



Climate Risk Assessment Workbook

For Municipalities



MANITOBA CLIMATE
RESILIENCE TRAINING

Manitoba



Municipality or District: _____

Email Address: _____



Step 1: Climate Hazard Assessment

Task 1.1: Develop a list of climate-related hazards

The goal of Step 1 is to:

- Identify the climate hazards that already affect or will affect your community; and
- Understand how the climate hazards are predicted to change.

Begin by reflecting on the climate hazards that have affected your community in the past.

Instructions: What climate hazards have impacted your area in the past? Write them in **Box 1.1**.

Past Climate Hazard	When was it?	What was experienced?	How long did it last?
Heatwave	July 2022, August 2023	Day temperatures of +30°C, Night temperatures of +20°C	3-4 days at a time

Box 1.1: Identify past climate hazards in your community.

Step 1: Climate Hazard Assessment

Task 1.2: Identify how climate is predicted to change

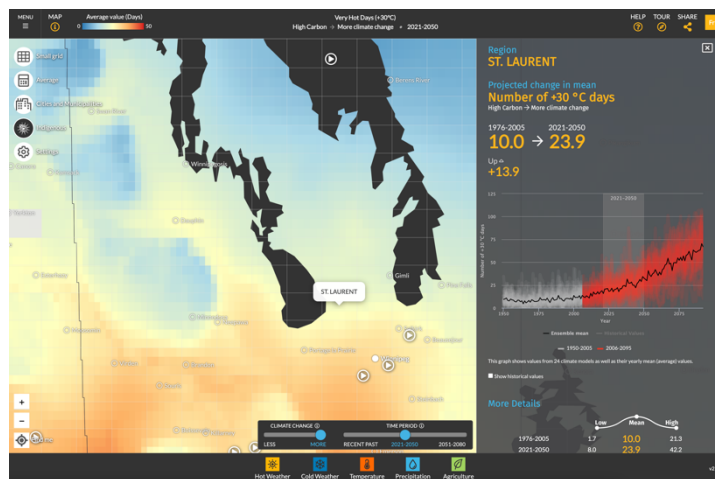


Figure 1.1: The Climate Atlas of Canada's interactive map.

Step 1: Visit The Climate Atlas of Canada at [ClimateAtlas.ca](https://climateatlas.ca)

Step 2: Click "Map" on the top of the homepage

Step 3: Locate your community on the map

Step 4: Explore the variables at the bottom of the page to see your projected climate future

Figure 1.2: How to find data on the Climate Atlas of Canada.

To identify how a changing climate will affect the hazards facing your community, or to anticipate new hazards, you must explore projected climate data. This can be found on the Climate Atlas of Canada, pictured in **Figure 1.1**. The Atlas provides users with an interactive map showing both historical and future climate data for a variety of scenarios and variables.

Instructions: Visit the Climate Atlas of Canada following the steps outlined in **Figure 1.2**. Be sure to set the "climate change" slider at the bottom of the page to "more." Explore the variables listed in **Box 1.2** and then fill in the data for your community.

Variable	Recent Past: 1976-2005	Near-term Projection: 2021-2050	Long-term Projection: 2051-2080	Change (+/-)
Very Hot Days (+30°C)	days	days	days	days
Very Cold Days (-30°C)	days	days	days	days
Annual Mean Temperature	°C	°C	°C	°C
Mean Spring Precipitation	mm	mm	mm	%
Frost-Free Season	days	days	days	days

Box 1.2: Fill in the boxes using data for your community from the Climate Atlas of Canada.



Step 1: Climate Hazard Assessment

Task 1.3: Identify how climate hazards are predicted to change

Instructions: Based on your knowledge of how the climate in your area is expected to change, as well as your review of past climate hazards, **identify what you think are the top four future climate hazards in your area.**

Try to think of several single-event climate hazards as well as a slow-onset hazard that might have the greatest impact on your community. See examples in **Figure 1.3**. Then, fill the information into the Climate Impact Assessment Sheets – one for each hazard.

