Tools for Municipal Adaptation Planning: The Climate Atlas of Canada

ClimateWest Building Prairie Resilience

March 3, 2022

Today's Agenda

- 1. Who is ClimateWest
- 2. The Climate Data Guide
- 3. Speaker Introductions
- 4. Introduction to the Climate Atlas of Canada
- 5. Case Study: All One Sky
- 6. Q&A
- 7. Closing Remarks



Housekeeping

This webinar is being recorded.

Have a question during the session?

Drop it in the chat box and we'll do our best to address it. Be sure to register for Part 2 of this webinar series taking place on March 15!

Register at: climatewest.ca/events After the event, keep an eye out for an email containing the webinar recording link!

Meet ClimateWest



A network-based, non-profit and regional hub for climate services in Manitoba, Saskatchewan and Alberta.



Our mission is to empower people, communities, businesses and governments to address climate risk through planning and action across the Prairie region.



ClimateWest is comprised of 3 founding partners:

- Prairie Adaptation Research Collaborative (PARC)
- Prairie Climate Centre (PCC)
- International Institute for Sustainable Development (IISD)



The Climate Data Guide



- Overview of credible resources that offer free access to climate data about the future
- Prairie-focused
- Provides the basics for how climate information and data can be used in risk management and adaptation planning
- Includes cheat sheets to help you determine your data needs

Matthew Loxley

Matt is a Research Associate at the Prairie Climate Centre (PCC) based in Winnipeg.

His work at the PCC revolves around climate model data and adaptation. He also contributes compelling data visualizations and crafting accessible reports about climate adaptation to ClimateWest. Matt holds a Bachelor of Science (Ag.Env.Sc.) in Renewable Resource Management from McGill University and a Master of Environmental Science in Climate Change Impact Assessment from the University of Toronto.



Sarah Prescott

Sarah is a Project Manager for climate mitigation and adaptation projects with the All One Sky Foundation.

Recently she has been applying her research and analytical skills towards deciding what type of baby supplies and furniture she should obtain for her first child, who is expected to enter the world just a few months from now. Sarah says that two degrees and 10 years of work experience have almost prepared her for this task!



The Climate Atlas of Canada

Matthew Loxley, Research Associate March 3rd, 2022





From Risk to Resilience

Prairie Climate Centre

Evidence-based perspective to communicating the science, impacts, and risks of climate change through maps, documentary video, research reports, and plain-language training, writing, and outreach.



Welcome to the Climate Atlas

The Climate Atlas of Canada combines climate science, mapping and storytelling to bring the global issue of climate change closer to home for Canadians. It is designed to inspire local, regional, and national action that will let us move from risk to resilience.











Environment and Climate Change Canada Environnement et Changement climatique Canada



 $SSHRC \equiv CRSH$

Social Sciences and Humanities Research Council of Canada Conseil de recherches en sciences humaines du Canada



Public Health Agency of Canada

Agence de la santé publique du Canada

Health





Santé Canada Canada



CLIMATEDATA.CA

Canada's new climate data portal



Environment and Climate Change Canada

Environnement et Changement climatique Canada











How was the Atlas created?

- Data from 24 Climate Models (2 carbon scenarios) obtained from PCIC research centre in Victoria, B.C.
- Modeled daily temperature and precipitation data from 1950-2095, for a 10 km X 10 km grid for all of Canada (~2 trillion numbers)
- Processed, analyzed, summarized and displayed the data as interactive maps and graphs



The Atlas also includes:





Welcome to the Climate Atlas

The Climate Atlas of Canada combines climate science, mapping and storytelling to bring the global issue of climate change closer to home for Canadians. It is designed to inspire local, regional, and national action that will let us move from risk to resilience.

www.climateatlas.ca







Please join us for a major release of Indigenous-focused data, knowledge, and resources developed by, with, and for Métis, First Nations, and Inuit communities. Special guests include Cassidy Caron, Kluane Adamek, and Siila Watt-Cloutier. Register on eventbrite. **1PM Eastern** **12PM Central** **10AM Pacific** March 15th 2022

Thank you!

