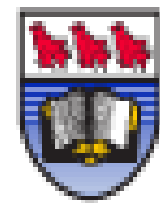


# What's Climate Got to Do With it?

24 March 2022

Arrowsmith Naturalists Club



University  
of Victoria

**Kari Tyler**

# What I'm going to talk about

- Who we are
- Intro Climate Data
- Future Climate Projections
- Recent Events
- Introduction to Resilience
- Activity!



University  
of Victoria

**Kari Tyler**

**[ktyler@uvic.ca](mailto:ktyler@uvic.ca)**

- Regional climate service provider
- Launched 2005, sister organization to Pacific Institute for Climate Solutions
- 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

Tells you what to wear each day



## CLIMATE

Tells you what types of clothes to have in your closet



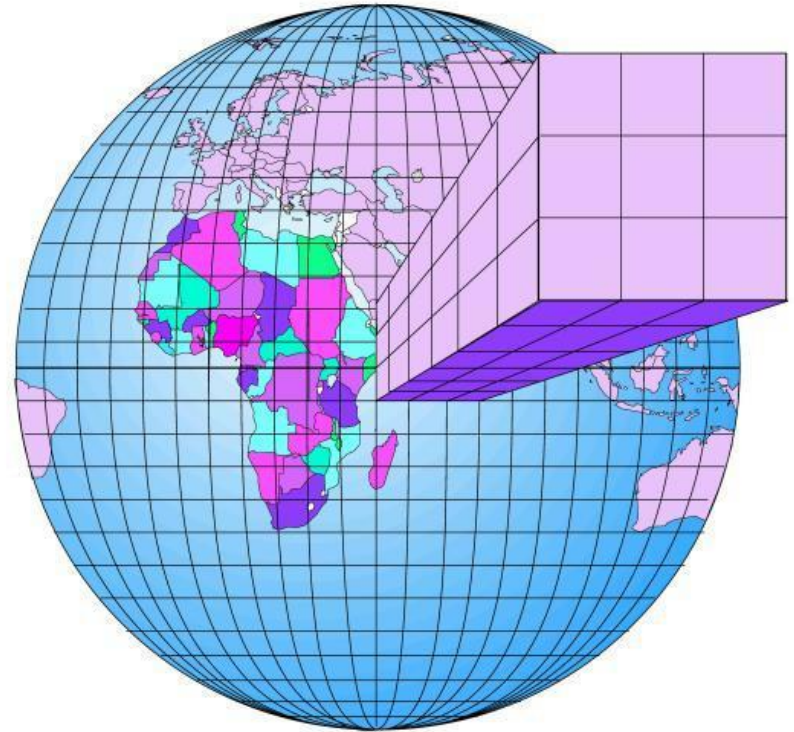
NOAA National Centers for Environmental Information

[www.ncei.noaa.gov](http://www.ncei.noaa.gov)

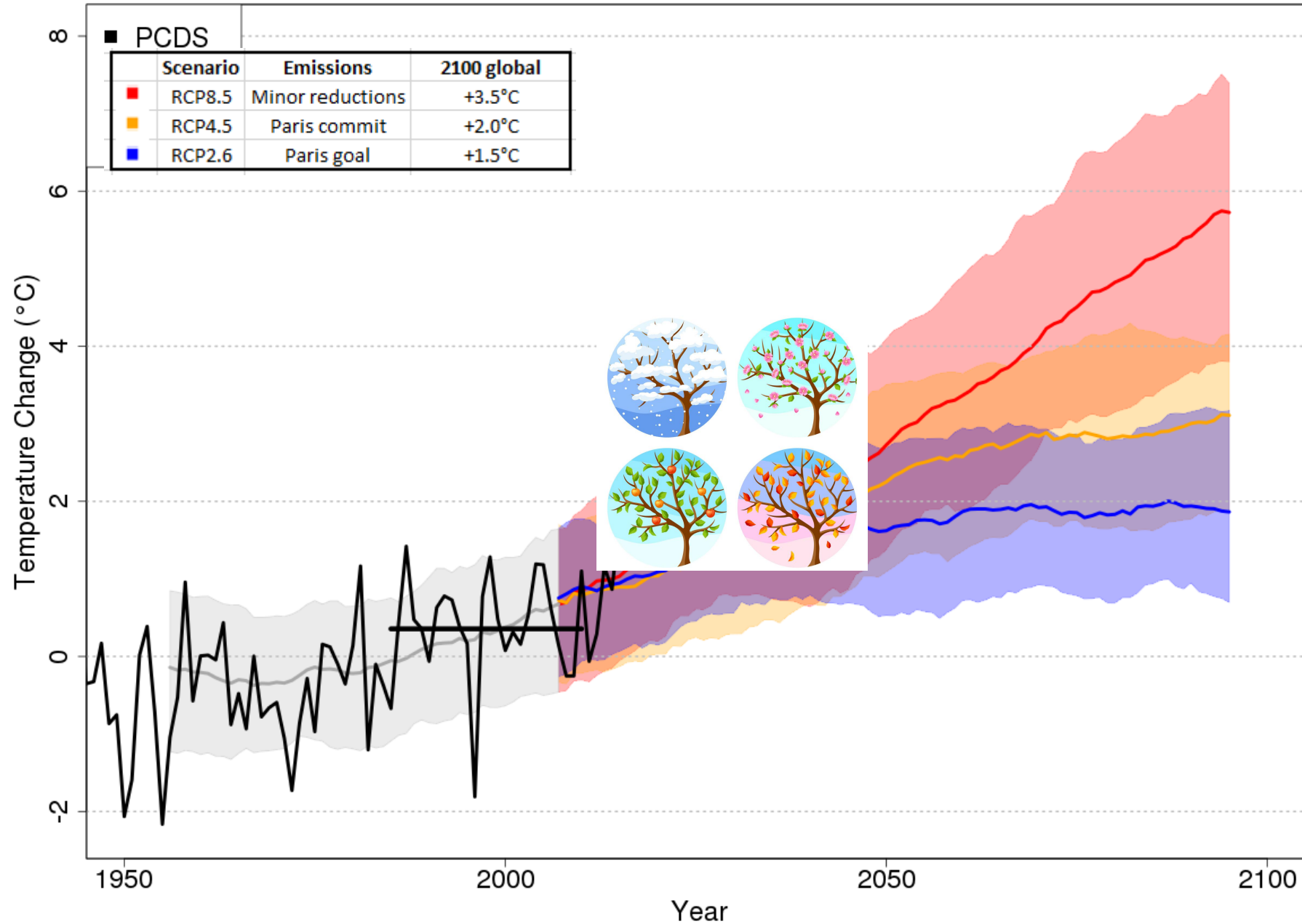
**Climate = long term statistics of weather**  
(for climate scientists & those who work with them)

# Climate → Climate models

“Prediction is hard, especially about the future”