Single event climate hazards			
Winds (strong)	Freezing rain	Wildfire/ grassfire	Hail
Heavy snowfall	Extended snowpack	Tornado	Fog
Extremely hot days	Heat wave	Blizzards	Heavy rainfall
Lightning	Thunderstorms	Floods	Drought
Icy roads	Cold spell	Dry spell	
Slow-onset hazards			
Length of frost-free period		Length of growing season	
Warming winters and loss of extreme cold		Changes to jet streams	Freeze-thaw cycles

Figure 1.3: Climate hazard examples.

Top Future Climate Hazards in Your Area

#	Climate Hazards
0	Example: Heatwaves
1	
2	
3	
4	

Box 1.3: Identifying top climate hazards for your area



Step 2: Climate Impact Assessment

Task 2.1: Develop an inventory of climate change hazards and impacts

The goal of Step 2 is to:

- Consider impacts of the identified climate hazards
- Explore how these impacts might be felt in the future
- Understand the consequences for your community

A **hazard** is a climate or weather event (e.g. tornado), an **impact** is a hazard's effect (damaged buildings), a **consequence** could be increased insurance claims.

Use your list of climate hazards to begin thinking about potential impacts of each climate hazard.

Instructions: View the example in **Figure 2.1**. For each climate hazard identified in Step 1, think of the direct impacts. Consider which aspects and assets of your community may be the most exposed to climate hazards and record them in **Box 2.1**.

Climate Hazard	What Are the Impacts of This Hazard?
Example: Heatwave	-More hot days and night -Reduced water supply -Loss of soil moisture -Increased risk of wildfires -Amplification of drought conditions

Figure 2.1: An example of how heatwaves impact communities.



Step 2: Climate Impact Assessment

Task 2.2: Identify the climate risks to your community



Community & people

Fatalities, injuries, medical treatment, hospitalization, temporary or permanent displacement, mental health and emotional well-being



Critical services

Loss of services such as transportation, water, electricity, etc.



Buildings and infrastructure

Damage to buildings, equipment, vehicles, infrastructure.



Local economy

Disruption or loss of ability to produce, consume, and trade goods and services, and to generate income supporting livelihoods



Natural environment

Impacts to land, water, air, plants, and animals, and the provision of ecosystem services

To fully assess climatic risk, you must first identify the presence of living things, natural systems, and the built environment that may be impacted in the event of a climate hazard. **Figure 2.2** outlines different categories to focus your thinking as you consider the various consequences to your community.

Instructions: Using the information you've gathered and the flow chart template in **Box 2.2**, develop your Climate Impact Assessment. For each identified hazard, list the impacts from **Box 2.1** and consider the associated consequences of those impacts. See the example in **Figure 2.3** before you get started.

Figure 2.2: Different categories to consider when recording the consequences of climate hazards.

Example: Climate Impact Assessment











Climate Hazard:	Heatwave
How is the Hazard Projected to Change in the Future?	
<ul style="list-style-type: none"> • An average of 2.3 more heatwaves each year • The average heatwave is 1.8 days longer. • The average summer temperature is 2.1°C warmer. <p>As summer temperatures and the number of days above +30°C increase, future heatwaves may be hotter, more frequent, and last longer.</p>	
What Are the Impacts of this Hazard?	
<ul style="list-style-type: none"> - More hot days and nights - Reduced water supply - Loss of soil moisture - Increased risk of wildfires - Amplification of drought conditions 	
What Consequences Might Occur in a Worst-Case Scenario?	
 Community & People	<ul style="list-style-type: none"> - Seniors/vulnerable community members suffer heat stroke - Cancellation of outdoor events, sports, and gatherings - Food security threatened by crop loss
 Critical Services	<ul style="list-style-type: none"> - Air conditioning failures in public buildings - Increased demand for emergency medical services - Electrical grid brownouts/blackouts
 Buildings & Infrastructure	<ul style="list-style-type: none"> - Foundational cracks in buildings - Heat damage to roads - Equipment failures from overheating
 Local Economy	<ul style="list-style-type: none"> - Financial pressure on farmers and agricultural businesses - Overwhelming demand for water-based attractions - Tourism industry brought to stand-still due to fire bans, water restrictions, etc.
 Natural Environment	<ul style="list-style-type: none"> - Loss of plant & animal life due to heat; water shortage - Decreased water quality and quantity lead to boil water advisories - Demand for irrigation exceeds water supply

Figure 2.3: An example of a completed Climate Impact Assessment. Adapted from All One Sky Foundation (2021). Climate Resilience Express: A Community Climate Adaptation Planning Guide.








