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Climate Change Adaptation Guidebook for Forest-Based Communities

Erin Fraser-Reid and Jodie Krakowski

Canada

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Erin Fraser-Reid¹ and Jodie Krakowski¹

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Foreword

Why climate change adaptation planning?

Canada's climate is changing, and it will continue to do so. Climate change is sometimes discussed as a future concern, but it's important to realize that climate change is happening now, and it has been happening for some time. Changes in our climate have been affecting forests, watercourses, grasslands, communities, and businesses for decades. We are now seeing its fingerprints on many of the costliest disasters in Canadian history.

Small forest-based communities can be especially vulnerable to the impacts of climate change. They are close to the forest and their residents often have close relationships with these forests, as well as the products and values they provide. For example, local forests provide clean water sources and opportunities for employment, hunting, gathering medicinal plants, hiking, skiing, and spiritual or aesthetic enjoyment.

Regardless of the specific benefits local forests provide to each resident, it's undeniable that the forests around rural communities are a critical part of what makes forest-based communities special. Understanding the changes taking place in local forests and working to keep these ecosystems healthy should be a priority for all residents of forest-based communities.

Many residents, governments, First Nations, and businesses in and around forest-based communities have realized that they must prepare for the changes that are

likely to happen in their local area. Having science-based, realistic plans in place is the best and most cost-effective way for forest-based communities to adapt to climate change. It's always easier, cheaper, and safer to proactively plan and take targeted adaptation actions than it is to react to an unexpected disaster already in progress.

How to use this guidebook

This guidebook is designed to help small Canadian forest-based communities develop a Community Climate Change Adaptation (CCCA) Plan. It follows a practical, step-by-step approach, explains key concepts, and lists the desired objectives for each step. Lots of examples from communities across Canada are included, and the appendices provide current, user-friendly resources for more information.

Because each forest-based community is different, the approach described in this guidebook is flexible. There is no "one size fits all" approach. This guidebook will share advice on how to get to the heart of the top priority issues for your community, and where to find experts to help with the plan if you're interested. Feel free to tailor the approach described in this guidebook to best fit your community.

Our understanding of climate and forests keeps growing, and your community will keep changing over time. Think of your CCCA Plan as a living document that should be reviewed and updated from time to time. This step-by-step guide can be used to develop the first CCCA Plan for your community, as well as for future updates.

Acknowledgements

This guidebook builds on a draft document that was originally produced in 2011, *Pathways to Climate Change Resilience: A Guidebook for Canadian Forest-Based Communities*. The original community adaptation guidebook was a collaboration between the Canadian Model Forest Network and Natural Resources Canada and was created with the goal of providing guidance to residents of rural Canadian forest-based communities in “understanding and acting to reduce community impacts from the changing climate”. This goal is still extremely relevant, but the publicly available climate and adaptation datasets and other resources have evolved and expanded significantly since 2011. As such, the 2011 guidebook was updated with new information and resources in 2020. Many thanks to Cindy Pearce, who led the creation of the original 2011 guidebook, and to Sheri Andrews-Key, who worked on the updated 2020 version with Cindy Pearce.

This version of the community adaptation guidebook is a complete re-imagining of the original 2011/2020 guidebook approach and breaks the adaptation planning process into smaller, more manageable steps. It also includes highlighted information boxes, modernized graphics, and significantly expanded and updated links and references to current Canadian climate and adaptation data, information, and resources. Since this guidebook is intended to be used by “everyday folks”, meaning people without significant training in climate change, environmental science, or community planning, it is hoped that these revisions will encourage more communities to consider taking on some climate change adaptation planning.

Many thanks to our Natural Resources Canada colleagues who reviewed and improved this version of the guidebook, including Sarah Nason, Keyara Carifelle, Isabell Souliere, Carolyn Mann, Jennifer Throop, and Brian Eddy.

Infographics—Figures 3, 4, 9, 10, 12, 13, and 16—were originally created by FUSE Consulting.

Land Acknowledgement

This guidebook was created on Treaty 6 territory—a traditional meeting ground, gathering place, and travelling route for the Cree, Saulteaux, Blackfoot, Métis, Dene, and Nakota Sioux—but it's meant to be applied throughout the land now known as Canada. This guidebook encourages the inclusion of diverse ways of knowing and life experiences to best understand the changes that are currently taking place in Canada's forests and forest-based communities, the impacts these changes are having and will have on people's lives, and how we can all adapt our behaviours and expectations to deal with these changes. Indigenous Peoples have been actively responding to environmental changes since time immemorial; understanding and appreciating this resilience is a critical part of inclusive and equitable climate change adaptation. Working together and considering a range of perspectives are the best ways to keep forest-based communities safe and resilient to the effects of climate change.

If you have any questions about the approach described in this guidebook, have suggestions for changes or updates to the process, or successfully use this guidebook to improve the resilience of your forest-based community, please reach out to us!

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Introduction

Welcome to the Community Climate Change Adaptation (CCCA) guidebook! The following pages will walk you through the steps to produce a CCCA Plan for your community. Following the process described in this guidebook will help you understand your community's areas of vulnerability to climate change and then develop and implement targeted adaptation actions to reduce those vulnerabilities. Climate change could also bring opportunities to some regions, and the CCCA Plan development process will encourage an exploration of those areas.

No community will be immune to the effects of climate change. In fact, forest-based communities will be among the first to experience the impacts of a changing climate firsthand.

Has your community or a community in your region been evacuated in recent years because of unprecedented flooding or wildfires?

Have crops or gardens failed or been less productive recently because of drought?

Have new “warmer weather” crops or plants been able to survive and grow in your region?

Have warmer winters affected local forestry or industrial operations, or winter/ice road conditions?

Have you noticed different plants, insects, or animals in the forests around your community, or have you noticed that the usual plants or animals are growing or moving differently compared with the past?

Climate change makes changes like these much more likely.

Taking action against climate change as an individual can seem huge and overwhelming at first. However, there are many things that we can all do to make a meaningful difference in this fight. Helping your forest-based community develop a CCCA Plan is one of those things.

“The bottom line is this: climate change is affecting you and me right here, right now, in the places where we live. But, by working together, we can fix it. Sure, it's a daunting problem... But we can't give in to despair. We have to go out and actively look for the hope that we need that will inspire us to act. And that hope begins with a conversation today.”

- Dr. Katherine Hayhoe, Climate Scientist; TED Talk, 2018

https://www.ted.com/talks/katharine_hayhoe_the_most_important_thing_you_can_do_to_fight_climate_change_talk_about_it

Generally, climate change actions fall into two broad categories: **mitigation** and **adaptation** (Figure 1).

Climate change mitigation describes actions that directly tackle the root causes of climate change and lower or stabilize the amount of greenhouse gases in the atmosphere. Mitigation actions could include

- introducing new technologies or initiatives to reduce energy consumption by residents and businesses,
- implementing land use or community planning initiatives to encourage the creation of compact, walkable, energy efficient communities, or
- managing forests to capture and store carbon and prevent it from being released into the atmosphere.

Climate change adaptation, on the other hand, describes actions that will reduce the negative impacts of climate change on people and the things people value, or help people take advantage of new opportunities that could arise from the changing climate. Examples of adaptation actions include

- evaluating and upgrading vulnerable local infrastructure to ensure it will be able to withstand a predicted increase in extreme weather events like flooding,
- introducing water restrictions during the summer months because of recurring droughts,
- planting a new high-value crop that can now thrive in the area because of higher summer temperatures and longer growing seasons, or
- removing flammable fuels from the forests around communities to reduce the risk of wildfires burning into communities (e.g., FireSmart treatments).

Mitigation and adaptation actions are often closely related, and sometimes one action can be considered both mitigative and adaptive. For example, planting trees within a community is a mitigation action because the new trees will absorb and store greenhouse gases from the atmosphere. The same tree planting project could also be considered an adaptation action because the new trees will help cool surrounding areas during the summer months through shading, helping to reduce the negative impacts of higher summer temperatures on residents.

Planning to adapt to climate change

There is strong evidence that planning ahead to proactively address climate change impacts is far more cost-effective and much safer than reacting to emergencies after they are already underway. In other words, “**an ounce of prevention is worth a pound of cure.**”

The process described in the coming pages is meant to empower small forest-based communities to identify their areas of vulnerability to climate change, and then proactively plan and take local actions to manage the specific risks and opportunities. Implementing targeted local adaptation actions will help forest-based communities become more resilient and better adapted to future climate changes.

There is no need to hire a professional facilitator or rely on outside experts for advice or direction to develop a CCCA Plan; no one knows the community better than its residents and stakeholders.

The approach described in this guidebook will help community members identify the key shared values that may be affected by climate change, evaluate the risks climate change poses to those values, brainstorm and prioritize adaptation actions, set timelines, assign responsibility for implementation, and then assess the

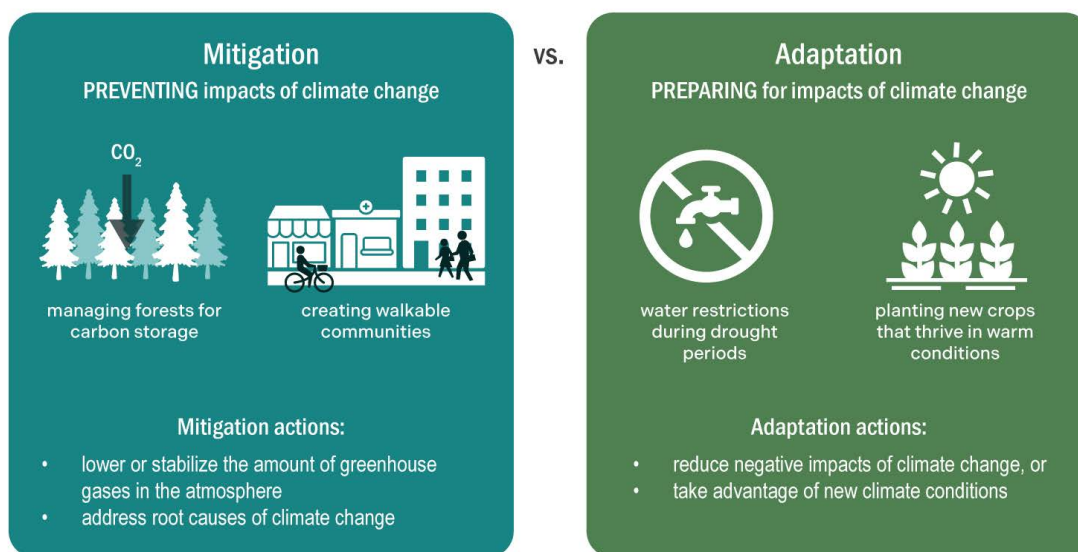


Figure 1: Climate change mitigation and adaptation

effectiveness of the adaptation actions for future improvement. Community **adaptive capacity** (see the information box on page 19) sets the scope and helps determine what is feasible for your community. Monitoring will track progress and help determine if the actions were successful.

This guidebook will follow the steps of the CCCA Plan development process (**Figure 2**). As you can see, the climate change adaptation cycle never really stops. Once the first eight steps of the process have been completed and a CCCA Plan has been created for your community, the process carries on through implementation of the priority adaptation actions and monitoring. After a few years, when the CCCA Plan requires updating, the results of the monitoring program should inform the next version.

As you proceed through the steps described in this guidebook, you will be building your community's CCCA Plan. Each guidebook step produces a piece of the CCCA Plan, so by the time you arrive at step 8 (Compile CCCA Plan), the plan will be largely complete. At that point, the Community Champion will just need to compile the work that has been done into a single document, which will be your CCCA Plan.

Important information is highlighted throughout the guidebook in blue outlined boxes.



Information meant to spur ideas or act as helpful hints are contained in boxes with  symbols.

Community Climate Change Adaptation Plans have been developed and implemented in forest-based communities across Canada. One such community is **Dawson City, Yukon**. Refer to the green boxes throughout this guidebook to learn more about how Dawson City developed their plan and addressed the challenges that came up during their plan development process.

The full Dawson City climate change adaptation plan is available at: https://www.yukonu.ca/sites/default/files/inline-files/Dawson_CAP_final_2011.pdf

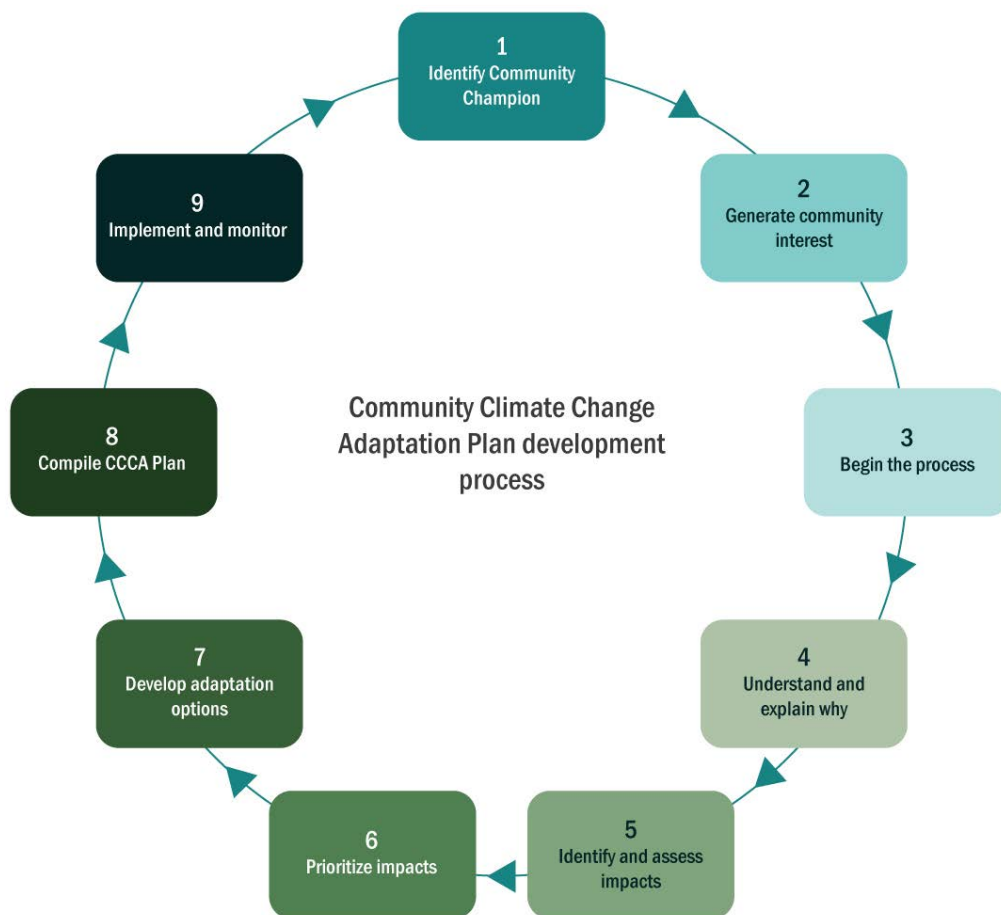


Figure 2: Community Climate Change Adaptation Plan development process

A mini “check-in” has been included at the end of each guidebook step to help you gauge your progress and decide whether you’re ready to move on to the next step in the CCCA Plan development process.

The questions posed at each check-in link back to the objectives established for each step, the products or processes that should have been initiated or completed during that step, and sometimes, a few other questions for consideration. Each mini check-in has been compiled into a master checklist, which is in **Appendix A**. Feel free to print or save this checklist if you think it will be helpful to help keep track of your progress.

In addition to describing the steps to create a CCCA Plan, this guidebook also contains several appendices with resources and examples of other community adaptation and resiliency plans. **Appendix B** in particular contains many online resources that have been organized according to the themes of: Canada-wide climate and climate change resources, regional climate and climate change resources, adaptation information and examples, community/municipal-focused adaptation resources, Indigenous-focused adaptation resources, climate impacts on forests information, and other resources.

Forest-based communities in Canada are unique

There is no “one size fits all” approach with a CCCA Plan—these plans should be designed for the community by its residents and stakeholders. Each CCCA Plan developed using this guidebook will be different, just like each forest-based community is different.

Canadian forests have grown and evolved alongside their local climates for millennia. So, it should be no surprise that as our climate changes, our forests will change too. Some of these changes will be sudden and dramatic, whereas others will be gradual and far less noticeable. Far more than in urban areas, changes to the forest will affect the residents of forest-based communities.

Residents of these communities often have special connections with their local environment for employment, recreation, and sustenance. Local forests can almost be considered an extension of forest-based communities; these forests are a big part of why many people have chosen to live where they do.

Understanding which climate changes are likely to happen, how these changes may affect the community and its surrounding forests, and how to adapt to these changes, is especially important for forest-based communities to keep their connections to the land safe and sustainable. This guidebook will help you understand the changes taking place in your local forest, how these changes

could affect residents, and how to best direct your valuable time and resources to the areas that will most benefit your community.

People who live in forest-based communities are independent, resilient, and creative when it comes to solving problems. You work wonders with limited resources, although you may be far from neighbouring communities and major government centres.

You can do this!

A few questions about climate change

Before we get started, let’s address a few of the common questions that sometimes get asked about climate change:

What is climate? It’s the average weather based on scientific data collected over several decades, usually 30 years. For some examples of climate datasets that can be used to help develop a CCCA Plan, see the information boxes on page 10, and have a look through the resources listed in Appendix B.

Is global warming different from climate change?

Yes and no. The term global warming refers to the most recent period of rising global temperatures that began with the Industrial Revolution in the 1800s. The term climate change includes global warming, plus the broader changes that are happening because of it. These other changes include rising sea levels, melting glaciers, increases in the frequency and intensity of wildfires and extreme weather events (storms, heat waves, etc.), and the changes to growing season lengths and flower blooming times.

Doesn’t the climate always change? Yes. The Earth’s climate has been changing regularly throughout our planet’s history. At least five major ice ages have occurred in the past, each of which involved periods of cooling and warming. Today, however, climate change is occurring more rapidly than in the past because of greenhouse gases emitted into the atmosphere from human activities, particularly the burning of fossil fuels. In Canada and other northern regions, measurements show the climate has already warmed at least twice as fast as areas closer to the equator. Canadian ecosystems and communities are already experiencing some of the biggest effects of climate change.

The global and local climate does still vary year-to-year due to natural changes in air and ocean circulation (such as El Niño and La Niña), volcanic eruptions, and other factors, but the long-term trend clearly shows increasing temperatures over time. See **Figure 3** for an example of temperature variability in relation to climate change trends.

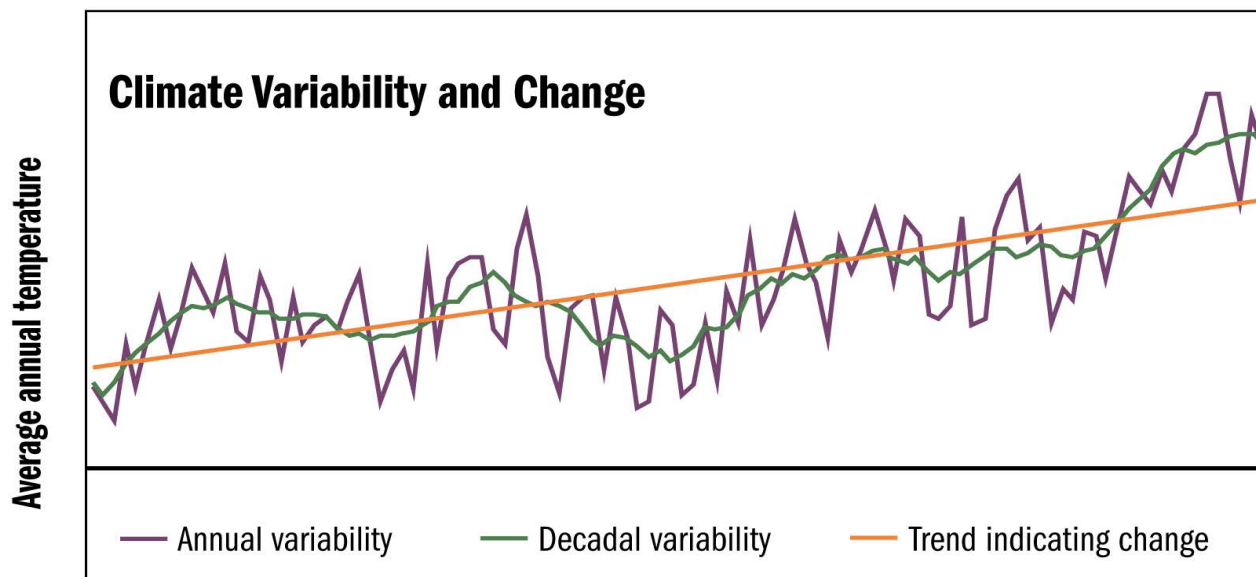


Figure 3: Variability in yearly average and decadal (10-year period) temperatures in relation to an overall trend

How will forests be affected by climate change? The short answer is that it will vary across the country. Some climate-driven changes to forests will be sudden and dramatic, while others will be gradual and subtle. Either way, climate change will affect tree growth and survival rates, the patterns and intensities of wildfires and extreme weather events like floods and windstorms, and the number and species of trees and other plants that grow back after disturbances.

The specific impacts of climate change on forests will be different across regions, and the impacts will not be straightforward—they will be cumulative and interconnected (**Figure 4**). For example, lower-than-normal amounts of rainfall during the growing season can weaken trees and make them more susceptible to attack by forest insects. Forest insect outbreaks can kill a portion of the trees in a forest, which would then increase the flammability of the forest, leading to increased wildfire hazards.

Regardless of the specific changes that take place in your local forest, one thing is clear: **the future will not be like the past.**



Check out the plain language story maps created by Natural Resources Canada that describe how Canadian forests and forest-based communities could be affected by climate change.

English version: https://ca.nfis.org/forestchange/StoryMap_EN/Intro.html

French version: https://ca.nfis.org/forestchange/StoryMap_FR/Intro.html

Can I really do anything about this? Absolutely! Humans can influence climate change by emitting fewer greenhouse gases (mitigation) and by understanding and planning for the expected changes from climate change (adaptation). Individual actions, government policies, research, business innovation, and community planning are all needed to successfully adapt to climate change. As Dr. Hayhoe said in her TED Talk, “By working together, we can fix it!”

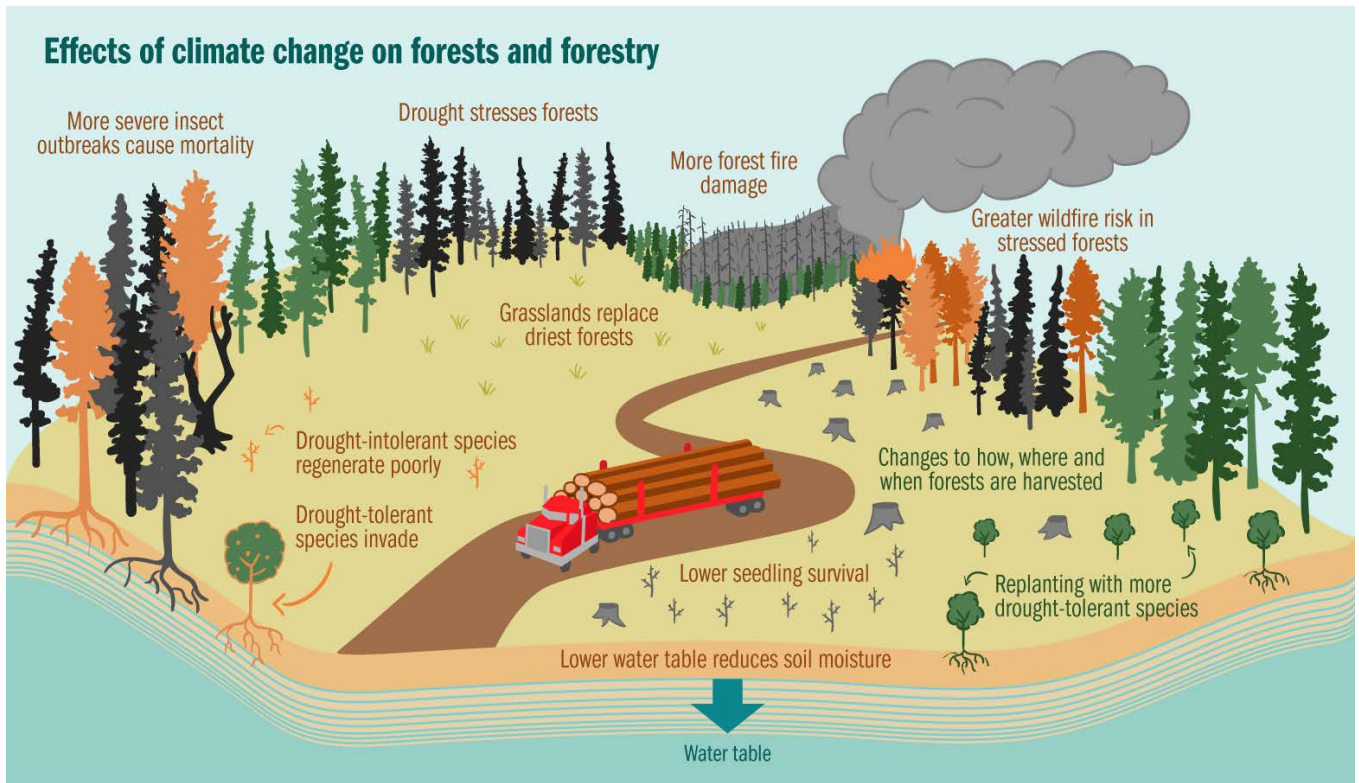


Figure 4: Effects of climate change on forests and the forest industry, which is often a major employer in forest-based communities, and some potential adaptation actions. Orange symbols represent potential negative impacts. Green symbols represent potential positive impacts (opportunities).