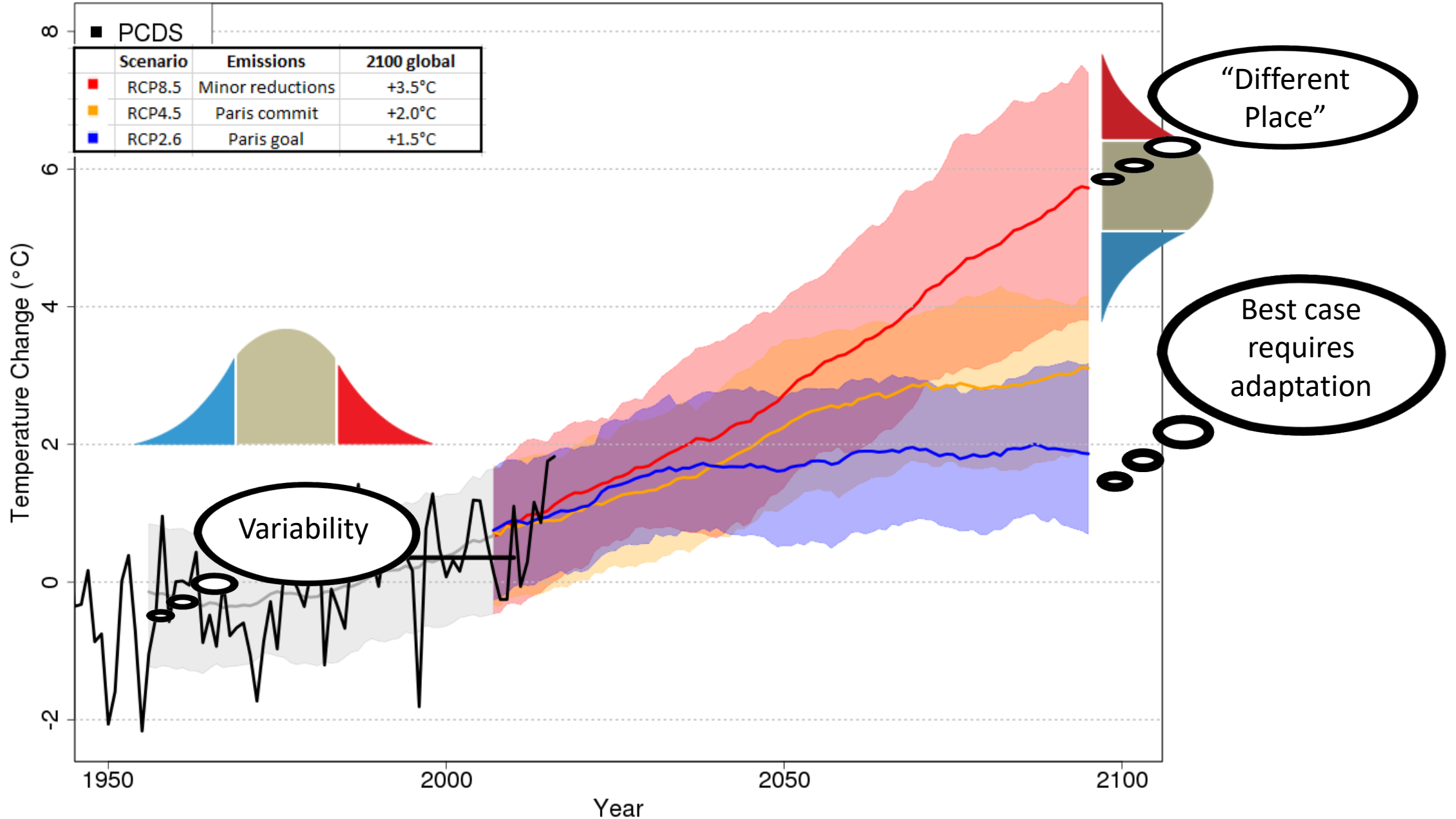
# Future Warming in BC



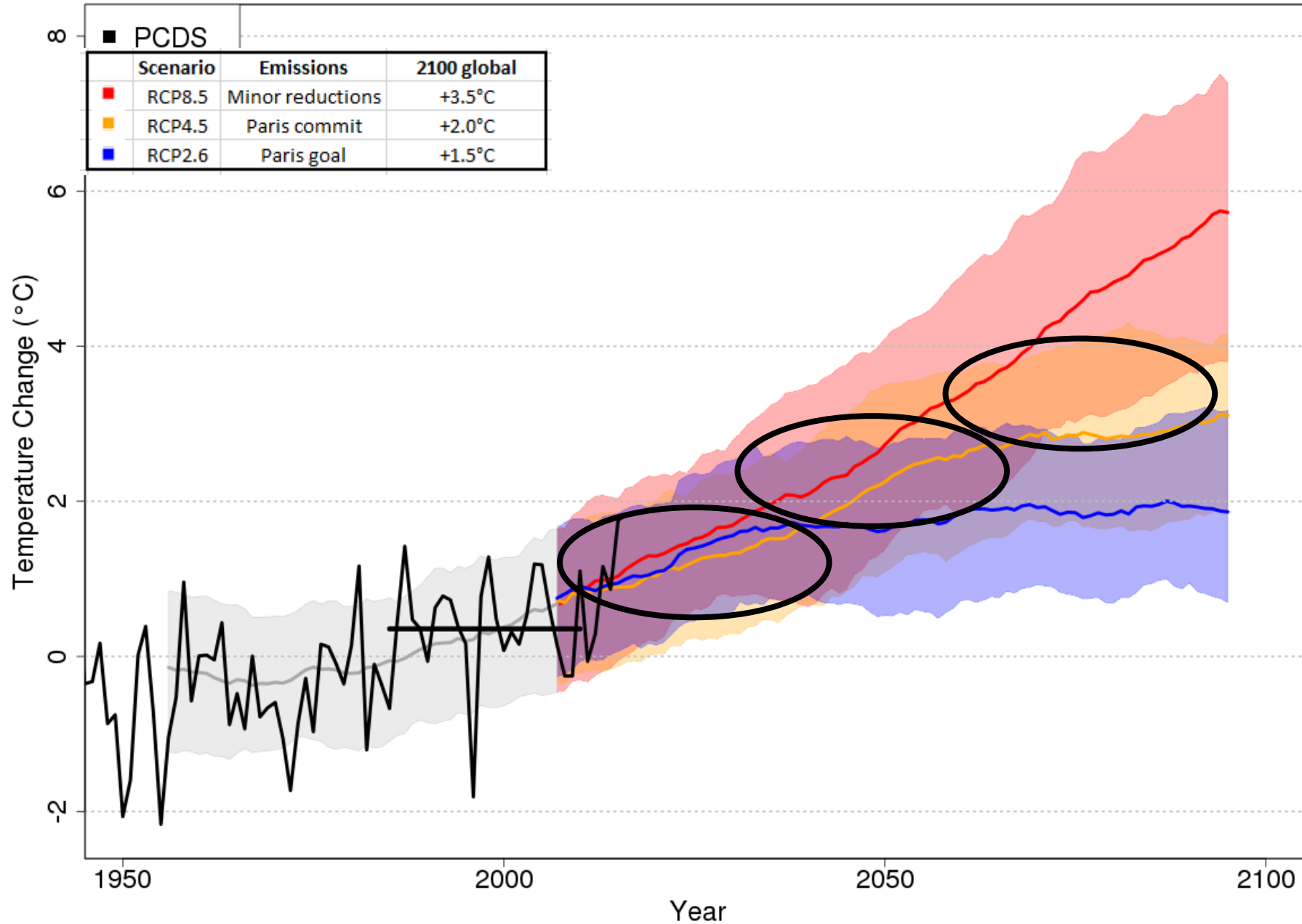
BC Annual Average Temp.  
- Change from the “mean”



# Future Warming in BC



# Future Warming in terms of time period

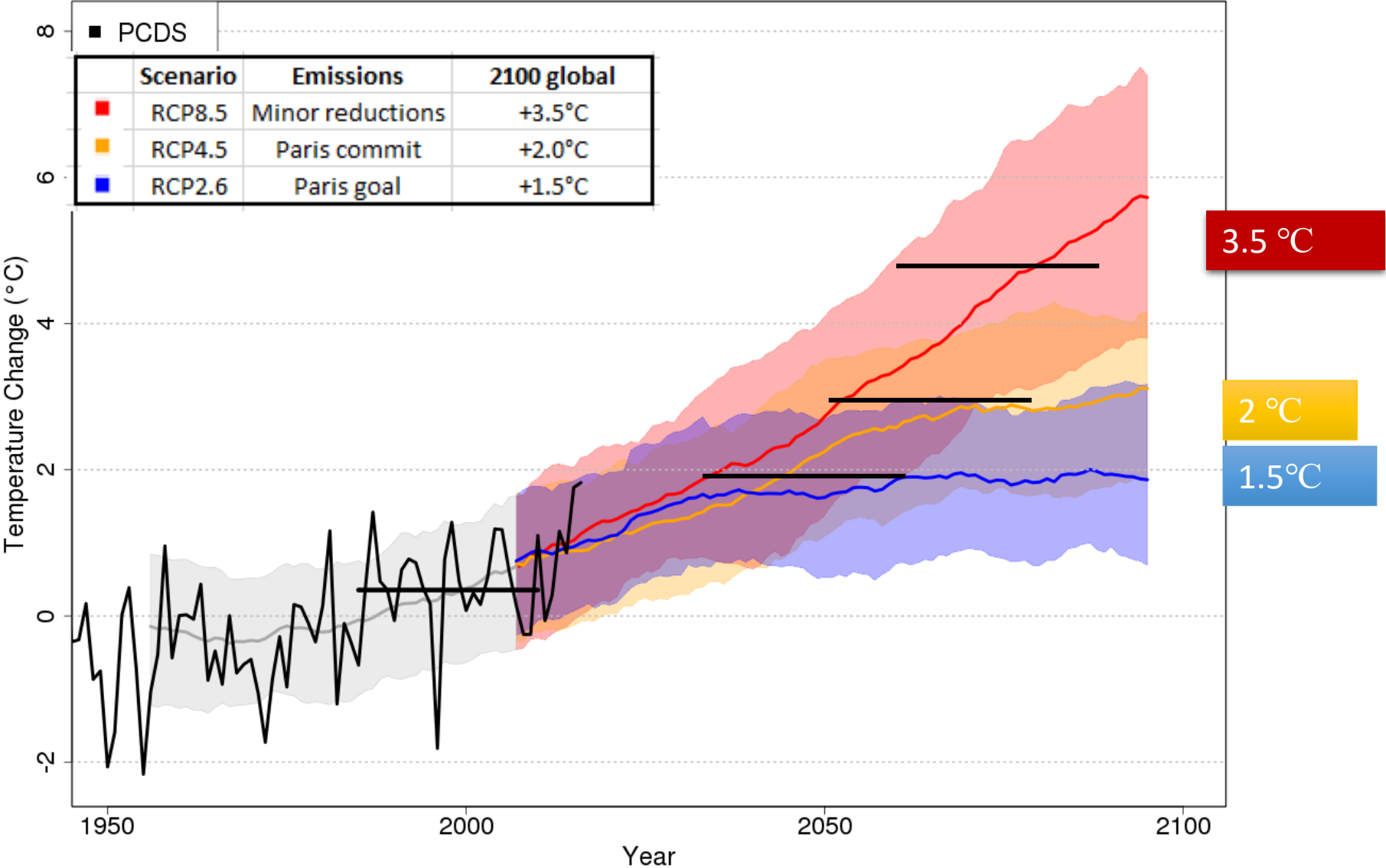


Climate is described in 30 year time periods:

2050s = 2041-2069

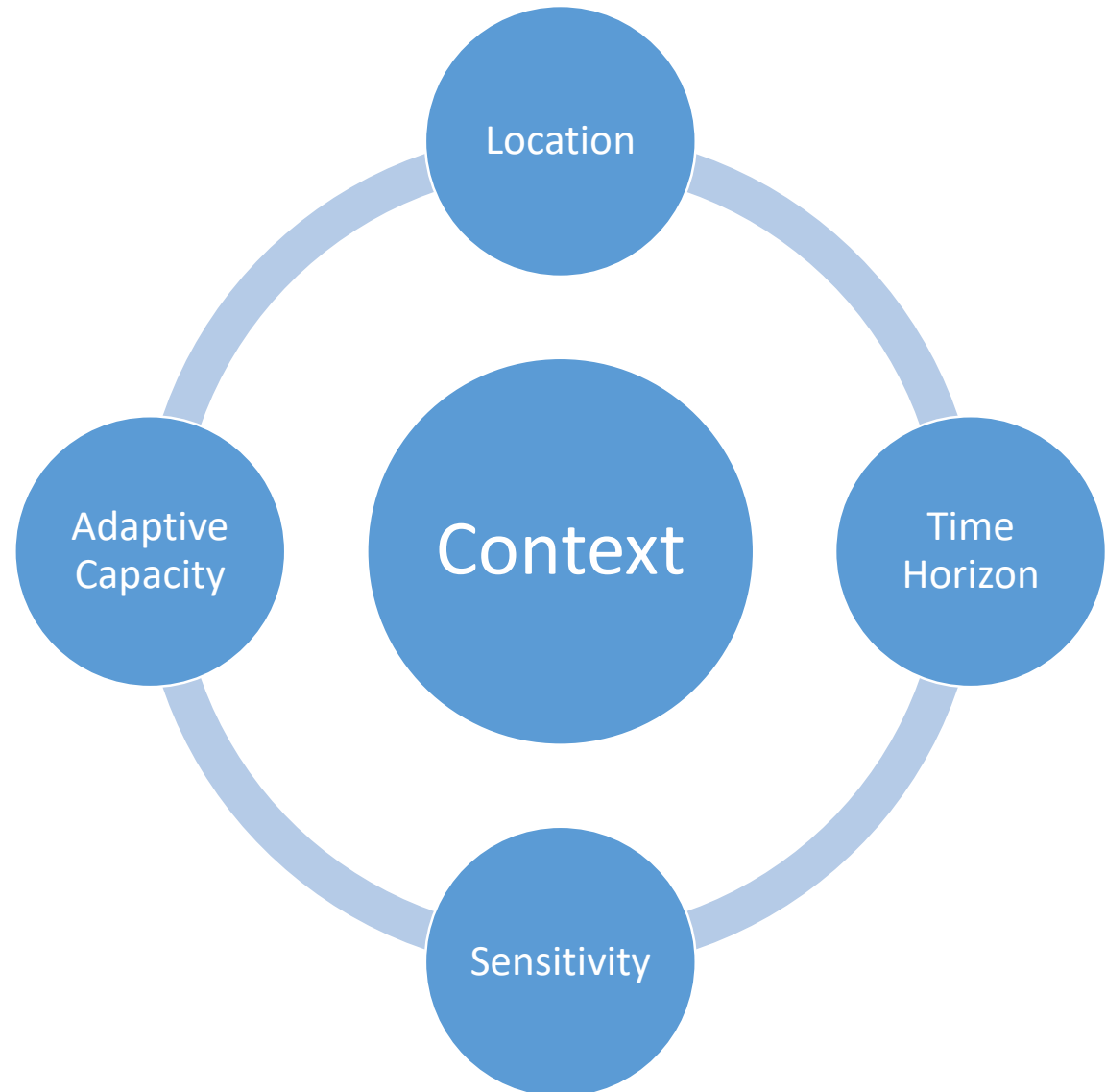


# Future Warming in terms of Global Temp



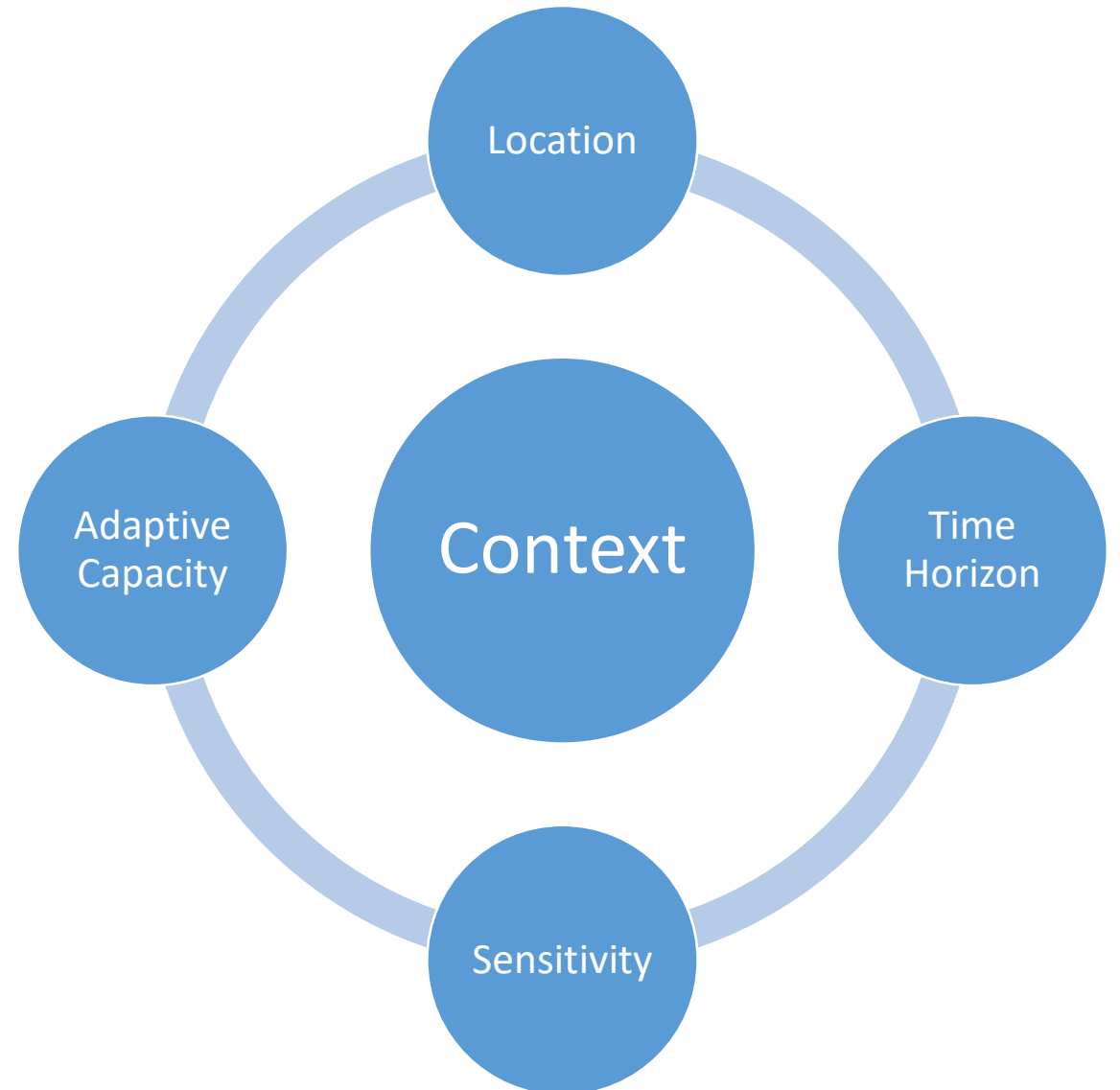
# What climate data do you need?

- It depends on the context that the data is being applied



# What climate data do you need?

- What is a your decision making context?
  - Strategic planning
  - Response to existing issues
  - Location specific design decision
  - Professional knowledge and experience
- What is a your sphere of influence?
  - Who can be influenced?
  - What can change as a result of this decision?



