individual experts such as biologists, hydrologists, geographers and foresters may also have knowledge and information about the local area.

  These people can be invited to workshops and community events, or they may need to be interviewed individually. Community surveys can also be used to gather local knowledge about local climate and potential impacts and opportunities.

  The individuals and organizations that should be included in the community process will depend on the topics that are included in the Climate Resilience Action Plan. A focus on river flooding might involve streamside residents who have tracked river levels over time or people who fish on the river, and/or a fisheries stewardship group and the biologist who maintain a water monitoring station.

- **Community champion(s)**

  The many uncertainties about climate change can create much debate within a community. This makes it important to involve at least one broadly respected individual or organization that is willing to speak publicly about the need to adapt to a changing climate by being better prepared now. These individuals will need to be willing to set aside time to become familiar with climate change information, attend community events and group meetings, and engage in one-on-one discussions. They also need to be prepared for and able to handle passionate sometimes heated discussions.

- **Climate science and adaptation expertise**

  Climate and adaptation specialists can make important contributions at particular stages in the process. Climate change information is becoming more readily available on the internet, but the support of a climate scientist can be very helpful to review and explain potential local effects. There is growing Information about impacts and adaptation actions, however local conditions need to be considered so the plan addresses the community's specific context.

  This expertise can be accessed

General advice from other communities on engaging community members:

- **Make climate change impacts relevant** - Be mindful of the goals/concerns of partners and participants and how climate change might affect their interests.
- **Involve a climate science expert** – Climate science is complicated and is best explained by a climate science expert who is knowledgeable about the local area.
- **Keep it simple** - Avoid over-focusing on technical modelling and jargon. Present information visually and graphically using local situations for greater relevance and quicker understanding of impacts.
- **Avoid information overload** – There is a lot of information available about climate change and adaptation. Some community members will want to read detailed reports, others will want concise summaries and other will want brief fact sheets. Establish an information library and expect to need to create summaries and fact sheets.

from government agencies, universities, colleges and consulting firms. The authors of the regional chapters in *From Impacts to Adaptation - Canada in a Changing Climate 2007* are good contacts for these experts.

Advice from other communities on adaptation planning:

- **Seek committed champions –** Respected community members who are willing to champion the effort are necessary. These champions guide and support the process as well as being the community spokespeople. Without champions, some community efforts have failed.
- **Create a project team –** For a community-wide adaptation plan, a representative cross-section of the community should steer the project. This team will make decisions about the process, provide their input and advice and be ambassadors for the project in the community.
- **Understand the steps in the process –** A full adaptation plan takes several steps: understanding climate change, charting impacts, deciding on priority vulnerabilities/risks/opportunities and creating the action plan. It is necessary for the project steering team and partners to understand these steps to have realistic expectations of the time and effort required.
- **Leverage resources (funds and time)** – These plans are seldom completed effectively 'off the side of the desk'. Someone will need to take responsibility for getting started, often by working with potential partners to secure resources. If resources are not available, start with lower cost community learning activities.

1.4 Starting the Discussion and Moving Forward

In rural forest-based communities it is often best to start building momentum for a climate change adaptation effort with one-on-one discussions with potential champions. It is essential to get their views about locally observed changes in the climate and the need to be prepared for more changes. If the champions agree that this is important to the community, or at least are not opposed to the idea, then the discussion should move to a larger group.

Bringing a handful of selected community members together to take a look at the community through a climate resilience lens is often a useful next step. This group can decide whether a community climate change adaptation initiative is needed, and if so, what next steps should be taken. This initial discussion can be organized by any individual or organization who wants to explore whether there is interest in looking closer at climate change adaptation in the community. Who is invited to attend this initial discussion will depend on the community and the level of interest in climate change.

Resource 1.2 Community Climate Resilience Lens Questions in the **Community Resource Collection**

Since climate is part of every aspect of rural living, its effects on our lives are often overlooked or taken for granted. By looking at the community through a climate resilience lens, participants will get a better understanding of the changing climate conditions, possible community impacts, and any climate risks or opportunities.

The **Community Resource Collection** contains the following resources to assist with these first steps:

1.3 - Community Resilience Action Planning Questions

1.4 - Project Team Guidance

By sharing initial perspectives on aspects of community life that might be impacted by a changing climate, the group can decide whether the time is right for the community to move forward on climate change adaptation. If it is agreed that the time is right, the next

step is often to create a project team to move the project forward.

1.5 Possible Challenges/Barriers and Potential Solutions

It is essential to be realistic and candid about potential challenges and barriers to engaging a community in climate change resilience discussions. The table below lists Rural Climate Change Adaptation Project Challenges/Barriers & Potential Solutions.

Rural Climate Change Adaptation Project Challenges/Barriers & Potential Solutions

Challenge/Barrier	Possible Solutions
In the community	
Difficulty engaging the community when other challenges are seen to be more urgent	Proceed with community events to promote learning about local climate changes and possible impacts Encourage climate change adaptation being included in the community decision processes for the other challenges and for emergency preparedness
Disruptions by climate change skeptics	Emphasize local observations of climate and environmental change and historical climate change data Focus the project on being better prepared for recent and possible future changes similar to emergency planning, 'just in case' the expected changes happen
Involving busy key local government staff (e.g. water system manager, engineer, etc.)	Plan for one-on-one sessions with key staff at their convenience to bring their knowledge to the project Plan for reasonable report review timelines – ask participants for timeframes
Frequent local government staff changes	Include more than one local government staff member in the project if possible
Limited local project coordination/research skills	Partner local expertise with a project management, research and/or climate change adaptation support
External resources	
Climate change experts comfortable with rural projects	Use the regional section of the *Impacts to Adaptation* assessment to define possible future climate conditions Search the internet for regional or sector specific specialists who may provide expertise or resources
Few individuals with local climate change impacts and adaption research and planning expertise	Plan for significant refinement of research and action plans to reflect local conditions Be satisfied with defining major impacts and actions, with intentions to revisit as resources are available
Project funding	Do low cost community events to promote learning about local climate changes and possible impacts Encourage the integration of climate change adaptation in all community decisions, with careful attention to emergency preparedness

Key messages:

- **One size does not fit all** - Each community will need to decide on the scale and scope of climate change adaptation planning they are able to complete at a particular time, and recognize that adaptation will continue over time.

- **Mainstream for quick action** – As almost everyone in Canadian rural forest-based communities are likely to be impacted by climate change, broad community involvement in the planning process will increase support for adaptation actions taken by governments and other organization, and encourage citizens to take their own actions.

- **It takes a team** – A successful community scale adaptation planning team requires leadership, champion(s), a local coordinator, committed community members, researchers, climate science experts and technical expertise in the topics that will be examined.

- **Be realistic** – Community-wide climate change adaptation planning is a complex process that requires significant resources. Mainstreaming climate change information and smaller scale efforts focused on urgent risks can be an effective beginning to longer term climate change adaptation.

2. Learn about Changing Climate

This chapter tells you about:

- Starting with local observations of recent climate conditions
- Climate language – the concepts and terms climate scientists use and what they mean
- Gathering historical climate data for the community
- Presenting future climate projections
- How to mainstream climate information to broaden community understanding

2.1 Start with Local and Traditional Knowledge

Many of the people who live in forest-based communities spend a lot of time working and playing outdoors. This often leads to an awareness of local climatic changes before they are identified in official climate records.

The first step in a community based climate resilience process is to collect observations about the changing local climate. In Chapter 1this is suggested as a topic for a meeting with potential partners to start the community discussion about climate resilience - *What changes in climate and the local environment are you observing*? These local observations can also be collected during community events, through a community website, a community-wide survey, interviews with select individuals or by posing questions at meetings of local weather observers such as outdoor recreation groups. Elders in First Nations communities and long time residents who have lived their lives outdoors can be particularly helpful.

For example, in Vanderhoof, BC, a community survey resulted in observations of shorter winters, bird species not previously seen in the region, and shallower snow packs.

Resource 2.1 – Climate Information Sources in the **Community Resource Collection**

Local observations may provide enough information for the community to start examining the impacts and defining actions to improve community climate resilience.

2.2 Resources

This section is based on the authors' experiences communicating climate science in rural communities. The historical and future projections of climate change are from *Impacts to Adaptation - Canada in a Changing Climate 2007.* We are fortunate to have many sources of information about past

Climate Resilience Trail Steps

1. Get prepared
2. **LEARN ABOUT CLIMATE CHANGE**
3. Chart & Scan Impacts & Opportunities
4. Decide Priorities
5. Plan & Take Action
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and future climate in Canada.

2.3 Learning Climate Language

In the past, it has been assumed that climate in a local area is relatively stable – that in recent history the range of climate conditions that will occur in the future have been experienced. It is beginning to become clear that this is no longer the case. To begin to understand climate as a changing factor it is necessary to learn the concepts and terms climate scientists use to describe climatic conditions.

Climate Language Intro

Weather - The day-to-day and hour-by-hour atmospheric conditions at a given location.

Extreme weather event - An event that is rare within the weather conditions at a particular place.

Climate - The average weather described in terms of the mean and variability of features such as temperature, precipitation or wind over a period ranging from months to thousands or millions of years. The usual period for describing climate in Canada is 30 years.

Climate variability – The highs and lows of climate conditions over a long period of time.

Climate change - A statistically significant change in either the average state of the climate or in its variability, measured over an extended period – usually at least 30 years.

- ***Weather and climate***

Although weather and climate are commonly used in the same context, there is an important distinction:

- *Weather* describes the atmospheric conditions at a given location and short time frame – for no longer than a couple of weeks.
- *Climate* is the blend of day-to-day weather and year-to-year variability in climate into a set of average conditions over a long term. An average of thirty year records of weather observations is commonly used to describe climate conditions in Canada.

Traditionally, weather is expected to be highly variable day to day, and climate to be variable year to year. However, the overall climate is expected to be within the range of recent experience. Many of the decisions a community makes are based on this assumption. However, climate has become more dynamic and changing than in the past. By knowing more about the recent and possible future climate changes, improvements can be made in both daily decisions and long term planning.

- ***Climate variability, change and extremes***

  The terms climate variability and climate change are sometimes used interchangeably just as weather and climate are, but they are very different phenomena for climate scientists. Extreme weather events have been seen as signals of climate change, though individual events are not. The definition box on the left defines these terms.

  - *Climate variability* refers to swings and variations in climate experienced on time scales shorter than several decades. For example, the El Nino and La Nina weather patterns on the west coast that shift from warm/dry to cool/wet over a number of years is a source of climate variability.
  - *Climate change* refers to changes in the average climate conditions over longer time scales of 30 years or more. For example across the prairies, since 1895, the average annual temperature has increased 1.6 ^{o}C. This is a signal of a changing climate.
  - *Extreme weather events* are rare within the weather patterns in a particular place, such as severe winds, intense rain, heavy snowstorms or droughts. These events can last for hours, days, months or several years (e.g. multi-year droughts), and reflect the outer ranges of climate variability. As climate change occurs, extreme events can become more frequent and/or more severe, beyond the historical

range of variability.

These severe events have the potential to directly affect the daily lives of community members more than other aspects of climate variability and change.

Climate change occurs naturally over long time scales, as well as in response to increased greenhouse gases in the atmosphere. No distinction is made between natural and human-caused climate change in this guidebook, as the cause is not important to the forest-based community's desire to adapt and increase community resilience.

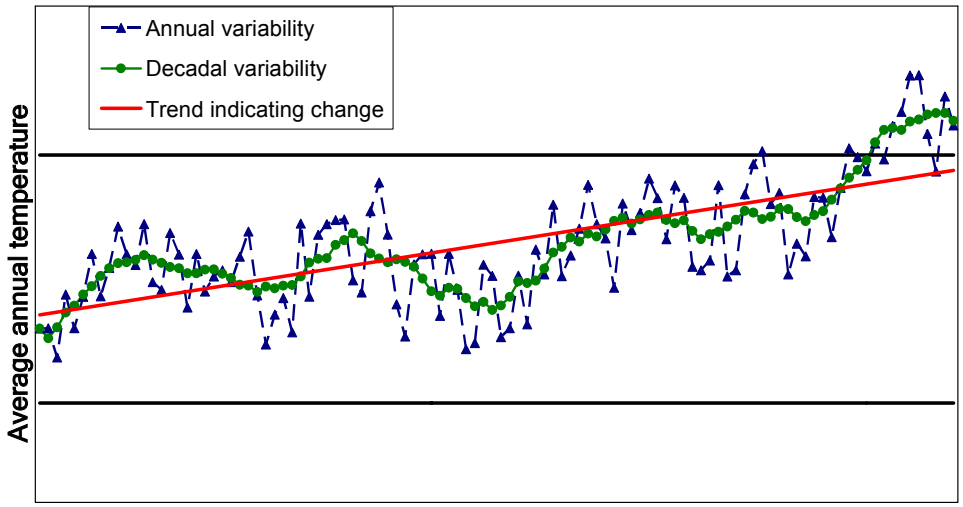
- ***Describing a changing climate***

  Describing the climate of a specific area generally requires air temperature and precipitation information for a period of at least 30 years. The common measures of climate change are:

  - *Air temperature* - one of the main features of climate. It is easily measured consistently over time and place so it is most often used as a signal of climate change. Information about historical air temperatures and changes, called *trends,* are available for weather stations across Canada (see Community Resource Collection for more information)

    Changes in average (or mean) annual air temperature over several decades are often reported as the amount the climate has changed, or may change in the future. For example, across Canada, air temperature has increased 1.3 °C on average in the past half century. Climate scientists know that a change of 1 to 2 °C in average annual temperature signals an important shift in climate, although it often seems insignificant to others. To put this change into context, a 5 °C drop in average annual temperature prompted the last ice age.