Step 1

Identify a Community Champion or Advisory Committee to lead the CCCA Plan process

Objectives

- **Identify a Community Champion or an Advisory Committee**
- **Let's get started!**

Identify a Community Champion or an Advisory Committee

Hearing, understanding, and incorporating a broad range of observations, opinions, and expertise is essential to make sure the CCCA Plan addresses the top climate change issues facing your community and develops relevant and feasible local adaptation options. This process will require a strong leader to keep things on track and moving forward. A Community Champion or Advisory Committee should be identified to lead this process.

Ideally, the Community Champion/Advisory Committee members should be well-connected local residents who can commit to leading the development of a CCCA Plan from start to finish, like people with long track records of volunteering. Being an expert in climate change isn't required. Someone with good communication, organizational, and networking skills, who is also inclusive and open to different ideas would do a great job as Community Champion or as a member of the Advisory Committee.



An existing community group or club could act as the advisory committee for the CCCA Plan. If you go this route, just make sure to reach out to non-club members to ensure no one feels excluded.

If the community decides to use an Advisory Committee, it's recommended that a chair or committee leader be identified to ensure the committee remains on track.

Instead of selecting a single **Community Champion** to lead the Dawson City adaptation plan, a **project team** made up of representatives from two community-based groups—the International Polar Year Dawson Community Adaptation and Vulnerability in Arctic Regions (CAVIAR) and the Northern Climate Exchange—led the process.

An ideal Community Champion/ Advisory Committee member is:

- Able to meet deadlines
- Able to compile research and other information
- Available to participate fully in the process
- An excellent listener and communicator
- Comfortable speaking publicly
- Committed to the project
- Computer literate
- Confident interacting with all types of people
- Familiar with the local area and region
- Flexible
- Inclusive
- Local
- Motivated
- Organized
- Passionate about climate change
- Respectful of others
- Well connected
- Willing to learn
- Willing to reach out to others



Depending on the **adaptive capacity** of your community, it may make sense to partner with other nearby communities to complete a regional CCCA Plan.

There are many examples of regional climate change adaptation plans available online—see the one that was prepared for the Northeast region of British Columbia for a recent example: <https://retooling.ca/resources/northeast-climate-change-vulnerability-assessments-district-of-chetwynd/>

Step 1 check-in:

- ☐ **Has a Community Champion or Advisory Committee been selected?**
- ☐ **Are you excited to begin?**

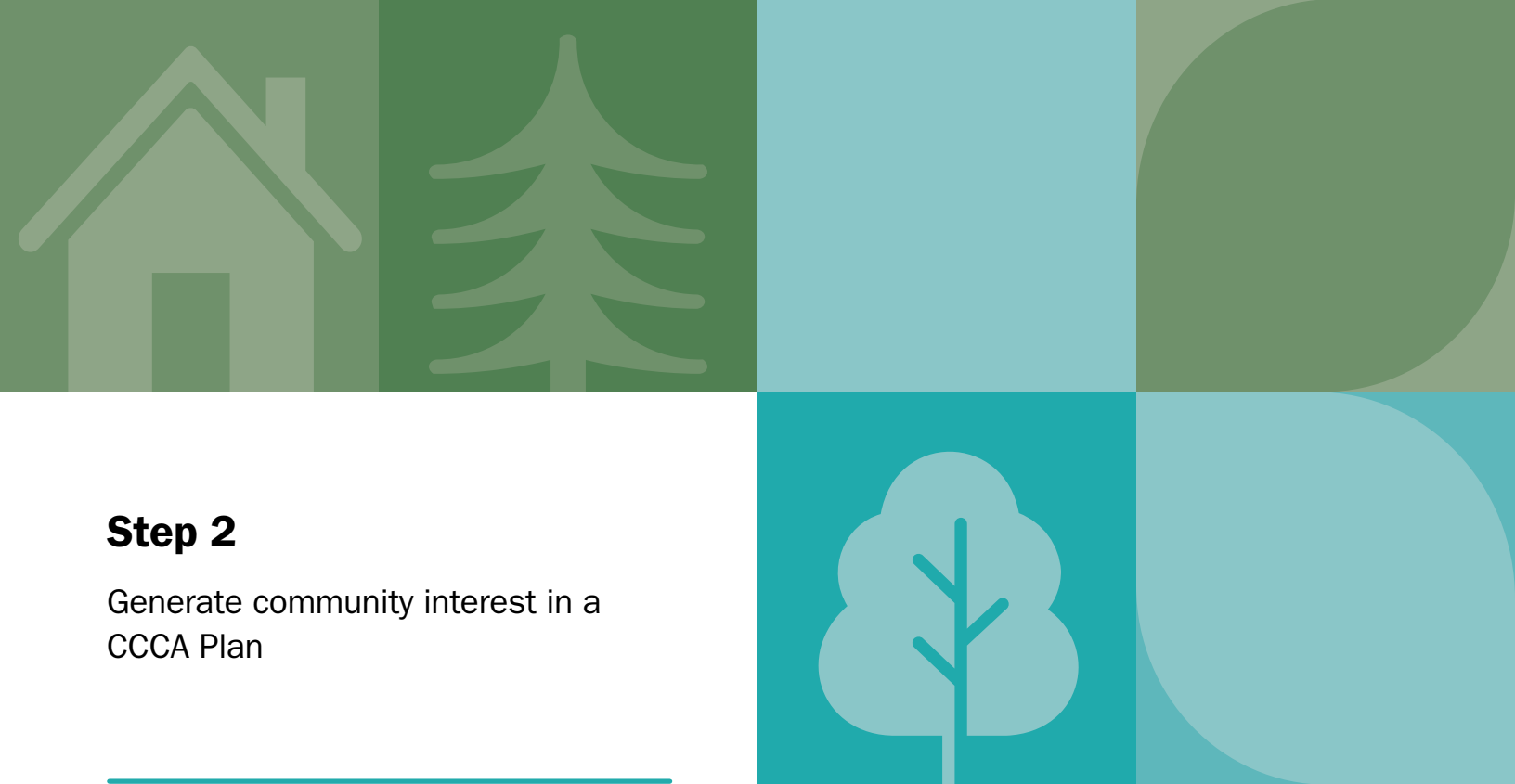
Let's get started!

Congratulations! You have chosen a Community Champion or Advisory Committee to lead this process. It's time to start developing your CCCA Plan.

For ease of understanding, this guidebook will continue to refer to the Community Champion and the tasks this person should complete. If an Advisory Committee approach was taken, the Community Champion direction and advice would pertain to that team.

The following sections of the guidebook will guide you through the CCCA Plan development process. Each section, or step, will identify at least one desired outcome or goal, and will also identify several objectives that should be achieved along the way. A few other considerations are also included at the end of each step. Feel free to use the master checklist in Appendix A to help you keep track of progress.

Let's get started!



Step 2

Generate community interest in a CCCA Plan

Objectives

- **Learn about the climate changes predicted for your region**
- **Develop a rationale to support developing a CCCA Plan for your community**
- **Draft a general work plan**
- **Identify local stakeholders**
- **Hold initial engagement sessions**

Learn about the climate changes predicted for your region

The Community Champion should learn some basic climate science and start to understand the main climate changes that are predicted for the community or region. There is no need to try to become an expert on all things related to climate change—the Community Champion should just try to gather some knowledge about the general changes predicted for the region so they can explain why the community should prepare a CCCA Plan.

Explore some of the resources in the climate data information boxes on the next page and listed in Appendix B. Pull together some information that shows visually what is predicted to happen in your region, and what changes have already occurred. Pick some key climate changes that are relevant for your community and region, and that communicate a clear message.



For example, precipitation amount and timing, frequency or severity of drought events, seasonal or monthly average temperatures, minimum or maximum temperatures, growing season lengths, and extreme temperature events like number of days warmer than 30 °C are all potentially affected by climate change and could be part of a CCCA Plan.

Develop a rationale to support developing a CCCA Plan for your community

Using the climate data and predictions for your community, and some of the other community adaptation plan examples available online and listed in **Appendix C**, the Community Champion should prepare a brief rationale outlining why and how the community would benefit from having a CCCA Plan.

The rationale should describe some of the major climate changes expected for the community or region, as well as what those changes might mean for the community and the surrounding forests. This list of potential changes and implications doesn't need to be exhaustive, that will come later in this process. This rationale is just meant to be a starting point to get people interested and motivated to be part of the CCCA Plan development process.

Several key climate data resources are listed below. Refer to Appendix B for a brief description of each of the following resources, plus links to many more.

National resources:

- **Climate Data Canada:** <https://climatedata.ca/> (see the Climate Data Canada box below)
- **Canadian Centre for Climate Services:** <https://www.canada.ca/en/environment-climate-change/services/climate-change/canadian-centre-climate-services.html>
- **Climate Atlas of Canada:** <https://climateatlas.ca/>
- **Environment and Climate Change Canada, historical weather data:** https://climate.weather.gc.ca/historical_data/search_historic_data_e.html

Regional resources:

- **Pacific Climate Impacts Consortium (BC, YK):** <https://pacificclimate.org/>
- **ClimateWest (AB, SK, MB):** <https://climatewest.ca/>
- **Ecology North – Climate Solutions (NT):** <https://ecologynorth.ca/our-work/climate-solutions/>
- **Ontario Resource Centre for Climate Adaptation (ON):** <https://orcca-craco.ca/>
- **Ouranos (QC):** <https://www.ouranos.ca/en>
- **CLIMAtlantic (NS, NB, PE, NL):** <https://climatlantic.ca/>

Climate Data Canada:

[Climatedata.ca](https://climatedata.ca) has a wealth of free Canadian climate data. This site also has lots of other helpful information, tools, and community climate change adaptation plan examples. Everything is searchable by location and includes historic and future data, alongside lower and higher greenhouse gas emission scenarios to compare options for future climate risks.

This site also contains a “Learning Zone” that explains the science behind climate data, among other topics.

Below is **Figure 5** showing average annual temperature for Sioux Lookout, Ontario. The historic temperature is the black line. Future predicted temperatures until 2100 are blue for low greenhouse gas emissions, green for medium emissions, orange for medium to high emissions, and red for high to very high emissions. The shading shows the variability in the predictions. It isn’t necessary to pick an emissions scenario for your CCCA Plan. Instead, focus on the general trends. In the example below, the key take-away is Sioux Lookout is predicted to become warmer in the future.

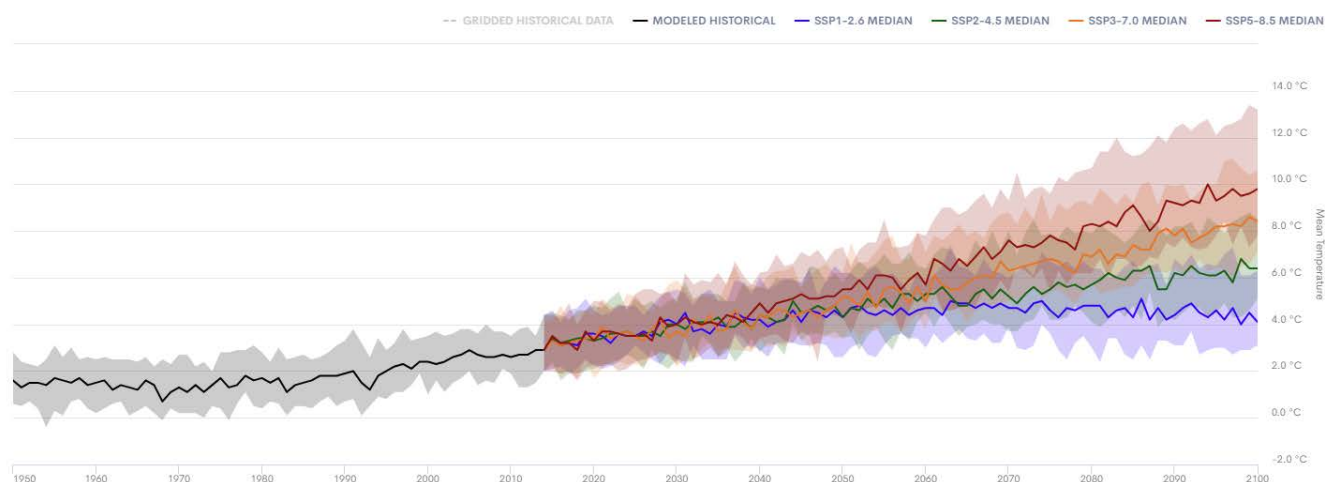


Figure 5: Average annual temperature for Sioux Lookout, Ontario. **Source:** www.climatedata.ca [Accessed 5 March 2025]

When developing the rationale, think about the shared values that connect people in the community and highlight how those values could be affected by climate change. These could include the importance of family, community vibrancy or stability, safety, maintaining or improving the economic health or tax base of the community, environmental sustainability, or local job creation. Identify and focus on the issues that are most pressing for your community. Keep in mind, though—fear isn't usually a good motivator for people. Try not to focus too much on catastrophic worst-case scenarios; instead, try to create a vision for a better future for the community with your rationale.

Figure 6 is one way to visualize community well-being and the range of factors that can contribute to it. Feel free to use or edit this diagram to support the rationale being prepared for the CCCA Plan.

The CCCA Plan rationale should also identify an overarching goal that will guide the development of the CCCA Plan. Goals are high-level, aspirational desired outcomes and could include statements such as:

"Nelson's natural ecosystems and the services they provide us are healthy, abundant, and diverse."

-Nelson, BC

"Build a community that reduces the risks of climate change through available opportunities and initiatives."

-Thunder Bay, ON

"Appropriately prepare Saint John for the changing climate."

-Saint John, NB



Figure 6: The many components that can contribute to community wellbeing. More information on this project is available at <https://dialogdesign.ca/community-wellbeing-framework/>

Source: Adapted with permission from Conference Board of Canada and DIALOG Design.

Review some of the community plans listed in Appendix C for ideas on what an appropriate goal might be for your community. Don't be afraid to use components of goal statements from other communities to craft the goal for your community. The goal statement will be reviewed with community residents, so don't worry about getting it perfect at this stage.

Goals such as those listed on the previous page are lofty and it can be difficult for people to visualize how they can be achieved. To help with this, the Community Champion should develop a few objectives to accompany the overarching goal(s). Try to keep the objectives realistic for the community; don't assume that more people will be hired or that funding will automatically be allocated to climate change adaptation projects. Those things might happen, but it's best to not count on them at this stage. Try to word objectives in a way where you will be able to tell if they are being met or not—be specific. The objectives will also be reviewed with community members, nothing is written in stone!

The city of Saint John, New Brunswick developed eight objectives to accompany their goal of preparing the community for a changing climate. The goals were

- integrate climate change impacts into community planning,
- reduce shoreline erosion and promote natural infrastructure,
- protect natural spaces, local habitats, and migration routes,
- provide public education on how to deal with the impacts of climate change,
- reduce the impact of climate change on human health,
- support vulnerable groups to increase adaptive capacity,
- increase resilience to flooding and sea level rise, and
- increase resilience to extreme weather.

The **Dawson Local Advisory Committee** developed the following vision statement (goal) to guide their plan development:

Dawson City and its hinterlands will be a self-sustaining society, a community that lives within the limits of the local ecosystem and serves as a haven for its residents in an uncertain world.

It will achieve this by (objectives)

- taking steps to increase its resilience,
- actively promoting self-sufficiency,
- increasing our knowledge of the environment around us, and
- developing ways to adapt to sudden changes in society and climate.



When preparing the CCCA Plan rationale, consider including some of the potential risks or costs associated with not adapting to climate change.

Local Governments for Sustainability (ICLEI) has produced a **Cost of Doing Nothing (CODN) toolbox** intended to help communities evaluate these considerations and justify allocating resources to climate change adaptation.

Although this toolbox is intended for municipal planners, it does contain useful information for the Community Champion.

Check out the CODN toolbox at <https://icleicanada.org/project/codn/>

Draft a general work plan

The Community Champion should also develop a draft work plan, including a timeline that shows the key steps in this process. Use Figure 2 or the checklist in Appendix A as guides for the major steps in the CCCA Plan process. It could be helpful to create a flowchart or a “Gantt chart” to help people visualize the overall process. Make sure to identify the points in the process and the approximate timing (season and year) for broader community engagement and involvement.

Develop a few different ways that community members could become more involved in the CCCA Plan process and encourage interested people to join the plan development team. There should be a range of tasks available for people, which should vary in the type and amount of expertise required and the time commitment involved. These tasks could include

- become a member of the advisory committee (if applicable),
- commit to attend and provide input at community meetings,
- act as an “ambassador” for the project by talking about the project and encouraging others to participate and attend community meetings,
- lead or participate in outreach discussions with certain stakeholders or community groups,
- help the Community Champion host and run community meetings by greeting people, taking notes, leading small breakout discussions, etc.,
- review parts of the CCCA Plan as they are drafted, or
- help to write, edit, or review the final CCCA Plan.

The Community Champion should be realistic about their own areas of expertise and time availability and should look for community members who would be able to help fill these gaps. For example, if the Community Champion isn't active on social media, they should identify someone who can post information online on behalf of the Community Champion and invite them to be a member of the plan development team.

Identify local stakeholders

Make a list of key local stakeholders. **Figure 7** lists a few examples of potential community stakeholders. Your list should include local government representatives, Indigenous communities and key individuals within those communities, local business owners and industry groups, and area residents. Make sure to include clubs or organizations that are active in the community on the list of stakeholders; this could include formal groups (e.g., Royal Canadian Legion), service organizations (e.g., Lions Club, Kinsmen Club, Freemasons), community/family support agencies (e.g., those that oversee shelters or food banks), as well as more informal groups (e.g., snowmobiling club, gardening group). Also look for any environmentally focused non-governmental organizations (ENGOS) that are active in your region and consider inviting those groups to also be part of this process.

Don't forget about young people: make sure to include organizations like 4-H, Girl Guides and Boy Scouts, Indigenous youth organizations, and local schools/school groups on your list of stakeholders.

The people, organizations, and clubs being identified as stakeholders don't need to have a specific mandate or interest in climate change or the environment; just try to identify the groups that are active in your community. Each stakeholder group will likely have slightly different perspectives on the community and may have different priorities for climate change adaptation. Understanding and incorporating a range of perspectives will make a more robust CCCA Plan that reflects the needs and priorities of the community.

Stakeholders



Figure 7: Potential community stakeholders



Most Canadian forestry companies have a **public advisory group** that meets regularly to provide input and advice to help inform forestry planning and objective setting.

Groups like this are very knowledgeable about the local forests and the climate change–related risks (e.g., wildfire, drought, forest insects and disease) to forests. It's highly recommended that groups like this be engaged in the CCCA Plan development process.

Depending on where the sawmills or wood processing facilities are located, it's possible that the public advisory group is based in a nearby community.

Don't be afraid to expand your search outside your community and look regionally when identifying key stakeholder groups!

Canada's Indigenous Guardians program

"Indigenous Guardians monitor, manage, and steward their lands and waters. Indigenous Guardians are 'boots-on-the-ground' and act as the 'eyes and ears' of the territory." – Indigenous Guardians Toolkit

The Indigenous Guardians toolkit is available at <https://www.indigenousguardianstoolkit.ca/>.

No two Indigenous Guardian programs are the same, but there are common elements to the roles and responsibilities of guardians across Canada. Typically, Indigenous Guardians are paid staff who do some or all the following activities:

- Patrol and monitor lands and waters
- Integrate local and Traditional Knowledge to manage and steward lands and waters
- Maintain and promote cultural activities
- Research and collect data on priority issues
- Prioritize and conduct ecological restoration work
- Work with the community and the public to ensure laws, regulations, guidelines, and protocols are understood and followed
- Build relationships and educate resource users about key stewardship and management issues

The knowledge and expertise held by Indigenous Guardians could be extremely helpful in the CCCA Plan development process, especially around capacity building, community outreach, data collection, and monitoring.

There are currently more than 120 Indigenous Guardian programs operating across Canada. Check out this map to see if any communities with guardian programs are located close to your community:

<https://www.indigenousguardianstoolkit.ca/program-map>

Hold initial community engagement sessions

Once the list of potential stakeholders is complete, the Community Champion should start to approach these groups to explain the CCCA Plan concept and generate some interest in completing a plan for the community. Talk about why you think this plan would benefit your community. Show some of the climate change information that has been compiled for the community or region, as well as the rationale and the work plan during these early get-togethers. Get people's thoughts on what should and shouldn't be included in the CCCA Plan (the scope). Show people some of the options for how they can get involved in the CCCA Plan process. Be open to any feedback you receive during these initial conversations and make sure to take lots of notes. Encourage people reach out to you directly for more information.

It isn't necessary to have all the answers or to start solving problems at these early get-togethers. The focus should be on getting community members interested and excited to be part of developing a CCCA Plan.

Indigenous communities and residents have been observing and successfully adapting to climate changes for countless generations.

If your community is not predominantly Indigenous, you should consider reaching out to nearby Indigenous communities to let them know about the CCCA Plan and invite them to share their knowledge and be full participants in CCCA Plan development, if they are interested and available. Remember to consider the capacity of any communities you approach to help with this work. Many Indigenous communities receive a lot of requests for information but have limited resources. Make sure to connect with Indigenous communities early in this process.

If you're consulting Indigenous people as subject matter experts, you may want to consider providing a financial **honorarium to Elders or other Knowledge Keepers** who are providing their expertise. It's important to remember that the other subject matter experts being engaged in this process (government staff, foresters, engineers, western trained scientists, etc.) will likely be paid for their time; Indigenous community members should be offered that same courtesy, if possible.

Communicate with community groups, all levels of government (including Indigenous governments and leaders) and other stakeholders in the manner that is most comfortable for them. For example, municipal, county, or provincial/territorial government staff may prefer formal meetings. Other folks may prefer an informal chat over a cup of coffee. Use your experiences, judgement, and knowledge about the community to arrange these sessions.



Start by reaching out to people you, your helpers, or other advisory committee members already know, as well as community groups they currently participate in. As you gain more experience and confidence with these discussions, start expanding your network and meet with people and groups you're less familiar with.

Don't forget to include "regular folks" as part of your conversations and outreach, not just people who work for a particular industry or are part of a club. Make sure to include people who are new to the community, in addition to long-term residents. Also try to speak with at least a few people who live off the land, meaning people who obtain a significant portion of their food and other resources through hunting, fishing, trapping, or foraging, because these people are often very aware of changes taking place in forests and other natural areas. Members of Indigenous communities also often hold significant knowledge in this area.

Regardless of the specific groups that make up your community, the key is to embrace the mindset that every person in the community has a role to play in addressing climate change, no matter their background or area of expertise. It's critical to hear and include as many diverse perspectives as possible as part of the CCCA Plan process. A variety of people, groups, and organizations contribute to community well-being, and they are different in each community. Make sure to be inclusive when identifying potential stakeholders.



In-person meetings are best for generating community interest in the CCCA Plan. But, if need be, consider using an online meeting platform like FaceTime, Google Meet, or Zoom to ensure as many stakeholders as possible are included.

