

# Climate Vulnerability and Risk Assessment Workshop



MANITOBA CLIMATE  
RESILIENCE TRAINING

**URBAN**  
SYSTEMS

Manitoba 

August 25, 2023



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# INTRODUCTION



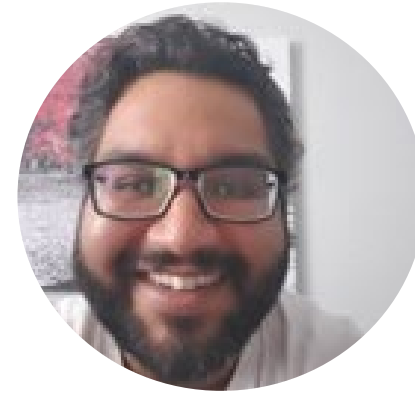
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**Hillary  
Beattie**



**Kailee  
Mortimer**



**Ali Mujahid**



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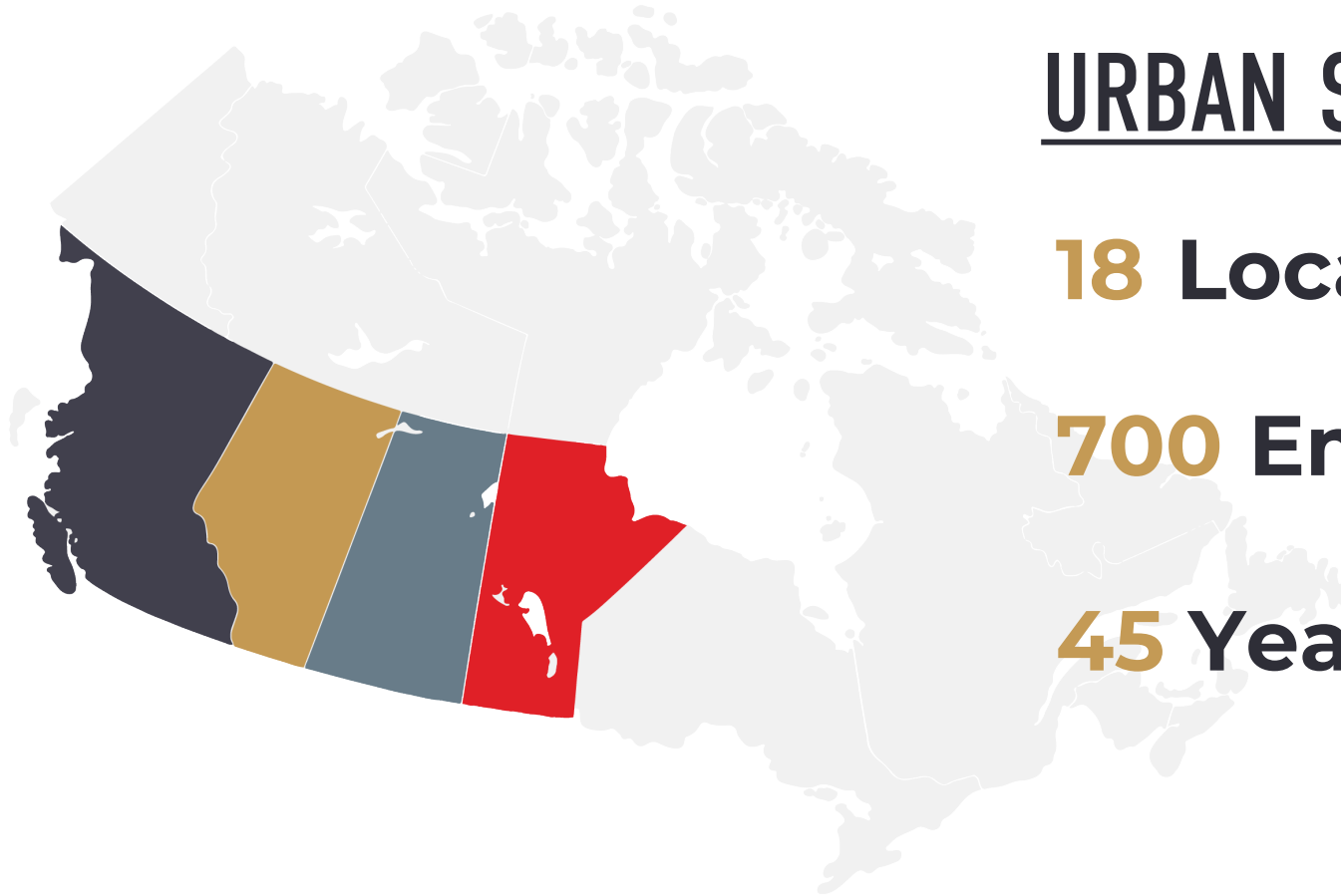
# About Urban Systems

## URBAN SYSTEMS

**18** Locations

**700** Employees

**45** Years in Business





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# About Urban Systems



## URBAN SYSTEMS

- |   |  |  |
|---|--|--|
|  Asset Management        |  Community Energy Solutions |  Community Planning     |
|  Economic Development    |  Healthy Communities        |  GIS                    |
|  Governance & Finance    |  Land Development           |  Land Economics         |
|  Land Survey & Geomatics |  Landscape Architecture     |  Transportation         |
|  Water & Wastewater      |  Community Infrastructure   |  First Nations Advisory |

## URBAN MATTERS

- |  |  |  |
|--|--|--|
| Homelessness  | Housing                     | Food & Water Security                     |
| Inclusion     | Climate Change              | Financial & Environmental Sustainability  |
|  | Meaningful Local Economies  |  |





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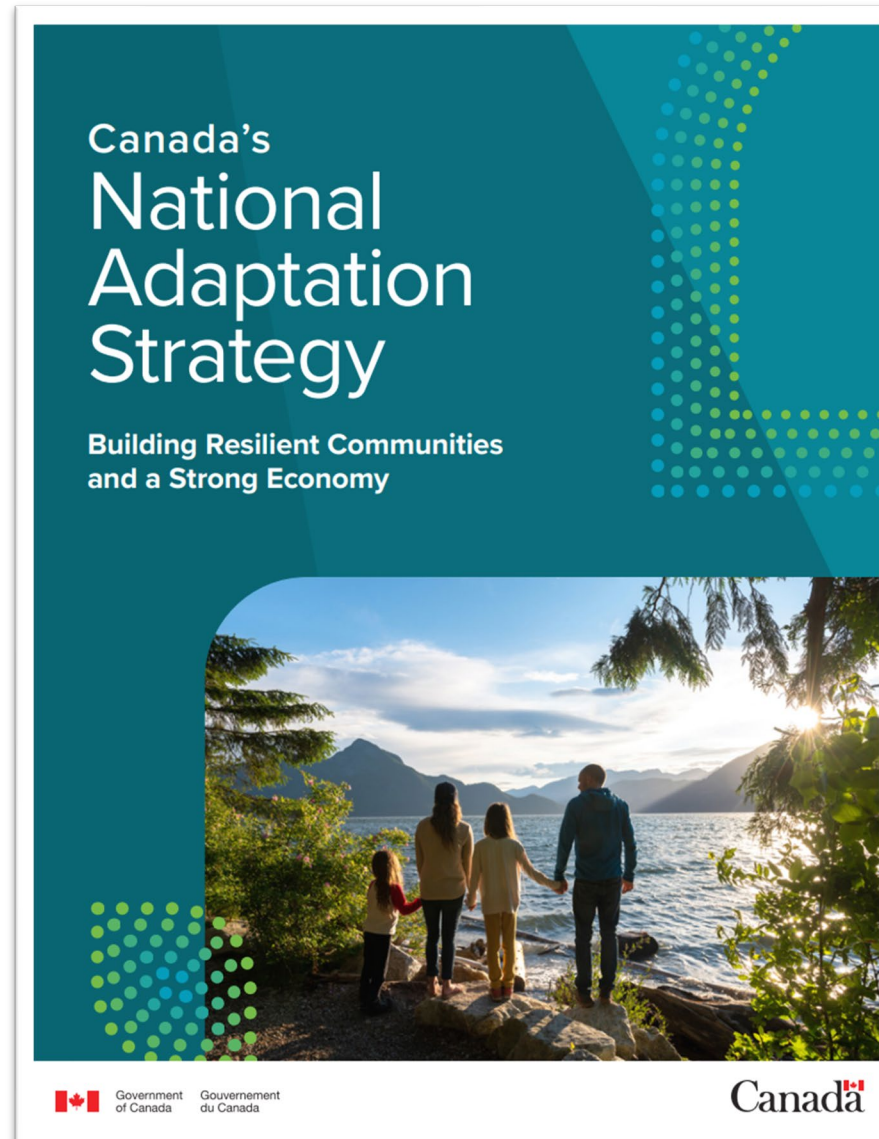
# Introduction

- What is your name?
- What community are you from?
- What do you hope to get out of this workshop?

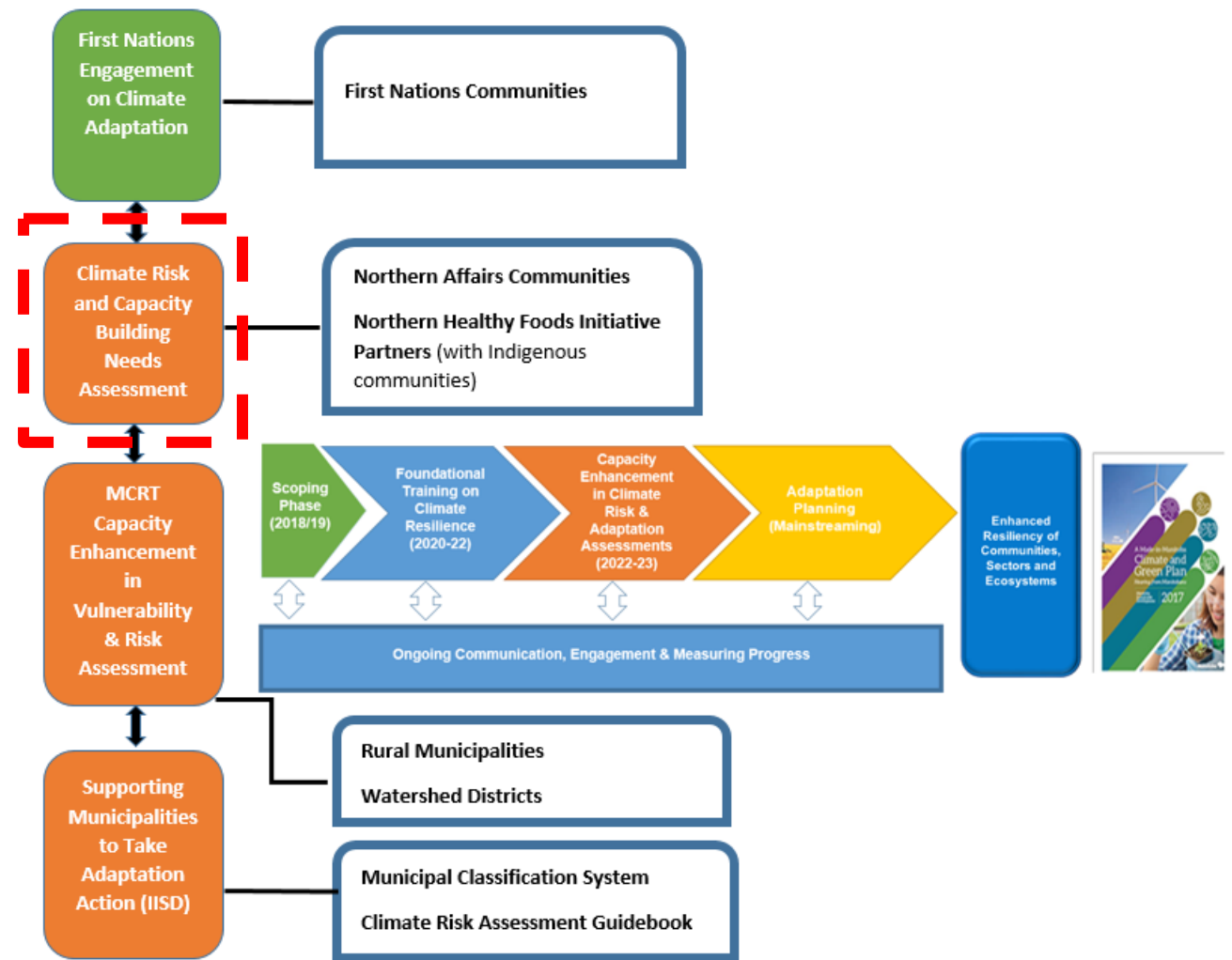
# Project Context



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# Project Context







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# Climate Risk and Capacity Building Needs Assessment Project Goals

