

Contaminated Sites: Taking Future Climate Into Account, Finding and Using Climate Data

SABCS Conference on Contaminated Sites
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What we'll cover today

Learning Objectives

- Help you build your understanding of climate information, including how to access future climate data.
- Explore ways to use future climate data to support contaminated sites management, remediation, custodianship.

Presentation Agenda

1. Introduction to climate services and climate information
2. Recent extreme events, some climate projections for BC
3. Climate data & online tools – move into workshop activities

Canadian Centre for Climate Services

- **Support Desk** to help answer your questions and find the right datasets
- **Website** with:
 - ✓ Access to climate data portals
 - ✓ Links to 300+ resources
 - ✓ Intro to climate information concepts
- **Training and guidance** for using climate data
- **Co-development** of new data products
- **Collaboration** with regional climate organizations to co-deliver services with locally-relevant information to users

“Provides Canadians with information and support to consider climate change in their decisions.”



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Regional Climate Service Provider

- Regional climate service provider
- Launched 2005; sister organization to Pacific Institute for Climate Solutions (PICS)
- Partner with researchers and users of climate information



Regional Climate Impacts

- developing, providing, and interpreting future projections of regional climate change



Hydrologic Impacts

- quantifying the hydrologic impacts of climate change and variability



Climate Analysis and Monitoring

- serving the need for past climate information and its interpretation



Computational Support Group

- enabling high speed computing on large datasets, developing online tools, and maintaining open-source code

Weather vs Climate

WEATHER

Tells you what to wear each day



CLIMATE

Tells you what types of clothes to have in your closet



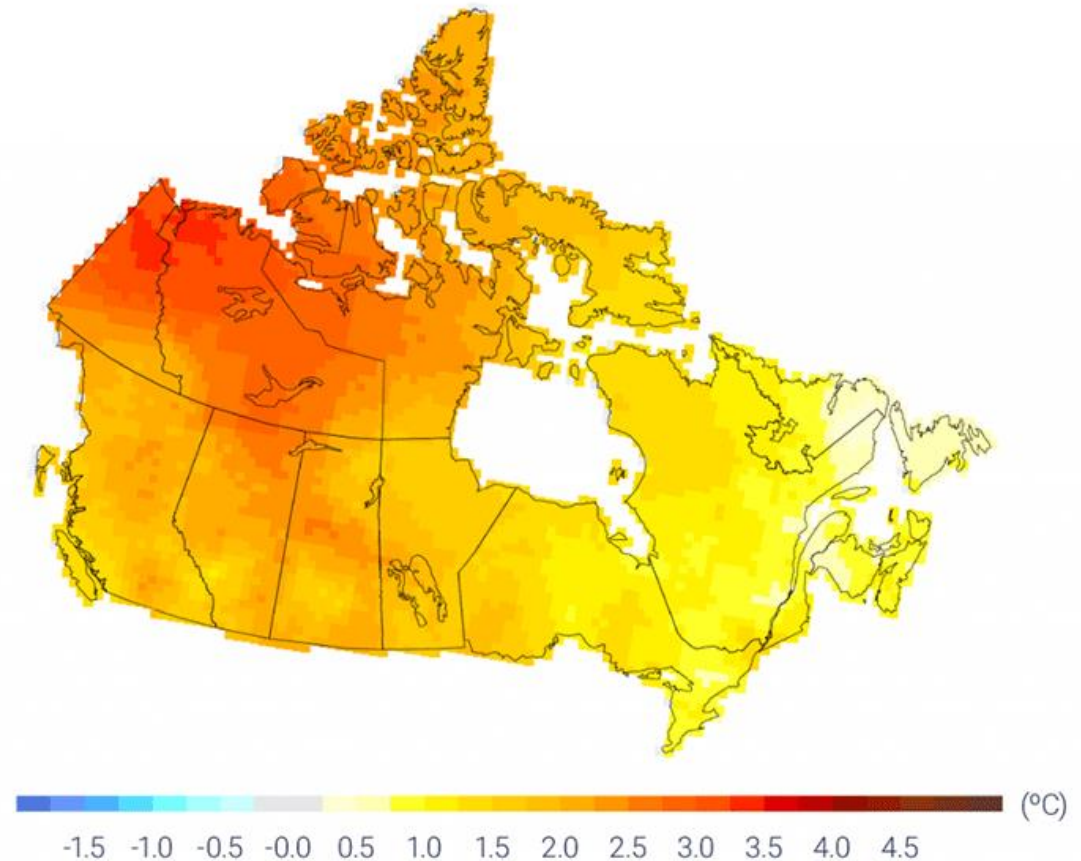
NOAA National Centers for Environmental Information

www.ncei.noaa.gov

Climate = long term statistics of weather

The climate is changing

- Effects of widespread warming are evident in many parts of Canada and are projected to intensify in the future
 - **World temperature** has increased by over 1°C in past 150 years
 - **Canada** has warmed at 2X the global rate, 3X in the North
- These changes can bring significant impacts and risks
- **Climate data and information helps to understand and plan for these changes**

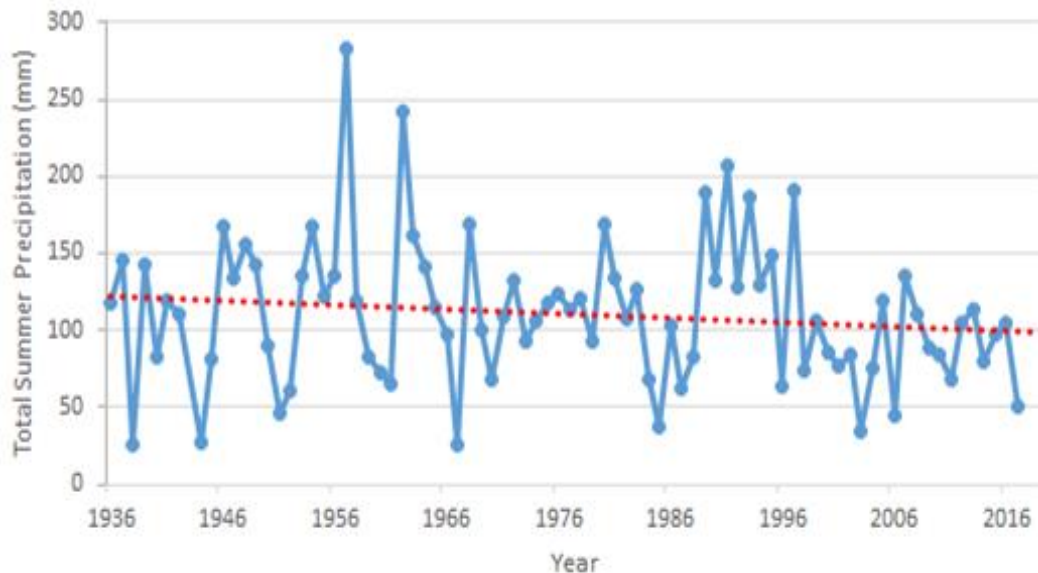


Increase in annual average temperature in Canada between 1948 and 2016. Source: Canadian Gridded Temperature and Precipitation Anomalies (CanGRD)

CLIMATE CHANGE IS BOTH:

1) The **change in average conditions** over long time periods, like changes in in average precipitation or in sea levels.

2) The **change in extreme events** with different **intensity and frequency**, like changes in extreme rainfall.

