



INTRODUCTION TO THE CANADIAN CENTRE FOR CLIMATE SERVICES

Clean Air Partnership Webinar

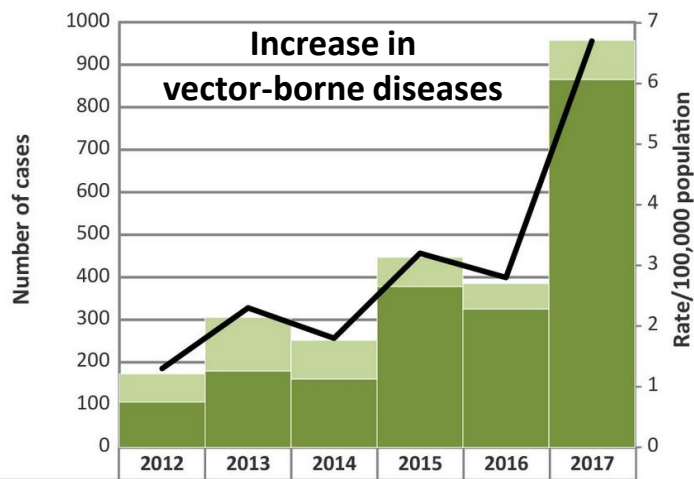
March 25, 2019

Monica Harvey, Policy Analyst

**CANADIAN
CENTRE FOR
CLIMATE
SERVICES**



CLIMATE CHANGE POSES SEVERAL RISKS TO MUNICIPALITIES IN ONTARIO



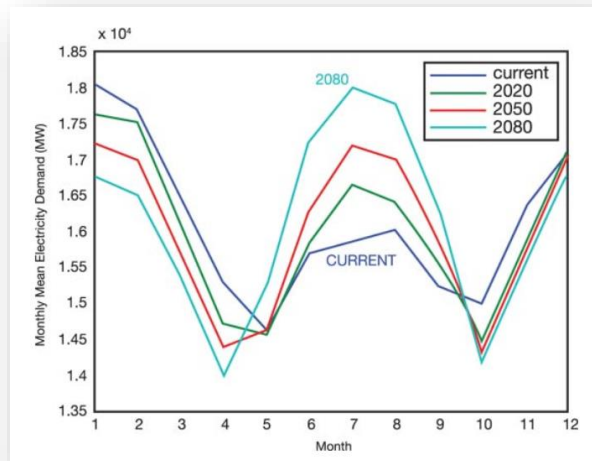
Increase in confirmed and probable lyme disease cases in Ontario

Urban Heat Island Effect



2017 Sept Heat Warning for Southern Ontario

Increasing electricity demand for cooling



Projected electricity demand for Ontario



Extreme weather events: Ice Storm

2013 Toronto Ice Storm
1 M people without power for up to 10 days

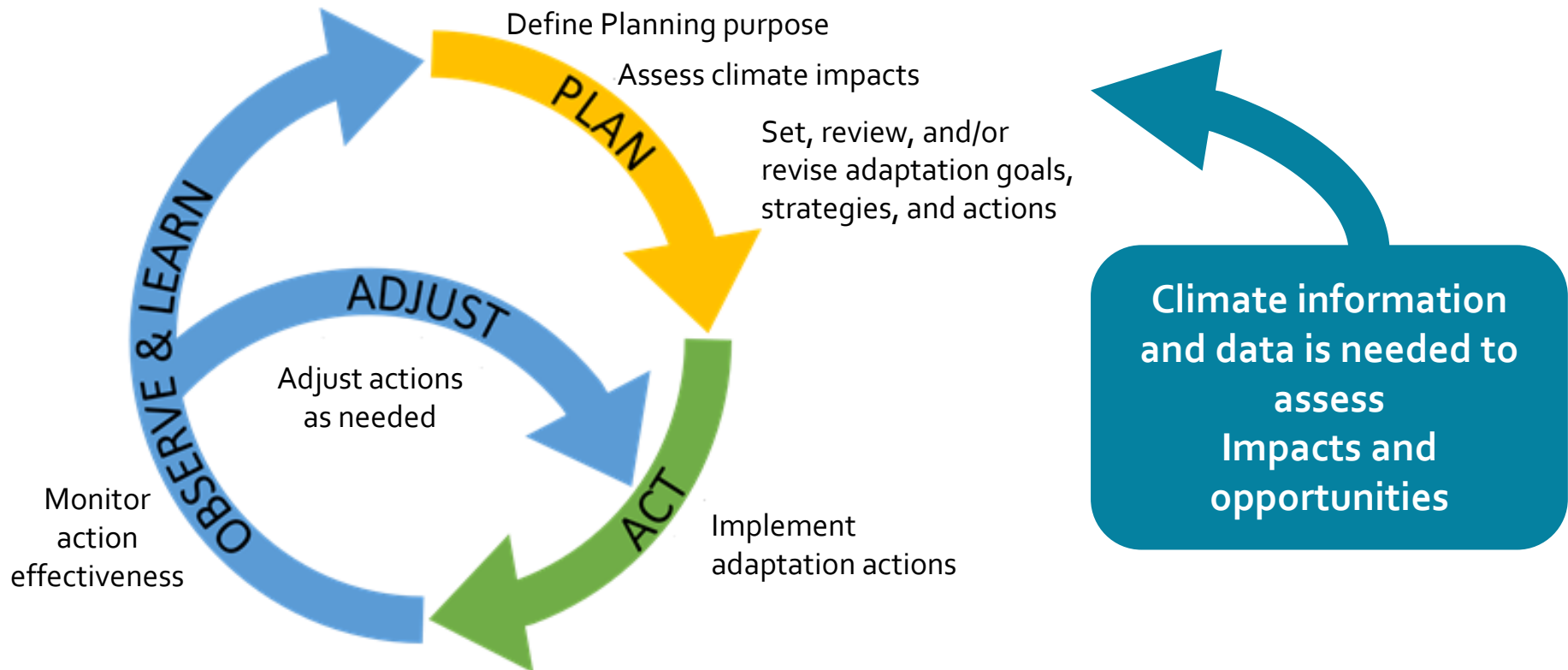


Extreme weather events: Heavy Rain

2013 Flooding event caused damage to Highway 552

CLIMATE INFORMATION AND DATA INFORMS ADAPTATION MEASURES

Climate Change Adaptation Cycle



CLIMATE DATA AND INFORMATION HELPS COMMUNITIES INCREASE THEIR RESILIENCE

Climate data and information can improve:

- Infrastructure design
- Business continuity
- Strategic planning
- Public health programs



CURRENT GAPS IN CLIMATE DATA AND INFORMATION

- **Lack of awareness** and access to existing information
- **Gaps** in relevant and useful products
- **Uncertainty** on how to incorporate climate change in decision-making



CANADIAN CENTRE FOR CLIMATE SERVICES

Established so that Canadians have the information and support they need to understand and plan for climate impacts

CANADIAN
CENTRE FOR
CLIMATE
SERVICES

WHAT WE DO



DELIVER CLIMATE SERVICES
DRIVEN BY USER NEEDS

PROVIDE ACCESS TO
CLIMATE INFORMATION



BUILD LOCAL CAPACITY

OFFER TRAINING AND SUPPORT



CANADIAN
CENTRE FOR
CLIMATE
SERVICES



OUR CLIMATE SERVICES INCLUDE...

- **Engaging with users** to understand needs
- **Increasing awareness and access** to existing climate data and information
- **Developing new products** through collaboration with experts and users
- **Providing training and guidance** on using climate data
- **Working with regional hubs** for locally relevant information and expertise

We help answers questions like:

How is the climate changing in my region? What can I expect in 10, 50, 100 years?

What services are at risk as the temperature continues to rise?

How do I incorporate climate change into decisions?

