
CLIMATE RESILIENCE FOR ALBERTA MUNICIPALITIES



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INTRODUCTION

On March 11 in Edmonton and March 14 in Calgary the Municipal Climate Change Action Centre (MCCAC) and C-3 hosted **Climate Resilience for Alberta Municipalities**. Focused on building community resilience to future climate impacts, the workshop was attended by representatives from municipal and provincial government, businesses, and non-governmental organizations.

The workshop objectives were to build capacity and raise awareness of:

- climate trends and projections and why they might matter to municipalities;
- how to effectively plan for the threats and opportunities of a changing climate; and
- how municipalities in Alberta are building climate resilience.

WHY BUILD RESILIENCE?

The climate is changing and will continue to change in the future. On a global scale, the number of natural disasters such as winter storms, severe storms, floods, and wildfires have been occurring with increasing frequency. This trend is especially pronounced in Alberta, where six out of seven of the costliest natural disasters in Canadian history have taken place.



In addition to an increase in the number of extreme events, projections for Alberta call for increases in mean temperature, increases in annual precipitation, and changes in the seasonal pattern of precipitation. These changes will result in a heightened risk of adverse impacts to municipal infrastructure and services, the local economy, private property, and public safety. It is therefore imperative that Alberta municipalities build resilience to adapt to and take advantage of opportunities related to a changing climate.



WHAT DO WE MEAN BY A CLIMATE RESILIENT MUNICIPALITY?

In response to a climate event, an **unprepared municipality** will typically experience:

- impaired service levels before recovery actions are initiated;
- slow and costly recovery; and
- reduced service levels post-event.

In contrast, a **resilient municipality** will typically experience lower residual costs related to the climate event, and may also experience benefits as a result of building resilience and adapting to climate change. The response of a resilient municipality will typically be characterized by:

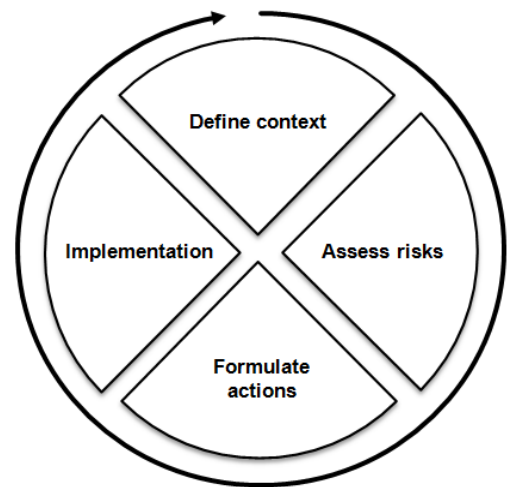
- reduced exposure and severity of climate impact;
- shorter duration of impaired service levels;
- faster and more cost-efficient recovery; and
- restored service levels post-event.

HOW TO BUILD RESILIENCE

Resilience planning is an iterative process that necessitates a continuous cycle of planning, implementation, monitoring, and review. In addition, resilience planning should not be considered in isolation – it should be an integral part of municipal strategic planning.

The generic approach to building resiliency covers four key areas:

1. **Define context:** define scope, identify relevant stakeholders, analyze climate data for your region, and develop an evaluation framework.
2. **Assess risks:** identify, analyse, and evaluate climate risks.
3. **Formulate actions:** set resiliency goals, identify adaptation actions, and prioritize actions.
4. **Implementation:** implement your adaptation action plan, and monitor, evaluate, and review the plan.



CLIMATE TRENDS AND PROJECTIONS

At each workshop, Dr. Mel Reasoner presented climate trends and future projections to 2050. These projections are summarized in Table 1.