Climate Variability and Change



In Canada the weather varies from season to season. Information about average annual temperature doesn't mean much because climate isn't experienced as an annual average. Seasonal changes in average temperature, and in the minimum and maximum temperatures, are often more helpful to describe climate changes.

Resource 2.2 – Common Measures of Historical Climate Change in the **Community Resource Collection**

  - *Precipitation* - also an important climate feature that is highly variable across the landscape. The amount and type of precipitation (e.g. rain, snow, etc.) in a specific place is greatly influenced by the local landscape including the

location, size, height and slope direction of valleys, hills and mountains. As a result, historical precipitation trends show lots of variation, and don't signal a change in climate as clearly as temperature trends.

Precipitation trends are often expressed as a percentage change over time rather than as an absolute amount. For example, there has been a 12% increase in average precipitation across Canada in the past half century.

– *Extreme weather events* - often described based on the return interval or how frequently they have occurred over a defined time period (e.g. a 50-year event – meaning this event occurred once in 50 years). Individual extreme weather events cannot be tied directly to climate change, as these events do not happen often. However, the frequency and intensity of extreme events compared to what would be expected based on historical records has increased in recent decades and is expected to increase in the future.

- *Seasonal climate conditions* - most important for community members to have information about. Climate change does not happen consistently across all seasons so it is necessary to seek seasonal information when it is available.

A Country of Seasons

In Canada, distinct seasons greatly affect our lives. To have everyday meaning in our lives, climate information needs to reflect seasonal differences. Seasons are defined by climate scientists as:

Winter - December to February

Spring - March to May

Summer - June to August

Fall - September to November

2.4 Community Climate Change Profile

An important task for the community team will be to create a climate change profile, ideally with the support of a technical specialist with climate expertise. The team will need to decide what climate elements are important to community life and how the information should be presented (e.g. tables, graphs, etc.).

Advice from other communities about learning about changing climate:

- **Begin with observations** - Community members are eager to share the changes they are seeing in the local climate and environment, and the impacts on their community.
- **Show how the climate has already changed** – Climate information has been compiled for regions across Canada that show past climate changes.
- **Describe current climate conditions** – This will help community members begin to understand the local climate, as compared to the weather.
- **Involve climate science experts to discuss projections of future climate** – Call on a climate science expert to present the future climate projections for the area.
- **Be up front about uncertainty** - Climate science does not have all the answers about future climate change and impacts – but there is enough information to get started and be better prepared.
- **Repetition is good** – More than one presentation and discussion about climate science and local changes is encouraged to build understanding and comfort with this new information.

Most profiles will include:

- current annual and seasonal average temperatures and precipitation to describe the current climate and provide a baseline for understanding possible future climate conditions.

- recent changes in annual, and seasonal average temperature and precipitation to illustrate how the climate is already changing.

Community Examples and **Resource 2.3** Community Climate Change Profile in the **Community Resource Collection** .

- a range of possible future annual temperatures and precipitation, as well as other conditions when available to show how the local climate might change in the future.

For most forest-based communities in Canada, temperature changes in the past century, and those projected for the next century will be in the range of 1 to 3 °C. This seems like a very small change to non-climate scientists. The importance of this scale of change can be illustrated by comparing the current average annual temperature and precipitation for the community with other communities that are familiar to community members, including communities with warmer climates. See the example in the Community Resources Collection section 2.3.

Preparing a profile with a technical specialist is most effective. However, the remainder of this chapter provides guidance about publicly available climate information that can be used to create a climate profile.

2.5 Understanding Current Climate Conditions

We are fortunate that in most regions of Canada (except for the far north and at higher elevations in the west) the Meteorological Service of Canada has maintained weather stations for over a century. Records of temperature, precipitation, wind speed and other weather conditions make it possible to describe local climate in many locations. Information from these stations is also the foundation for weather reports and forecasts that citizens are familiar with. Climate data from weather stations across Canada has been compiled for two 30-year periods (1961-1990 and 1971-2000) and can be used to describe recent climate. This information is publicly available and can be reviewed and downloaded from the Meteorological Services of Canada website.

Meteorological Service of Canada for compiled climate data from weather stations across Canada.. climate.weatheroffice.ec.gc.ca/Welcome_e.html

2.6 Learning from Recent Climate Changes

Local climate data can complement local observations of changing climate conditions, often bringing numerical verification to observed trends. The climate information that has been collected by the Meteorological Services of Canada has been analyzed to examine climate changes for regions across Canada.

Maps for historical seasonal temperature change and annual precipitation change across Canada in **Chapter 2 Section 4.3** ***Impacts to Adaptation: Canada in a Changing Climate*** *2007.* http://adaptation.nrcan.gc.ca/assess/2007/ch2/4_e.php

Impacts to Adaptation: Canada in a Changing Climate 2007, the national assessment of climate change impacts, provides national and

regional scale information about changes (see maps for seasonal temperature change and annual precipitation change – in Chapter 2 Section 4.3 of the assessment). More detailed regional information may be available for specific areas from Canadian and regional climate change centres (see Resource 2.1 Climate Information Sources in the Community Resource Collection).

A technical specialist is able to secure detailed historical climate data for individual climate stations across Canada. This data can then be analyzed in a number of ways to show climate variability and change over time for a range of climate factors. An example of this type of analysis is shown in Resource 2.5 in the Community Resource Collection.

In addition to providing information for the community profile, a community can benefit from knowing more about past climate change by:

- **Realizing that in most of Canada the climate has already begun to change** and the amount of change varies across the country and between seasons.
- **Seeing the difference between climate variability and climate change** in the local area.
- **Remembering how well the community coped** during years when extreme climate conditions occurred (e.g. droughts) or when extreme weather events happened (e.g. windstorms, heavy rainfall). If the community coped well, it is more likely to be resilient to similar future climate changes.
- **Learning what climate conditions have stressed the community** by recalling past extreme weather events (e.g. heavy rainfall), or longer term seasonal extremes (e.g. droughts) that taxed the community's ability to cope. The technical specialist can review the weather records during these events, and describe the climate conditions (e.g. daily and seasonal precipitation) that lead to community stress. These climate stress conditions should be kept in mind as the community learns more about possible future climate conditions. Is it likely that future climate conditions will be similar, or more challenging than the climate conditions that tested the resilience of the community?

Adaptation action example
Potential Impact:: *Water shortages*
Due to: • Reduced mid and late summer stream flows from lower summer rainfall, less snowpack and higher evaporation with warmer temperatures
Potential actions: *Act now* – Water conservation practices (watering restrictions, low flow retrofits, plant drought tolerant landscaping, etc.); fix leaks in water mains *Watch* – Install stream flow gauge on source water streams *Plan* – Study whether increased storage of spring run-off in a larger or additional reservoir will be needed

2.7 Learn about Future Climate Change

In addition to planning how to become more resilient to recent climate changes, the community is encouraged to consider possible future climate changes, how these changes might impact the community and how the community might take action to strengthen its resilience.

To do this, the community will need information about possible future climate conditions. Some may be tempted to look at the historical changes (e.g. 1.3 °C increase in temperature on average since 1948 across Canada) and assume this will continue into the future at the same rate. Climate scientists caution against

making this assumption because climate is affected by a large number of factors which interact over time and space. As a result, climate scientists use extremely detailed computer climate models to project future climate conditions.

These models project changes in temperature, precipitation, wind speed and other climate properties compared to a baseline (usually 1961-1990) for defined geographic areas and time periods in the future (usually the 2020s, 2050s and 2080s). These models are designed for global or regional scales.

The models account for some uncertainty about the future by examining a number of 'scenarios' for future development and greenhouse gas emissions. Future climate projections should be considered as possible alternatives, none of which will actually happen, but any of which could prove similar to reality in the future. Based on the possible future climate conditions the community can anticipate how community life might change and how to strengthen community resilience. As it is uncertain exactly how climate might change, it is important for the community to consider a range of scenarios, including the most extreme, to try to anticipate surprises and build resilience.

Future climate change projections will be needed for the community climate profile. Climate scientists have developed a number of formats to show possible future climate conditions (See examples from *Impacts to Adaptation*: *Canada in a Changing Climate* Chapter 2 Section 3 on the next page). It will be important for each community to select the format that will be most effective for community members.

To learn more about future climate change projections and greenhouse gas scenarios:

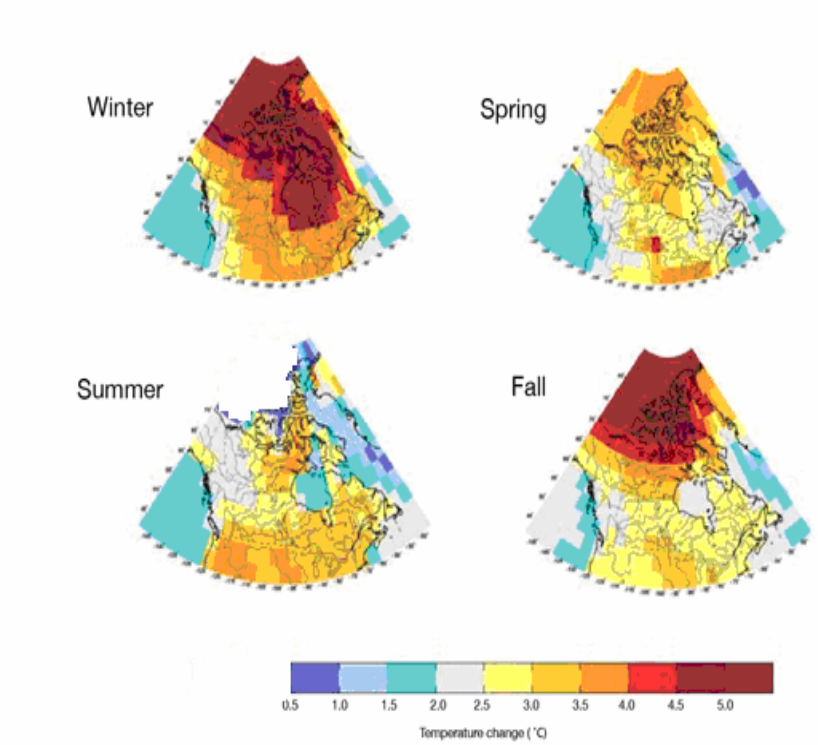
Impacts to Adaptation – Canada in a Changing Climate. 2007. Natural Resources Canada. (Chapter 2 – Section 3) http://adaptation.nrcan.gc.ca/assess/2007/index_e.phphttp://adaptation.nrcan.gc.ca/assess/2007/ch2/4_e.php

Climate Change 2007 Synthesis Report. Intergovernmental Panel on Climate Change. 4th Assessment Report. http://www.ipcc.ch/publications_and_data/ar4/syr/en/main.htmlhttp://www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_synthesis_report.htm

Preparing for Climate Change – A Guidebook for Local, Regional and State Governments Chapter 2 for a simple explanation of Climate Change and Greenhouse Gas Emissions. http://cses.washington.edu/cig/fpt/guidebook.shtml

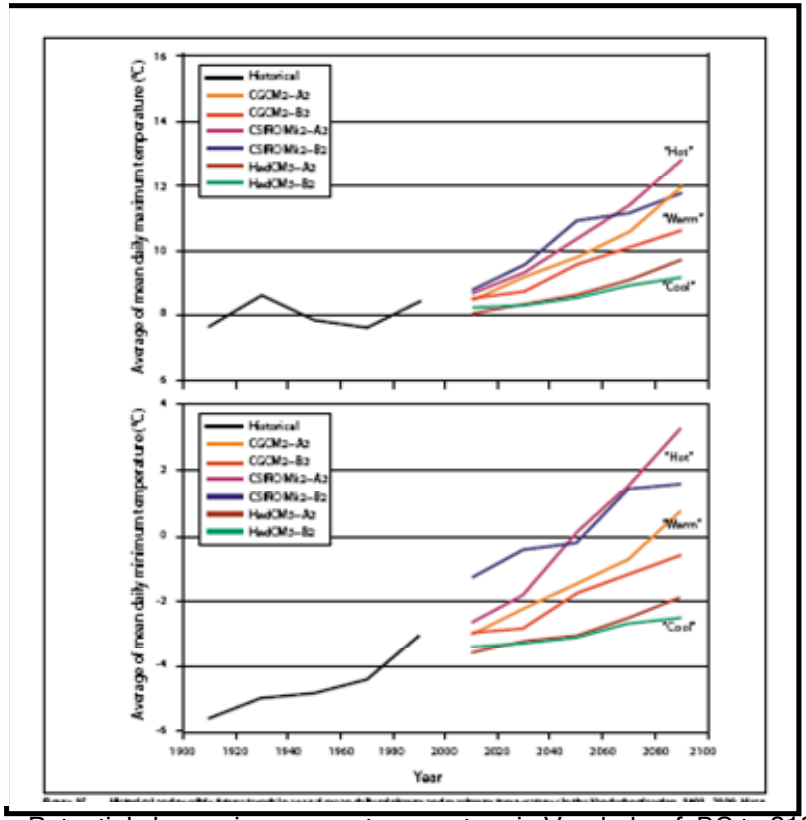
Community Examples in the **Community Resource Collection** for ideas about how to show possible future climate conditions.

Example of Maps of Future Climate



Potential seasonal change in average temperature across Canada by 2050. From: *Impacts to Adaptation – Canada in a Changing Climate,* 2007.