Climate Impact Assessment Sheet

Climate Hazard:			
How is the Hazard Projected to Change in the Future?			
What Are the Impacts of this Hazard?			
	What Consequences Might Occur in a Worst-Case Scenario?	Severity	Likelihood
 Community & People			
 Critical Services			
 Buildings & Infrastructure			
 Local Economy			
 Natural Environment			

Box 2.2: A template for completing a Climate Impact Assessment.








Climate Impact Assessment Sheet

Climate Hazard:			
How is the Hazard Projected to Change in the Future?			
What Are the Impacts of this Hazard?			
	What Consequences Might Occur in a Worst-Case Scenario?	Severity	Likelihood
 Community & People			
 Critical Services			
 Buildings & Infrastructure			
 Local Economy			
 Natural Environment			

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Climate Impact Assessment Sheet

Climate Hazard:			
How is the Hazard Projected to Change in the Future?			
What Are the Impacts of this Hazard?			
	What Consequences Might Occur in a Worst-Case Scenario?	Severity	Likelihood
 Community & People			
 Critical Services			
 Buildings & Infrastructure			
 Local Economy			
 Natural Environment			

Box 2.2: A template for completing a Climate Impact Assessment.



Climate Impact Assessment Sheet

Climate Hazard:			
How is the Hazard Projected to Change in the Future?			
What Are the Impacts of this Hazard?			
	What Consequences Might Occur in a Worst-Case Scenario?	Severity	Likelihood
 Community & People			
 Critical Services			
 Buildings & Infrastructure			
 Local Economy			
 Natural Environment			

Box 2.2: A template for completing a Climate Impact Assessment.



Step 3: Climate Risk Assessment

Task 3.1: Assess the severity of identified climate risks to your community

The goal of Step 3 is to:

- Understand how susceptible your community is to each of the impacts and consequences you have previously identified.
- Determine priorities for the adaptation planning phase and consider solutions.

Climate hazards and their consequences can be assessed using a severity rating scale from *insignificant* to *catastrophic*. This has been provided for your reference in


Figure 3.2. Consider your community's current vulnerabilities. Refer to your climate impact assessment and recall what key assets or groups are exposed to climate hazards.

How sensitive are community activities, assets, and services to changes in climate, as well as changes in climate hazards?

What risk management measures are currently in place?

What is your community's ability to adjust to or take advantage of changes in climates and their associated hazards?

Instructions: Return to your Climate Impact Assessment. For each consequence you have identified, assign a level of anticipated severity were that consequence to occur. Use the numbers 1 – 5 and see the **Figure 3.2** on the following page for a reference guide of severity levels.

	What Consequences Might Occur in a Worst-Case Scenario?	Severity
 Community & People	- Seniors/vulnerable community members suffer heat stroke	4
	- Food security threatened by crop loss	5
	- Cancellation of outdoor events, sports, and gatherings	1



Severity Level	Description
1 Insignificant	<p>No practical impact on the community, its people, or assets.</p> <ul style="list-style-type: none"> • Impact may be observed but does not change day-to-day life • No deaths, injuries, or effects on health and safety • No impact to the economy, environment, property, or services.
2 Minor	<p>No significant impact on the community, its people, or assets, and can be handled through business-as-usual practices.</p> <ul style="list-style-type: none"> • No deaths or injuries, minor short-term effects on health and safety • Very minimal impact on local economy • Insignificant environmental disruption or damage • Slight damage to property and infrastructure, very short-term service interruptions, or negligible costs • No liabilities or significant extra costs
3 Moderate	<p>Moderate impacts at the local and regional scale of minor importance, to be addressed through low-cost or no-regret adaptation actions.</p> <ul style="list-style-type: none"> • Few injuries, or modest temporary impact on quality of life • Interruptions to business revenue and employment for less than one week • Isolated and reversible damage to wildlife, habitat, and/or ecosystem • Potential damage to property/infrastructure, short-term service interruptions, localized evacuations • Modest to higher cost events
4 Major	<p>Major impacts at the local and regional scale that are of high importance to municipal operations and agencies, requiring assistance from national agencies to quickly address through strategic adaptation actions.</p> <ul style="list-style-type: none"> • High possibility of injuries or chronic health issues or major temporary impact on quality of life • Interruptions to business revenue and employment for more than one week • Irreversible damage to wildlife, habitat, or ecosystems • Damage to property and infrastructure, longer-term service interruptions, major delays, and evacuations • Community complaints; dissatisfaction or anger with situation; legal liabilities and lawsuits possible
5 Catastrophic	<p>Extreme impacts at the local and regional scale of very high importance to operations and agencies to urgently address:</p> <ul style="list-style-type: none"> • Many serious injuries or illnesses, fatalities, and/or long-term impacts on quality of life • Interruptions to businesses and revenue for more than a month, extending to entire sectors at a major economic cost • Widespread and irreversible damage to wildlife, habitat, and ecosystems • Widespread damage to property and infrastructure, long-term interruption of services, widespread evacuations • Major costs to municipality, high possibility for legal liabilities and lawsuits