CCCS WEBSITE

LAUNCHED OCT 2018

www.canada.ca/climate-services/

Increases awareness and access to existing climate data and information

Canadian Centre for Climate Services



Library of climate resources

Datasets, tools, guidance and related resources



Climate information basics

Climate change concepts, trends and role of climate information in decision-making



Climate Services Support Desk

1-833-517-0376
Get help from our climate experts to find, understand and use climate information

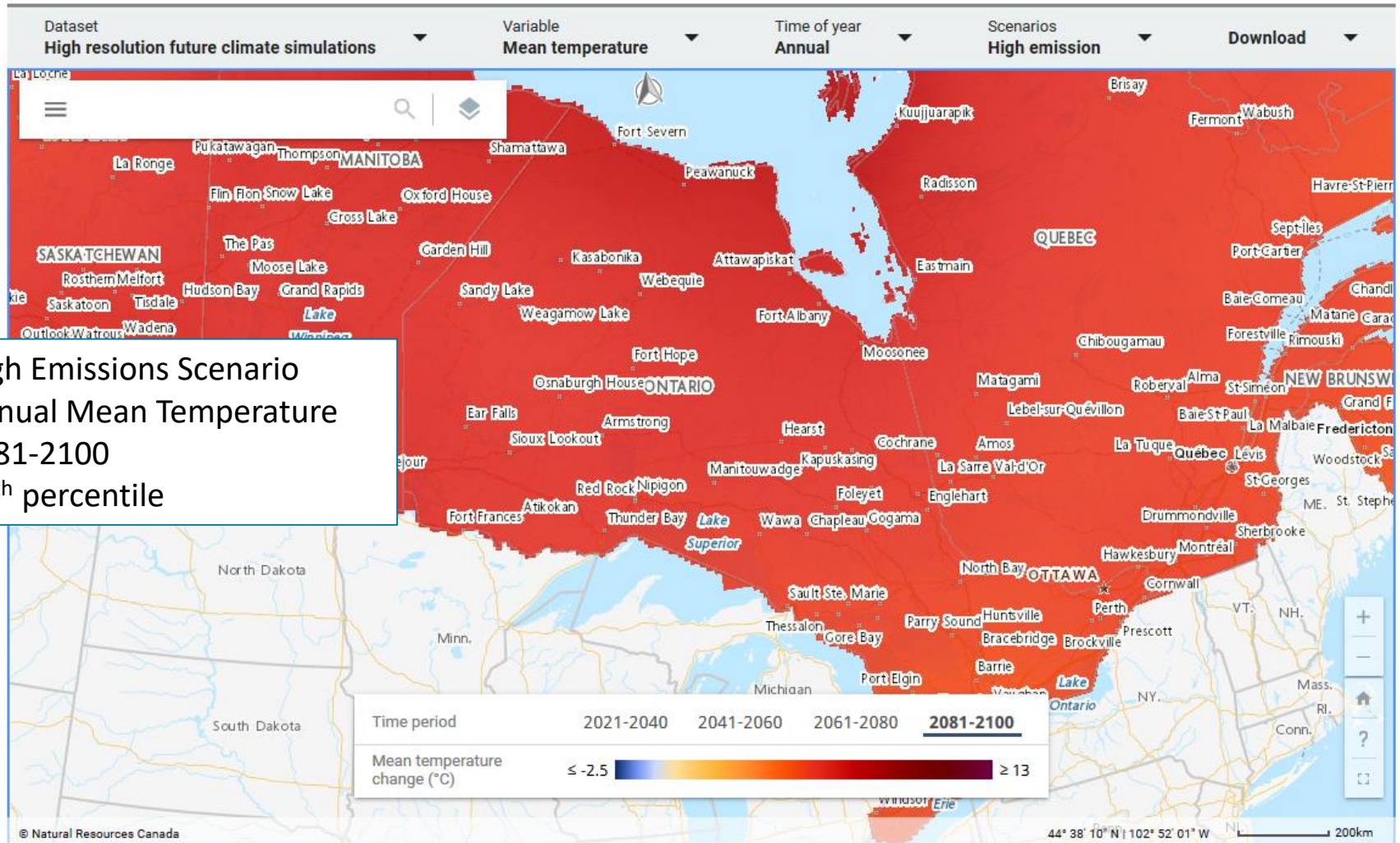


Display and download climate data

View selected climate datasets on maps or download data

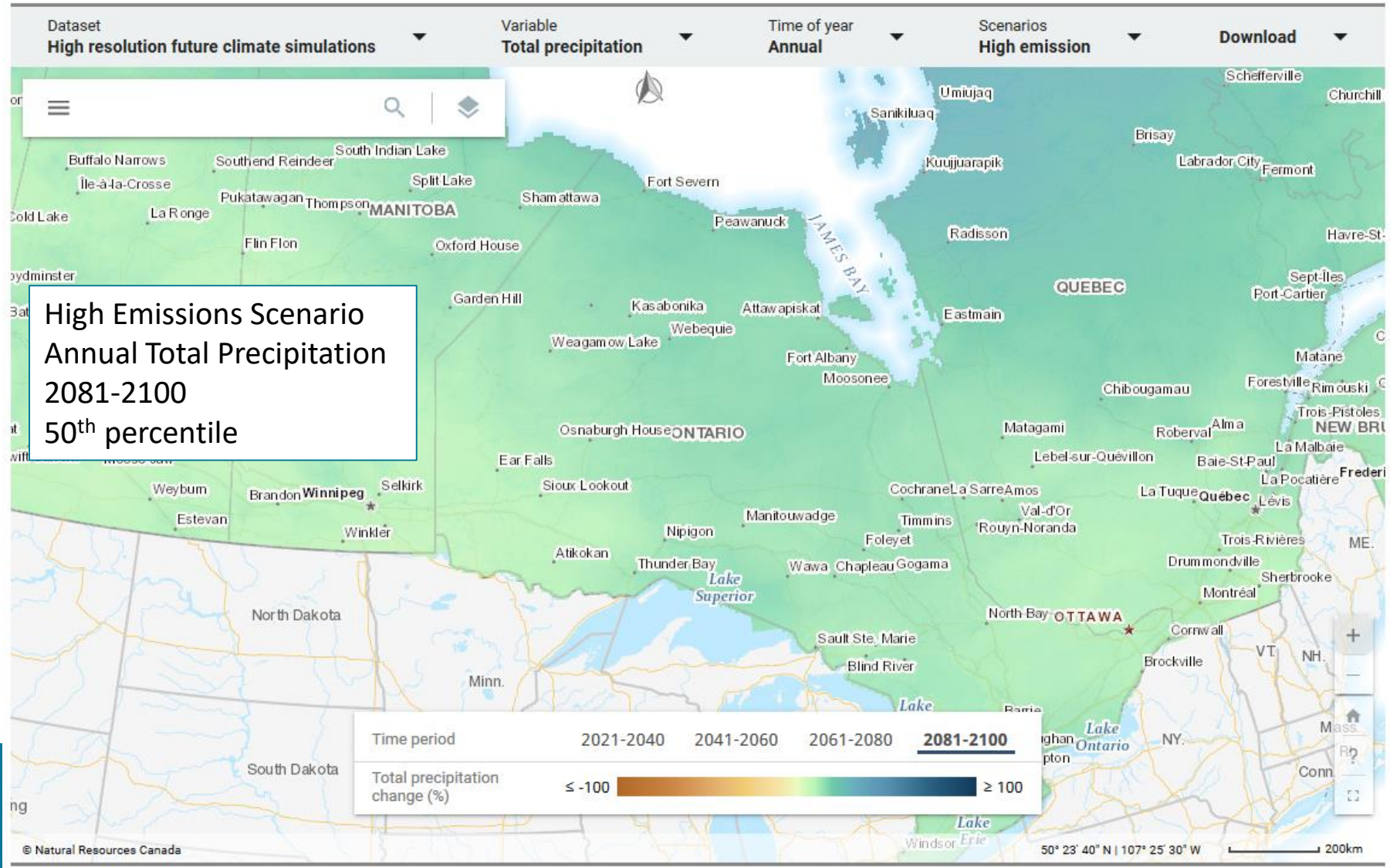
CCCS WEBSITE

CLIMATE DATA VIEWER



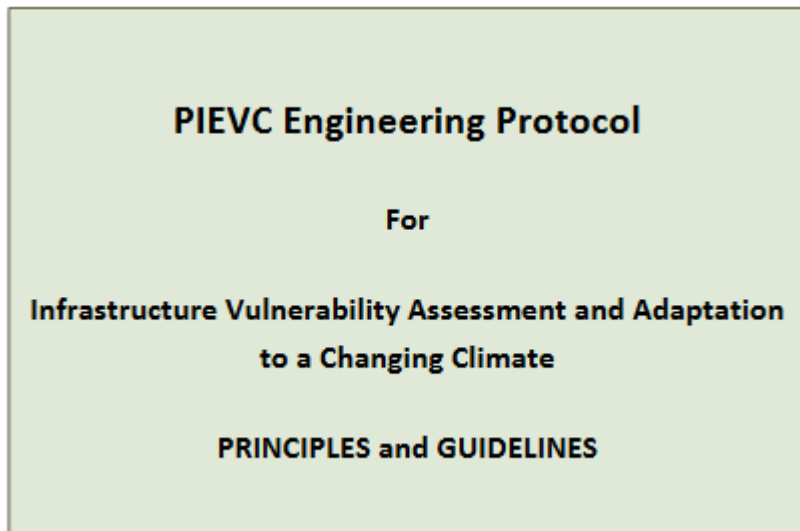
CCCS WEBSITE

CLIMATE DATA VIEWER



CCCS WEBSITE LIBRARY OF CLIMATE RESOURCES

Easy to use searchable database with links to over 300 other datasets, guidance documents and regional climate studies such as:



<https://pievc.ca/assessments> includes examples of previous assessments

Federation of Canadian Municipalities guidance documents and programs



CLIMATE SERVICES SUPPORT DESK

- **Climate Services Support Desk officers are available to assist users** in finding, understanding and using climate data, information and tools to consider climate change in planning and decision-making
- Support desk activities are coordinated with experts from regional climate consortia and federal departments



1-833-517-0376



info.cccs-ccsc@canada.ca

CLIMATE SERVICES SUPPORT DESK CASES

“Wow you guys are good!” – User from Ontario NGO



Support desk

Ontario waste water treatment plant needed **historical precipitation data** to determine potential sources of increased wastewater flow

Provided **historical annual precipitation data** for the relevant years

Ontario NGO needed **downscaled Ontario data and information on downscaling techniques** for a report

Provided links to the **Ontario Climate Change Data Portal** and **Ouranos Guidebook on Climate Scenarios**

Regional municipality in Ontario looking for a more recent study on **increasing frequency of storm events and rainfall**

Confirmed data from the specific study referenced **was the most up-to-date**

City official was looking for data to support a study on **Urban Heat Island Effect**

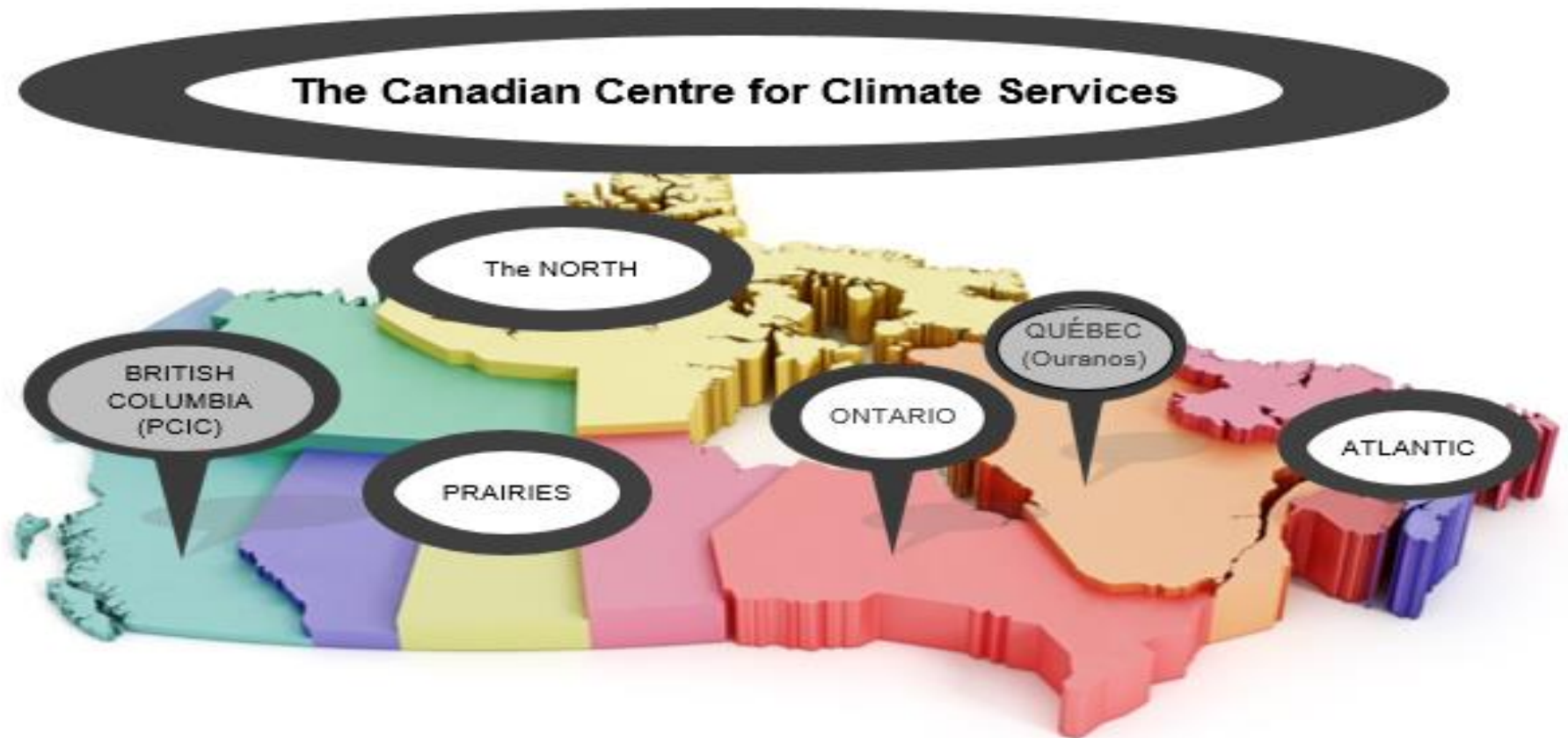
Provided links to how **heat island effect is calculated** and information on what datasets would be most useful

NEXT STEPS: CANADIAN CLIMATE DATA PORTAL

- Additional and **more detailed datasets** for download
- **Easy to use interface** to find and obtain data
- **Sectoral Modules** with information tailored to specific sectors
- Phased approach with **continual enhancements**



NEXT STEPS: WORKING TOWARDS A NETWORK OF REGIONAL HUBS

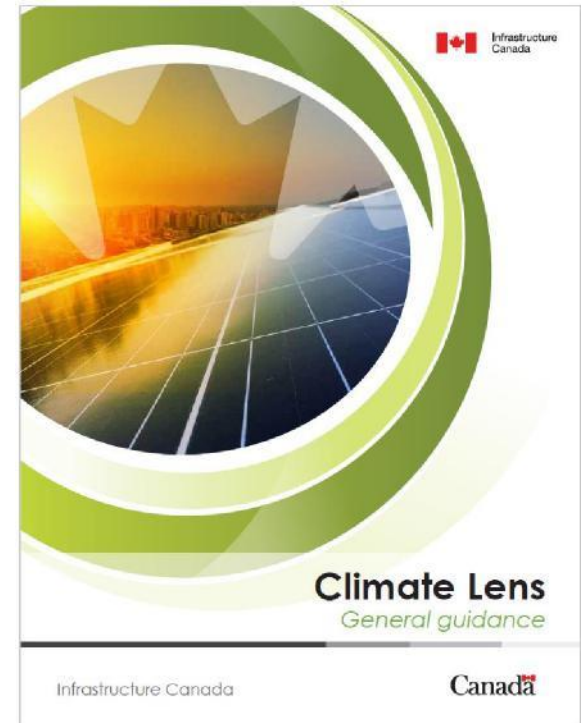


INFRASTRUCTURE CANADA'S CLIMATE LENS



OBJECTIVES OF THE CLIMATE LENS

- The **climate lens assesses opportunities to reduce carbon pollution** and helps identify **when and how a project should be adapting** project design to better withstand impacts of climate change.
- There is **guidance** to support the application of the lens to infrastructure projects.
- Climate change resilience assessments submitted to Infrastructure Canada **require a qualified party provide an attestation** that the assessment was carried out according to this guidance.

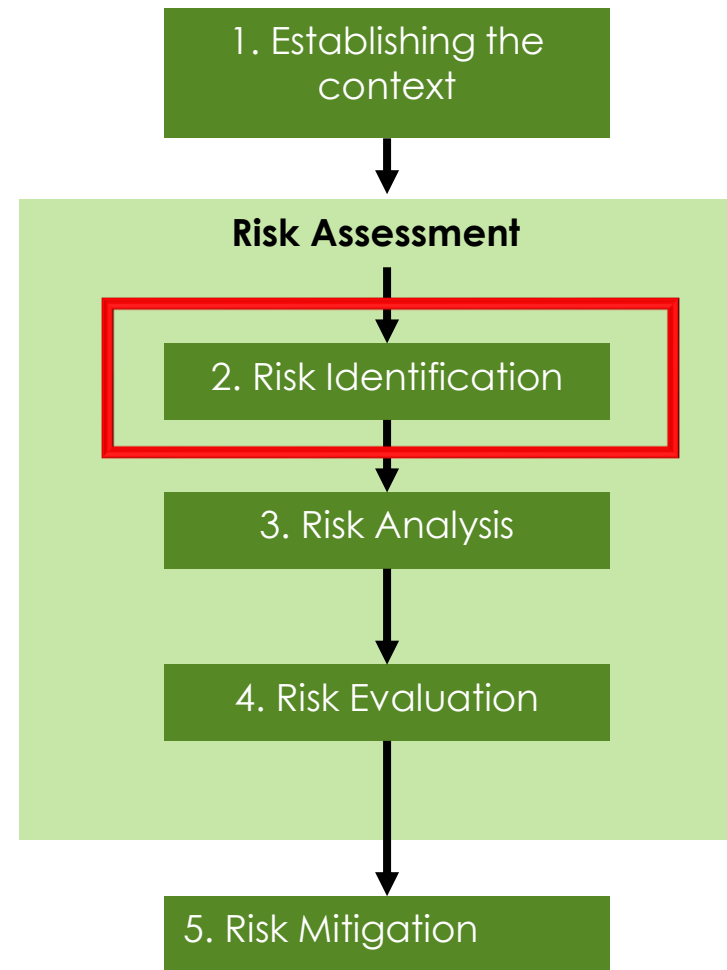


http://bit.ly/INFC_climate_lens

Please direct questions to:
infcc.info@canada.ca

RESILIENCE ASSESSMENT APPROACH

- The assessment broadly follows the process established in **ISO 31000 on Risk Management** and is couched in a set of **guiding principles**.
- **PIEVC protocol** is one tool that can support this approach.
- Assessment should also look at different climate change scenarios.