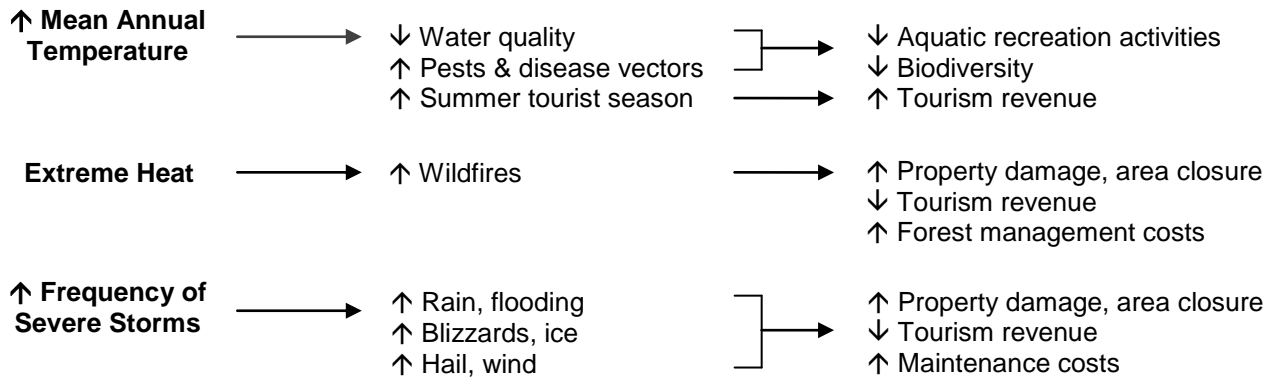
Table 1: Climate projections for southern and northern Alberta by 2050.

Climate Element	Projections by 2050 Northern Alberta	Projections by 2050 Southern Alberta
Average temperature – Annual	+ 2.2°C	+ 2.1°C
Average precipitation – Annual	+ 7.0%	+ 5%
Average temperature – Summer	+ 1.9°C	+ 2.4°C
Average precipitation – Summer	+ 2.0%	- 1.0%
Average temperature – Winter	+ 3.0°C	+ 2.3°C
Average precipitation – Winter	+ 12.0%	+ 10.0%
Average precipitation – Spring	+ 9.0%	+ 9.0%
Average snowfall – Spring	- 11.0%	-12.0%
Heating degree days – Annual	- 774 days	- 706 days
Cooling degree days – Annual	+ 29 days	+ 41 days
Growing degree days – Annual	+ 267 days	+ 343 days
Frost free days - Annual	+ 18 days	+ 20 days

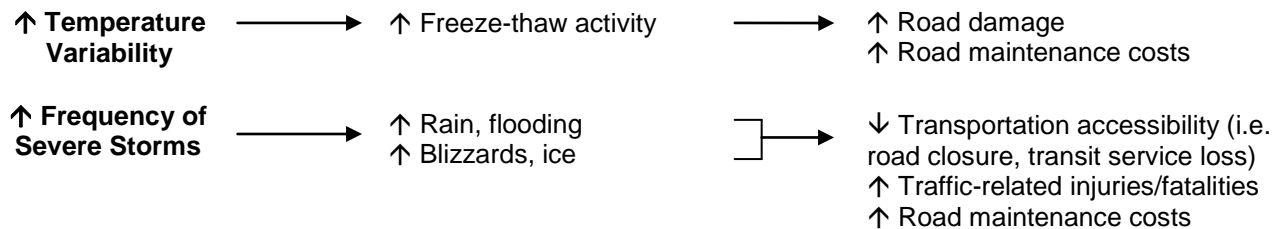
CLIMATE IMPACTS TODAY AND TOMORROW

Workshop participants were asked to identify positive and negative climate impacts on five areas: tourism and recreation, transportation, water resources, agriculture, and the built environment.