- Enhance the resiliency of Northern Affairs Communities to climate change
- Build capacity in NACs to understand the climate impacts, vulnerabilities, risks (and opportunities) and potential adaptation options resulting from climate change
- Develop a training plan for those communities and organizations



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# Purpose of Workshop

- Support you in taking the initial steps of a climate risk and vulnerability assessment
- Build knowledge within communities
- Provide a step-by-step guide that can be replicated in your community in the future
- Help communities prepare for funding applications for adaptation actions



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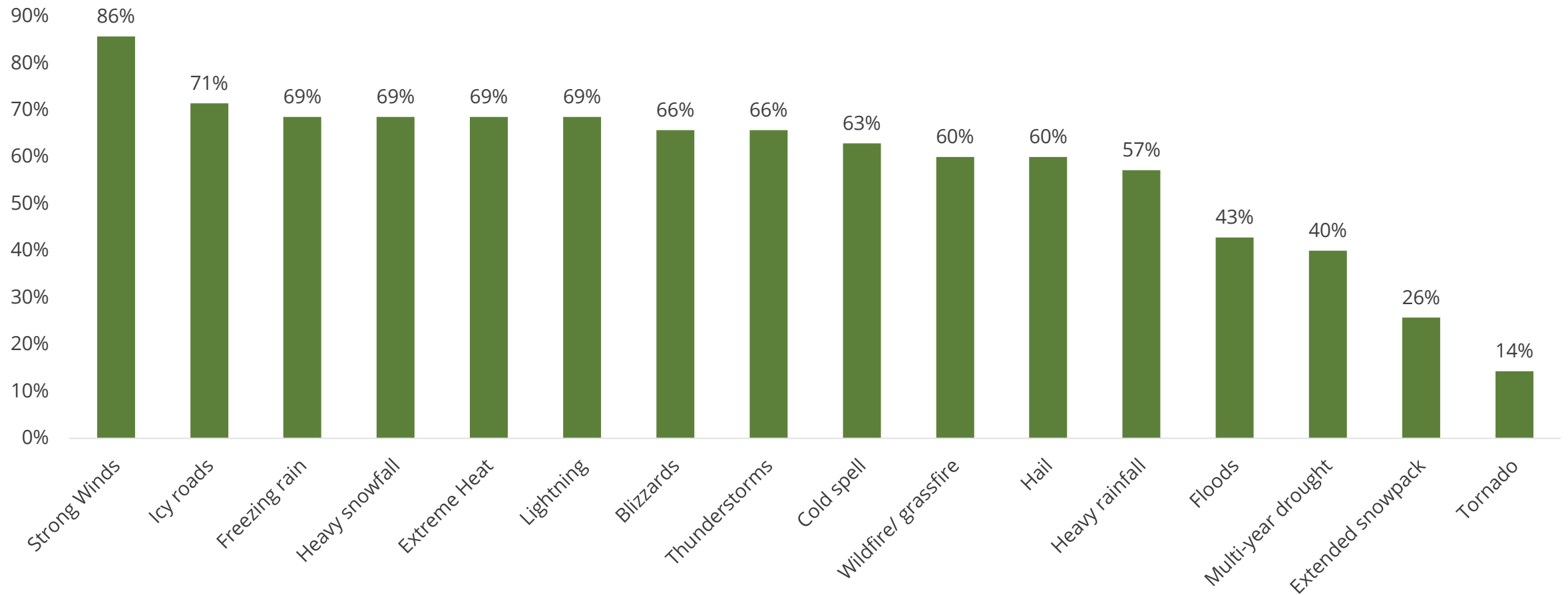
# SURVEY RESULTS



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# Climate Survey Results

Have you observed any of the following climate hazards in your community?



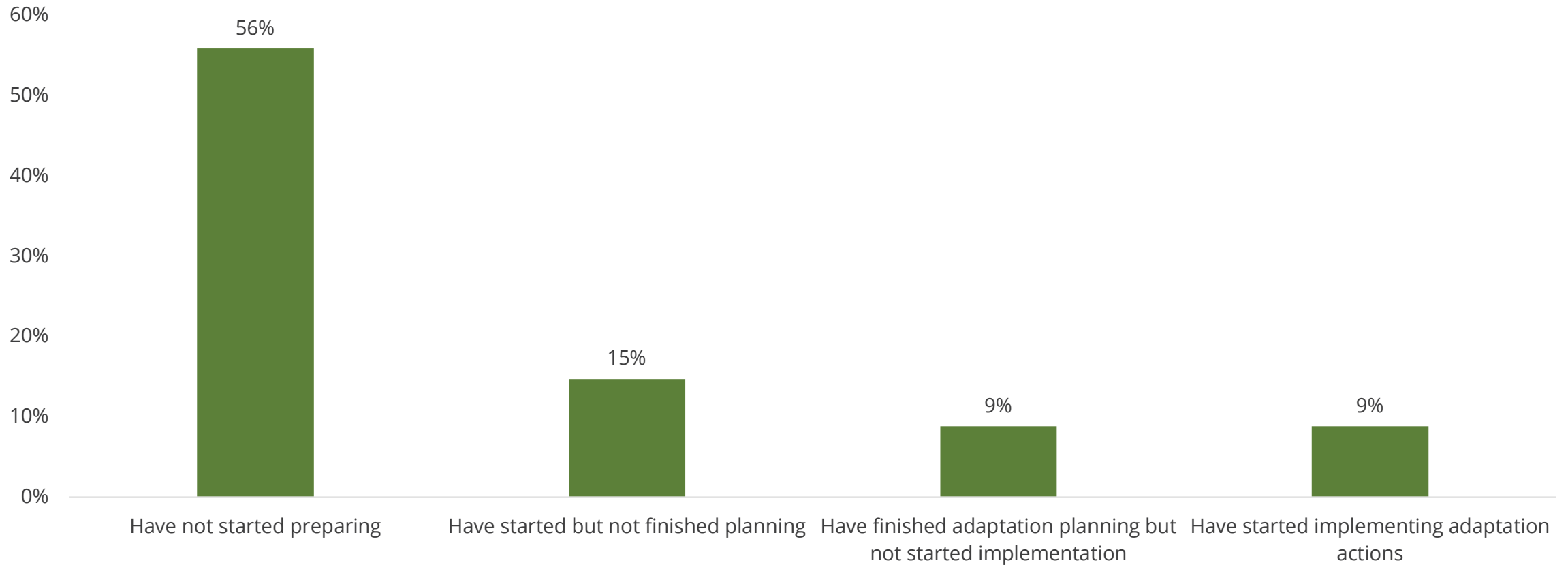




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# Climate Survey Results

*Which stage is your community at in terms of preparing for climate change adaptation?*

