CANADIAN CENTRE FOR CLIMATE SERVICES | CENTRE CANADIEN DES SERVICES CLIMATIQUES

Environment and Climate Change Canada | Environnement et Changement climatique Canada

Canada

Observed Climate Change Impacts in the Prairie Provinces and Future Projections

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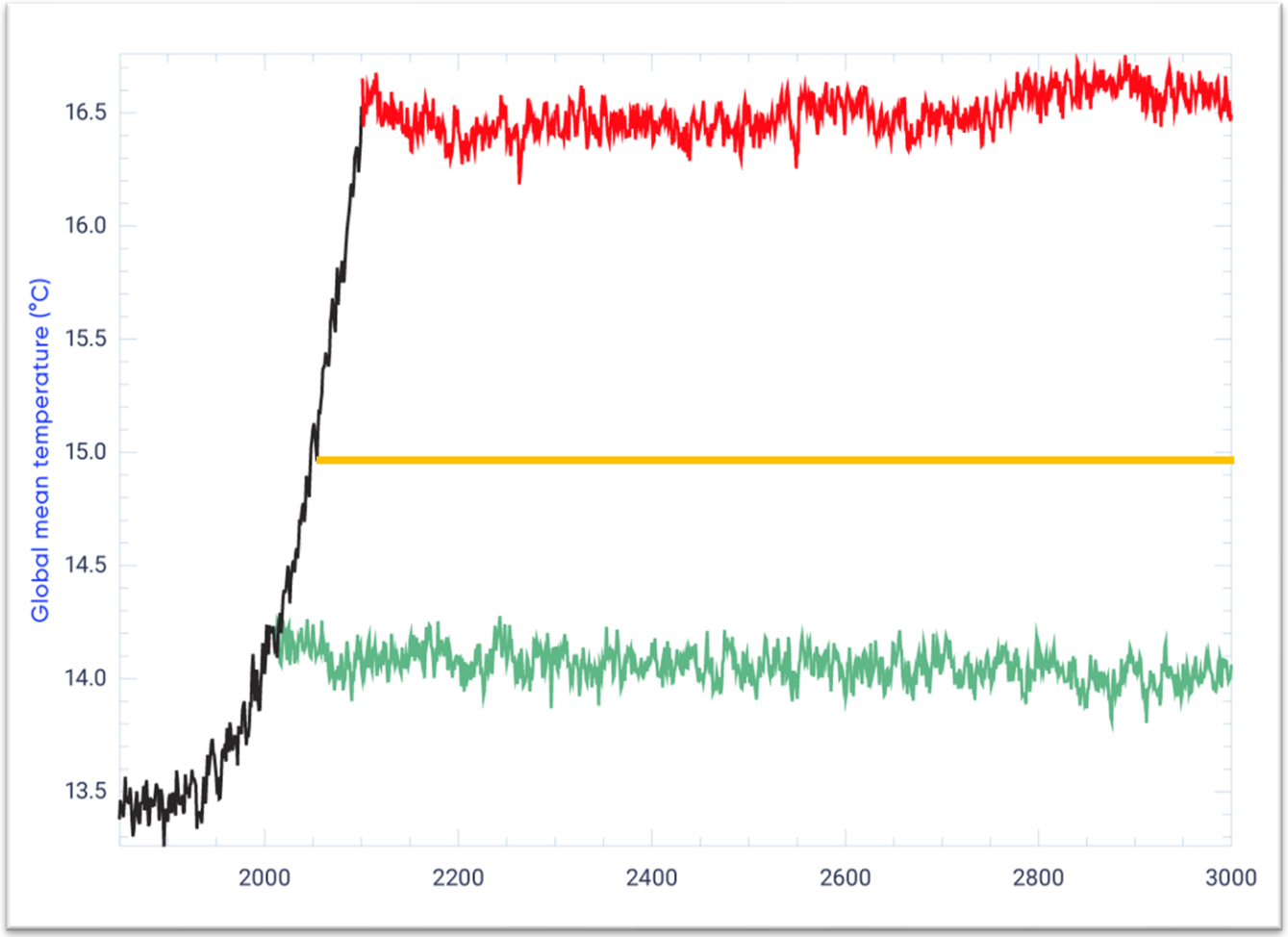
Canadian Centre for Climate Services

ClimateWest Forum, Saskatoon

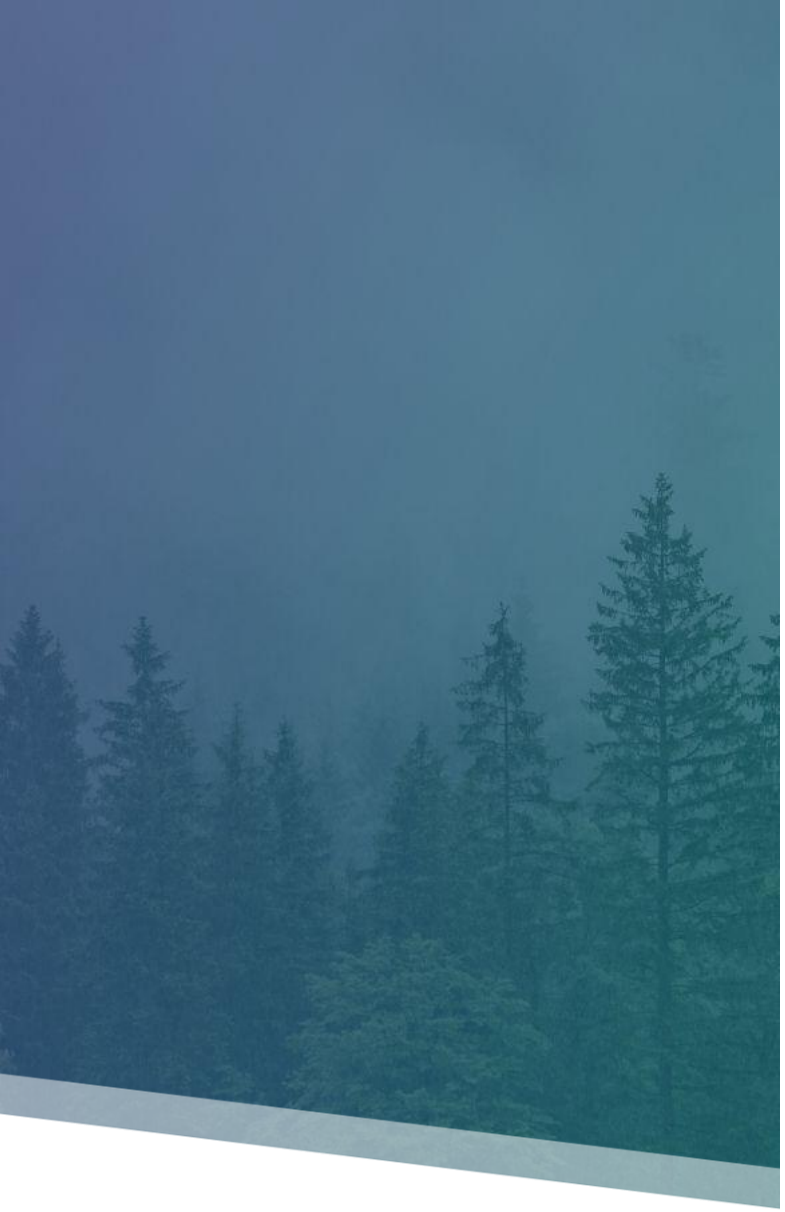
June 17, 2025

Reaching net zero

- The climate will continue to warm until global greenhouse gas emissions are reduced to net-zero, at which point the temperature will stabilize
- Climate model simulations show that zeroing emissions stabilizes temperature
- Global mean surface temperature simulated by the Canadian Earth System Model following a cessation of emissions in 2010 (green), 2050 (yellow) and 2100 (red)**



Sources: Gillet et al., 2021, Nature Climate Change (https://www.nature.com/articles/ngeo1047)
*** ECCC, CCCma*



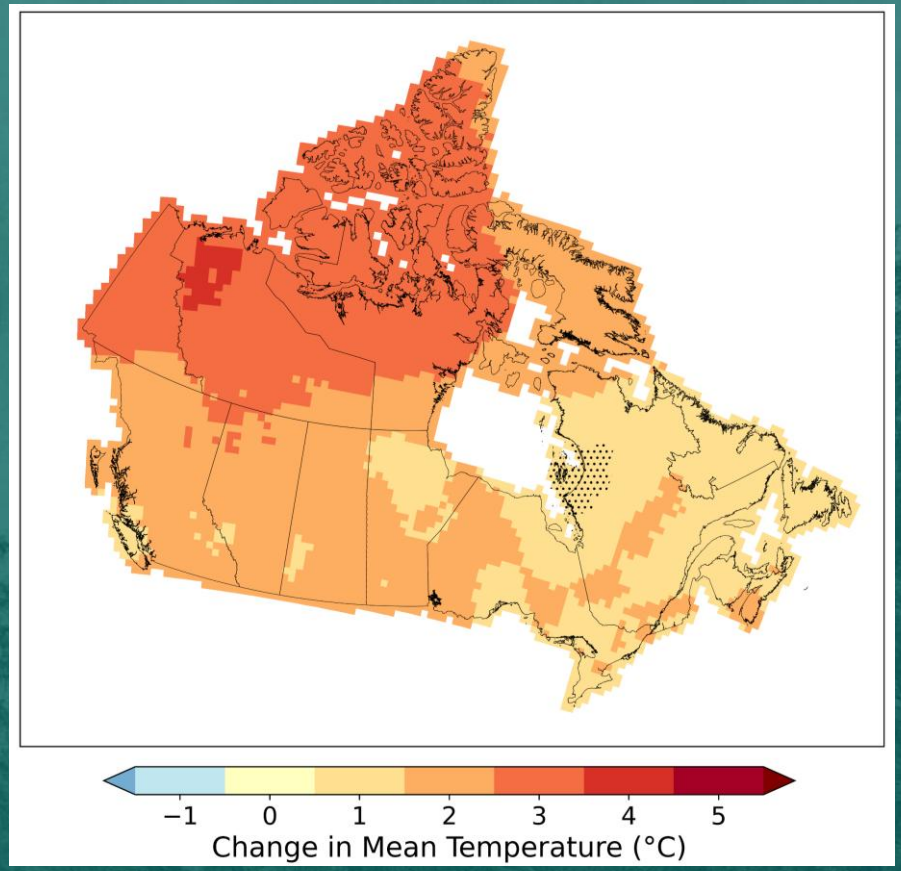
Outline

- Observed changes
- Future projections
- Services, data and tools to support adaptation planning