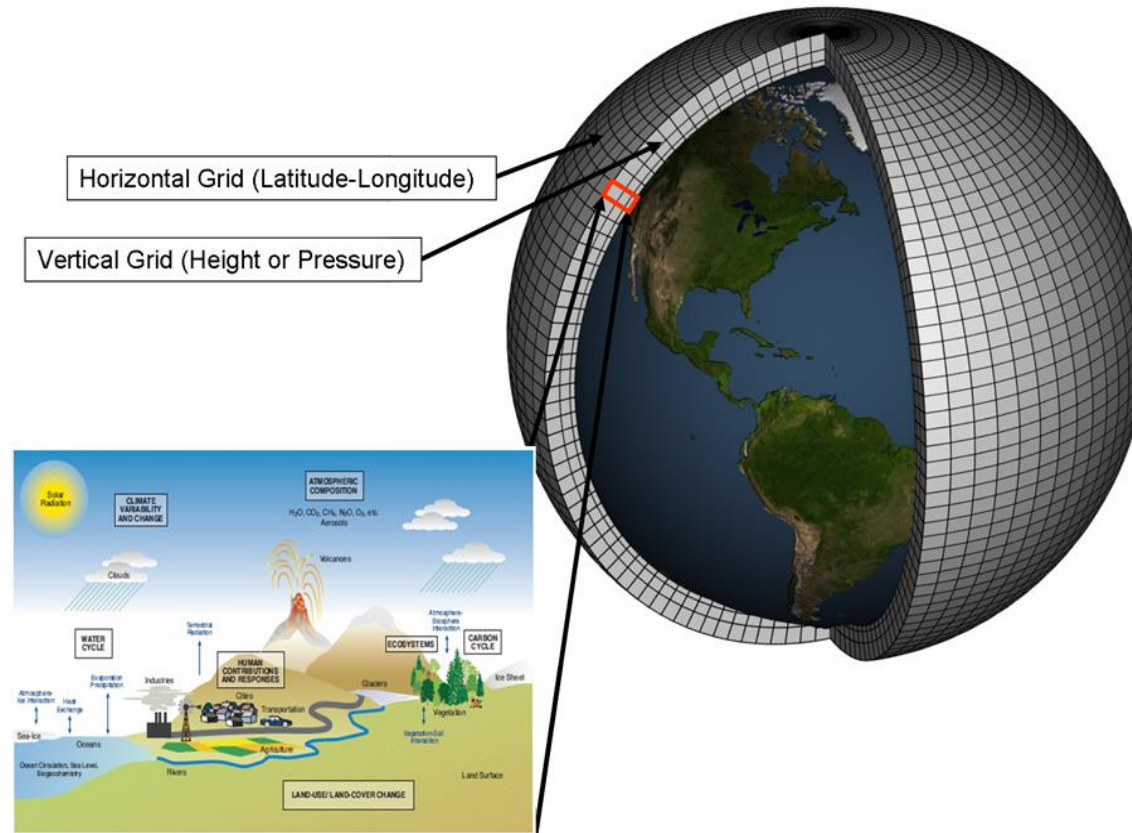


↔
The changes
are linked

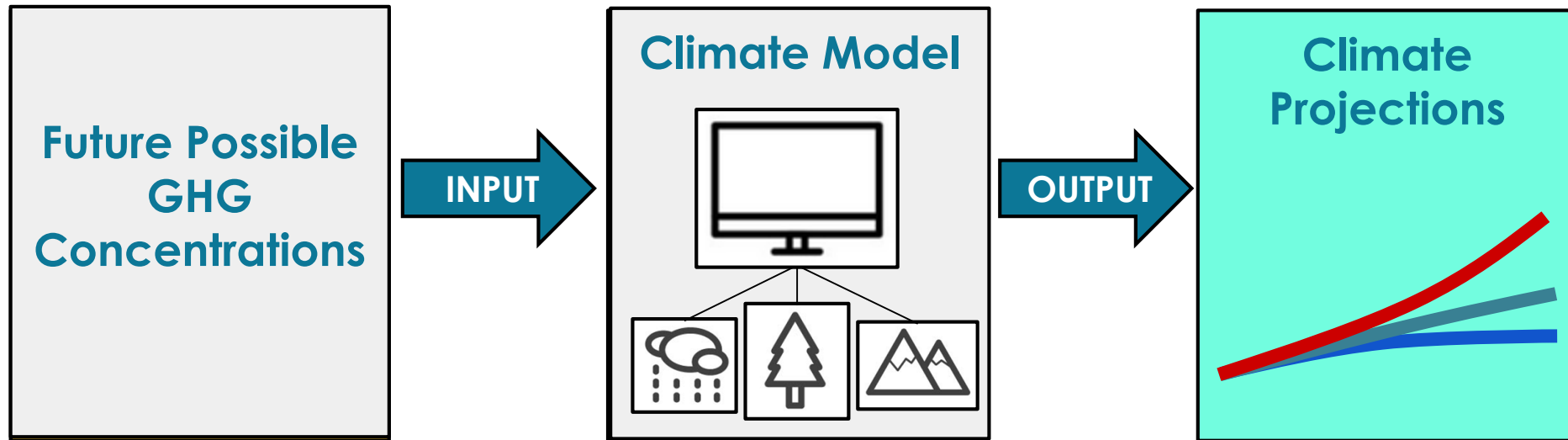


Figure: ECCC AHCCD for Comox, BC

What are climate projections, and where do they come from?

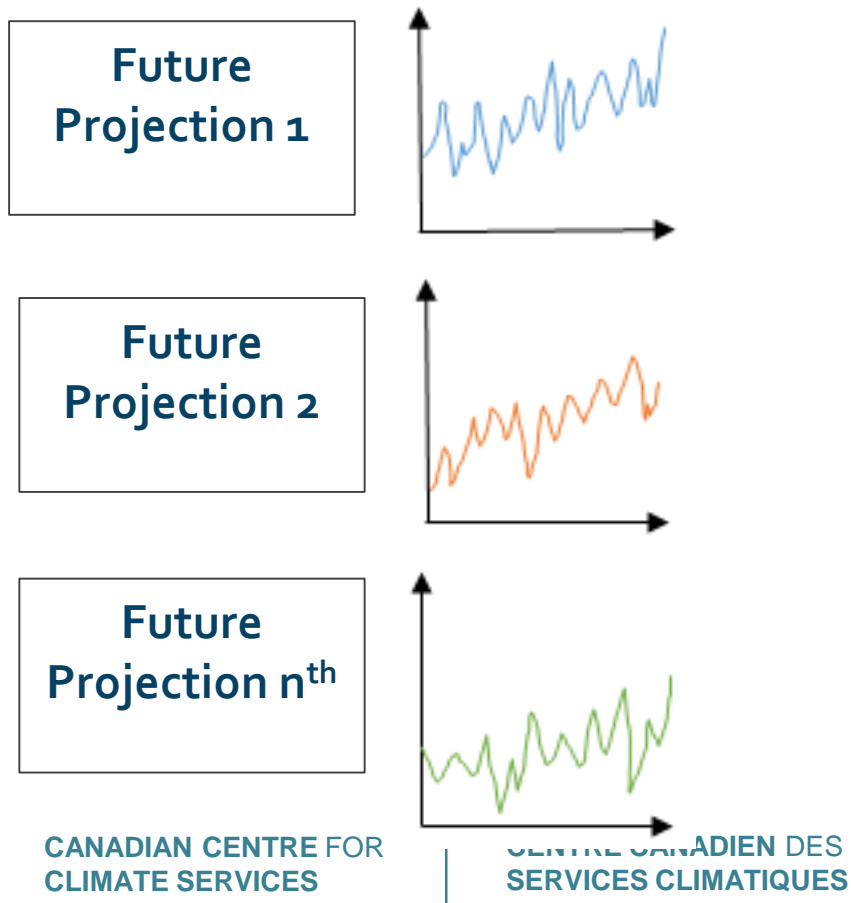


What are climate projections, and where do they come from?