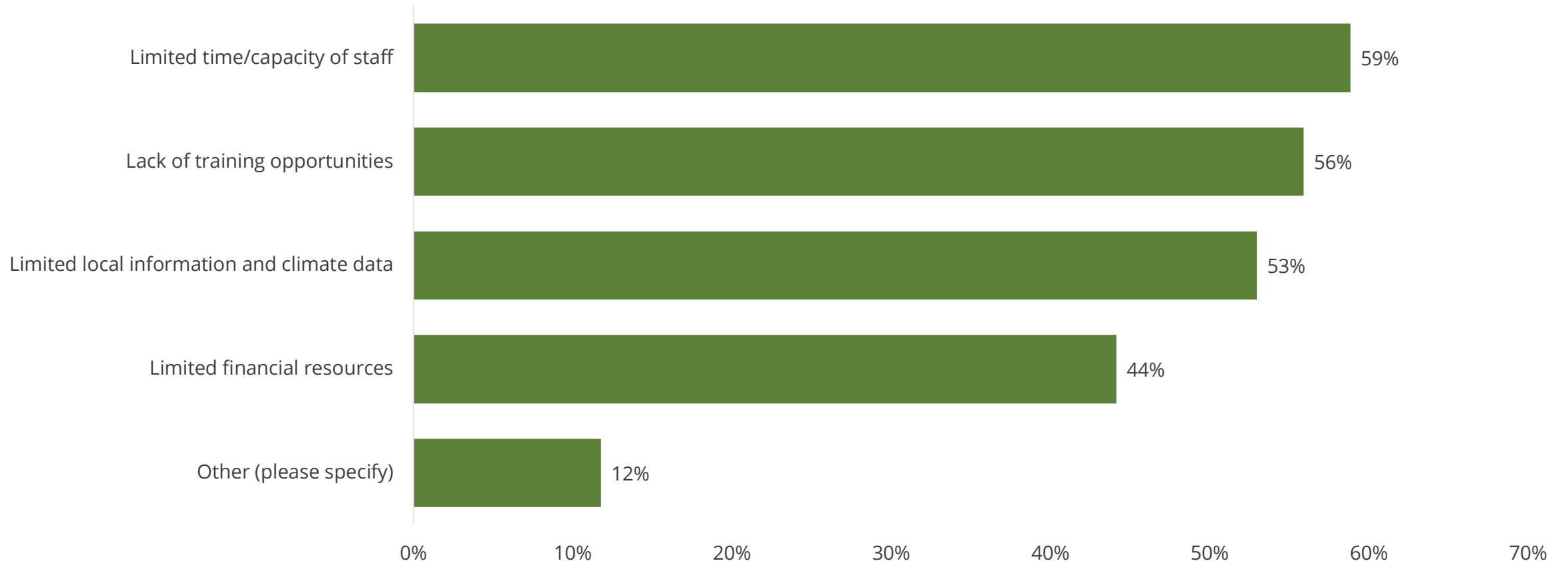




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# Climate Survey Results

*What barriers to adaptive action, if any, have you encountered?*

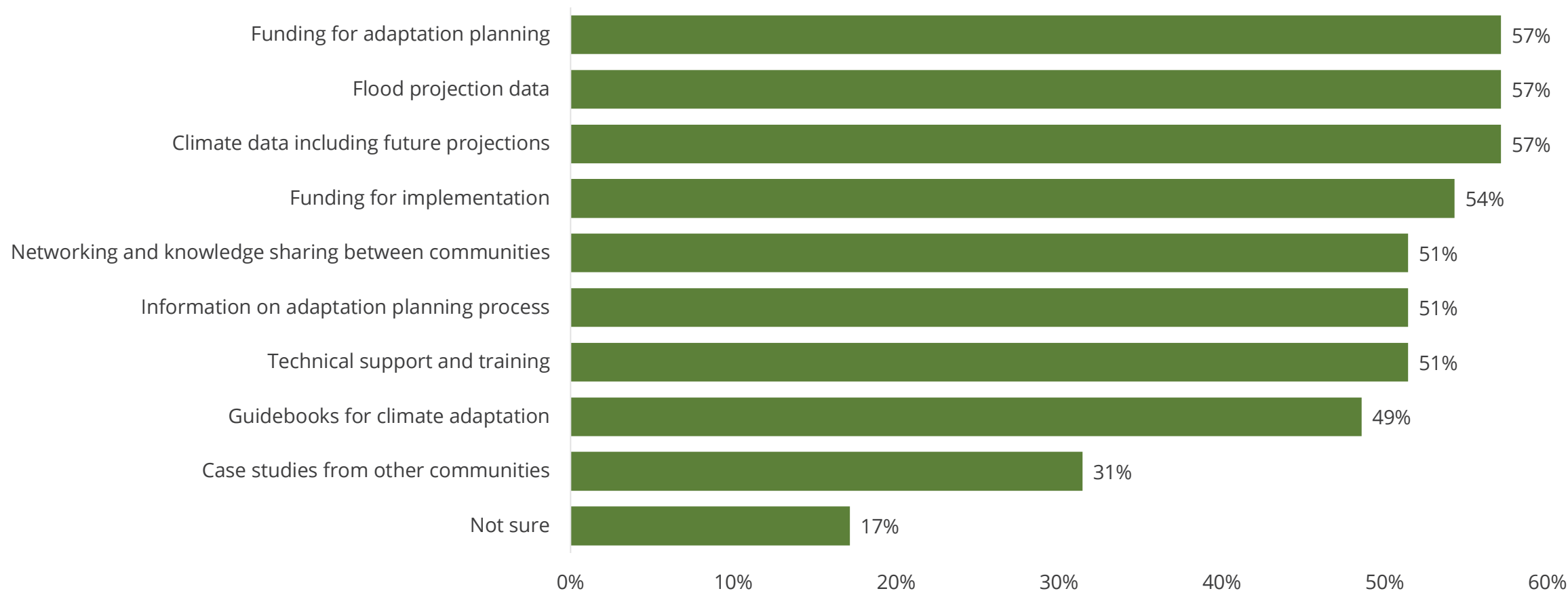




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# Climate Survey Results

*What type of resources about climate adaptation does your community need?*





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# Workshop Agenda

- Climate Risk Assessment
  - Climate Hazard Assessment
  - Impact Assessment
  - Climate Risk Assessment
- Potential Adaptation Actions





