Workshop Summary | From Abstract to Applied: Climate Data Workshop
City Hall, Edmonton, Alberta

This report summarizes the November 7, 2023, climate data workshop that was held for City of Edmonton's 'Environment and Climate Resilience' section. The workshop organizing committee included ClimateWest, Prairie Adaptation Research Collaborative (PARC), International Institute for Sustainable Development (IISD), and the Prairie Climate Centre. The workshop was supported through the Ecotrust Foundation of Alberta's Cities IPCC Legacy Research Grant.

Ten City of Edmonton staff were in attendance from the City's 'Environment and Climate Resilience' section. The team included mitigation specialists, adaptation specialists and climate generalists. The team had a wide range of expertise, including: data and visualization, urban planning, project engineering and community mobilization. With this diversity in mind, the workshop was designed so participants could achieve the following objectives:

1. Identify available climate data and information resources;
2. Identify which level of climate data is suitable for their roles;
3. Describe potential applications of climate data in their work; and,
4. Communicate climate data within and outside their section.

Workshop Organizing Committee:

With support from:

Key Takeaways

The climate has already changed in Edmonton and will continue to change. For example, participants are already noticing changes to Edmonton winters and tick seasons. Year-to-year climatic variability can make it difficult to perceive climate change. Even so, climate projections for the Edmonton region include warmer and wetter winters, warmer and drier summers, and more, heavy rainfall events.

Climate data can be an effective decision-support tool and comes in many formats. Choose a climate data provider that suits your needs. Free, online climate data resources such as the Climate Atlas of Canada and ClimateData.ca are a great starting point for understanding regional climate change (example: Edmonton Climate Report on the Climate Atlas). Some applications of climate data might require direct work with climate scientists and consultants (example: PARC's high-resolution dataset for the Metro Edmonton Region). Tailored climate data tools also exist (e.g., the Design Value Explorer is designed for professionals who consult the Building Code of Canada and/or the Highway Bridge Design Code as part of their work).

Know what your audience cares about. Some participants work with stakeholders who ask specific, detailed questions about climate modelling assumptions, limitations and outputs (e.g., engineers). For others, sharing high-level information is sufficient for decision-making and action (e.g., residents). Participants agreed it is helpful to collaborate with groups who understand your audience when developing and testing climate messaging and climate data products.

When communicating climate data, use several datapoints, data sources, data types and frames to deliver your message. Whether communicating the impact of heavy rain on stormwater drainage or navigating the effects of a changing frost-free season, participants and presenters agreed that several data points are needed to inform good decision-making. One should not just consider one climate variable in isolation. Also consider various timescales (30-year averages as well as annual extremes) and various data sources (climate models, hydrological models, economic models).

Highlighting the positive impact of climate action on society, overall wellbeing and quality of life can accelerate and improve buy-in among residents and decision-makers. For example, energy efficient buildings can also lead to more indoor temperature comfort and be more climate resilient. Bike lane infrastructure can reduce emissions and promote active transportation. Edmonton's Climate Change and Energy Perceptions Report also provides timely information about common values and about which programs and issues matter to Edmontonians. For example, because fiscal responsibility is a key value, decision-makers can highlight the financial benefits of early action on climate adaptation.

Work toward climate adaptation and mitigation together to maximize impact. Sometimes described as low-carbon resiliency, municipalities are working toward reducing their contribution to climate change and preparing for the impacts of a changing climate.

Introduction

Kerra Chomlak (ClimateWest) welcomed everyone to the workshop and provided an overview of ClimateWest and background on the project. This workshop is part of a larger project to identify and test wise practices for mobilizing climate data.

To tailor the workshop content, a pre-workshop survey identified participants' key climate data needs, as well as barriers to implementing climate data. Four prominent themes were identified:

- Edmonton's 'Environment and Climate Resilience' section has varied climate data needs. The team includes various climate specialties (including adaptation and mitigation) and stakeholders (including residents, city councilors and infrastructure professionals);
- There was limited familiarity with PARC's high resolution data for the Metro Edmonton Region;
- There were various barriers to using climate data. Participants wanted more information about how climate data applied to their work, which types of data were available, and how to communicate data to their stakeholders; and,
- There was an interest in understanding some foundational concepts in climate modelling: global and regional models, downscaling methods, and climate scenarios (i.e., representative concentration pathways (RCPs), shared socioeconomic pathways (SSPs)).