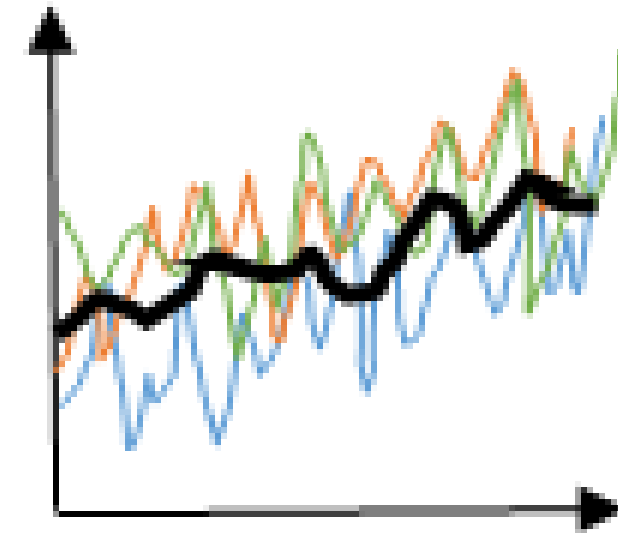


We can represent the range of model outputs using multi-model ensembles

Individual model output



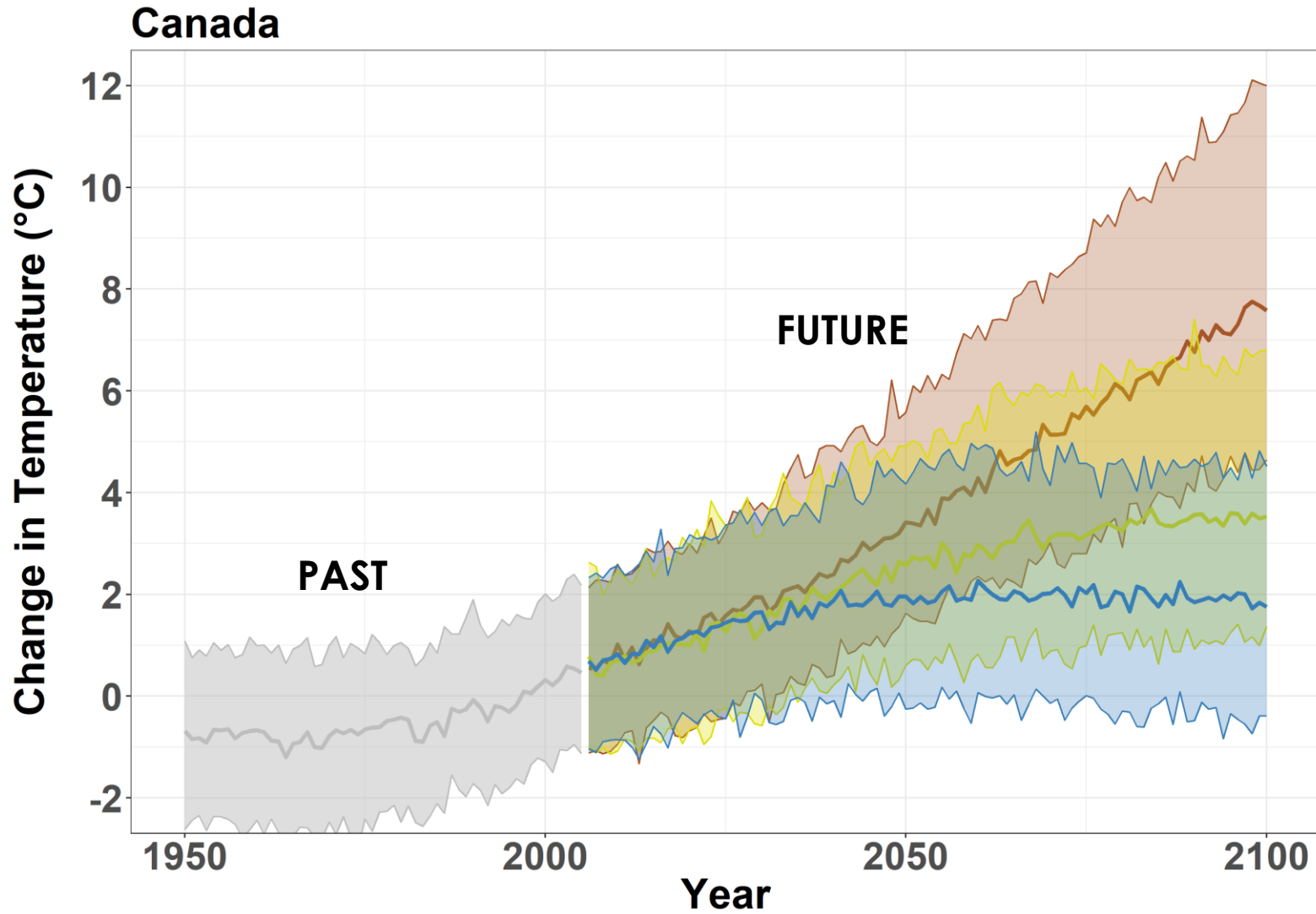
Multi-model ensemble



Source: ECCC-CCCS

Pacific Climate Impacts Consortium | pacificclimate.org

EMISSIONS SCENARIOS AND DECISION-MAKING



High Emissions
RCP 8.5
SSP5 – 8.5



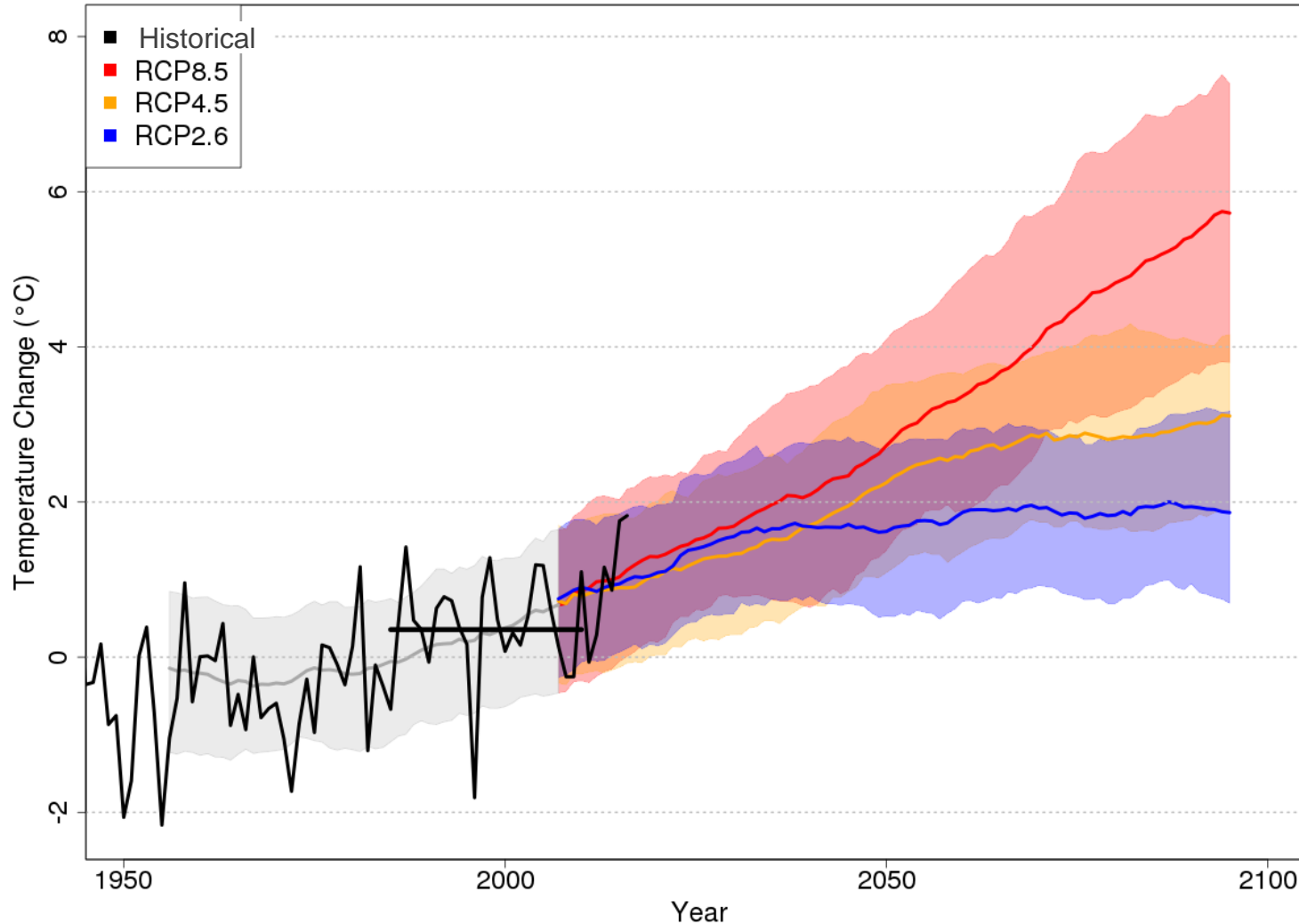