Some options for generating community awareness and interest for a CCCA Plan could include

- posting information on the community's website, Instagram or Facebook page,
- hosting a meeting at a community hall, church, café, Band office, or other gathering place and inviting community members to attend,
- requesting time to present information during existing club meetings or community gatherings,
- setting up displays or posters at community events, gathering places or on notice boards,
- arranging for interviews or placing ads with local newspapers, news websites, or radio stations; including those focused on Indigenous issues and communities such as Windspeaker (windspeaker.com),
- developing activities related to climate change for local children or young people, or
- presenting information during a school assembly or hosting events for local elementary, high school, or college students.

If you're meeting with an Indigenous community or group, be aware that **most Indigenous communities and leaders will expect that cultural protocols take place at the beginning of the first meeting.**

Indigenous cultural protocols are not just "manners" or "rules," they represent a culture's deeply held ethics and beliefs. Since the Indigenous community members will be providing their cultural knowledge of the land, animals, and plants to support the CCCA Plan during your meetings, you should reciprocate by showing respect for the community's protocols and beliefs.

Protocols differ significantly among communities, so make sure to research what is expected and appropriate for the specific communities you will be meeting with. There are numerous federal and provincial/territorial government resources available to help you with protocols, respectful communication tactics, and key community contact information. If applicable, you should also learn how to properly pronounce the name of the community, as well as the names of people you will be meeting with. Many Indigenous community websites have pronunciation guides and other helpful information.

Use your knowledge about your community and its residents to determine the approaches that will work best. Try to reach as many people as possible with this outreach.



Many people can feel uncomfortable or intimidated at the thought of sharing their opinions or ideas in front of a large group of people. So, if lots of people show up for your in-person or online community meeting, you may want to consider using **breakout sessions or groups**.

This is an approach often used in large meetings or gatherings that separates a large group of people into smaller groups (~5–10 people) for short, targeted discussions. Following the breakout period, each small group then reports back to the main meeting with a short summary of the main points that were discussed.

Using breakout sessions as part of a large meeting can make people feel more comfortable and confident about sharing their opinions and ideas, which will lead to better and more effective community engagement and discussions.

If you use breakout sessions during community meetings, it's recommended that a member of the plan development team be assigned to each breakout group to lead the discussion, keep the conversation on track, take notes on the main points that were raised, and then report back to the main meeting on the key areas of discussion.

Identify some external experts, if desired

Community members are the true experts on local issues, needs, and capacity. However, they may not be environmental or climate scientists, engineers, or foresters, for example. Although it isn't required, the Community Champion may want to approach some external experts about providing their expertise in support of the CCCA Plan. The external experts shouldn't direct or lead the CCCA planning process, but they could be called upon periodically to verify information, explain or fill in data gaps, or to review parts of the CCCA Plan as they're developed. This isn't a mandatory part of the CCCA Plan process; only consult experts if they're interested, available, and you think their advice will be useful.

When looking for outside experts, investigate the various post-secondary institutions in your province or territory, locally important industries, or industry groups, as well as all levels of government (federal, provincial/territorial, and county/municipal). Also look for land-based groups like the Indigenous Guardians.

The Dawson Adaptation project team established a **Technical Advisory Committee** made up of government and academic experts from outside the community. This committee evaluated and reinforced local findings by integrating scientific and expert knowledge into the plan at key points during the process.

Step 2 check-in:

- ☐ Have you learned about the climate changes predicted for your region?
- ☐ Have you developed a rationale to support developing a CCCA Plan for your community?
- ☐ Have you drafted a general work plan?
- ☐ Have key stakeholders been identified?
- ☐ Have initial engagement sessions been held?
- ☐ Is the community engaged and excited to begin?

Step 3

Begin the process

Objectives

- **Finalize plan development team membership and roles**
- **Develop a communications and outreach plan**
- **Identify existing plans and processes that could incorporate climate resilience**
- **Determine the CCCA Plan scope**
- **Refine and finalize the work plan**

Finalize plan development team membership and roles

Developing a CCCA Plan can be a lot of work. Recruiting a team of helpers to work closely with the Community Champion will be helpful for organizing meetings, researching issues, recording community feedback, liaising with external experts or community groups, drafting sections of the plan, and writing and editing the final plan. If an Advisory Committee was established (as opposed to selecting a single Community Champion to lead the process), that group can also act as the plan development team. Do what works best for your community!

During the initial outreach meetings, the Community Champion should have compiled a list of people who were interested in being more involved in the development of the CCCA Plan, as well as the types of roles these people were interested in performing. Using this information, the Community Champion should now finalize the plan development team membership and assign each person a role on the team.



Try to keep plan development team membership to less than 10 people. Each team member should be able to influence the decision-making of the group. That becomes difficult when teams grow too large.

The Community Champion should make sure to carefully review the team members and the expertise that each person brings to ensure the team is well rounded and possesses all the skills that will be required to produce a CCCA Plan. Make sure to attach value to people's "life skills" and the knowledge gained by spending time in the forest or on the land in addition to formal post-secondary education or professional credentials. If there are any significant gaps, try reaching out to people with the desirable skills directly to invite them to join the plan development team.

It's critical that the plan development team reflects the diversity of the community/region being assessed with the CCCA Plan. **Ensure the demographics (age, gender, occupation/employment background, race/ethnicity, educational level, socioeconomic status, marital/family status, etc.) of the people on the plan development team reflects the community.** If there are any significant gaps on the team, consider reaching out directly to the under-represented groups with an invitation to join to the plan development team.

The Community Champion should also draft some “rules of engagement” or “terms of reference” for the plan development team. At first, this may seem like an overly bureaucratic item for a community group. However, clearly laying out the expectations associated with being a member of the plan development team will help the team work more effectively together. At minimum, it's recommended that the rules of engagement include a list of the team members and each person's role, the expectations associated with being a member of the plan development team (e.g., regularly attending meetings, coming prepared to discuss the meeting topic, being respectful of other team members, completing any assigned tasks), any expectations associated with specific roles on the team (e.g., taking notes and distributing meeting minutes within x days of the meeting), and a meeting schedule. Each member of the plan development team should review and approve the document.

Develop a communications and outreach plan

Since the Community Champion and plan development team are preparing the CCCA Plan on behalf of their community, it's critical that the team regularly updates community members and other stakeholders on their progress. Make sure to widely advertise upcoming engagement sessions, and other ways people can contribute, to demonstrate transparency in the planning process.

The communications and outreach plan doesn't need to be extensive or extremely detailed, but it should clearly list the key stakeholders and other participants that will be engaged (and how often) during each phase of the plan development process. It should also state how and when (approximately) updates will be shared with stakeholders and the broader community.



Regularly posting information on a social media account or a website can be a very effective way to keep residents informed on CCCA Plan progress. However, keep in mind that not everyone has a social media account, and some folks may not have reliable internet access. Make sure to communicate with residents by phone or mail as well.

Identify existing plans and processes that could incorporate climate change adaptation

The Community Champion or a member of the plan development team should set up a meeting or information sharing session with local municipal, county, or regional planning staff to talk about ways climate change adaptation could be incorporated into existing or new plans and processes.

This is an opportunity for the Community Champion and the rest of the plan development team to become more informed about how community and landscape-level planning is done, the plans or processes that are currently in place or under development, and which plans or processes could potentially incorporate climate change adaptation or resilience. If a member of the plan development team has some local government-related work or volunteer experience, this would be a great opportunity for them to provide their insight.

Make sure to also ask about plans or processes under the control of other levels of government that could affect the community or the surrounding forests. For example, forest management plans are typically prepared by provincial/territorial governments or forest industry operators and can provide a wealth of information on the composition and condition of local forests, the forest management objectives and activities planned for the short- and long-term, and the projected/expected impacts of climate change on local forests. Look regionally for these types of resource or land management plans.

Plans or processes that could include climate change adaptation considerations include

- community development plans, including any planned areas of expansion,
- energy efficiency or emissions reduction plans (relating to climate change mitigation),
- emergency protocols, emergency communication and evacuation plans/routes,
- wildfire risk areas and any risk reduction plans or activities,
- flood risk maps and mitigation plans,
- drinking water supply areas, water management (or water use) plans, or watershed management plans,

- industrial development plans (planned road building or work camp construction, planned resource extraction areas, number and duration of workers coming to the area, etc.),
- waste management processes, including recycling and composting (green waste),
- road building and maintenance plans, including roads managed provincially or by industry,
- community greenspace or natural area plans,
- building permit requirements, and the assessment and approval processes,
- agriculture, irrigation, or farming plans or approval processes,
- cultural planning initiatives, or
- land-use or resource management plans, including
 - forest management plans or maps of areas planned for timber harvesting,
 - fire management plans, including those associated with cultural (Indigenous) burning,
 - species at risk recovery plans,
 - wildlife management plans or local regulations associated with hunting, fishing, trapping, etc.,
 - wildlife habitat or biodiversity management plans, or
 - coastline, marine, or fisheries management plans.

Once the potentially relevant plans and processes have been identified, the Community Champion or a member of the plan development team should review these items through a climate change lens and start identifying where there might be opportunities to incorporate climate change adaptation and resilience concepts. If any of the identified community stakeholders have expertise in any of these areas, try to get their thoughts and feedback on how adaptation could be incorporated into the plans and processes.

Plan to check back in with the local municipal, county, or regional planning specialists you met with during step 2 to get their thoughts on whether the list of plans and processes that were identified to revisit with a climate change adaptation lens is complete and makes sense. Government planning specialists are the experts in this area, and they will need to be on board with the CCCA Plan and its recommendations if they are going to make changes to existing plans or processes.

Determine the CCCA Plan scope

Using the information gathered through research and the initial community outreach sessions, the Community Champion and plan development team should now discuss and finalize what the CCCA Plan should include, as well as what should be excluded (the scope).

Each community will need to determine the scale and scope of CCCA Plan that is appropriate and feasible for their community. Be mindful of the **adaptive capacity** of your community (see information box below and **Figure 8**) and try not to expect too much from a team of volunteers—be mindful and respectful of people's other time commitments.



If this is the first CCCA Plan for the community, try to keep the scope narrow so the plan can be completed within a reasonable timeframe.

Successfully completing even a basic CCCA Plan will build momentum for future community climate action.

During these early discussions, try to identify at least a few potential easy wins where climate change adaptation could be incorporated into plans or processes right away, with no or minimal changes to business as usual. To identify these easy wins, focus on the plans and processes that are under the control of the municipal or local government; policies controlled by higher orders of government will be more difficult and time-consuming to change. That isn't to say that bigger ticket items shouldn't be considered as part of these sessions—they absolutely should be! Just make sure to include a mix of ideas. More challenging, longer-term, or expensive ideas can always go in a "parking lot" for future reassessments if they aren't currently feasible.

Adaptive capacity is the ability and willingness of the people and organizations in a community to plan, mobilize resources, and take action to adjust to the impacts of climate change, including climate variability and extremes. If adaptive capacity is high, the community has a better chance of adjusting to climate change impacts, even those that cause major disruptions to the community. If adaptive capacity is low, adapting to climate change will be difficult—communities with low adaptive capacity will be the most vulnerable and least resilient to climate change.

Adaptive capacity is generally determined by four main factors (Figure 8):

- People
- Knowledge and technology
- Economic resources
- Institutions and governance structures

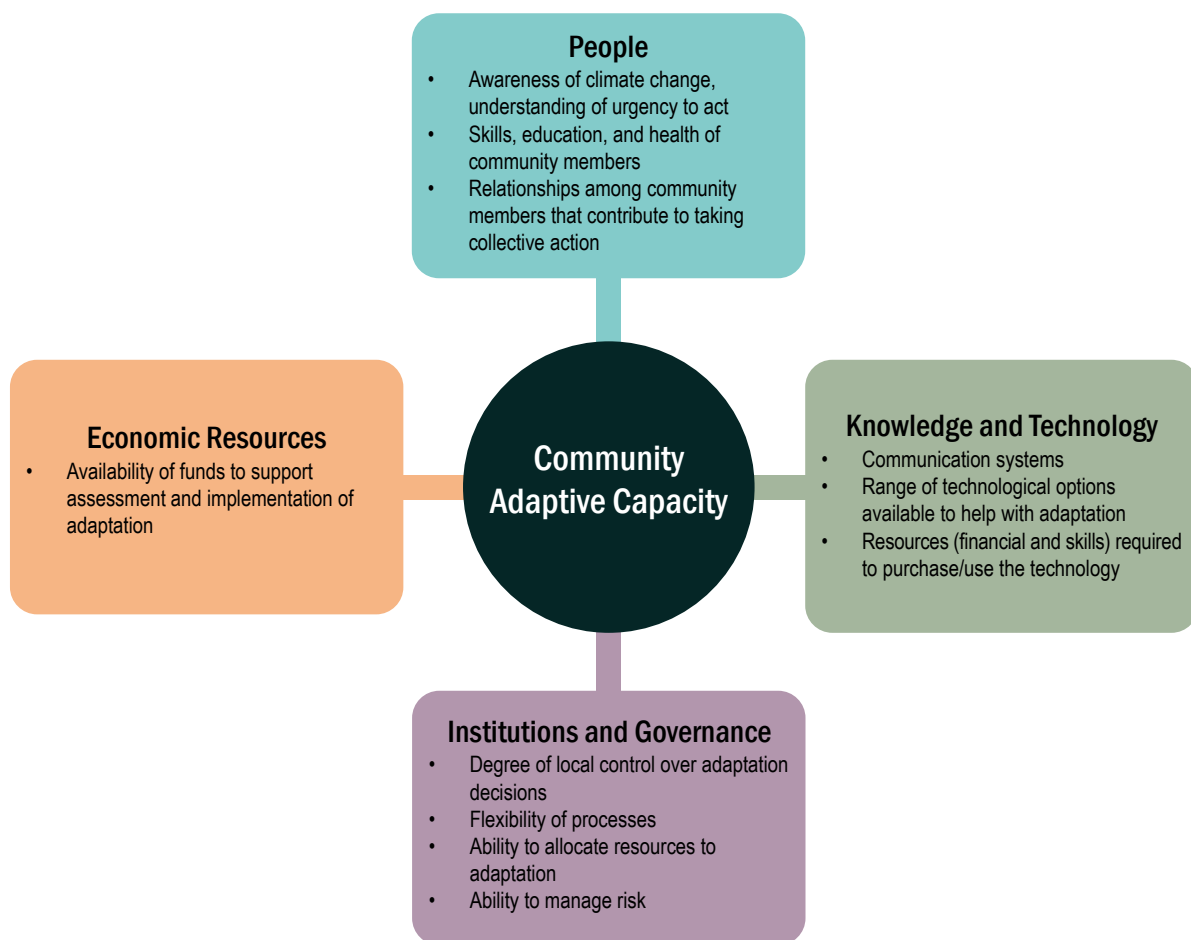


Figure 8: Some of the main factors that contribute to community adaptive capacity

How would you know if your community has high or low adaptive capacity? You can start by thinking about how your community has handled some recent changes. Try asking questions like:

- How well have we adapted to recent changes in the community? Which community factors were strengths? Which were barriers?
- How well have we managed through recent unusual weather events like periods of drought or extreme storms?
- What helps the people and organizations in the community cope with and adjust to change? Think especially about those who would be most vulnerable to climate stresses.
- What reduces the community's ability to cope with change?
- Has the community attempted to implement a major new initiative lately? Was it a success? What were the barriers?

Refine and finalize the work plan

Update the draft work plan and timeline that was prepared as part of step 2 to incorporate the additional information and feedback that has been gathered so far.

Review the work plan and timelines with the plan development team, as well as any other people or groups that will be heavily involved in the CCCA Plan development process. These people/groups should all “sign off” on the work plan and timelines to signify their agreement to participate in the process as described in the work plan.

Since the work plan and timeline constitute a contract of sorts among the plan development team, every reasonable effort should be made to keep the planning process on track and aligned with what was agreed to.

What should you do if the adaptive capacity of your community seems low? A few suggestions:



- Spend extra time generating community interest and raising awareness of climate change before starting to develop a CCCA Plan
- Invite a climate change expert to give a talk, webinar, or walking tour to improve residents' understanding of climate change and the potential community impacts and opportunities that could arise
- Organize an emergency preparedness event
- Investigate if government or other funding is available to support community adaptation planning, potentially including hiring a facilitator to lead a community discussion before starting the CCCA Plan development process

Step 3 check-in:

- ☐ Has the plan development team membership been finalized?
- ☐ Has a communications and outreach plan been created?
- ☐ Have you started to identify the existing plans and processes that might be able to incorporate climate resilience considerations?
- ☐ Has the CCCA Plan scope been finalized?
- ☐ Is the Plan scope consistent with the community's adaptive capacity?
- ☐ Has the work plan been updated to reflect recent discussions and input?
- ☐ Are the work plan and CCCA Plan objectives consistent with the community's vision, priorities, and objectives?

Step 4

Understand and explain why

Objectives:

- **Gather information about observed climate changes in the community and local forests**
- **Develop a Community Climate Change Profile**
- **Start a community input tracking table**

Gather information about observed climate changes in the community and local forests

The Community Champion and/or selected plan development team members should now continue the conversations with community members and stakeholders by reaching out to folks to discuss and understand the climate-related changes that have already been observed in and around the community, including in the local forests.



The community of Vanderhoof, British Columbia conducted a community survey to understand the changes being observed around the community. Results showed residents have noticed **shorter winters with lower snowpacks and new bird species** moving into the region.



Record all the changes that people have observed in the local climate, as well as any implications of these changes that people may have noticed. Make notes on every change that is mentioned, even if it seems very small, location specific, or conflicts with what others have observed.

Encourage people to think about and discuss positive and neutral changes they are seeing, in addition to those that appear to be more negative.



Climate change affects different people differently, even within the same community or region. Expect to hear some conflicting statements when talking to people about what they have noticed. That is OK!

For example, some people may notice changes to the climate such as later first frost dates, more rain falling during the winter months, or hotter and drier summers compared with the past. Other people might be more attuned to the implications of these types of changes such as better tree and plant growth compared with the past, higher costs for winter snow and ice removal, or more/longer periods of public forest closures due to extreme wildfire risks during the summer months. Record all these observations.

Understanding what community residents have seen and experienced will add impact and context to the scientific climate data. Regional, averaged climate data can miss many important local changes. A picture or story about the changes that have occurred can also be much more compelling and interesting than a table or graph of data points.

If the discussion doesn't flow easily at first, try asking some open-ended questions to start these conversations. These could include:

- How has the weather or climate changed since you were young or since your parents or grandparents were children?
- Are the summers or winters different from the past? How?
- Is the local or regional forest different than it used to be? How?
- Are the periods of freeze-up or break-up different from the past? Have these changes affected your work or travel?
- Has the timing, safety, or experience of outdoor winter activities (cross-country skiing, snowmobiling, use of winter roads, ice fishing, etc.) changed? How?
- Has it become easier or more difficult to hunt, fish, or harvest wild foods? Has the timing or location of these activities changed? Has the safety around pursuing these activities changed?
- Has climate or weather affected important local services or supplies? Which ones and when?

A resource that might be helpful for discussing these issues with community residents and stakeholders is the **Alberta Narratives Project**: <https://climateoutreach.org/reports/alberta-narratives-project-core-narratives/>.

This initiative is intended to help people have **constructive and respectful conversations about climate change** that focus on shared values and respect for the different ways people can see the world. Although the project was based in Alberta, the recommendations and advice would be widely applicable across Canada.

Try to be creative in the approaches used to gather residents' and stakeholders' insights to involve as many people as possible. Some ideas include

- hosting a community-wide event and inviting everyone to attend,
- hosting one-on-one or small group conversations (online or in-person),
- re-connecting with the groups you met with during your initial outreach sessions, and having these conversations using the approaches that were successful earlier in the process,
- conducting a community survey (online or physical),
- scheduling a storytelling or photo-sharing session,
- organizing community or forest walks and encouraging people to talk about the changes they see during the walks,
- organizing community mapping projects, essay, photography, or art contests, or
- reaching out to local schools about starting or contributing to a student-led climate change project.

Don't be afraid to re-use the techniques that seemed to work best for connecting with different community groups, residents, and stakeholders during the "generate community interest" phase of step 2.

Develop a Community Climate Change Profile

Using what you have learned about the climate changes that have been observed in and around your community, plus the historic and projected future climate data for the community or region, determine which climate changes should be the focus of the CCCA Plan. The selected changes should be those that seem to be the most important for the community and/or are predicted to have the biggest impacts on people's quality of life. Resist the temptation to include too many climate changes in the CCCA Plan, especially if it's the first one for the community. Consult an outside expert for help, if desired.

Focus on trends, not details.

Climate models are not designed to predict the precise future climate in a specific area. But they do show overall trends for a region. Focus on these trends, rather than on uncertainty. Try not to get bogged down in the details (Figure 3).

Pull all this information together into a **Community Climate Change Profile**. The profile will guide future discussions around areas of potential risk for the community, so it is important these data focus on the most significant climate changes occurring in the region. An example profile from Castlegar, British Columbia is contained in **Appendix D**.

The Dawson City adaptation plan used the following metrics in their **Community Climate Change Profile**:

- Annual temperature
- Annual precipitation
- Streamflow trends of the Yukon River

Distribute or post the Community Climate Change Profile for community members and stakeholders to review. If there are recommendations to include additional or different climate change elements in the profile, seriously consider incorporating those recommendations. However, make sure to consider data availability and the feedback from all parts of the community in your decisions. Try not to assign too much weight to a few loud voices.

If there are members of your community or local stakeholders who aren't fully fluent in the dominant language of your community, you may want to consider getting at least the **key messages translated** throughout this process. In addition to new Canadians, it's possible that some Indigenous Knowledge Keepers or Elders might not be fully fluent in English or French, especially in more northern or remote locations.

If you ask someone within your community to translate documents or portions of documents, you may want to consider whether an **honorarium or stipend** can be provided to the translator. Translation is complicated technical work, and it should be treated as such.

Start a community input tracking table

It's highly recommended that the Community Champion create and regularly update a **community input tracking table** or document. This is an important way to show accountability, transparency, and consistency to community members. If possible, consider assigning a member of the plan development team the responsibility of creating, continually updating, and sharing the tracking table with community members.

Use the tracking table to record every suggestion for change that is received from a community resident or stakeholder. Note who suggested the change, whether the suggestion will be incorporated or not, and provide a brief rationale for the decision. A tracking table is also a great way for the plan development team to keep track of their decisions in case any need to be revisited later in the process. This table will also be an incredibly valuable resource during future CCCA Plan updates. An example community input tracking table has been included in **Appendix E**; feel free to edit that table to meet your needs.

Step 4 check-in:

- ☐ Have you gathered information from residents and stakeholders about the climate changes that people have noticed in the community and local forests?
- ☐ Has a Community Climate Change Profile been created that identifies the highest priority climate changes for the community?
- ☐ Did you start a community input tracking table?
- ☐ Have all community members and stakeholders had an opportunity to contribute to the process so far?



Step 5

Identify and assess impacts to ecosystems and the community

Objectives

- **Understand how climate changes could impact local forests**
- **Create a Community Climate Change Impact Inventory**
- **Gather community feedback**

Understand how climate changes could impact local forests

Because of their proximity to the forest, forest-based communities tend to be more affected by changes in forest condition than larger communities. Therefore, it's advisable that the CCCA Plan consider how the climate changes predicted for the region might affect the local forests. The Community Champion or plan development team should research how each of the key changes described in the Community Climate Change Profile could affect the natural ecosystems around the community.

When doing this research, focus on the general trends of the predictions, not the specific details. For example, the Climate Data Canada information box on page 10 presented a graph of average annual temperature changes predicted for Sioux Lookout, Ontario. There is a lot of data and other information behind these graphs, including different greenhouse gas emission scenarios and ranges of predicted values to represent the future climate. Rather than spending time trying to decide which emission scenario would be best, or which part of the range of values would be most likely to represent the future climate,



focus on the general trend. For the Sioux Lookout example, the general take-away should be that the community (and region) are predicted to become warmer in the future, potentially a lot warmer.

When researching the effects of climate change on forests, limit your research to just the climate changes that were included in the Community Climate Change Profile. These are the climate changes that have been identified as the most important or potentially impactful to residents and stakeholders in your community, so these changes should be the focus of the CCCA Plan.