To ground the workshop in wise practices for climate data mobilization, IISD conducted a literature review. The findings from this review informed the workshop planning process. Appendix A includes a description of findings and how they were applied.

Climate Data in Action

Cameron Hunter (International Institute for Sustainable Development) presented on the benefits of using climate data in municipal planning. To start, Cameron emphasized that municipalities often use climate data in two contexts: adaptation planning processes (more general climate information and climate information is more openly accessible) and operations-level processes (more specific climate information and less openly accessible climate information).

In municipal planning, climate data can be used as a highly effective decision support tool, for example:

- The City of Selkirk incorporated climate data directly in its Climate Change Adaptation Strategy. The strategy considers Selkirk's key service areas (e.g., transit services, water utility), then evaluates potential impacts from seasonal climatic changes.
- Flood maps convinced Town of High River decision-makers to not re-develop in a flood plain and instead to buy out property owners then remediate the land into a floodway.

Cameron shared the following quote from Duane Nicol, CAO, City of Selkirk, demonstrating how municipalities can re-frame climate adaptation and affirm the value of using climate data:

"The perception is that [climate adaptation] is additional or new, and it's really not. We do infrastructure planning all the time, we do community building all the time: we're just not using the best information that's available to us." -- Duane Nicol, CAO, City of Selkirk

There are several case studies and resources that provide both inspiration and guidance on incorporating a climate lens into municipal planning. For example, the Federation of Canadian Municipalities has tools for managing climate impacts by service area. The Climate Atlas video 'Toronto and Climate Change: Building Resiliency and Cutting Emissions' showcases Toronto's approach to low-carbon resiliency.

Edmonton's Climate Data Journey

"Edmonton's climate is already changing…we're going to be experiencing whole new temperature ranges we haven't experienced in Edmonton yet." -- Sincy Modayil, City of Edmonton

Sincy Modayil (City of Edmonton) discussed the City of Edmonton's experience using climate data. Edmonton's climate data work began in earnest in 2016 with a general climate hazard assessment, and it has evolved to include various research projects and more granular climate risk assessments, which required climate change projections of higher resolution supplied by PARC.

Plain language phrases help communicate climate impacts to a broad audience. For example, Edmonton will experience "hotter hots." Some of the other expected changes in Edmonton include warmer and wetter winters, warmer and drier summers, and more heavy rainfall events.

The City of Edmonton has also been using innovative methods for addressing and communicating climate action. The City of Edmonton has a Climate Change Almanac. Another such example is an artistic rendering that visualizes the effects of climate change on the River Valley. The rendering below shows the shift from a parkland ecosystem (left) to a mixed grassland ecosystem (right).

City of Edmonton (2018). Climate Resilient Edmonton: Adaptation Strategy and Action Plan. https://www.edmonton.ca/sites/default/files/public-files/assets/Climate_Resilient_Edmonton.pdf?cb=1629999628 page 2

Climate Atlas of Canada

"That's something we try to do at Prairie Climate Centre: presenting adaptation as a way to improve the overall community… the actions we are taking to make our society better." -- paraphrased from Izabella Robak (Prairie Climate Centre)

Izabella Robak (Prairie Climate Centre) provided a guided tour of the Climate Atlas of Canada. Izabella emphasized the functionality of the free, online map, including the user's ability to select variables, choose climate data according to region, download data and create visualizations and table using Atlas data. Of note, the Climate Atlas also has several videos, reports, and articles. This includes a downloadable climate report for the Edmonton region.

ClimateData.ca is another free, online resource for climate data.

Questions and answers:

> **Can I layer multiple variables on the map? What is the best way to compare variables?** While you cannot layer multiple variables directly on the Climate Atlas online map, you can download create custom tables or charts for two variables and compare the information.
>
> **Does the Climate Atlas show air quality information?** This 'air quality' topic page on the Climate Atlas includes various articles, videos, and other resources related to air quality.

Linking Climate Data to Impacts and Action

In small groups, participants reflected on climate data for the Edmonton region. They discussed the potential impacts on the city and their work, what was easy to understand about the change, and areas where they still had questions.