# Climate projections in BC



Warmer winters  
fewer days below freezing



More hot summer days  
longer dry spells in summer

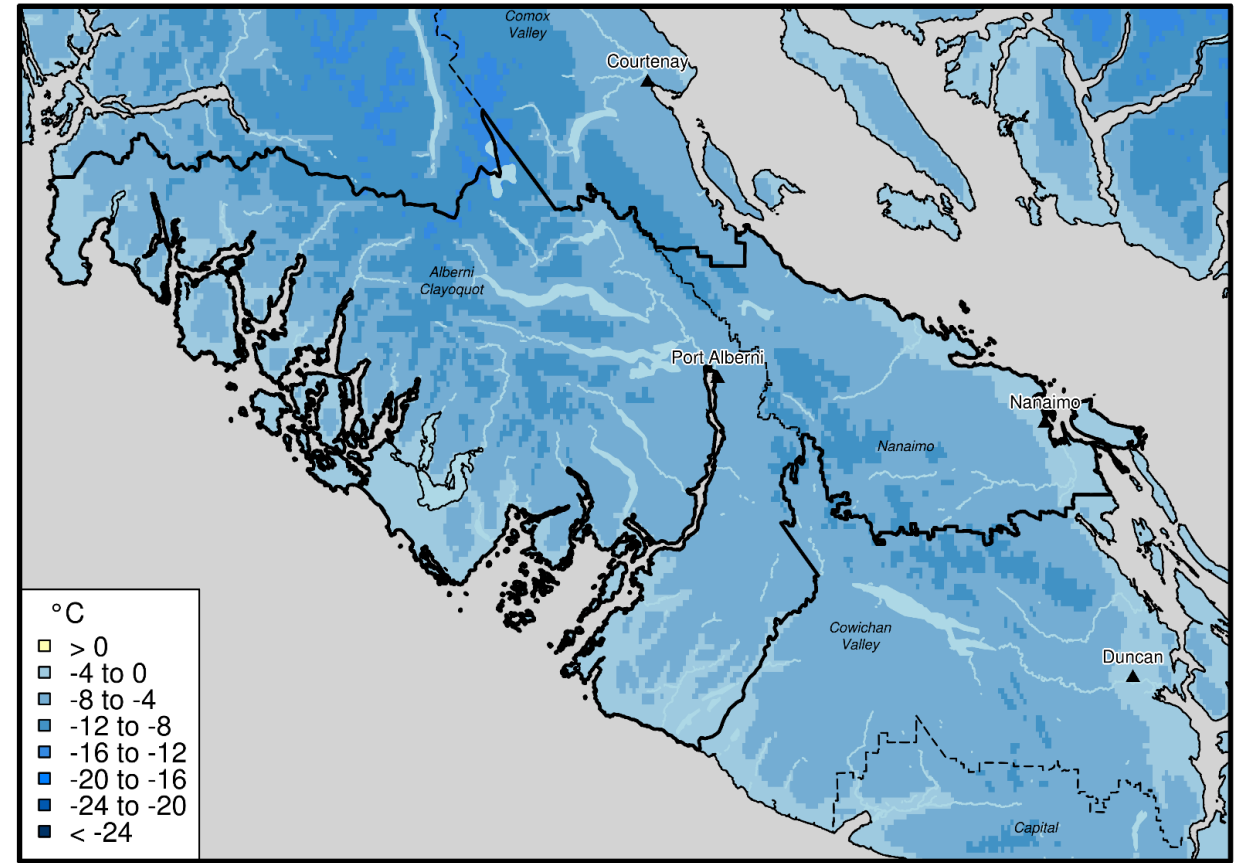
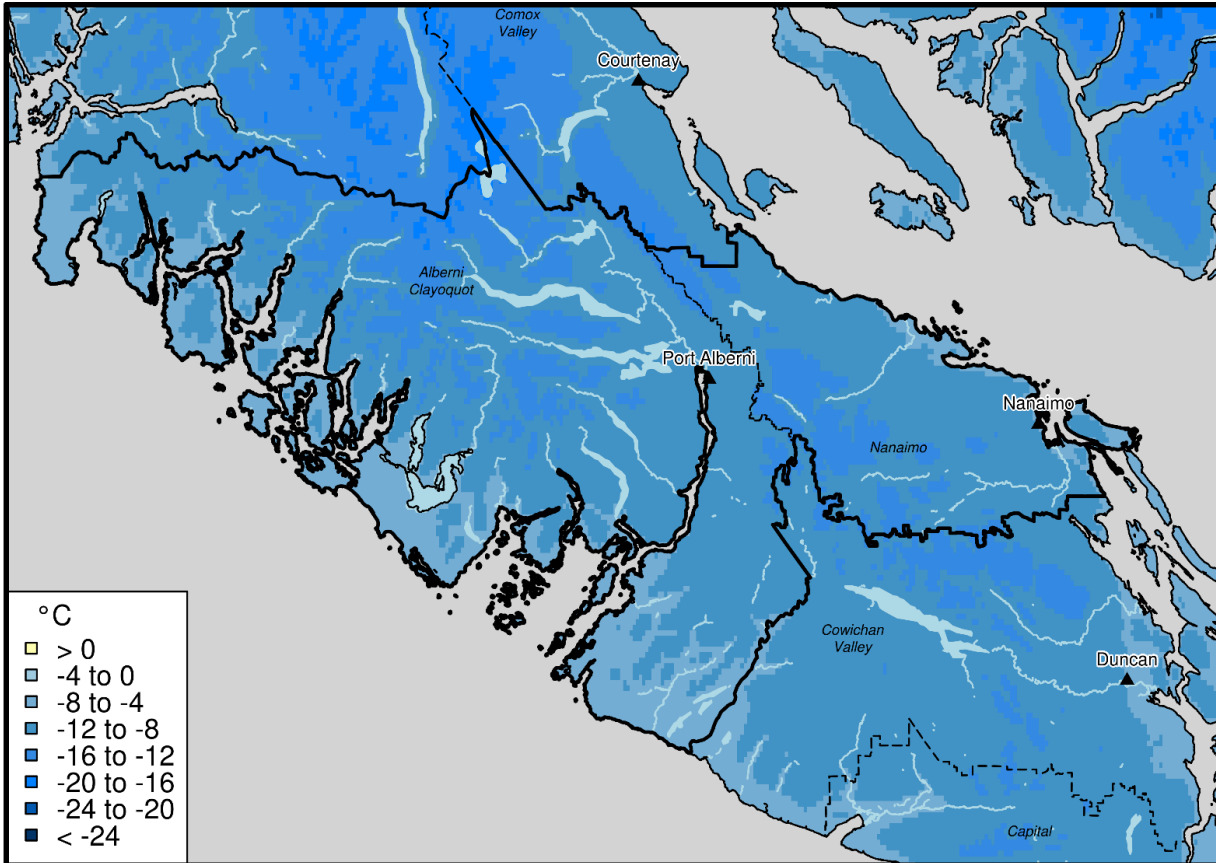


More precipitation in the fall,  
winter and spring



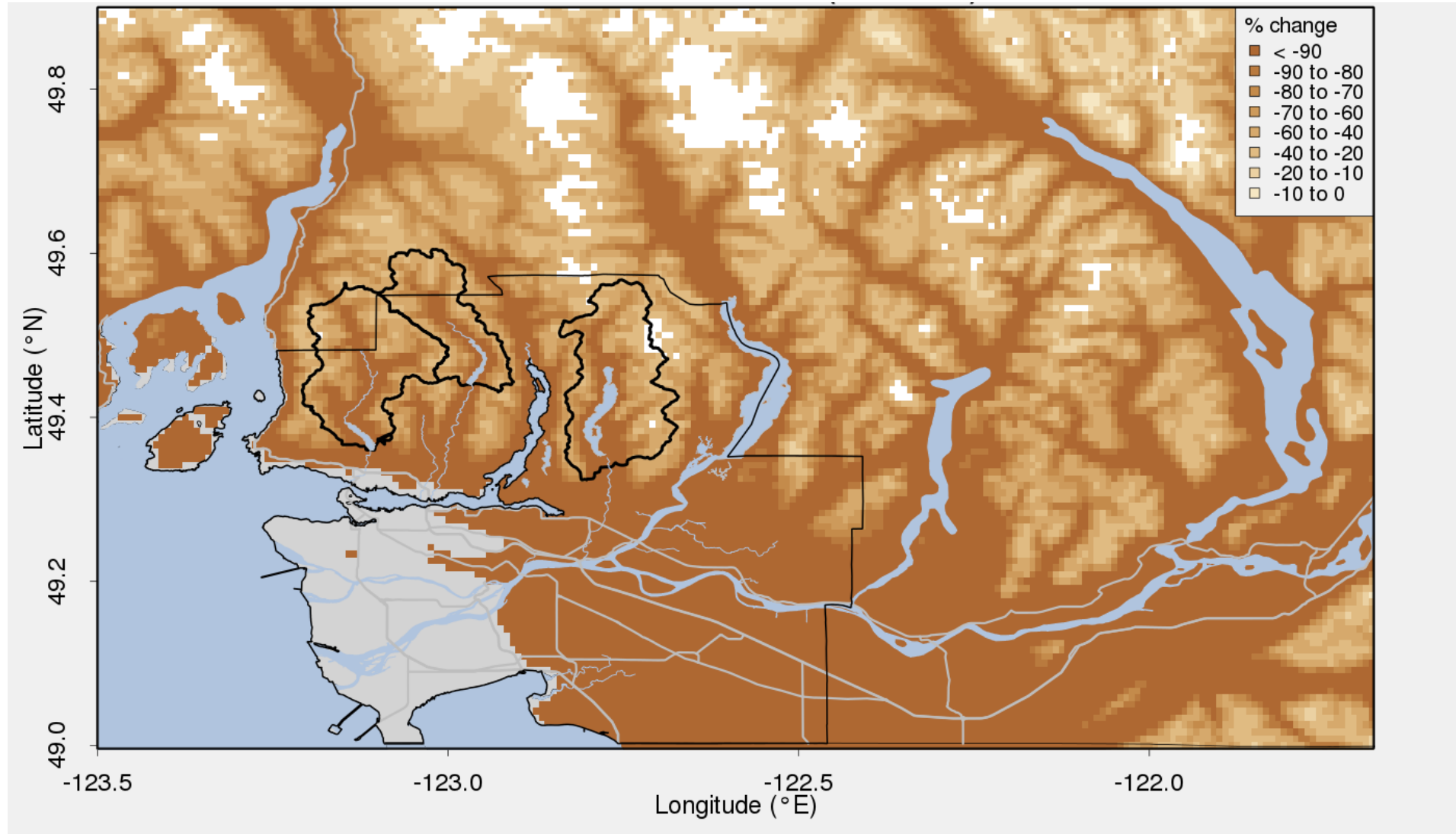
Increased frequency and intensity  
of precipitation and storm events