Example of Graphs of Future Climate



Potential change in average temperature in Vanderhoof, BC to 2100. From: *Assessing potential biophysical and socioeconomic impacts of climate change on forest-based communities: a methodological case study*. 2008

2.8 Reflecting Uncertainty

While it is certain that the changing climate will lead to environmental and community changes, there is uncertainty about exactly what will happen as well as the size and timing of changes. Uncertainty is a given in any climate change assessment because we cannot know the future climate with certainty. In addition, there is also uncertainty about ecosystem responses and how communities might be impacted and respond.

Possible ways to reflect uncertainty in climate change adaptation are listed in the box on the right.

2.9 Community-wide Climate Change Learning

In rural forest-based communities, almost everyone should consider adapting to current and possible future climate changes. For example households, businesses and governments need to be better prepared for emergency situations such as power disruptions from storms or wildfires, or property damage and road washouts during flooding. As well, property owners and businesses may need to understand why local governments need to increase taxes to strengthen community infrastructure. Local governments may need to add back-up power for water systems, or change regulations about building in floodplains.

Reflecting uncertainty in climate change adaptation

- **Consider a range of possible futures or scenarios –** Future climates should be described with a range of possible conditions rather than one outcome (e.g. 2-4 ^{o}C increase rather than 3 ^{o}C increase). After an initial assessment of possible impacts it is helpful to draw participants' attention to the greatest possible change, and ask them to consider 'what if' this scenario were to occur.
- **Expect and accept differences of opinion –** Expect that there will be differing opinions about climate change and potential impacts. Bring these differences together by using scenarios of possible future conditions. Encourage the need to be prepared, as a community is for emergency situations.
- **Encourage discussion –** Where differences are expressed, probe for the reasons for the differences to promote better understanding and learning.
- **Flag uncertainties –** Document uncertainties throughout the assessment. If possible, reflect the scale of each uncertainty.
- **Be careful with language –** Great care should be taken when communicating about climate change. Words such as 'will', 'may', 'is likely to' etc. must be consistent with technical documents.

While it may be easier to educate a handful of local government staff and elected officials, in the long run this leaves the staff and officials with the job of informing the community about the changing climate and what can be done to increase community resilience. To date rural communities have found that mainstreaming community education as broadly as possible throughout a community supports moving on and adapting as swiftly as possible. The box at the left describes types of learning activities that have been effective to open the discussion about climate change adaptation in rural communities.

Columbia Basin Trust Communities Adaptation to Climate Change Initiative *Starting the Dialogue* summary, fact sheets and videos. http://cbtadaptation.squarespace.com/videos-documents-fact-sheet/

Who to involve and how to share climate change information:

- **Who?**
  - Climate change information should be mainstreamed so all community members have the opportunity to learn about local change and decide how to adapt.
  - A technical specialist with climate expertise should be involved to share scientific information at a series of events and hear local observations. Often it is costly for these individuals to travel to forest-based communities so a series of activities should be scheduled during each visit.
- **How?**
  - An ***open public presentation*** with take-home materials.
  - ***Meetings*** with local government officials and staff, forest sector, transportation sector, business groups, outdoor recreation groups and others who might need to adapt to climate change.
  - Project team members might also host ***kitchen table discussions*** or ***information tables*** at community gathering places such as the grocery store, community centre, farmers market, etc.
  - Many information sources will likely be found at this stage so it will be important to establish an ***information library*** that is accessible so people can add and read materials easily. Possible ways to do this are: a special area in your local library, links on the local government website, a project website http://www.weebly.com/ or a project WIKI http://www.wiki.com/.
  - Three types of information are often needed: ***technical documents***, ***summaries*** of technical documents which provide more details and links to further information and very simple one page ***fact sheets***,.
  - **Short videos** can be very effective – look to high school and local college programs to assist with creating stories that are relevant to the community.

Key messages:

- **We live in seasons in Canada** – Use information about seasonal climate so community members can quickly relate to and understand new information.
- **Local observations open the door** - Begin by compiling local observations of changes in climate and the environment from people who have been in the area spending time outdoors or observing climate for many years. This information may be sufficient to begin to consider your community's climate resilience.
- **Get to know the past climate** - Historical climate data will enrich understanding of local climate and help confirm trends community members are seeing in temperature, precipitation and other factors. If possible, a technical specialist with climate expertise should lead any complex analyses of the local data and assist community members in applying this information to an action plan.
- **Learn about possible future climate** - Projections of future climate scenarios for 2020, 2050 and 2080 are available for all of Canada. Work with a climate specialist to decide which climate factors to focus on and how to present the information. Look for potential climate surprises that may not be anticipated.
- **Include locally relevant information** - The community based team should define the climate properties that are important to the community.
- **Keep the information simple** - Use tables, pictures and other helpful illustrations to explain the information as complex data can often discourage community members. Make a special effort to show how small changes in climate can cause large shifts in environmental and community conditions.

3. Chart & Scan Impacts & Opportunities

This chapter tells you about:

- How climate changes influence the local natural environment in Canadian forest-based communities
- How changes in climate and the natural environmental might influence community safety, infrastructure, economy and quality of life
- Different approaches a community might take to chart and understand the linkages between climate changes and community impacts and opportunities
- Thinking beyond the community to broader climate change implications that may impact the community
- Which climate change impacts a community should consider further through existing community organizations and processes, and which require detailed assessment in a separate community adaptation planning process

3.1 From Climate Change to Community Life

Once information has been gathered about past and potential future climate change, the next step in adaptation planning is to understand the current and possible future effects of climate change on a community. This can be challenging because climate has wide-reaching influences for forest-based communities.

Specific climate changes such as an increase in temperature can affect a community directly through primary and secondary climate impacts, and through indirect impacts as the natural environment responds to these changes.

The examples below show the different ways climate change might affect a forest-based community.

- **Primary effect** – Change in a climate element directly affects community life. For example, increased temperatures can reduce winter heating costs and increase summer heat stress for elderly and young community members.
- **Secondary impact** – Change in one climate element causes change in a related climate element, which can then affect community life. For example, increased winter temperatures cause less winter snowfall resulting in lower community snow removal costs and lower snowpack which changes stream

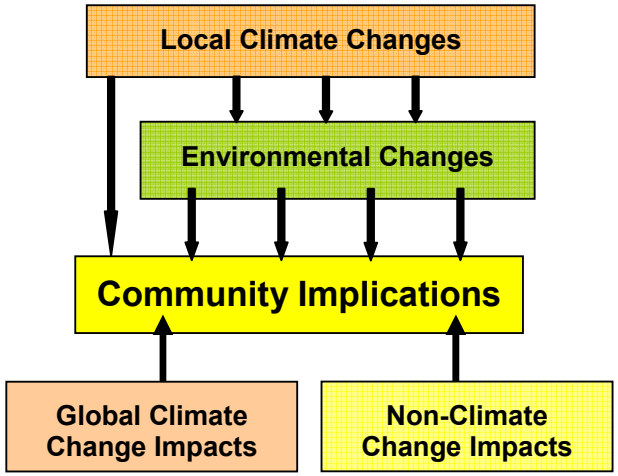
Climate Resilience Trail Steps

1. Get prepared
2. Learn about Climate Change
3. **CHART & SCAN IMPACTS & OPPORTUNITIES**
4. Decide Priorities
5. Plan & Take Action
6. Watch, Learn & Refine

flow patterns.

- **Indirect impacts** – Change in a climate element causes a change in the natural environment which affects community life. For example, warmer winter temperatures reduce the length of the winter season and the depth of river ice resulting in a shorter season for winter road access. These changes result in declining economic activity and disruptions in personal transportation.

Charting the linkages from climate changes to potential community impacts requires careful and thoughtful review of the possible impacts. It is also important to consider potential impacts of global climate change on a community (e.g. food security), and other impacts that are not directly related to climate change, as shown in the diagram below.



Forest-based communities are already experiencing impacts from climate change. Observations of current changes and the linkages from climate change to community life provide examples that communities can use to understand how climate change might impact them in the future.

Overall climate change effects are expected to be negative for most communities in Canada but there are likely to be positive opportunities as well. For example:

- longer growing seasons could create greater timber growth and more bountiful and varied agriculture and home gardening crops in locations where water is not limited.

- warming temperatures can create a longer summer-like season with expanded recreational and tourism activities.

Once the community has a better understanding of the potential impacts of climate change, it will be necessary to focus on the highest priority impacts for further review and action planning.

This chapter provides background information and guidance on how to chart the links from climate change to community life. This includes alternative Pathways a community might use to explore and share observations and information about climate change impacts. Charting impacts will likely be done initially across a broad spectrum of community life, and then in more detail for the short list of initial priority impacts. This chapter also outlines approaches to scan the potential community impacts and opportunities to identify initial priorities for further assessment and action.

3.2 Resources

There are two very helpful publications for Canadian communities assessing climate change impacts. Sections 3.3 and 3.4 of this chapter are largely based on these sources. The reports authors are ideal first contacts for further information.

- ***From IMPACTS to ADAPTATIONS: Canada in a Changing Climate*** *2007* by D.S. Lemmen, F.J. Warren, J. Lacroix and E. Bush (editors). Government of Canada. http://adaptation.nrcan.gc.ca/assess/2007/index_e.php

- ***Climate Change and Canada's Forests: from Impacts to Adaptation.*** (2009) by T.B. Williamson, S.J. Colombo, P.N. Duinker, P.A. Gray, R.J. Hennessey, D. Houle, M.H.Johnston, A.E. Ogden, D.S. Spittlehouse. Sustainable Forest Management Network and Natural Resources Canada, Canadian Forest Service, Northern Forestry Centre. http://www.sfmnetwork.ca/docs/e/SP_ClimateChange_English.pdf

3.3 Charting and Learning about Community Impacts and Opportunities

A community climate profile, as described in Chapter 2, provides a community with basic information about recent and possible future changes in climate. The next task is to explore, understand and chart the possible impacts – both positive and negative – on community life. The breadth, complexity and uncertainty associated with climate change impacts make it important to explore and describe them in ways that are straightforward for community members to understand.

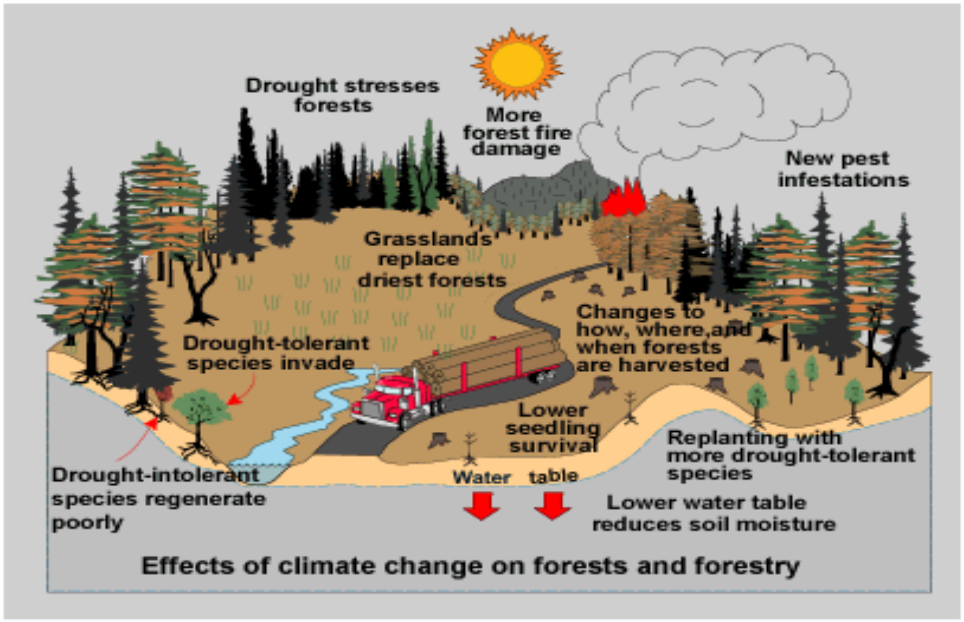
NRCAN posters are available at: http://adaptation.nrcan.gc.ca/posters/index_e.php

This section shows four different Pathways to structure and communicate impacts while encouraging learning and discussion amongst community members. Through these Pathways, readers will also be introduced to basic and more detailed information about the climate change impacts that rural forest-based communities can expect to experience in the future.

Whatever Pathway is chosen, both local observations and available technical information should be integrated to enrich the understanding of impacts.

Advice from other communities about charting and scanning impacts:

- **Weave together research, expert views and local knowledge** – The best outcomes have come from weaving together research findings, information from experts and local knowledge. Research is limited, and every area is different so local knowledge is necessary to ground truth early research.
- **Be certain to explore climate scenarios with the greatest change** – There is a natural tendency to focus on recent actual impacts, and there is limited research to define the impacts from the scenarios with the greatest climate change. Participants will likely need to be prompted to imagine what the impacts might if the higher change scenarios did happen.
- **Identify priority impacts to focus on first** – Most communities will identify many actual and possible impacts. At this stage, it is necessary to shorten the list of impacts that will be focused on; you can't do it all at once.



3.3.1 Pictures/posters & maps

Pictures, posters and maps can be good foundations for charting impacts. Well designed images can prompt quick learning and understanding of climate change impacts, although they can be expensive to create.

Natural Resources Canada has prepared a series of posters and images that are good starting points for charting community impacts. An image that could be used for a community event to discuss climate change impacts on forests and forestry is shown above.

Maps are especially helpful if the community is examining land-based impacts such as flooding and wildfires. Images from Google Earth can be cost-effective tools.

Google Earth Images - http://www.google.com/earth/index.html

3.3.2 Box and arrow impact diagrams

These diagrams begin with the expected climate changes then trace changes in the environment to community impacts and opportunities using boxes or bubbles and line connectors. An example of this approach is shown on the next page.