1

Observed Changes

Temperature and Precipitation



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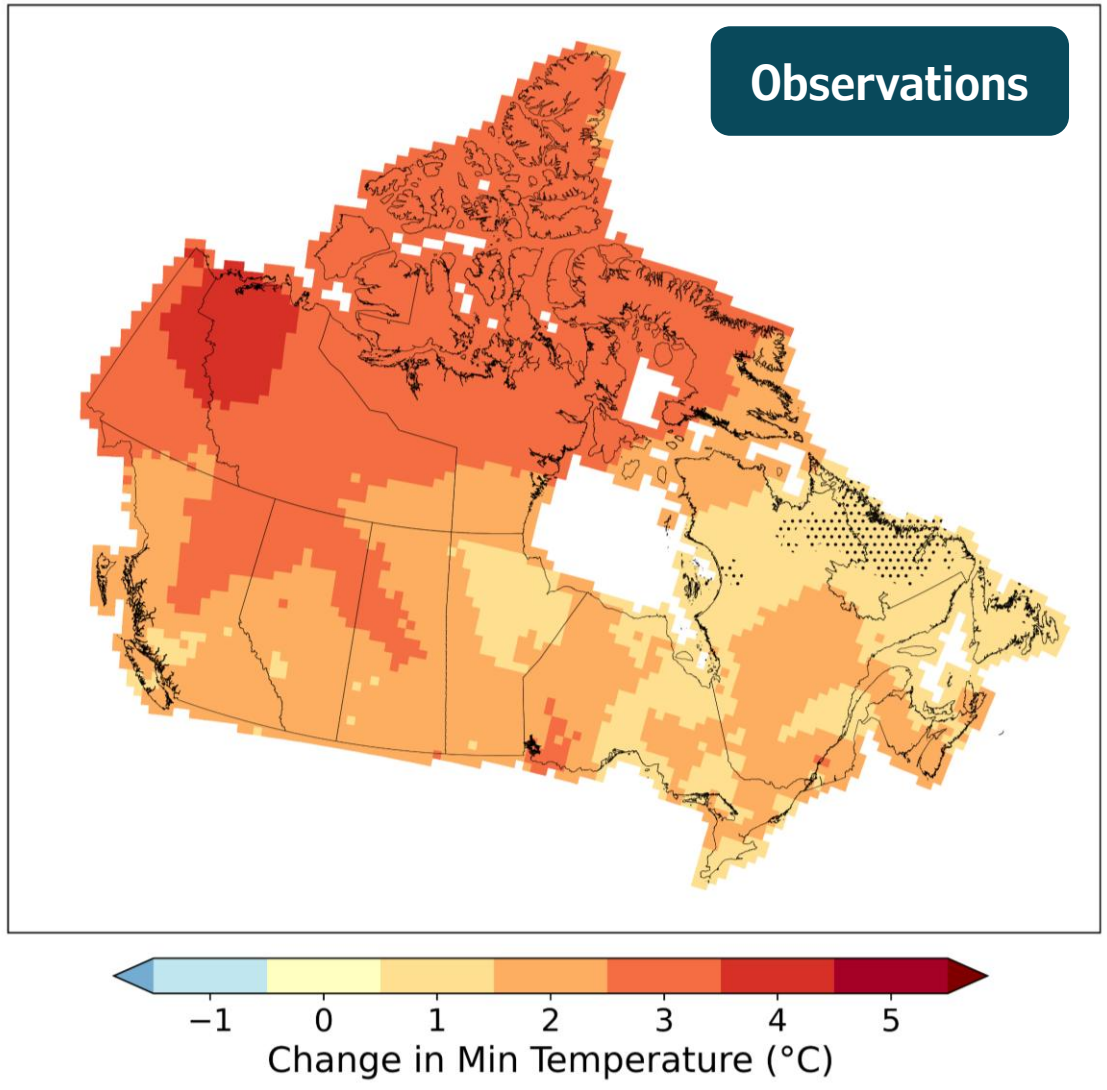
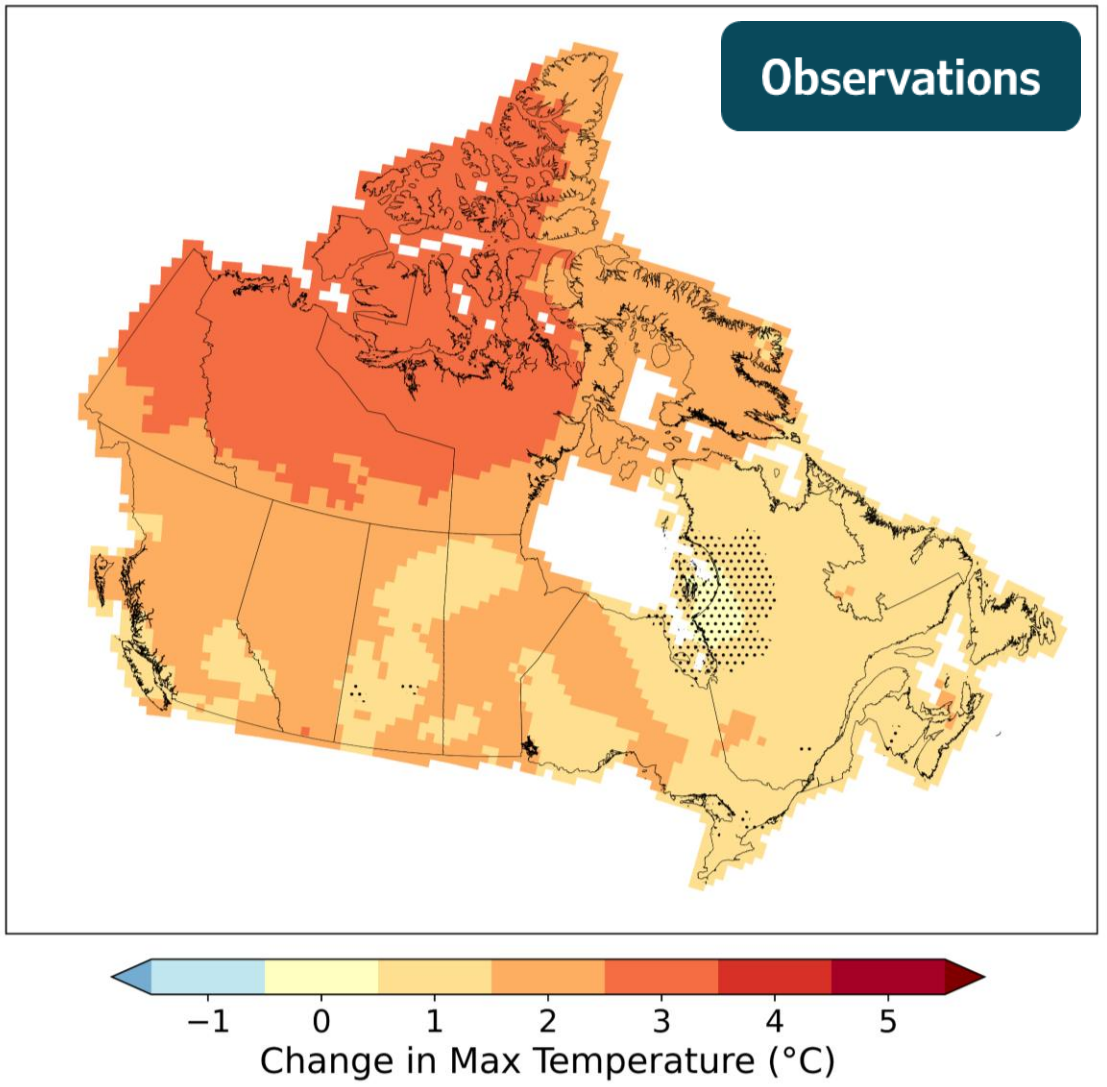
Trend in annual minimum temperature change , 1948-2023
(°C/75 years)



Night-time Low

Trend in annual maximum temperature change, 1948-2023
(°C/75 years)



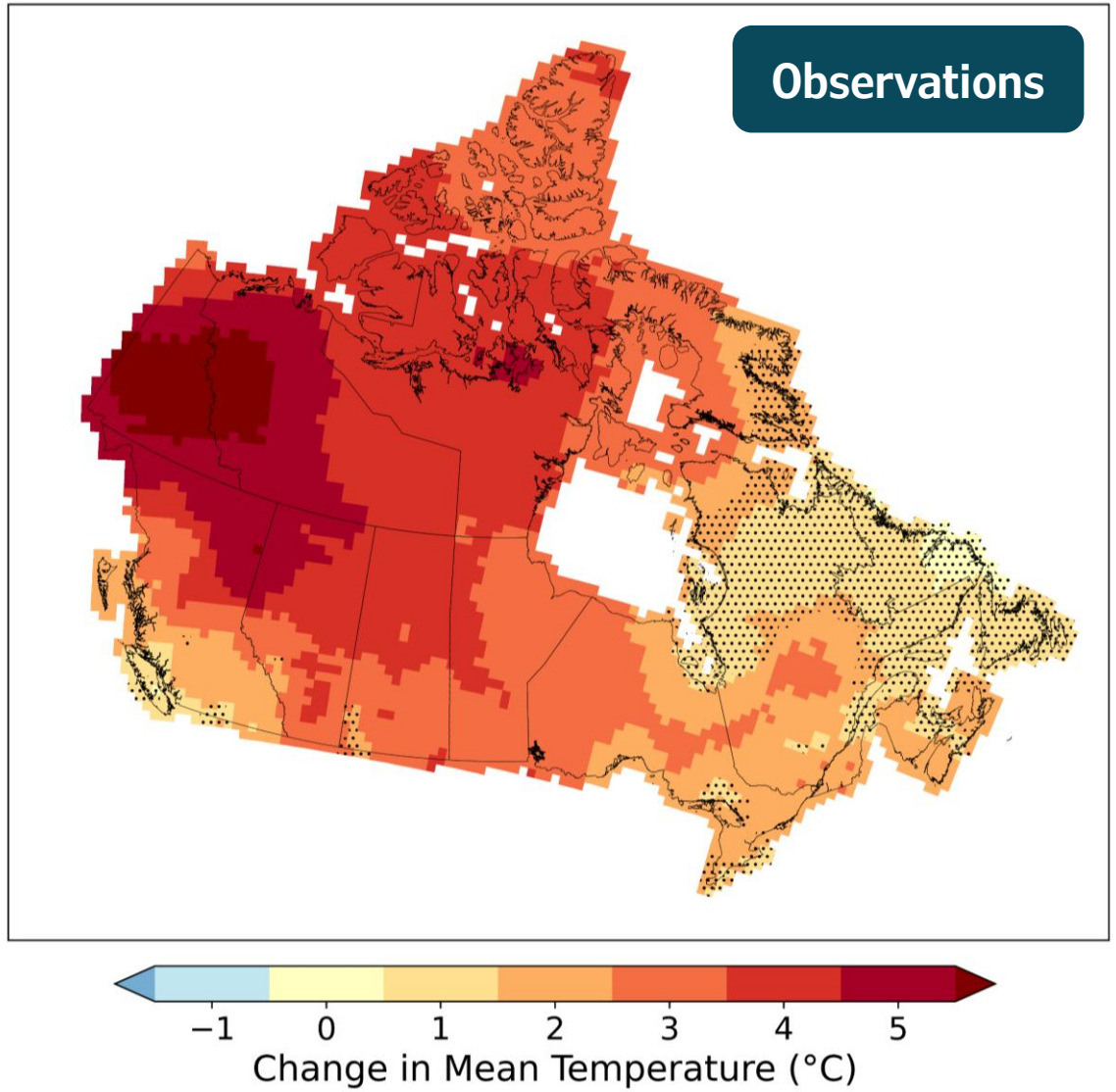
Day-time High

Source: Eva Gnegy, CCCS

Winter Temperature Change

- Largest temperature increases seen in Winter
- Largest increases seen in minimum temperatures (night-time lows)
- Changes not significant in stippled area

Trend in Winter average temperature change, 1948-2023
(°C/75 years)



Source: Eva Gnegy, CCCS

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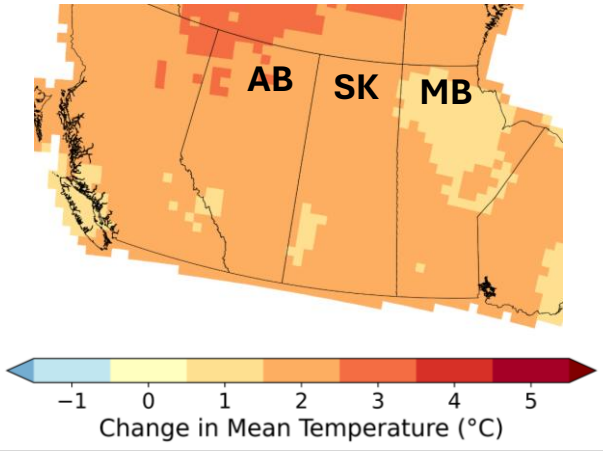
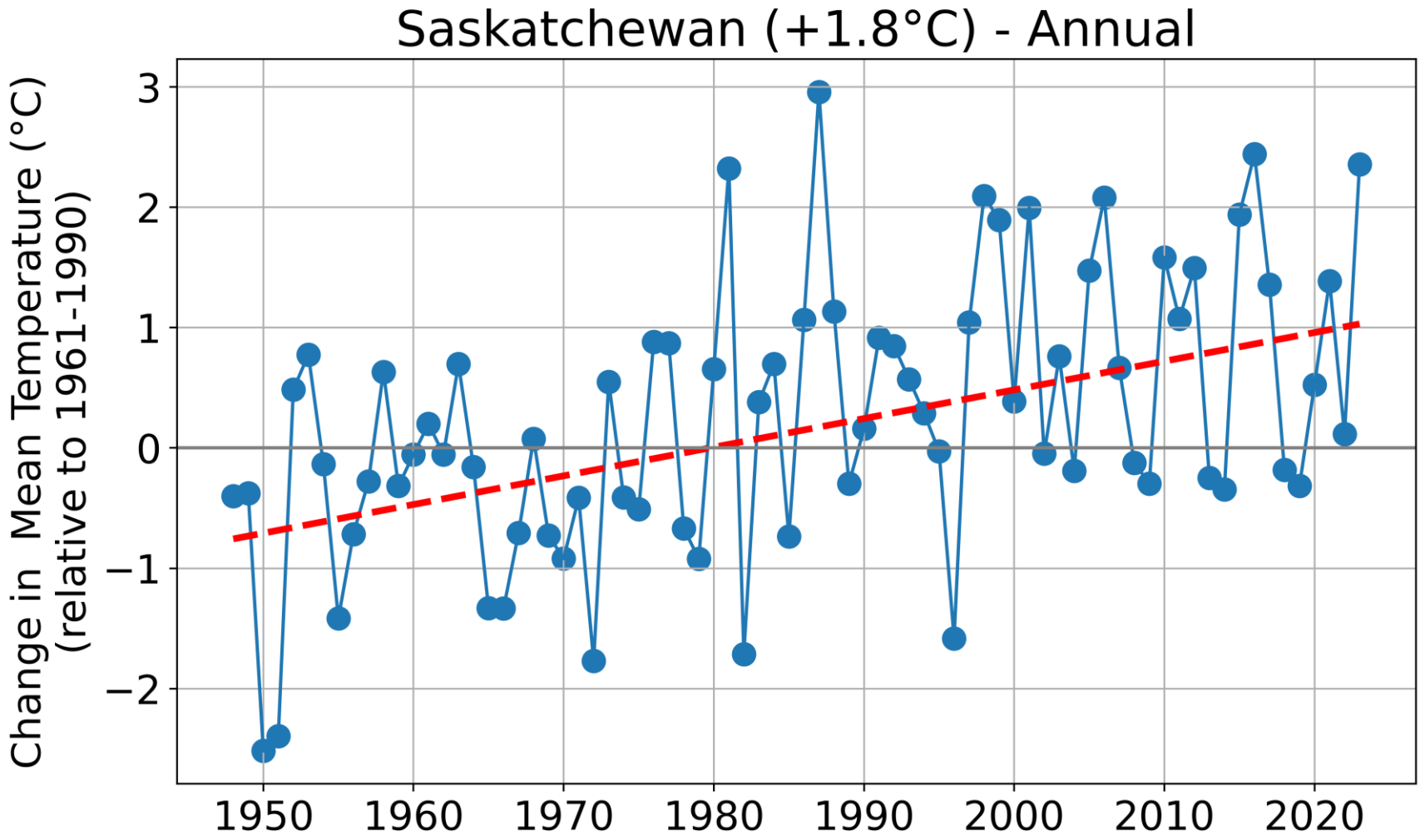