# Coldest days less cold



Coldest day in winter comparing the past to the 2050s

# Decreased snowpack



**April 1 snowpack: ~60% decrease**



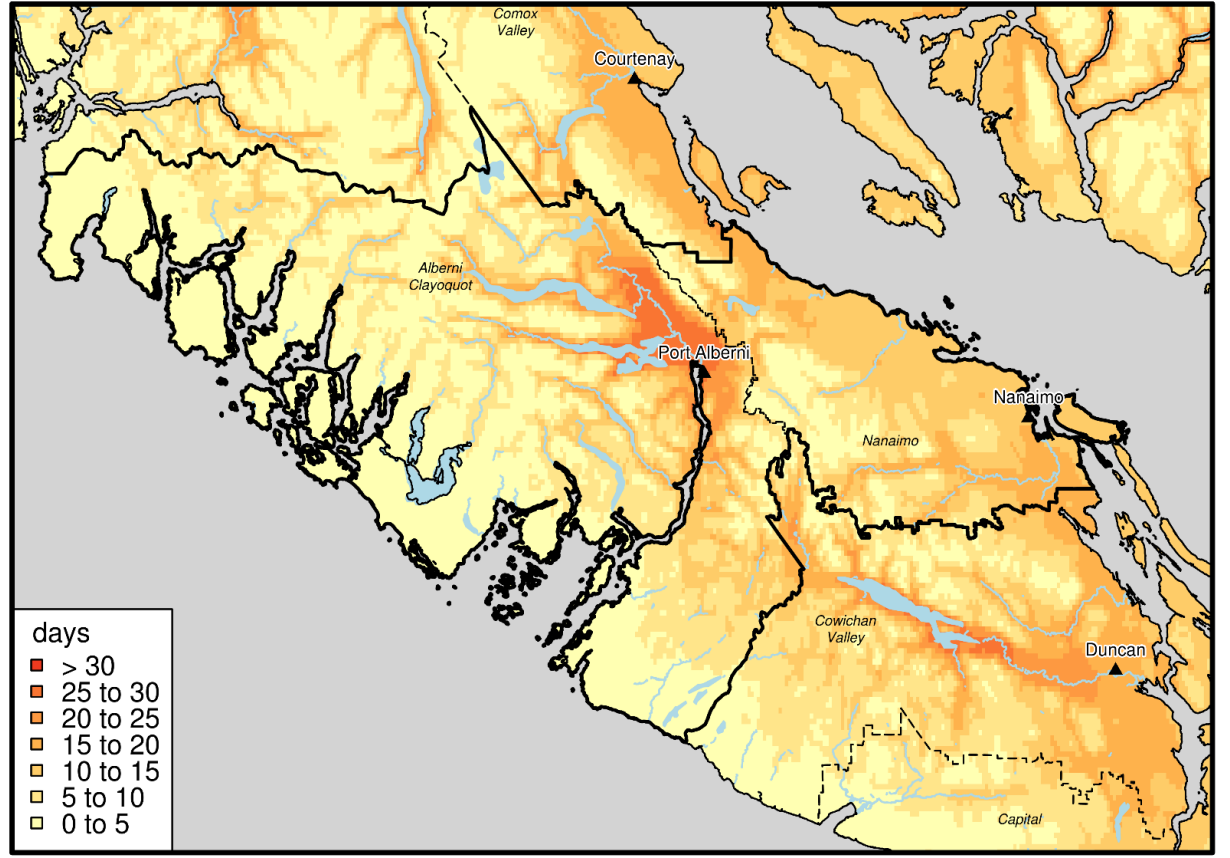
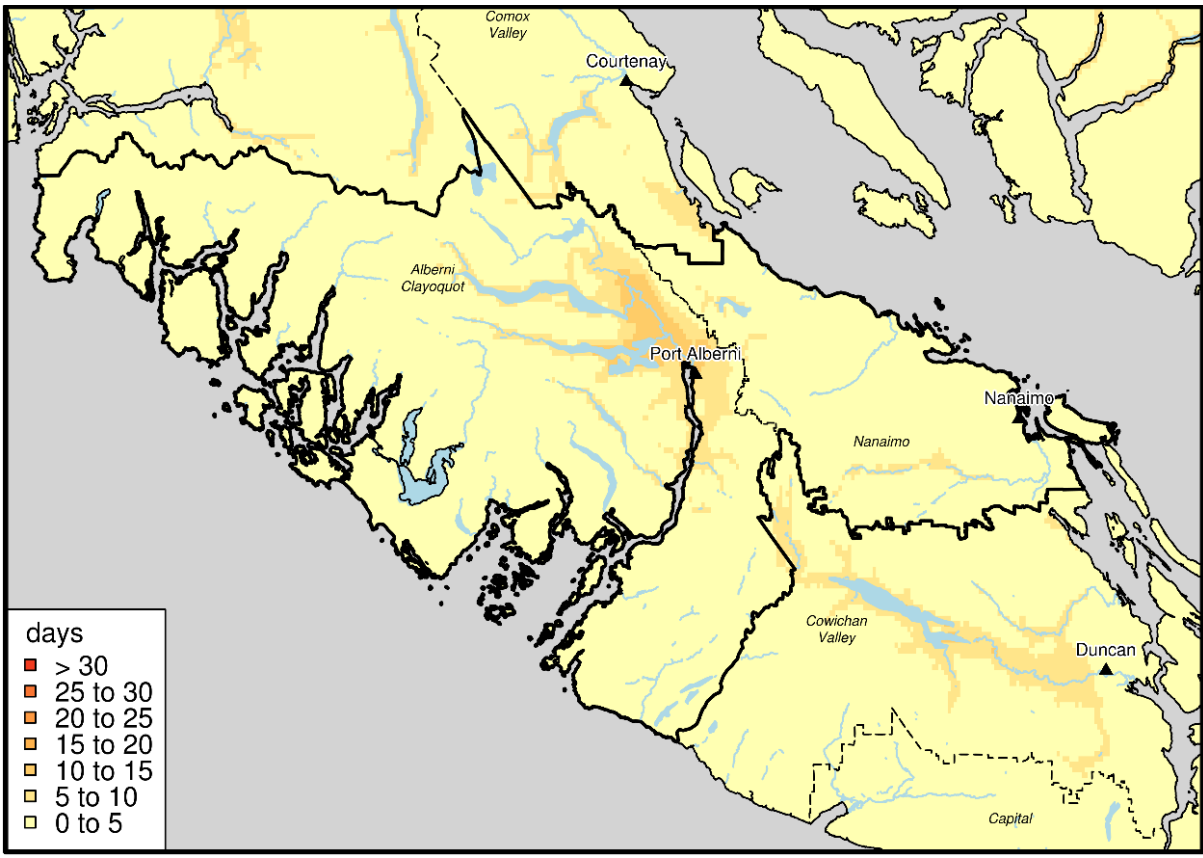
# Decreased snowpack