RISK IDENTIFICATION

Each risk should be assessed in the following order:

- A. **Climate change hazard*** (e.g. projected increase in precipitation)
- B. Impact on asset (e.g. overflow of a wastewater treatment plant)
- C. Consequence of impact (e.g. which resulted in increased risk to public health)

*Important to consider **climate change hazards** posed by:

- extreme events (e.g. increased storm intensity)
- incremental/slow onset events (e.g. gradual changes in the freeze-thaw cycle)



OBTAINING CLIMATE HAZARD DATA

- Identify climate variables and data by understanding what your asset is vulnerable to (e.g. freeze-thaw cycles)
- Start with high-level resources (e.g. maps) to screen for relevant hazards, and then drill down into the data
- Climate services like those found on the **CCCS website** and from the **Climate Services Support Desk** can be helpful to clarify which resources may be available



RISK/CONTEXT DETERMINES APPROPRIATE DATA

*The CCCS is here to help you understand **which data is appropriate to identify climate risks in your context and how it can be used***

- **Resolution:** GCM (100 Km²) vs. statistically downscaled (10 Km²)
- **Future and historical:**
 - Historical: Gridded data vs. weather stations
 - Future: RCP 2.6, 4.5, or 8.5 emission scenarios
- **Variables:** Temp, precip etc. Each variable has its own limitations
- **Time period:** appropriate time period dependent on lifecycle of asset (also time intervals: daily, monthly, seasonal, and annual)
- **Value type:** anomaly and/or actual
- **Percentiles:** Range of projections considered dependent on risk threshold (e.g. 95th percentile used for higher risk critical infrastructure)



EXAMPLES CLIMATE DATA AND INFORMATION AVAILABLE



HISTORICAL LOCAL CLIMATE CHANGE BURLINGTON REGION

The local climate is already changing

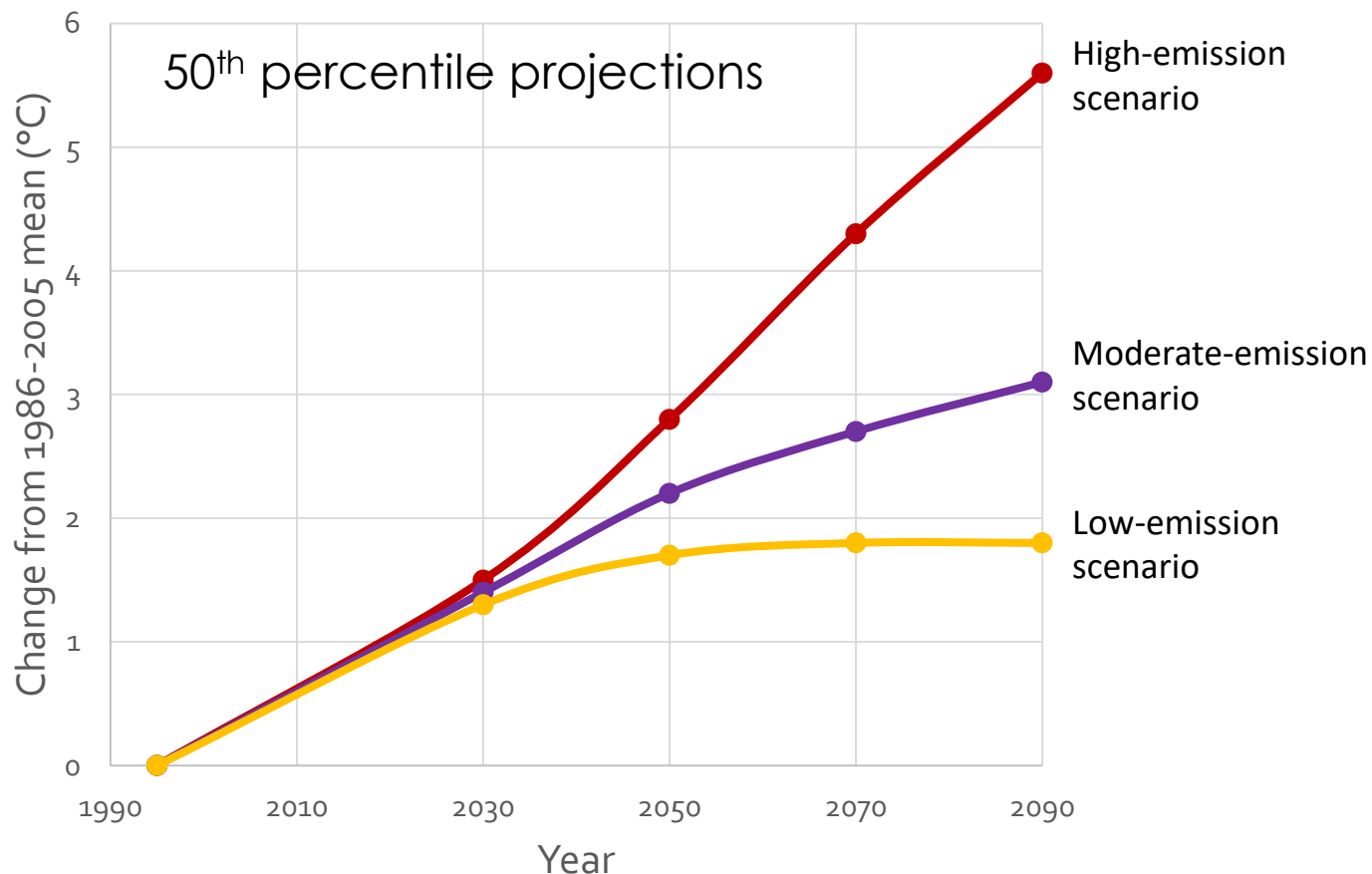
Trend	Annual	Winter	Spring	Summer	Autumn
Mean temp (°C) (1948-2016)	+0.9	+0.7	+1.2	+1.0	+0.7
Total Precipitation (%) (1948-2012)	+9.9	+5.5	+2.8	+6.4	+19.2



CCCS Data viewer

Annual mean temperature change for Burlington region between 1948 – 2016 (Gridded data)