Moderate Emissions
RCP 4.5
SSP2 – 4.5



Low Emissions
RCP 2.6
SSP1 – 2.6



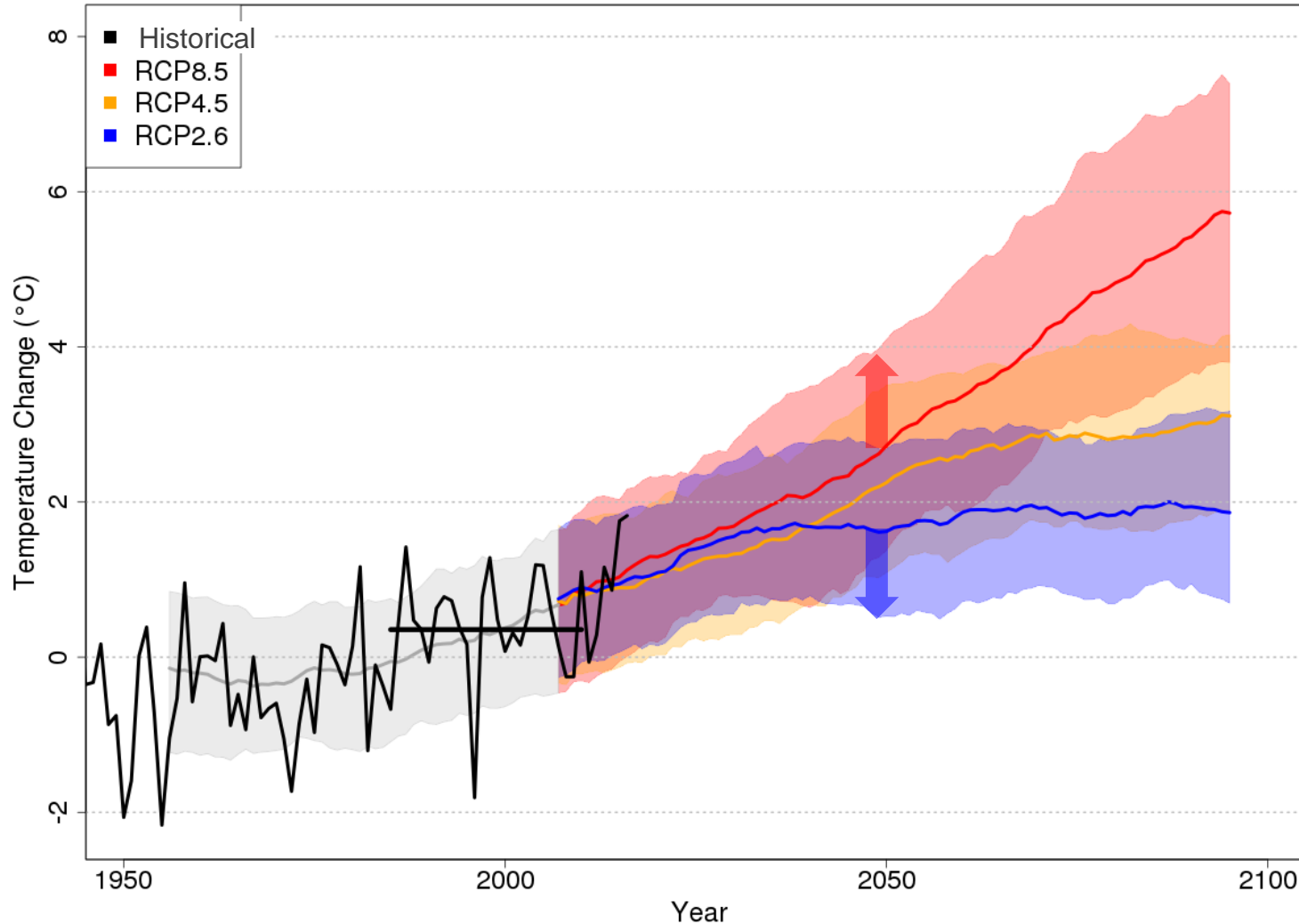
BC: Historical Average Temperature → Future Temperature



Summary:

1. Conditions keep changing with time in all but best case.
2. Must accommodate wider range of conditions in all cases.
- 3. Past conditions are not a good guide for future conditions.**