Also, try to focus your research on Canadian data sources—a pine forest in Quebec will function and respond differently to climate stressors than a pine forest in the southern United States or Asia, for example. In fact, your provincial or territorial forestry or natural resources department likely has a lot of information about the current condition of the forests around your community, including tree species composition, tree age, and forest health information. These government departments likely also have information about how the different forest types are expected to be affected by climate change. Much of this information would be available online or would likely be provided upon request. Don't be afraid to ask your provincial/territorial government for help as part of this process.

Figure 9 shows some example relationships between predicted climate changes and forest ecosystem responses.

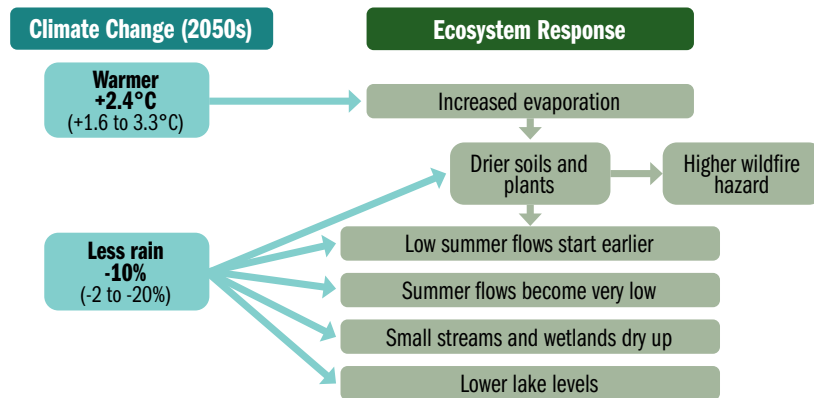


Figure 9: Relationships between selected climate changes and some associated ecosystem responses. This flowchart shows that predicted warmer temperatures in the 2050s could increase the rate of evaporation in the forest, leading to drier soils and plants, and raising the wildfire hazard. Predicted decreases in rainfall in the 2050s could also lead to drier forest soils and plants and higher wildfire hazards, in addition to contributing to changes in streamflow timing and amounts, which then may affect water levels in other regional waterbodies like streams, wetlands, and lakes.

Table 1 and Appendix F contain a few more examples of ways that natural ecosystems can be affected by climate changes.

Make sure to consider extreme weather events when thinking about potential ecosystem impacts—these events are expected to become more common in the coming decades and can have very dramatic effects on the community and the local forests. For example, what used to be considered a 1 in 50-year heat wave or flood might happen every 5 or 10 years in the future. These events are difficult to predict but can still have significant effects on community safety and stability and residents' quality of life.

There is no need to try to list or consider every possible ecosystem response to the climate changes that will be affecting your community. Just focus on those that are important to the community's residents and stakeholders. For example, if no one is very interested or concerned with potential changes to forest berry production, there is no need to include it as an important ecosystem response.

Table 1: Selected potential ecosystem responses arising from different climate changes

Climate change	Potential ecosystem responses
Warmer summer temperatures	Earlier forest berry production More unhealthy or dead plants and trees
Warmer winter temperatures	More forest-damaging insects survive and reproduce, leading to declining forest health and resilience Lower winter snowpacks and less spring run-off
Higher summer rainfall	Increased stream flooding risk Faster tree and plant growth Lower summer wildfire hazards
Lower summer rainfall	Reduced fish reproduction/survival due to low stream flows Less productive food crops and forests Failure of forest berry crops
More frequent freeze-thaw events	More winter damage to plants in natural areas and community parks, particularly seedlings More soil heaving, slumping, and damage to roads

The Dawson City adaptation plan identified five **key ecosystem or landscape changes** that were likely to affect community residents:

- Seasonal and weather changes
- Forest fires
- Flooding
- Regional changes to wildlife and biodiversity
- Permafrost degradation

Using what you've learned from your research, summarize and compile your findings so they can be shared with community members. Keep the summary short, simple, and to the point. Make a note of where the various information was pulled from (sources) by keeping a list of books or articles that you read and websites you visited.

An external climate change expert could review the ecosystem response summary that has been created to verify that it's accurate and complete.

Create a draft Community Climate Change Impact Inventory

Using what you've learned about the climate changes that have already occurred, the projections for the future climate (Community Climate Change Profile), and how these changes could alter local forests, the Community Champion and plan development team should now start thinking about how all these changes might impact the community and its residents and stakeholders. This is called a **Community Climate Change Impact Inventory**.

Consider both exposure and sensitivity when brainstorming potential community impacts.

Exposure describes how vulnerable important community values/infrastructure/ways of life are to the effects of climate change, including climate variations and extreme events. For example, a coastal forest-based community might be exposed to the impacts of hurricanes, rising sea levels, and saltwater intrusion into fresh water sources.

Sensitivity describes the degree to which important community values/infrastructure/ways of life could be impacted by climate change. For example, a coastal forest-based community could be very sensitive to the impacts from hurricanes if a large proportion of local jobs are reliant on sea-based tourism, if there are few wind-resistant trees in or around the community, or if there are portions of the community at or below sea level.

Reference: <https://eco-intelligent.com/2019/10/22/exposure-sensitivity-and-adaptive-capacity/>



Don't forget to look for areas of **opportunity**, as well as areas of risk or vulnerability.

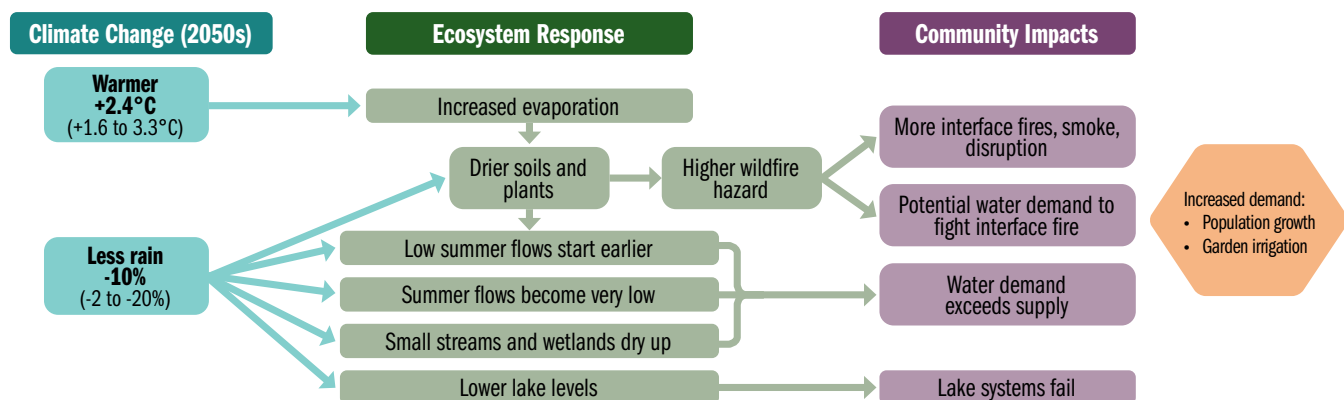


Figure 10: Continuation of the flowchart initially presented in Figure 9 showing the relationships between climate changes, ecosystem responses, and community impacts. In this example, the ecosystem response of higher wildfire hazard has the potential to lead to a greater number of interface fires (forest fires that also burn community buildings or infrastructure) and impact residents through smoke or other disruptions. In this example, higher wildfire hazards also have the potential to cause increased summer water demand, as more water could be needed to fight nearby wildfires. The orange hexagon identifies some potential future changes (more people in the community and increased garden irrigation) that could exacerbate the potential pressures on local water supplies.

The information box below provides a few examples of some potential climate change impacts to forest-based communities. Appendix F contains some more examples of potential impacts. Review some of the example community adaptation plans listed in Appendix C to see what other communities have identified as important potential impacts. Be creative and inclusive when brainstorming potential community impacts.

Record all potential impacts that are suggested, even if they seem unlikely or minor. These potential impacts will be prioritized later in the process, there is no need to eliminate any ideas at this stage.

The draft Community Climate Change Impact Inventory should be presented to community residents and

stakeholders for their feedback, so compile and summarize this information in ways that will be readily understood by a range of people. It's recommended that the Community Champion present the information in multiple formats (verbally and in writing) and make sure to include a variety of text, tables, diagrams, photos, flowcharts, and/or graphs.

Regardless of the specific approach taken to compile and present this information, it's critical that the materials are clear and easy to understand, and that the plan development team can explain the relationships and answer questions about the information presented. See **Figures 10, 11, and 12** for a few examples of how this type of information can be summarized and presented for community feedback.

Examples of climate change–related impacts to forest-based communities:

Negative examples:

- More frequent wildfires change the species and age of trees in the forest, reduce timber supply and forestry jobs, and could threaten community safety
- Ongoing drought degrades forest health, reducing the amount and quality of habitat for locally important wildlife, which reduces local hunting and trapping harvests
- Warmer winters have less snow, shortening the season for local ski hills and snowmobile groups, which reduces tourism revenue in the community during the winter

Neutral examples:

- Warmer minimum temperatures encourage more spring and fall outdoor recreation
- Longer growing seasons mean different crops can be grown in the region
- Changing climate means different birds or animals may become common in the region

Positive examples (opportunities):

- Longer growing seasons improve the production of berries and other wild foods
- Less snowfall reduces municipal snow clearing costs
- Fewer very cold winter days mean fewer outdoor workdays will be lost due to weather

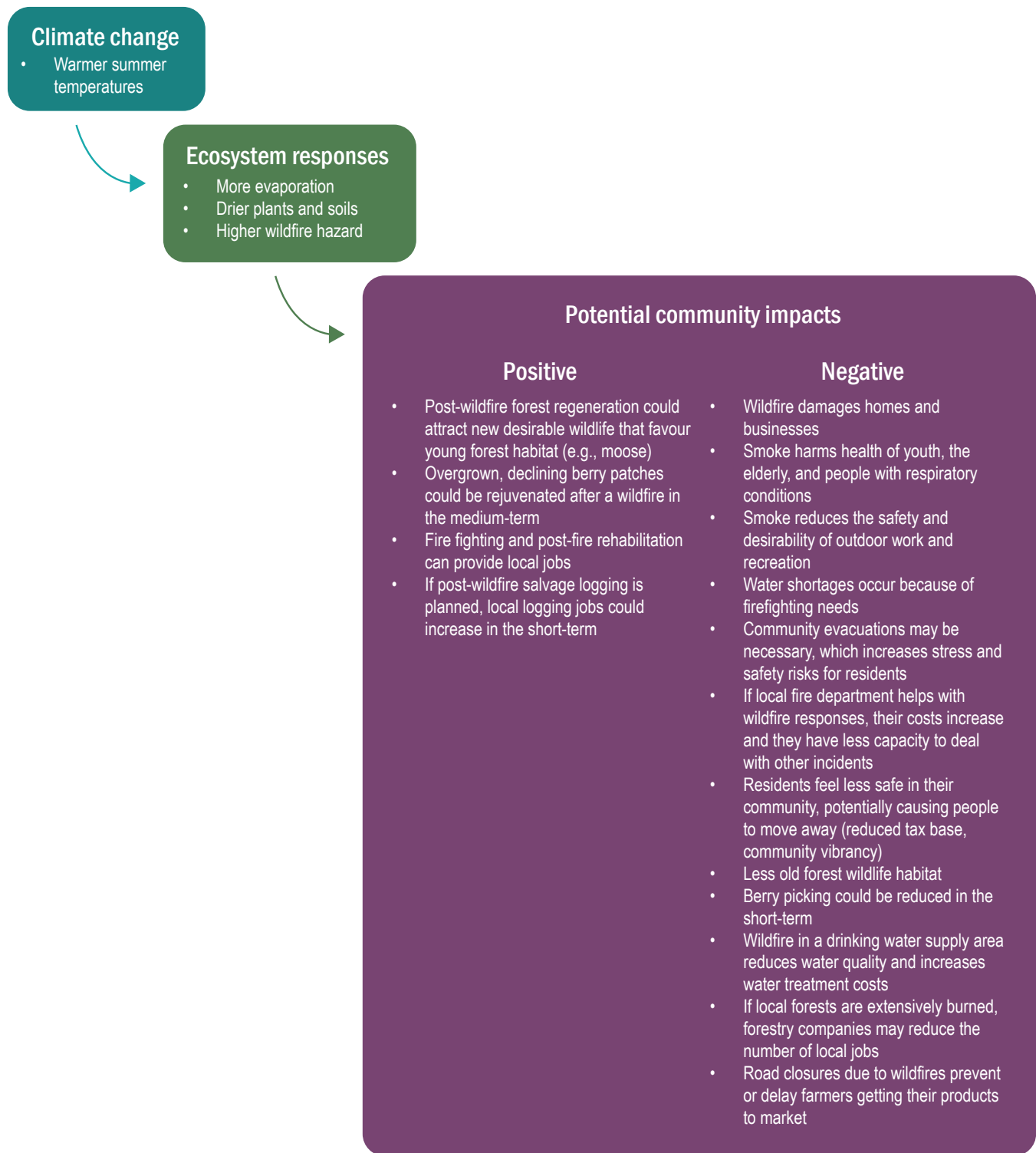


Figure 11: Potential community impacts arising from a predicted climate change (warmer summer temperatures) and the associated ecosystem responses (increased evaporation, drier plants and soils, higher wildfire hazard) to warmer summer temperatures

How does climate change affect communities?

Climate change increases the likelihood of hotter summers, warmer winters, and more extreme events.

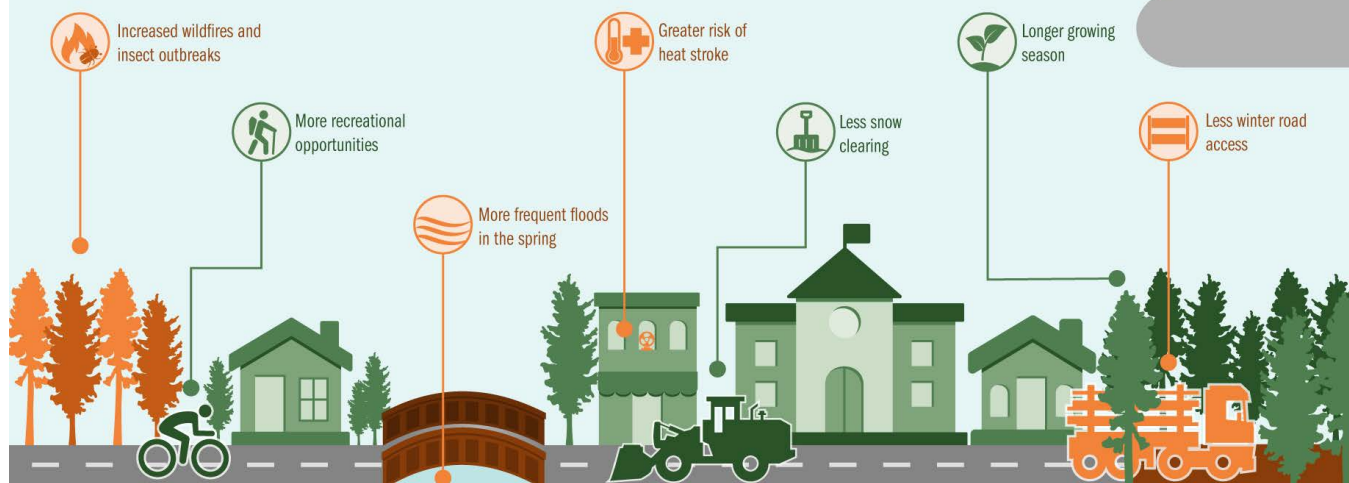


Figure 12: Selected potential impacts to forest-based communities from climate change. Orange symbols represent potential negative impacts. Green symbols represent potential positive impacts (opportunities)

Feel free to use any of the example diagrams or flowcharts shown in this guidebook as a jumping off point to develop visuals for use in your community's CCCA Plan.

Think broadly: consider global climate factors and local non-climate factors

When developing the draft Community Climate Change Impact Inventory, also consider how national or global climate change effects may affect the community. Global climate changes could disrupt crop production and distribution, raising food costs and affecting availability. They could also make products like vehicles, computer parts, medicines, and packaged food items more expensive or scarce. Extreme storms disrupting transportation could worsen local food insecurity.

Non-climate factors also could impact the community and the surrounding forests. These factors can be especially important when considering the adaptive capacity of the community, or how well the community will be able to cope with the consequences of climate change. Try to include some of these factors in the draft Community Climate Change Impact Inventory (**Figure 13**).

Examples of non-climate factors that Canadian forest-based communities could encounter include

- a single industry economy or small tax base,
- physical isolation all or part of the year (community access via boat, plane, or winter road),
- insufficient affordable or available housing,

- insufficient or aging infrastructure,
- declining population, or
- limited internet connectivity or limited technological capacity.

Although a CCCA Plan may not directly address challenges such as these, these realities all need to be meaningfully considered when developing a CCCA Plan. For the plan to be successful, it's critical that it be realistic for the community to implement. What is considered realistic will be different for each forest-based community.

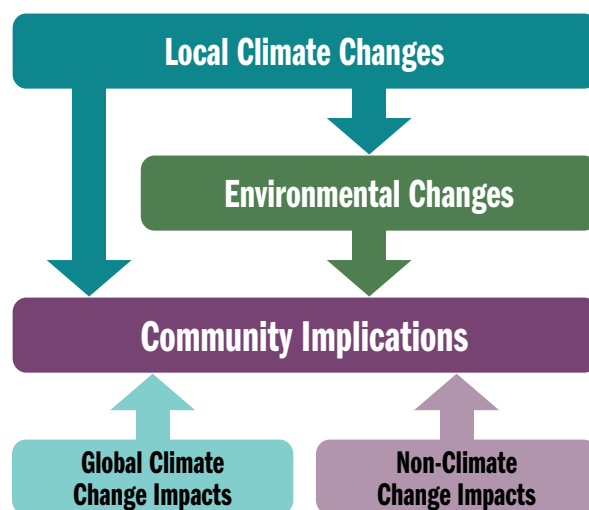


Figure 13: Local and global climate changes, environmental changes, and non-climate change impacts combine to affect forest-based communities

Global climate factors: food supply example

The province of Newfoundland and Labrador imports about 90% of its fresh produce. This makes the province's fresh food supply very vulnerable to storms and transportation disruptions, which are expected to intensify with climate change. To improve local food security, local entrepreneurs opened a hydroponic farm (Living Water Indoor Farm) on Fogo Island that supplies local businesses and residents with leafy produce year-round.

An external expert could review the Community Climate Change Impact Inventory at this stage to make sure nothing critical was missed.

The Dawson City adaptation plan identified both potential direct and indirect **community climate change impacts**.

Direct impacts:

- Tourism and recreation
- Access
- Water quality and contamination
- Behaviour and cultural shifts
- Health, employment, and well-being
- Costs

Indirect impacts:

- Declining economy
- Poorer living conditions
- Rise in social problems in community

Gather community feedback on the draft Community Climate Change Impact Inventory

Reconnect with community residents and stakeholders and gather their thoughts and feedback on the draft Community Climate Change Impact Inventory. Use the techniques that worked well in earlier stages of CCCA Plan development, like community meetings, targeted discussions, or online surveys, among others. Make sure to ask if any potential community impacts are missing or have been mischaracterized.

Record all the feedback received from residents and stakeholders around additional potential positive, neutral, and negative community impacts, even if they seem unlikely or of little potential consequence to the community.



Make sure to remain open to new and different ideas. Community and stakeholder support and buy-in for the CCCA Plan remains important!

Add the community feedback to the community input tracking table for record keeping. This will also continue to demonstrate accountability, transparency, and consistency to residents and stakeholders.

Carefully consider all the feedback that was received and adjust the draft Community Climate Change Impact Inventory, if warranted. If input from residents or stakeholders isn't going to be incorporated, add a brief rationale for this decision to the community input tracking table.

Following community engagement, the Community Champion and plan development team should now finalize the Community Climate Change Impact Inventory. Ensure each identified climate change leads to an ecosystem response, which is then linked to the community impacts.

An external climate change expert could review the final impact inventory at this stage to make sure nothing was missed, if desired.

A major potential **community-based impact** identified for Dawson City was an increased risk of flooding. Some potential **consequences of flooding** on the community included

- floods threatening Parks Canada heritage resources and other building stock,
- flooding potentially exceeding the ability of Yukon's Emergency Measures Organization to respond, limiting the availability of emergency services in the region,
- a planned site for the new sewage treatment facility being vulnerable to changing hydrological conditions like flooding,
- septic field breaches becoming more likely as water tables rise, which may lead to contaminated surface water and/or wells, and
- increased surface run-off causing infrastructure problems as silt clogs drains.

Selected areas of potential **regional ecosystem changes and impacts** identified for the Dawson City region/forests:

Ecosystem changes	Potential impacts
Increasing frequency of forest fires	Alters biodiversity of the region and shifts natural cycles Changes in forest species composition Loss of biomass shifts migration patterns Fire damage to vegetation alters availability of food for herbivores
Permafrost degradation	Thawing permafrost becomes a carbon source, rather than a carbon sink
Decreased water quality, increased contamination	Warming conditions exacerbate the build up of polychlorinated biphenyls (PCBs) and heavy metals in water due to changes in air circulation

Step 5 check-in:

- ☐ Have you gathered information about how climate changes could affect local forests?
- ☐ Has a Community Climate Change Impact Inventory been created that identifies how the community and its residents and stakeholders could be affected by climate change?
- ☐ Have residents and stakeholders been given an opportunity to review and offer feedback on the Community Climate Change Impact Inventory?
- ☐ Did you add any new feedback received to the community input tracking table?
- ☐ Are the impacts different from what was expected?

Step 6

Identify the highest community priorities

Objectives

- **Create a climate change vulnerability assessment for the community**
- **Gather community feedback**
- **Set climate change adaptation priorities**

Create a climate change vulnerability assessment for the community

Using the information collected and compiled up to this point in the CCCA Plan development process, it's now time to further evaluate and prioritize the potential community impacts identified in the Community Climate Change Impact Inventory.

For each potential impact, the Community Champion and plan development team should now evaluate each for their potential **consequences** to the community (positive or negative), the **likelihood** of the impact occurring, and the adaptive capacity of the community to respond to the potential impact.

There is no need to compile data or to consult outside experts for this evaluation. Instead, use a relative ranking system (e.g., low, medium, high, very high) where each potential impact is assessed relative to the other potential impacts. During this process, it's recommended that a brief rationale or a few notes be recorded around how the rankings were derived in the community input tracking table or in a separate document. Community residents and stakeholders will have questions about the rankings, so the Community Champion and plan development team should be prepared to provide that information. Be open to revising the rankings based on feedback from community members, if warranted.

Once the potential consequences, likelihood of occurrence, and adaptive capacity of the community have been established, use those rankings to assign an overall priority to each potential community impact.

Consequence is the known or estimated outcome of a particular climate change impact.

Likelihood is the probability of the event occurring over a given period.

For example:

- Low consequence: slightly longer ski season
- High consequence: more hospital admissions due to health impacts from wildfire smoke
- Low likelihood: once every 50 years
- High likelihood: once every 5 years

Table 2 shows a few potential climate change impacts that could affect a hypothetical forest-based community, along with their respective rankings for consequence,

likelihood, adaptive capacity, and overall priority for adaptation action. This type of evaluation is called a **vulnerability assessment**.

Table 2: Example partial climate change vulnerability assessment for a hypothetical forest-based community

Potential Community Impact	Potential Consequences			Likelihood	Adaptive Capacity	Priority
	Negative (Risks)	Positive (Opportunities)	Ranking			
More frequent, severe droughts impact water availability	- Higher costs to residents and businesses to secure alternate water supplies if wells run dry - Higher costs for new housing or business developments to drill deeper wells - Crops and gardens may fail	Spurs community action and buy-in for water planning and conservation/efficiency measures	High	Moderate (once in ~10 years)	Moderate	Moderate
More intense rainstorms exceed stormwater system capacity	- Plugged storm drains and culverts cause road damage - Septic field breaches contaminate surface water/wells - Damage to fish habitat and juvenile fish/eggs	N/A	High	High (once every 1–2 years)	Moderate	High
Higher summer temperatures increase the risk of wildfires near the community	- Wildfire damages community property or infrastructure - Wildfire smoke causes health issues for residents - Damage to important wildlife habitat - Local timber supply is reduced, affecting the local economy - Emergency services may be unable to cope with increased demand for services	Ongoing wildfires can provide short-term jobs in fire fighting and post-fire land rehabilitation	High	Low (once in ~20 years)	Low	Moderate
Changing environmental conditions reduce the number of tourists visiting the region	- Lower revenues for local restaurants, hotels, shops, and tour operators - Reduced local employment opportunities	- Less stress on local resources - Opportunity to re-focus tourism to take advantage of the new environmental conditions	Moderate	Low	High	Low

Another approach that can be used to identify community priorities is a **risk assessment**, such as the example matrix shown in **Figure 14**. Under a risk assessment approach, each impact is scored according to its consequence and likelihood, which are then multiplied to calculate a risk rating score. Under this approach, the numbers assigned to each category and the cutoffs for each category are flexible and would be at the discretion of the planning team and community residents and stakeholders.