Eventbrite link to Indigenous Knowledges launch event: https://www.eventbrite.ca/e/climate-atlas-indigenousknowledges-content-launch-tickets-229019482437

m.loxley@uwinnipeg.ca



USING CLIMATE ATLAS DATA FOR CLIMATE ADAPTATION PLANNING: AN EXAMPLE

March 3, 2022 Webinar Presented by: Sarah Prescott All One Sky Foundation





About All One Sky Foundation



All (Tre Sky





Overview

Climate Atlas data can be used throughout the climate adaptation planning process

- Implementation of actions may require analysis of climate data
- Evaluation may include monitoring of local climate changes, using climate data



- Help communities and stakeholders understand how the climate is projected to change in their region
- Scoping the planning process deciding on grid size and location, time frame (e.g. 2050-2080), and climate change scenario (e.g. RCP 8.5)
 - Identify potential climate change impacts and their consequences
 - Estimate the probability of climate impacts occurring historically and in the future
- Actions may include the need to better understand climate risk, and include research or analysis of climate data

Using climate data in a climate adaptation risk assessment

To inform risk assessment:

- Review changes to local climate
- Identify related climate risks and best 'proxy' climate variable / indices for that risk
- Download and analyse data for 'proxies' indicators to determine likelihood of occurrence
- Calculate 'likelihood' score
- Incorporate this score into the risk assessment score





Example: St. Albert

St. Albert



www.google.com/maps

All One Sky

Define scope and review climate projections

- Decide on:
 - A grid size and location (e.g., 'small grid', St Albert)
 - A time period (e.g., 2050-2080)
 - A climate change scenario (e.g., RCP 8.5)
- Download and summarize projections in accordance with defined scope:
 - Modeled historical values
 - Projected mean and 10th/90th percentile values

Variables available from the Atlas

Overall Temperature	Overall Precipitation	Hot Weather	Cold Weather	Agriculture
Annual Mean	Mean Annual	Number of Very Hot	Number of very cold	Frost-Free Season
Temperatures (°C)	Precipitation (mm)	Days (+30°C days)	days (-30°C days	(days)
Spring, Summer, Fall and Winter Mean Temperature (°C)	Mean Spring, Summer, Fall and Winter Precipitation (mm)	Tropical Nights	Freeze Thaw Cycles (days)	Date of First Fall Frost
Annual Max. Temperature (°C)	Mean Growing Precipitation (mm)	Average warmest max temperature (°C)	Frost Days	Date of Last Spring Frost
Spring, Summer, Fall and Winter Max. Temperature (°C)	Heavy Precipitation Days (10 mm)	Summer Days	Icing Days	Corn Heat Units (CHU)
Annual Min. Temperature (°C)	Heavy Precipitation Days (20 mm)	Cooling Degree Days (CDD)	Coldest Minimum Temperature (°C)	Growing Degree Days Index (Base 4°C)
Spring, Summer, Fall and Winter Min. Temperature (°C)	Wet Days	Number of Heat Waves	Heating Degree Days (HDD)	Growing Degree Days Index (Base 5°C)
	Dry Days	Average Length of Heat Waves (days)	Freezing Degree Days (FDD)	Growing Degree Days Index (Base 10°C)
	Max 1-Day Precipitation (mm)	Longest Spell of +30°C Days	Mild Winter Days (- 5°C or colder)	Growing Degree Days Index (Base 15°C)
	Max 3-Day Precipitation (mm)	Number of expected +30°C days ("Hot Season")	Winter Days (-15°C or colder)	
	Max 5-Day Precipitation (mm)	Extremely Hot Days (+32°C to +33°C)		

Develop climate change impact scenarios

- <u>To inform risk assessment:</u>
 - Work with the community to **identify potential local climate-related risks and opportunities**, considering climate data
 - Create 'climate change impact scenarios' covering the identified risks and opportunities
 - An overall change to the local climate e.g., warmer winters
 - A specific risk/opportunity relating to this e.g., reduced winter recreation
 - A specific definition and 'threshold' for assess risk levels
 e.g., number of 'mild winter days' where temperatures are -5°C or colder in a given year
 - Potential **consequences to the community** as a result of this situation e.g., increased difficulty in maintaining outdoor ice rinks and cross-country ski trails