Summer 2015 Metro Vancouver

<https://www.nsnews.com/news/dry-summer-puts-focus-on-water-use-1.2012407>

# Projected increase in very hot days



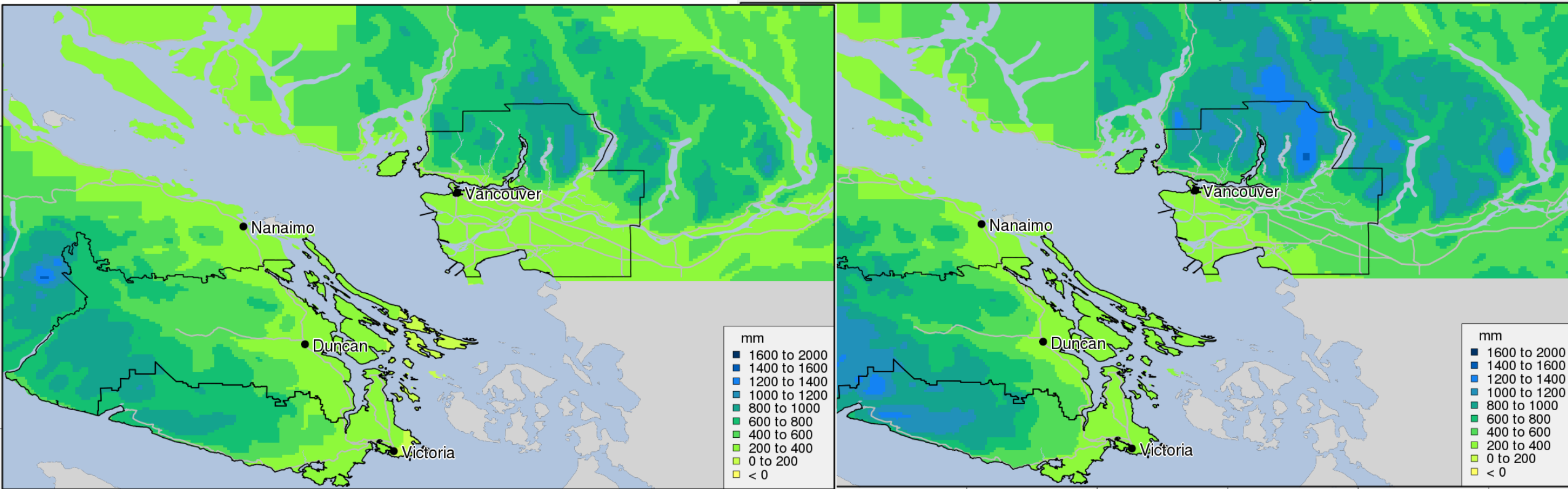
Projected occurrence of hot days (over 30°C) comparing the past to the 2050s



# Increased hot days



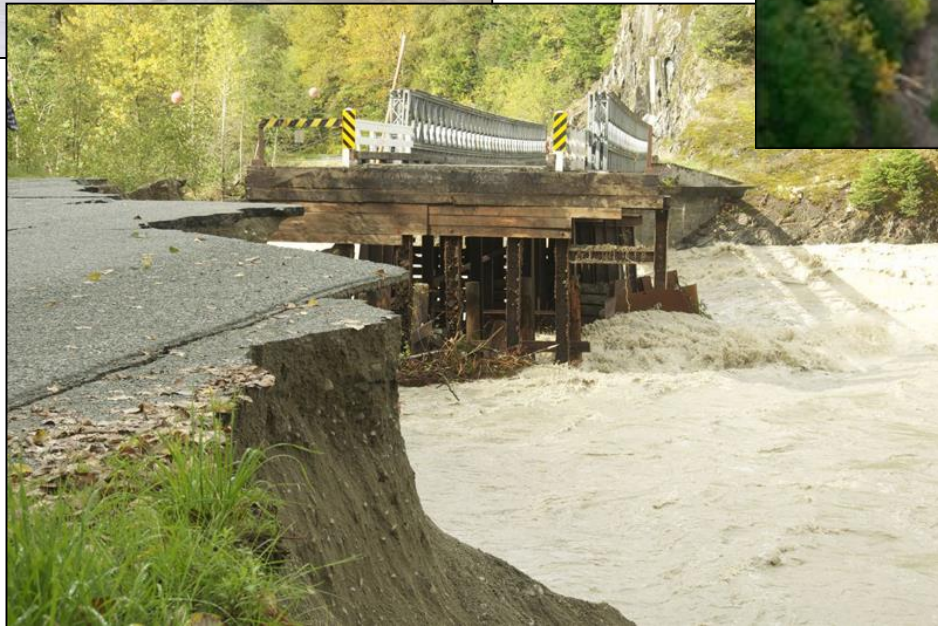
# More frequent and more intense wet days



Wettest day of the year (comparing the past to the 2050s)

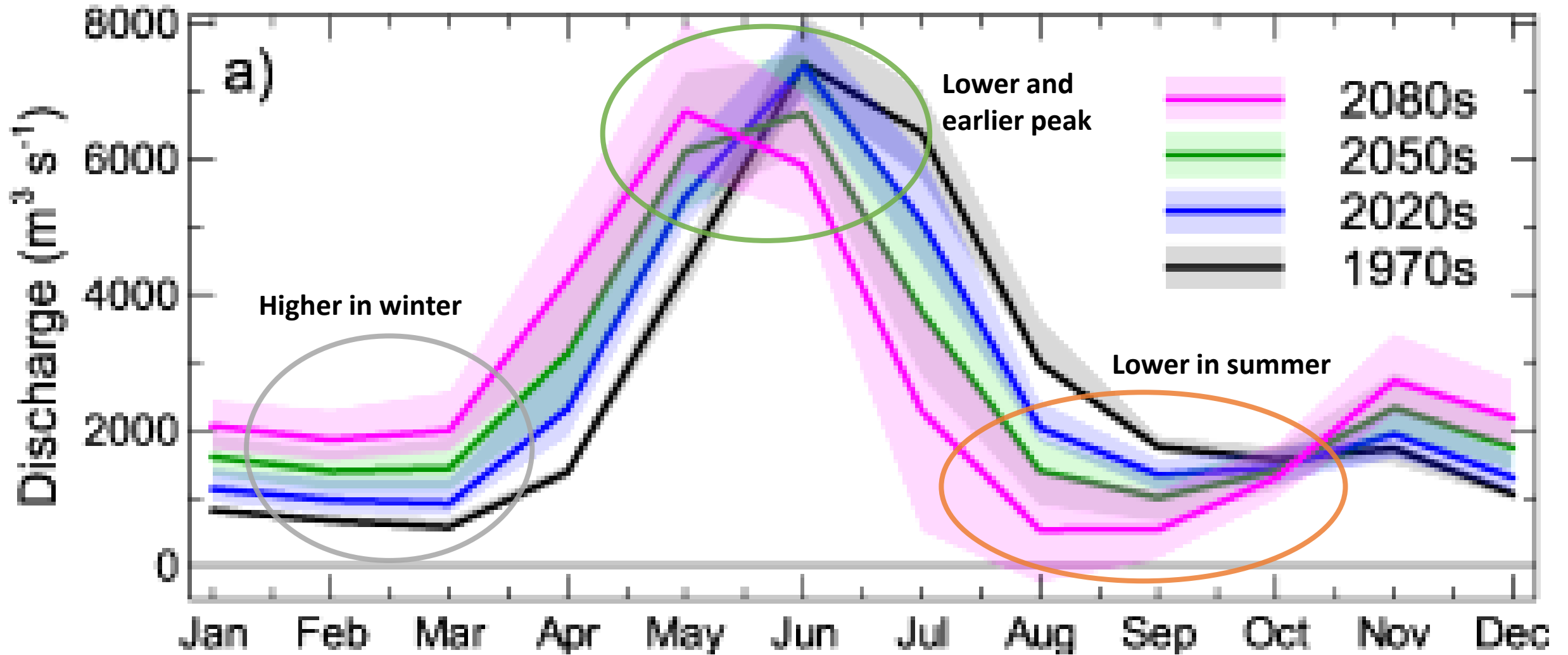


# More frequent and more intense wet days



# Future streamflow

Fraser River at Hope



Statistical emulation of streamflow projections from a distributed hydrological model: Application to CMIP3 and CMIP5 climate projections for British Columbia  
Water Resources Research

Volume 50, Issue 11, pages 8907-8926, 19 NOV 2014 DOI: 10.1002/2014WR015279

<http://onlinelibrary.wiley.com/doi/10.1002/2014WR015279/full#wrcr21222-fig-0010>