Observations

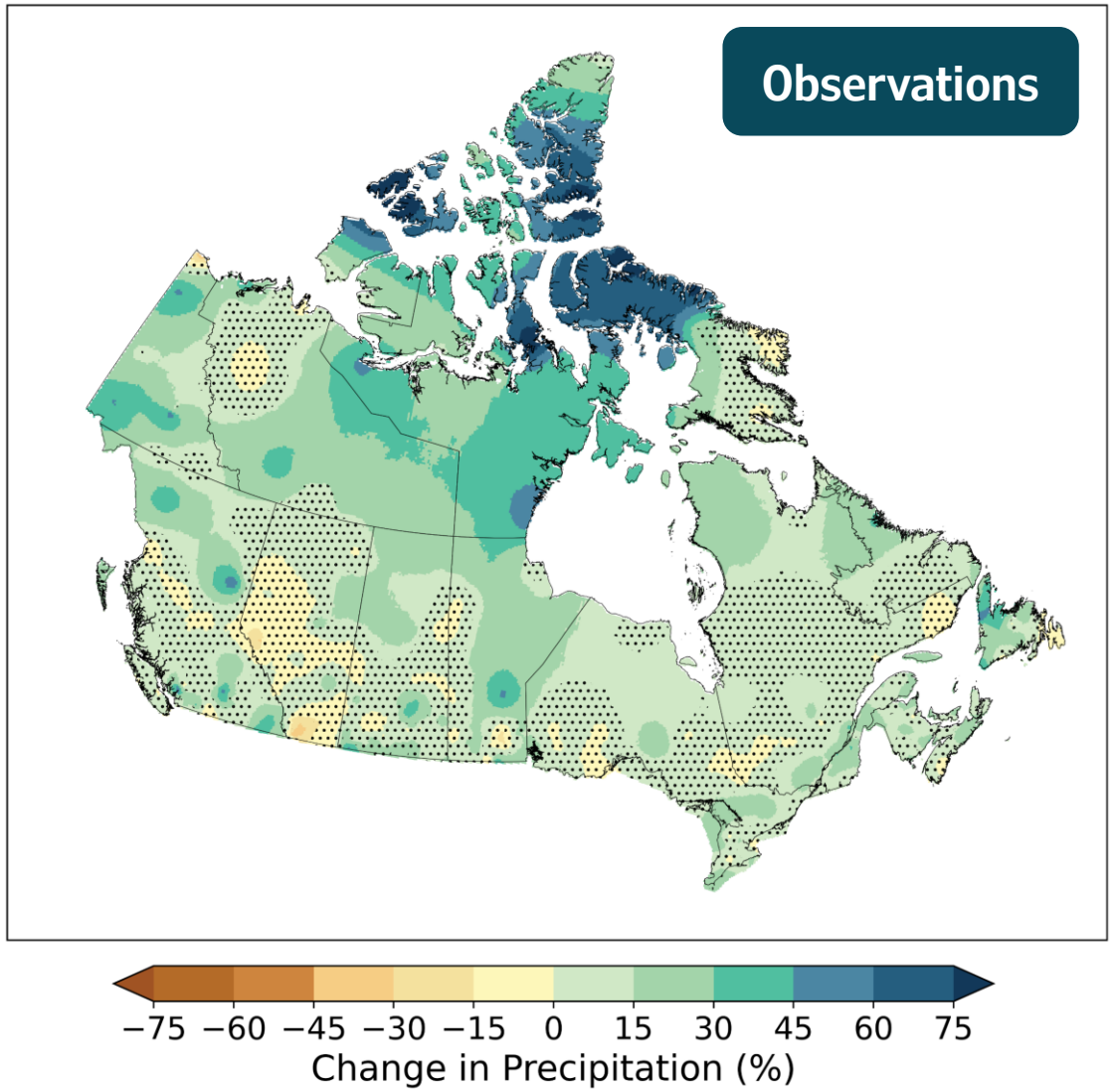


Source: Eva Gnegy, CCCS

Annual Precipitation Change (%)

- Overall, precipitation has increased in Canada
- However, this is not the case in much of the southern Prairies and most of Alberta
- Changes not significant in stippled area

Trend in annual precipitation change, 1948-2018 (%/75 years)



Source: Eva Gnegy, CCCS

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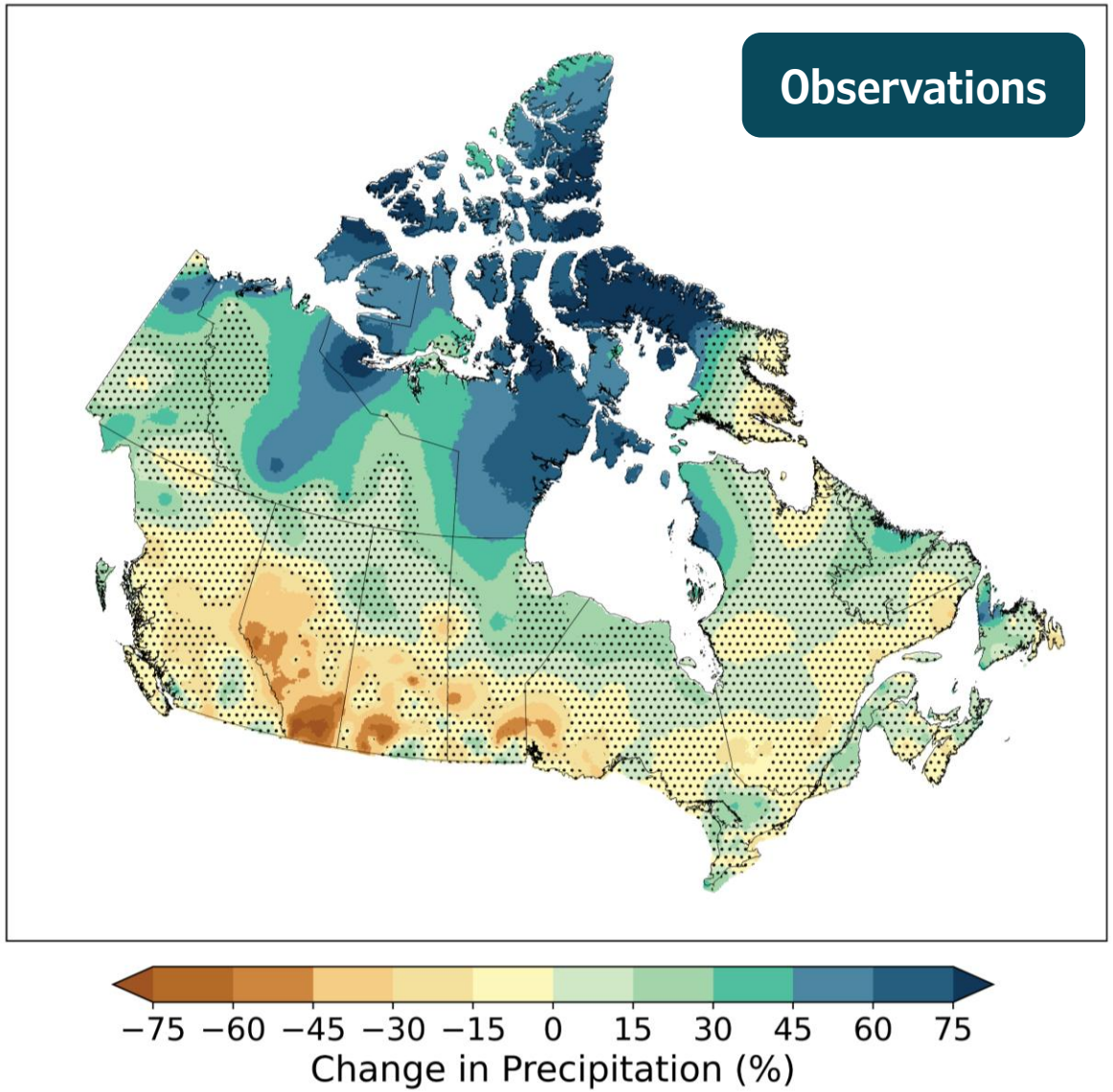
Winter Precipitation Change

- Significant drying in southern Prairies in Winter
- Changes not significant in stippled area

Trend in Winter precipitation change, 1948-2018 (%/75 years)



Source: Eva Gnegy, CCCS

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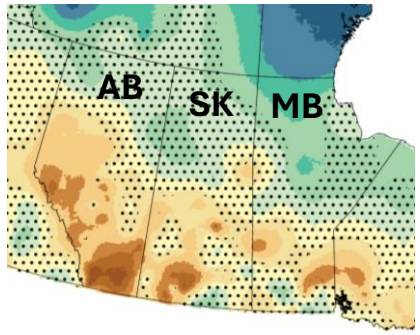
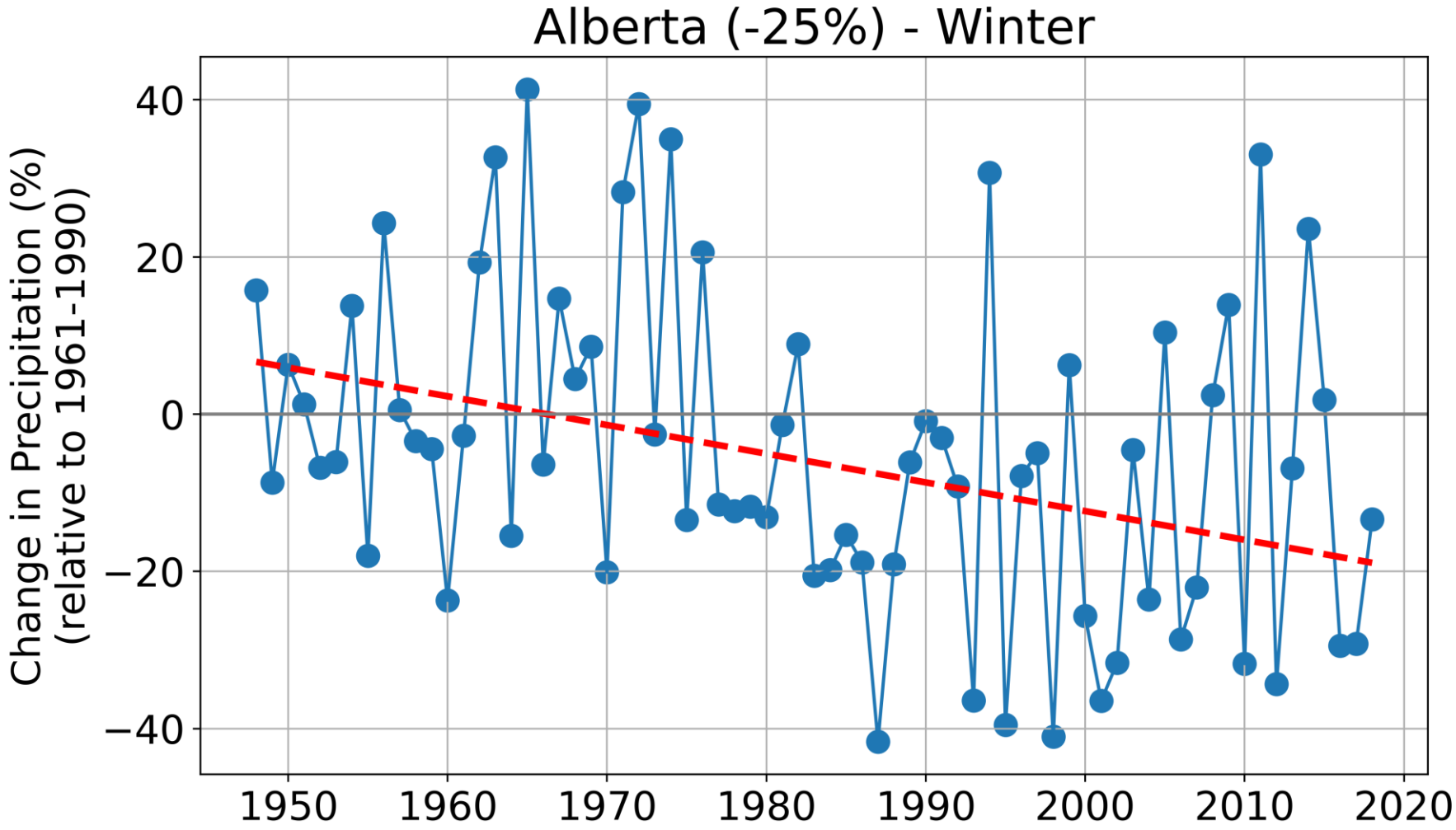


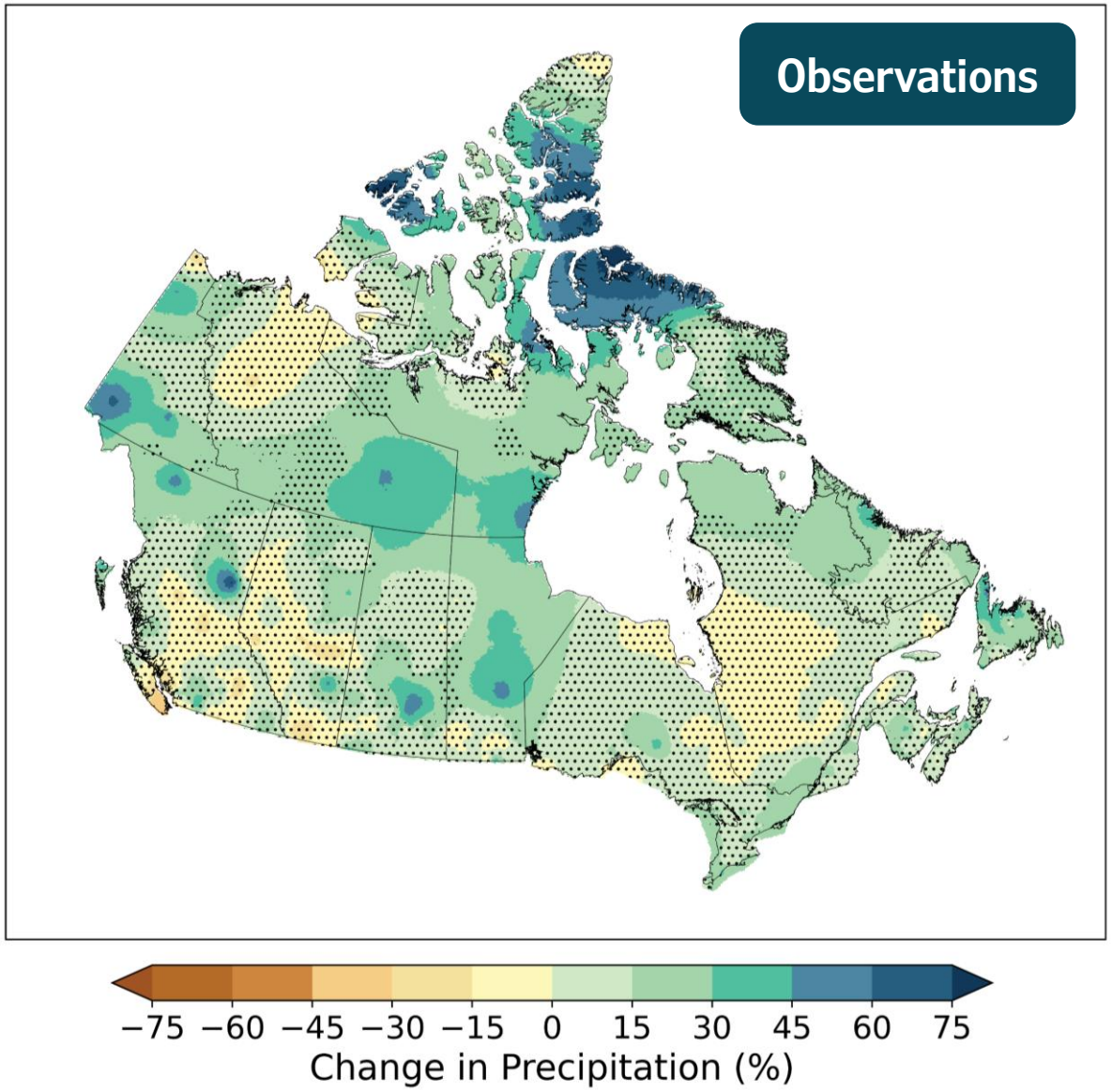


Source: Eva Gnegy, CCCS

Summer Precipitation Change (%)