PROJECTED CHANGE IN BURLINGTON: ANNUAL MEAN TEMPERATURE



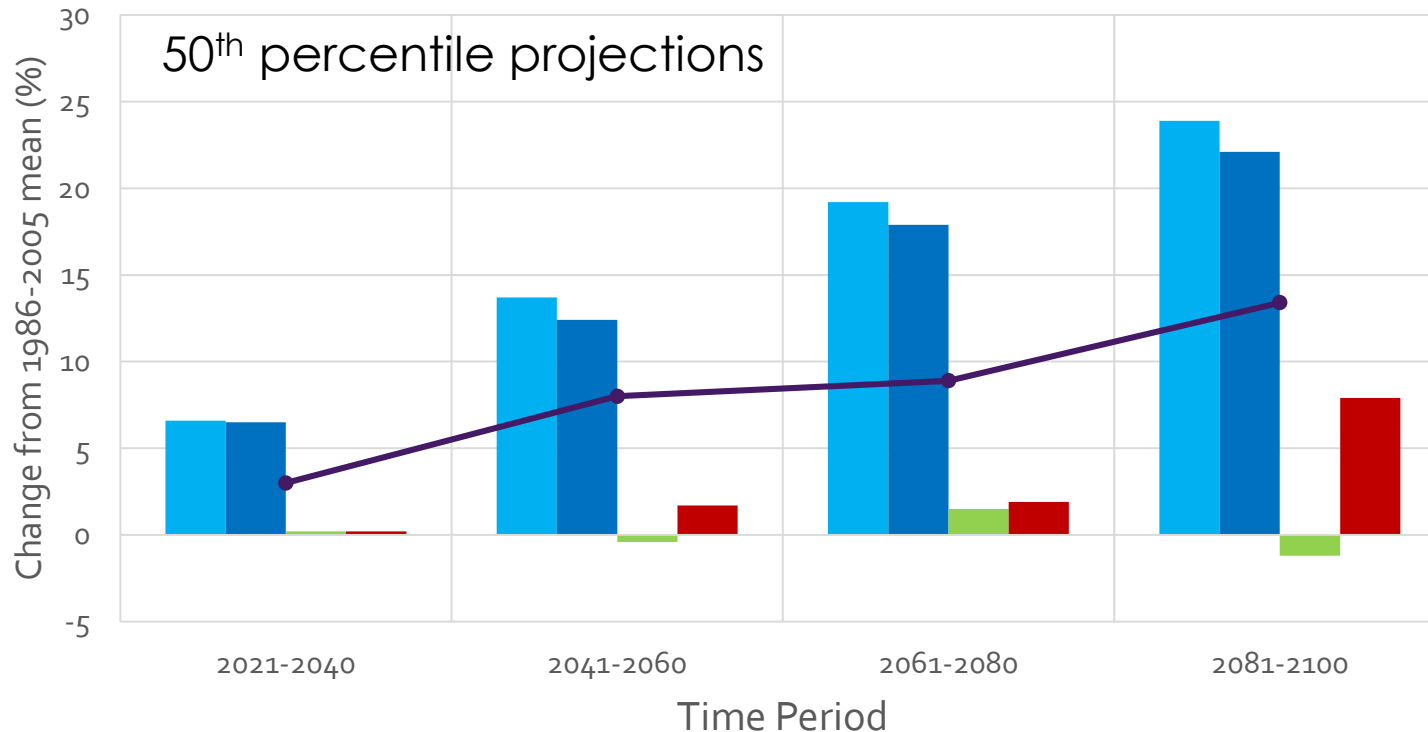
The projected annual mean temperature change for Burlington by the end of the century is between 1.8 and 5.6 °C



PROJECTED CHANGE IN BURLINGTON: SEASONAL PRECIPITATION

Looking only at the high-emission scenario (RCP 8.5)

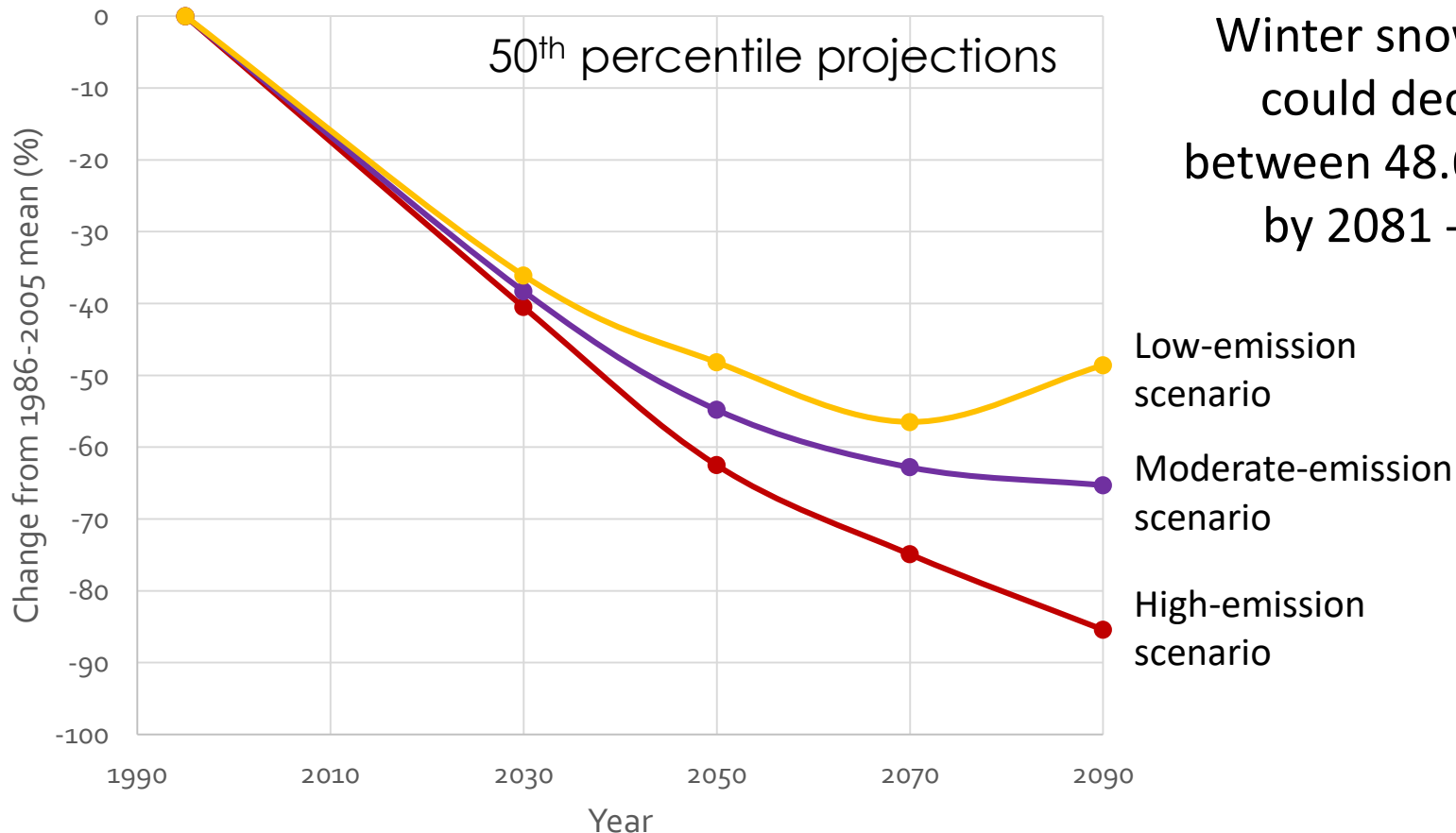
Winter Spring Summer Autumn Annual



Generally more
projected
precipitation

But varies
significantly by
season

PROJECTED CHANGE IN BURLINGTON: WINTER SNOW DEPTH



Winter snow depth
could decrease
between 48.6 – 85.4%
by 2081 - 2100



THANK YOU

Questions?

Website:

English:

www.canada.ca/climate-services

Français:

www.canada.ca/services-climatiques

Contact:



1-833-517-0376



info.cccs-ccsc@canada.ca



REFERENCES

Quest (2015) Resilient Pipes and Wires Report: Adaptation awareness, actions and policies in the Energy Distribution Sector. Available at:

<https://questcanada.org/project/resilient-pipes-and-wires/>

Region of Peel (2012) Urban Heat Islands and Climate Change. Available at:

https://www.peelregion.ca/planning/bulletins/UrbanHeatIslands_and_ClimateChange.pdf

Global News (2017) Heat warning issues for southern Ontario on first day of fall. Available at:

<https://globalnews.ca/news/3763925/heat-warning-southern-ontario/>

CCDR Canada Communicable Disease Report (2018) Climate Change and Lyme Disease. Available at: [https://www.canada.ca/en/public-health/services/reports-publications/canada-](https://www.canada.ca/en/public-health/services/reports-publications/canada-communicable-disease-report-ccdr/monthly-issue/2018-44/issue-10-october-4-2018/article-1-lyme-disease-ontario-2017.html)

[communicable-disease-report-ccdr/monthly-issue/2018-44/issue-10-october-4-2018/article-1-lyme-disease-ontario-2017.html](https://www.canada.ca/en/public-health/services/reports-publications/canada-communicable-disease-report-ccdr/monthly-issue/2018-44/issue-10-october-4-2018/article-1-lyme-disease-ontario-2017.html)

OCCIAR Ontario Centre for Climate Impacts and Adaptation Resources (2015) Climate change impacts and adaptation in Ontario: Water and Transportation Infrastructure. Available at:

http://www.climateontario.ca/doc/RACII/National_Assessment_Syntheses/SummarySheets/Chapter8-Water_and_Transportation_Infrastructure.pdf



APPENDIX

WEBSITE FEATURES



CCCS WEBSITE

www.canada.ca/climate-services/

Jobs ▼

Immigration ▼

Travel ▼

Business ▼

Benefits ▼

Health ▼

Taxes ▼

More services ▼

[Home](#) → [Environment and natural resources](#) → [Weather, climate and hazards](#) → [Climate change](#) → [Canada's climate plan](#)
→ [Adapting to climate change in Canada](#)

Canadian Centre for Climate Services



Library of climate resources

Datasets, tools, guidance and related resources



Climate information basics

Climate change concepts, trends and role of climate information in decision-making



Climate Services Support Desk

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Get help from our climate experts to find, understand and use climate information



Display and download climate data

View selected climate datasets on maps or download data

CLIMATE INFORMATION BASICS: TRENDS & PROJECTIONS

Temperature, Precipitation, Sea Ice, Snow Depth

Patterns of temperature change in Canada

The mean (average) annual temperature in Canada increased by 1.7°C from 1948 to 2016. Warming has been even stronger in the North, particularly in winter. The mean annual temperature in northern Canada has risen by 2.3°C over this same period.