Community members can create these charts on large flip charts with post-it notes or they can be created with a computer program. The flowchart option in Microsoft Powerpoint and other digital programs make this relatively easy, and can be used in an interactive format to include local observations or technical information.

These diagrams can be the most effective way to engage community members and support them to share their views and to learn about the links between climate changes and community life.

This learning can be called upon again and again as the community moves forward with climate change adaptation.

This charting approach has been used effectively in different settings in rural forest-based communities. They have been helpful as part of an introduction to climate change where participants brainstorm links between climate changes and community life. As well, this charting approach is helpful during workshops on specific community topics to suport participants to build a common understanding of the processes which link climate changes to this aspect of community life .

Charts can be prepared for one environmental factor (e.g. wildfire or flooding) or for one community factor (e.g. safety or municipal infrastructure). Knowledgeable community members can really get involved working together to chart impacts. This builds community capacity by increasing local knowledge and relationships, and involves the community in decision-making. Technical specialists should be invited to participate in the process or to review the community charts. If necessary, the charts can be drafted by technical specialists then reviewed by community members.

Below is a portion of a chart created by a group examining summer water availability in a rural area in British Columbia. The basic information for four seasonal charts was created during a 1.5 hour workshop with about 12 individuals including elected officials, planners, public works manager, gardeners and farmers as well as water and forestry specialists.

3.3.3 Checklists

This approach provides a list of climate changes, environment/ecosystem changes and community impacts/opportunities that communities might experience. Community members and technical specialists review these lists and indicate which items are relevant for a specific community.

Who to involve and how to do impact & opportunity charting:

- **Who?**
  - *Environmental changes* - Community members and technical specialists (e.g. ecologists, foresters, geographers, water specialists, etc.) who are knowledgeable about local forest ecosystems.
  - *Community implications* - Community members and technical specialists (e.g. municipal and regional government staff, economic development personnel, health providers) who are familiar with emergency preparedness, government infrastructure, the local economy and community quality of life factors.
  - All community members should have an opportunity to review draft charts and provide input.
- **How?**
  - Research, interviews and workshops are best to draft potential impact charts.
  - Use open house events or community workshops for broad public review.
  - Many information sources may be found at this stage so it will be important to establish an information library now if this has not already been done. Possible ways to do this are: a special area in your local library, links on the local government website, a website http://www.weebly.com/and/or a project WIKI http://www.wiki.com/

A 3-page example checklist has been created using the two references listed in Section 3.2 Resources of this chapter.

Resources 3.2 and 3.3 for examples of checklists in the **Community Resource Collection**.

Another example of a checklist approach is based on the diagram linking climate change, environment and community impacts shown earlier in this chapter.

These checklists can be used along with posters or impact/opportunity diagrams to prompt community members to think about factors that might affect their community.

Resource 3.1 in the **Community Resource Collection** for the full chart

3.3.4 Narratives, stories and written descriptions

Impacts can be described using written descriptions. This approach allows for detailed descriptions of the links and potential impacts. However this can fill many pages which may discourage some community members from being involved and make the information difficult to grasp.

If this approach is chosen, bullet format with bolded highlights are suggested.

See other examples of impact diagrams in the ***District of Elkford Climate Change Adaptation Strategy*** *(Appendix C)*

http://cbtadaptation.squarespace.com/storage/Elkford_CCA_Final_Report-_FINAL-31.pdf

3.4 Integrating Global Climate and Non-Climate Factors

Community members along with local environmental and community specialists will be able to chart local climate impacts. This section outlines the importance of also considering global climate factors and local non-climate factors when assessing possible climate change impacts.

3.4.1 Global climate factors

Climate is expected to change globally, with different impacts in different parts of the world. Changing climates in other nations may impact Canada. The Canadian forest sector serves global markets, with competition from many other nations, making Canada's forest sector exposed to global conditions. Climate change may result in structural change in global forest product markets, with producers in the southern hemisphere being the main beneficiaries and potentially creating challenging impacts on North American producers.

The Vanderhoof Case Study has more information about possible global forest sector impacts (pg. 63) – http://bookstore.cfs.nrcan.gc.ca/catalog_e.php?Catalog=29156

Other global impacts of changing climate, such as human migration from storm, drought and flood prone areas, may have impacts for Canada. However, little is known about the potential impacts climate change influenced immigration (known as 'environmental refugees') may have on rural Canadian communities.

3.4.2 Non-climate factors

Understanding the impacts of climate change should also account for other factors that may impact community life. In particular, local and regional development projects (e.g. new mines or resorts), declines in the forest sector and an aging population have the potential to impact change community life. To reflect reality, a Community Climate Change Adaptation Plan needs to account for these changes as well. For example, to accurately evaluate the impacts of climate change, a community with a dwindling water supply will need to account for an expected new development with increasing water demand.

3.5 Complexity

Charting the possible impacts of climate change on Canadian forest-based communities will be difficult due to complex links and the uncertainty surrounding future climate change (as is discussed in Chapter 2) and impacts.

Accepting complexity in climate change adaptation

- **This is a beginning** – Communicate early and often that this assessment is the beginning of a journey. Emphasize that it isn't possible to know all of the potential impacts right now. Focus on identifying the most important impacts based on current knowledge. Plan to update the assessment with new observations and information.
- **Every community is different** – Start with assessments for other communities and refine them to fit the unique character of your community.
- **Encourage learning** – Design information and education activities to promote learning. Encourage community members to share their observations, learn about new information and consider the linkages between climate, environmental conditions and community life.

Charting the possible community impacts of climate change in Canadian forest-based communities is especially difficult because:

- the natural environment is complex and the possible physical and biological changes are many and inter-related;
- climatic and environmental conditions impact many parts of community life;
- each community has its own distinct environmental, economic, social and cultural conditions that will influence how a changing climate might create impacts or opportunities; and
- climate is considered stable, within a range of known variability, meaning few communities have experience making decisions while accounting for a changing climate.

This combination of climate, environment and community conditions makes for unique sets of impacts and actions for each community.

Some may people may say "why bother?". This head-in-the-sand approach is unwise as we can already see that the possible impacts from wildfires, flooding and other climate related events will have serious impacts for forest-based communities. Involving community members now in becoming more prepared for climate change will strengthen community capacity and resilience to the inevitable surprises from climate change.

Suggested ways to understand and reflect the complexity of this situation are listed in the box on the previous page. Ways to reflect and record uncertainties are suggested In Chapter 2.

Example Impact Summary

Increased wildfire due to:	
• Longer fire season from higher summer temperatures	
• Drier conditions from less precipitation and higher summer temperatures causing more evaporation	
• More dry fuels from dead trees after expected bark beetle outbreaks and due to drying from increased evaporation	
Current impacts?	Fires that burned for more than 2 weeks within 2 km of town for 2 years out of last 5.
Impacts in 2050s with greatest projected climate change?	• Summer temperatures could increase by 3°C; precipitation could decrease by 15%. • Fire season could be 40 days longer. • Bark beetle outbreaks are likely as winter minimum temperatures could increase by 2°C. • High likelihood of frequent uncontrollable fire conditions. • Planned development of large homes in the interface zone will increase potential impacts.

3.6 Impact Summary

Regardless of the Pathway used to explore and understand potential impacts, it is necessary to compile the impact information into simple, meaningful descriptions that can be considered in more detailed assessments. The table on the left shows an example of how this can be done.

3.7 Initial Scan and Next Steps

At this point many potential climate change risks and perhaps some opportunities will be identified for the community. The next step in climate change adaptation is to complete more detailed assessments to identify the greatest risks and best opportunities. This will be followed by defining actions to reduce these risks or

capture the opportunities. Chapters 4 and 5 outline Pathways for these steps in adaptation planning.

A single community may not have the resources to complete detailed assessments for every one of the potential implications of climate change in the first round of climate change adaptation actions. Also, your community may have other processes or initiatives in place that could be considering some of the climate change implications that have been charted. For example, there may be a group tasked with economic development, and it may be more effective for this group to reassess their economic development plans and decisions in light of potential climate change impacts.

An initial scan of the risks and opportunities is recommended to identify a shortlist of potential community impacts that need to be examined further in this phase of climate change adaptation. At this stage it is also important to effectively hand-off any topics that should be examined by other community processes.

Each impact in the impact charts should be assigned to one of the following categories:

- **high priority topics to assess now:** topics that should be assessed in detail ***now*** in the adaptation planning process (e.g. current transportation and energy supply disruptions);

- **high priority topics to mainstream now:** topics that should be incorporated ***now*** in ongoing community planning;

- **lower priority topics:** topics that can be monitored and assessed in a ***later*** adaptation planning phase, or an ongoing community planning process; and

- **topics to watch:** topics where no immediate attention is warranted at this time. Note that continued monitoring of new information and local conditions is encouraged to verify this category over time.

It is suggested that this scan be done in three steps:

1. Identify the highest initial priority impacts (See *Initial Priority Scan Question 1 - Impact Priority* table on the next page).

2. Identify existing community processes that might incorporate adaptation planning for specific impacts and evaluate if the high priority impacts can be mainstreamed into these planning processes (See *Initial Priority Scan Question 2 – Community Processes* table on the next page).

3. Considering practical factors such as:

   - *Community interest* – It is a fundamental principle of community development that communities must be ready to consider and address specific topics before real change can occur. If the community is not interested in a topic, and particularly if there is not a champion for this topic, it might be best left to a later phase.

   - *Available technical information/ support* - Understanding climate change impacts well enough to be able to make well-informed decisions in some cases will require specific technical information and possibly expert support. If information and/or support aren't readily available, it might be best to engage technical expertise and/or start collecting the necessary information rather than doing a detailed assessment with limited information.

- *Available funding* - If two topics have relatively equal implications for the community, but funding is available for a detailed assessment for one of the topics, you should consider making this a higher priority at this time. The other topic would be a priority for a later phase after the community has learned from the first assessment.

At the end of this stage the community will have defined the initial priority topics that will be assessed in more detail to identify the highest priorities for action explained in Chapter 4.

Initial Priority Scan Question 1 – Impact Priority

		IMPACT TIMING Is there an **immediate threat** based on current climate conditions? Or - Does **responding to the threat** involve long-term investments or contracts, lengthy implementation or substantial costs? Or - Is a **long-term investment** being planned that should consider a changing climate?	
		Yes	**No**
Is a **high value at stake**?	**Yes**	**HIGH PRIORITY** **Should be assessed in detail and action taken**	MID PRIORITY Watch and reassess in the future
	No	MID PRIORITY Watch and reassess in the future	LOW PRIORITY Watch for changes

Adapted from: *Adapting to Climate Change: A Business Approach. Pew Centre on Global Climate Change. 2008.*

Initial Priority Scan Question 2 – Community Process

	Planning or Decision Process Exists?	
Impact Priority	**No**	**Yes**
HIGH	Highest priority for detailed assessment and action - Go to Chapter 4	Support existing process to include climate change implications. If not possible should be assessed in detail and action taken - Go to Chapter 4
MID & LOW	Reassess in future. Continue to monitor new information and local conditions to verify low implications - Go to Chapter 6	Encourage existing process to include climate change. If not possible, reassess in future. Continue to monitor new information and local conditions to verify low implications - Go to Chapter 6

Adapted from: Preparing for Climate Change - A Guidebook for Local, Regional and State Governments. The Climate Impacts Group, King County Washington, ICLEI. 2007.

Resource 3.4 Example Initial Priority Scan in the **Community Resource Collection**.

Key messages:

- **A small change in climate shouldn't be ignored** as these shifts can trigger changes in the natural environment that ripple through community life.
- **Use a structured approach** to chart the links from climate change to community life and define initial priorities to make possible risks and opportunities easier to understand.
- **The links from climate to community can be complex and difficult to trace** so observations from community members should be combined with information from scientific reports and technical specialists to thoroughly explore and understand these links.
- **Everyone will likely need to adapt to some climate changes** so consider implications for individuals and families, businesses, organizations and all orders of government.
- **Look for opportunities from climate change.** For example. growing a broader range of plants in gardens and fields, longer summer tourism and recreation seasons.
- **Avoid becoming overwhelmed** by the complexity and uncertainty, and the amount of information about climate change implications. Get started and stay focused on the highest priorities, with a proactive approach.
- **Encourage ongoing learning** during and after the project by setting up and maintaining an information library.
- **Identify community processes and initiatives** that should be mainstreaming climate change in their decisions. By considering climate change in all decisions, eventually all risks and opportunities will be considered.
- **Create a shortlist** of the highest priority impacts and opportunities that need to be assessed further in this phase of adaptation planning.

4. Decide Priorities

This chapter tells you about:

- The importance of a community's ability to adapt to climate change
- The different ways a community can evaluate which climate effects are most important to take action on
- A suggested approach to assess opportunities from climate changes
- How different communities have decided which climate change impacts are the highest priority for them, and advice from their experiences

4.1 The Task

Chapter 3 shows ways to think about how climate change might affect a rural forest-based community. Because climate change impacts will be different between communities, it is necessary to identify which ones are most important in each community. Then the community can decide what actions should be taken to reduce impacts and realize opportunities.

Each community will need to identify and detail priorities for adaptation action by considering the current impacts of climate and assessing the importance of future climate change impacts. For example, in a particular community, should the first priority be to take actions to adapt to the potential for increased and more intense wildfires, or to adapt to possible water shortages? Usually a community has limited resources, so it is not initially possible to take action on all impacts or opportunities. Without clear priorities, a community may overlook critical climate change effects or misuse resources and time on lower priority impacts.

Deciding which climate impacts are most important for a rural forest-based community is the focus of this chapter.

In recent years forest-based communities in Canada have been faced with many challenges, including a changing climate. Most have developed systems and plans, and have taken action to increase their ability to survive and thrive during changing times.