Most of Alberta and the southern Prairies have not seen a significant increase in precipitation in the summer

Trend in Summer precipitation change, 1948-2018 (%/75 years)



Source: Eva Gnegy, CCCS

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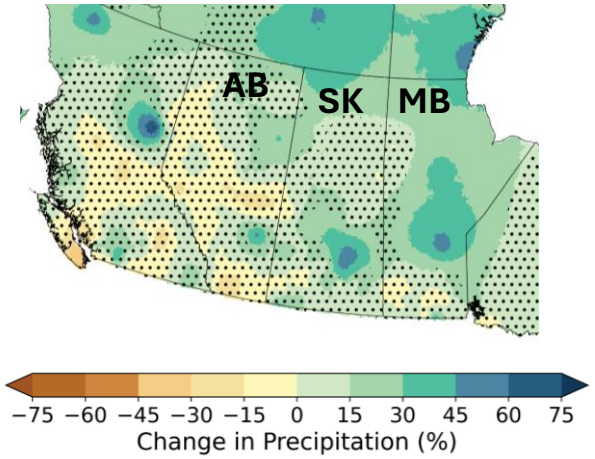
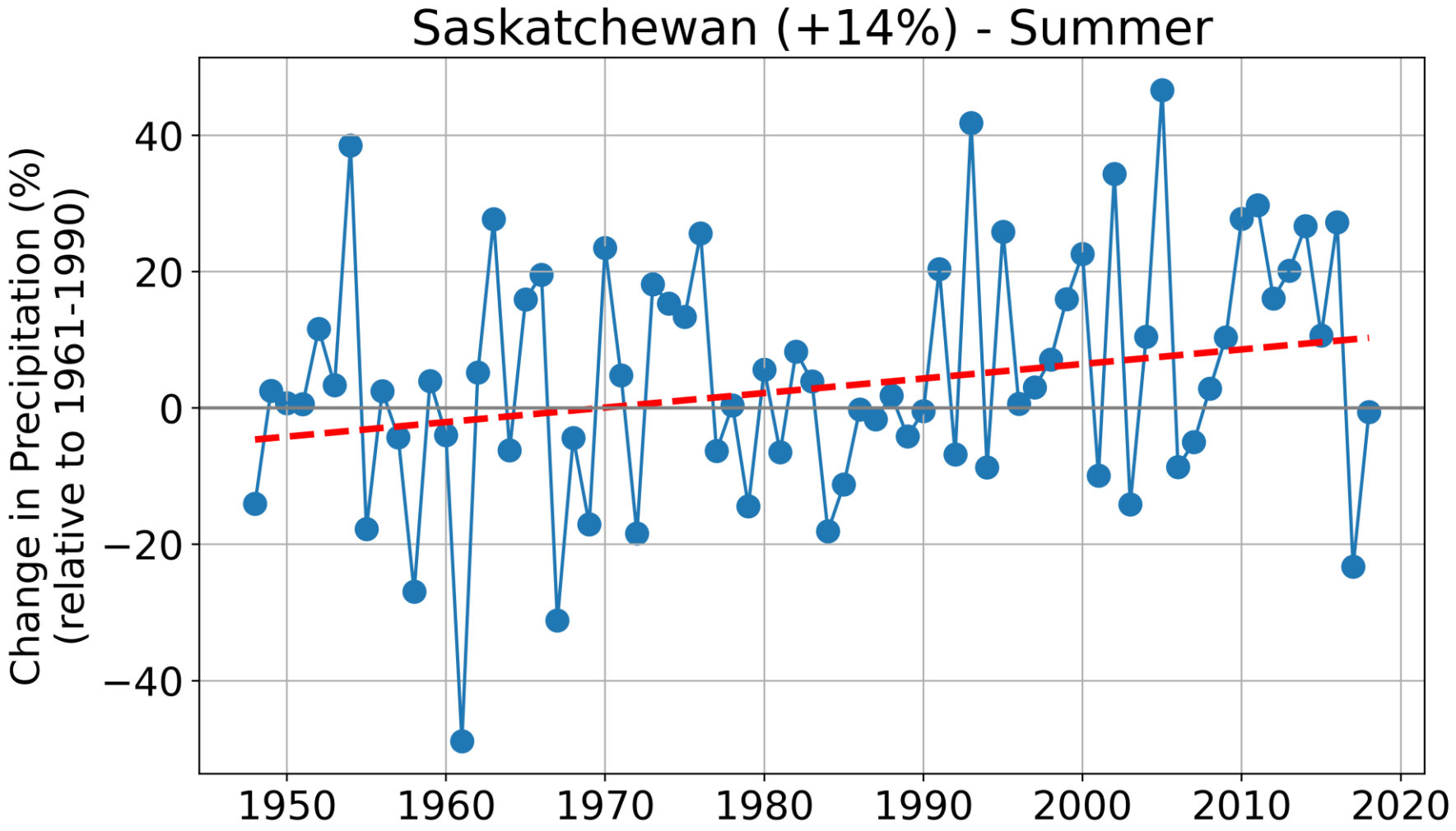
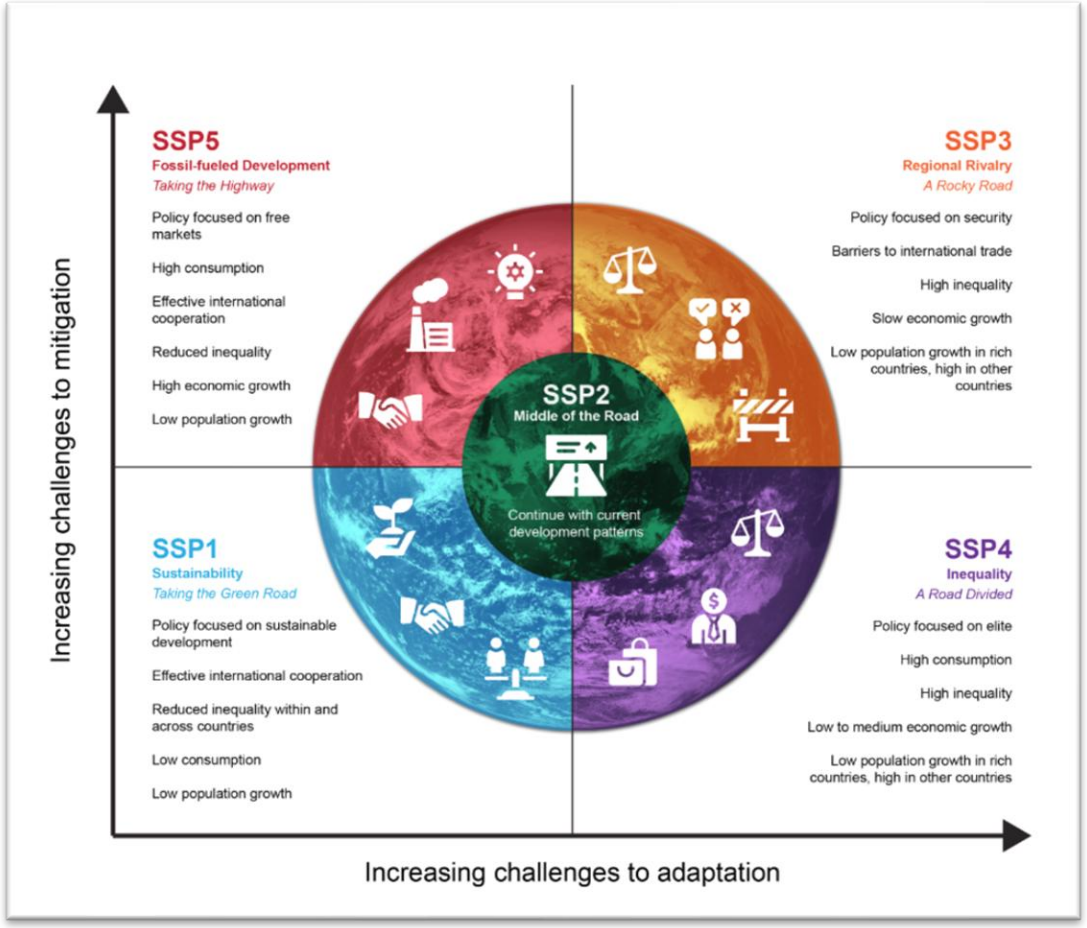

AB
SK
MB
−75 −60 −45 −30 −15 0 15 30 45 60 75
Change in Precipitation (%)

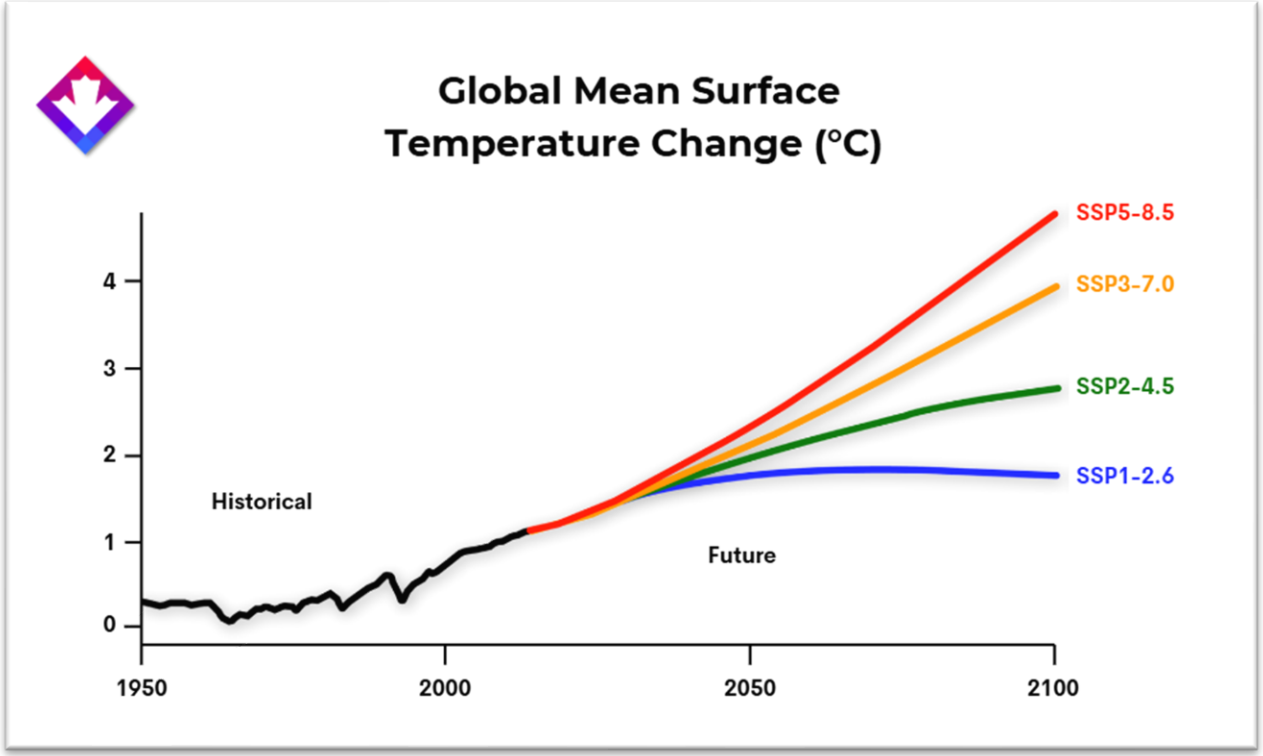

Saskatchewan (+14%) - Summer
Change in Precipitation (%)
(relative to 1961-1990)
40
20
0
−20
−40
1950
1960
1970
1980
1990
2000
2010
2020