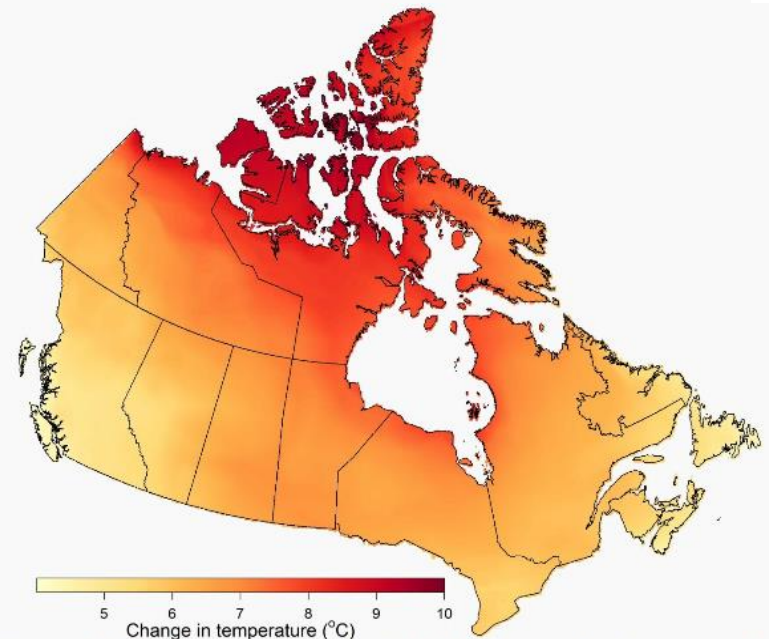
Future changes in temperature will be determined mainly by the amount of GHGs emitted. There is a large range of possible futures, which are described by different emissions scenarios. In general, higher global emissions scenarios project greater warming.

Compared to the recent past (1986 to 2005), mean annual temperature in Canada is projected to increase by 1.8°C to 6.3°C¹ by the end of the century. During the same period, summer temperature in Canada is projected to increase by 1.4°C to 5.4°C. Mean winter temperature is projected to increase by 2.4°C to 8.2°C¹.

Find temperature data in the library of climate resources.

Includes:

- Key concepts
- Patterns over time
- Impacts of change
- Adapting to change
- Other resources

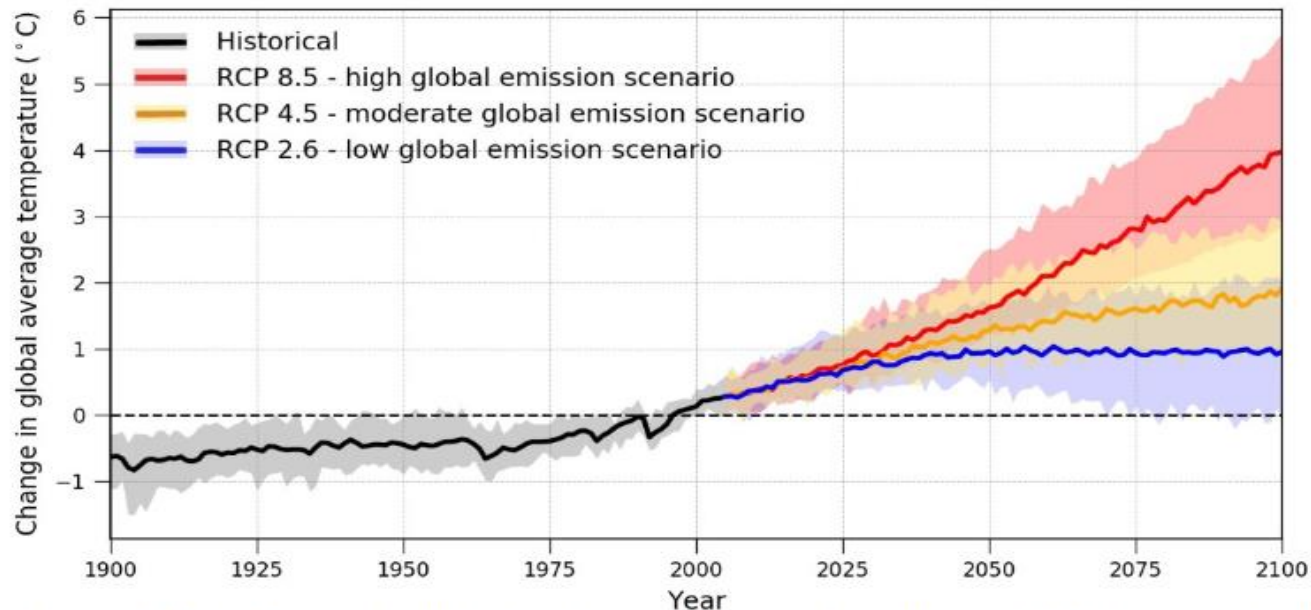


This figure is a map of projected changes in annual temperature by the end of the 21st century across the Canadian landmass. Changes in annual temperature are relative to the 1986-2005 reference period. The dataset used here is a statistically downscaled dataset, based on the Bias Correction/Constructed Analogues with Quantile mapping reordering (BCCAQ) version 2. The emission scenario used here is the Representative Concentration Pathway 8.5.



CLIMATE INFORMATION BASICS: SCENARIOS & MODELS

Figure 1: Change in global average temperature relative to the 1986-2005 reference period



This figure shows changes in global average temperature, relative to the 1986 to 2005 reference period, simulated by 29 global climate models from the Coupled Model Intercomparison Project, Phase 5 (CMIP5).

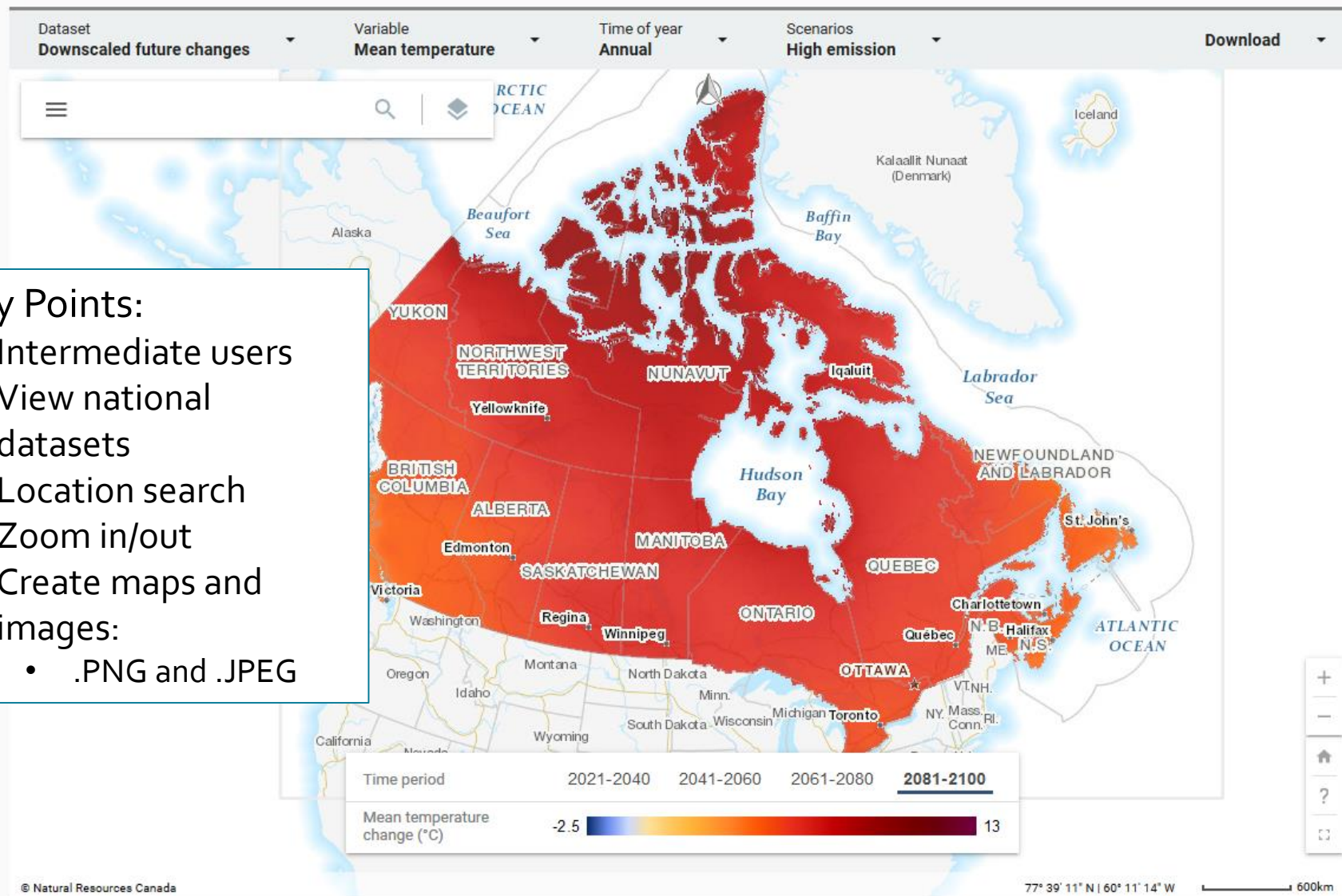
Describes:

- Emission scenarios
- Models & projections
- Uncertainty
- Other resources

Climate data viewer

Use the data viewer tool to view climate data on the map below. Begin by choosing one of the available datasets. There is a detailed description of the selected dataset below the map. You can zoom to a specific geographic location or click on the data for additional information. You can specify datasets, variables and other options using the drop-down menus at the top of the map.

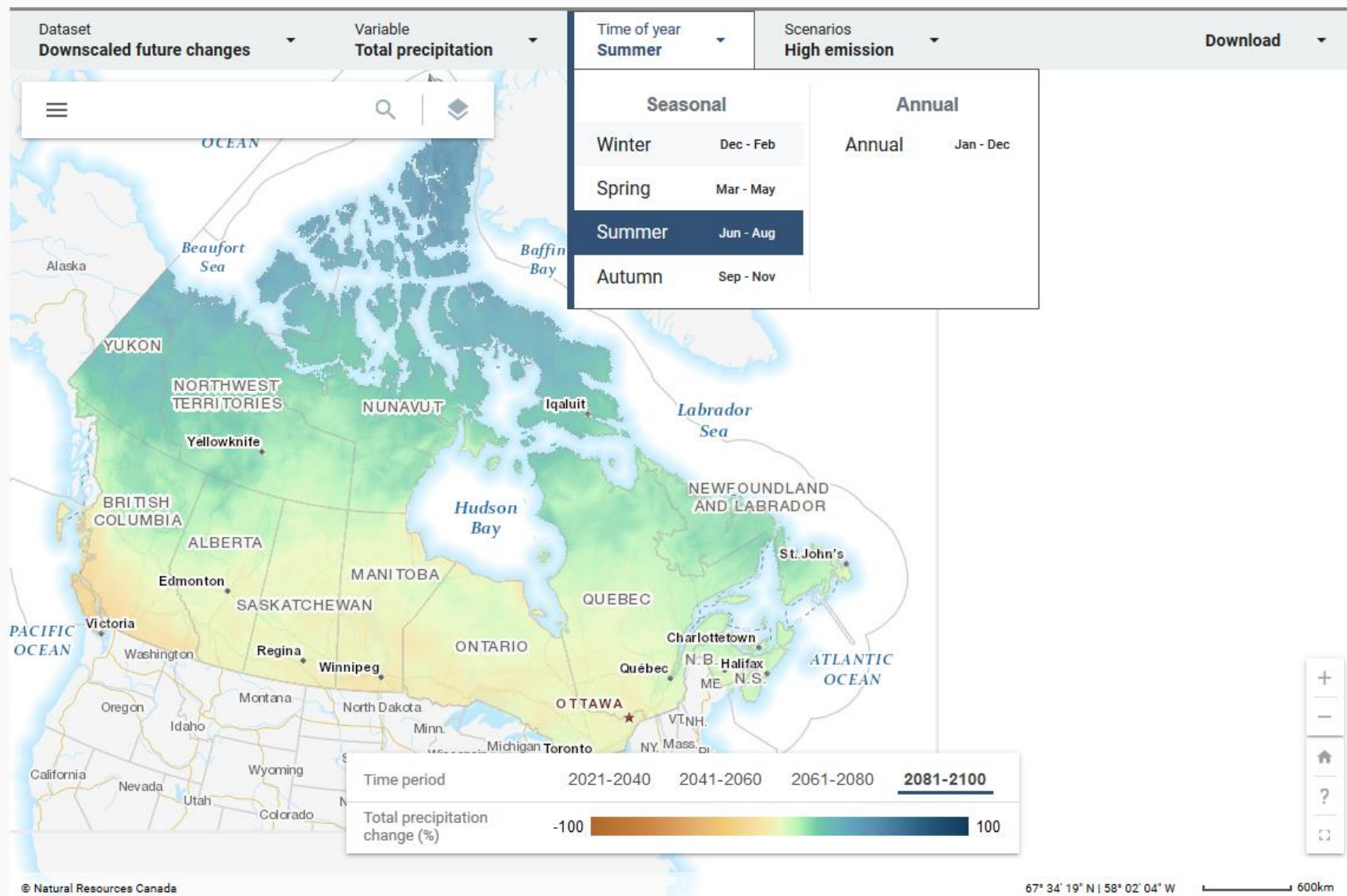
For help, see the [help file](#) or click the '?' icon in the bottom right corner of the map.