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# CLIMATE RISK ASSESSMENT



# WEATHER

WHAT YOU GET

CONDITIONS OF THE  
ATMOSPHERE OVER A SHORT  
PERIOD OF TIME

CAN CHANGE WITHIN  
MINUTES OR HOURS



Saturday



Sunday

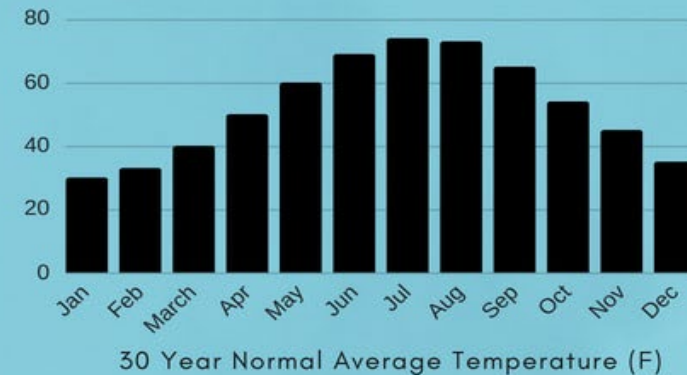
VS

# CLIMATE

WHAT YOU EXPECT

HOW THE ATMOSPHERE BEHAVES  
OVER A LONG PERIOD OF TIME  
AND SPACE

AVERAGE REGIONAL WEATHER  
PATTERN OVER DECADES



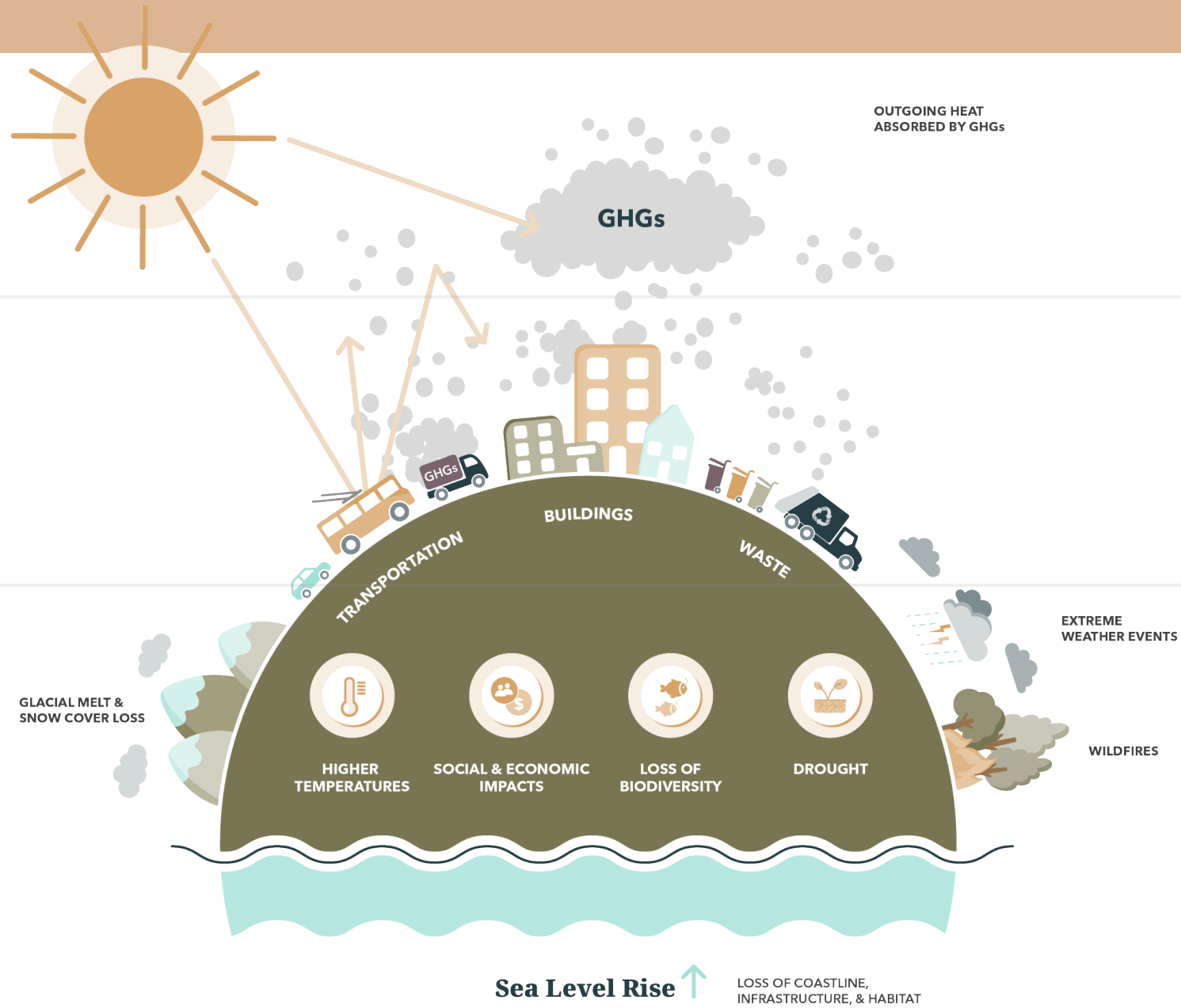


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Greenhouse  
Effect

Sources of  
Greenhouse Gases

Impacts

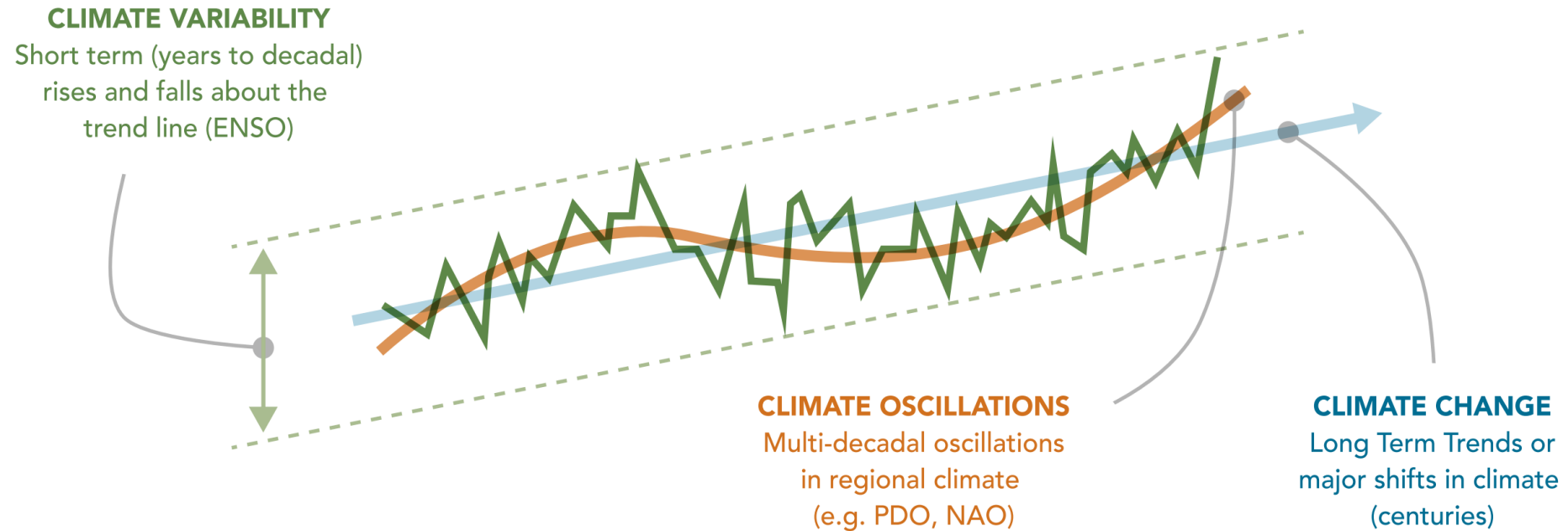




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# Climate Change 101

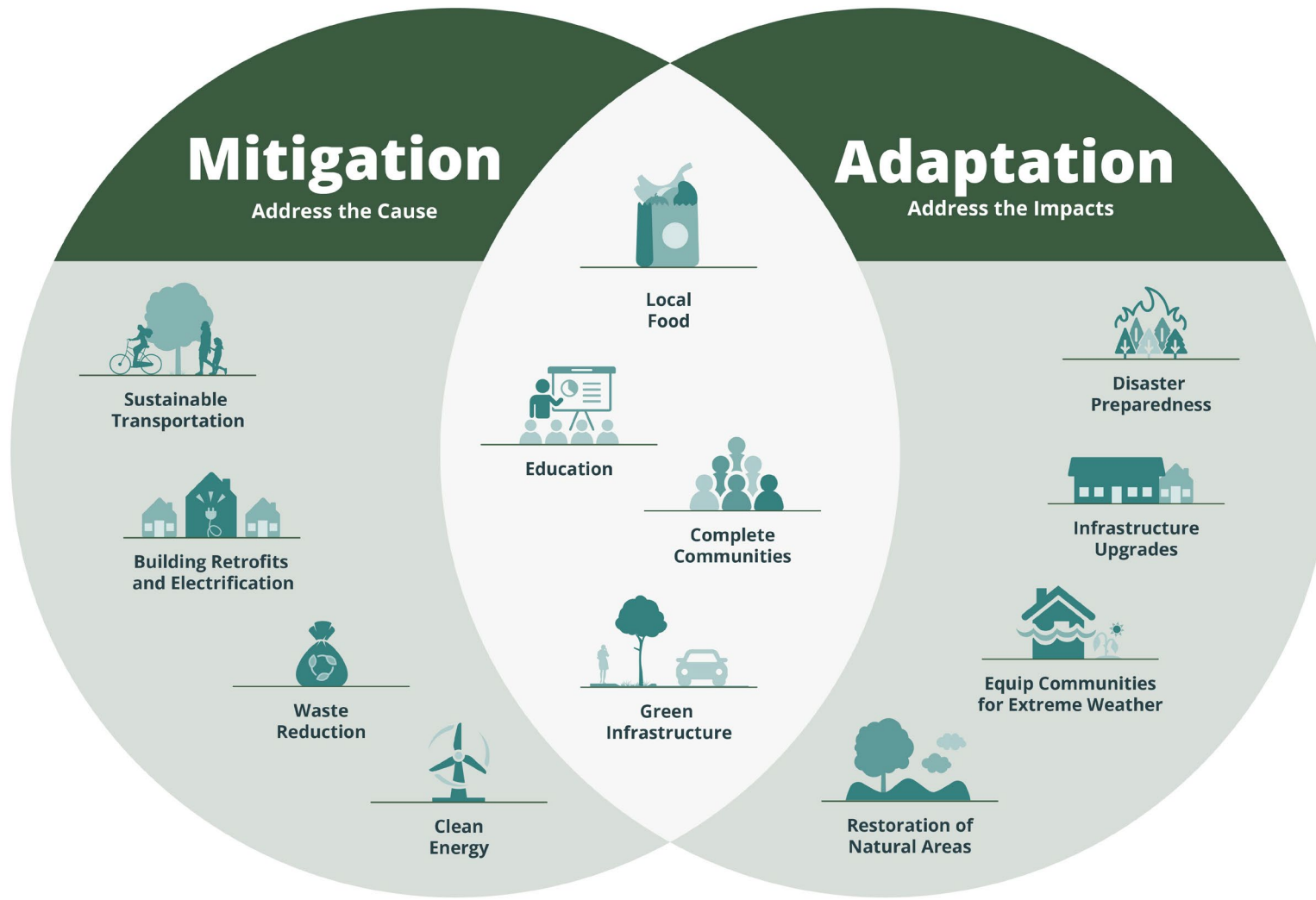
## Natural Variability and Climate Change







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# Climate Risk Assessments

Step 1: Climate  
Hazard  
Assessment



Step 2: Impact  
Assessment



Step 3: Climate  
Risk  
Assessment



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# Why do a VRA?

- To build community resilience to a changing climate
- To provide a location specific understanding of climate impacts and the risks they pose
- To design resilient and adaptive solutions for climate risks
- To help prioritize finite time and resources to where they have the most impact



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# Workbook



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## Climate Vulnerability and Risk Assessment

Workbook for Northern Communities

February 2023

Prepared by Urban Systems Ltd.  
Prepared for the Province of Manitoba

**URBAN**  
SYSTEMS

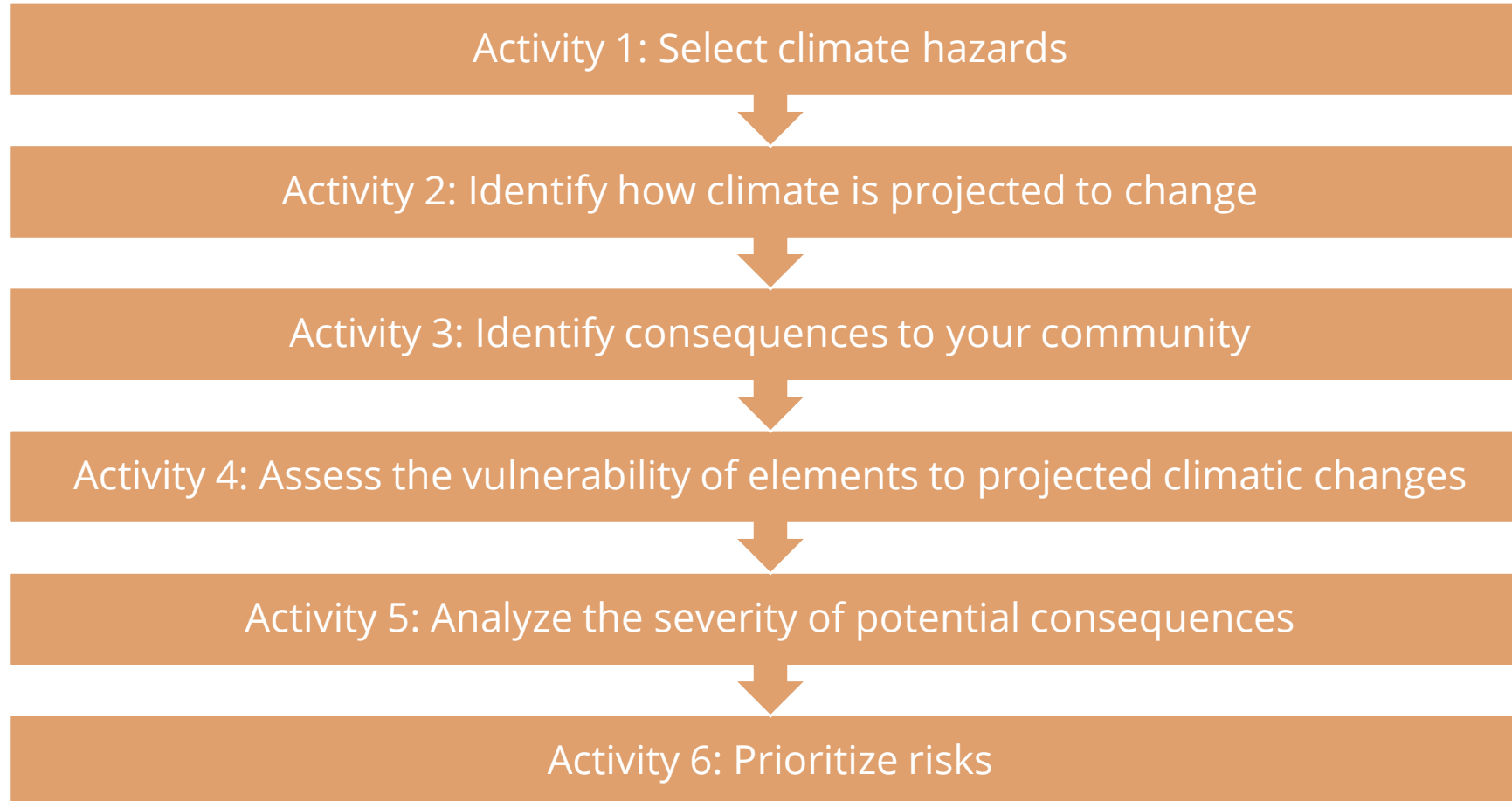
Manitoba 





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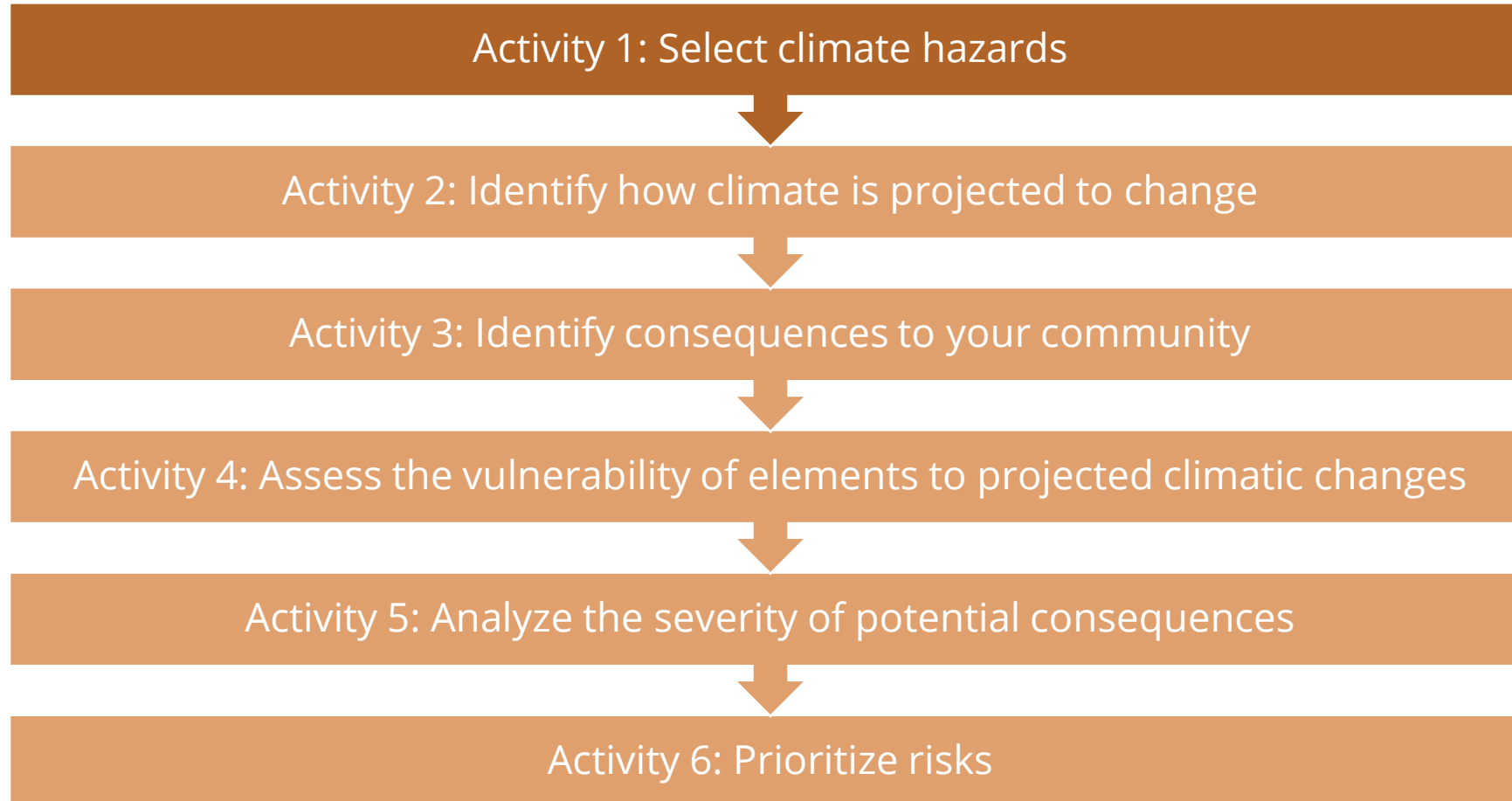
# Climate Risk Assessments





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# Climate Risk Assessments





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# Climate Hazards

Climate hazards are biophysical events or processes that can cause harm to human health, economies, infrastructure, and to natural resources and ecosystems



Extreme Heat



Extreme Cold



Extreme Rainfall



Drought



Extreme Weather Events  
(storms)



Extreme Wind



Wildfire



Freeze/thaw cycles



Heavy Snowfall



Landslides



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# Activity 1

Select which hazard you want to focus on today:



Extreme Heat



Wildfire



Extreme Rainfall



Extreme Cold



### Activity 1

#### Hazard

Example: Wildfire

### Activity 2

#### Variable

Very Hot Days (+30C)

#### Near Term Projected Change

- Very hot days (+30C) are to increase to 8 by 2050

#### Long-Term Projected Change

- Very hot days (+30C) are to increase to 19 by 2080

### Activity 3

#### Consideration

Buildings and  
Infrastructure

#### Climate Consequences

Wildfire may cause damage to  
community buildings (Town Hall,  
Fire Station #2 etc) and affect critical  
services like transportation

### Activity 4

#### Sensitivity

##### Description

The Town Hall is particularly  
susceptible to this hazard as it is fenced  
in by wildland vegetation on two sides.  
River Road is sensitive to wildfire  
since it is one of the only 2 emergency  
access routes for a subdivision and  
wildfires in the proximity may cut off  
evacuation efforts

##### Rating

2

#### Adaptive Capacity

##### Description

There is a wildfire evacuation plan in  
place that designates Pineview Pass  
as an alternate emergency evacuation  
route in case River Road is cut off.