2

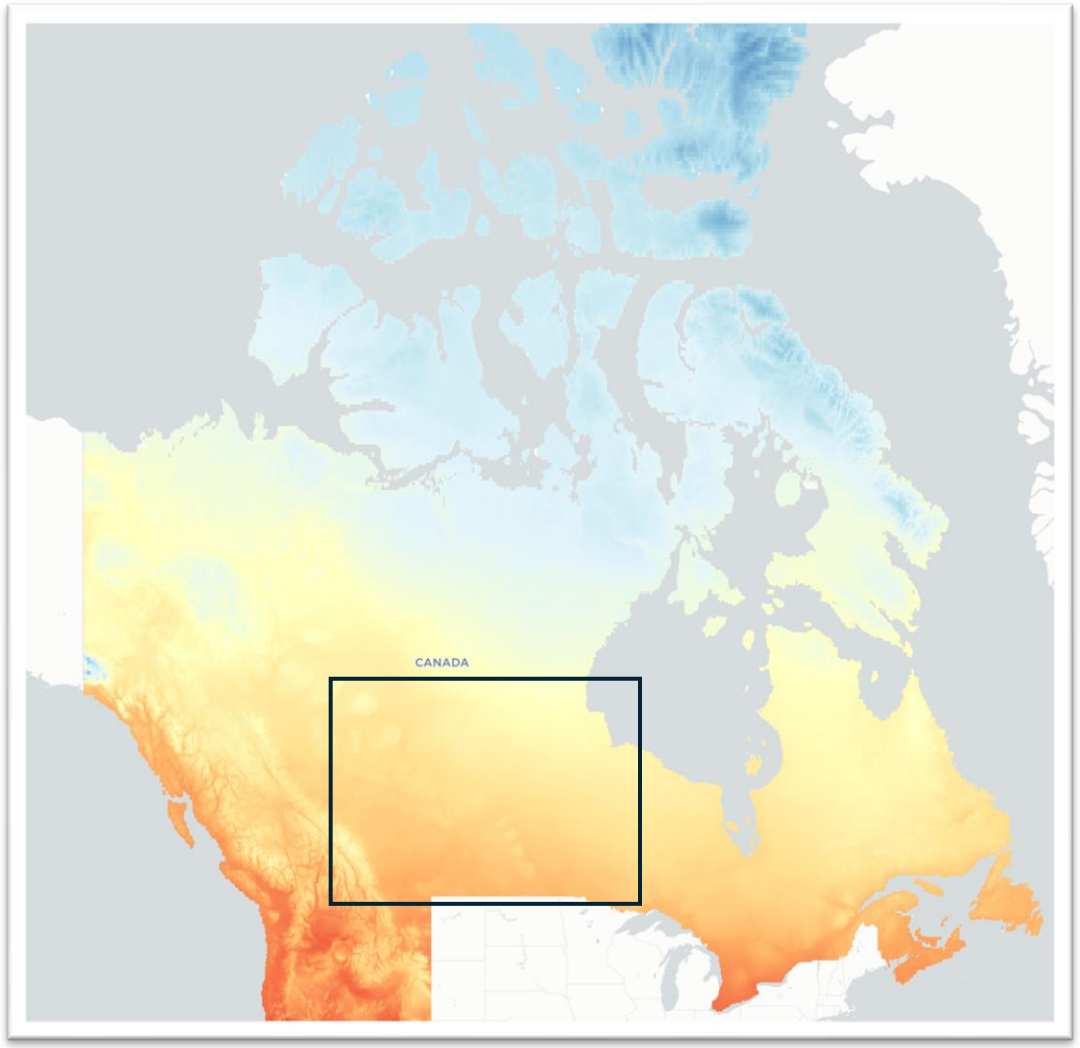
Future Projections

Emissions Scenarios: Drivers of Future Climate

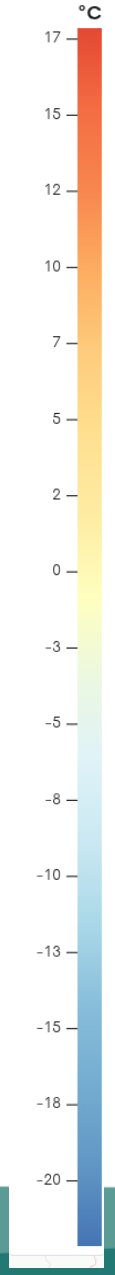




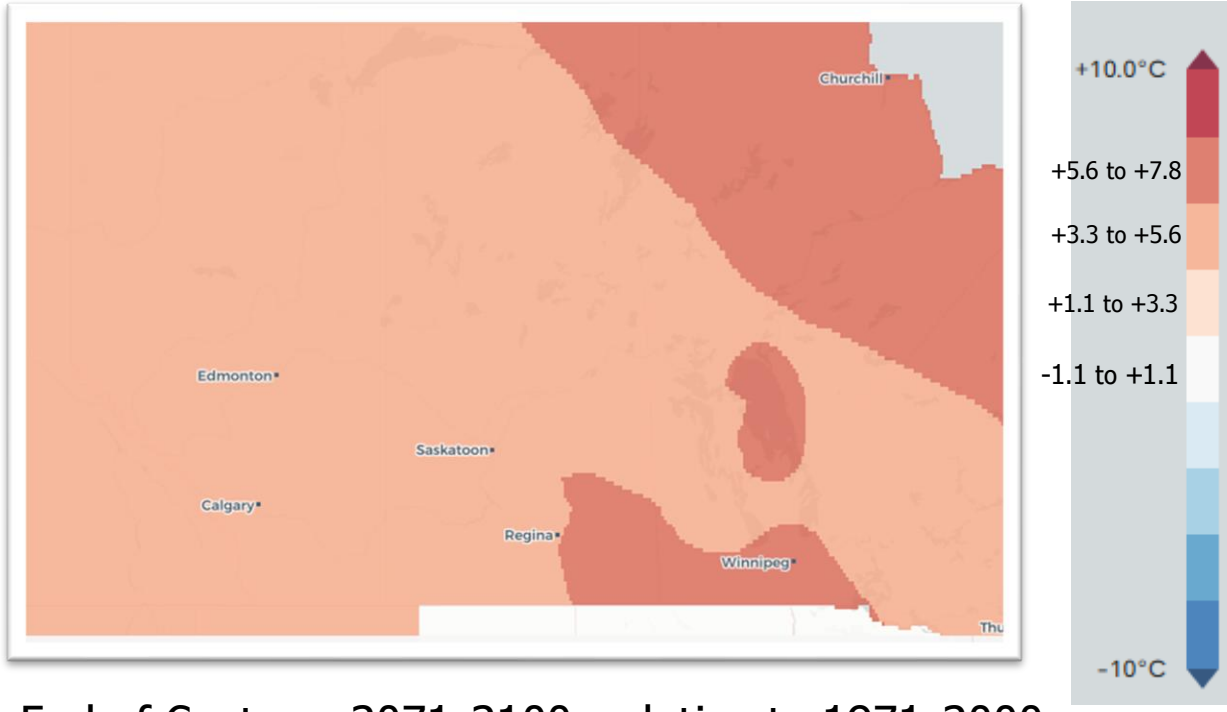
Annual Average Temperature, SSP3-7.0



End-of-century, 2071-2100

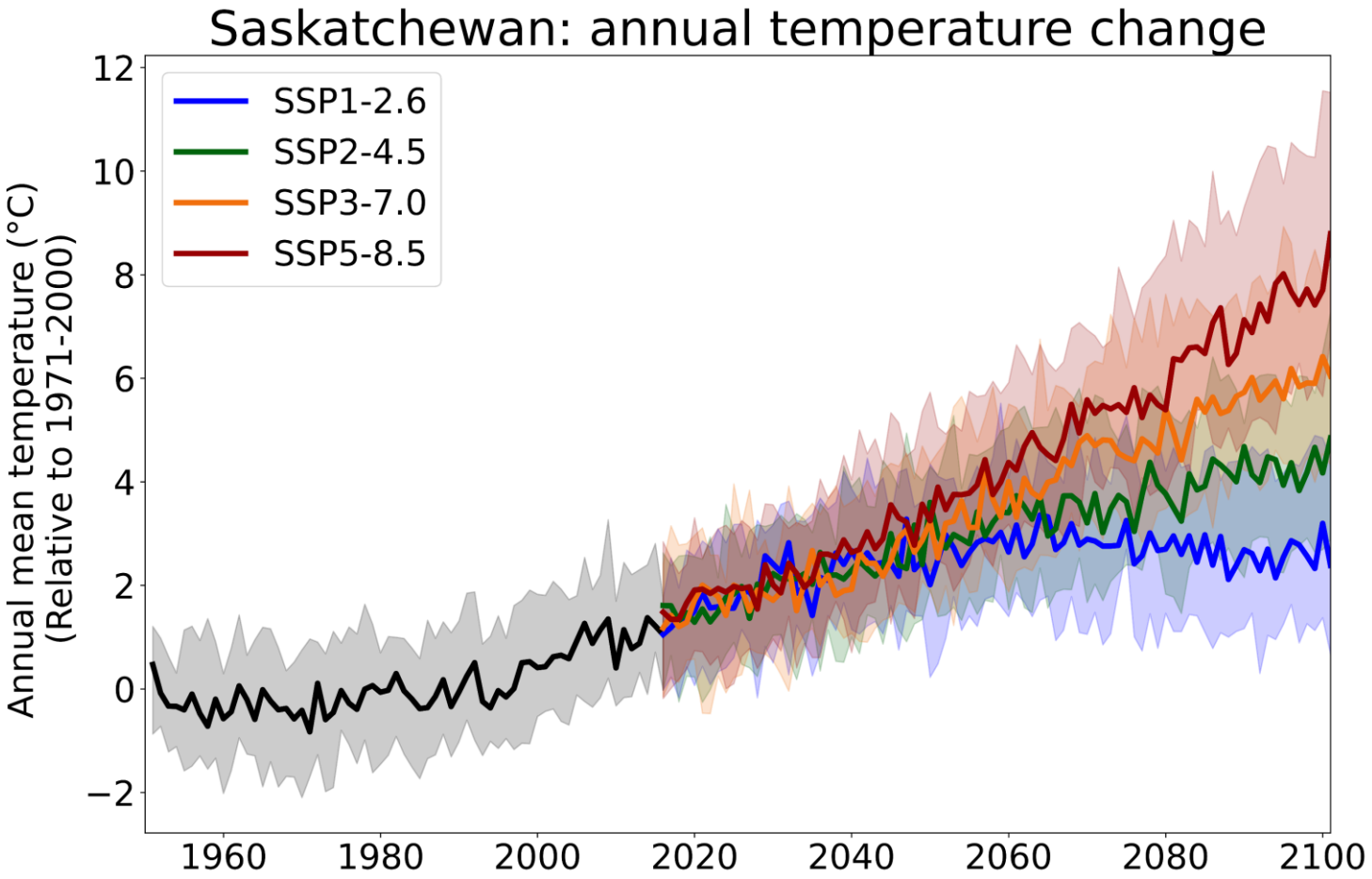


Temperature change (°C)