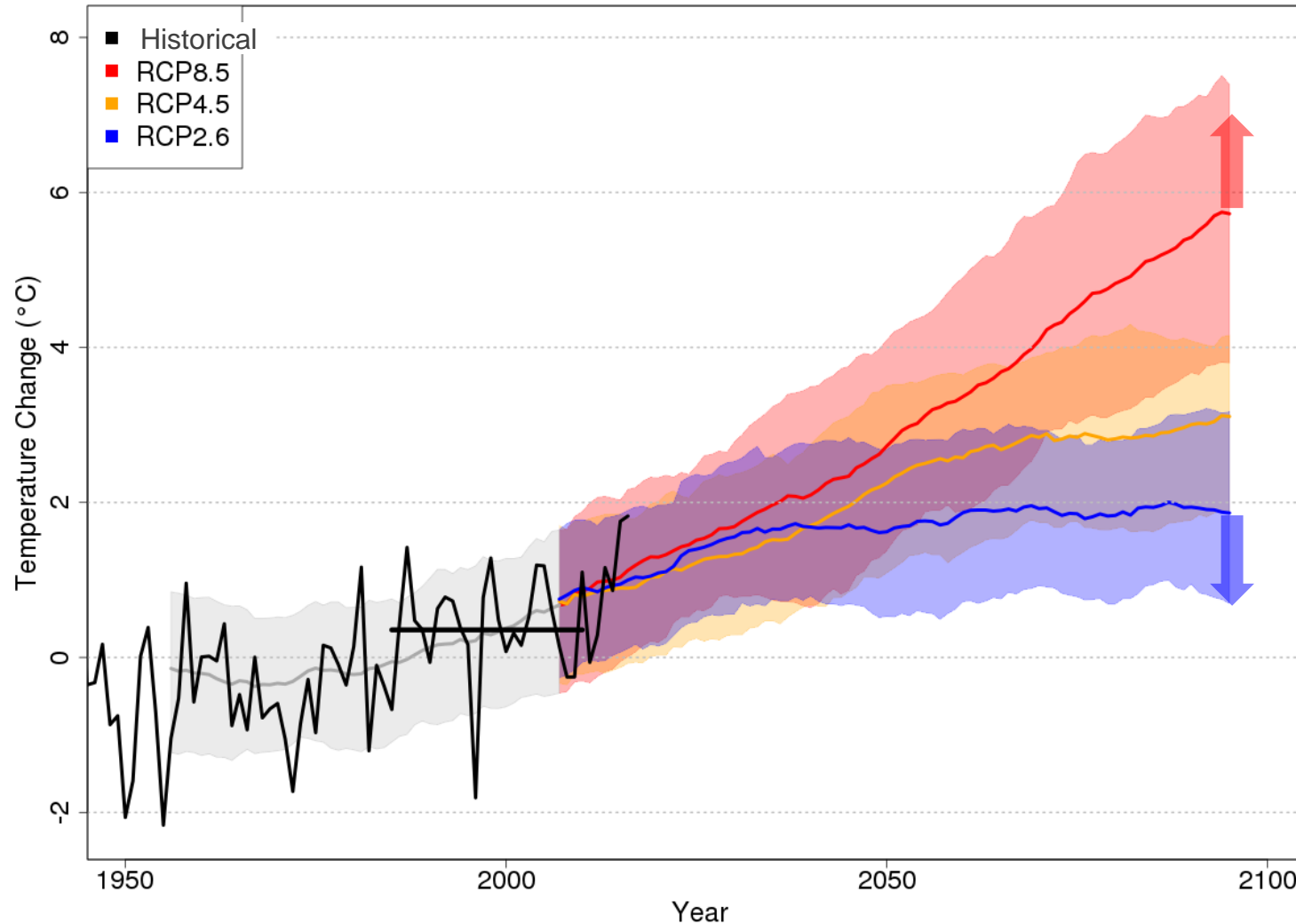
BC: Historical Average Temperature → Future Temperature



Summary:

1. Conditions keep changing with time in all but best case.
2. Must accommodate wider range of conditions in all cases.
- 3. For example, by 2050 there is a wider range than the historical period.**

BC: Historical Average Temperature → Future Temperature



Summary:

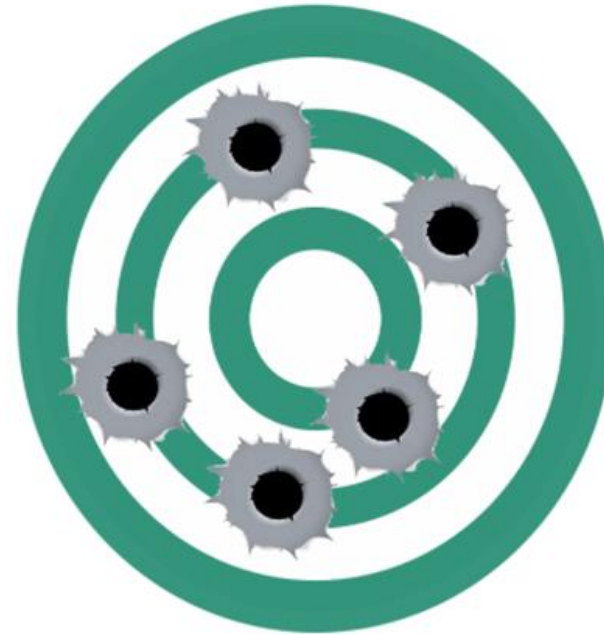
1. Conditions keep changing with time in all but best case.
2. Must accommodate wider range of conditions in all cases.
3. ***By 2100 the range of outcomes has expanded even further.***

Precisely Wrong vs Generally Accurate

“Past data are known quantities”



“Forecasts have uncertainties”



Checking in: questions?

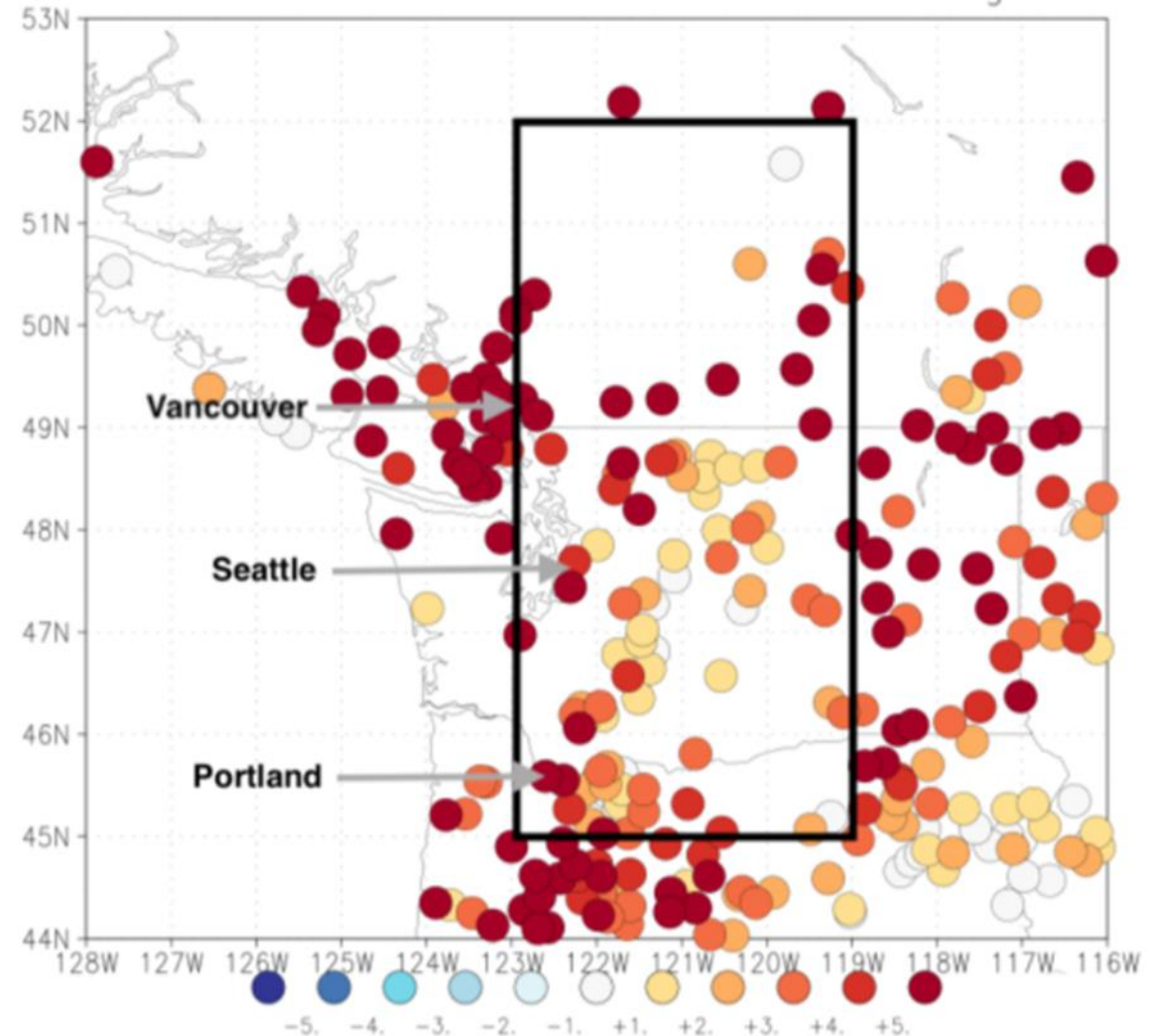


Summer Heat Dome

- In the summer of 2021, observed temperatures at many locations were far outside the range of historically observed temperatures
- It is estimated that this event would occur roughly once in a thousand years in today's climate; it would have been at least 150 times rarer in the absence of human-caused climate change
- **In a future world, with global mean temperatures 2°C above preindustrial, such an event could occur once every 5-10 years**

Attribution results and figure from:
www.worldweatherattribution.org – an international group of climate scientists who undertake rapid extreme event analyses.