##### Rating

2

#### Vulnerability Rating

High

### Activity 5

#### Consequence Level

Major - 3

### Activity 6

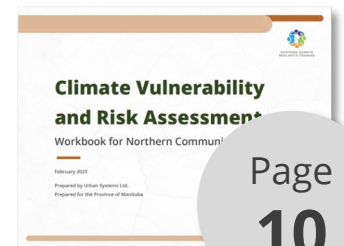
#### Risk Level

High





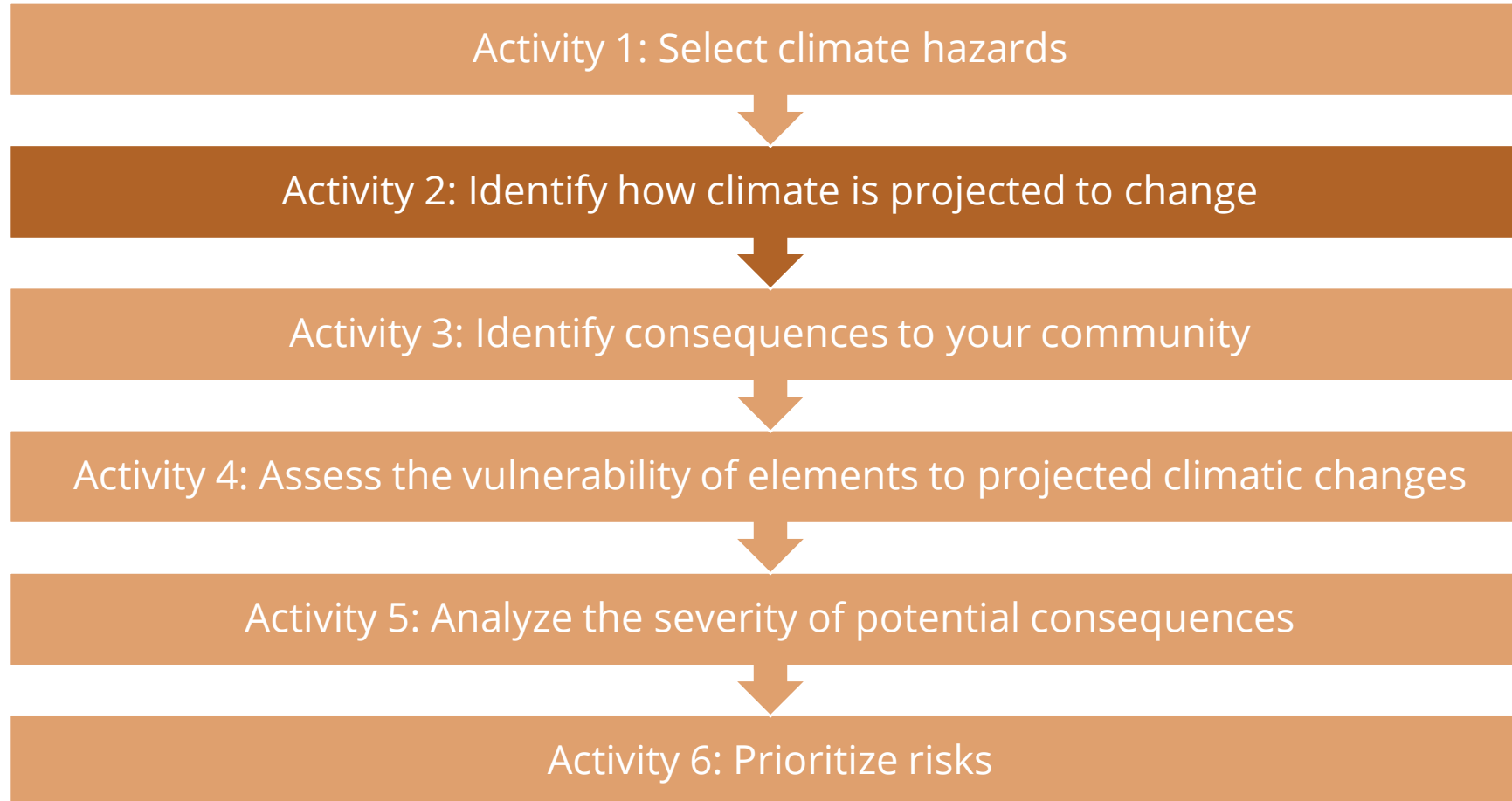
CLIMATE HAZARD	CURRENT TREND(S)
Example: Wildfire	Community members, historical climate and weather data have observed an increase in the frequency and magnitude of wildfires. Increase in the damage (hectares burned, cost of rebuilding, firefighting efforts) and longer wildfire seasons (how many days on average) have been recorded.





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# Climate Risk Assessments





# Climate Variables

For each climate hazard, there are multiple variables that allow you to understand how the hazard will likely change

## Climate Hazard: Drought Variables:

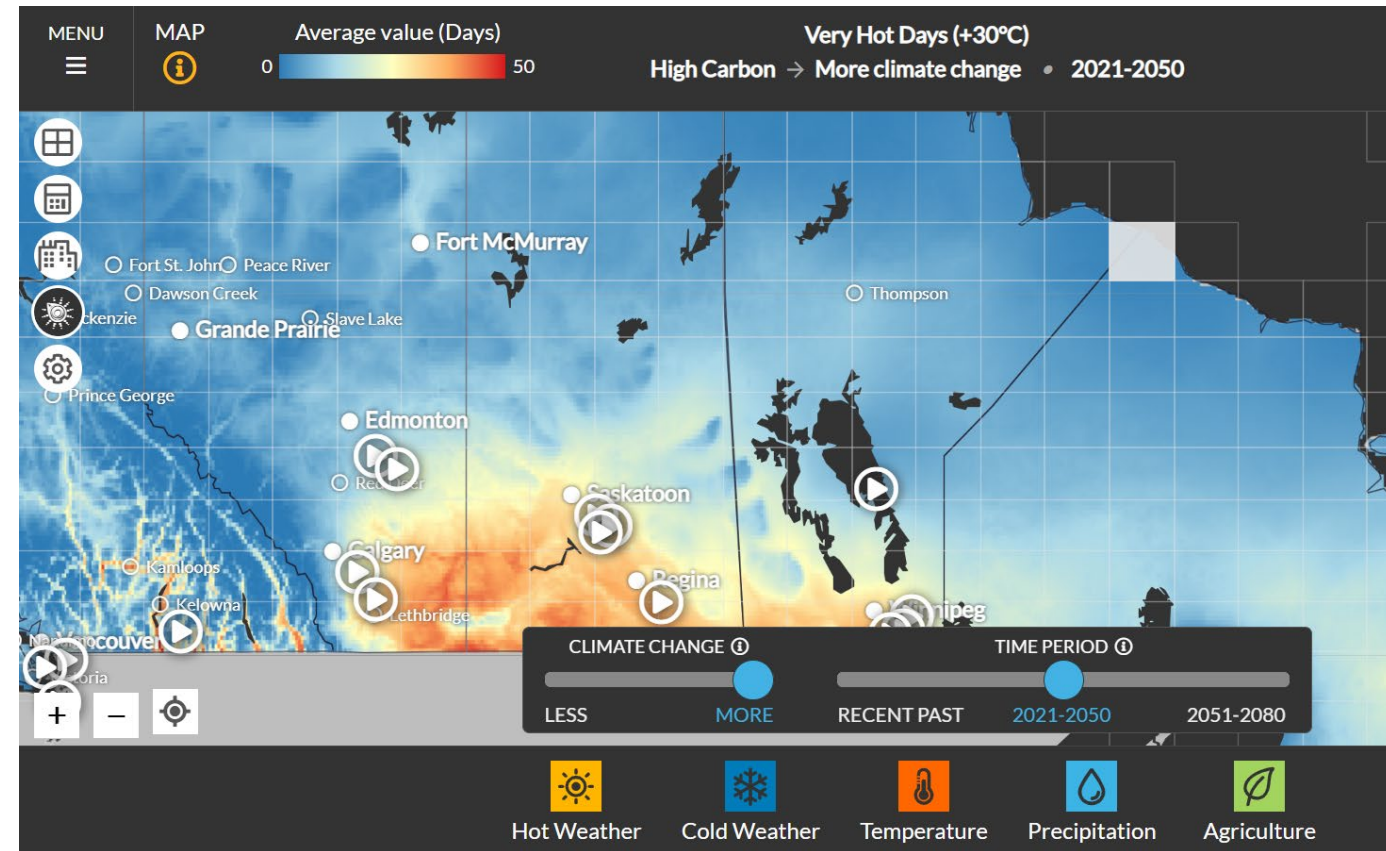
- Very hot days (+30C)
- Precipitation
- Mean temperature during summer
- Dry days
- Warmest maximum temperature



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# Climate Atlas of Canada

- National data portal and interactive tool which combines climate science, mapping, and storytelling
- Allows users to explore projected climate changes for many variables and indices





## Activity 2

Identify how your climate is projected to change

1. Look at climate reports and identify relevant climate variables
2. Identify how climate trends are projected to change with selected variables
3. Record results

**Goal:** Demonstrate how to use climate variables to understand how your community is expected to change over the century



# Example Variables

Hazard	Variables
Extreme Heat	Very hot days (+30C) Extremely hot days (+32C) Warmest maximum temperature
Wildfire	Summer Precipitation Mean Summer temperature Very hot days (+30C) Extremely hot days (+32C) Extremely hot days (+34C)
Extreme Rainfall	Precipitation (annual) Wet days (>10 mm) Max-1 day precipitation Max-5 day precipitation
Extreme Cold	Winter Days (-15 C) Very Cold Days (-30 C) Coldest Minimum Temperature



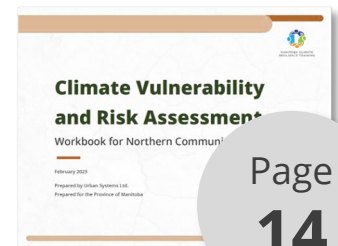
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Activity 1	Activity 2		
Hazard	Variable	Near Term Projected Change	Long-Term Projected Change
Example: Wildfire	Very Hot Days (+30C)	- Very hot days (+30C) are to increase to 8 by 2050	- Very hot days (+30C) are to increase to 19 by 2080

[illegible]