A potential drawback with this approach is that it doesn't directly consider adaptive capacity, or the willingness/ability of the community to make changes,

in the calculations. If a risk assessment approach is used to evaluate potential community impacts arising from climate change, it's strongly recommended that adaptive capacity be considered separately before finalizing the priority rankings of potential impacts.



Try not to get too focused on discussing the specific numeric scores that are assigned to various risks or opportunities; the relative ranking categories are far more important for establishing priorities.

Risk score = Consequence X Likelihood		Consequence				
		Very Low 1	Low 2	Moderate 3	High 4	Very High 5
Likelihood	Almost Certain 5	Moderate 5	High 10	Very High 15	Very High 20	Very High 25
	Likely 4	Moderate 4	High 8	High 12	Very High 16	Very High 20
	Possible 3	Low 3	Moderate 6	High 9	High 12	Very High 15
	Unlikely 2	Low 2	Moderate 4	Moderate 6	High 8	High 10
	Rare 1	Low 1	Low 2	Low 3	Moderate 4	Moderate 5

Figure 14: Example risk assessment matrix

Anticipated **consequences, likelihoods, adaptive capacities, and priority rankings** associated with **increased risk of flooding** predicted for Dawson City:

Potential Impacts	Consequence	Likelihood	Adaptive Capacity	Priority
Floods threaten Parks Canada/heritage resources and other building stock	High	High	Low	High
Flooding may exceed the responses planned in the Yukon's Emergency Measures Organization, limiting the availability of emergency services	High	High	Low	High
Planned site of new sewage treatment facility may be vulnerable to changing hydrological conditions like flooding	High	High	Low	High
Septic field breaches are more likely as water tables rise, which may lead to contaminated surface water and/or wells	Low	High	High	Low
Increased surface run-off causes infrastructure problems as silt clogs drains	Low	High	High	Low

Anticipated **opportunities, likelihoods, adaptive capacities, and priority rankings** associated with the **seasonal weather changes** predicted for Dawson City:

Potential Opportunities	Likelihood	Adaptive Capacity	Priority
Mining season is extended because of a warming climate	High	High	Low
Decreased heating costs due to warmer shoulder seasons	High	High	Low
Warmer climate conditions yield longer growing seasons and an increase in agricultural productivity	Medium/High	Medium	Medium
Warmer growing conditions lead to a greater variety of crops that can be reliably grown	High	Medium	Medium/High
Increased yields from local harvests because of increased productivity regionally	Medium/High	Medium	Medium/High

Gather community feedback on the vulnerability or risk assessment

Once the first draft of the community's vulnerability assessment has been created, community residents and stakeholders should be given an opportunity to review the assessment and provide their comments and other feedback.

The Community Champion and plan development team should use the methods that have worked well earlier in the CCCA Plan development process to connect with people and gather input from diverse groups.

Whether the plan development team puts together a summary document, a PowerPoint presentation or just creates a list of talking points for themselves, the team should make sure to explain how the rankings were determined and should also be prepared to answer

questions about the decision-making process and about how various numbers or rankings were derived. Try to include a few potential opportunities for the community, as well as risks, when pulling all the information together.

An external expert could also review the draft vulnerability assessment at this stage to make sure nothing critical was missed.

Set climate change adaptation priorities

Using the feedback obtained from community residents and stakeholders, the Community Champion and plan development team should finalize the community's vulnerability assessment. Part of this process should include the identification of the top priorities (both risks and opportunities) that will be further evaluated for potential adaptation actions.

Top priorities can be identified by

- highest potential risk or benefit to the community,
- potential to cause the most damage to the community in the short- or long-term,
- time and resources required to address the issue,
- jurisdiction of responsibility and willingness of the jurisdiction to make changes,
- adaptive capacity of the community, or
- community interest.

Try to include a few “easy wins” or items considered to be “low-hanging fruit” on the priority list. Having a few actions that can be quickly incorporated into existing processes or easily implemented will help to demonstrate success with the CCCA Plan process and will help build momentum and interest in tackling larger, more challenging items.

The Community Champion and plan development team should use their judgement to determine whether the list of priority risks and opportunities requires further input from community residents and stakeholders before being finalized. If the priorities were discussed and largely agreed to during community discussions of the vulnerability assessment, then further consultation may not be required. If, however, there was significant disagreement or questions about the priority risks and opportunities from residents or stakeholders, it's recommended that the priority risks and opportunities be reviewed again with the community before finalizing.

Step 6 check-in:

- ☐ **Was a climate change vulnerability or risk assessment created for the community?**
- ☐ **Have community residents and stakeholders been given an opportunity to review and offer feedback on the vulnerability or risk assessment?**
- ☐ **Did you add any new feedback to the community input tracking table?**
- ☐ **Have priority impacts (including risks and opportunities) been identified for the community?**
- ☐ **Has any new information come to light that changes the priority items or their level of priority?**

Step 7

Develop adaptation actions and assign responsibility for implementation

Objectives

- **Develop adaptation actions to address the priority vulnerabilities and opportunities**
- **Identify barriers to adaptation actions**
- **Engage with the community on potential adaptation actions**
- **Create a priority list and assign responsibilities for implementation**

Develop adaptation actions to address the priority vulnerabilities and opportunities

The Community Champion and plan development team should now start compiling a draft list of adaptation actions that could address the priority vulnerabilities and opportunities identified for the community. Focus on those items identified as the highest priorities for the community and/or the easy wins. There is no need to spend time developing adaptation actions for any items the community considers to be of low priority.

When considering appropriate adaptation actions, make sure to refer back to the flowcharts, diagrams, and lists created earlier in the CCCA Plan development process that show the linkages between climate changes, ecosystem responses and the associated community impact(s). **Make sure the adaptation actions being put forward target the climate change and ecosystem response that is leading to the potential community impact.** Trying to address an impact without considering why the impact could occur will not be an effective adaptation strategy.



It's cheaper, easier, and safer to proactively plan for and address potential community impacts than to react to emergencies after they are already underway.

For example, through earlier examples (see Figure 10) we have seen that the climate change of warmer temperatures is predicted to lead to more evaporation, drier plants and soils, and an increased wildfire hazard (ecosystem responses to warmer temperatures). These changes are then predicted to result in more interface fires, smoke exposure, and general disruption for community residents and stakeholders (community impacts from higher wildfire hazards).

In this example, implementing **FireSmart** or other forest fuel reduction treatments around the community would be a great potential adaptation action because FireSmart treatments directly reduce wildfire hazards around communities. In this case, the adaptation action (FireSmart treatments) is directly tackling the ecosystem response (increased wildfire hazard) that is predicted to result from a climate change (warmer temperatures).

If, on the other hand, the adaptation action suggested in this scenario was to upgrade the main community access road to enable a faster evacuation in the event of a wildfire, that wouldn't be considered an appropriate climate change-centred adaptation action. Although upgrading the main access road might be good for the

community, it wouldn't help to reduce wildfire risk around the community, so it wouldn't be an appropriate adaptation action in response to warmer temperatures.

See **Table 3**, **Figure 16**, and **Appendix G** for additional examples of adaptation actions that have been suggested for Canadian communities.

FireSmart Canada

FireSmart is a national program that helps Canadians increase their neighbourhood resilience to wildfire and minimize the negative effects of wildfire in the areas where human development meets or intermingles with the natural environment (the wildland-urban interface).

Research has shown that buildings and their surrounding lands at the wildland-urban interface are particularly vulnerable to wildfire (**Figure 15**), so FireSmart focuses on specific actions that residents and business owners can implement to reduce the risk that their property will be damaged by wildfire. Visit www.firesmartcanada.ca for additional guidance and information.

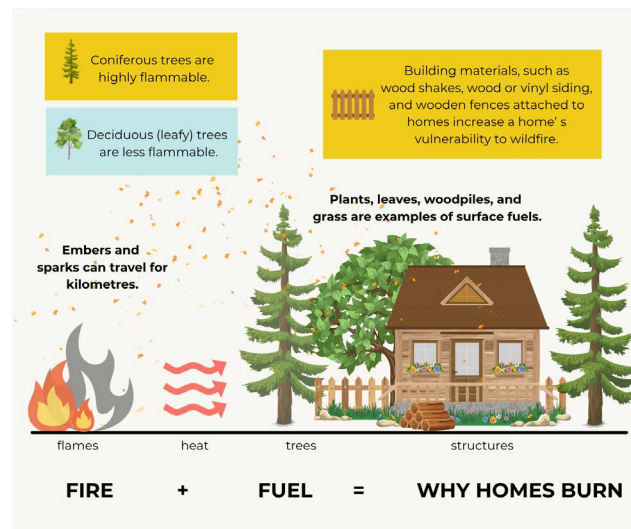


Figure 15: Understanding wildfire behaviour.

Source: Adapted with permission from <https://firesmartcanada.ca/wp-content/uploads/2023/04/Begins-at-Home-Guide-WEB.pdf>



Be mindful of inequalities that may exist in your community when considering potential adaptation actions.

For instance, residents without access to a reliable vehicle, who lack a nearby support network (friends/family), or the funds to pay upfront for a hotel could have difficulty evacuating the community on their own in case of a rapidly developing emergency, like a flood or wildfire.

Table 3: Examples of adaptation actions proposed by Canadian communities to address potential priority community impacts from climate change

Community Impact	Adaptation Actions	Community
Wildfire smoke impacts residents' health	- Identify community health gaps and trends - Develop education and activity programs	Yellowknife, Ndilo, Dettah and Kakisa, NT
Changes in water quality, flows, and quantity affect potable water, wastewater collection, and treatment systems	- Adjust operations staffing, provide additional training, and improve water/wastewater infrastructure - Review land-use policies to avoid building in high-risk areas - Update emergency plans	Akwesasne, ON
More severe flooding impacts buildings and infrastructure, causing evacuation and repairs	Develop flood mitigation strategies to reduce flood risk and impacts to people and property	High River, AB
Poor communication among regional communities impairs effective regional adaptation efforts	Foster collaboration among municipalities to effectively identify regional vulnerabilities	Saint John River Valley, Charlotte County and Tantramar/Chignecto region, NB
Regional agricultural production predicted to decline	- Adapt farming practices to reduce heat impacts on livestock and crop health - Modify crops that are planted in the region and the timing of operations - Explore irrigation options	Abitibi-Témiscamingue, QC

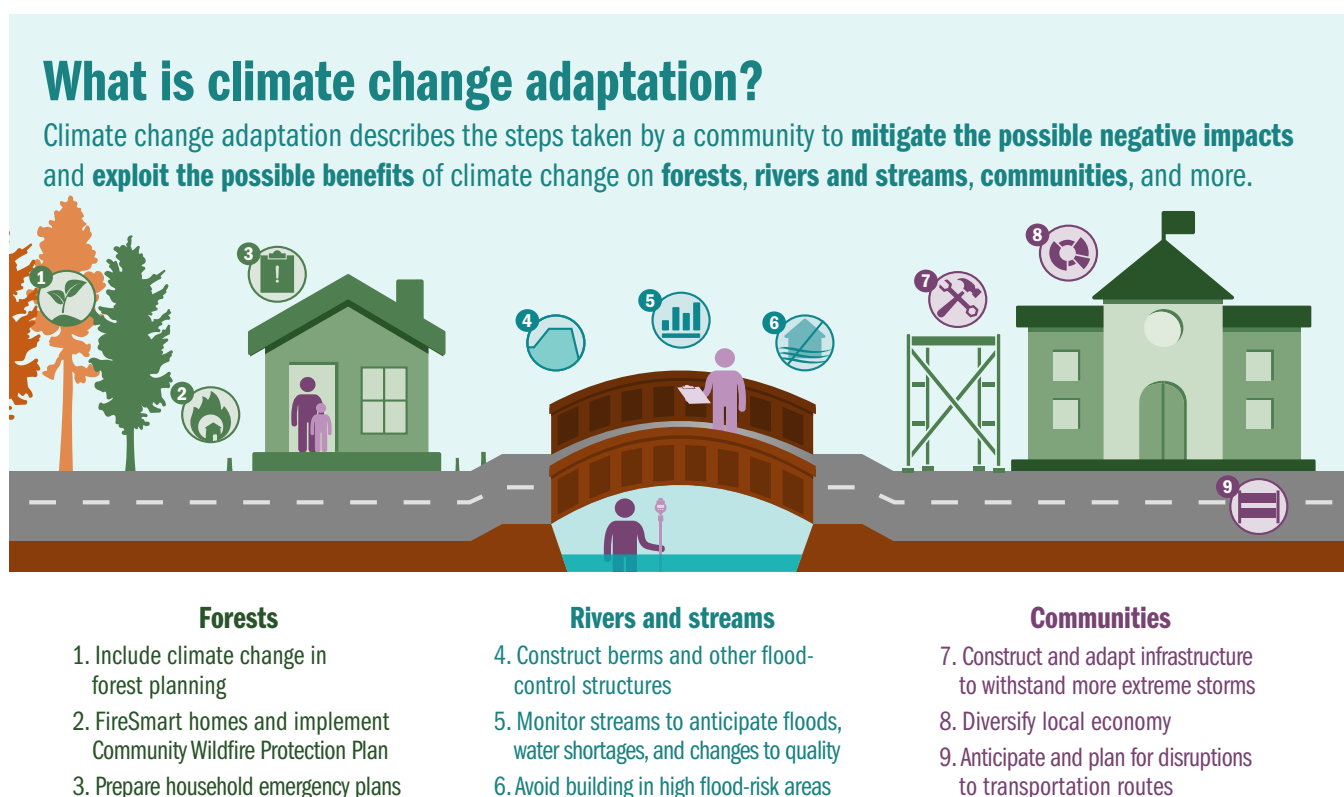


Figure 16: Examples of climate change adaptation actions that could be appropriate for forest-based communities

Selected **adaptation actions** proposed to **reduce the impact of flooding** on Dawson City:

Consequence	Priority	Lead Partner	Suggested Adaptations
Floods threaten Parks Canada heritage resources and other building stock	High	Government of Yukon, City of Dawson, Tr'ondëk Hwëch'in First Nation	Release information about possible flooding Investigate whether the level of the dyke should be raised Determine who is responsible for the work Update flood response plan Maintain active monitoring during spring break-up
Septic field breaches are more likely as water tables rise, which may lead to contaminated surface water and/or wells	Low	Government of Yukon	Implement a flood risk and climate change assessment Compile information from Yukon Energy and Yukon government that addresses shifts in stream flow and glacial melt
Increased surface run-off causes infrastructure problems as silt clogs drains	Low	City of Dawson	Identify the drains that are most vulnerable to siltation and prioritize maintenance and response during floods

Some adaptation actions can be undertaken by community residents in and around their homes and businesses. The Intact Centre on Climate Adaptation (an applied research centre at the University of Waterloo) has created several climate-ready infographics to help residents, communities, governments, and businesses identify and reduce their risks associated with climate change.

The infographics are available at <https://www.intactcentreclimateadaptation.ca/climate-ready-infographics/>.

Selected **adaptation actions** proposed to **take advantage of some opportunities** associated with **seasonal weather changes** in Dawson City:

Opportunity	Priority	Lead Partner	Suggested Adaptations
Mining season is extended because of a warming climate	Low	Government of Yukon	Monitor the effects of seasonal weather changes, as required
Decreased heating costs due to warmer shoulder seasons	Low	Tr'ondëk Hwëch'in First Nation, City of Dawson	Concentrate on local fuel sources Change lifestyles to further save on fuel costs
Warmer climate conditions yield longer growing seasons and an increase in agricultural productivity	Medium	Tr'ondëk Hwëch'in First Nation, City of Dawson	Support community garden initiatives Identify an existing community that is similar to Dawson City that will help to identify successful agricultural opportunities Develop skills to capitalize on opportunities related to seasonal weather changes
Warmer growing conditions lead to a greater variety of crops that can be reliably grown	Medium/ High	Tr'ondëk Hwëch'in First Nation, Government of Yukon	Re-establish experimental farms
Increased yields from local harvests because of increased productivity regionally	Medium/ High	Tr'ondëk Hwëch'in First Nation, City of Dawson	Explore vegetable storage options Investigate possible markets for agricultural surplus Advertise local produce

Identify barriers to adaptation actions

It's inevitable that barriers to adaptation will be identified while the Community Champion and plan development team are brainstorming potential adaptation actions.

Barriers could include

- homeowners being reluctant to remove flammable material and trees from their property,
- homes, businesses, and farms being currently located in flood-prone areas,
- the high short-term cost of building and infrastructure upgrades and retrofits,
- limited community water storage capacity,
- forest management activities being approved by the provincial/territorial government (community has little control over decisions),
- provincial/territorial governments being reluctant to approve cultural burning or other Indigenous traditional land management practices, and
- no local monitoring data existing on a metric of interest to local residents.

When barriers to adaptation are encountered, make a note of them. Many items that currently seem like barriers might be solved over the longer-term with extra funding, advances in technology, or through collaboration with industry or government partners. Add any barriers identified by the plan development team to the community input tracking table. This information will be informative and important when the community starts on an updated CCCA Plan in the future.

Engage with the community on adaptation actions

Once some draft adaptation actions have been developed for each of the community's identified priority impacts, community residents and stakeholders should be given an opportunity to review the suggested actions and provide their comments and other feedback.

The Community Champion and plan development team should again use the methods that have worked well earlier in the CCCA Plan development process to connect with people and gather input from diverse groups. Be prepared to explain how the list of potential adaptation actions was developed, and **make sure to highlight the linkages among climate changes, ecosystem responses, community impacts, and the suggested adaptation action(s).**

Add any feedback to the community input tracking table, and document how/whether the feedback will be incorporated into the CCCA Plan, as was done at earlier stages.

It might be worthwhile to schedule a meeting specifically with municipal, county, regional, and/or provincial/territorial representatives to discuss the specific priority areas, especially if external funding or other support will be needed for implementation. An external expert could review the list of priority adaptation actions that have been developed so far to ensure nothing important was missed, if desired.

Create a priority list of adaptation actions and assign responsibility for implementation

Using the final list of adaptation actions, identify the top priority items for implementation. Make sure to include a few "easy wins" on the list, especially if this is the first CCCA Plan for the community.

Try to align the priority actions with other community goals and priorities, to the extent possible.



A few ideas for **easy wins**:

- Apply for government grant funding to support energy efficiency upgrades
- Prepare or update the community's emergency response plan
- Develop or revise community or regional plans collaboratively with nearby communities
- Develop and implement a water restriction system during the dry season
- Plant some locally sourced trees or other plants in an ecologically degraded area within the community

Some of the **proposed adaptation actions** identified in the Dawson City Adaptation Plan were recommended for **immediate implementation**. These included

- maintaining or developing research and monitoring to observe changes and evaluate possible climate change impacts and responses,
- integrating climate change assessments into rural planning processes,
- updating Yukon's Emergency Measures Ordinance to reflect possible climate change vulnerabilities,
- continuing weed-pull programs,
- diversifying the economy by supporting emerging markets,
- advertising local produce, and
- communicating the need to respect fish and wildlife to present and future generations.

Other **adaptation actions** were recommended for **implementation within 10 years**. These included

- implementing preparedness education to respond to potential climate change-related emergencies,
- developing education programs to assist residents in making sound decisions when coping with, or preparing for, climate induced changes in the community,
- constructing a helicopter pad for emergencies,
- incorporating flexible regulations and policies into rural land-use planning,
- expanding existing trail networks, and
- emphasizing grassroots culture and unique community events (e.g., music festival).

For each priority action, the Community Champion and plan development team should identify a lead person or organization to demonstrate ownership and encourage progress on implementation. Depending on the action, reach out to your contacts with the municipality, county, provincial/territorial or federal governments, not-for-profit organizations, private industry, and/or local groups to secure buy-in and support for the implementation of adaptation actions.

In addition to a lead person or organization, it's recommended that the following items also be considered/ specified for each priority adaptation action:

- Timelines for implementation, including any key milestones
- Individuals or organizations that will support the lead person/organization
- Existing information, knowledge, capacity, or technology gaps and how they will be addressed
- Any assumptions the team is making that are relevant to the particular action
- Time and financial resources needed for implementation, if known
- Barriers to implementation

Step 7 check-in:

- ☐ Have adaptation actions been developed for each of the community's priority risks and opportunities?
- ☐ Have the barriers to adaptation been discussed and recorded?
- ☐ Have community residents and stakeholders been given an opportunity to review and offer feedback on the potential adaptation actions?
- ☐ Did you add any new feedback to the community input tracking table?
- ☐ Has a list of top priority adaptation actions been developed?
- ☐ Are the top priority adaptation actions feasible to implement?
- ☐ Do all top priority adaptation actions have an implementation lead identified?
- ☐ Has the community's adaptive capacity changed?

Step 8

Compile the CCCA Plan

Objectives

- **Develop a monitoring plan**
- **Compile the CCCA Plan**

Develop a monitoring plan

The best way for community residents and stakeholders to know whether the CCCA Plan has been effective is through monitoring. Anecdotes and personal observations can be interesting and informative, but unbiased data collected through a targeted monitoring program will provide the best insights. The monitoring plan can include collecting data or information that currently doesn't exist in the community and/or information meant to inform future decisions. This could include monitoring local weather or longer-term climate variables, changes occurring in the community or in nearby forests, or the impacts of these changes on the community.



Only collect data and other information if there is a clear use for it. Do not collect extra data or information “just in case” it might be useful in the future.

Collecting information and assessing trends will help community residents and stakeholders determine if CCCA Plan actions are on track, whether costs are within expected limits, and will help to identify new or existing problems that need to be addressed.

To start developing a monitoring plan, the Community Champion and plan development team should identify some measurable indicators, or metrics, associated with each priority adaptation action that can be tracked over time. For each indicator, note what will be measured, how it will be measured, who will measure it, and what will be done with the information. Try to keep the indicators simple and choose the minimum number of indicators needed to investigate key questions.

When developing indicators, think “**S.M.A.R.T.**”:

- **Specific:** widely understood, the indicator has one meaning for everyone
- **Measurable:** indicator can be measured using clear, unbiased methods; it isn't based on opinions or feelings
- **Achievable:** affordable and realistic to measure with the currently available technology, skills, and funding levels
- **Relevant:** indicator is highly related to the question being asked
- **Time-bound:** indicator is measured/associated with a specific period

As an example, let's say that a hypothetical forest-based community is interested in knowing whether the number of summer heat waves is increasing in their region because they are considering whether air conditioning capacity should be upgraded in their municipal buildings. The plan development team suggests monitoring the number of hot summer days for a few years to get a better understanding of the frequency of heat waves.

As it's currently described, this indicator is **not** S.M.A.R.T. for the following reasons:

- The temperature that is considered “hot” would be different for different people. A specific temperature for “hot” days should be listed.
- The duration of the monitoring program is vague—it's currently described as lasting “for a few years.” Vague statements like this are difficult for funders and decision-makers to plan for or allocate resources toward. The duration of a monitoring program should be based on the metric being evaluated and how many years of data would be required before trends might become evident.
- The source and timing of the temperature data collection isn't specified. Environment and Climate Change Canada weather stations, airport weather stations, and backyard thermometers will all record slightly different temperatures on a given day, so it's important to specify the source of the data. Temperature also fluctuates during the day, so this indicator should also specify the timing of the temperature data collection or make it clear that the daily maximum temperature will be recorded.
- The start and end of “summer” can also be different under different definitions. For instance, astrological summer is the period between the summer solstice (approx. June 21) and the fall equinox (approx. September 21), whereas meteorological summer is the period between June 1 and September 1. Regardless of the approach used, it's recommended that the indicator be clear around the period when temperature will be measured.