Figure 3.2: Different levels of severity for consequences with examples.



Step 3: Climate Risk Assessment

Task 3.2: Prioritize climate risks to your community

Consider the outcomes of the consequence assessment in the previous task. Review your severity rankings and for each one, assign a level of anticipated risk. Likelihood represents the chance of each consequence occurring and have been organized from very *unlikely* to very *likely*.

This exercise will help you decide which risks to take forward into adaptation planning response, and which ones may need further work or research.

Instructions: Follow the steps below.

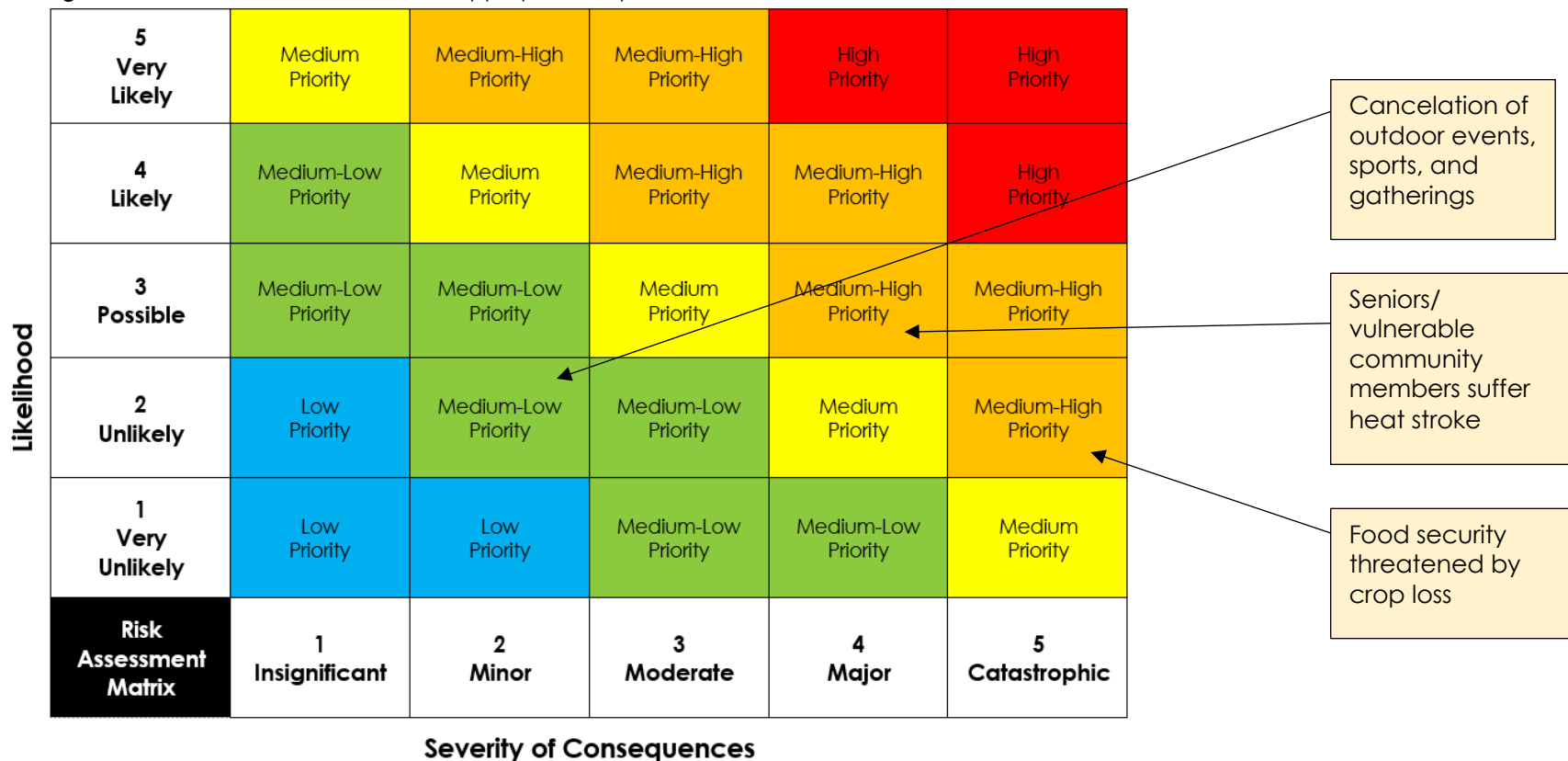
1. Use **Figure 3.2 and 3.3** to assign a level of likelihood to each consequence.
2. Plot each consequence on the Risk Assessment Matrix (**Figure 3.6**).
 - o Place by consequence severity along the bottom and *likelihood* along the left side to find the suggested priority rating.