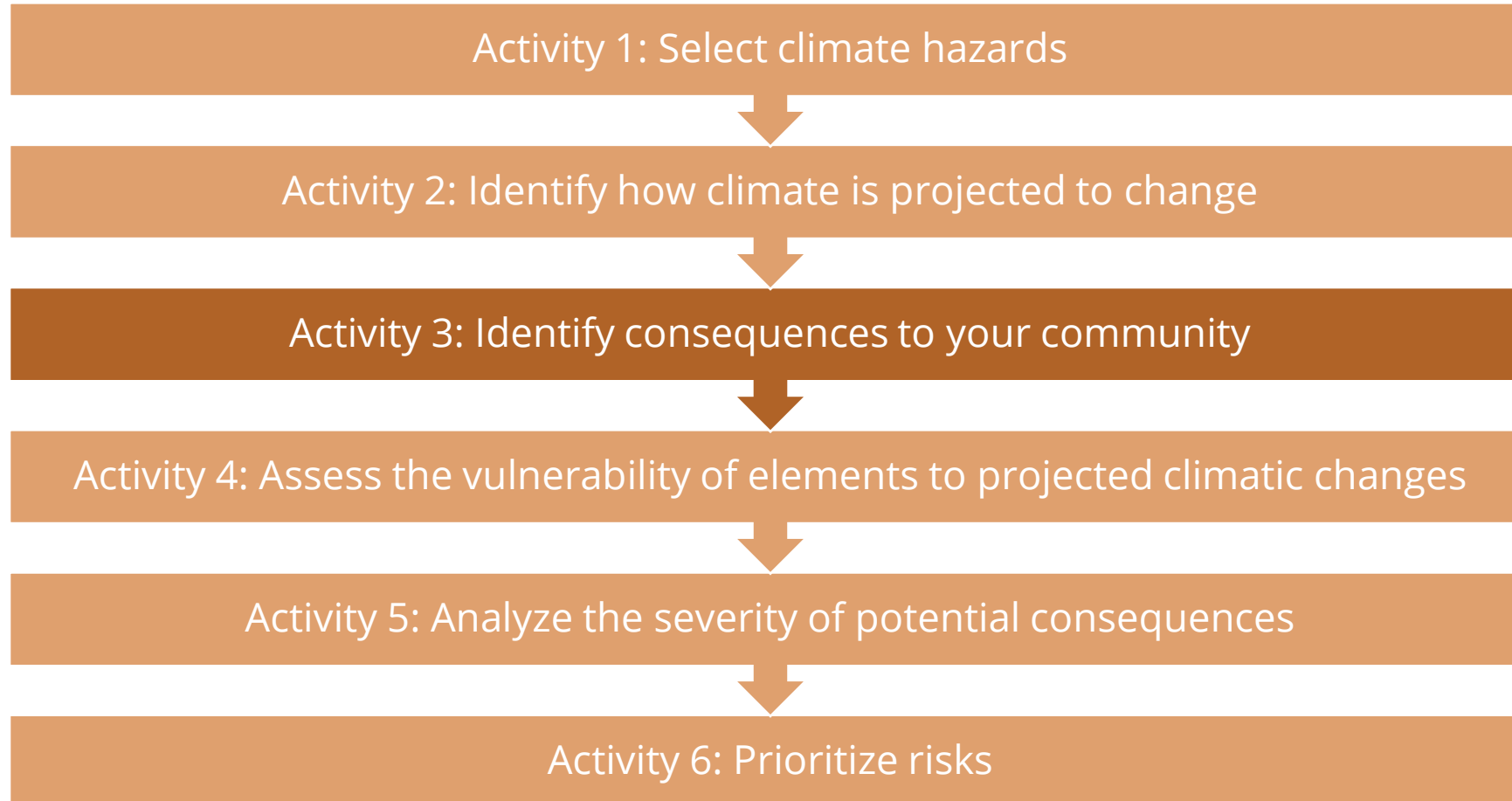
CLIMATE HAZARD	CURRENT TREND(S)	NEAR TERM PROJECTED CHANGES (2021 – 2050)	LONG-TERM PROJECTED CHANGES (2051 – 2080)
Example: Wildfire	Community members, historical climate and weather data have observed an increase in the frequency and magnitude of wildfires.	<ul style="list-style-type: none"> <li>- Precipitation during summer is to decrease by 11%</li> <li>- Very hot days (+30C) are to increase to 8 by 2050</li> <li>- Very hot days (+30C) are to increase to 12 by 2080</li> </ul>	<ul style="list-style-type: none"> <li>- Mean temperature during summer is expected to increase to 30 C by 2080</li> <li>- Extremely hot days (+34C) are to increase to 14 per year by 2080</li> </ul>





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# Climate Risk Assessments



# Climate Impacts and Consequences

## Climate Hazard

(e.g. Wildfire)



## Projected Changes

(e.g. increasing summer temperature, decreasing precipitation)



## Climate Impacts

(e.g. infrastructure damage, economic loss)



## Potential Consequences

(e.g. biodiversity loss, increased financial burden)





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# Activity 3

## Identify consequences to your community

### Consequence Considerations:

- Public health and safety
- Food security
- Buildings and infrastructure
- Local economy
- Financial and legal
- Natural environment
- Local service and operations

**Goal:** Help you identify how the climate hazards are expected to impact your community



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# Tips for developing an inventory of consequences

Questions to keep in mind:

1. What occurs because of a specific hazard?
2. What are the effects of these hazards on human and natural systems?

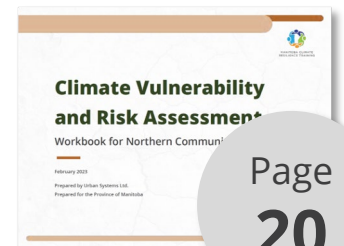


Activity 1		Activity 2		
Hazard		Variable	Near Term Projected Change	Long-Term Projected Change
Example: Wildfire		Very Hot Days (+30C)	- Very hot days (+30C) are to increase to 8 by 2050	- Very hot days (+30C) are to increase to 19 by 2080

Activity 3		Activity 4				Activity 5	Activity 6	
Consideration	Climate Consequences	Sensitivity		Adaptive Capacity		Vulnerability Rating	Consequence Level	Risk Level
		Description	Rating	Description	Rating			
Buildings and Infrastructure	Wildfire may cause damage to community buildings (Town Hall, Fire Station #2 etc) and affect critical services like transportation	The Town Hall is particularly susceptible to this hazard as it is fenced in by wildland vegetation on two sides. River Road is sensitive to wildfire since it is one of the only 2 emergency access routes for a subdivision and wildfires in the proximity may cut off evacuation efforts.	2	There is a wildfire evacuation plan in place that designates Pineview Pass as an alternate emergency evacuation route in case River Road is cut off.	2	High	Major - 3	High



CLIMATE HAZARD	ELEMENT(S)	CLIMATE RISK (CONSEQUENCES)
Wildfire	Local Economy	Losses incurred due to wildfire will place an increased financial burden on business owners
	Buildings and Infrastructure	Wildfire may cause damage to community buildings (Town Hall, Fire Station #2 etc) and affect critical services like transportation
	Natural Environment	Wildfire may burn down the natural environment of the community, affect local biodiversity





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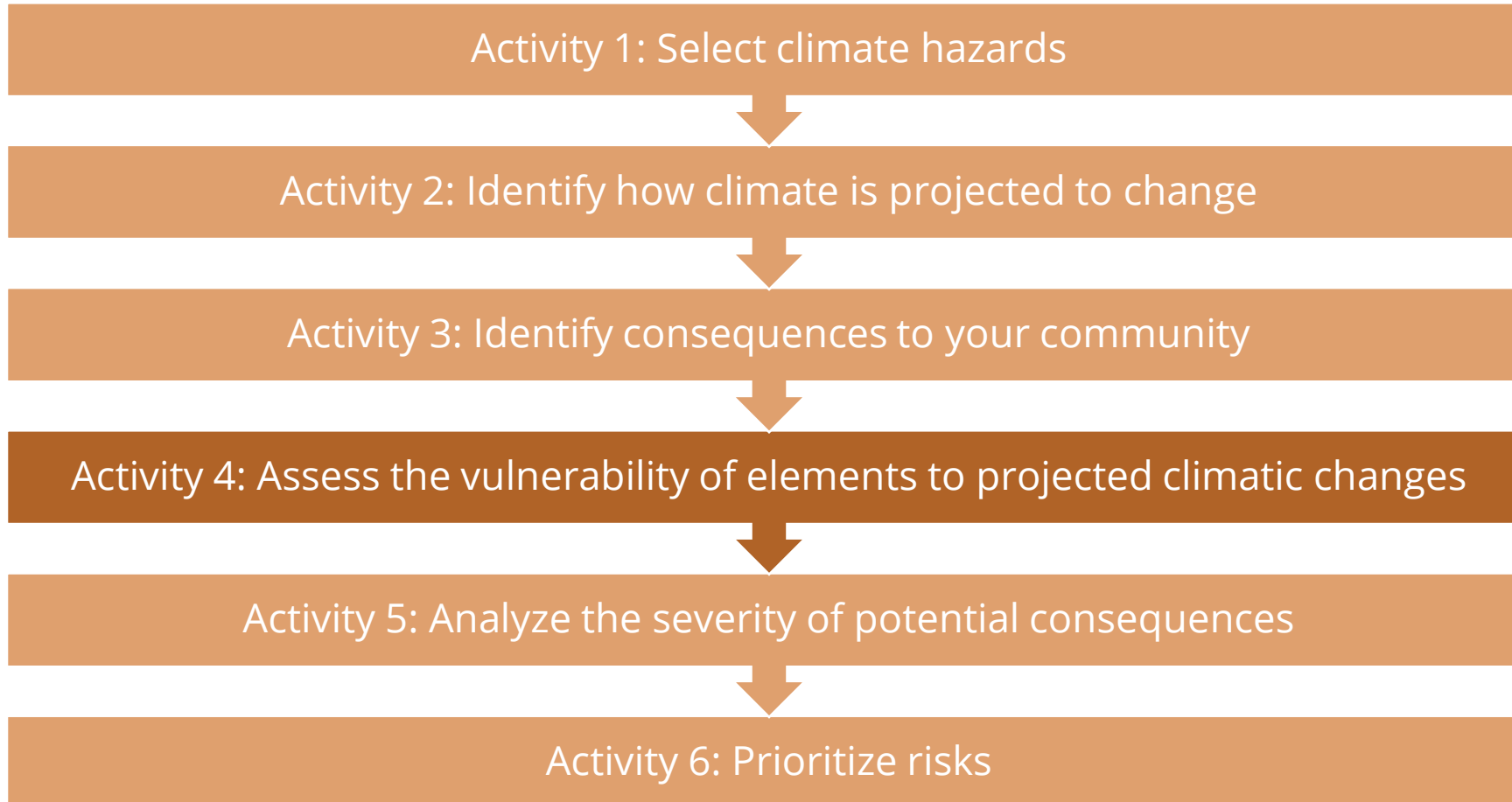
# BREAK





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# Climate Risk Assessments





## **Sensitivity**

The degree to which an element could be affected by a specific climate-related hazard.

## **+ Adaptive Capacity**

How easily an element at risk can adapt when exposed to climate hazard(s).



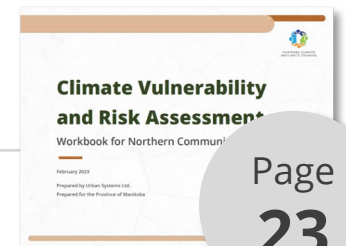
## **Vulnerability**



# Sensitivity

**If the impact occurs, will it affect functionality (the ability of the system / asset / group of people to serve its purpose or provide the use it is designed for)?**

SENSITIVITY RATING		DEFINITION
HIGH	3	Functionality will get worse
MEDIUM	2	Functionality is likely to get worse
LOW	1	Functionality will stay the same

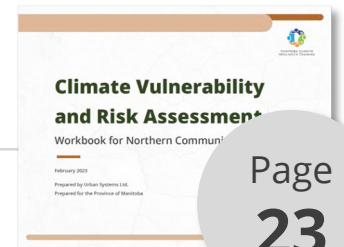




# Adaptive Capacity

**Can the system / asset / group of people adjust to the projected impact with minimal cost and disruption?**

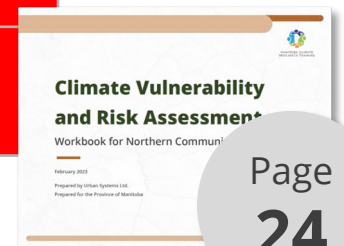
ADAPTIVE CAPACITY RATING		DEFINITION
HIGH	3	Will require substantial costs and intervention
MEDIUM	2	Will require some costs and intervention
LOW	1	Little to no costs or intervention necessary





# Vulnerability Scale

	Sensitivity	Low	Medium	High
Adaptive Capacity		1	2	3
Low	1	V1	V2	V3
Medium	2	V2	V3	V4
High	3	V3	V3	V4





# Vulnerability

VULNERABILITY RATING		DEFINITION
EXTREME	4	Extremely likely to be adversely affected, because the element, sector, group or asset is highly sensitive to a given hazard and has a low capacity to adapt.
HIGH	3	Highly likely to be adversely affected, because the element, sector, group or asset is highly sensitive to a given hazard and has a low capacity to adapt.
MODERATE	2	Moderately likely to be adversely affected, because the element, sector, group or asset is moderately sensitive to a given hazard and has a low or moderate capacity to adapt.
LOW	1	Low likelihood of being adversely affected, because the element, sector, group or asset has low sensitivity to a given hazard and has a high capacity to adapt.