Summer 2021 Heat Dome: Observed temperature anomalies relative to average highest daily temperature: dark red dots are stations with temperatures more than 5°C greater than average highs



November 2021- Atmospheric River

- A 1-in-50 to 1-in-100 year event
- A compound extreme event;
 - Intense precipitation
 - Existing wet conditions
 - Snowmelt at higher elevations.
- Maximum values of extreme streamflow exceeded 1-in-100 year values at several basins
- Probability of such events has increased by about 50% due to climate change
- With about 3°C warming, the event will be 150%-300% more likely



Climate Projections – British Columbia



Warmer winters,
fewer days below freezing



More hot summer days,
longer dry spells in summer



More precipitation in the fall,
winter, and spring



Increased frequency and intensity
of precipitation and storm events

Climate Projections – Metro Vancouver

- Wetter winters, particularly fall
- Drier summers
- Reduced snowpack

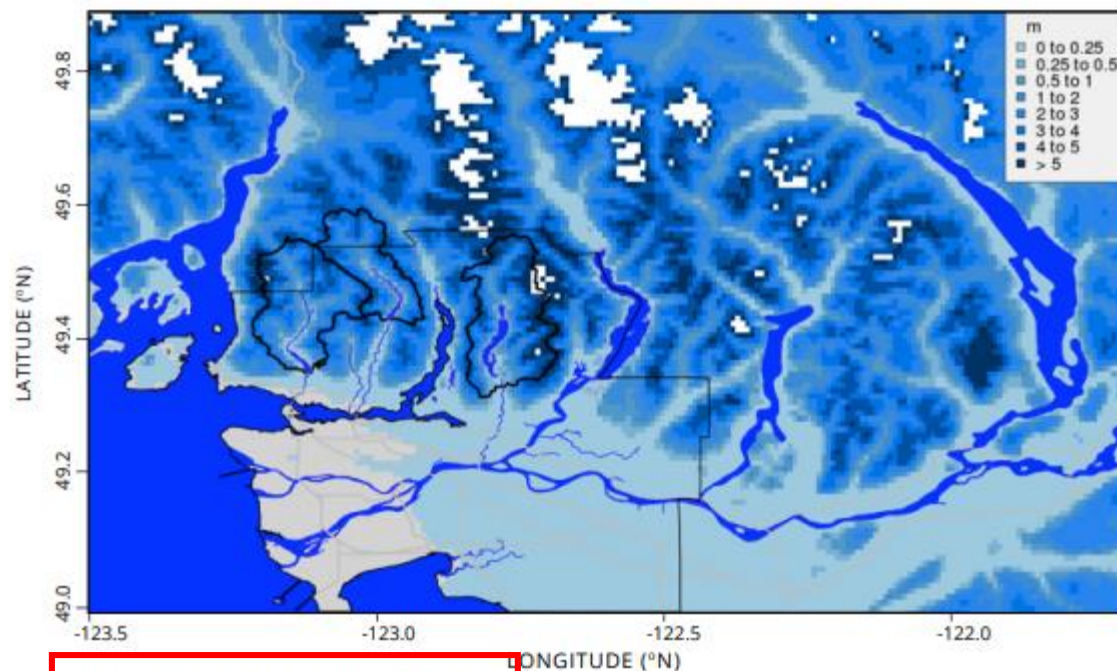


FIGURE 8: APRIL 1 SNOWPACK - PAST