Using the above information, a S.M.A.R.T. indicator for the hypothetical forest-based community to understand the frequency of summer heat waves could be “[Community organization X] will establish an ongoing temperature monitoring program that will record the number of days per year with maximum temperatures equal to or above 30 °C as recorded at the [XYZ] Environment and Climate Change Canada weather station.”

Creating a S.M.A.R.T. indicator such as this will ensure that no matter who establishes the program or records the information, the data will be comparable year-over-year and will be able to show trends. This example S.M.A.R.T. indicator would also have the benefit of using an existing dataset that is available to the community at no cost.

When developing indicators, keep in mind that the **monitoring plan should also track the implementation status of the priority adaptation actions**. Periodically reporting on implementation status will help demonstrate progress and will show community residents and stakeholders that the CCCA Plan is working to increase community resilience. It will also confirm that commitments made during the CCCA Plan development process are being delivered.

A few more examples of S.M.A.R.T. monitoring indicators are

- number of wildfires that occur within 50 km of community each year,
- area (hectares) of forest burned by wildfires within 100 km of community each year,
- annual number of frost-free days as reported by [Climatedata.ca](https://climatedata.ca/),
- annual snowfall (cm) measured at [ABC] High School,
- number of hours community residents are without electricity (due to power outages) each year,
- peak spring stream flow in [XYZ] River (m³/s) between March 1 and May 1 annually at [X] stream gauge station.

Establishing a monitoring program for the first time can be tricky and expensive. An external expert could review the monitoring plan and provide some suggestions for improvements or efficiencies, if desired.

Keep in mind that there may be existing local groups that could take on all or a portion of the monitoring responsibilities. Review the clubs, groups, and organizations that were identified as potential stakeholder groups earlier in the process, particularly environmental, nature or outdoor recreation clubs, youth or student groups, and Indigenous-led organizations like the **Indigenous Guardians** (see information box on page 14). If the plan development team intends to have these groups play a role in monitoring, it's highly recommended that the monitoring group co-develop the monitoring program with the Community Champion or another member of the plan development team.



Citizen science refers to members of the public being involved in monitoring and scientific research. Depending on what is being monitored, the people in the community might be best positioned and qualified for this work. **Appendix H** contains information on a selection of citizen science organizations and tools.

An example partial monitoring plan is shown in **Table 4**.

Because not everyone who participated in the CCCA Plan development process will be involved in carrying out the monitoring plan, it's important to regularly post or report on monitoring results for transparency and to demonstrate progress. It's recommended that monitoring reports be made available to residents and stakeholders and that the reports contain both the data that was collected and a visual summary of the data (e.g., graph or series of photos) so that a range of people can easily understand the results.

It isn't necessary to produce a physical report of monitoring results; results could be reported to a webpage or social media account that is updated as new results are available, or periodic meetings or online webinars could be organized to disseminate the information. As with most parts of the CCCA Plan, do what fits your community best.

Compile the CCCA Plan

Congratulations, you have made it to the end of the CCCA Plan development process!

It's now time to compile all the information that has been discussed with community residents and stakeholders into the CCCA Plan. The CCCA Plan should include final versions of the

- CCCA Plan rationale, vision, and objectives,
- Community Climate Change Profile,
- summary of forest ecosystem responses to key climate changes,
- Community Climate Change Inventory,
- vulnerability or risk assessment,

- list of priority adaptation actions for the high priority vulnerabilities and opportunities,
- implementation lead person or organization for each priority adaptation action, and
- monitoring plan.

It's recommended that the decision-making considerations and processes used throughout the CCCA Plan development process be included as an appendix in the document, as well as the community input tracking table. This information will be incredibly helpful for the people who update the CCCA Plan in the future.

Finally, present a copy the CCCA Plan to the local/municipal government who will be responsible for implementing the recommendations in the community.

Congratulations on completing your CCCA Plan!

Step 8 check-in:

- ☐ Has a monitoring plan been developed?
- ☐ Does the monitoring plan also track the implementation status of priority adaptation actions?
- ☐ Has the CCCA Plan been compiled using the information that has been gathered throughout this process?
- ☐ Have final copies of the CCCA Plan been posted or distributed for community members and stakeholders?
- ☐ Has a copy of the CCCA Plan been provided to the local government(s) who will be responsible for implementing the recommendations?

Table 4: Example partial monitoring plan for a hypothetical forest-based community

Objective	Adaptation Action	Measurement Target	Method	Data Collector	Information Use
Reduce risk of wildfire damage to community	Complete a community FireSmart plan by [date]	• Completion of FireSmart plan (Y/N) • % of plan recommendations • started • in progress • complete	• Hire FireSmart experts or collaborate with local government staff to develop plan	• Local government staff • Community members	• Local government planning and tracking of wildfire risk
Reduce risk of flooding to infrastructure	Upgrade storm sewer system to accommodate higher peak flows by [date]	• % of required upgrading complete	• Contractors or municipal/regional crews upgrade drainage	• Local government engineering department	• Local government infrastructure inventory
Evaluate whether new crops can be grown in the region	Collect [ABC] weather data for [number] years using [XYZ] protocols	• Monitoring system has been established with clear measurement protocols (Y/N)	• Initiate a local citizen science initiative to collect weather data	• Community members	• Inform local decisions on potentially desirable new crop species

Step 9

Implementation and monitoring

Objectives

- **Implement, monitor, evaluate, and refine**

Implement, monitor, evaluate, and refine

Once your CCCA Plan has been compiled, the work carries on through implementation and monitoring. Try to ensure that the monitoring plan developed as part of step 8 is implemented, and that the priority adaptation actions identified in the CCCA Plan move toward implementation. Share as much information as possible with community residents and stakeholders and keep working to encourage people and industries to consider and incorporate climate change adaptation into daily decisions and longer-term planning, which is often called “mainstreaming.”



Climate change adaptation is not a one-time event. Successfully adapting to climate change involves a series of decisions and actions over time by individuals, households, organizations, and governments. Try to normalize this information and mindset so that residents and stakeholders can better understand their climate risks and take targeted actions to increase their resilience.

Keep in mind that CCCA Plans should be viewed as “living documents” that will need periodic updating to remain relevant. The community should commit to reviewing and updating the CCCA Plan every few years, especially if the community is being noticeably impacted by climate change or other factors. Changes that could signal it's time to update the CCCA Plan include the generation of significant new data or information, a change in the community's priorities, new funding opportunities, or a change in the identified vulnerabilities or opportunities.

Updates can be minor tweaks, or a complete redo of the CCCA Plan, depending on the needs of the community. For example, if new climate or extreme weather data or information becomes available, the community may want to return to step 4 (understand and explain why) in this guidebook to understand and consider the new information. If, on the other hand, the community learns that the priority adaptation actions recommended for immediate implementation aren't feasible, it may only be necessary to return to step 7 (develop adaptation actions and assign responsibility for implementation) to revisit the top priority recommendations. In this second example, there would be no need to start the process over as most information would still be valid. Use your judgement about what would best suit and benefit your community.

Consider developing a **plan to maintain the stakeholder relationships** that you have built through the CCCA Plan process. This does not need to be a lot of work or take up a bunch of time, but since you spent significant time and effort establishing these relationships, it makes sense to keep them going. These relationships could help the community in numerous ways in the future, including in areas that may not be directly related to climate change adaptation. Maintaining relationships is particularly important if new bridges were built with nearby Indigenous communities, where relationships and trust are especially important.

Consider inviting key stakeholders to community events, sending them copies of CCCA Plan monitoring results, or even just sending them a holiday card each year.

The Dawson City adaptation plan was originally published in 2011. In 2018, a community adaptation workshop was held to gauge whether residents and stakeholders were interested in updating the 2011 plan. At that time, community members were not interested in updating the plan, but were interested in staying connected, sharing information, and developing new adaptation projects.

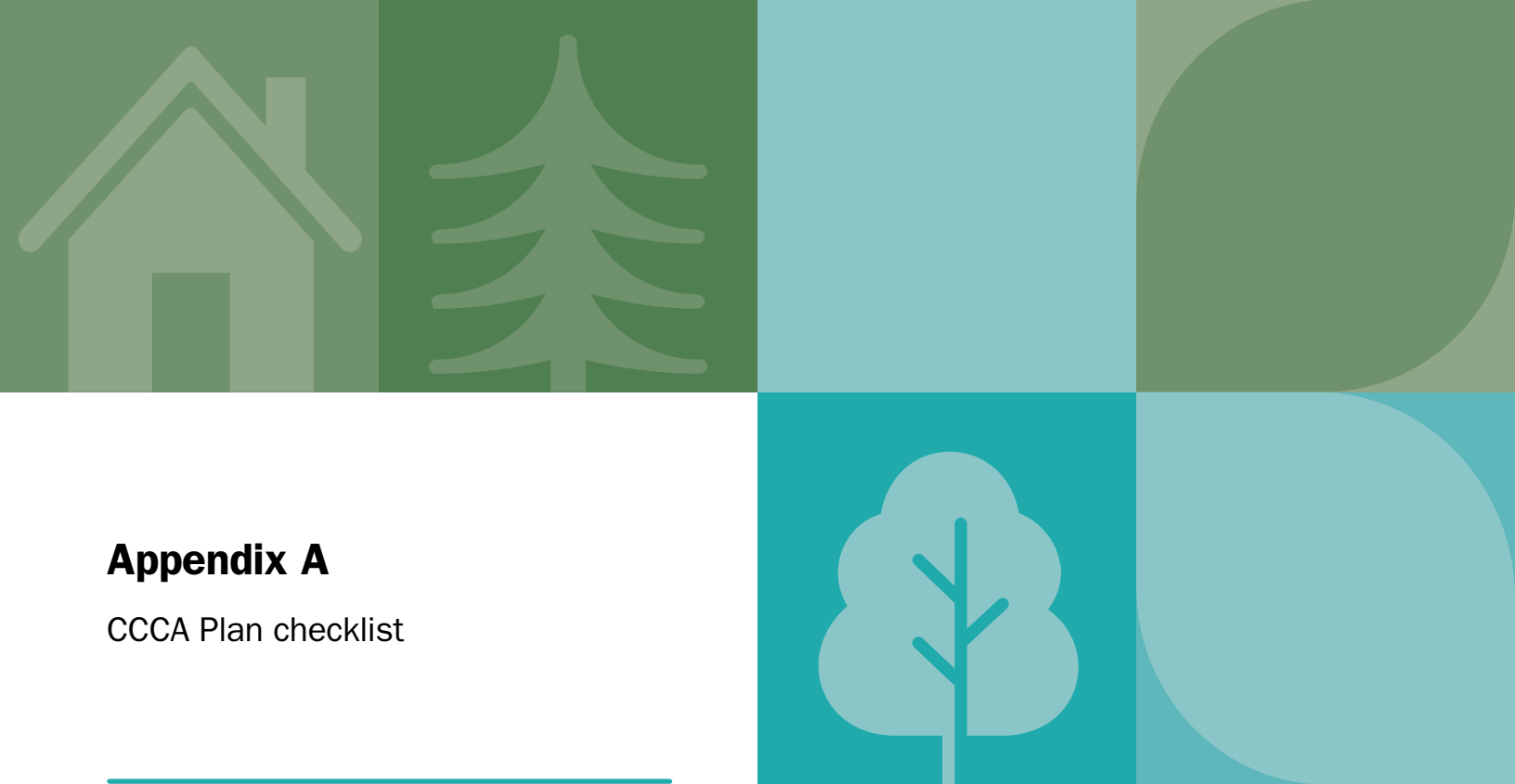
Since that community meeting, Yukon has completed a major land-use planning initiative, which included climate change as a major consideration. This work went well beyond the scope of a CCCA Plan, but still incorporated many of the principles of the CCCA Plan development process, including basing the initiative's recommendations on input received from the general public, community members, and stakeholders.

More information on the Dawson Region Land-Use Plan is available at <https://dawson.planyukon.ca/>.

By watching and learning more about climate change and refining plans and actions as needed, your community can continue to build its capacity and become more resilient to climate change.

Step 9 check-in:

- ☐ **Are the adaptation actions being implemented as planned?**
- ☐ **Has the monitoring plan been implemented?**
- ☐ **Have you developed and implemented a plan to maintain relationships with stakeholders?**
- ☐ **Are the adaptation actions achieving their goals?**
- ☐ **Are the monitoring results being shared with community residents and stakeholders?**
- ☐ **Is it time to update the community's CCCA Plan?**



Appendix A

CCCA Plan checklist

Community Climate Change Adaptation (CCCA) Plan checklist

Step 1: Identify a Community Champion or Advisory Committee to lead the CCCA Plan process

- ☐ Has a Community Champion or Advisory Committee been selected?
- ☐ Are you excited to begin?

Step 2: Generate community interest in a CCCA Plan

- ☐ Have you learned about the climate changes predicted for your region?
- ☐ Have you developed a rationale to support developing a CCCA Plan for your community?
- ☐ Have you drafted a general work plan?
- ☐ Have key stakeholders been identified?
- ☐ Have initial engagement sessions been held?
- ☐ Is the community engaged and excited to begin?

Step 3: Begin the process

- ☐ Has the plan development team membership been finalized?
- ☐ Has a communications and outreach plan been created?
- ☐ Have you started to identify the existing plans and processes that might be able to incorporate climate resilience considerations?
- ☐ Has the CCCA Plan scope been finalized?
- ☐ Is the Plan scope consistent with the community's adaptive capacity?
- ☐ Has the work plan been updated to reflect recent discussions and input?
- ☐ Are the work plan and CCCA Plan objectives consistent with the community's vision, priorities, and objectives?

Community Climate Change Adaptation (CCCA) Plan checklist

Step 4: Understand and explain why

- ☐ Have you gathered information from residents and stakeholders about the climate changes that people have noticed in the community and local forests?
- ☐ Has a Community Climate Change Profile been created that identifies the highest priority climate changes for the community?
- ☐ Did you start a community input tracking table?
- ☐ Have all community members and stakeholders had an opportunity to contribute to the process so far?

Step 5: Identify and assess impacts to ecosystems and the community

- ☐ Have you gathered information about how climate changes could affect local forests?
- ☐ Has a Community Climate Change Impact Inventory been created that identifies how the community and its residents and stakeholders could be affected by climate change?
- ☐ Have residents and stakeholders been given an opportunity to review and offer feedback on the Community Climate Change Impact Inventory?
- ☐ Did you add any new feedback received to the community input tracking table?
- ☐ Are the impacts different from what was expected?

Step 6: Identify the highest community priorities

- ☐ Was a climate change vulnerability or risk assessment completed for the community?
- ☐ Have community residents and stakeholders been given an opportunity to review and offer feedback on the vulnerability or risk assessment?
- ☐ Did you add any new feedback to the community input tracking table?
- ☐ Have priority impacts (including risks and opportunities) been identified for the community?
- ☐ Has any new information come to light that changes the priority items or their level of priority?

Step 7: Identify adaptation actions and assign responsibility for implementation

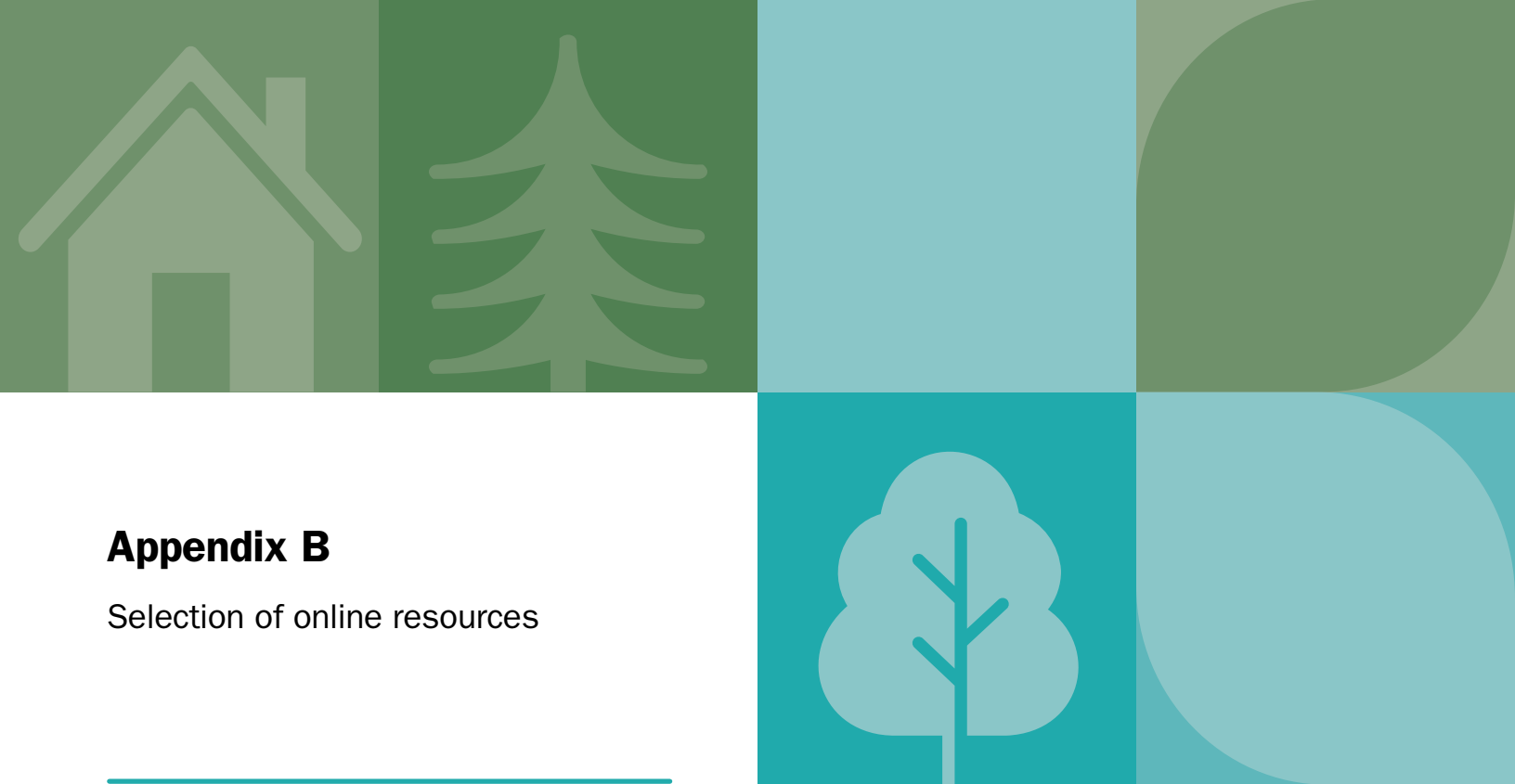
- ☐ Have adaptation actions been developed for each of the community's priority risks and opportunities?
- ☐ Have the barriers to adaptation been discussed and recorded?
- ☐ Have community residents and stakeholders been given an opportunity to review and offer feedback on the potential adaptation actions?
- ☐ Did you add any new feedback to the community input tracking table?
- ☐ Has a list of top priority adaptation actions been developed?
- ☐ Are the top priority adaptation actions feasible to implement?
- ☐ Do all top priority adaptation actions have an implementation lead identified?
- ☐ Has the community's adaptive capacity changed?

Step 8: Compile the CCCA Plan

- ☐ Has a monitoring plan been developed?
- ☐ Does the monitoring plan also track the implementation status of priority adaptation actions?
- ☐ Has the CCCA Plan been compiled using the information that has been gathered throughout this process?
- ☐ Have final copies of the CCCA Plan been posted or distributed for community members and stakeholders?
- ☐ Has a copy of the CCCA Plan been provided to the local government(s) who will be responsible for implementing the recommendations?

Step 9: Implementation and monitoring

- ☐ Are the adaptation actions being implemented as planned?
- ☐ Has the monitoring plan been implemented?
- ☐ Have you developed and implemented a plan to maintain relationships with stakeholders?
- ☐ Are the adaptation actions achieving their goals?
- ☐ Are the monitoring results being shared with community residents and stakeholders?
- ☐ Is it time to update the community's CCCA Plan?



Appendix B

Selection of online resources

The list below contains just a small sample of the online resources available to help forest-based communities prepare a CCCA Plan. New resources are constantly being developed, so this list is far from exhaustive. The Community Champion is encouraged to investigate whether additional materials and resources are available that could help their community in their climate change adaptation journey.

Canada-wide climate and climate change resources and information

Climate Data Canada:

<https://climatedata.ca/>

Website offering a wide range of climate resources, including historical data, projections, and analysis tools. Also includes datasets, maps, and graphs of temperature, precipitation, and more.

Climate Atlas of Canada:

<https://climateatlas.ca/>

Interactive tool that combines climate science and mapping with community-based research and Indigenous Knowledge to help Canadians learn about climate change.

Canada in a Changing Climate:

<https://changingclimate.ca/>

The source of the Canada's Changing Climate reports. These reports provide national and regional perspectives on how climate change is impacting Canada's communities,

environment, and economy, and how we are adapting to these changes. Regional reports are available for the Atlantic provinces, Quebec, Ontario, Prairie provinces, British Columbia, and Northern Canada.

Canada in a Changing Climate – National issues report, Chapter 3: Rural and remote communities:

<https://changingclimate.ca/national-issues/chapter/3-0/>

Climate and climate change information specifically relevant to rural and remote communities, and the challenges small communities can face.

Canadian Centre for Climate Services (CCCS):

<https://www.canada.ca/en/environment-climate-change/services/climate-change/canadian-centre-climate-services.html>

A dedicated multi-disciplinary team with expertise across a broad range of climate-related disciplines. This site contains links to a library of climate resources, climate information, climate data, and a climate services support desk where people can get help from the CCCS' experts.

Environment and Climate Change Canada historical weather data:

https://climate.weather.gc.ca/historical_data/search_historic_data_e.html

Searchable database containing Canadian weather records back to 1840.

CBC News climate dashboard:

<https://newsinteractives.cbc.ca/features/2023/climate-dashboard/>

An online tool that tracks current weather conditions and extreme events across Canada in real time and compares these observations with historical trends. The tool is searchable by community and contains weather information for 486 locations in real time.

Counting the costs of climate change:

<https://climateinstitute.ca/map-climate-costs-tracker/>

Information, maps, and fact sheets related to the financial costs of climate change, and the benefits of implementing adaptation actions from the Canadian Climate Institute.

ClimateWest's guide to finding climate information and data:

https://climatewest.ca/wp-content/uploads/2022/01/A-guide-to-finding-Climate-Information-Data_2022.pdf

Document containing an overview of several key climate service organizations and climate data portals in Canada that can serve as credible sources of climate information and data. Focused on the Prairie provinces, but the guidance is applicable to any Canadian region.

CLIMAtlantic's guide to finding climate information and data for Atlantic Canada:

<https://climatatlantic.ca/data/climate-information-data-guide/>

Guidebook that helps users understand the available climate datasets, how climate projections are developed, and the key considerations to keep in mind when choosing and applying climate datasets. Focused on the Atlantic provinces, but the general guidance is applicable to any Canadian region.

Regional climate and climate change resources and information

Pacific Climate Impacts Consortium (PCIC):

<https://pacificclimate.org/>

Regional climate service centre that provides practical information on the physical impacts of climate variability and change in the Pacific (British Columbia) and Yukon region of Canada. Hosted at the University of Victoria.

ClimateWest:

<https://climatewest.ca/>

The regional hub for climate services in Alberta, Saskatchewan, and Manitoba. This site provides access to regionally relevant climate information and provides support to use it effectively in planning and decision making.

Alberta Climate Information Service (ACIS):

<http://agriculture.alberta.ca/acis/about.jsp>

An agriculture-focused interactive tool that helps users see Alberta weather forecasts, and over 10,000 maps of Alberta weather and climate-related information. The site also provides access to near-real time weather station data from more than 350 meteorological stations operating in Alberta.

Alberta's Climate Future:

<https://open.alberta.ca/dataset/89a69583-a11b-4e31-a857-b311ab6563cc/resource/17ce2d24-ba7b-466c-acd9-33a2cf6beb69/download/aep-alberta-climate-report-arc.pdf>

Document published in 2019 describing the climate changes that have already occurred in Alberta, the projections for future climate changes, and some potential implications of these changes.

SaskAdapt – Saskatchewan's Climate Future:

<https://www.parc.ca/saskadapt/sk-climate/sk-climate-future.html>

Website with current, past, and future climate change scenarios for Saskatchewan. Created by the Prairie Adaptation Research Collaborative (PARC).