# Climate projections in BC



Warmer winters  
fewer days below freezing



More hot summer days  
longer dry spells in summer



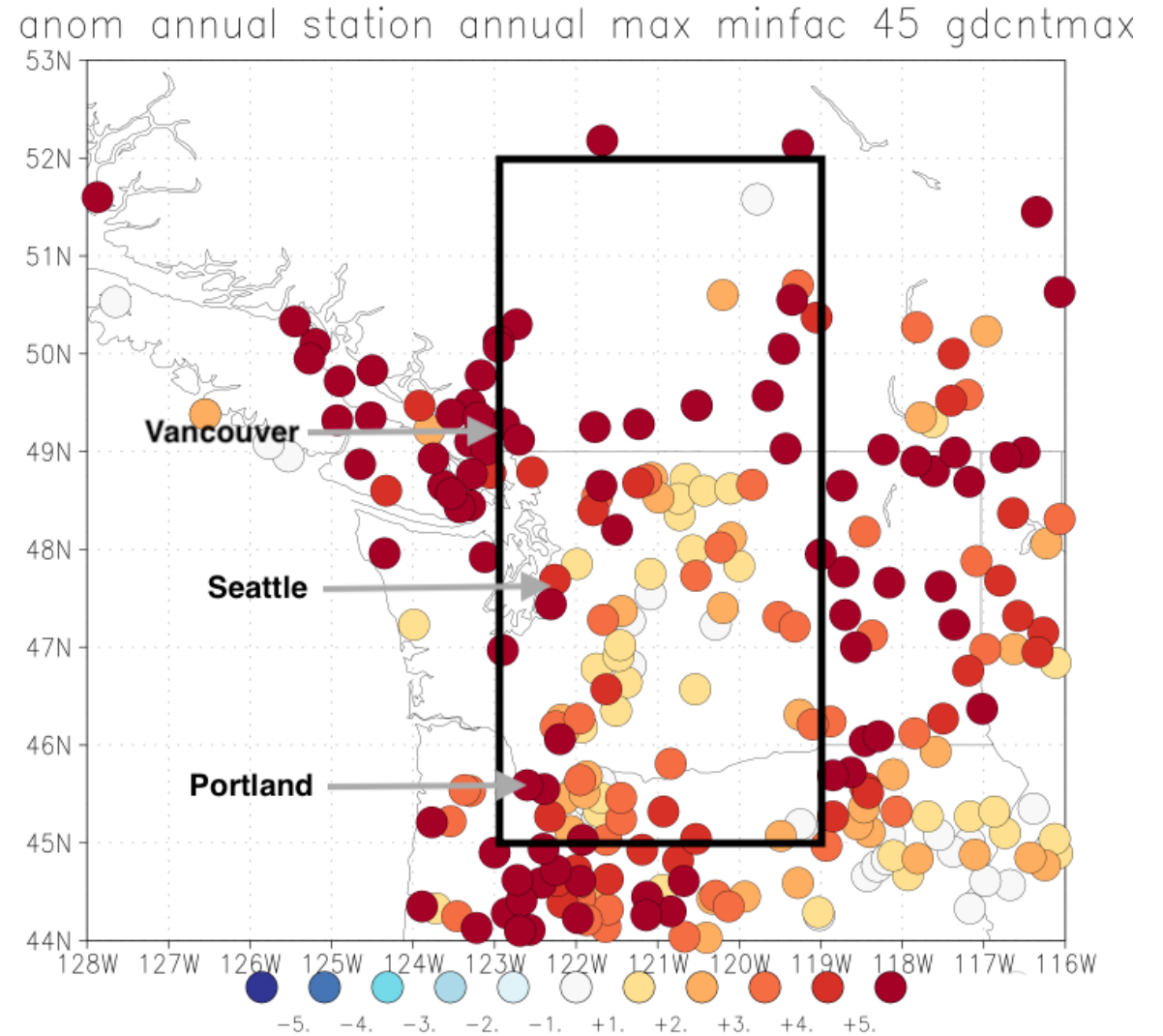
More precipitation in the fall,  
winter and spring



Increased frequency and intensity  
of precipitation and storm events

# June 2021 Heat Bubble

- ~150x more likely with climate change
- ~2 °C hotter with climate change
  - some records were broken by as much as 5 °C.
- Under a global 2 °C warmed climate, it's likely similar events could occur as often every 5 to 10 yrs

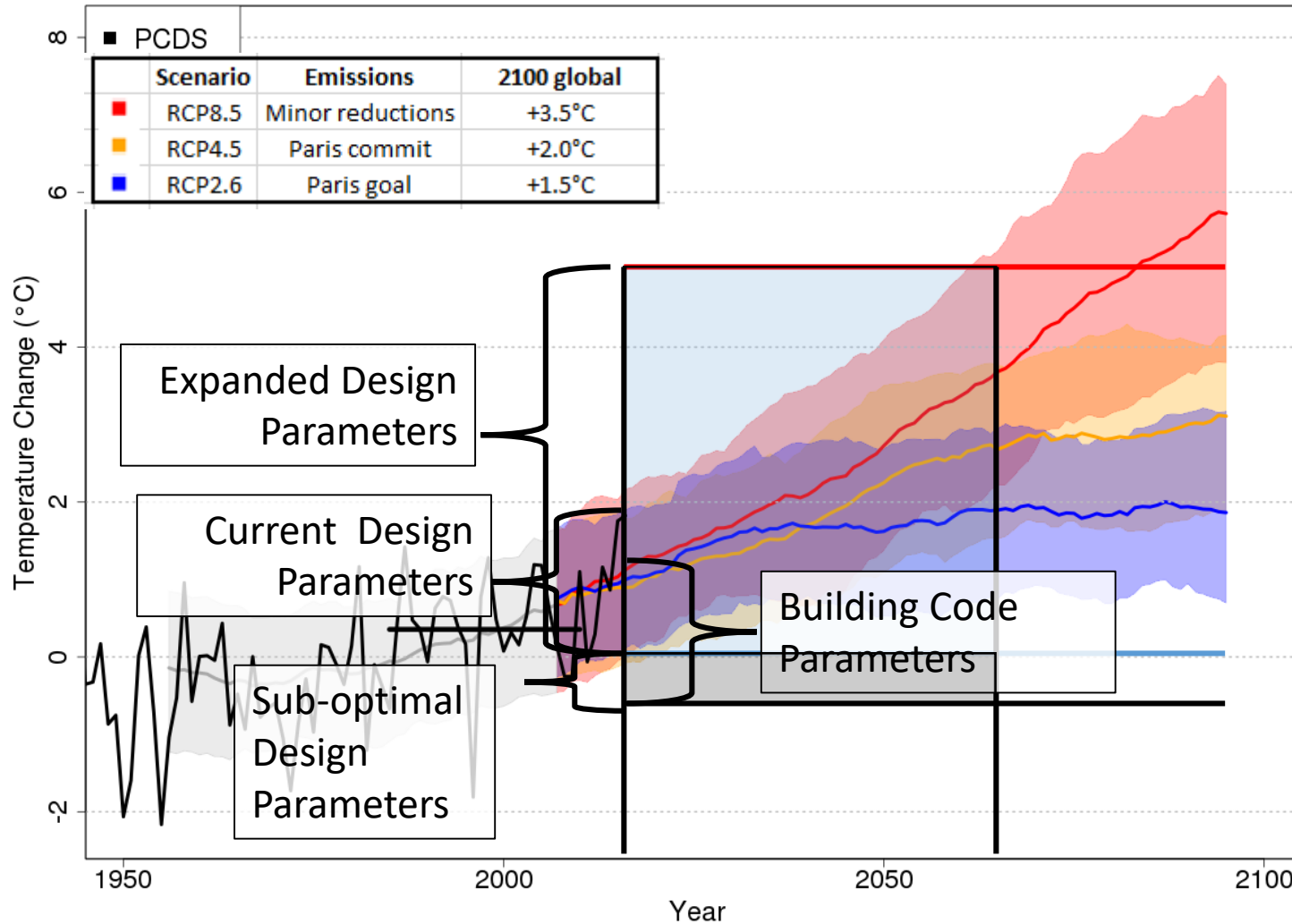


# November 2021 Atmospheric River

- A one in 50-to-100 year event
- probability of such events has increased by about 50% due to climate change
- 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
- The probability of such extreme streamflow events are 2 - 4 times as large as they were in the 1950s
- With about 3°C warming the event will be 1.5 -3 x more likely



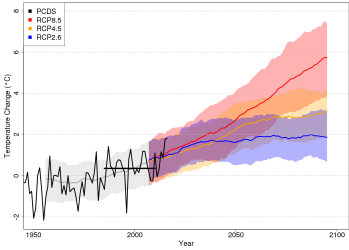
# Climate Design Parameters



1. Past conditions not a good guide for future
2. Past conditions don't even represent today
3. Building code values use past → inadequate
4. Conditions keep changing with time in all but best case
5. Must accommodate wider range of conditions in all cases
6. 2050s cautious roughly equals 2070s optimistic

# Best Practices for Adaptation & Resilience

- Start using future projections



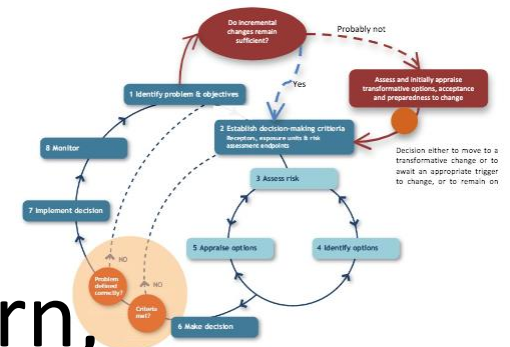
- Understand how your decision making context informs your use of data



- Talk to people with different roles



- Iterate: learn, rinse, repeat, learn, bump, turn, keep going, try again...