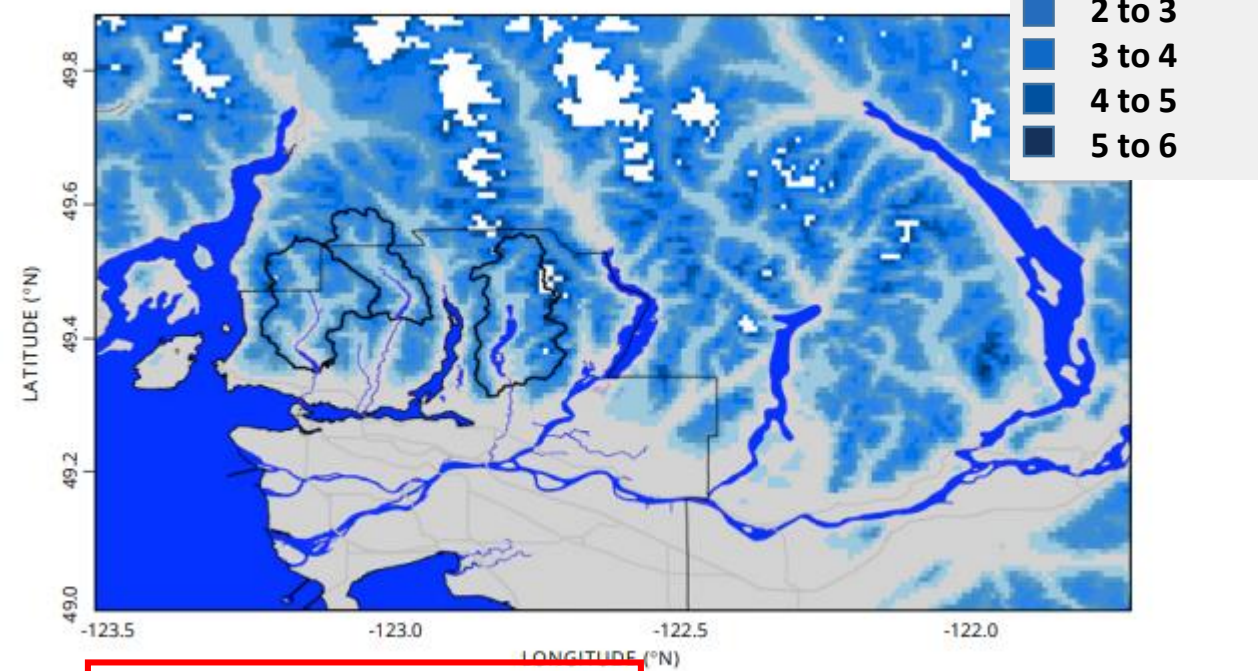
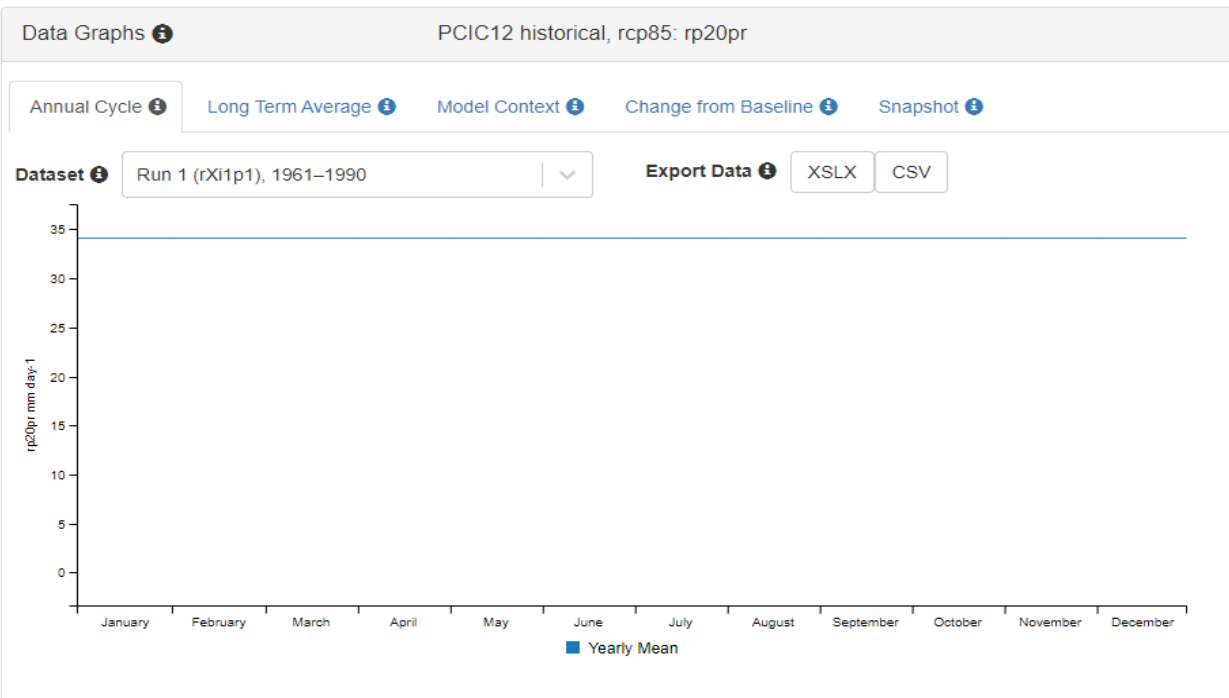
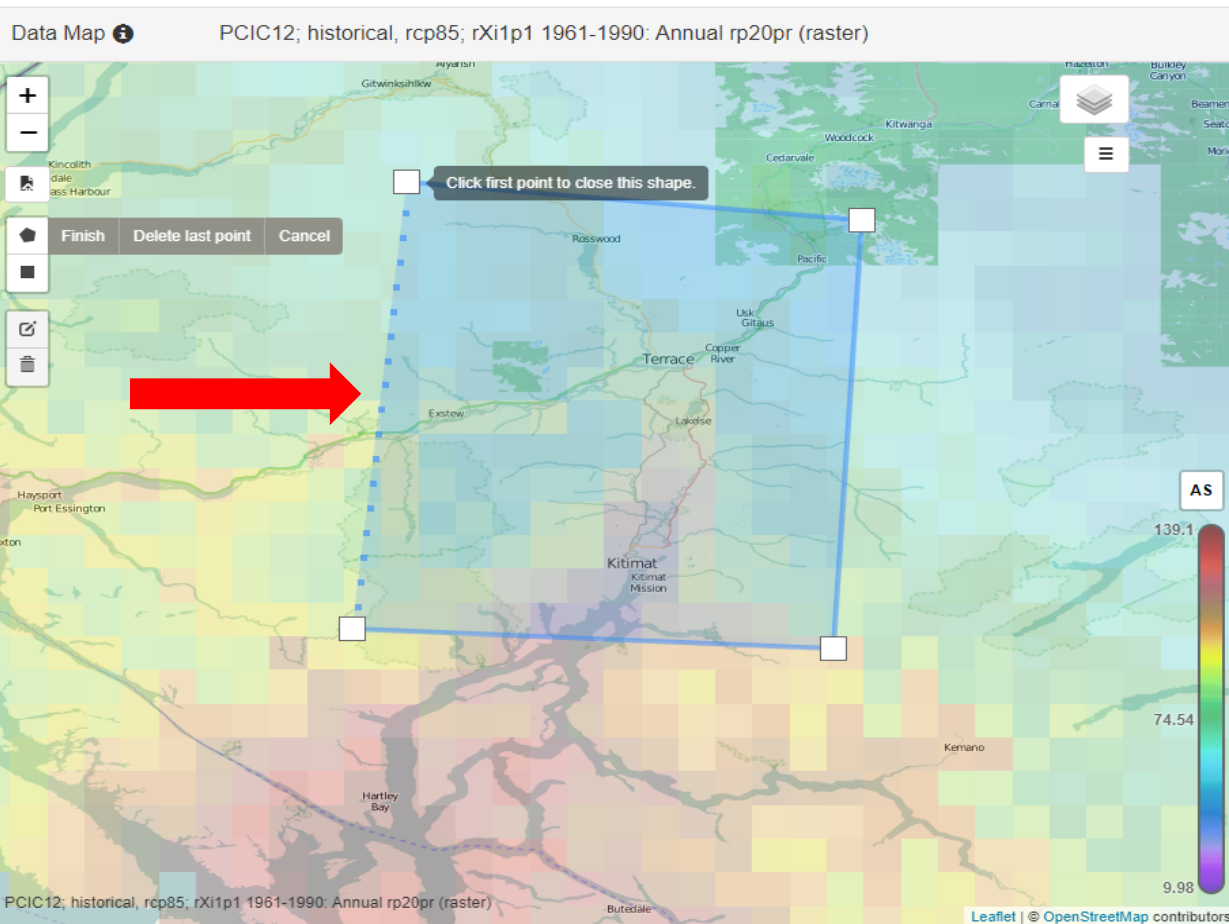


FIGURE 9: APRIL 1 SNOWPACK - FUTURE (2050s)

Available Data: PCIC Climate Explorer

Model PCIC12 |
 Emissions Scenario Historical, then RCP 8.5 |
 Variable rp20pr - 20-year annual maximum one day precipitation amount

Filtered Datasets Summary PCIC12 historical, rcp85: rp20pr → 6 datasets



filtered datasets ↓

Statistical Summary PCIC12 historical, rcp85: rp20pr

Time of Year Annual |
 Export Data XSLX CSV

Run	Averaging Peri...	Min	Max	Mean	Median	Std.Dev	Units

Available Data: PCIC Design Value Explorer

 Design Variable:
[Map](#) [Table C-2](#) [Help](#) [About](#)
Overlay Options

Period

- Historical design values
- Future change relative to 1986-2016

Global Warming

 Stations

(HISTORICAL ONLY)

 Grid
Colour Scale Options

Colour Map

Scale

Num. Colours



Range: 2630 to 12540


Data from map pointer

Hover over map to show position of cursor. Click to hold design values for download.

[Download this data](#)