Likelihood level	Definition
1 - Very Unlikely	This has never happened in our area, or it happened much longer than 20 years ago. / This is not likely to happen until far in the future.
2 - Unlikely	This may have occurred in our area in the past, but it was at least 20 years ago. / This could happen 20 years from now.
3 - Possible	This has occurred in our area once in the past 20 years. / This might occur once in the next 20 years.
4 - Likely	This has occurred in our area several times in the past 20 years. / This might occur several times in the next 20 years.
5 - Very Likely	This has occurred in our area yearly or every other year, during the past 20 years. / This might occur every other year or so.

Figure 3.3: Risk assessment matrix. Each box assigns a priority rating to assist in adaptation planning. Adapted from All One Sky (2021).



Figure 3.5: Levels of likelihood and the appropriate response needed.

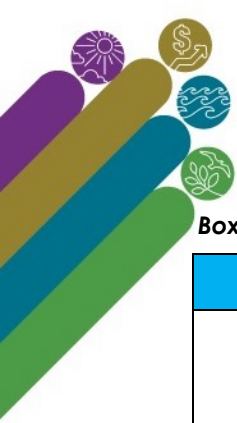


Risk level	Climate risk
Medium-High Priority	Seniors/vulnerable community members suffer heat stroke
Medium-High Priority	Food security threatened by crop loss
Medium-Low Risk	Cancelation of outdoor events, sports, and gatherings



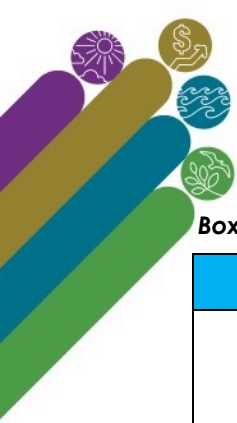
Box 3.6: Fill in this blank Risk Assessment Matrix with your community's climate change adaptation planning priorities.

Likelihood	Hazard:					
	5 Very Likely					
	4 Likely					
	3 Possible					
	2 Unlikely					
	1 Very Unlikely					
Risk Assessment Matrix		1 Insignificant	2 Minor	3 Moderate	4 Major	5 Catastrophic
Severity						



Box 3.6: Fill in this blank Risk Assessment Matrix with your community's climate change adaptation planning priorities.

Likelihood	Hazard:					
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Severity						



Next Steps: Action Planning

Instructions: For each consequence in a **red** or **orange** square in the matrix, begin thinking about actions your municipality or watershed district can take to address it through future adaptation planning measures.

Climate Hazard:	
Highest Priority Consequences	Potential Mitigation & Adaptation Actions
Example: People need to be evacuated due to wildfires	<ul style="list-style-type: none"> - Explore the creation of a firebreak around the community - Take inventory of vulnerable buildings, like healthcare centres, nursing homes, and schools - Plan evacuation routes and backup routes - Educate citizens on ways to reduce the risk of wildfires - Encourage citizens to make their own evacuation plan



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