Some highlights from this discussion include:

- **Bringing several data sources together leads to better decision-making and communications.** Pairing climate data with stories and other data sources creates a more complete picture of risks, impacts and vulnerabilities.
- **Consider which level of information the data user needs.** Residents, engineers, councilors, operators all need (and have) different climate data needs. Tailor messaging and climate data communications to what they care about.
- **It is helpful to know how variables and indices are defined.** This way, participants are clear about what the data can (and cannot) tell them.

The breakout discussions are summarized below. Data was collected for the Edmonton Region from the Climate Atlas of Canada for three climate variables: very cold days, frost-free season, and very hot days.

	Very cold days (-30C) **1976-2005: 7 days** **2021-2050: 3 days** **Change: - 4 days**	**Frost-free season (days)** **1976-2005: 131 days** **2021-2050: 151 days** **Change: 20 days**	**Very hot days (+30C)** **1976-2005: 4 days** **2021-2050: 11 days** **Change: 7 days**
What are the potential impacts of this change?	Infrastructure impacts, such as bursting pipes and need to change building codes. Social element: people might be happy with fewer cold days.	Longer gardening and outdoor tourism season (e.g., patios). Short skating season. Makes heat pumps more feasible. More ticks and pests. More precipitation, more fires, drier conditions, more drought.	Layer with other data, like tree canopy to better understand adaptation needs and heat islands across the city.
What could this change mean for my work?	Need to consider more data points. There are short-term actions and long-term actions to consider (for instance, HVAC).	Potentially need to change snow-clearing practices (e.g., could expect different kinds of snow, which could impact equipment and crews).	Our audience (engineers, council) are interested to know the 'data trail', sources, and reliability of the data. Work directly with people who know the users and know what they need. This will help with translating and reducing the burden of knowing the data inside and out. Successful examples of this with sensitivity analysis done with EPCOR, and the Design Value Explorer.

What is easy to understand about this change?		Growing up, Edmontonians never had to check for ticks. This is new for many people. More comfort in shoulder seasons, and more discomfort in winter.	Keep track of the extreme events (e.g., summer fires, orange air in New York City in 2023). Pair these with data to communicate impact. People are motivated to act on extreme heat when it feels 'close' to them in the summer months, or as summer is approaching. Communicate accordingly.
Which questions remain about this change?	As models change to CMIP6, how does that affect planning processes? Other data could be considered, such as the number of pipes bursting during very cold days. Consider that trends might not be climate change related.	There might be health-related challenges and discomfort with prolonged heat. New experiences for some people. Not many homes have A/C. When does the frost-free season begin? Since it is an agricultural index for growing weather, it starts after the first frost, even if it thaws again after. Freeze-thaw cycles might be appropriate for infrastructure and operations.	There is uncertainty with the data. Can liken this to a weather report. The weather forecast is not always right, but it's enough to give us an idea of how to dress for the day. Is our climate data enough to act?

Showcase: High Resolution Climate Data for Edmonton

David Sauchyn and Soumik Basu (Prairie Adaptation Research Collaborative (PARC)) presented PARC's climate research in the Edmonton area. This included an Ecotrust-funded research project, in which PARC produced dynamically downscaled, high-resolution (3.3 km x 3.3 km grid) data for the Metro Edmonton Region. Of note, the high-resolution climate data highlights climate variability within Edmonton and climate variability over time.

Downscaling is the process PARC used to take lower-resolution data sets (i.e., global climate models) and develop a high-resolution, regional data set for the Edmonton Metro Region. PARC shared information about the downscaling process and compared statistical and dynamical downscaling methods. **Statistical downscaling** requires less-intensive data processing, is more widely available, and is easier to interpret. **Dynamical downscaling**, on the other hand, requires more intensive data processing, but captures fine-scale climate processes well and enables an understanding of the regional climate system.

Discussion:

- Participants shared several ideas for how city staff could use this data:
    - The PARC climate data shows intra-city variability. This could support evidence-based prioritization in city planning and investments.
    - The PARC climate data has information for the Metro Edmonton Region. This could support evidence-based decision-making for conservation zones designations (i.e., whether and where to conserve quality farmlands).
    - Climate projections could be used to anticipate future needs for tree canopy improvements, fire services, plant watering, and building designs.