Climate Resilience Trail Steps

1. Get prepared
2. Learn about Climate Change
3. Chart & Scan Impacts & Opportunities
4. **DECIDE PRIORITIES**
5. Plan & Take Action
6. Watch, Learn & Refine

Advice from other communities about adaptation assessments:

- **It's really all about adaptive capacity** – If a community is able to adapt to a climate impact, then no further assessment or actions are needed.
- **There is no 'one-size-fits-all' approach** – Communities will need to review the existing impact, risk, vulnerability and combined approaches to select the one that fits best in their circumstances.
- **Ensure the assessment process is clear** - Clear structure and definitions are essential to minimize confusion.
- **Start with recent impacts** – By starting with impacts that people are familiar with, they can learn the process before moving on to possible future impacts, which are usually more difficult to assess.
- **Point out uncertainties** – Throughout the assessment uncertainties should be documented.
- **Engage individuals who will be responsible for actions** – These individuals will know about existing adaptation capacity and possible actions. They need to understand why action is needed to make it happen.

Adjusting to a changing climate is no different, similar skills and resources will be called upon.

The ability to adapt to change is known as *adaptive capacity*. The concept and community characteristics used to evaluate a community's climate change adaptive capacity are outlined in Section 4. 3.The remainder of this chapter provides background information on the assessment Pathways.

4.2 Resources

This chapter is based largely on the following resources:

- ***Adapting to Climate Change – A Risk-based Guide for Local Governments*** (Guides are available for Ontario, Alberta and BC and are being created for all Canadian provinces/regions – see Resource Section in the Community Resource Collection for weblinks)
- ***Managing the Risks of Climate Change – A Guide for Arctic and Northern Communities Volume 2.*** 2010. Centre for Indigenous Environmental Resources. http://ccrm.cier.ca/index.php
- ***Climate Change Impacts & Risk Management – A Guide for Business and Government.*** 2006. Australian Government. http://www.climatechange.gov.au/en/what-you-can-do/community/~/media/publications/local-govt/risk-management.ashx
- **Changing Climate, Changing Communities:** Guide and Workbook for Municipal Climate Adaptation. 2010. ICLEI Canada. http://www.iclei.org/index.php?id=8708

- ☐ ***Preparing for Climate Change – A Guidebook for Local, Regional and State Governments***. 2007. Climate Impacts Group (CIG), University of Washington, King County, Washington in association with ICLEI. http://cses.washington.edu/cig/fpt/guidebook.shtml

- ☐ ***Communities Adapting to Climate Change Initiative for the Columbia Basin Trust -*** http://cbtadaptation.squarespace.com/ (See Assessing Vulnerability and Risk section)

- ☐ ***Example community climate change adaptation plans –*** See Example communities in the Community Resource Collection.

4.3 Community Adaptive Capacity

4.3.1 The Concept

As the climate changes, it is likely that most residents and organizations in Canadian forest-based communities will need to make some adjustments in how they live, work and play to minimize negative impacts and realize potential opportunities. How swiftly and effectively these adaptations are made will influence how well communities progress as the climate changes.

Each community must explore how prepared they currently are for local climate changes. What plans, infrastructure, networks, resources, and so forth are in place now, or could easily be put in place to adapt to regional changing climate? For example, are local governments, businesses, community organizations and households truly prepared for emergencies? Has this preparedness been tested recently?

A community's ability to decide upon and implement actions will depend on their ability to adapt to change, also known as their *adaptive capacity*. If adaptive capacity is high, the community has a better chance of adjusting to climate impacts, even those that cause major disruptions to the community. If adaptive capacity is low, then adapting to any change, including climate impacts, may be difficult or impossible. Communities with low adaptive capacity will be most vulnerable and least resilient to climate change. As a result, if these communities are exposed to climate changes they are expected to experience significant impacts. This could be a remote community nestled in a forest setting with high wildfire hazard and only one access route. The small population may have very limited financial resources and expertise to plan and implement climate change adaptation actions.

Adaptive Capacity

The capabilities, resources and institutions of community or group to implement effective adaptation actions.

One of the benefits of considering adaptive capacity is that a community can become more aware of its strengths, which in turn can be applied to other challenges or opportunities (e.g. forest industry restructuring). This can also highlight capacity gaps that may need to be filled to adapt to climate change, as well as other changes.

4.3.2 Assessing Adaptive Capacity

According to the Intergovernmental Panel on Climate Change, the capacity to adapt to climate change is determined by four main factors: people, technology, economic resources and institutions. These factors are described in the table on the next page.

There are two scales of adaptive capacity that should be evaluated in a community assessment:

- **General adaptive capacity** – This refers to the ability to plan, mobilize resources and take action across a broad range of community situations. Communities will need to be prepared for surprise events

Community Climate Change Adaptive Capacity	
Factor	**Includes**
People	- Awareness of the issue, perception of urgency and ability to manage risk - Skills, education, experience, networks (human and social capital) - Knowledge and access to information
Technology	- The range of technological options available
Economic resources	- Availability of adequate economic resources to those who need to adapt
Key institutions & service providers	- Degree of local control to make adaptation decisions - Flexibility - Ability to efficiently allocate resources to adaptation - Ability to manage risk

a) the community's capacity to reach agreement on the need for this new investment;

b) the technology, knowledge and skills available to the community to design and build a bigger reservoir;

c) whether funds are available or can be accessed for this project; and

d) whether the level of government who must make this decision and build the reservoir will make this a priority and complete the project.

4.3.3 Canadian forest-based communities

Recent evaluations of Canadian forest-based communities have pointed to adaptive capacity challenges. For example the local economy is often small and dominated by the forest sector or another resource sector such as mining. Major climate change impacts on the dominant industry can be difficult to adapt to. The local labour force may also be very specialized for the timber industry or other resource industry, with skill sets that are not easily transferred to other sectors.

On the other hand, rural forest-based communities typically have strong social networks, which lend strength during emergency events. These strong social networks are critical factors in strengthening adaptive capacity and resilience.

The table below summarizes the results of these evaluations.

Rural & forest-based community adaptive capacity	
Assets • Strong social capital • Strong attachments to community • Strong traditional and local knowledge • High rates of volunteerism	**Limitations** • Small, undiversified economies • Limited economic resources • Higher reliance on natural resource sectors which are vulnerable to a changing climate • Isolation from services and limited access • Very specialized local labour force with skill sets that are not easily transferable to other sectors • Lower proportion of population with technical training • Limited control over management of local forests • Potential misperception of the risks of climate change

Sources: *From Impacts to Adaptation: Canada in a Changing Climate 2007* and *Understanding Climate Change Risk and Vulnerability in Northern Forest-based Communities.* See References Section in Community Resource Collection citation.

4.4 Introduction to Assessment Approaches

This section introduces the four approaches or Pathways to define climate change adaptation priorities currently used in Canada. The factors that are considered in each assessment approach are provided along with a summary of their relative merits and challenges. More details can be found in the Resources listed in Section 4.2 of this chapter and in the Community Resource Collection.

Canadian communities should also evaluate possible opportunities as the climate changes, such as expanded agriculture or tourism. Evaluating opportunities is not well developed in any of the existing approaches; a suggested approach is outlined in this section.

There is no one way to decide which climate change effects are priorities that require special adaptation actions. Every community will need to select an approach and decide on the level of detail and complexity that works for them, or design their own way to wisely define the most important challenges and opportunities for action in their unique circumstances.

The **Community Examples**, and **Resource 5.1** - Assessment Details in the **Community Resource Collection** for more detailed information about each assessment approach.

Once the assessment is completed, climate change impacts and opportunities should be divided into three categories:

1. Action is required
2. Monitor and re-evaluate over time
3. No further assessment is required

Communities can then focus on the impacts that require action now (Category 1) and decide on priority actions, in the next activity along the Climate Resilience Trail (Chapter 5).

4.4.1 Assessment lens

There are currently four approaches used to evaluate which climate change effects are most important for a community to act on. Each approach has grown from a particular lens on community development and climate change as shown in the table on the next page.

Whichever approach is used, communities will need to answer the following questions:

1. How might a changing climate affect the community currently and in the future? (As outlined in Chapter 3)
2. What is the community already doing, or could easily do, to respond to climate change effects? (A component of *adaptive capacity* as explained above).
3. What are the weak spots in the community that can't be easily overcome currently and as the climate changes in the future?
4. What impacts or consequences might happen if additional actions are not taken to overcome weak spots? How likely is it that these consequences or impacts will occur?
5. Which weak spots are most important to take action on first?

The main differences between the four assessment approaches is in how much detail is written down and examined about the factors in the decision process, with the greatest detail in vulnerability and risk ratings and the least in impact ratings. While some approaches are more suited to rural forest-based communities than others, they are all described in this chapter to introduce all the options. Each community can then decide what will work best for them.

Impact Rating Example

Topic	Potential Climate Change Impact	Impact Rating
Extreme storms	High winds and heavy snows may cause more trees to fall on power lines resulting in more frequent and longer lasting power outages	HIGH
	More frequent and heavier rains may washout roads more often	MEDIUM
	High winds and heavy snows may damage radio towers and disrupt radio signals	LOW

Community Example for Impact Rating in the **Community Resource Collection**.

Climate Change Assessment 'Lens'	
Lens	**Description**
1. Impact ratings	Used for many years to assess how major initiatives such as dams, mines, and other significant developments might affect communities (often called socio-economic impact assessments)
2. Climate change vulnerability ratings	Designed to evaluate how susceptible to harm a community or region is to climate change
3. Risk ratings	Part of structured risk management systems used by governments and business to understand and take action to reduce risks, including risks from a changing climate
4. Combined assessments	Use aspects of the above approaches to create assessments for specific situations such as particular communities or sectors (e.g. tourism, forestry, etc.).

4.4.2 Impact rating

Most communities are familiar with impact ratings or assessments, such as socio-economic impact assessments, because this process has been used for decades by governments, businesses and communities to evaluate the implications of new projects such as mines, dams and other significant developments. This is the simplest process, and the results (such as High, Medium and Low impact rating) generally reflect the relative importance of potential consequences or opportunities for a community. How the impacts are analyzed to assign an impact rating and what each impact rating means may or may not be fully explained.

Community Example for Vulnerability Rating and **Resource 4.1** in the **Community Resource Collection**

Climate Vulnerability Rating Example

Potential Climate Change	Impact		Adaptive Capacity		Vulnerability Rating
More frequent and heavier rain storms may washout roads more often	High exposure because: • rainstorms are already more intense and more frequent High sensitivity because: • several culverts have been at risk of overflowing during storms in the past few years • there is only one route to health and other services • only 2 days of perishable food on hand	and	Low adaptive capacity because: • decisions to upgrade crossings or fix washouts are made in the regional centre and this road is not a priority • there is no equipment in the community to do repairs • air access is expensive	=	High

4.4.4 Risk rating

Risk management is a process of selecting and implementing the best course of action in uncertain situations. Risk rating is part of the risk management process which uses a standardized set of steps that include:

1. Identifying potential risks and current *risk controls.*
2. Analyzing the *consequences* and *likelihood* of each risk.
3. Rating the importance of each risk.

Some organizations and professional/ technical specialists use risk rating and risk management in daily decision-making. These approaches have been refined for rating and managing climate change risks to communities. Risk management offers a framework to identify, understand and prioritize climate change risks and to select adaptations to reduce risks to acceptable levels.

First, each potential climate change impact (as defined in Chapter 3) is assessed. An example is provided below.

Secondly, most approaches then locate each impact on a matrix of consequences and likelihood or frequency to define the relative risks created by each impact.

Community Example for Risk Rating and **Resource 4.2** in the **Community Resource Collection**

Climate Risk Rating Example

Potential Climate Change Impact	Current risk controls		Consequences		Likelihood/ Frequency		Risk Perception		Risk Rating
More frequent and heavier rain storms may washout roads more often	• Regular monitoring during heavy rains • Air medivac services • Some households stock extra food	effects	High because: • Some households will run out of food • Heating fuel supplies may run out	and	Now = 2 times in 5 years 2020 = Very likely to increase	and	Very concerned: • washouts will get worse & take longer to be fixed • school relies on heating fuel so there won't be shelter anywhere	=	Now = Medium 2020 = High

4.4.5 Combined assessment

Several assessments have linked concepts from the above approaches to create combined assessments that meet the needs in a particular community setting, or for a specific topic or sector (e.g. infrastructure). Examples include:

- *Preparing for Climate Change- A Guidebook for Local, Regional and State Governments.* 2007.Climate Impacts Group, University of Washington and ICLEI, Oakland CA - This guidebook suggests completing a vulnerability assessment and a risk assessment, then combining these assessments to identify priority planning areas as shown in the table below.

- *Changing Climate, Changing Communities*: Municipal Climate Adaptation Guide and Workbook.2010. ICLEI CANADA - This new guide recommends using a vulnerability assessment to identify risks that require a full risk assessment.

- The Northern Climate Exchange has combined consequence and likelihood from risk assessments with adaptive capacity from vulnerability assessment to identify priorities.

Figure 9.1 Sample Vulnerability-risk Matrix for Identifying Priority Planning Areas

PLANNING AREAS WITH SYSTEMS THAT ARE...

	Low Vulnerability	High Vulnerability
High Risk	*May be priority planning areas*	*Should be priority planning areas*
Low Risk	*Are unlikely to be priority planning areas*	*May be priority planning areas*

Northern Climate Exchange Community Adaptation Projects

http://www.taiga.net/nce/adaptation/projects.html

Elkford Climate Change Adaptation Final Report
http://cbtadaptation.squarespace.com/elkford-bc/

Kaslo and Area D Climate Change Adaptation Plan
http://www.rdck.bc.ca/publicinfo/climate_change/climate_changeadaptation.html

4.4.6 Comparing assessment approaches

The table below summarizes the merits and challenges of the different assessment approaches based on rural community experiences with each.