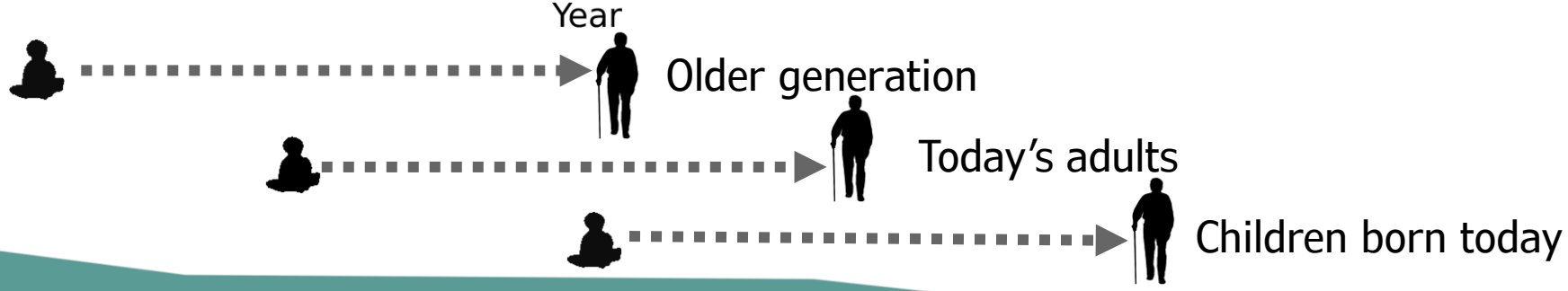


End of Century, 2071-2100, relative to 1971-2000

Source: ClimateData.ca



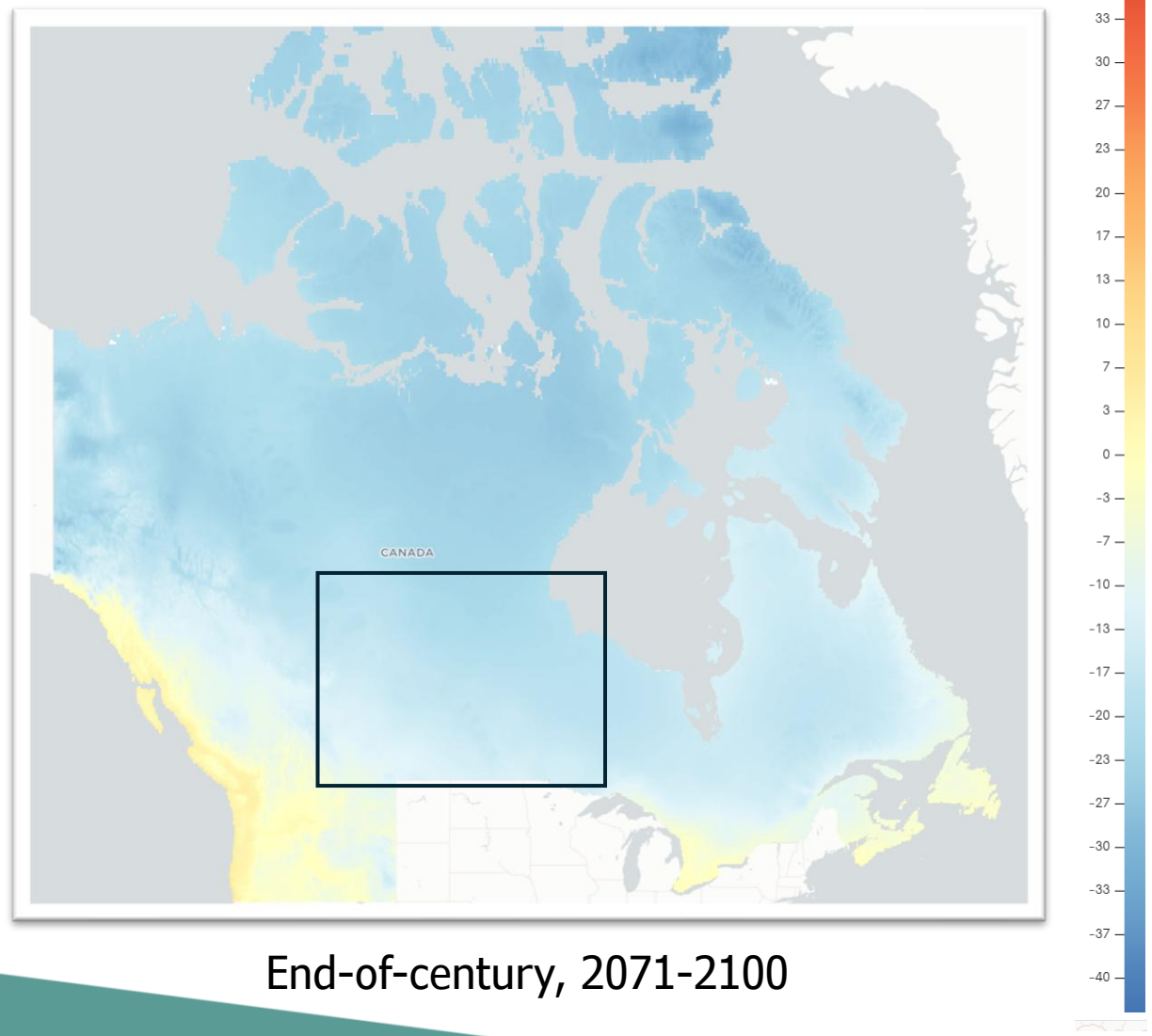
Source: Carrington Pomeroy, CCCS



Winter Minimum Temperature, SSP3-7.0

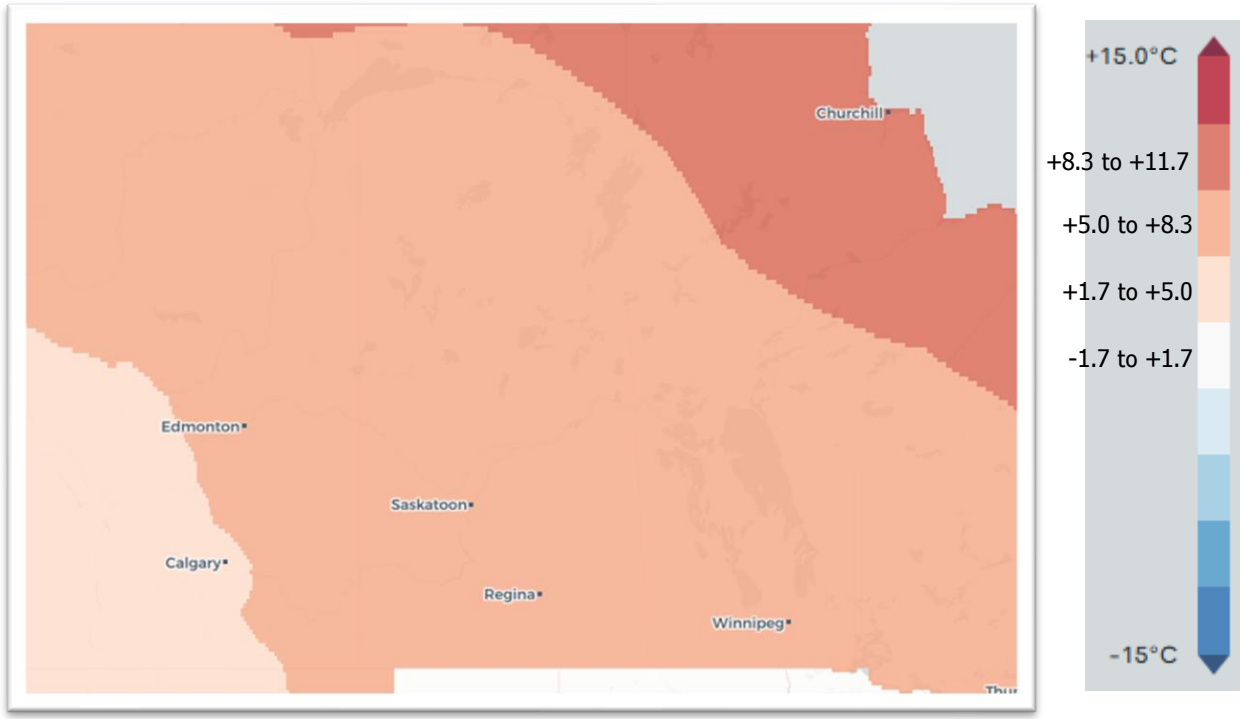
Night-time Low Temperature

Projections



End-of-century, 2071-2100

Temperature change (°C)



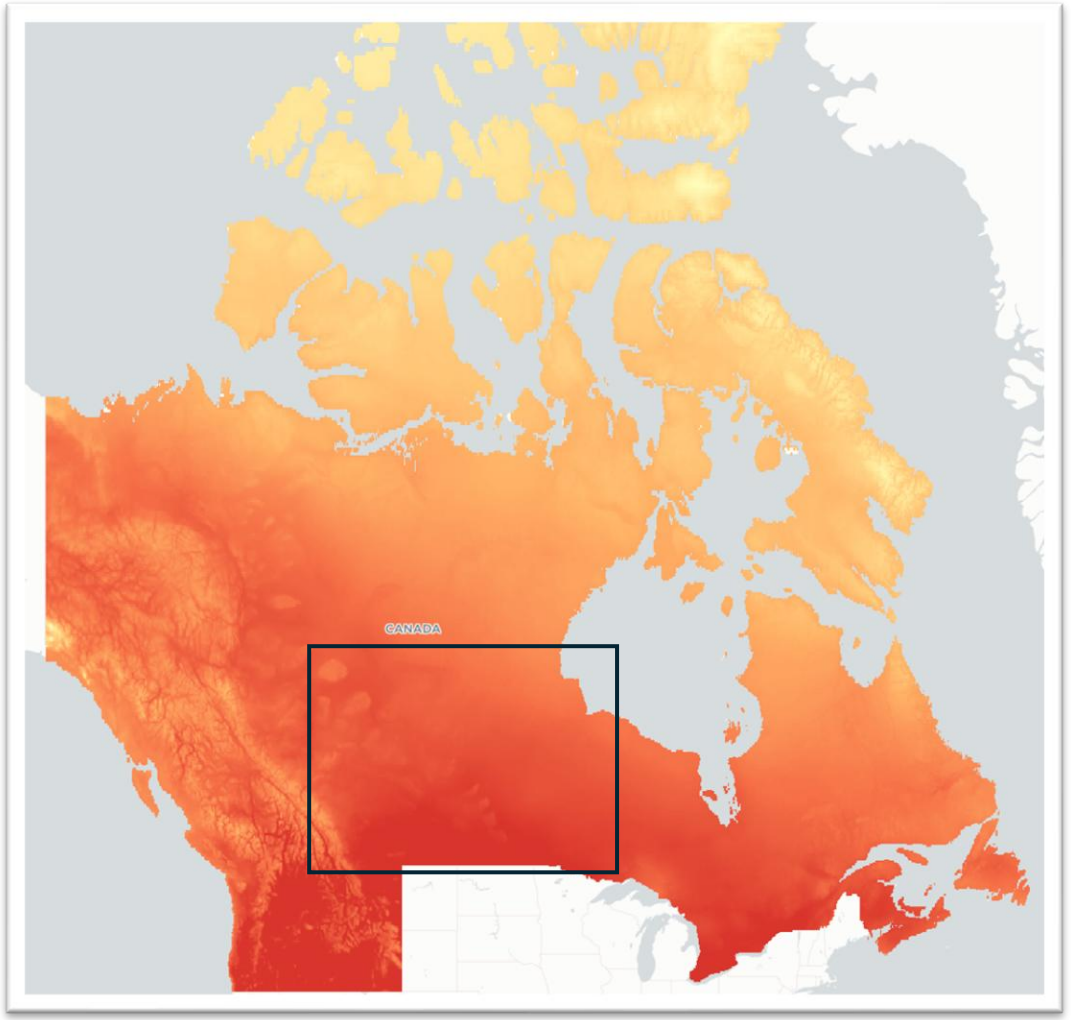
End of Century, 2071-2100, relative to 1971-2000

Source: ClimateData.ca

Summer Maximum Temperature, SSP3-7.0

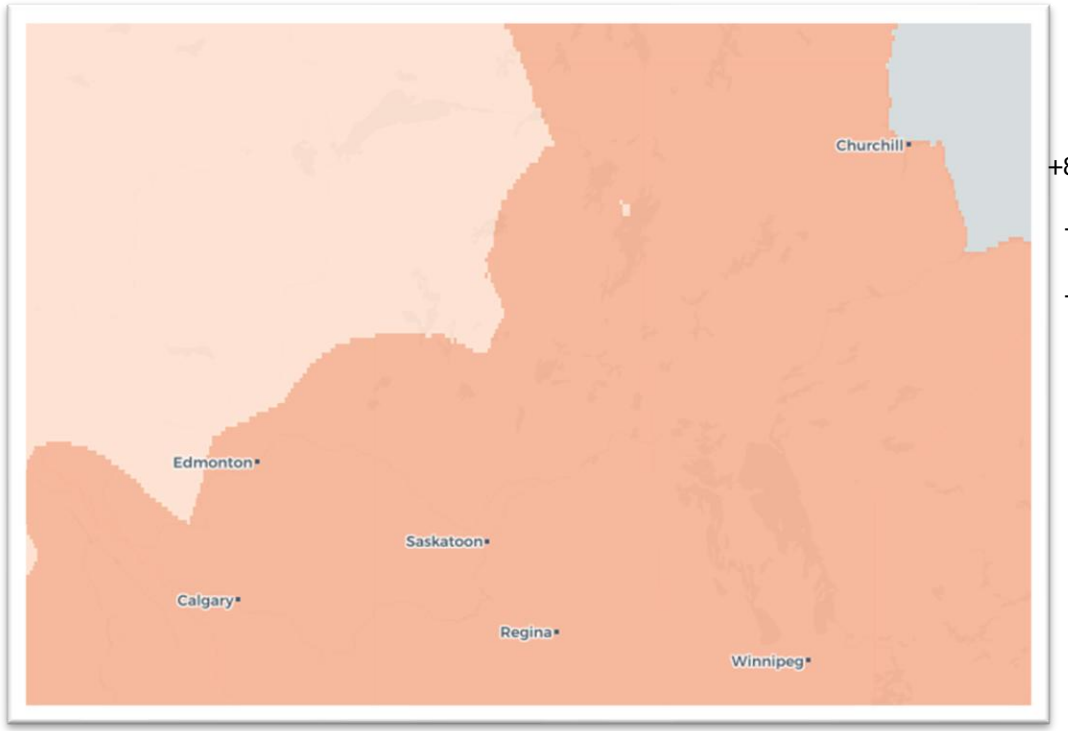
Day-time High Temperature

Projections



End-of-century, 2071-2100

Temperature change (°C)

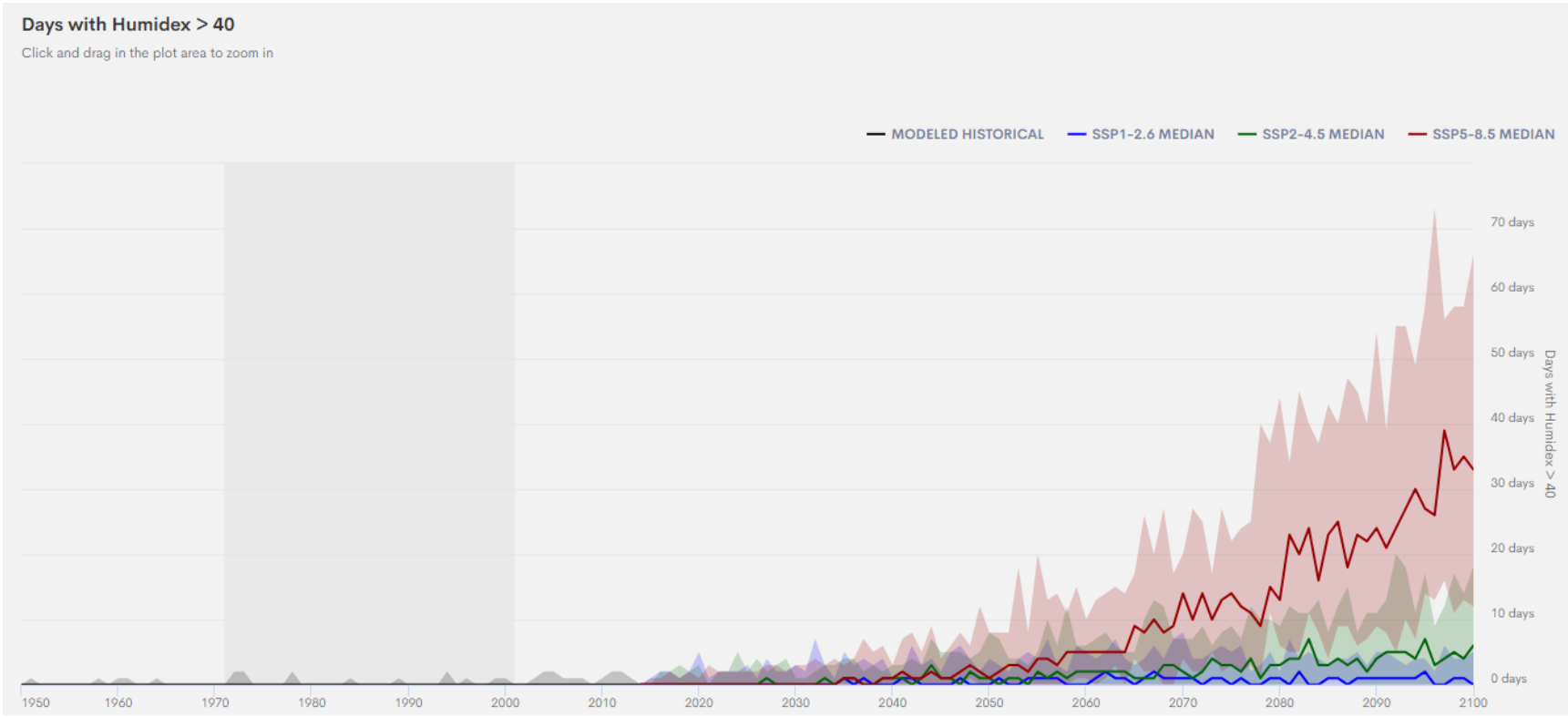


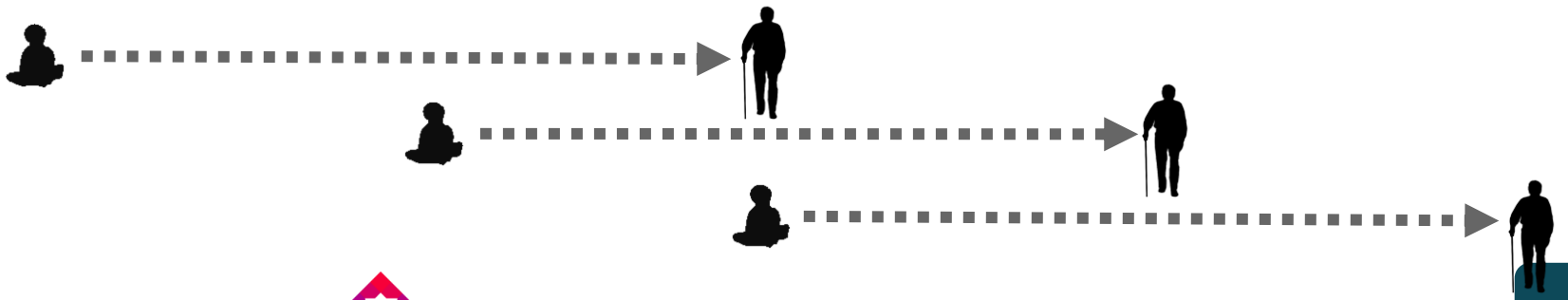
End of Century, 2071-2100, relative to 1971-2000