- Participants discussed maps showing projected near surface temperatures to be higher in the south end of the city than the north end of the city. This fine resolution data inspired questions about landforms and vegetation cover, chinooks, and how this change might intensify over time. After the workshop, Dave Sauchyn confirmed that this difference can likely be explained by the fact that Edmonton is situated in an area of transitions from high to lower average temperature from the southwest to northeast of Edmonton (see Environment Canada's 'Temperature Climatology' maps).
    - There was an interesting discussion about what is causing this temperature variability. Is it planning decisions within the city's control (e.g., tree canopy cover) or external climatological processes? It would be beneficial to know the causes of the difference to (1) confirm that the data is plausible and can be explained, and (2) to determine how much city planning decisions can (or cannot) mitigate heat. However, it is important to be cautious about getting caught up in over analysis as this may hinder timely beneficial actions. Is it possible to take positive action now even without a detailed explanation? Currently, the north end of the city experiences more socio-economic vulnerability, so assessing vulnerability alongside the climate hazards is important.

Visualizing and Presenting Climate Data

"Communication needs to consider what the audience cares about and is interested in and help connect the issue to these things. We need to recognize that the same message will be received differently by different audiences and craft multiple messages to achieve the same effect across a broad range of positionalities." -- Candice Howarth, Laurie Parsons and Harriet Thew in "Effectively Communicating Climate Science Beyond Academia"

Jon Belanger (Prairie Adaptation Research Collaborative) discussed the range of mapping and visualizing options that can be used to amplify and communicate climate data. There are many mapping tools, such as ArcGIS, QGIS, Grassgis, MapServer, and MapInfo Professional. Animations are another effective visualization tool. When designing a map, it is important to be clear about what information you want to convey and highlight. Avoid information overload and avoid crowding a map. Your data categorization and colouring choices can be used to emphasize trends.

Moving Forward with Climate Data

"Climate resilient development is enabled when governments, civil society and the private sector make inclusive development choices that prioritise risk reduction, equity and justice, and when decision-making processes, finance and actions are integrated across governance levels, sectors and timeframes (very high confidence)." -- IPCC Sixth Assessment Report

"Maladaptation can be avoided by flexible, multi-sectoral, inclusive and long-term planning and implementation of adaptation actions with benefits to many sectors and systems. (high confidence)" -- IPCC Sixth Assessment Report

To close the day, participants reflected on how the workshop learnings could apply to their work going forward:

- Apply values-based messaging to the complete streets program and connecting climate change adaptation/mitigation efforts to improving peoples' lives.
- Use climate data maps as a decision-support tool, especially as an evidence-based prioritization tool. Climate data could be overlapped with socio-demographic data to identify areas exposed to greater risk.

- Incorporate climate data into the district planning process (e.g., add climate data to 'current context' section, incorporate climate data with other data sources such as networks and socio-demographics).
- Use climate data to inform a zoning bylaw to preserve trees
- Evaluate Edmonton's energy demands in a future climate change scenario and update carbon emissions forecast. Examples like this show how council decisions can be evaluated with both adaptation/risk and energy/GHG emissions considerations in mind. More projected hot days could cause demand more increased air conditioning and energy usage. Heat pump instillations and other retrofits can reduce energy usage, both now and in a future climate scenario.
- Display climate maps for residents and add information to the 'Change for Climate' newsletter.
- Add short, plain-language messaging on climate impacts to Edmonton's Climate Change Almanac (following the style of the Climate Atlas).
- Incorporate climate data into work to translate extreme weather experiences into design parameters and to communicate the range of possible future climates to risk managers.
- Appreciate the practical applications of the PARC data. 'Spatial analogue' maps on the Climate Atlas compare Edmonton's future climate to other locations' current climate. This will help explain Edmonton-specific benefits of taking action to adapt, and that future changes are not that far away.
- Interested in exploring more uses of climate data in Edmonton e.g. University of Alberta fire modelling, Edmonton Metro Region Board's Climate and Vulnerability Risk Assessment to come out mid-December.