Climate Change in Manitoba:

<https://www.gov.mb.ca/climateandgreenplan/climatechange.html#:~:text=Manitoba%20is%20Canada's%20sixth%2Dhighest,sectors%2C%20two%20important%20economic%20contributors.>

A summary of information about climate change in Manitoba. Includes some basic information about climate change and describes how these changes could affect Manitoba.

Ontario Resource Centre for Climate Adaptation (ORCCA):

<https://orcca-craco.ca/>

Organization dedicated to helping Great Lakes communities and other Ontario users adapt to climate change and build local resilience. The website also contains a resource library and provides support desk services.

Ouranos:

<https://www.ouranos.ca/en>

Innovation hub focused on climate change in Quebec. Contains general climate and climate change information, the specific changes occurring in Quebec, and access to climate datasets and modeling platforms.

Understanding climate change in Quebec:

<https://www.quebec.ca/en/government/policies-orientations/plan-green-economy/initiatives-fight-climate-change/understand-climate-change>

Website with links to Quebec-focused climate change resources.

CLIMAtlantic:

<https://climatatlantic.ca/>

Website that provides information on risks, impacts, and adaptation specific to Atlantic Canada. Data, tools, an adaptation library and help desk services are among the available resources.

Climate Change Nova Scotia:

<https://climatechange.novascotia.ca/node/326>

Information and data on Nova Scotia's past and future climate, including temperature, precipitation, growing season length, and sea level rise. Data is broken up into 13 provincial regions.

Climate Change in New Brunswick:

<https://www2.gnb.ca/content/gnb/en/corporate/promo/climate-change/climate-change-in-nb.html>

Website with information about climate change and the changes projected for New Brunswick's climate.

Newfoundland and Labrador climate data:

<https://www.gov.nl.ca/ecc/occ/climate-data/>

Website with a climate data portal, links to Road Weather Information System data, and projections of extreme precipitation events for selected Newfoundland and Labrador communities.

Our changing climate (Prince Edward Island):

<https://www.princeedwardisland.ca/en/information/environment-energy-and-climate-action/our-changing-climate>

Website with links to information about climate change, and its potential effects on Prince Edward Island.

Compendium of Yukon Climate Change Knowledge:

<https://www.yukonu.ca/sites/default/files/inline-files/2020%20Compendium.pdf>

Summary document containing an overview of recent climate change work in, and relevant to, Yukon. Intended to be a reference document for use by the general public, governments, organizations, students, researchers, the scientific community, and others.

Ecology North – Climate solutions:

<https://ecologynorth.ca/our-work/climate-solutions/>

Website with many resources related to tackling climate change in Northwest Territories, including descriptions of past and current projects, and measures residents can take to reduce their carbon footprints.

Northwest Territories climate trends and projections:

<https://www.gov.nt.ca/ecc/en/services/climate-change/climate-trends-and-projections>

Website with many links to information about climate and climate change in Northwest Territories, including climate trends and projections, the impacts of those changes on the territory, potential adaptation actions, and other resources.

Adaptation information and examples

Natural Resources Canada – Forest climate change adaptation tools:

<https://natural-resources.canada.ca/climate-change/climate-change-impacts-forests/forest-change-adaptation-tools/17770>

Forest-focused adaptation tools and resources including maps, databases, web applications, and synthesis reports.

Natural Resources Canada – Database of adaptation options:

<https://cfs.nrcan.gc.ca/adaptation-options>

A searchable database of climate change adaptations that have been proposed in scientific literature. Each potential adaptation action is connected to a specific vulnerability that the action is intended to address.

Canada in a Changing Climate – Map of adaptation actions:

<https://changingclimate.ca/map#z=4&lat=58.42862399306741&lng=-97.68022174999959>

In addition to the reports identified earlier, the Canada in a Changing Climate website also houses a “map of adaptation actions,” which shows some adaptation actions that have been implemented across Canada. The database that accompanies the map is searchable by keyword, location, sector, type of adaptation action, and more.

Plant hardiness of Canada:

<http://www.planthardiness.gc.ca/>

Website that explores the relationship between plants and climate across Canada. This site contains plant hardiness zone maps, which have traditionally been used by gardeners to help identify the plants that are expected to grow and survive in their area. This site also contains range maps and summary information for individual species of trees, shrubs, and perennial herbs across Canada.

Mini forests:

<https://www.cbc.ca/news/climate/tiny-forests-japan-canada-1.7114111>

An article that provides an overview of the emerging mini forest movement in Canada. Mini forests are groupings of densely planted native trees and shrubs established within communities and have been suggested as a way to restore degraded land, support climate resilience, and enhance biodiversity within communities.

FireSmart Canada:

<https://firesmartcanada.ca/>

A national program designed to help Canadians increase their neighbourhood's resilience to wildfire and minimize its negative effects. This website contains many resources for homeowners, residents, businesses, governments, and Indigenous communities.

Intact Centre on Climate Adaptation – Reports and Resources:

<https://www.intactcentreclimateadaptation.ca/recent-reports/>

The Intact Centre on Climate Adaptation is an applied research centre located within the Faculty of Environment at the University of Waterloo. This group works with residents, communities, governments, and businesses to reduce the risks associated with climate change, including those from flooding, wildfire, and extreme heat. The centre has also produced a series of climate-ready infographics that are available at <https://www.intactcentreclimateadaptation.ca/climate-ready-infographics/>.

Natural Resources Canada – Adapting to our changing climate in Canada informational poster:

https://natural-resources.canada.ca/sites/nrcan/files/environment/pdf/adaptation_poster_e-access.pdf

Informational poster intended to help people understand Canada's changing climate, the impacts these changes are having, and how Canadians are adapting. The poster can be downloaded and printed from the website.

Adaptation Library – Resources for climate adaptation:

<https://www.adaptationlibrary.ca/#/options/>

A publicly accessible and searchable collection of community, forestry, and energy-related adaptation information. The library is searchable by region: British Columbia, Prairies, Ontario, Quebec, Atlantic, and North.

Local Adaptation in Canada, survey report:

<https://ok-ccar.sites.olt.ubc.ca/files/2019/06/Local-Adaptation-in-Canada-Full-web.-1.pdf>

This document reports on the results of a 2018 survey of Canadian local governments. It summarizes what was heard from communities regarding the climate changes and associated impacts that have already been observed in communities, the adaptation actions that have been planned or implemented, barriers to adaptation, and future priorities.

Canada's top climate change risks:

<https://cca-reports.ca/reports/prioritizing-climate-change-risks/>

Report created by an expert panel that identifies 12 major areas of climate change risk facing Canada from a national perspective.

iCoolkit — Citizen's "Coolkit" on climate change and urban forestry:

<https://citizens-coolkit.herokuapp.com/>

This toolkit is described as a structured, visual, and fun approach to help people engage with their neighbours on issues related to climate change and urban forestry. Content is intended for urban areas, but the approaches and visuals could also be appropriate for smaller communities.

Fraser Basin Council – CoNext Climate Preparedness Hub:

<https://www.fraserbasin.bc.ca/bc-wide-work/climate-change/climate-resilience/>

A new climate preparedness training program designed to empower community leaders and staff in small, rural and remote communities in British Columbia to adapt to climate change and build community resilience. This free, 5-month program will provide learners with the skills, tools, and support needed develop and implement adaptation strategies.

Retooling for Climate Change:

<https://retooling.ca/>

Resource created by the Fraser Basin Council that provides numerous tools and resources for Indigenous organizations, local governments, and the public. Focused on British Columbia, but many resources are widely applicable.

BC Adapts Video Series:

<https://www2.gov.bc.ca/gov/content/environment/climate-change/adaptation/resources/bc-adapts>

A video series illustrating actions that British Columbia communities are taking to adapt to the impacts of climate change.

Climate Change Adaptation Program in British Columbia:

<https://www.bcclimatechangeadaptation.ca/>

Partnership between British Columbia's Ministry of Agriculture and Food and agriculture industry representatives. The website contains information and resources focused on adaptation in agriculture.

Prairie Climate Centre:

<https://prairieclimatecentre.ca/>

Evidence-based perspectives on communicating the science, impacts, and risks of climate change through maps, documentary videos, research reports, and plain-language training, writing, and outreach. Hosted at the University of Winnipeg, this site also has a series of Building a Climate-Resilient City reports available for download at <https://prairieclimatecentre.ca/reports-publications/>.

SaskAdapt - Theme Assessments:

<https://www.parc.ca/saskadapt/adaptation-options/theme-assessments.html>

Website that provides key background information, data, and adaptation options specific to Saskatchewan. Information is organized by theme, including "communities", "forest management", and more.

Agricultural adaptation to climate change (Manitoba):

<https://www.gov.mb.ca/agriculture/environment/climate-change/adaptation.html>

Information and links related to agriculture, changing growing conditions, and potential adaptations in Manitoba.

Planning for the future – Guidance and tools for enhancing the climate resilience of Manitoba's integrated watershed management plans:

<https://www.iisd.org/publications/guide/enhancing-manitoba-integrated-watershed-management-plans>

A guidebook to help teams who work on watershed planning or water-related issues in Manitoba.

Local Governments for Sustainability (ICLEI) adaptation and resilience projects:

<https://icleicanada.org/adaptation-and-resilience-planning/>

Website containing numerous links to adaptation resources for communities across Canada.

Climate action in Ontario's Northern Municipalities:

https://climateriskinstitute.ca/wp-content/uploads/2021/06/Report-on-Climate-Action-in-Northern-Ontario_Final-for-Publication.pdf

The results of a survey about municipal climate action taking place in several northern Ontario communities that was published in 2021.

Up North on Climate:

<https://www.upnorthonclimate.ca/>

Website focused on northern Ontario communities and working with Traditional Knowledge and Indigenous Elders and youth. Also contains a resource library, including a community adaptation report and videos.

Adapting to climate change (Quebec):

<https://www.quebec.ca/en/government/policies-orientations/plan-green-economy/initiatives-fight-climate-change/adapting-climate-change>

Website with Quebec-based information about climate change, local climate change initiatives, and examples of tangible climate-friendly actions that people can implement themselves.

CLIMAtlantic – Coastal Adaptation Toolkit:

<https://climatlantic.ca/coastal-adaptation/>

Toolkit intended to help Atlantic rural coastal communities and property owners plan for the effects of climate change.

New Brunswick Climate Change Adaptation Resources:

<https://nben.ca/en/resources-for-climate-adaptation/resources-new-brunswick.html>

Website with many links to climate change adaptation resources and examples from New Brunswick

Hazard mapping in Yukon communities:

<https://www.yukonu.ca/research/our-research/northern-climate-exchange/hazard-mapping-in-yukon-communities>

Results of a project that mapped climate change-related hazard risks for Yukon communities. Hazard maps serve as an adaptation planning tool that can support decision-making related to climate change impacts on communities.

Ecology North – Northern adaptation guides:

<https://ecologynorth.ca/portfolio/northern-adaptation/>

Adaptation guides for people and communities in the north. Topics include preventing permafrost degradation, planning fire resilient communities, managing changing snow loads, and treating wastewater in the north, among others. Resources are available in English, French, Inuktitut (South Baffin dialect), and Inuinnaqtun.

Climate Change and the NWT, 2018 Climate Change Forum:

<https://climatechange.toolkitnwtac.com/>

Compendium of northern climate change information, including presentations, case studies, threat assessments, community climate risk profiles, technical reports, and videos. Includes Community Climate Change Profiles for all 33 NWT communities.

Community/municipal-focused adaptation resources

Adapting to Climate Change – An introduction for Canadian municipalities:

https://natural-resources.canada.ca/sites/www.nrcan.gc.ca/files/earthsciences/pdf/mun/pdf/mun_e.pdf

Downloadable booklet produced by Natural Resources Canada intended to provide municipal decision makers and staff with information to help them understand the need for climate change adaptation and how to put adaptation measures in place. Includes several case study examples.

Local Governments for Sustainability (ICLEI) – Small and Rural Communities Climate Action Guidebook:

<https://icleicanada.org/project/small-and-rural-communities-climate-action-guidebook/>

Designed for municipal staff and decision makers in small and rural communities who are tasked with developing local climate initiatives or reducing greenhouse gas emissions. This guidebook can help municipalities develop realistic climate action policies, engage, and collaborate with the public, and more.

Local Governments for Sustainability (ICLEI) – Changing Climate, Changing Communities guidebook:

<https://icleicanada.org/project/changing-climate-changing-communities-guide-and-workbook-for-municipal-climate-adaptation/>

A guide and workbook to assist local governments in the creation of adaptation plans to address the relevant climate change impacts associated with their communities.

Federation of Canadian Municipalities – Climate and sustainability:

<https://fcm.ca/en/focus-areas/climate-and-sustainability>

Current news articles and other resources related to climate, sustainability, and municipalities.

HealthyPlan.City:

<https://healthyplan.city/en>

A free tool that maps “built environment” indicators, vulnerable populations, and environmental inequity within more than 125 Canadian communities.

Climate change impacts on health and wellbeing in rural and remote regions across Canada – A synthesis of literature:

<https://www.canada.ca/content/dam/phac-aspc/documents/services/reports-publications/health-promotion-chronic-disease-prevention-canada-research-policy-practice/vol-39-no-4-2019/2-glance-vol-39-no-4-2019-eng.pdf>

An article that highlights key health concerns associated with climate change in rural and remote regions, as well as potential future and existing adaptation strategies. Table 1 in this article presents examples of existing and potential adaptation strategies related to the health of rural Canadians.

Building climate-resilient rural communities:

<https://storymaps.arcgis.com/stories/89e97ce2e9f3485cbb325a8c760e5c05>

British Columbia-focused “story map” that describes some of the climate change vulnerabilities of rural, remote communities, with a focus on human health-related impacts. This story map also contains a map of the British Columbia communities that have prepared adaptation plans under the federal government’s First Nation Adapt Program.

Building Resilient Rural Communities:

<https://pressbooks.bccampus.ca/ccedarrproject/>

Free, downloadable book published by the Centre for Rural Health Research and Rural Health Services Research Network of BC.

Ecology North – Integrating climate change into municipal planning:

<https://ecologynorth.ca/portfolio/integrating-climate-change-measures/>

Guide developed to help northern communities mainstream climate change into all their decision making processes. It comprises 10 chapters covering topics like adaptation planning, hazard mapping, and asset management and includes plenty of useful NWT-specific information.

Ecology North – Preparing for climate change posters:

<https://ecologynorth.ca/portfolio/preparing-for-climate-change-posters/>

Series of posters highlighting the main impacts of climate change on northern communities, including impacts to buildings, food security, transportation, drainage, and flooding.

CLIMAtlantic Adaptation – Municipalities:

<https://climatlantic.ca/adaptation/municipalities/>

Selection of resources to help municipalities in Atlantic Canada adapt to climate change.

Community Climate Resilience Self-Assessment Tool:

<https://mccac.ca/community-climate-resilience-self-assessment/>

Online tool intended to help communities assess their internal climate resilience (adaptive capacity).

Indigenous-focused adaptation resources

Indigenous Climate Hub:

<https://indigenousclimatehub.ca/>

A platform for Canadian Indigenous-led resources, funding, communication tools, and information sharing focused on climate change adaptation.

Climate Atlas of Canada – Indigenous Knowledges:

<https://climateatlas.ca/indigenous>

Information about Indigenous ways of knowing and being, and how these experiences and observations are critical for understanding and addressing climate change.

First Nation Adapt Program:

<https://www.rcaanc-cirnac.gc.ca/eng/1481305681144/1594738692193>

This federal government program provides funding to First Nation communities located south of the 60th parallel to assess and respond to climate change impacts on community infrastructure and disaster risk reduction.

Indigenous Climate Change Adaptation Planning Toolkit:

<https://yourcier.org/iccap-toolkit/>

Provides a suite of user-friendly tools, resources, and key considerations to support Indigenous individuals and communities undertaking climate change adaptation planning.

Dibaginjigaadeg Anishinaabe Ezhitwaad – A Tribal Climate Adaptation Menu:

<https://forestadaptation.org/tribal-climate-adaptation-menu>

A framework for integrating Indigenous and Traditional Knowledge, culture, language, and history into the climate adaptation planning process. This is an American resource but could be applicable for some Canadian land managers/owners.

Indigenous Climate Monitoring Toolkit:

<https://indigenousclimatemonitoring.ca/>

This toolkit has step-by-step guidance, tools, best practices, and examples of a range of approaches to community-based climate and impacts monitoring for Indigenous communities in Canada. Resources highlight Indigenous Knowledge systems, science, and collaborations.

Assembly of First Nations National Climate Strategy:

<https://afn.ca/environment/national-climate-strategy/>

A website that describes how and why this climate change strategy was developed. Also includes links to informational videos and a link to download the strategy, which is based on seven priority areas. Each priority area includes specific goals, objectives, and detailed lists of strategies and actions.

The Métis Nation Climate Change Strategy:

<https://www.mnbc.ca/sites/default/files/2024-06/MNC%20-%20Metis%20Nation%20Climate%20Change%20Strategy%20-%20FNL.pdf>

A strategy created by the Métis Nation that provides a roadmap and a call to action and collaboration with partners to address climate change. The strategy includes five interconnected priority areas for action: nature stewardship, sustainable energy and infrastructure, emergency management and climate resilience, health and well-being, and economic development and prosperity.

British Columbia Indigenous Communities Adapt program:

<https://www2.gov.bc.ca/gov/content/environment/climate-change/indigenous-communities/indigenous-adapt>

A website with links to resources and tools supporting Indigenous climate change adaptation information, tools, data, and examples. British Columbia-focused, but content is relevant across Canada.

First Nations of Quebec and Labrador Sustainable Development Institute:

<https://fnqlsdi.ca/climate-change/>

An organization that works to facilitate climate change adaptation by First Nations communities in Quebec and Labrador.

CLIMAtlantic Climate Change Impacts – Indigenous Communities:

<https://climatatlantic.ca/impacts/indigenous-communities/>

Information and resources specific to Indigenous communities in Atlantic Canada.

Climate impacts on forests information

Natural Resources Canada – Climate change and forests:

<https://natural-resources.canada.ca/climate-change/climate-change-impacts-forests/impacts-climate-change-forests>

Government of Canada webpage describing the many potential impacts of climate change on Canada's forests.

Natural Resources Canada story map – Forest Change:

EN: https://ca.nfis.org/forestchange/StoryMap_EN/Intro.html

FR: https://ca.nfis.org/forestchange/StoryMap_FR/Intro.html

Story map describing climate change impacts and adaptations in Canada's forests. Available in both English and French.

Climate Atlas of Canada – Forests and Climate Change:

<https://climateatlas.ca/forests-and-climate-change>

Article describing the potential impacts of climate change on Canadian forests. Contains links for further information.

CLIMAtlantic Adaptation – Land & Forests:

<https://climatatlantic.ca/adaptation/land-forests/>

Information and infographics describing the impacts of climate change on the forests of Atlantic Canada, plus suggested adaptations for forests and woodlots.

Other resources

Climate anxiety toolbox – A resource guide for young people facing climate anxiety and grief:

<https://weadapt.org/knowledge-base/youth-and-intergenerational-climate-justice/climate-anxiety-toolbox/>

Collection of free resources to help people deal with climate anxiety, including articles and courses from weADAPT, an international climate change adaptation platform.

Canadian climate anxiety resources:

<https://climateinstitute.ca/climate-anxiety/>

Collection of resources to help people deal with climate anxiety (also sometimes called eco anxiety, ecological grief, or solastalgia) from the Canadian Climate Institute.

Canadian Society for Hydrological Sciences:

<https://cshs.cwra.org/en/greyjay/greyjay-data/>

Publicly available water-related datasets, including streamflow data, and links to provincial water datasets and data tools for Alberta, British Columbia, Manitoba, Ontario, and Quebec.

Seagull – Great Lakes Observing System:

<https://glos.org/>

Website that provides datasets on the Great Lakes, including live conditions, lake trends, and forecasts.

Great Lakes Water Level Dashboard:

<https://coast.noaa.gov/digitalcoast/tools/glwld.html>

Dashboard that provides access to monthly Great Lakes water level data and forecasts across a variety of timescales. Contains more than 150 years of historical data.

Appendix C

Community climate change adaptation plan examples and case studies

Community adaptation plan examples

Castlegar, British Columbia

Adapting to Climate Change – Project Summary Report and Action Plan:

https://ckfoodpolicy.ca/wp-content/uploads/2017/01/Castlegar_ClimateChangeAdaptationReport_2011.pdf

Xat'sùll First Nation (Soda Creek), British Columbia

Climate Change Adaptation Case Study:

https://retooling.ca/wp-content/uploads/2020/10/BCRAC_FBC_Case-Study_Xatsull.pdf

Qualicum Beach, British Columbia

Community Climate Change Adaptation Plan:

<https://qualicumbeach.com/project/community-climate-change-adaptation/>

Campbell River, British Columbia

Climate Adaptation Plan:

<https://www.campbellriver.ca/planning-building-development/green-city/climate-action/climate-adaptation-strategy>

Ghost Lake, Alberta

Climate Resilience and Adaptation Plan:

https://ghostlake.ca/wp-content/uploads/2022/12/2202648_SVGL-FinalPlan-withApps_Dec9_22.pdf

Black Diamond and Turner Valley, Alberta

Climate Resilience Action Plan:

<https://static1.squarespace.com/static/5ed809f05c460126fe7f10e2/t/5ee1203564200343637d4de3/1591812216330/Black%2BDiamond%2Band%2BTurner%2BValley%2BClimate%2BResilience%2BAction%2BPlan.pdf>

Banff, Alberta

Climate Resilience Action Plan:

<https://static1.squarespace.com/static/5ed809f05c460126fe7f10e2/t/5ee11a5081366b4c3c3d776c/1591810649266/Banff%2BClimate%2BResilience%2BAction%2BPlan.pdf>

Altona, Manitoba

Community Climate Action Plan:

<https://climateactionmb.ca/wp-content/uploads/2024/06/Altona-CCAP-2024.pdf>

Swan Lake First Nation, Manitoba

Community for Climate Project:

<https://climateactionmb.ca/community-for-climate/sfn/>

Niagara-on-the-Lake, Ontario

Climate Change Adaptation Plan:

<https://www.notl.com/sites/default/files/2022-03/Final%20Climate%20Change%20Adaptation%20Plan%20-%20March%2025%202022.pdf>

Halton Hills, Ontario

Climate Change Adaptation Plan:

<https://www.haltonhills.ca/en/residents/adaptation.aspx>

Cree Nation of Mistissini, Quebec

Climate Change Adaptation Action Plan:

https://www.cngov.ca/wp-content/uploads/2018/05/climate-change-adaptation-action-plan_community-proposal_mistissini_march-2018_fv.pdf

Dorchester, New Brunswick

Climate Change Adaptation Plan:

<https://eosecoenergy.com/en/wp-content/uploads/2017/06/FINAL-Dorchester-Adaptation-Plan-2017sm.pdf>

Grand Bay – Westfield, New Brunswick

Community Climate Adaptation Plan:

<https://grandbaywestfield.ca/wp-content/uploads/2021/04/15.4.1-Climate-Change-Adaptation-Plan.pdf>

Dawson City, Yukon

Climate Change Adaptation Plan:

https://www.yukonu.ca/sites/default/files/inline-files/Dawson_CAP_final_2011.pdf

Mayo Region, Yukon

Climate Change Adaptation Plan:

https://www.yukonu.ca/sites/default/files/inline-files/MayoCAP_for_web_0.pdf

Tetlit Gwich'in (Fort McPherson), NWT

Climate Change Adaptation Plan:

<https://ecologynorth.ca/portfolio/fort-mcpherson-adaptation-planning-project/>

Tsiigehtchic, NWT

Climate Change Adaptation Plan:

<https://ecologynorth.ca/portfolio/tsiigehtchic-adaptation-planning-project/>

Community adaptation case studies and information repositories

NE BC Climate Resilience Network:

https://www.fraserbasin.bc.ca/Northeast_Climate_Resilience_Network.html

Climate change vulnerability assessments have been completed for several communities and districts in NE British Columbia: Fort St. John, Dawson Creek, District of Tumbler Ridge, District of Chetwynd, and Northern Rockies municipality.

Selkirk College Online Repository:

https://sc.arcabc.ca/innovates_climate_capacity_building

Website with many “State of Climate Adaptation” assessments and other resources for BC rural communities.