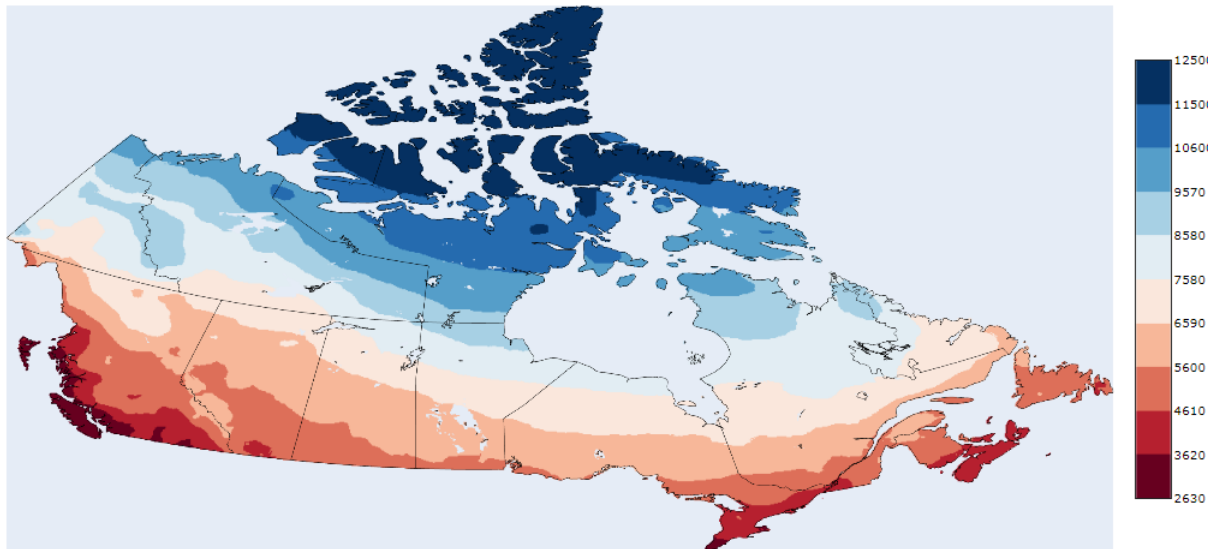
Lat	80.230365
Lon	-72.939369

Lat	53.855402
Lon	-95.993269

Historical design values

Design value	Units	Interpolation value
DRWP5	Pa	80
HDD	°C-day	6900
IDFCF	ratio	n/a
MI		0.625
PAnn	mm	550
R1d50	mm	75
R15m10	mm	19
RAnn	mm	385
RL50	kPa	0.1
RHAnn	%	74
SL50	kPa	3
TJan1.0	°C	-38
TJan2.5	°C	-36
TJul97.5	°C	27
TwJul97.5	°C	20
Tmax	°C	24
Tmin	°C	-34
WP10	kPa	0.2
WP50	kPa	0.2

HDD Heating degree days below 18 °C (°C-day) • Historical



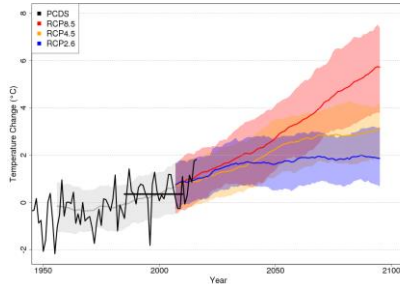
Regional Training & Engagement



Kari Tyler
ktyler@uvic.ca

Sign up for our mailing list at pacificclimate.org

Best Practices for Adaptation

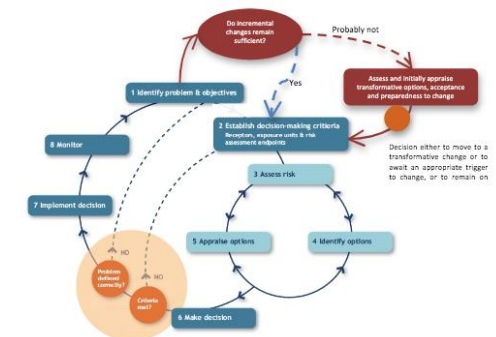


Make use of available climate information

Consider a range of future projections



Practice cross-disciplinary engagement



Learn and iterate

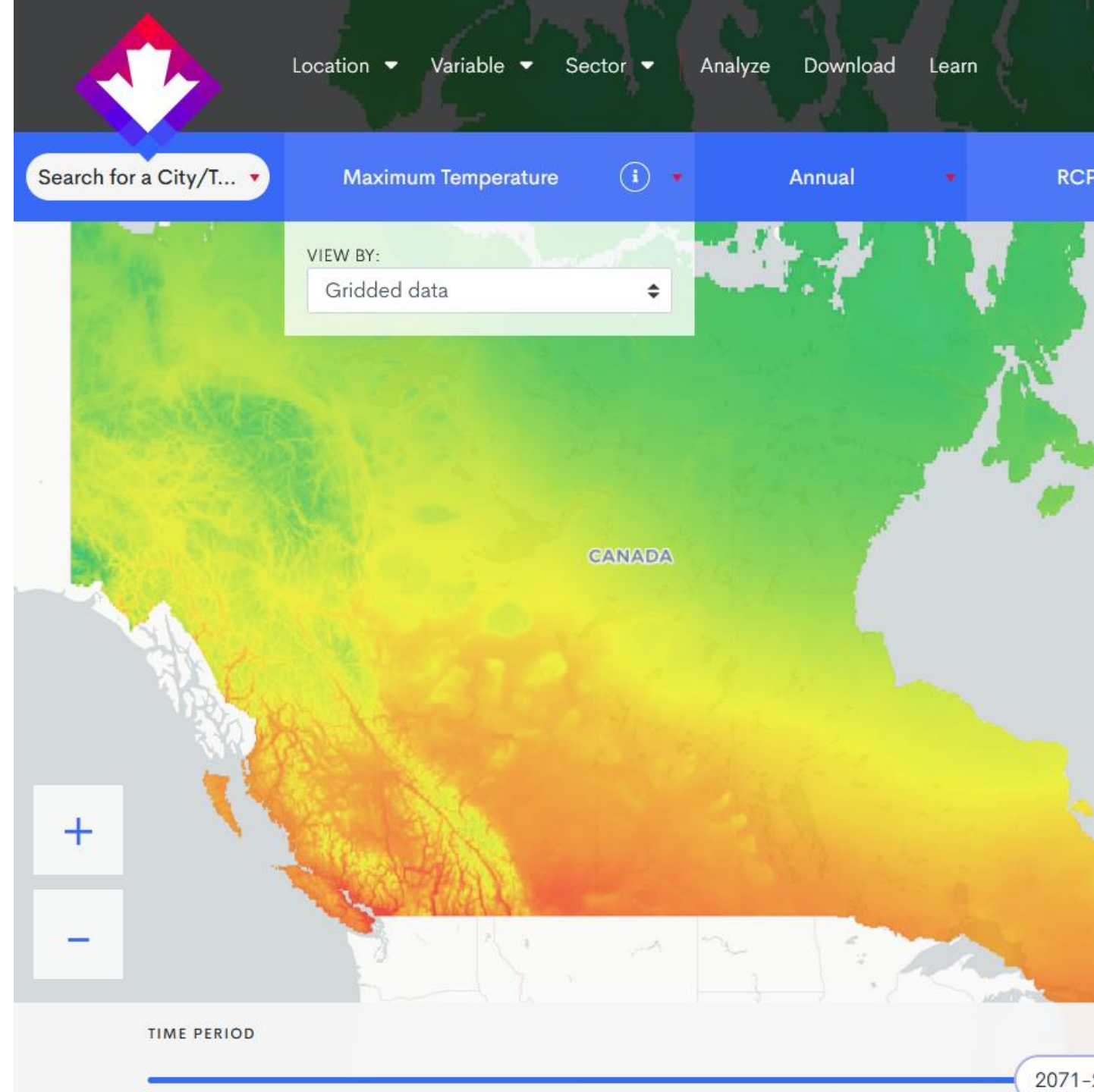
CLIMATEDATA.CA

Climate Data

- Download and view climate data
- High resolution climate data
- Temperature and precipitation variables and climate indices
- Sea level rise
- Observed climate normals and daily data download
- Intensity Duration Frequency (IDF) curves
- Local and national scale charts and maps
- Ability to compare emission scenarios
- Customizable tools to analyze and extract data

Helpful Resources

- Sector modules with tailored case studies
- Learning Zone



Additional resources



Federal Contaminated Sites Action Plan (FCSAP)

Integrating Climate Change Adaptation Considerations into Federal Contaminated Sites Management

Version 1.0

[Chapter 5 — Regional Perspectives Report \(changingclimate.ca\)](https://changingclimate.ca)

https://publications.gc.ca/collections/collection_2022/eccc/En14-487-2022-eng.pdf



Environment and
Climate Change Canada

Environnement et
Changement climatique Canada

Canada

BREAK! COME BACK FOR THE WORKSHOP



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EN: canada.ca/climate-services

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