Merits and Challenges of Climate Change Assessment Approaches

Assessment approach	Forest-based community examples	Merits	Challenges
Impact rating	None	• Simple and straightforward	• May not explicitly consider adaptive capacity, but this can be added easily. • May not provide enough details about how ratings were reached if there are a large number of impacts to assess, and many people who need to understand the ratings.
Vulnerability rating	Kimberley, BC – Infrastructure, tourism Castlegar, BC – food security	• Widely used in climate change adaptation planning for regions and nations.	• No simple tools to organize and analyze the many factors (i.e. magnitude, importance, timing, persistence or reversibility, likelihood and distribution of impacts) making it difficult to ensure all of the factors are fully considered. • Community members have had difficulties grasping the meaning of and rating exposure and sensitivity
Risk rating	Castlegar, BC - Stormwater	• A structured process that makes it straightforward to gather, organize, evaluate and document the information used. • Several guides and tools available • Familiar to professional/ technical personnel	• Complex risk language is difficult to grasp (the CIERS guide has attempted to simplify the language) • The many steps in the evaluation can be overwhelming. • Differences in attitudes towards risk may be challenges (e.g. some of us are risk takers while others are risk avoiders) • Potential to underestimate risks from low probability impacts.
Combined approaches	*Vulnerability & risk* Elkford, BC Castlegar, BC – Water supply Rossland, BC *Risk & adaptive capacity* Dawson City and Whitehorse, Yukon Kaslo and Area D, BC	• Assessments can be made more relevant, less intimidating and achievable for the individuals who are contributing.	• Rural communities who have tested the combined risk and vulnerability approach have found it can be long and onerous, with confusion about the difference between sensitivity and consequence.

4.4.7 Opportunity assessment

Unlike in most areas of the world, Canadian communities are expected to experience some benefits and opportunities from climate change. Longer and warmer summers may change the agricultural products that are feasible to grow, and may alter the types and length of season for recreation and tourism activities.

Although the assessment processes evaluate climate change impacts which could be positive, none of the current assessment approaches specifically include evaluation of opportunities. The vulnerability or risk management approaches can be adjusted to include positive benefits or opportunities as illustrated below. An example assessment based on the risk management approach is shown at the bottom of this page.

Climate Opportunity Assessment Approach

Benefits	and	Likelihood/ Frequency	and	Opportunity Perception	=	Opportunity Rating
How large might the benefits be from this impact?		How likely is it that the benefits will occur? And how often?		How is the potential opportunity viewed by those who may be affected?		Which climate impacts are most important to act on to realize opportunities?
Outcome or impact of a climate event in relation to the achievement of objectives		Chance of occurrence or the number of occurrences per unit of time		The significance assigned to opportunities by those who might take action on the opportunity		Relative level of opportunity

Climate Opportunity Assessment Example

Potential Climate Change Impact	Benefits	and	Likelihood/ Frequency	and	Opportunity Perception	=	Opportunity Rating
Longer and warmer summers lengthen the growing season	Potential to grow a wider range of crops		Now = 15% increase in last 50 years 2050 = 10% increase very likely		Skeptical - increasing weather variability has caused high farming losses		Now = Medium 2050 = High

4.5 Community Based Assessments

At this early stage of learning about the most important climate change impacts for rural communities, individual communities have tested several approaches. The specifics of each approach depend upon:

- the climate change adaptation issues the community needs or wishes to address;
- the resources, expertise and time available for the process; and
- the comfort the planning team and community have with different approaches.

This section provides advice from these communities.

4.5.1 Selecting an Assessment Approach for your Community

The following advice is based on the experience of rural communities who have blazed the Trail in climate adaptation planning:

- **It's all about adaptive capacity** – Rural forest based communities have always adapted to variability in weather and other changing conditions. If a community is able to respond to both the vulnerabilities/risks and opportunities that arise as the climate changes, including surprises, then no additional actions are needed. However, if recent climate changes are taxing community capacity, or projected changes are expected to tax capacity, then additional adaptation actions are needed. This makes realistic assessment of adaptive capacity crucial to climate change assessments.
- **No one-size-fits-all approach** - There is currently no one-size-fits-all approach for defining priorities to strengthen climate resilience in rural forest-based communities. Given the wide range of ecological, social and economic conditions in rural communities, it is unlikely that any one approach will be most effective everywhere.

  Each community needs to scan the alternative approaches and choose the one that works best for them, or combine aspects of different approaches into their own unique community assessment.

  If a community is already using an approach to manage risks or to do strategic planning, it may be best to continue using the same approach for climate change adaptation planning and adjust it as needed.

- **Create clear process and definitions –** Take time to understand and describe the structured process used to organize and evaluate the information within the assessment, and to define the ratings that will be used. Often it is best to review the structure and definitions with the project team before the actual assessment to ensure there is broad understanding and agreement with the approach. Also present one or two example climate effects. Without this agreement, the assessment can quickly become messy as individuals express different ideas about what is to be done in each step, and what each rating level means.

- **Start with impacts now, then look to possible futures –** Most Canadian forest communities are already experiencing some climate change impacts. It is recommended that these impacts, and impacts that can be expected in the next five years be assessed first, followed by evaluation of possible future impacts. 2020 is the suggested timeframe for most potential future impacts except when long-term investments (e.g. roads, water systems,

Who to involve and how in an climate adaptation assessment

- **Who?**
  - The project steering committee and community staff members who will be responsible for implementing priority actions from this plan should have a role in selecting the assessment process.
- **How?**
  - Agreement should be reached about what assessment approach to use before an assessment is started. Practicing with the approach before doing an actual helps everyone get comfortable with the structure and terms.
  - Providing examples of community assessments using the different approaches is the quickest way to illustrate each of the assessment types. Based on this, the project steering committee and key community staff can agree on the preferred approach.

sewers, buildings, etc.) are involved, or when it may take a long time to address an impact (e.g. when a regional land use plan would be needed).

- **Point out uncertainty** – At some point in the process the uncertainties in climate projections, ecological responses and community impacts should be recorded. This provides a place to recognize that a range of outcomes are possible, but allows the community to move forward to action. When impacts are being charted, and again during the assessment of priorities, participants should be reminded to consider the possible implications of scenarios that project the greatest climate change.

- **Engage individuals who will be responsible for action** – Local, regional and provincial government staff who are responsible for infrastructure such as water supply, sewer and roads need to be involved in the assessment to bring their knowledge of the local systems to the discussion, and to offer suggested actions. Members of economic sectors or community groups who will implement actions should also be involved in assessments.

  Assessment meetings should be scheduled so these people can attend. If they cannot be there, the assessment should be reviewed with them before it is finalized.

  If these people do not participate, they will have to be brought on board before actions will be implemented, which can cause delays and disagreements about what should be done.

4.5.2 Doing an Assessment

At this stage it is important to involve technical specialists both from within and outside the community. Additional research may also be needed to better understand potential impacts and opportunities, and community adaptive capacity.

Communities have found that it is usually most effective to complete a draft assessment with the technical specialists, either one-on-one or in focused discussions, and then to have the broader project team and the community review and comment on the draft assessment.

During this step it is especially important to compare and contrast individual ratings and to take time to document and explore the thinking behind these ratings. It is important to share thoughts about why one person sees the impacts or consequences as high, while another sees them as medium or low. This will enrich the assessment and understanding of local climate change impacts.

It is also important to recognize that in some, if not many, cases 'don't know' may be the most accurate outcome. The reasons for this rating needs to be documented. This outcome will flag climate effects that should be researched or monitored so that new information can be brought to the next assessment.

As most communities will be doing this type of assessment for the first time, there should be regular reminders that the community is starting the journey and many of these topics will be revisited and re-examined over time.

Adaptation action example

Potential Impact: Pest outbreaks

Due to:

- Increased survival and activity of diseases, bark beetle, defoliator and aspen pest species with warmer temperatures
- Increased plant stress from drought or excess water and damage from storms

Potential actions:

Act now – Identify susceptible species & forests and learn to identify signs of infestations.

Watch – Closely monitor for damage and infestations.

Plan

- Public areas: Landscape with a diversity of pest tolerant species that will grow well in future climate conditions and expect to have to remove damaged trees that become hazards.
- Forest operations: Harvest the most susceptible forests first, expect to do more salvage harvesting and reforest with a diversity of pest tolerant species that will grow well in future climate conditions.

Key messages:

- **Identifying the highest priorities for action** is the main purpose at this point along the Trail.
- **Each community will need to select or design their approach** to assess climate effects that meets its needs. The selected approach should fit the climate and community issues that need to be assessed as well as the time, resources and expertise available.
- **Agreement is needed within the project team** about the assessment approach used, the process and the terms. This will avoid confusion and frustration for those involved.
- **Thoughtful evaluation of the adaptive capacity of the community is essential** – both to recognize what the community is already doing, or could easily do that increases its ability to adapt as the climate changes, and to realistically examine the community's ability to respond to surprises as the climate changes.
- **Technically knowledgeable individuals should be hands-on** early in the assessment to capture what they know about the likelihood and consequences of a potential climate effect, current coping actions, adaptive capacity of the community, and possible future adaptation actions. These experts should come from within and outside the community,
- **Involve community members** so they understand climate impacts and are encouraged to do what they can to adapt, and support adaptation actions that local governments may decide to take.

5. Plan & Take Action

This chapter tells you about:

- General advice about climate adaptation actions to increase community resilience
- Setting community climate resilience goals and selecting priority actions
- Creating a Climate Resilience Action Plan with goals, priority actions, leadership and timelines

Priority climate risks and opportunities have been determined through the earlier assessments (Chapter 3). The next step is to prepare a Climate Resilience Community Action Plan for the community's identified priorities and begin to take action.

Since the beginning of the process, participants have likely been thinking and talking about adaptation actions. Ideas may have emerged that local governments, individuals, and organizations might use to adapt to the expected impacts of climate change and natural environments. The next activity is to set community goals, examine possible actions and determine who should do what by when. A Climate Resilience Action Plan lists and organizes these goals and actions. This chapter covers creating Climate Resilience Community Action Plans.

5.1 General Advice

It is important to remember the following general advice about climate change adaptation during action planning:

- **Strive to be climate resilient, not climate proof** – Climate change is complex and will create dynamic and diverse impacts. Thus it isn't possible to climate proof any community. By anticipating and preparing for impacts, a community will build its climate resilience, and reduce negative impacts of a changing climate.

- **Anticipate and act rather than being forced to react** – It is less expensive and disruptive to anticipate and prepare for changes and to act to strengthen resilience. Choosing to ignore risks may result in significant, costly disruptions to community life

Climate Resilience Trail Steps

1. Get prepared
2. Learn about Climate Change
3. Chart & Scan Impacts & Opportunities
4. Decide Priorities
5. **PLAN & TAKE ACTION**
6. Watch, Learn & Refine

Advice from other communities about planning and taking action:

- **No need to reinvent the wheel** - Start with a preliminary set of options that other communities have identified.
- **Use a clear set of ranking criteria** – Clearly define how priority actions are decided. Where appropriate, compare the cost of actions with the potential cost of impacts.
- **Beware of decisions based on past climate conditions**
- **Identify leaders** – The highest priority actions should have lead organizations assigned and ideally these organizations will have agreed to take on these actions.
- **Record resources to implement actions** – During the discussions ideas will come up about funding, people or other resources that might be helpful. Record these for future reference.
- **Take action on obvious priorities before all the info is in** – Some actions are obvious priorities or 'low hanging fruit' or 'no regrets'. These can be implemented swiftly, even before planning is complete.
- **Choose low tech, low cost, on-site options when feasible** – Some impacts can be overcome by costly investment in bigger infrastructure such as increased water storage, or relatively simple inexpensive changes such as water conservation. Simple, low cost options are usually better.

- **Prepare for disaster impacts as well as slow onset changes** - Climate changes will cause both obvious, extreme affects such as flooding or wildfires, as well as subtle changes in the environment that may be less noticeable. It makes sense to initially focus on actions to avoid disaster impacts. The slow onset impacts, such as vegetation and water level changes, will require visionary thinking and actions or else they may be overlooked.

- **Integrate** - Actions to strengthen climate resilience should include climate change mitigation to stabilize and reduce greenhouse gas emissions. Community goals and actions related to climate change should be integrated (or mainstreamed) with other community priorities and ongoing planning processes as much as possible.

- **Give equal attention to opportunities** - There is a tendency to emphasize the negative impacts of climate change and overlook possible opportunities. Take time to think through and define actions to capture possible benefits for the community (e.g.. new niche crops to grow, increased tourism with a longer warm season).

5.2 Resources

This chapter is based largely on the following sources as well as the experiences of communities who have created climate change adaptation plans:

☐ ***Preparing for Climate Change – A Guidebook for Local, Regional and State Governments*** (Chapters 10-11) http://cses.washington.edu/cig/fpt/guidebook.shtml)

- ☐ ***UKCIP Adaptation Wizard*** - Step 4. What should I do? http://www.ukcip.org.uk/index.php?Itemid=273&id=147&option=com_content&task=view

- ☐ ***Managing the Risks of Climate Change Adaptation – A Guide for Arctic and Northern Communities***. (http://ccrm.cier.ca/start_here.php)

- ☐ ***Adapting to Climate Change A Risk-Based Guide for Municipalities***. STEP 5: Risk Controls and Adaptation Decisions and STEP 6: Implementation and Monitoring. See Resources Section of the Community Resource Guide for weblinks to guides.