Appendix A

WORKSHOP AGENDA **From Abstract to Applied: Mobilizing Climate Research to Enhance Climate Resilience in Edmonton**

Tuesday, November 7, 2023
9:30 a.m. to 3:30 p.m. MST

Heritage Room, City Hall
Edmonton, Alberta

9:00 - 9:30	Welcome and refreshments
9:30 - 9:45	**Opening: Kerra Chomlak, ClimateWest**
9:45 - 10:00	**Climate Data in Action: Izabella Robak, Prairie Climate Centre & Cameron Hunter, International Institute for Sustainable Development (IISD)** A brief presentation showcasing the importance of climate data in municipal planning
10:00 - 10:15	**Edmonton's Climate Data Journey: Sincy Modayil, City of Edmonton** The City of Edmonton's experience with climate data
10:15 - 10:30	Break with refreshments
10:30 - 11:00	**The Climate Atlas of Canada: Izabella Robak, Prairie Climate Centre** The Prairie Climate Centre will demonstrate the Climate Atlas – a user-friendly entry point into the world of climate data
11:00 - 12:00	**Linking Climate Data to Impacts & Actions** Through faciliated discussion, participants will explore potential applications of climate data
12:00 - 1:00	Lunchtime (lunch is provided)
1:00 - 1:45	**Showcase: High Resolution Data for Edmonton: David Sauchyn & Soumik Basu, Prairie Adaptation Research Collaborative (PARC)** PARC produced high resolution climate projections for Edmonton. PARC will provide a detailed exploration of how the data set can be used.
1:45 - 2:00	Break with refreshments
2:00 - 2:45	**Visualizing & Presenting Climate Data: Jon Belanger, Prairie Adaptation Research Collaborative** In a brief, interactive mapping demo, participants will explore how climate data can be visualized and incorporated into reports and presentations
2:45 - 3:15	**Moving Forward with Climate Data: Kerra Chomlak, ClimateWest** Reflection on key takeaways
3:15 - 3:30	Closing

Workshop Organizing Committee:

ClimateWest
IISD International Institute for Sustainable Development
Edmonton
Prairie Climate Centre
PARC

With support from:

ALBERTA ecotrust

Appendix B – Literature Review Summary

Pre-workshop findings:	Application in workshop:
Know your audience's context, work and social culture, and needs (Foundations for Decision Making, Jones, et al., 2014).	A City of Edmonton representative participated in the workshop organizing committee and was involved in key decisions (scope, objectives, workshop content). A pre-workshop survey identified some of participants' climate data barriers and needs.
Case studies and narratives effectively communicate adaptation actions and climate change data (Effectively Communicating Climate Science beyond Academia: Harnessing the Heterogeneity of Climate Knowledge, Howarth, Parsons, & Thew, 2020, & Foundations for Decision Making, Jones, et al., 2014)	Presenters shared several case studies from Toronto, Selkirk and High River.
Communicate data in several formats and use diverse data sources to reach your audience. Particularly useful are visual communication types, such as photos, videos, illustrations, or infographics (Climate services promise better decisions but mainly focus on better data, Findlater, et al., 2021)	Presenters included videos, maps, animations, charts and tables, case studies, stories, visual renderings in their presentations.
Depend on trusted messengers to deliver information within their areas of expertise (Effectively Communicating Climate Science beyond Academia: Harnessing the Heterogeneity of Climate Knowledge, Howarth, Parsons, & Thew, 2020)	University researchers (PARC, PCC), thinktanks (IISD) and non-governmental organizations (ClimateWest) were key presenters.

Appendix C – Climate Variable for the Edmonton Region

VERY HOT DAYS (+30°C)

Edmonton Region

1976-2005	2021-2050	Magnitude of change
3.8	11.4	↑ 7.6

Note. The data in this table are from the "Climate Atlas of Canada," by the Prairie Climate Centre, n.d., www.climateatlas.ca, and can be found by clicking on "Edmonton" on the map and selecting "more" climate change for the high carbon scenario.

MEAN ANNUAL TEMPERATURE (°C)

Edmonton Region

1976-2005	2021-2050	Magnitude of change
3.3	5.4	↑ 2.1

Note. The data in this table are from the "Climate Atlas of Canada," by the Prairie Climate Centre, n.d., www.climateatlas.ca, and can be found by clicking on "Edmonton" on the map and selecting "more" climate change for the high carbon scenario.

VERY COLD DAYS (-30°C)

Edmonton Region

1976-2005	2021-2050	Magnitude of change
7.4	3.2	↓ -4.2

Note. The data in this table are from the "Climate Atlas of Canada," by the Prairie Climate Centre, n.d., www.climateatlas.ca, and can be found by clicking on "Edmonton" on the map and selecting "more" climate change for the high carbon scenario.