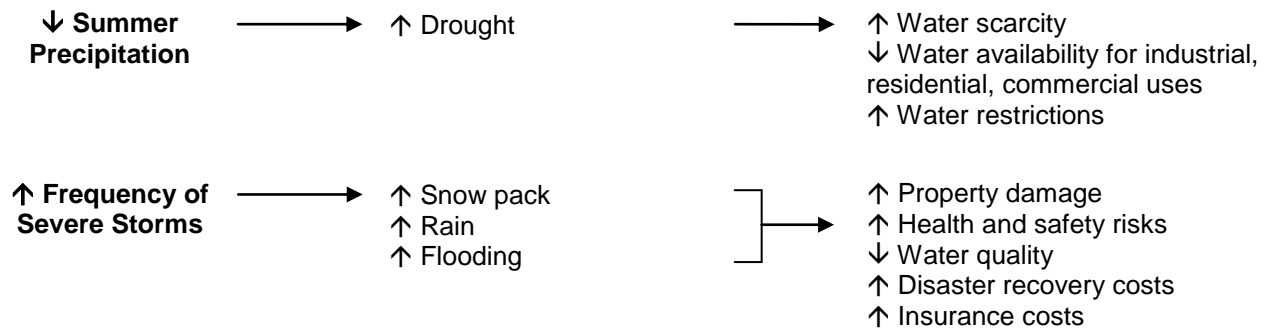
Tourism and Recreation



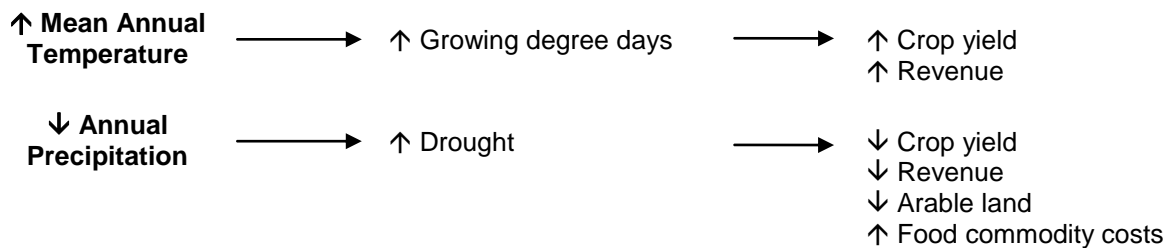
Transportation

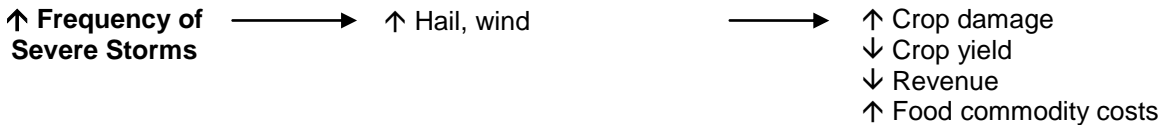


Water Resources

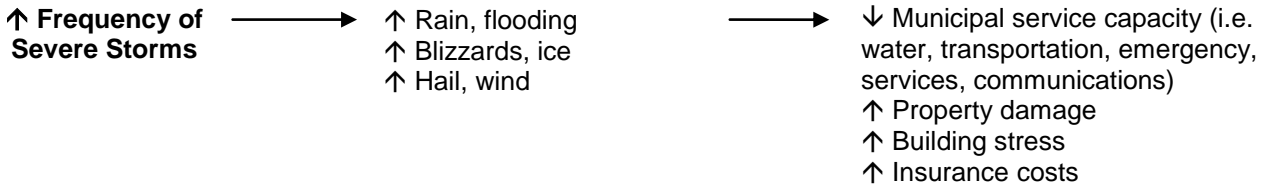
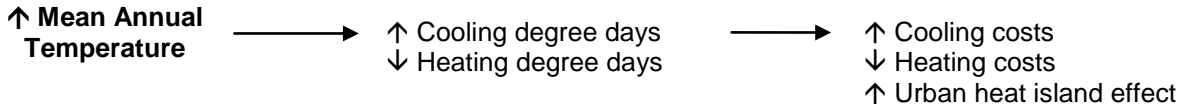


Agriculture and Food





Built Environment



PRIORITIZING RISKS AND OPPORTUNITIES

Participants were asked to identify the three greatest climate risks to their community, taking into consideration the severity of consequence and likelihood of the risk event occurring. Results from the Edmonton and Calgary workshops are aggregated in Table 2.

Table 2: Participant identification of priority climate risks and opportunities.

Climate Risk / Opportunity	# of Votes
Water scarcity	★★★★★★★★★★★★★★★★★★★★
Stormwater flooding	★★★★★★★★★★★★★★★★★★★★
River flooding	★★★★★★★★★★★★★★★★
Utilities & transportation service loss due to winter storms	★★★★★★★★
Infrastructure damage due to hail and wind storms	★★★★★★★★
Biodiversity loss	★★★★★★
Wildfires	★★★★★★
Water quality degradation	★★★★★★
Increased pests, disease, invasives	★★
Infrastructure damage due to freeze-thaw activity	★
Reduced crop yield	★
Increased energy demand	★
Urban heat island effect	
Reduced tourism opportunities	
New tourism opportunities	

ACTION PLANNING

Action planning involves identifying and implementing actions that moderate risk or exploit beneficial opportunities in response to future climatic conditions. When prioritizing potential adaptation actions one should consider if they are consistent with other policies and programs, technically feasible, affordable, effective, acceptable, equitable, regret vs. no regret, and hard vs. soft actions.