- ☐ ***FROM IMPACTS to ADAPTATION: Canada in a Changing Climate 2007,*** Lemmen, F.J. Warren, J. Lacroix and E. Bush (editors). Government of Canada. http://adaptation.nrcan.gc.ca/assess/2007/index_e.php

5.3 Climate Change Resilience Planning

Climate change resilience planning follows the same step-wise process for most other community plans:

- A **vision** is a brief statement of the long-term outlook the community wishes to achieve in the future. Many communities have crafted vision statements in other planning processes which can be revisited in a climate resilience plan. The vision statement can be adopted as is, or revisions suggested based on a new understanding of future climate and impacts. If a community vision doesn't exist, one should be crafted for this plan.

- **Goals and/or objectives** are statements describing more specific outcomes about aspects of community life.

  There should be at least one goal or objective for each priority risk or opportunity identified in the resilience assessments.

  These statements should include outcomes that are measurable, and ideally they should include a timeframe for achieving the outcome. Some plans will include goals as broad statements that reflect the language of the community vision, and objectives which are more specific and describe what will be done to achieve the goal.

Resource 5.1 – Adaptation Action Options in the **Community Resource Collection**

- **Strategies, actions or tasks** define the what, who and when for activities to achieve the goals/objectives. Section 6.4 provides more guidance on this level of planning.

- **Monitoring measures** are sometimes included in plans. If they are not, they will need to be created while the plan is being implemented (see section 5.7).

Each community will need to decide what structure to use for the levels in their plan, with clear definitions of what information is included in each level (see example in the table on the next page).

5.4 Adaption Actions

The primary purpose of adaptation actions is to reduce unacceptably high vulnerabilities or risks to acceptable levels or to make the most of opportunities. This step involves brainstorming possible actions for each goal, any idea is acceptable at this stage. Then assess these options against a set of criteria including such things as

costs, benefits, barriers/ impediments and other factors to define the best actions.

Example Community Plan Structure

The District of Elkford *Climate Change Adaptation Strategy* uses the following structure:

Planning level	Description	Example
Vision	From the Official Community Plan (OCP)	
Goals	Broad statements representing the community vision	Elkford is a resilient Firesmart community
Objectives	More specific guiding statements that detail what will be done to meet the goal	Fire resilient homes and buildings
Strategies/ Lead	Detail how, who and when each objective will be accomplished	1. Update the building bylaw 2. Firesmart education program 3. Firesmart rebate program All District responsibility – timing to be decided in OCP implementation

5.4.1 Brainstorm options

The following are good places to start to create a list of possible adaptation actions for each goal:

- **Adaptation plans from other communities** – Review what other communities have chosen to do, but remember these communities may have eliminated some actions that would work in your community.

- **Climate change adaptation reports** – Review relevant reports for possible adaptation actions. *From Impacts to Adaptations* listed in the Resources (Section 5.2) is very helpful,

- **Existing tools** – Consider the current legal requirements, plans, policies and practices associated with each goal. Is it possible to adjust one of these factors to achieve the goal?

- **Ideas and suggestions from community members and technical specialists** - Gather adaptation action suggestions throughout the planning process. Ask community members and technical specialists to share their ideas.

Adaptation action options from existing rural community plans and relevant technical sources have been compiled in resource 5.1 in the Community Resource Collection.

For each adaptation goal ask the following questions:

a) **Information**
- Are *outreach or education activities* needed?
- Is *research* needed to gather more information?
- Is a *local study* needed to define actions?

b) **Broad direction -** Do *existing legislation, plans* or *policies* need to be changed/adjusted?

c) **Day to day activities -** Do changes need to be made in how things are currently done (e.g. current operational practices)?

The list of possible actions will be different for every community, reflecting the possible climate changes, impacts on the natural environment and the community, and the adaptive capacity of the community. Resource 5.1 in the Community Resource Collection is a checklist of possible adaptation actions gathered from rural climate change adaptation plans and other references.

5.4.2 Set action priorities

The next step is to review the list of possible actions to decide which are feasible and to identify priority actions. The challenge is to identify the best actions to improve the community's climate resilience without:

- *over-adapting* and wasting resources (e.g. building a more expensive, higher bridge than what available information would justify in anticipation of increased peak flows);
- *under-adapting* and not being prepared or protected from likely impacts (e.g. building a second water system that relies on a water source that is already declining);
- *Maladapting*, by creating unintended, adverse, secondary consequences that outweigh the benefits of the action (e.g. after thinning interface forest areas to reduce wildfire risks increasingly more intense windstorms cause blowdown), or
- *restricting future options* (e.g. building new community facilities without accounting for increasing temperatures).

Given the uncertainty about future climate changes and impacts, this is a challenging task and deserves thoughtful attention.

Each possible action should be assessed using a consistent set of criteria to evaluate whether they are feasible and to identify priorities. A structured assessment is recommended, (e.g. using a checklist with the criteria below to assess each possible action). This will strengthen the choice of priorities and encourage participants to share their views about the possible actions.

A general categorization of options is provided in the table at the left. The following is a list of potential criteria for a thoughtful evaluation of each possible action:

- **Meets goals** – This is an obvious criteria but it is often overlooked, particularly if an action is favoured without careful evaluation.
- **Urgency of vulnerability/risk reduction –** The resilience assessments will have identified whether the vulnerabilities/risks are high or low. The highest ranked impacts are most important to take action on as soon as possible. It is especially important to reduce risks when:
  - significant consequences are already

Climate adaptation options:

No regrets – Delivers benefits that exceed costs, whatever the extent of climate change.

Low regrets – Yields large benefits for relatively low costs with positive benefits even when climate risks are uncertain.

Win-win – Enhances climate change adaptive capacity while also contributing to other community goals.

Flexible – Incremental adaptation, rather than large-scale actions in one step, making the best decision and reviewing the performance of previous decisions. Includes delayed actions to gather more information or observe changes.

Do nothing – Conscious decision in response to low priority impacts or where climate risks are out-weighed by other community factors. Should be continuously monitored to ensure nothing has changed.

occurring;

- science attaches a high confidence that a future risk will happen; and
- unique resources are at risk, such as sensitive areas or structures with high cultural, economic or environmental values.

Urgency can be assessed as: High – to be done within 1 year, Moderate – to be done in 2-5 years, or Low – a 5-10 year timeframe.

- **Level of vulnerability/risk reduction** – Each possible action should reduce the anticipated climate risk, or build capacity for future action. If not, the action may not be helpful. Each action can be assessed as likely to achieve a defined range of risk reduction (e.g. None – no change in risk; Low – little change; Moderate – mid-range of change; High – Almost removes risk).

Assessing Risks/Benefits and Costs

Risk	Cost of Possible Action	
	High	Low
High	Ensure risk reduction and other benefits justify costs	Do now
Low	Do only if there are other benefits	Do only if there are other benefits

- **Benefits** – Possible benefits, in addition to risk reduction, relate to building a climate resilient community such as :
  - increasing community awareness,
  - increasing technical capacity,
  - enhancing flexibility,
  - building partnerships, and
  - complementing other community initiatives

Opportunities from changing climates will also have benefits that need to be considered when setting priorities.

- **Costs –** The exact cost of possible actions is often not known at this stage. Costs can be estimated and categorized as high, moderate and low. Costs can sometimes be reduced by building in adaptation at favorable times such as:
  - at the early stages of planning new developments;
  - when infrastructure is being upgraded anyway;
  - when routine maintenance is being done;
  - when plans come up naturally for review; and
  - before being forced to act (e.g. sudden extreme event or decaying infrastructure).

Consider refining options to reduce costs if possible.

- **Risk reduction and other benefits exceed costs –** Priority actions must reduce risks and/or have other benefits which exceed costs. This can be a Yes/No evaluation (see table at left).

- **Barriers and opportunities –** To assess whether a possible action can be implemented consider barriers and opportunities. The following may be barriers or opportunities for a specific action:

Who to involve and how to do action planning:

- **Who?**
  - Appropriate individuals from the organizations who may implement adaptation actions
  - Scientific or technical experts including representatives from relevant professional groups
  - Representatives from regulatory agencies and local governments
  - Elected community leaders
  - Those who may be affected by adaptation actions, which may include the whole community
- **How?**
  - *Research* adaptation plans from other communities to get ideas about possible actions and criteria for assessing options
  - *Interview* scientific and technical experts, representatives from regulatory agencies and local government to list possible actions and discuss criteria for assessing options
  - *Host workshops* to brainstorm options, finalize criteria for assessing options, assess options and secure commitments from organizations to take responsibility for actions. These should be focused workshops involving individuals with adequate background in the priority topic(s) being discussed.
  - Use *open house events or community workshops* for broad public review. Include activities to involve participants such as dot counts to record preferences.

    – legislation/law, policy or current plans
    – available funding
    – expertise and staff time availability
    – timing of other initiatives/goals
    – community support, and
    – partnerships and/or leadership commitments

    Actions to overcome specific barriers may be needed before other actions can become a priority (e.g. changing a community bylaw may require changing provincial legislation first).

- **Red flags** – Actions should be carefully considered if:
  – they increase greenhouse gas emissions, or
  – they do not enhance community resilience across a range of possible future climates, environmental changes or community impacts (e.g. relocating a sewer lagoon to a higher location that is still within the floodplain if the peak stream flows projected with significant climate warming actually occur).

Once options have been evaluated you may find they fall into three categories:

- **Do it** - Actions that are do-able and need to be assigned priorities. These include no regret, win-win and flexible actions (see box on page 61) that have benefits beyond climate resilience.

- **More info** – Actions that are promising, but more information is needed before deciding whether they should be implemented. The priority of the task to gather further information will need to be decided.

Tests for an effective action plan:

- Will it help reduce risks and harness opportunities?
- Does it line up with broad community goals?
- Does it make sound economic and practical sense?
- Can it be readily implemented?
- Is it flexible?
- Is it up to date? Has new information come to light that could change the plan?
- Can it be quickly understood and accessed by community members?

From: *United Kingdom Climate Impacts Program*

- **Not now** – These actions are not appropriate now but may be in the future.

Priorities can now be assigned to the 'Do it' and 'More info' actions. High priority actions have the highest urgency, greatest risk reduction and other benefits compared to the costs, many opportunities, few barriers and no red flags. This is an ideal time to invite community organizations and others to commit to taking leadership for appropriate actions.

At the end of this evaluation it is important to step back and consider how effectively the priority actions are likely to reduce the identified risks. There may still be residual risks that cannot be eliminated or prepared for. Participants should recognize these residual risks, and consider whether these risks are acceptable. If they are not acceptable, then priority actions should be reconsidered.

5.5 Action Plan Pathways

A Climate Resilience Action Plan may focus on one type of priority climate change impact (e.g. impacts on community infrastructure), or it may cover an assessment of a number of priority impacts. Regardless of the scope, these plans have three main purposes:

- to compile and present information so others can learn about the climate change risks and opportunities for the community;
- to provide enough information so community members can understand why goals, objectives and priority actions have been selected; and
- to provide guidance to those who will implement and monitor or watch specific actions and the entire plan.

To achieve these purposes, an effective plan will include:

- **Planning process and participants** – An outline of the steps in the process and the involvement of science experts and community members.
- **Expected future conditions** - Brief overview of the expected future climate changes, environmental responses and community impacts, including uncertainties as determined in the impact charting exercise in Chapter 3.
- **Initial scan and resilience assessment results** – Summaries of the assessments that were completed to define priority topics, areas and community risks.
- **Community vision and climate resilience goals**
- **Priority actions for each goal** - A brief description of the expected impacts and a list of actions with priority, leadership, partnering groups and timeframe for completion.
- **Climate impacts to be assessed in the future** – A listing of climate impacts that were not included in the detailed assessments either because they were not identified as priority topic areas, or they were not assessed as the highest risks or priorities. These topics should be assessed in future climate resilience planning, or in other community planning processes.

Monitoring/Plan revision – A commitment to ongoing monitoring the status of actions (e.g. where things are at) and whether the actions achieve the goals. Ways to bring in new information about community risks and opportunities should be included. Also needed are expected milestone dates for monitoring activities and reporting.

As the community begins to implement priority actions, it is important to remember again that *this is the beginning of a journey*.

It is a first step in strengthening climate resilience at the community level, and it will need to be continued for decades, one step at a time.

Everyone should be reminded to *expect surprises,* unexpected outcomes from actions and unanticipated climate changes and impacts. These surprises will be opportunities to learn and adjust actions if necessary.

Adaptation action example

Potential Impact: ***Interface wildfires***

Due to:

- Increased frequency and intensity of wildfires from drier fuels and hotter weather with higher summer temperatures and less rainfall
- More dry fuels from higher summer temperatures as well as dead and damaged trees from pest outbreaks and storms

Potential actions:

Act now

- Governments, businesses & households practice emergency preparedness, including evacuations
- Educate to reduce human caused fires
- Firesmart homes, buildings and infrastructure (See Partners in Protection http://www.partnersinprotection.ab.ca/)
- Salvage dead trees if feasible

Plan

- Smoke advisory process and refuges
- Disaster response by governments & business
- Site rehabilitation after fires

Key messages:

- **Anticipate** impacts and act to reduce risks and capture opportunities, but expect and be prepared for surprises.
- **Mainstream** climate resilience goals and actions with other community goals and plans.
- **Avoid crises**. It is usually cheaper and less disruptive to anticipate risks and take action than to respond to crisis.
- **Thoughtful, structured evaluation** of possible actions will help the community pick the best ways to increase climate resilience.