# Activity 4

Assess the vulnerability of elements to projected climatic changes

Questions to keep in mind:

1. How sensitive are community activities, assets, and services to changes in climate and changes in climate hazards?
2. What risk management measures are currently in place?
3. What is your community's ability to adjust, or take advantage of changes in climate and changes in climate hazards?

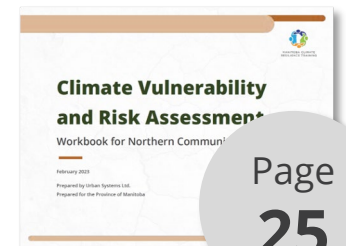
**Goal:** Help you understand your community's sensitivity and capacity to adapt to climate hazards



Activity 3		Activity 4				Activity 5	Activity 6			
Consideration	Climate Consequences	Sensitivity		Adaptive Capacity		Vulnerability Rating	Consequence Level	Risk Level		
		Description	Rating	Description	Rating					
		Buildings and Infrastructure	Wildfire may cause damage to community buildings (Town Hall, Fire Station #2 etc) and affect critical services like transportation	The Town Hall is particularly susceptible to this hazard as it is fenced in by wildland vegetation on two sides River Road is sensitive to wildfire since it is one of the only 2 emergency access route for a subdevelopment and wildfires in the proximity may cut off evacuation efforts	2	There is a wildfire evacuation plan in place that designates Pineview Pass as an alternate emergency evacuation route in case River Road is cut off.	2	High	Major - 3	High



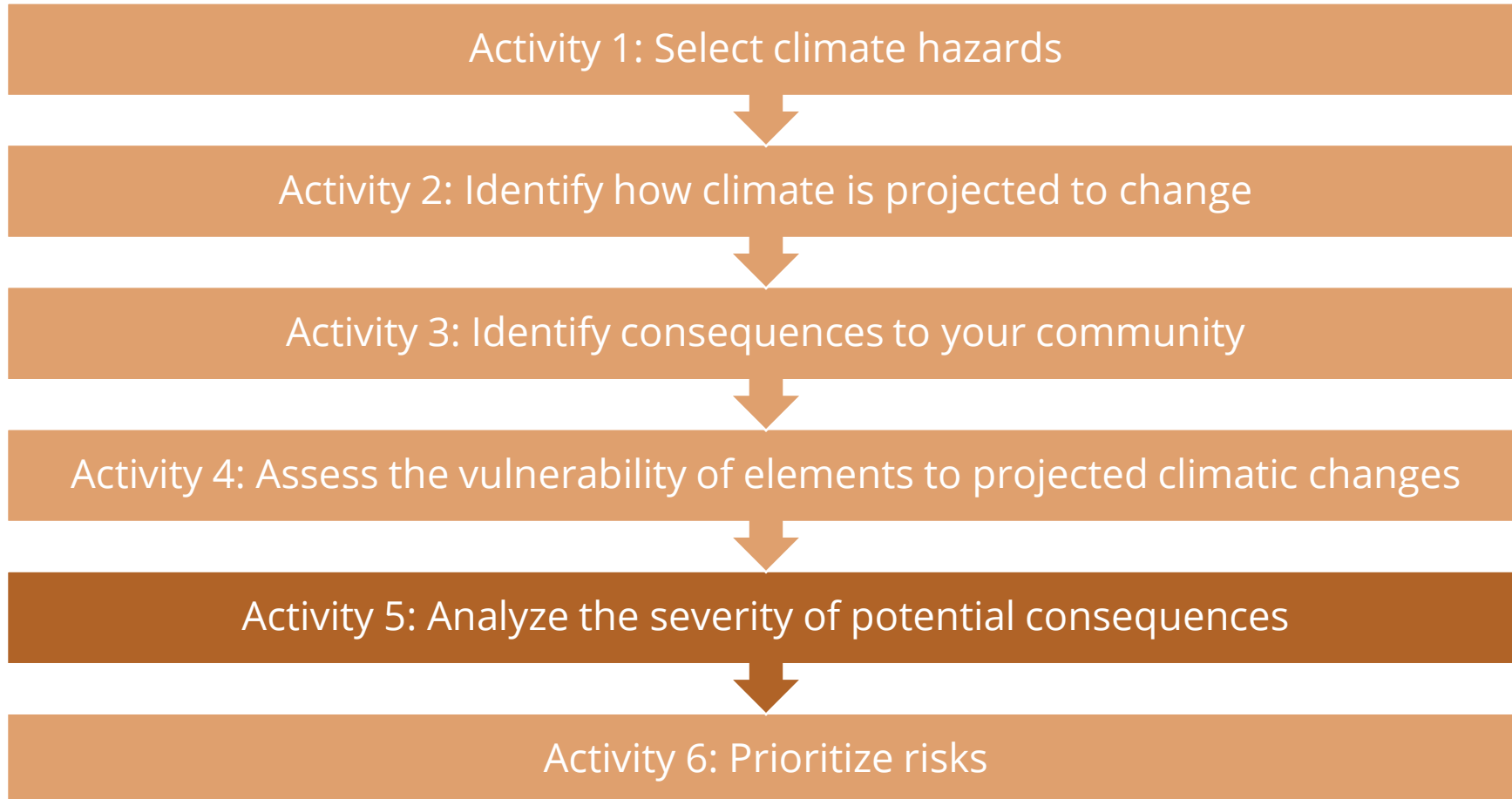
ELEMENT AT RISK							
CLIMATE HAZARD	PROJECTED	CONSEQUENCES	SENSITIVITY	SENSITIVITY RATING	ADAPTIVE CAPACITY	ADAPTIVE CAPACITY RATING	VULNERABILITY RATING
wildfire	Precipitation during summer is to decrease by 11%, Very hot days (+30C) are to increase to 8 by 2050 and increase to 13 by 2080	Wildfire may cause damage to community buildings (Town Hall, Fire Station #2 etc) and affect critical services like transportation or emergency access routes	The Town Hall is particularly susceptible to this hazard as it is fenced in by wildland vegetation on two sides River Road is sensitive to wildfire since it is one of the only 2 emergency access route for a subdevelopment and wildfires in the proximity may cut off evacuation efforts	2	There is a wildfire evacuation plan in place that designates Pineview Pass as an alternate emergency evacuation route in case River Road is cut off.	2	HIGH





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# Climate Risk Assessments





# Consequence Rating

CONSEQUENCE RATING		DEFINITION
EXTREME	4	Extreme impacts at the local and regional scale (non-acceptable) of very high importance to local operations and agencies to urgently address through adaptation.
MAJOR	3	Major impacts at the local and regional scale that are of high importance to local operations and agencies national agencies to quickly address through strategic adaptation actions.
MODERATE	2	Moderate impacts at the local and regional scale that are somewhat of importance to local operations and agencies to address through low cost or no-regret adaptation actions.
MINOR	1	No significant change in impact on the community, its people, and assets, and can be handled through business-as-usual processes or some local or regional impacts, with no specialised management required.



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# Activity 5

Analyze the severity of potential consequences identified earlier for each climate hazard and assign consequence ratings

EXTREME	4
MAJOR	3
MODERATE	2
MINOR	1

**Goal:** Help you understand the severity of the potential consequences

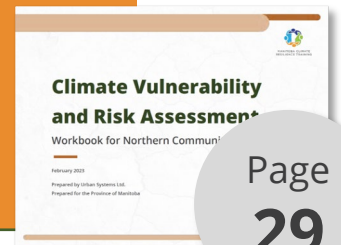




Activity 3		Activity 4				Activity 5	Activity 6	
Consideration	Climate Consequences	Sensitivity		Adaptive Capacity		Vulnerability Rating	Consequence Level	Risk Level
		Description	Rating	Description	Rating			
		The Town Hall is particularly susceptible to this hazard as it is fenced in by wildland vegetation on two sides. River Road is sensitive to wildfire since it is one of the only 2 emergency access route for a subdevelopment and wildfires in the proximity may cut off evacuation efforts.	2	There is a wildfire evacuation plan in place that designates Pineview Pass as an alternate emergency evacuation route in case River Road is cut off.	2			



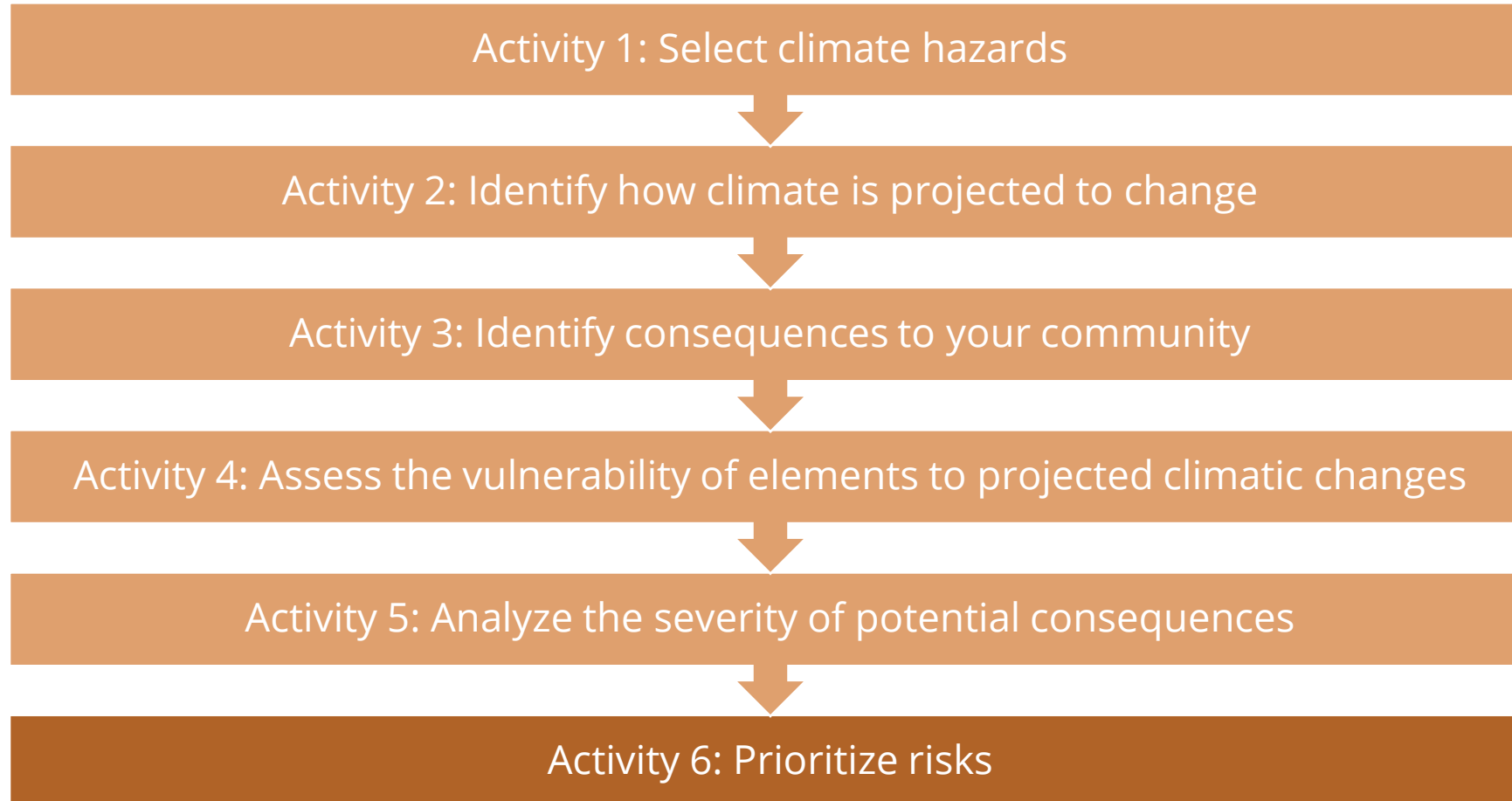
CLIMATE HAZARD	PROJECTED	CONSEQUENCES	SENSITIVITY	SENSITIVITY RATING	ADAPTIVE CAPACITY	ADAPTIVE CAPACITY RATING	VULNERABILITY RATING	CONSEQUENCE LEVEL	CONSEQUENCE RATING
Wildfire	Precipitation during summer is to decrease by 11%, Very hot days (+30C) are to increase to 8 by 2050 and increase to 13 by 2080	Wildfire may cause damage to community buildings (Town Hall, Fire Station #2 etc) and affect critical services like transportation or emergency access routes	The Town Hall is particularly susceptible to this hazard as it is fenced in by wildland vegetation on two sides River Road is sensitive to wildfire since it is one of the only 2 emergency access route for a subdevelopment and wildfires in the proximity may cut off evacuation efforts	2	There is a wildfire evacuation plan in place that designates Pineview Pass as an alternate emergency evacuation route in case River Road is cut off.	2	HIGH	MAJOR	3