Soft and hard adaptation actions may include:

Soft:

- Information: updated mapping of who is at risk, early warning systems, public education
- Preparedness: plans for clearing flood debris, helping people get back on their feet
- Planning: controlling (re)development in risk-prone areas
- Managed retreat: policies to remove or exchange developments in risk-prone areas for less sensitive land uses
- Risk transfer: purchasing insurance

Hard:

- Infrastructure: constructing, upgrading and maintaining flood defenses, pumps, enhancing wetlands, restoring natural watercourses, constructing reservoirs
- Property-level measures: installing flood mitigation measures on private property

Participants brainstormed adaptation actions that could mitigate the priority risks identified above and prioritized them to determine the top three actions for implementation. The results are summarized in Table 3.

Table 3: Priority adaptation actions to mitigate climate risks.

Climate Risk	Adaptation Actions Edmonton	Adaptation Actions Calgary
Water Scarcity	<ol style="list-style-type: none"> 1. Drought management plans 2. Water conservation (i.e. pricing, reuse, restrictions) 3. Construct reservoirs 	<ol style="list-style-type: none"> 1. Remove regulatory barriers to water reuse 2. Xeriscaping 3. Permanent water restrictions
River Flooding	<ol style="list-style-type: none"> 1. Flood response planning 2. Improve forecasting 3. Enhance flood mapping 	<ol style="list-style-type: none"> 1. Systematic infrastructure and building design 2. Regional mitigation planning 3. Strengthen EMS
Stormwater Flooding	<ol style="list-style-type: none"> 1. Low impact development 2. Wetland conservation 3. Infrastructure maintenance 	
Biodiversity Loss		<ol style="list-style-type: none"> 1. Education and awareness 2. Natural areas conservation 3. Inventorying and monitoring

ALBERTA MUNICIPALITIES BUILDING RESILIENCE

Alberta municipalities are at the forefront of extreme weather and climate variability. The municipalities below are demonstrating leadership by building resilience in their communities.

City of Leduc

Leduc is developing a weather and climate readiness plan, recognizing that adaptation is critical given that even with emission reductions the climate is changing. They are currently working with experts to identify and prioritize risks impacting municipal services. The risk analysis results will be used to determine mitigation strategies to develop an action plan for the municipality.

City of Edmonton

Edmonton's Energy Transition Strategy lays out what must occur to reduce the City's dependence on fossil fuels through energy conservation, carbon reduction, and resilience planning. Key opportunities to build resilience as part of their energy transition include: renewable energy generation, district energy, drainage upgrades, infill and transit oriented development, and encouraging self-sufficiency for businesses and residents in response to extreme weather.

City of Red Deer

Red Deer began working on their corporate climate change adaptation plan in 2011 and its first phase was accepted by Council on March 17, 2014. The purpose of the plan is to assess climate risks in order to develop appropriate management responses to protect natural and built infrastructure, corporate assets, and municipal services. Red Deer's Climate Change Adaptation Plan is the first of its kind to be adopted by an Alberta municipality.

Town of Canmore

In response to the 2013 Alberta floods, the Town of Canmore developed the Mountain Creek Hazard Mitigation Program. The program involved extensive analysis of Mountain Creek flood hazards. To address these risks, both active and passive flood mitigation actions were implemented including: the installation of debris nets, the use of articulated concrete mats to prevent erosion, and improved weather monitoring. In addition to addressing immediate flood risks, Canmore is in the initial stages of developing a community-wide adaptation plan.

MOVING FORWARD

The workshops demonstrated that there is significant interest in climate adaptation and resilience planning at the municipal level in Alberta. However, there is a need for increased support to help communities understand and build resilience to the risks and opportunities associated with a changing climate. To address this gap, participants were asked: "What support do you need to begin or continue climate adaptation planning in your community?" Responses included:

- education;
- information on regional climate trends, local impacts, and opportunities;
- capacity building support;
- third party expertise;
- performance incentives; and
- enabling legislative change.