All One Sky

Projected climate changes –cold weather

Climata Variable	Pacolino	2060s Projections				
	Mean	<u>Low (10th percentile)</u>	<u>Mean</u>	High (90 th percentile)	<u>Mean %</u> <u>Change</u>	
Number of very cold days (-30°C days)	7.8	0.0	1.1	4.3	-86%	
Freeze Thaw Cycles (days)	86.2	49.2	66.4	84.4	-23%	
Frost Days	190.1	120.4	144.9	170.1	-24%	
Icing Days	90.4	41.2	64.9	89.4	-28%	
Coldest Minimum Temperature (°C)	-35.2	-33.5	-27.4	-21.0	-22%	
Heating Degree Days (HDD)	5482	3520	4178	4833	-24%	
Freezing Degree Days (FDD)	1374	434.5	792.7	120.7	-42%	
Mild Winter Days (-5°C or colder)	129.3	60.9	87.7	113.9	-32%	
Winter Days (-15°C or colder)	57.0	9.7	29.0	51.2	-49%	

All

Climate Changes – Mild Winter Days





Fit histograms to determine likelihood of value of interest occurring



All OreSky

Climate Scenario: Reduced Winter Recreation

Projected climate change	Warmer winter temperatures
Impact event description	A shorter, more variable season for winter recreation activities that are dependent on cold, snow and ice
Potential	 Increased difficulty in maintaining outdoor ice rinks, leading to higher maintenance costs and/or poorer quality skating conditions Reduced snow accumulation leads to poorer quality cross country skiing conditions Impacts exacerbated for vulnerable populations (low income) who are less able to
consequences	 participate in organized sports Increased maintenance of indoor facilities as people shift indoors for winter recreation Effects to the mental wellbeing for those who are passionate about outdoor winter recreation
Proxy indicator / threshold	The number of mild winter days where temperatures are -5°C or colder is 88 days or less in any given year

Historic Value (1976-2005)	Future Value (2060s)
129 days	88 days (32% reduction from base period)

Annual probability		Likelihood score			
Historic	Future	Historic	Future		
<1%	53%	1	5		
All Ore Sky					

Use Frequency Distribution Data to Estimate Likelihood Score

• Determine a likelihood score for the risk/opportunity

Score	Descriptor	Recurring climate events	Single climate events
1	Rare	Annual probability <1% (Less than 1:100-year event)	Event is almost certain not to occur (probability < 1%)
2	Unlikely	Annual probability 1 – 2% (1:50 to 1:100 year event)	Event is not anticipated to occur (1% - 33% probability)
3	Possible	Annual probability 2 - 10% (1:5 to 1:50 year event)	Event is just as likely as not to occur (33% - 66% probability)
4	Likely	Annual probability 10-50% (1:1 to 1:5 year event or less)	Event is expected to occur (66% - 99% probability)
5	Almost Certain	Annual probability > 50% (once every two years or more)	Event is virtually certain to occur (probability > 99%)

Likelihood score of 5

Conduct 'Consequence' Assessment with Stakeholders

	Very Low (1)	Low (2)	Medium (3)	High (4)	Very High (5)
Social Functioning	Minimal disruption to daily life Minimal or no change in community cohesion and trust in others No self-evacuations Minimal or no impact on cultural resources, recovering full functionality within days	↔	Week-long disruption to daily life Moderate erosion of community cohesion and trust in others Small areas of the City (1 block) seeing temporary self-evacuations Moderate damage to cultural resources, with full recovery taking months	1	Months long disruption to daily life (e.g., in ability to access schools, recreation) Severe, widespread erosion of community cohesion and trust in others Large areas of some neighbourhoods requiring temporary evacuations, with some permanent displacement High damage to cultural resources, full recovery may not be possible or could take years

Consequence score of 2.4

-Consider consequences to

-Public Health and Safety -Social Functioning (shown above) -Economic Vitality -Natural Environment -City Services



Use Frequency Distribution Data to Estimate Likelihood Score



All Ore Sky



Summary & Conclusions

Summary & Conclusions

- Climate Atlas data can be used throughout the climate adaptation planning process
- Climate Atlas data can be very helpful to identify projected changes in climate for discrete geographic areas
- This information can be incorporated into a risk assessment process to help identify priorities for local adaptation efforts



Questions?

Contact:

Sarah Prescott sarah@allonesky.ca 587.785.8048



Webinar Series: Part 2



Join us for Part 2 of the Tools for Municipal Adaptation Planning Webinar Series!

This session focused on ClimateData.ca will include:

- An introduction to the tool
- A look at how it has been used to inform a community adaptation project
- Opportunities for Q&A

Visit www.climatewest.ca/events to register.



Thank you!

www.climatewest.ca E: <u>info@climatewest.ca</u> T: 204.995.6514 Toll Free: 1.877.938.6650