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# Climate Risk Assessments



# Activity 6

Prioritize risks in order to decide which risks to take forward into adaptation planning and response

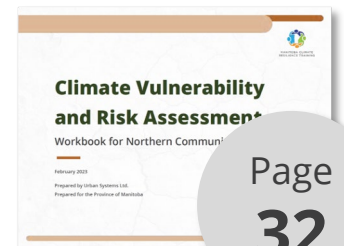
HIGH RISK	Immediate actions must be developed.
MEDIUM RISK	Consider “low cost” and “no regret” adaptation options.
LOW RISK	Future action (to be monitored) either because of change in climate or change in community.
ACCEPTABLE RISK	More information needed.

**Goal:** Help you prioritize risks in order to start identifying adaptation actions

[illegible]



ELEMENT AT RISK	BUILDINGS AND INFRASTRUCTURE						
CLIMATE HAZARD	PROJECTED	CONSEQUENCES	SENSITIVITY	ADAPTIVE CAPACITY	VULNERABILITY RATING	CONSEQUENCE LEVEL	RISK LEVEL
Example: Wildfire	Precipitation during summer is to decrease by 11%, Very hot days (+30C) are to increase to 8 by 2050	Wildfire may cause damage to community buildings (Town Hall, Fire Station #2 etc) and affect critical services like transportation or emergency access routes	The Town Hall is particularly susceptible to this hazard as it is fenced in by wildland vegetation on two sides  River Road is sensitive to wildfire since it is one of the only 2 emergency access route for a subdevelopment and wildfires in the proximity may cut off evacuation efforts	There is a wildfire evacuation plan in place that designates Pineview Pass as an alternate emergency evacuation route in case River Road is cut off.	HIGH	MAJOR	HIGH RISK







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# ADAPTATION MEASURES



# Potential Adaptation Measures

ADAPTATION MEASURES	WILDFIRE EXAMPLE
PHYSICAL INTERVENTIONS	Construction of firebreaks like fire-resistant chain-link fences
POLICY INTERVENTIONS	Fuel reduction laws, Fire prevention laws such as limits on firepits
HUMAN RESOURCES-FOCUSED INTERVENTIONS	Educating community members about the dangers of wildfire and how to avoid them
OPERATIONS AND MAINTENANCE-FOCUSED INTERVENTIONS	Ensuring FireSmart practices, using fire resistant materials for construction
NATURE-BASED SOLUTIONS	Restoration of natural firebreaks such as wetlands
INFORMATION-RELATED INTERVENTIONS	Public awareness campaigns regarding wildfire, easy to adopt behavioral changes to minimize chances of wildfire
RESEARCH-RELATED INTERVENTIONS	Understanding how indigenous fire management and traditional knowledge can be used to reduce consequences



# Activity 7 (Optional)

Identify potential adaptation measures for each of the prioritized climate risks identified in previous steps

Types of adaptation measures:

- Physical
- Policy
- Human Resources Focused
- Nature-Based Solutions
- Operations and Maintenance Focused
- Information Related
- Research Related



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# Extreme Heat Adaptation Measures

- Develop a public awareness campaign to provide education on being safe during a heat event
- Supply heat-smart, lightweight clothing and personal protective equipment to staff working outdoors
- Develop an Extreme Heat Response Strategy that includes information on cooling spaces that can serve community members during heat waves
- Conduct urban heat island effect assessment and identify priority areas and mitigations
- Explore ways to encourage the use of heat pumps, and to reduce cooling demand in new construction.



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# Wildfire Adaptation Measures

- Identify and develop guidelines for fuel management zones within high-use parks
- Develop a community education program on park use fire safety and awareness
- Expand and undertake education and fire prevention programs, including FireSmart, to reduce occurrences of human-caused fires.
- Prepare a water use strategy for combating wildfires.
- Prepare a fuels management plan and program for nearby watersheds.



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# Extreme Rainfall Adaptation Measures

- Establish a Flood Management Bylaw
- Establish a monitoring system for current and future precipitation intensities, reservoir levels, river flows/levels and sea level rise
- Increase use of green infrastructure on public and private property.
- Require that new buildings within the floodplain areas are adequately flood-proofed to an established standard
- Integrate wetlands into the urban environment





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# Extreme Cold Adaptation Measures

- Develop a power outage plan that includes education for people so that they know what to do in the case of a long-term power outage, where building heating equipment has the potential to breakdown.
- Develop a facility strategy that requires the consideration of passive heating systems in all new buildings.
- Increase public education on safety during ice events
- Adjust road clearing priorities in terms of transportation hierarchy to ensure pedestrian safety during snowfall/ice events



**HAZARD:** Increasing Risk of Wildfire Due to Decreasing Summer Precipitation and Increasing Summer Temperatures

**PRIORITIZED CONSEQUENCE**

**POTENTIAL ADAPTATION ACTION**

Building and Infrastructure

Have firesmart practices adopted throughout community, use fire resistant materials for new construction, have a firefighting plan, install sprinkler systems, have emergency evacuation plans

Local Economy

Ensure rebuilding policies are in place, make sure reconstruction and reimbursement channels are easy to access for affected parties, consider public education campaigns

Natural Environment

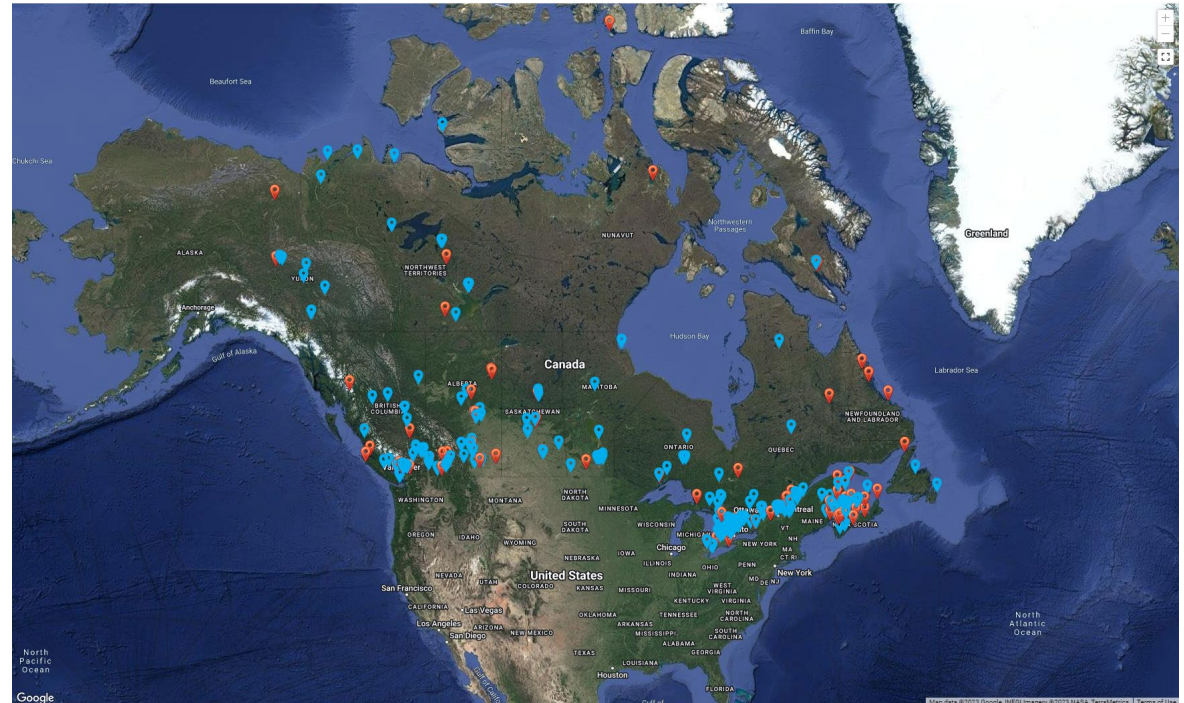
Consider having natural firebreaks for biodiverse ecosystems (restoring wetlands), have firefighting plans in place for woodland wildfires

**HAZARD:**

**PRIORITIZED CONSEQUENCE**

**POTENTIAL ADAPTATION ACTION**


# Climate Adaptation Case Study



- Map of Adaptation Actions includes case studies from across Canada
- Available at:  
[www.changingclimate.ca/map/](http://www.changingclimate.ca/map/)



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# Funding Opportunities

## Climate Change Adaptation Program

- Funder: Natural Resources Canada
- Deadline: **September 22, 2023**
- Program aims to:
  - Support decision-makers in identifying and implementing adaptation actions;
  - Enhance adaptation knowledge and skills among Canada's workforce; and
  - Increase access to climate change adaptation tools and resources.





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# Funding Opportunities

## Disaster Mitigation and Adaptation Fund

- Funder: Infrastructure Canada
- Deadline: **Currently Closed**
- Eligible infrastructure projects include new construction of public infrastructure and/or modification of existing public infrastructure that prevent, mitigate or protect against the impacts of climate change



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# Funding Opportunities

## Conservation and Climate Fund

- Funder: Province of Manitoba
- Deadline: **Currently Closed**
- Purpose of the Fund is to support projects occurring in Manitoba that incorporate actions to address and adapt to climate change and protect the environment



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# Funding Opportunities

## Building Sustainable Communities

- Funder: Province of Manitoba
- Deadline: **Currently Closed**
- Eligible community development projects include:
  - planning activities
  - organizational capacity building
  - community or regional initiatives
  - community, culture or recreation capital infrastructure projects





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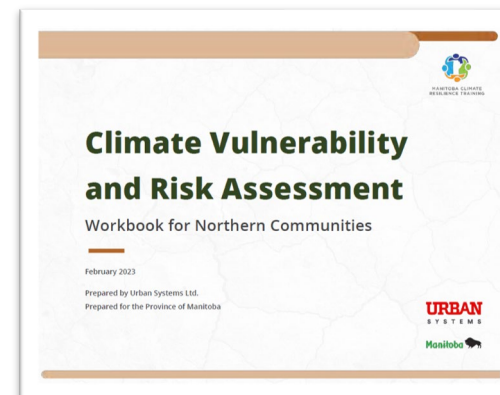
# CONCLUSION



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# Follow-Up Services

We can provide support with developing your own Vulnerability and Risk Assessment using the workbook template





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**Thank You!**

Please complete an Exit  
Survey and leave the  
worksheets behind





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# THANK YOU!