6. Watch, Learn & Refine

This chapter tells you about:

- Monitor actions, the overall plan and changes in the climate and the natural environmental
- Keep climate change on the community radar
- Update plans based on successes, new scientific information and local knowledge

6.1 General advice

As the plan is implemented, it is crucial to monitor the actions, the overall plan and the climate/environment changes to better understand community challenges and opportunities. Information should be shared to mainstream the learning process, and mainstream integrating climate change into daily decisions and long-term plans.

Communities will need to refine their plans based on new information and learning from implementing their first plan. There is still much to learn about the changing climate and how it will affect communities. This chapter provides advice about how to watch, learn and refine plans and actions.

It is important to remember the following general advice about climate change adaptation during action planning:

- **Climate adaptation is not a one time event** - It is a continuous series of decisions and actions over time by individuals, households, organizations and governments. Normalize information so that as many residents as possible understand climate risks and take actions to increase resilience.
- **Expect surprises** - The complexity of climate change and the interactions in the natural environment make it impossible to anticipate all community impacts. By being better prepared, with increased capacity to respond to surprises, a community may be able to avoid disruptions if a surprise happens.

Climate Resilience Trail Steps

1. Get prepared
2. Learn about Climate Change
3. Chart & Scan Impacts & Opportunities
4. Decide Priorities
5. Plan & Take Action
6. **WATCH, LEARN & REFINE**

Who to involve and how to do action monitoring:

- **Who?**
  - Appropriate individuals from the organizations implementing actions
  - Regulatory agency and local government staff
- **How?**
  - For smaller plans – 6 month check-in meeting; For bigger plans - 6 month check-in meetings for each priority topic and plan-wide communication either through a meeting or distributing a compilation of the priority topic meetings
  - Compile status of actions, barriers and learning
  - Report findings from monitoring to elected officials, through the media and public meetings, by making the summary findings publicly available.

6.2 Resources

This chapter is based largely on the following sources. As only a few rural communities have had climate change adaptation plans in place for more than a year or two, there is limited experience from the example communities.

- ☐ ***Preparing for Climate Change – A Guidebook for Local, Regional and State Governments*** (Chapters 12-13) http://cses.washington.edu/cig/fpt/guidebook.shtml

- ☐ ***UKCIP Adaptation Wizard* – Step 5. Keep it relevant** http://www.ukcip.org.uk/index.php?Itemid=273&id=147&option=com_content&task=view

- ☐ ***FROM IMPACTS to ADAPTATION: Canada in a Changing Climate 2007*** Lemmen, F.J. Warren, J. Lacroix and E. Bush (editors). Government of Canada. http://adaptation.nrcan.gc.ca/assess/2007/index_e.php

6.3 Watch

Today's community climate resilience plans will be based on the best information about complex, dynamic climate, environment and community systems. It won't always be possible to anticipate all the risks, or select the right actions. Watching how climate changes unfold, how these changes ripple through the natural environment and what community impacts occur is an essential element of long-term climate resilience.

The purpose of watching and monitoring is to gather information to decide whether a specific action or plan should continue as initially designed, or whether changes are needed.

It is likely that decisions about climate resilience will need to be refined frequently because of the rapid learning that is happening in these early days of climate change adaptation and the difficulty of predicting the changes and risks.

Three types of monitoring are recommended:

1. **Actions** - Review at least every six (6) months. Questions to ask:
   - Which actions are getting done?
   - Which actions are not getting done?
   - What are the barriers? Can they be removed?
   - What are enablers? Can they help with implementation of all actions?

2. **Climate and natural environment** – Ongoing monitoring of new research and local observations to better understand changes and risks.

   Historically, the provincial and federal governments have lead broad ranging climate and environmental monitoring. In recent years many of these monitoring activities have been cut back.

   An alternative to government led monitoring is citizen science programs. In these initiatives, local citizens regularly collect information following science-based protocols and document this information in standardized systems. Resource 6.1 in the Community Resource Collection lists current citizen science programs.

Resource 6.1 – Citizen Science Programs in the **Community Resource Collection**

3. **Climate resilience plan** (or other community plans where climate adaptation is being implemented) - review annually. Consider:
   - Are the identified actions achieving the stated goals?
   - Has anything changed that might require refinements to the plan (see box at right)?

Individuals or organizations should be designated as monitors at each level, responsible for gathering information, bringing people together, communicating results and celebrating successes. They should also scan for new information that should prompt updating the plan.

Who to involve and how to do climate and environment monitoring:

- **Who?**
  - Individuals involved in action monitoring
  - Scientific and technical specialists including representatives from resource agencies and relevant professional groups
  - Local climate observers (e.g. gardeners, farmers, naturalists, fishermen, hunters, guide-outfitters, nature-based tourism guides)
- **How?**
  - Community site for recording observations (e.g. website, bulletin board, drop-off box)
  - Citizen science monitoring program (see Resource 6.1 in Community Resource Collection)
  - Annual summary of climate and environment observations

Who to involve and how to do plan monitoring:

- **Who?**
  - Individuals involved in action monitoring
  - Elected officials
  - Scientific and technical specialists including representatives from relevant professional groups
- **How?**
  - For smaller plans – annual review meeting; for bigger plans - annual review meetings for each priority topic and plan-wide communication either through a meeting or sharing information from meetings
  - Summary of implementation successes and challenges, new information and local observations, possible new actions and reprioritized actions and timeline for plan revision
  - Public reporting of monitoring findings as above

Reasons to refine climate resilience plans:

- Climate changes or environmental responses are different than anticipated.
- Community risks or opportunities differ from what was expected.
- Community adaptive capacity has changed.
- The community vision, goals or objectives have changed.
- All priority actions have been completed or the actions are not achieving the original goals.
- New information, adaptation actions, barriers or opportunities have been discovered.

6.4 Learn

We have only just begun to learn about future climates and how community life might change. Ongoing sharing of information and learning will be needed to support adaptation. Community understanding of changing climates and impacts and support for climate resilience actions should be encouraged by ongoing communications about new information and actions that are being taken to reduce risks for the community.

There are several ways to prompt community learning:

- **Community information portal –** The information library that was created during this project should be maintained (if possible), updated with new information on an ongoing, periodic basis, and continue to be available to the community.
- **Report findings** -Individuals and organizations doing monitoring should report their findings regularly to the community.
- **Link to science** – Ask science experts studying climate related topics to let someone in the community know when new information becomes available. Invite them to do a presentation about the new information, or a media story.
- **Linking global to local** – Media coverage of provincial, national and global climate change events creates opportunities to spotlight what the community is doing to build climate resilience, and what future climate risks might be.
- **Continue to build adaptive capacity** – Continue to strengthen community knowledge and adaptive capacity by supporting key staff and leaders to participate in learning activities.

6.5 Ongoing Plan Refinement

A climate resilience plan cannot be a 'one-time, done it' kind of plan. It should be actively monitored and revised when needed. It is likely that sections of the plan will need complete revision at different times based on new information and learning about a particular risk. This expectation should be made clear to all planning participants.

A community can follow the same steps on the Climate Resilience Trail to refine their plan. The type of new information or learning that prompts the need to refine the plan will define which steps need to be revisited. For example:

- if there is new information about temperature, precipitation or extreme weather changes, then the community should return to the climate change information gathering activity (Chapter 2). After understanding the new information, the impact charts should be reconsidered to trace potential environmental responses to community impacts. Resilience assessments should be redone, and priority actions revised.

- if the community learns that the priority actions are not feasible, or new actions are possible, then it is only necessary to return to the action planning step (Chapter 5) to reassess possible actions. There is no need to start again at the beginning of the Trail.

By watching and learning more about climate change over time and refining plans and actions when needed, the community can continue to build its capacity to adapt to climate resilience. Remember - *This is the beginning of a journey…*

Guiding Principles for a Climate Resilient Community

- Increase public awareness
- Increase technical capacity
- Mainstream information
- Increase the capacity of the built and natural environment and social systems to adapt to climate change
- Strengthen community partnerships

From: *Preparing for Climate Change - A Guidebook for Local, Regional and State Governments*

Key messages:

- **Climate resilience planning is not a one time event** – Watching, learning and refining plans and actions must be ongoing.
- **Ongoing mainstreamed learning** is especially important for climate resilience because we are not sure how local climates will change, what the impacts will be or what our adaptive capacity will be.
- **Keep climate change adaptation on the radar** – It takes people and organizations time to integrate new information and thinking into their daily decisions. Every opportunity to remind the community about the changing climate should be taken.

How this Guidebook was Created

The Canadian Model Forest Network first identified climate change as a significant new challenge for forest-based communities in Canada. Three Model Forests partnered with the Canadian Forestry Service to develop a science-based framework for examining impacts and community vulnerability to climate change, including a detailed case study for Vanderhoof, BC. This project defined the need for a specially designed Guidebook to support small, rural forest-based communities to identify what they could do to reduce risks from local climate changes and to seize opportunities.

The Guidebook authors refined the scientific framework based on their experience with rural development and climate change adaptation planning in small communities in northern Canada and southern BC. They incorporated relevant aspects from other climate change adaptation guides, highlighting information and processes that are especially important to rural communities in forested areas.

The authors compiled advice and approaches from climate change adaptation projects in rural communities that they were personally involved in, as well as information from other rural projects. This advice and the tested approaches are highlighted throughout the Guidebook.

The national assessment completed by Natural Resources Canada in 2007 - *Impacts to Adaptation – Canada in a Changing Climate* was a valuable reference for this Guidebook.

Glossary

Based on *Adapting to Climate Change – An Introduction for Canadian Municipalities.* (2010) Richardson, G.R.A. Natural Resources Canada.

Adapted from Intergovernmental Panel on Climate Change (2007)

(climate change) Adaptation: Adjustment in natural or human systems in response to actual or expected climate stimuli and their effects, which moderates harm or exploits beneficial opportunities. There are various types of adaptation, including anticipatory, autonomous and planned adaptation.

(climate change) Adaptive capacity: The whole of capabilities, resources and institutions of a country, region, community or group to implement effective adaptation measures.

Climate: Climate in a narrow sense is usually defined as the average weather or, more rigorously, as the statistical description in terms of the mean and variability of relevant variables over a period of time ranging from months to thousands or millions of years. Variables taken into account most often include surface temperature, precipitation and wind. Climate in a wider sense is the state, including a statistical description, of the climate system.

Climate change: Climate change refers to a change in the state of the climate that can be identified (e.g. by using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer. No distinction is made between climate change due to natural process and human induced climate change.

Climate projection: The calculated response of the climate system to emissions or concentration scenarios of greenhouse gases and aerosols, or radiative forcing scenarios, often based on simulations by climate models. Because climate projections are based on assumptions concerning, for example, future socioeconomic and technological developments that may or may not be realized, they are therefore subject to substantial uncertainty.

Climate scenario: A plausible and often simplified representation of the future climate, based on an internally consistent set of climatological relationships and assumptions of radiative forcing, typically constructed for explicit use as input to climate change impact models. A “climate change scenario” is the difference between a climate scenario and the current climate.

Climate variability: Variations in the mean and other statistics (e.g. standard deviations, the occurrence of extremes, etc.) of the climate on all temporal and spatial scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system or to variations in natural or anthropogenic external forcing.

Extreme weather event: An event that is rare within its statistical reference distribution at a particular place. Definitions of “rare” vary, but an extreme weather event would normally be as rare as, or rarer than, the 10th or 90th percentile. By definition, the characteristics of what is called “extreme weather” may vary from place to place.

Greenhouse gas: Gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth 's surface, by the atmosphere itself and by clouds. Water vapour (H2O), carbon dioxide (CO2), nitrous oxide (N2O), methane (CH4) and ozone (O2) are the primary greenhouse gases in the Earth's atmosphere. In addition, there are a number of entirely human-made greenhouse gases in the atmosphere, such as the halocarbons and other chlorine- and bromine containing substances.

(climate change) Impacts: The adverse and beneficial effects of climate change on natural and human systems. Depending on the consideration of adaptation, one can distinguish between potential impacts and residual impacts.

Intergovernmental Panel on Climate Change (IPCC): A panel established by the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) in 1988 to assess scientific, technical and socioeconomic information relevant for the understanding of climate change, its potential impacts, and options for adaptation and mitigation.

Mainstreaming: In the context of climate change adaptation, mainstreaming refers to the integration of adaptation considerations (or climate risks) such that they become part of policies, programs and operations at all levels of decision making. The goal is to make the adaptation process a component of existing decision-making and planning frameworks. In the context of community development, mainstreaming refers to engaging a broad range of community members in community decisions.

Mitigation: In the context of climate change, mitigation is an anthropogenic intervention to reduce the anthropogenic forcing of the climate system; it includes strategies to reduce greenhouse gas sources and emissions and enhance greenhouse gas sinks.

"No regrets" policy/measure: A policy or measure that would generate net social and/or economic benefits irrespective of whether or not climate change occurs.

Risk: A combination of the likelihood (probability of occurrence) and the consequences of an adverse event (e.g. climate-related hazard).

Risk management: A systematic approach to setting the best course of action under uncertainty, by applying management policies, procedures and practices to the tasks of analysing, evaluating, controlling and communicating about risk issues.

Sensitivity: Sensitivity is the degree to which a system is affected, either adversely or beneficially, by climate variability or climate change. The effect may be direct (e.g. a change in crop yield in response to a change in the mean, range or variability of temperature) or indirect (e.g. damage caused by an increase in the frequency of coastal flooding due to sea-level rise).

Traditional knowledge: A cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment.

Vulnerability: Vulnerability is the susceptibility to be harmed. Vulnerability to climate change is the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability to climate change is a function of the character, magnitude and rate of climate variation to which a system is exposed, its sensitivity and its adaptive capacity.