Source: ClimateData.ca

Heat Extremes

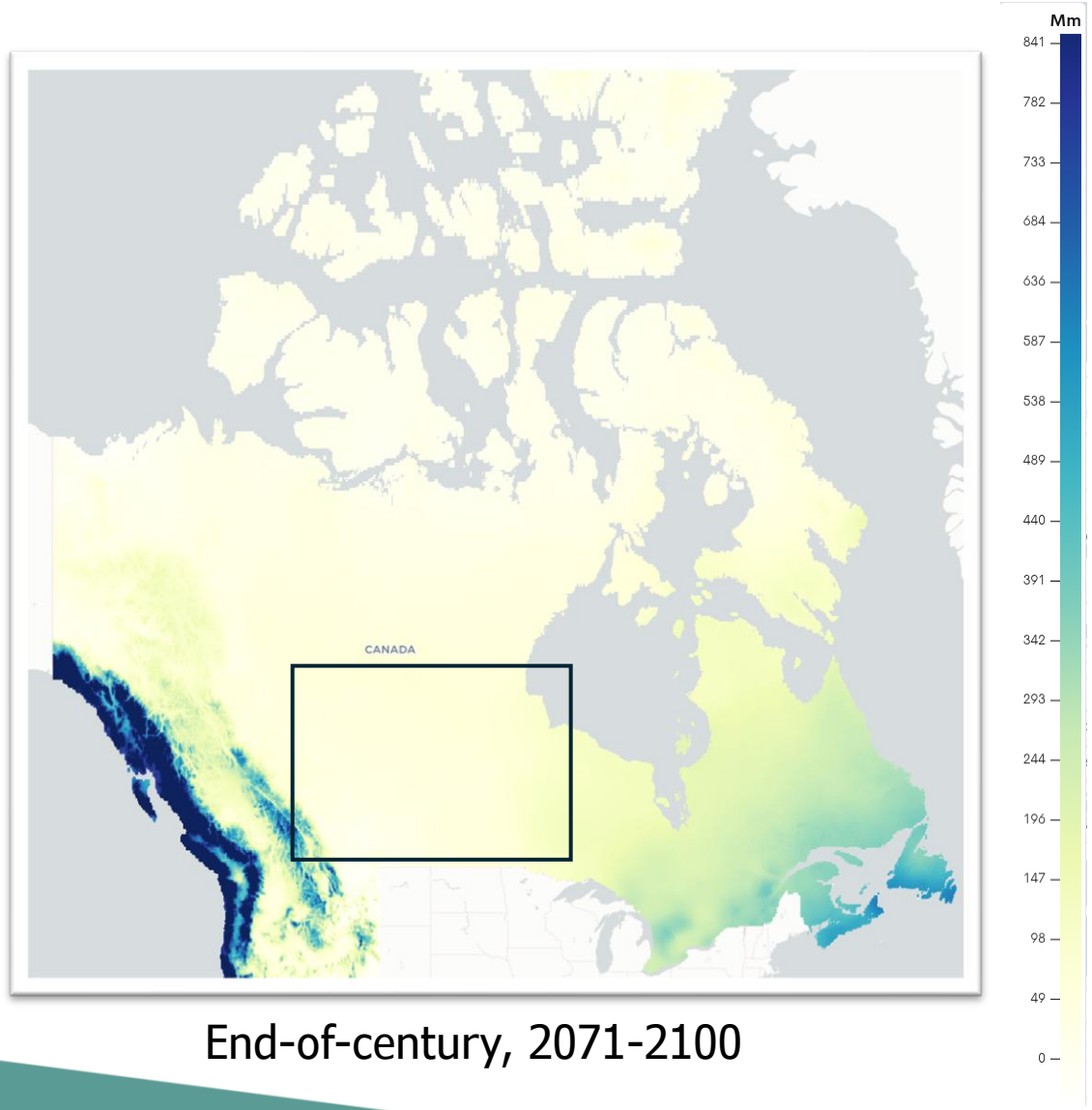
- Days with Humidex > 40
- Events rarely experienced now, will become more frequent in future





Source: ClimateData.ca

Winter Total Precipitation, SSP3-7.0



End-of-century, 2071-2100

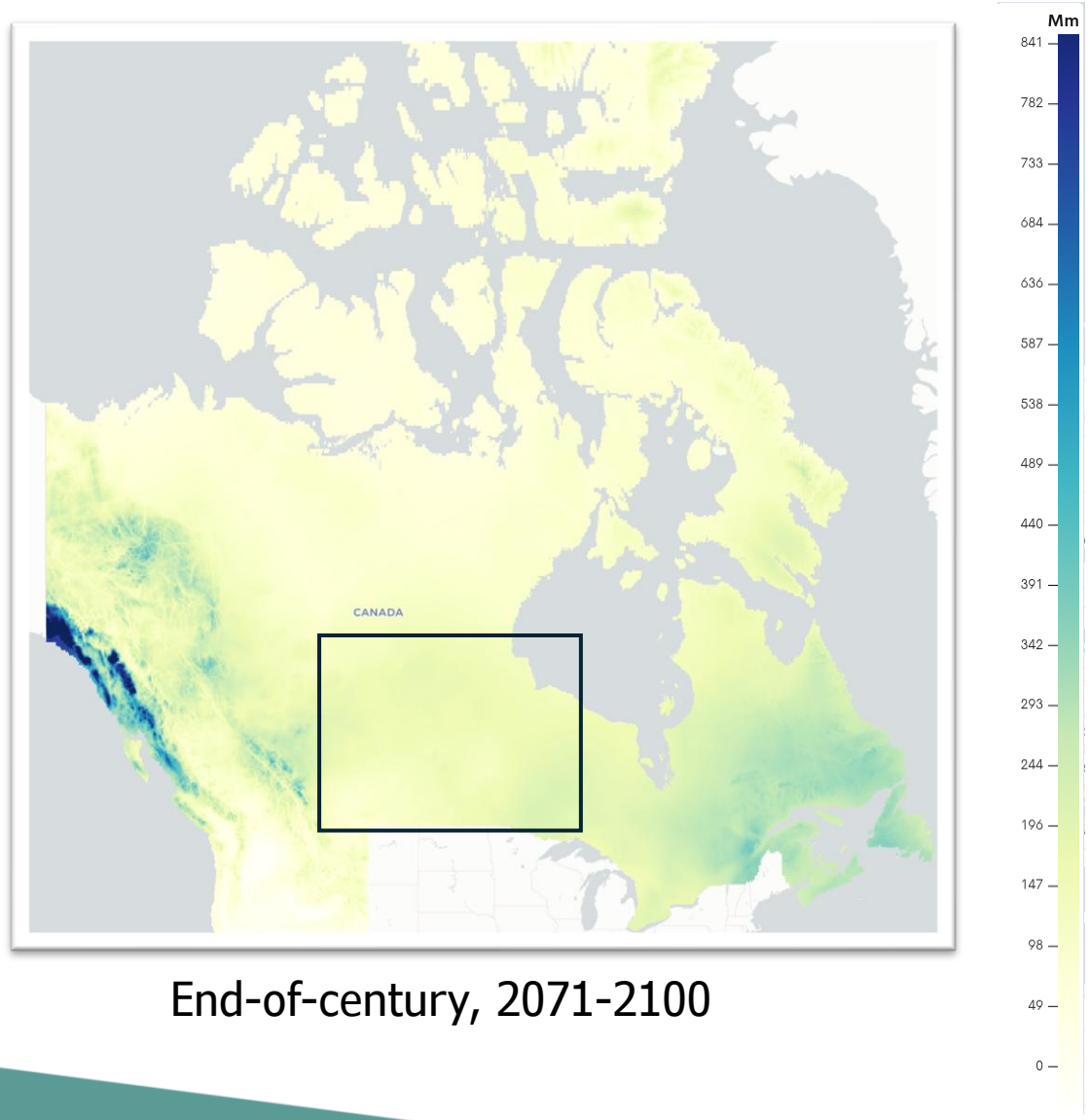
Precipitation change (mm)

End of Century, 2071-2100, relative to 1971-2000

Source: ClimateData.ca

Summer Total Precipitation, SSP3-7.0

Projections



End-of-century, 2071-2100

Precipitation change (mm)

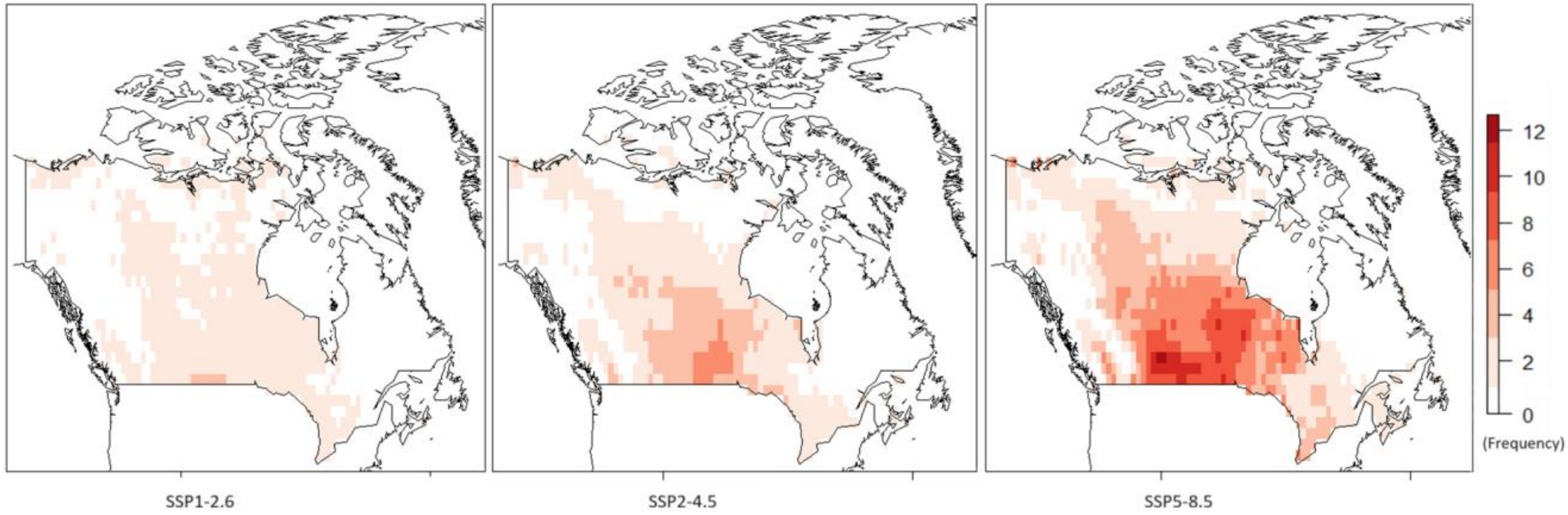
End of Century, 2071-2100, relative to 1971-2000

Source: ClimateData.ca

Severe drought

Severe drought frequency is projected to increase in the Prairies, particularly under a high emissions scenario

Under SSP5-8.5, severe drought conditions are projected to occur about half the time during 2081-2100 in the southern Prairies