Municipal Climate Change Action Centre – Database of municipal climate adaptation plans:

<https://mccac.ca/municipal-climate-adaptation-plans/>

Database containing all publicly available municipal adaptation and resilience plans and climate risk and vulnerability assessments that have been developed by communities in Alberta up to December, 2024.

Manitoba Community for Climate:

<https://climateactionmb.ca/community-for-climate/>

Manitoba-based initiative where the province’s Climate Action Team partnered with communities to find ways to reduce the use of fossil fuels [mitigation] and increase preparedness for climate impacts [adaptation]. Includes information from 10 communities, including 5 that are predominately Indigenous.

Niagara Adapts (Ontario):

<https://brocku.ca/esrc/niagara-adapts/#resources>

Website that describes Niagara Adapts, a partnership between Brock University and seven municipalities in the Niagara region of Ontario to advance climate change adaptation. The website describes the initiative, provides links to resources and information, and has links to three completed community adaptation plans.

Local Governments for Sustainability (ICLEI) – Advancing adaptation case studies:

<https://icleicanada.org/project/advancing-adaptation-case-studies/>

Website that describes the results from the Advancing Adaptation project, a cohort of 11 Ontario municipalities that designed and implemented adaptation actions in their communities.

Appendix D

Community Climate Change Profile
example: Castlegar, British Columbia

Climate Element*	Climate Normals (1961 – 1990)	Past Trends (1913 – 2002)	Projected Future Change (Compared with 1961 – 1990)		
			2020's	2050's	2080's
Temperature	8.3 °C	+1.4 °C	+0.9 °C	+1.9 °C	+2.7 °C
Total precipitation	731.9 mm	+26%	+3%	+5%	+6%
Total snowfall	224.6 cm	–6%	–4%	–12%	–20%
Frost free days	120 days	N/A	+12 days	+25 days	+35 days
Growing-degree days	2,038 days	N/A	+160 days	+367 days	+500 days

*Average yearly measurements

Reference: https://ckfoodpolicy.ca/wp-content/uploads/2017/01/Castlegar_ClimateChangeAdaptationReport_2011.pdf

Appendix E

Example community input tracking table

This table is an example of how a community input tracking table could be set up. Feel free to use this table in your CCCA Plan development process or use it as a starting point to create your own tracking table.

[Community Name] CCCA Plan Community Input Tracking Table								
Date	Name	Affiliation	Method	Comment	CCCA Plan Reference	Incorporated? (Y/N)	Rationale	Other Comments

Legend

Date – Date that the comment was submitted/received

Name – Individual who submitted the comment

Affiliation – If the person submitting the comment is doing so on behalf of an organization, club, interest group, etc., record that information in this column

Method – How the comment was submitted, whether it was through email, during a one-on-one discussion, during a community meeting, etc.

Comment – Summary of the comment or feedback that was received

CCCA Plan Reference – Step, section, or page of the CCCA Plan that the comment refers to

Incorporated – Whether the comment will be incorporated into the CCCA Plan (yes or no)

Rationale – Brief explanation of the main reasons the feedback will or will not be incorporated; this is particularly important if the feedback will not be incorporated.

Other Comments – Any other important information that should be noted, potentially including references to documents or emails, relevant background information or context, whether there will be additional follow-up conversations related to the comment, etc.



Appendix F

Selection of potential impacts to forest ecosystems and forest-based communities from climate change

Climate change will impact all parts of society by disrupting the natural, economic, and social systems we all rely on. See below for a few examples of how climate change could impact Canada's forest ecosystems and forest-based communities. Depending on where you live, there may be other potential impacts. Feel free to use these as starting points for your community discussions.

Potential impacts to forests and other natural environments

Natural Disturbances:

- Damage from intense storms (wind, rain, ice, snow, etc.)
- Forest insect and disease outbreaks
- Wildfires
- Landslides
- Permafrost thaw

Water and aquatic/marine species:

- Streamflow timing and amount
- Lake, sea, or river levels
- Periods of flooding or elevated water tables
- Periods of low water levels, low flows, or drought
- Water quality issues
- Changes to floodplain location or size
- Lake, river, or sea ice thickness, extent, or duration
- Changes in fish or aquatic/marine species habitat
- Number, presence/absence, or quality of fish or other important aquatic/marine species
- Availability or ease of harvest of fish or other important aquatic/marine species

Forests and forest species:

- Number, species, or health of plants and trees in the forest
- Number, species, or health of plants and trees that come back after a disturbance
- Tree or plant growth rates or reproduction rates (number of cones/seeds)
- Quality or abundance of berries or other important plants
- Availability or ease of harvest of forest berries or other important forest plants
- Changes in wildlife or bird habitat
- Number, presence/absence, or quality of desirable wildlife species, including birds
- Availability or ease of harvest of important wildlife species, including birds

Potential impacts to forest-based communities

Human health and safety:

- Illness, injury, or death from storms, heat waves, wildfires, or other extreme events
- Longer-term health impacts from extended exposure to heat or poor air quality
- Occurrence of pest-related diseases like Lyme disease or West Nile virus
- Stress associated with community evacuations or other effects of extreme events
- Malnutrition or food-borne illnesses
- Mental health disorders
- Social issues

Access:

- Deteriorating road conditions
- Ice or winter road conditions or duration of safe use
- Bridge or culvert capacity or integrity
- Costs of road, bridge, or culvert maintenance or repairs
- Presence or effectiveness of emergency evacuation routes
- Potential for portions of community to be cut off during certain times of year or during extreme events

Other infrastructure:

- Telephone, cellular, or internet connectivity or reliability
- Power supply or stability
- Power back-up systems
- Integrity of dams, weirs, berms, dikes, etc.
- Drinking water supply, storage, or treatment requirements
- Water availability for irrigation
- Storm water and wastewater facilities and their capacities
- Publicly accessible air-conditioned buildings
- Property loss or degradation or physical damage to homes, other buildings, or infrastructure

Food supply:

- Reliable access to imported and local foods, medicines, and other important items
- Time, effort, or expense required for subsistence hunting, fishing, trapping, or foraging
- Local food storage ability or capacity

Economy:

- Supply chain disruptions
- Rising insurance costs
- Increasing costs for raw materials
- Changes in labour availability or cost
- Costly repairs and downtime required if extreme weather damages infrastructure, plants, or equipment
- Declining corporate tax base if firms close or relocate
- Declining property tax base if people move away
- Outdoor recreation or tourism quality of experience, duration, and safety

Quality of Life:

- Public health
- Feeling of safety and security in the community
- Affordability or availability of good-quality housing
- Educational opportunities
- Community mobility
- Community support systems and services
- Availability or quality of amenities
- Availability or quality of parks and other green spaces
- Outdoor recreation quality and safety
- Community vibrancy
- Availability or quality of nature-based cultural activities
- Ability for residents to be self-sufficient

Local governance:

- Community decision-making and governance processes
- Infrastructure design or construction standards
- Community planning
- Safety codes, operating standards, or maintenance schedules
- Emergency preparedness planning
- Community wildfire protection plans
- Land use and development rules

Appendix G

Selection of potential adaptation actions for forest-based communities

The table below highlights several potential community impacts that could be linked to the climate changes of warmer temperatures and more frequent extreme storms according to the categories of “human health and safety,” “access,” “other infrastructure,” “food supply,” “economy,” “quality of life,” and “local governance.”

For each potential community impact, a few potential adaptation actions are proposed that could be appropriate for forest-based communities, depending on the specific impacts and opportunities that were identified by community residents and stakeholders. Feel free to use some of these ideas in your CCCA Plan, or just use this table as inspiration for developing your own adaptation actions.

Category	Climate Change	Potential Community Impacts	Potential Adaptation Actions
Human health and safety	Warmer temperatures	Increase in number of heat-related illnesses and deaths	• Develop heat wave plans in cooperation with health care providers, with particular attention to the most vulnerable individuals • Set up community cooling centres • Encourage neighbour check-ins during heat waves
		More people become sick from pest-related diseases	• Consider the adequacy of current pest management protocols • Connect with national, provincial/territorial, and/or regional health surveillance systems
	More frequent extreme storms	Flooded and water-damaged homes affect the health of residents	• Provide education about property drainage improvement • Encourage residents to purchase flood insurance and repair any damage promptly
		More frequent winter freeze/thaw cycles cause more injuries from falls and traffic collisions	• Establish an education program about safe winter walking and driving • Dedicate extra funding toward ice and snow clearing

Category	Climate Change	Potential Community Impacts	Potential Adaptation Actions
Access	Warmer temperatures	More frequent winter freeze/thaw cycles increase the frequency/cost of snow clearing, road maintenance, and road repairs required	• Increase the snow- and ice-clearing budget • Increase the road maintenance budget • Use different asphalt mixes or repair roads with cobbles
		Thinner ice and shorter winters reduce the length of time that winter and ice roads can be used safely	• Anticipate and plan for shorter seasons for winter and ice roads • Establish a winter/ice road monitoring and alert system • Build an alternate access route • Ensure a stockpile of critical supplies is in place before freeze-up/break-up
		Community evacuations become more common due to higher wildfire risks	• Create (or update) community emergency preparedness plans to include early warning systems, evacuation plans, and community disaster response plans • Create a plan to deal with temporary transportation, power, and communications disruptions • Test emergency preparedness plans with partner organizations by [date] • Encourage households and businesses to create (or update) their emergency plans and to have at least a 3-day cache of critical supplies on hand in case of an emergency • Prepare and implement a community wildfire protection plan • Encourage property owners to FireSmart their properties
	More frequent extreme storms	Intense rainstorms plug culverts and wash out roads and bridges	• Identify high-risk infrastructure and increase the frequency of inspections and maintenance
		Portions of the community are cut-off during or after storms	• Develop a plan to deal with transportation disruptions, particularly related to food, health care, and other critical supplies
Other infrastructure	Warmer temperatures	Higher risk of damage to community infrastructure from wildfires	• FireSmart around critical community infrastructure, such as water supply areas, water and sewage treatment plants, power plants, hospitals, etc.
		Current buildings do not have adequate air conditioning, have insufficient insulation, or are otherwise not well suited for warmer temperatures	• Revise design guidelines for new construction and renovations to better withstand current and future climate conditions • Identify and address climate change threats to local government buildings • Plant some trees to provide more shade

Category	Climate Change	Potential Community Impacts	Potential Adaptation Actions
Other infrastructure	Warmer temperatures	Water supply is limited during the summer months	• Raise awareness about local water supplies with flow monitoring and aquifer mapping • Initiate community education about the need to reduce water use • Explore options to increase water storage • Require new developments to install low-flow toilets, showerheads, faucets, etc. • Implement community water restrictions
	More frequent extreme storms	Intense rainstorms cause more flooding and water damage to homes and properties	• Encourage homeowners to purchase flood insurance • Identify flood-prone areas in the community • Create a flood risk plan and identify improvement opportunities • Reduce paved areas where possible to reduce surface run-off and potential for flooding • Establish or expand community greenspace to absorb stormwater and reduce the potential of flash flooding • Regularly monitor stormwater infrastructure to ensure it remains free from debris • Identify properties that could be purchased as part of a “managed retreat” from high-risk areas
		Higher costs due to increased insurance premiums	• Initiate community education about climate change risks and ways to reduce risks • Encourage residents and business owners to assess their climate risks and take appropriate actions
		Coastal erosion of waterfront land	• Evaluate whether installing bulkhead rocks, rip rap, or a seawall is feasible • Divert surface run-off away from sensitive areas • Restore native shoreline vegetation • Identify properties that could be purchased as part of a “managed retreat” from high-risk areas
		Power and communications outages during and after storms	• Encourage local power, telephone, cellular, and internet providers to ensure their infrastructure is resilient to the effects of storms, especially high winds • Install backup power sources • Flood-proof critical infrastructure

Category	Climate Change	Potential Community Impacts	Potential Adaptation Actions
Other infrastructure	More frequent extreme storms	More frequent landslides reduce water quality and increase water treatment costs	- Protect and restore riparian areas next to streams to reduce erosion and improve water quality - Increase water quality monitoring, especially during times of very high and very low water levels, and during heat waves - Regularly monitor areas at risk of landslides for signs of instability - Increase the maintenance budget to repair damage to water infrastructure from sediment
Food supply	Warmer temperatures	Local hunting and fishing become more challenging as animals and fish move to cooler areas	- Residents travel to different areas for subsistence hunting and fishing opportunities - Residents transition to consuming different foods - Implement local hunting or fishing conservation measures
		Drought reduces agricultural productivity	- Explore whether government grants or other support is available to help farmers transition to more resilient crops - Initiate education programs about adaptive farming practices - Investigate irrigation opportunities and costs - Encourage residents to grow food on their properties
		New warmer weather crops can now be grown locally	- Encourage farmers and market gardeners to explore these potential new options - Offer tax incentives to plant new crops
	More frequent extreme storms	Increased spoilage and contamination of food	Establish community freezers, root cellars, or “cut-and-wrap” facilities
		Storms disrupt access to imported foods and/or lead to significant price increases	- Ensure high-quality farmland is not converted to other land uses - Promote local food production by providing land for community gardens or greenhouses - Allow residents to keep goats, chickens, bees, etc. on their properties - Explore the feasibility of local food storage options
Economy	Warmer temperatures	Longer summer season increases tourism opportunities	- Explore the feasibility of developing hiking/mountain biking trails, campgrounds, backcountry staging areas, etc. to draw more summer tourists to the region - Offer a financial incentive for proprietors opening new businesses in the community

Category	Climate Change	Potential Community Impacts	Potential Adaptation Actions
Economy	More frequent extreme storms	Storms disrupt supply chains and increase costs for local factories and businesses	- Identify any weak parts of the supply chain and develop a plan to address or diversify those areas - Develop collaborations or partnerships with allied businesses
Quality of life	Warmer temperatures	Parks and other green spaces look degraded/unhealthy	- Plant a diversity of trees and shrubs that are suitable for the predicted future climate - Convert existing green spaces to xeriscapes if water is limited - Monitor trees and shrubs for pests or other problems, and take immediate action to address any issues
		Longer outdoor community recreation season	- Explore whether additional amenities (e.g., spray park, walking trails) are desired by community residents - Provide public awareness and safety training on the new or expanded recreational opportunities
	More frequent extreme storms	People feel less safe living in the community	- Organize some community events to bring people together - Bring in some educators, counsellors, or other specialists to help residents
Local governance	Warmer temperatures	The impacts of warmer weather on the community are currently not well understood	- Facilitate or fund ongoing learning about climate change in the community - Communicate with nearby communities and regional/provincial/territorial/Indigenous governments to collaborate on climate resiliency initiatives and share information - Encourage community residents to participate in citizen science initiatives - Encourage local businesses to assess the climate risks to their operations - Use seasonal forecasts to understand the potential demands on community services

Category	Climate Change	Potential Community Impacts	Potential Adaptation Actions
Local governance	More frequent extreme storms	Existing community infrastructure is not well suited to deal with the impacts of more extreme storms	• Mainstream climate change considerations into all community decisions and plans • Create (or update) a community plan to guide decisions toward sustainability and climate resilience, including a commitment to review and update the plan regularly • Inventory and assess all existing or planned infrastructure for suitability to the future climate • Require the use of updated extreme event return intervals in the design and construction of all new infrastructure • Do not permit new development, including community infrastructure, in areas prone to flooding or landslides • Require stormwater treatment on site for new developments • Require new developments to be FireSmart

Appendix H

Selection of citizen science organizations and tools

Citizen science is the practice of engaging members of the public to collect data or other information as part of scientific research or monitoring projects. Citizen science can involve collecting information to support large-scale environmental monitoring projects (such as the Audubon Society's Great Backyard Bird Count) or it could be a local, community-initiated project that is set up to collect information on something that is important to the community.

The government of Canada maintains a "citizen science portal", a database with links to more than 50 Canadian citizen science organizations and tools. Some of the tools from this database are included in the list below. The portal is located at <https://science.gc.ca/site/science/en/citizen-science-portal>.

As with all parts of this process, feel free to adopt some of these tools as part of your monitoring plan or just use this list as a starting point for your community discussions.

Biodiversity monitoring tools

NatureWatch:

<https://www.naturewatch.ca/>

A Canadian citizen science organization that connects people with fun, easy-to-use environmental monitoring initiatives. Information and data submitted to NatureWatch is pooled with information submitted by other participants across Canada and is used at several Canadian

universities to improve our understanding of the changes occurring in Canada's biodiversity, climate, and natural environment.

Specific NatureWatch programs include:

- FrogWatch: <https://www.naturewatch.ca/frogwatch/>
- PlantWatch: <https://www.naturewatch.ca/plantwatch/>
- IceWatch: <https://www.naturewatch.ca/icewatch/>
- WormWatch: <https://www.naturewatch.ca/wormwatch/>
- MilkweedWatch: <https://www.naturewatch.ca/milkweedwatch/>

iNaturalist:

<https://www.inaturalist.org/>

An app where people can record their animal, plant, insect, fungi, etc. observations to help scientists and resource managers better understand where and when organisms occur. Individuals can contribute to existing projects or can start their own data collection project.

EcoSpark:

<https://www.ecospark.ca/>

An environmental charity that works to connect people to their local natural environment through education, monitoring, and stewardship. This organization has several programs for youth participants; resources for teachers are available on the website.

Animal, bird, and insect monitoring tools

Audubon Society's Great Backyard Bird Count:

<https://www.birdcount.org/>

A four-day event in February each year that asks participants to submit their bird observations to help create a real-time snapshot of bird populations around the world.

Birds Canada:

<https://www.birdscanada.org/you-can-help/citizen-science/>

Website that describes the bird-related citizen science programs facilitated by the organization. Website is searchable by province or territory. National Birds Canada programs include:

- Breeding bird survey
- Canadian lakes loon survey
- Christmas bird count
- Great backyard bird count
- Nocturnal owl survey
- Project FeederWatch
- Project NestWatch
- Schoolyard bird blitz

Bird Surveys:

<https://www.canada.ca/en/environment-climate-change/services/bird-surveys/volunteers.html>

A searchable database of bird surveys across Canada that rely on participation from volunteers.

e-Butterfly:

<https://www.e-butterfly.org/en>

A website to report butterfly observations to help scientists better understand where and when butterflies occur.

Mission Monarch:

<https://www.mission-monarch.org/>

An organization that encourages people to survey different locations looking for milkweed and monarch caterpillars and then compile and submit their observations through an app or their computer.

Neighbourhood Bat Watch:

<https://batwatch.ca/>

An organization working to locate bat colonies and carry out population counts to monitor bat population trends over time.

Journey North:

<https://journeynorth.org/>

A website where observations about migratory species can be submitted. Specific projects include those related to hummingbirds, monarch butterflies, American robins,

bald eagles, and orioles, among others. The group also collects information on the timing of “ice out” (when ice cover melts on waterbodies) and other signs of seasonal change (e.g., tulip bulbs emerging in spring, leaves changing colour in fall).

Water quality, coastline, fish, and aquatic organism monitoring tools

Swim Drink Fish:

<https://www.swimdrinkfish.ca/>

An organization that uses community science, technology, and communications to connect people with water. Through a network of monitoring hubs, Swim Drink Fish teaches communities to monitor the health of their water with a view to advocating for the protection and restoration of important waterways.

Water Rangers:

<https://www.waterrangers.ca/>

An organization that sells easy-to-use water quality testing kits and provides a data submission platform to encourage people to collect and submit water quality data for fresh and salt water.

Coastie:

<https://parks.canada.ca/nature/science/impliquez-involved/science/coastie>

A citizen science program led by the University of Windsor in collaboration with Parks Canada. The initiative uses photos taken at participating sites to help scientists monitor coastal change over time. There are currently more than 30 Coastie stations in 10 Parks Canada administered sites in Prince Edward Island, Nova Scotia, New Brunswick, Newfoundland and Labrador, Quebec, and Ontario, with more sites planned.

Fish Health Tracking Tool:

<https://cwhc.wildlifesubmissions.org/#/finfish-en>

A tool that enables people to record and submit their observations on fish health. Any observations can be reported, including healthy fish, fish that look abnormal or that are acting unusual, the presence of invasive aquatic species, or fish that have been affected by environmental issues like chemical contamination.

Canadian Aquatic Biomonitoring Network (CABIN):

<https://www.canada.ca/en/environment-climate-change/services/canadian-aquatic-biomonitoring-network.html>

A freshwater ecosystem health monitoring network with standardized data collection methods, a database, activities map, and training opportunities.

Sequencing The Rivers for Environmental Assessment and Monitoring (STREAM):

<https://stream-dna.org/>

A community-based project that generates DNA-based data on freshwater benthic macroinvertebrates (small bottom-dwelling aquatic animals and the aquatic larval stages of insects; often used as indicators of water quality and the biological health of waterbodies). This project brings together scientists from the University of Guelph, Environment and Climate Change Canada, and community groups to better understand the health of river systems across Canada.

The Pacific Salmon Foundation's Citizen Science program:

<https://sogdatacentre.ca/atlas/citsci-program/>

A program that patrols the Strait of Georgia, British Columbia, collecting data on a variety of oceanographic parameters.

Niagara Coastal – Visual Assessment Survey Tool (VAST):

<https://www.niagaracoastal.ca/vast>

A program that encourages people to collect and submit data on what they see along the shorelines of the Great Lakes. By reporting their observations, Great Lake coastal communities can become active participants in the protection and management of their shorelines and coastal conditions.

Shark Sightings:

<https://www.dfo-mpo.gc.ca/species-especes/sharks/info/sightings-eng.html>

A website that encourages people to document and report any shark encounters in Canadian waters to Fisheries and Oceans Canada.

Secchi Disk:

<http://www.secchidisk.org/>

Climate change is affecting phytoplankton, which is the base of several aquatic food webs. This initiative encourages people to collect and submit data on phytoplankton to help scientists better understand the relationships and processes taking place at the bottom of the marine food chain.

Climate monitoring tools

Agroclimate Impact Reporter:

<https://agriculture.canada.ca/en/agricultural-production/weather/agroclimate-impact-reporter>

An online survey designed for the collection and reporting of weather and climate impacts on farm operations across Canada.

Community Collaborative Rain, Hail, and Snow Network:

<https://www.cocorahs.org/Canada.aspx>

A volunteer network of weather observers who measure and map precipitation in their communities.

Snow and ice monitoring tools

RinkWatch:

<https://www.rinkwatch.org/>

Citizen science research initiative that asks people who love outdoor skating to help monitor winter weather conditions and study the long-term impacts of climate change. Run by researchers at Wilfrid Laurier University.

Sknowledge Collective:

<https://www.sknowledge.ca/getting-started.html>

A website where people can share their snow measurements and weather observations to help scientists better understand the impacts of climate change on snow.

Pest monitoring tools

Prairie Pest Monitoring Network:

<https://prairiepest.ca/>

A coordinated insect surveillance program for the prairie provinces that tracks the distribution and abundance of insect pests that affect field crops. Insect populations and distributions are correlated with climate, weather, agronomic practices, and natural enemies; these factors are used by the network to forecast pest populations and better understand where crops may be affected.

Invasive Species Centre – Community Science Program:

<https://www.invasivespeciescentre.ca/take-action/community-science-program/>

A network of people concerned about the spread of invasive species. The website provides learning materials about different invasive species and highlights the many initiatives people can join to combat these organisms. Includes programs for invasive fish and invertebrates, aquatic plants, terrestrial plants, insects, and pathogens.

Early Detection and Rapid Response Network of Ontario:

<https://www.ontarioinvasiveplants.ca/what-we-do/edrr/>

This Ontario-based initiative aims to train and equip volunteers with the skills and resources needed to better detect and reduce invasive species in Ontario. This program also has a website for people to report the presence of invasive plants.

Budworm Tracker Program:

<https://healthyforestpartnership.ca/budworm-tracker/about-the-program/>

Community science program that helps monitor spruce budworm moth populations in eastern and Atlantic Canada. Volunteers receive a free kit with a pre-assembled moth trap, along with instructions on how to hang the trap, how and when to collect the moths, and where to send the samples for analysis by scientists.

Other tools**Globe at Night:**

<https://globeatnight.org/>

International citizen science campaign to raise public awareness of the impact of light pollution. Invites people to measure and submit their night sky brightness observations.

Zooniverse:

<https://www.zooniverse.org/>

An online platform that enables and supports citizen science. You can join an existing project on this platform or create your own new project.