MEAN ANNUAL PRECIPITATION (MM)

Edmonton Region

1976-2005	2021-2050	Magnitude of change
451	477	↑ 26

Note. The data in this table are from the "Climate Atlas of Canada," by the Prairie Climate Centre, n.d., www.climateatlas.ca, and can be found by clicking on "Edmonton" on the map and selecting "more" climate change for the high carbon scenario.

AVERAGE LENGTH OF HEATWAVES (DAYS)

Edmonton Region

1976-2005	2021-2050	Magnitude of change
1.4	3.4	↑ 2.0

Note. The data in this table are from the "Climate Atlas of Canada," by the Prairie Climate Centre, n.d., www.climateatlas.ca, and can be found by clicking on "Edmonton" on the map and selecting "more" climate change for the high carbon scenario.

FROST FREE SEASON (DAYS)

Edmonton Region

1976-2005	2021-2050	Magnitude of change
131	151.2	↑ 20.2

Note. The data in this table are from the "Climate Atlas of Canada," by the Prairie Climate Centre, n.d., www.climateatlas.ca, and can be found by clicking on "Edmonton" on the map and selecting "more" climate change for the high carbon scenario.

MAXIMUM 1 DAY PRECIPITATION (MM)

Edmonton Region

1976-2005	2021-2050	Magnitude of change
34	36	↑ 2.0

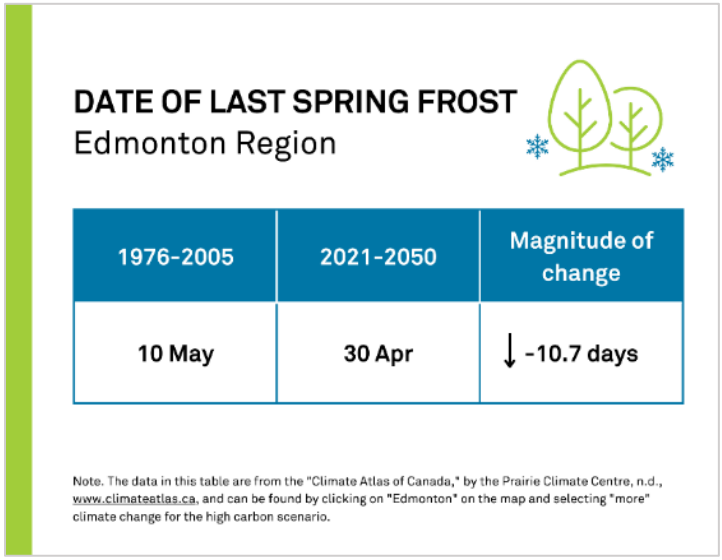
Note. The data in this table are from the "Climate Atlas of Canada," by the Prairie Climate Centre, n.d., www.climateatlas.ca, and can be found by clicking on "Edmonton" on the map and selecting "more" climate change for the high carbon scenario.

DATE OF FIRST FALL FROST

Edmonton Region

1976-2005	2021-2050	Magnitude of change
22 Sept	2 Oct	↑ 10 days

Note. The data in this table are from the "Climate Atlas of Canada," by the Prairie Climate Centre, n.d., www.climateatlas.ca, and can be found by clicking on "Edmonton" on the map and selecting "more" climate change for the high carbon scenario.



DATE OF LAST SPRING FROST
Edmonton Region

1976-2005	2021-2050	Magnitude of change
10 May	30 Apr	↓ -10.7 days

Note. The data in this table are from the "Climate Atlas of Canada," by the Prairie Climate Centre, n.d., www.climateatlas.ca, and can be found by clicking on "Edmonton" on the map and selecting "more" climate change for the high carbon scenario.

Appendix D – Project Reflection Cards

APPLYING CLIMATE DATA

A project that could benefit from climate data:

Applicable learnings and takeaways:

RESOURCES

Thank you for attending today's workshop!

Free online climate information resources:

- ClimateData.ca
- Climate Atlas of Canada
- Map of Adaptation Actions

ClimateWest's free Help Desk is also available to support you in accessing and applying climate data in your work.

204-995-6514 or 1-866-626-4862
info@climatewest.ca
www.climatewest.ca/help-desk/

ClimateWest