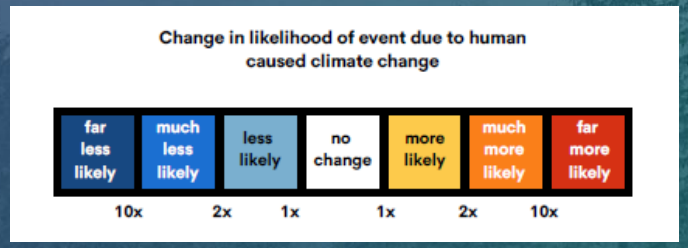


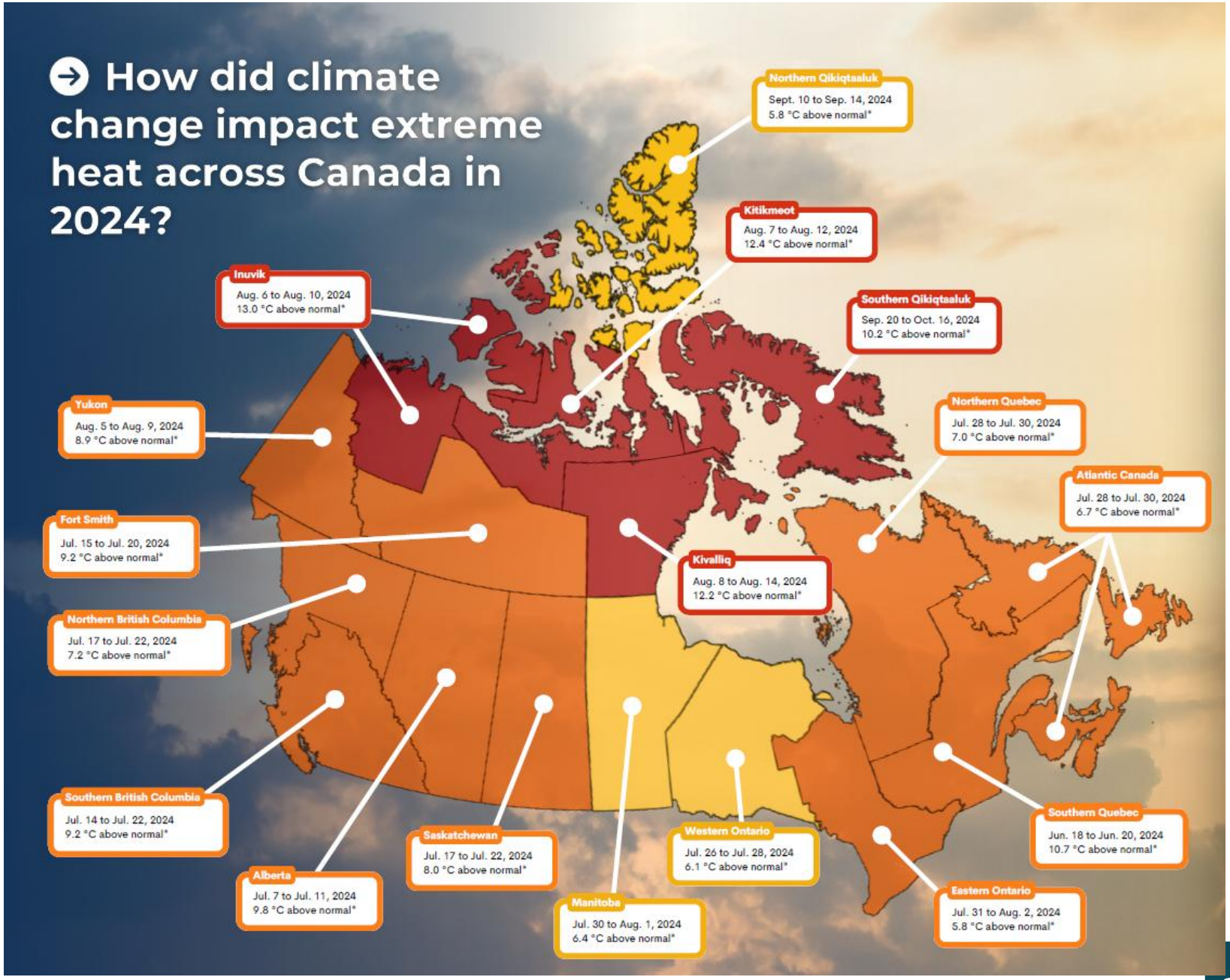
2081-2100

Source: Tam et al. (2024): *Assessing Potential Evapotranspiration Methods in Future Drought Projections across Canada*. Atmosphere-Ocean, https://doi.org/10.1080/07055900.2023.2288632

Has climate change impacted extreme events?

Rapid Extreme Weather Event Attribution System





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3

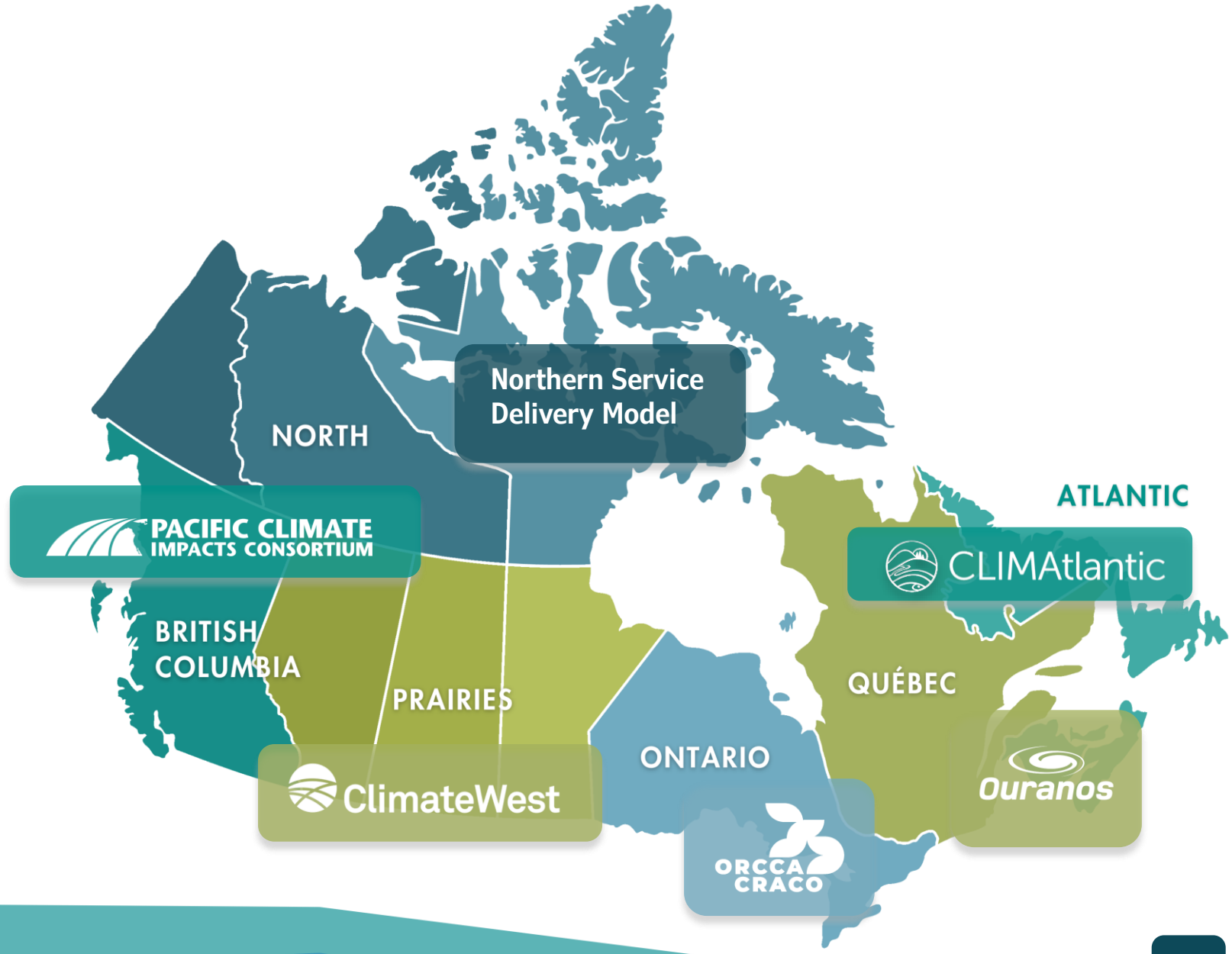
Services, Data and Tools

To support adaptation planning

National network

CLIMATE SERVICES IN CANADA

- CCCS – national climate service provider
- Supports a network of regional climate organisations
- ClimateWest – regional climate service provider for the Prairies
- All regional climate services are involved in the web portal ClimateData.ca

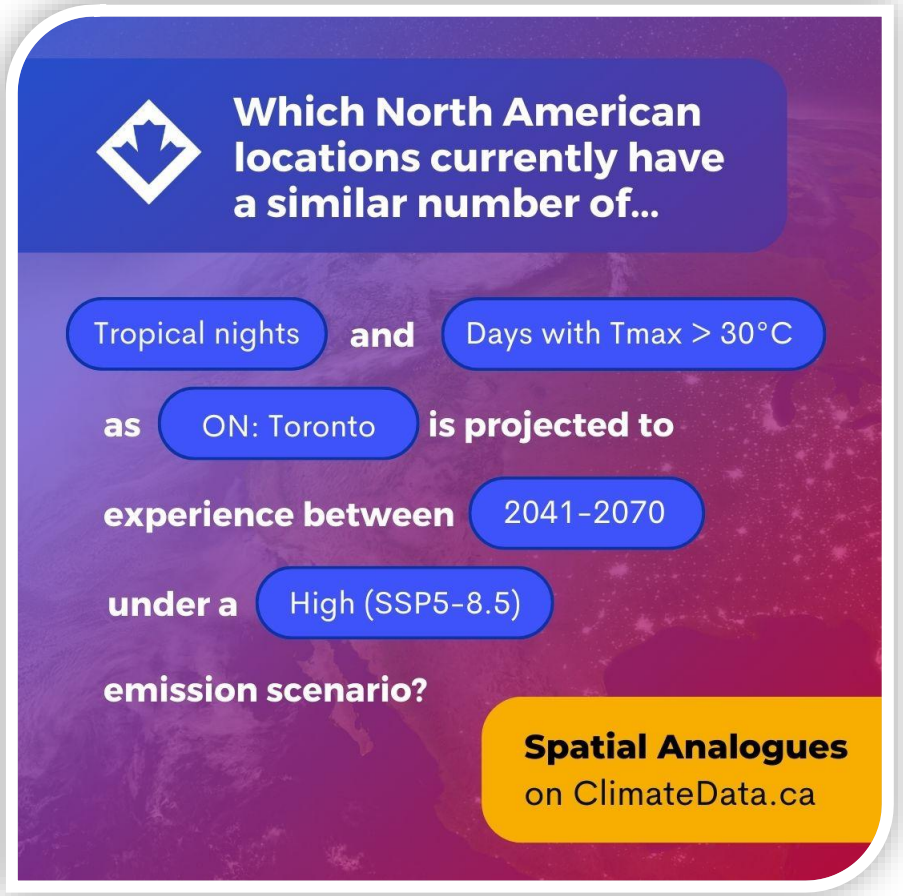


ClimateData.ca

ENVISION POSSIBLE CLIMATE FUTURES

Spatial Analogues

- Envision and prepare for your city's future climate
- Explore cities that are already experiencing one or more climatic conditions of concern (e.g. number of days above 30 degrees)



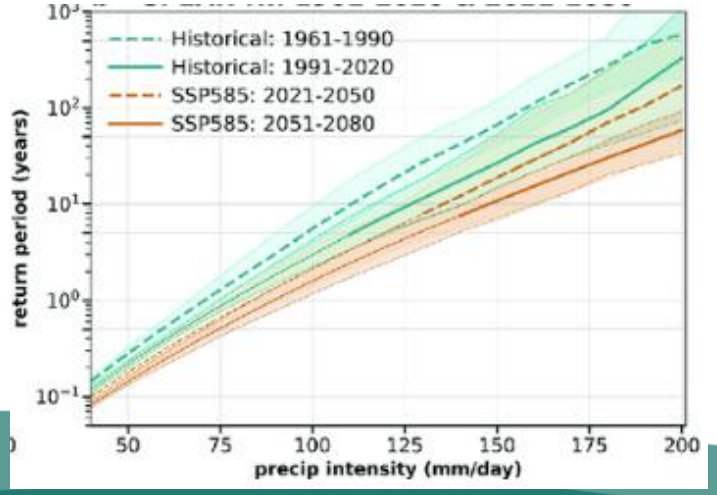
Coming Soon to ClimateData.ca!

CMIP6 Snowfall Projections

CMIP6 Rainfall Projections

CMIP6 Drought (SPEI) Projections

Return periods for temperature and precipitation

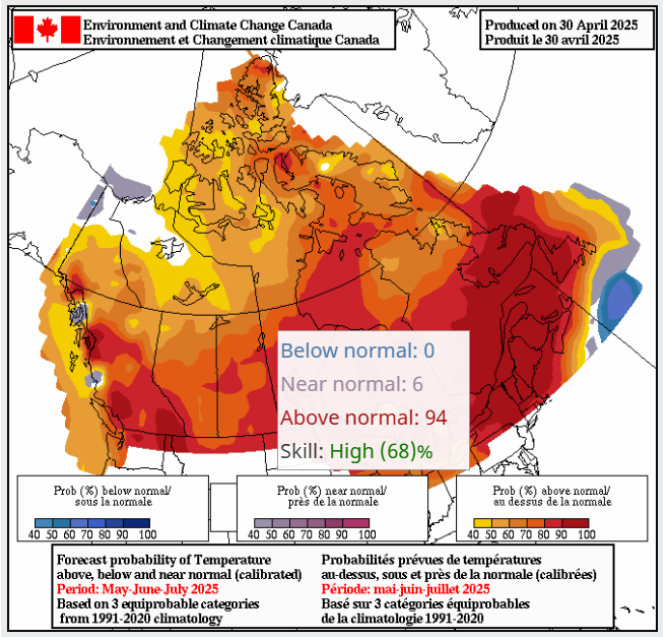


Coming Soon to ClimateData.ca!

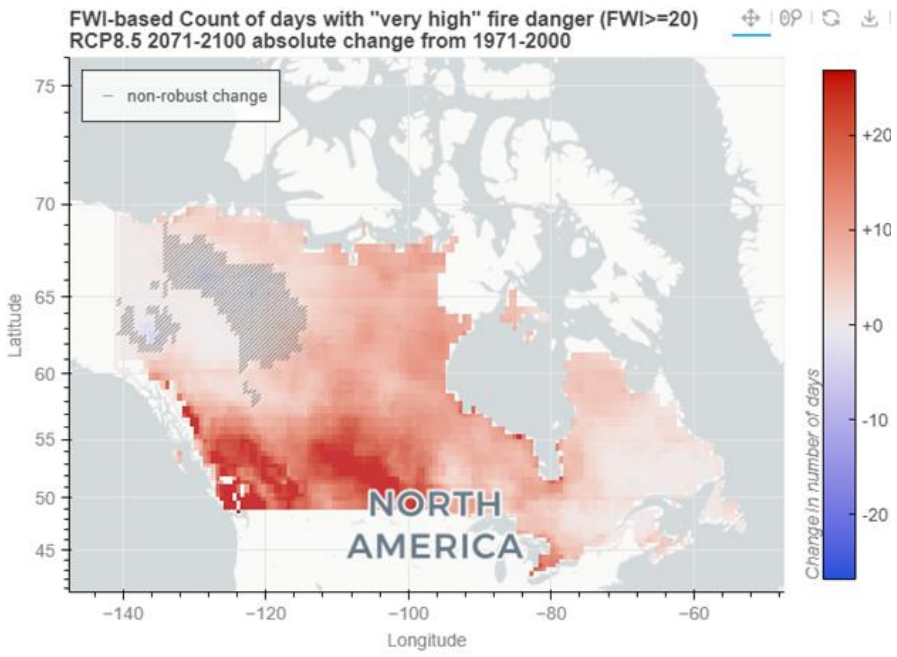
Wildfire potential in Canada

It can be helpful to consult multiple sources of data

- **Seasonal forecasts** can provide early indications of what the upcoming fire season could look like.



- ClimateData.ca's **Fire Weather App** provides long-term projections of fire season length and severity.



Thank you

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