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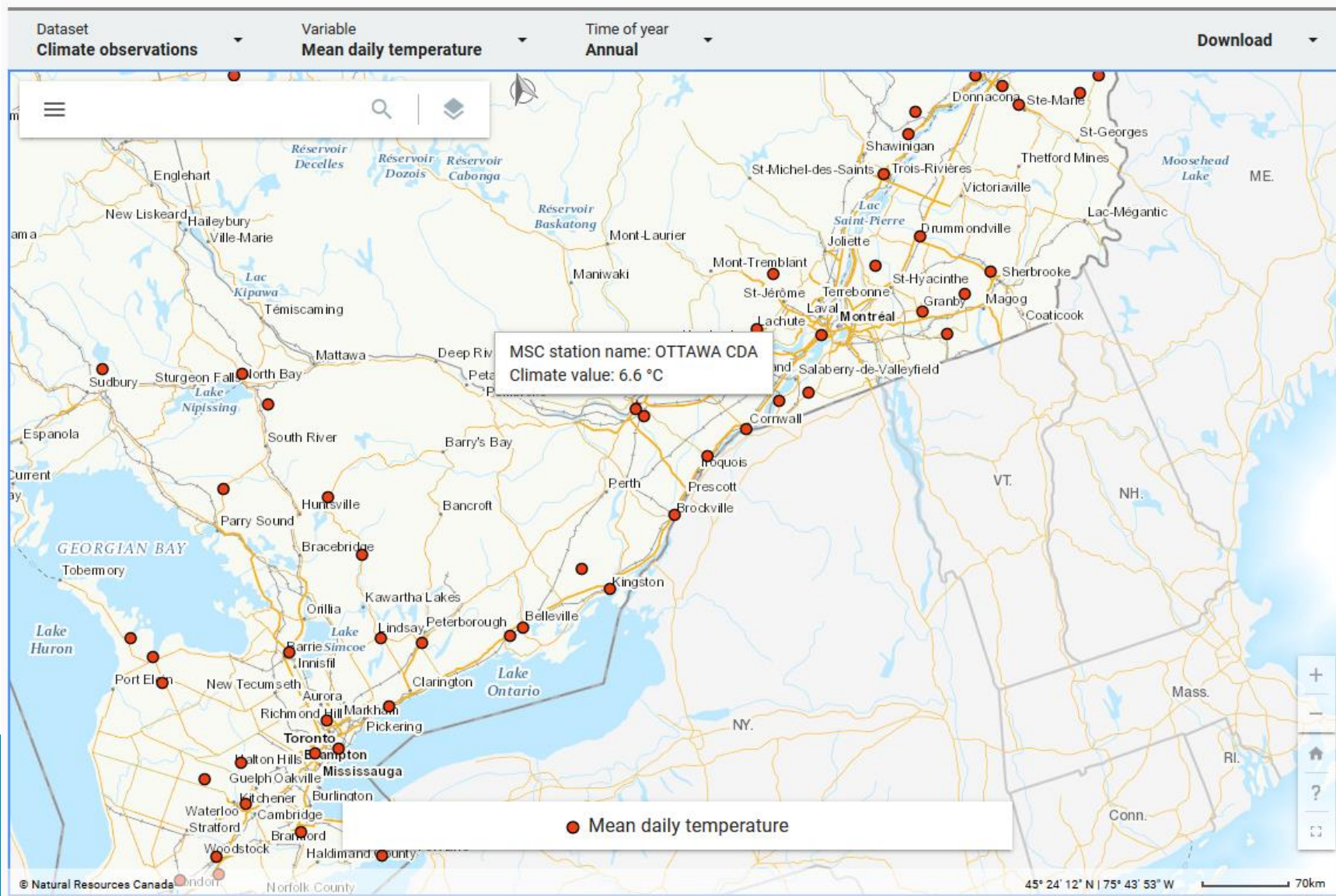
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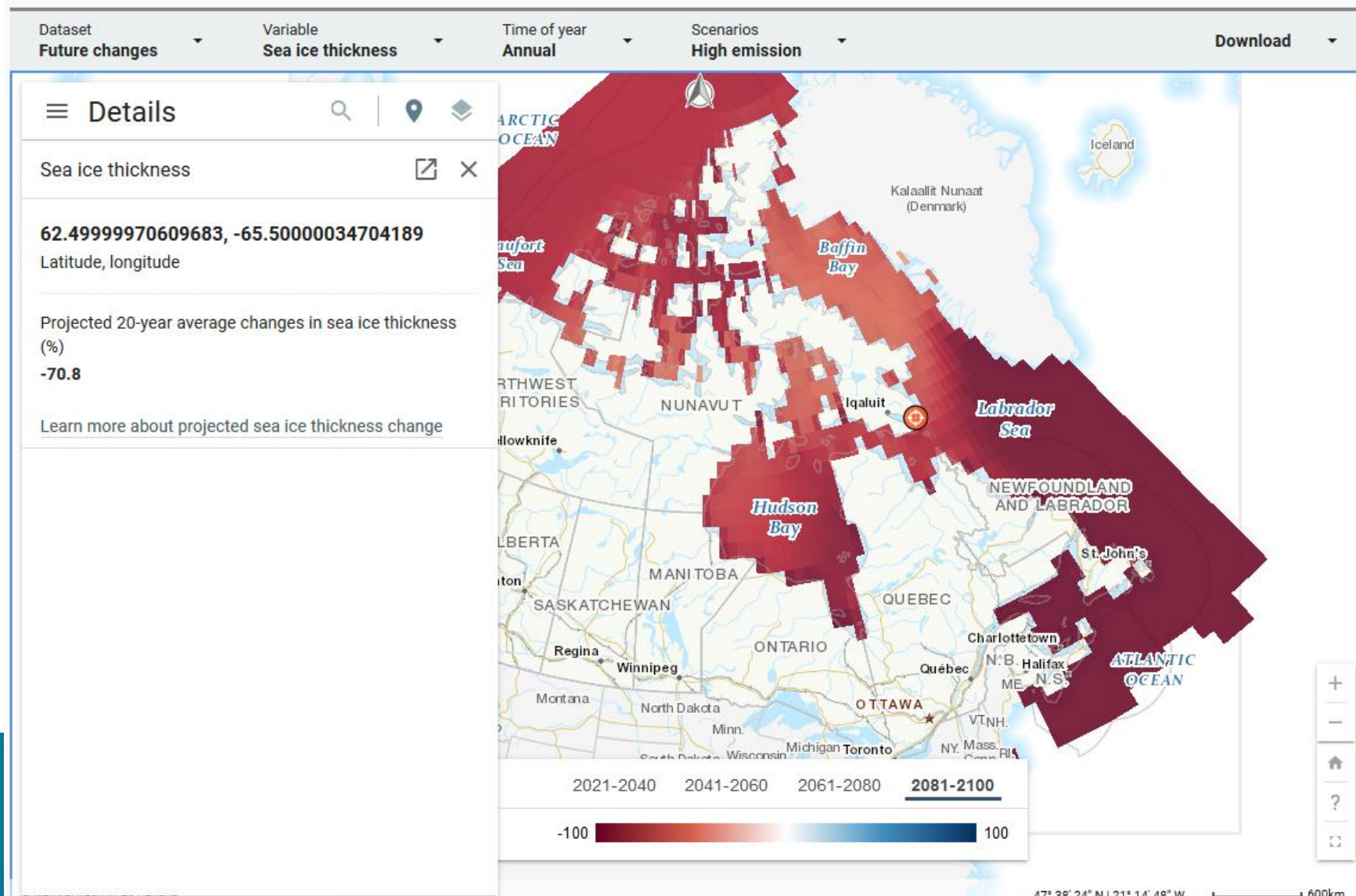
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Statistically downscaled climate scenarios

Use the climate data extraction tool to download climate data from the selected Environment and Climate Change Canada' datasets.

* Emissions scenario (Required)

[Learn more about emissions scenarios](#)

Low emissions scenario (RCP 2.6)

* Time interval / Time of year (Required)

[Contact the Climate Services Support Desk if you're interested in daily data](#)

Annual

* Value type (Required)

Anomaly values

* Ensemble percentile (Required)

[Contact the Climate Services Support Desk if you're interested in individual model output](#)

[Learn more about percentiles](#)

percentile

range

Year average ☐ User defined range

Year average range (Required)

-2100

Download format (Required)

[Contact the Climate Services Support Desk if you'd like data for a single grid point only](#)

Explanation of data formats

TIFF

Advanced options

Data download link

[Download: Statistically downscaled climate scenarios](#)

Key Points:


- Advanced users
- Find, map and download
- Download formats depends on dataset:
 - .CSV files for spreadsheets
 - .GeoTIFF for GIS
 - .NetCDF
 - ... and more

LIBRARY OF CLIMATE RESOURCES

Library of climate resources

This is a collection of links to climate datasets, tools, guidance and related resources. The sources include the federal government, provincial and territorial governments, national professional organizations, climate consortia and established international organizations. It can be useful for impact, vulnerability and risk assessments, and for adaptation planning.

Refine your search using the search filters. You can also type up to 5 keywords in the search bar.

 If you have questions, [contact the Climate Services Support Desk](#).

► Explanation of the different resource types

Search records

Search ...



Showing 1 - 10 of 325 results

Order by Name ascending

[7 Steps to Assess Climate Change Vulnerability in Your Community](#)

 Guidance

This workbook helps communities plan for climate change by assessing vulnerability to identified hazards.

Organization:

Government of Newfoundland and Labrador, Memorial University

Sub organization:

Search filters [Clear all](#)

▼ Sector

- ☐ Agriculture (26)
- ☐ Coastal management (30)
- ☐ Ecosystems and biodiversity



CCCS WEBSITE DATASETS AVAILABLE

Historical Data

- **Climate normal* (1981-2010) at weather stations (values)**
 - Variables: Mean temp, daily min temp, daily max temp
 - Timescales: Annual, monthly
 - Formats for download: CSV, GeoJSON
- **Adjusted historical climate data at weather stations (trends)**
 - Variables: (Dependent on the station) Mean temp, daily min temp, daily max temp, total precipitation, wind speed, sea level pressure, station pressure
 - Timescales: (Dependent on the station) Annual, seasonal, monthly
 - Formats for download: CSV, GeoJSON
- **Canadian Gridded Temperature and Precipitation Anomalies (CANGRD)**
 - Resolution: 50 Km
 - Variables: Min temp, max temp, and mean temp, total precipitation
 - Timescales: Annual, seasonal
 - Formats for download: GeoTIFF, NetCDF
- **Changes in Temperature and Precipitation (trends) – Gridded data**
 - Resolution: 50 Km
 - Variables: Mean temp, total precipitation
 - Timescales: Annual, seasonal
 - Formats for download: GeoTIFF, NetCDF



CCCS WEBSITE DATASETS AVAILABLE

Future Projections

Time periods: 2021-2040 / 2041-2060 / 2061-2080 / 2081-2100

- **Future climate simulations (global climate models) – Gridded Data**
 - Resolution: 100 Km
 - Variables: Mean temp, total precipitation, surface wind speed, sea ice concentration, sea ice thickness, snow depth
 - Timescales: Annual, seasonal
 - Scenarios: High Emissions, Moderate Emissions and Low Emissions
 - Formats for download: NetCDF, GeoTIFF
- **High resolution future climate simulations (downscaled) – Gridded Data**
 - Resolution: 10 Km
 - Variables: Daily max temp, daily min temp, mean temp and total precipitation
 - Timescales: Annual, seasonal
 - Scenarios: High Emissions, Moderate Emissions and Low Emissions
 - Formats for download: NetCDF, GeoTIFF