**FUTURE WILL  
BE DIFFERENT**



**PRESENT  
ALREADY IS**



**WIDER RANGE  
OF CONDITIONS**



**NEED  
RESILIENCE**



**RETHINKING EVERYTHING  
A FEATURE NOT A BUG**



imgflip.com





# Mindset shifts relating to climate change adaptation



1. *“Stationarity is dead”*
  - Future will be different than the past
  - The present is already different than the past
  - Range of conditions to plan for is wider than ever



2. *Flexible big picture planning*  
*(resilience principles & systems thinking)*



3. *“Restrictions breed creativity”*  
*(opportunity for transformative change)*

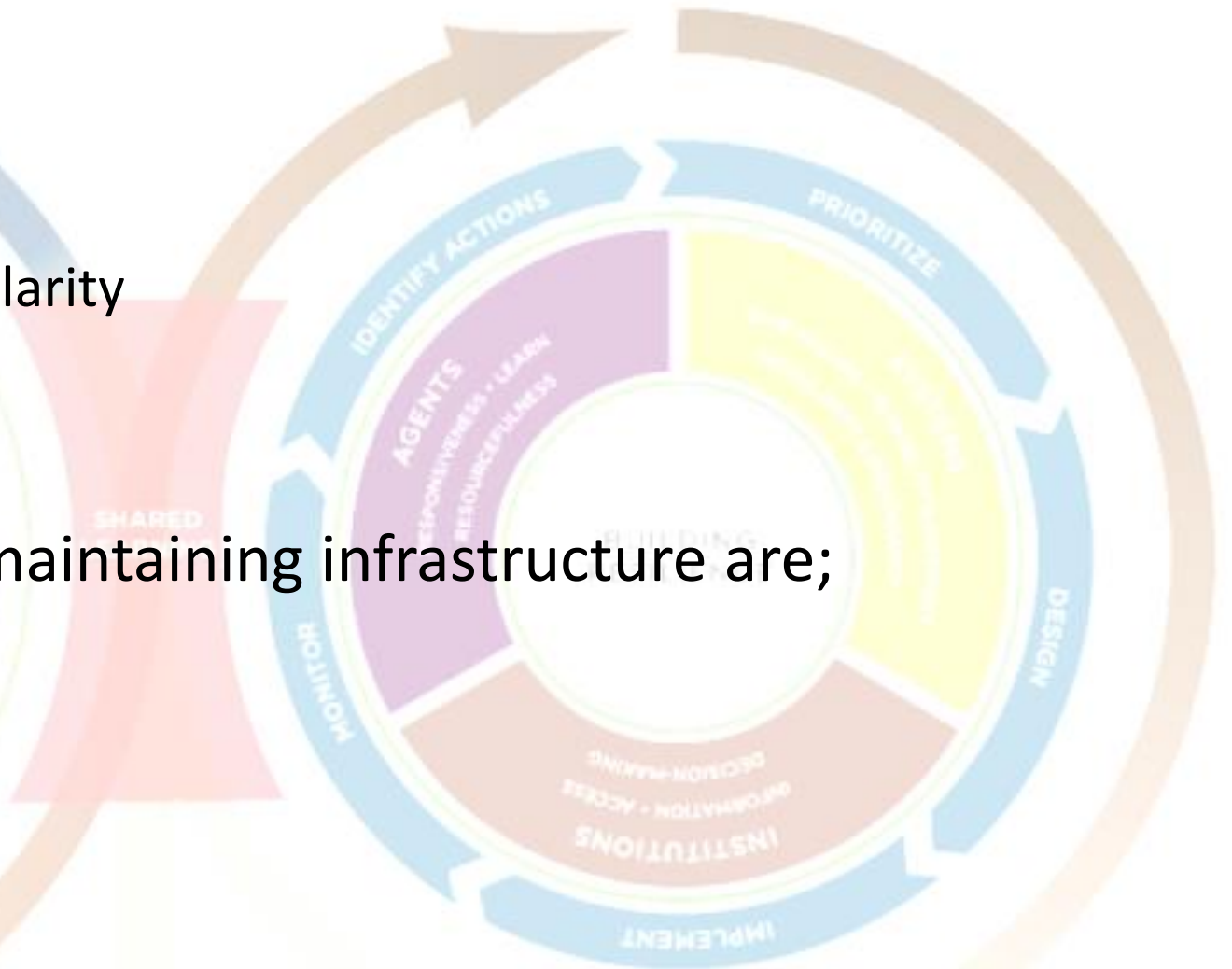
**Resilience**

Not a condiment!



# Characteristics of Resilient Systems

- Infrastructure systems are;
  - flexible and diverse
  - include redundancy or modularity
  - plan for safe failure
- People using, building and maintaining infrastructure are;
  - responsive
  - resourceful,
  - have the capacity to learn



# Characteristics of Resilient Systems

- Governance and administrative processes are;

- inclusive
- include stakeholder engagement,
- practice foresight and apply new knowledge
- representative and accountable

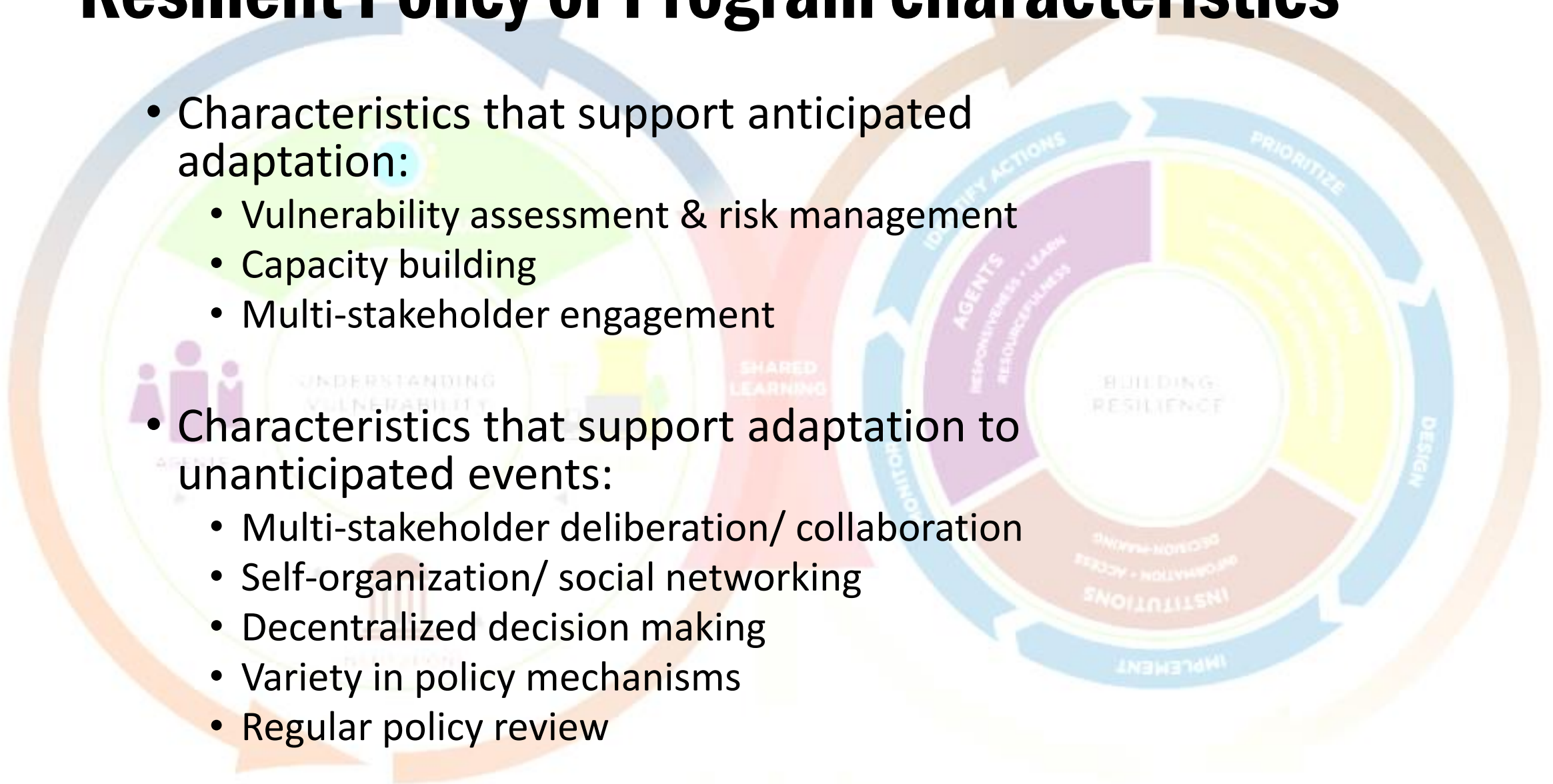
- Ecosystems are;

- flexible and diverse
- connected
- protected

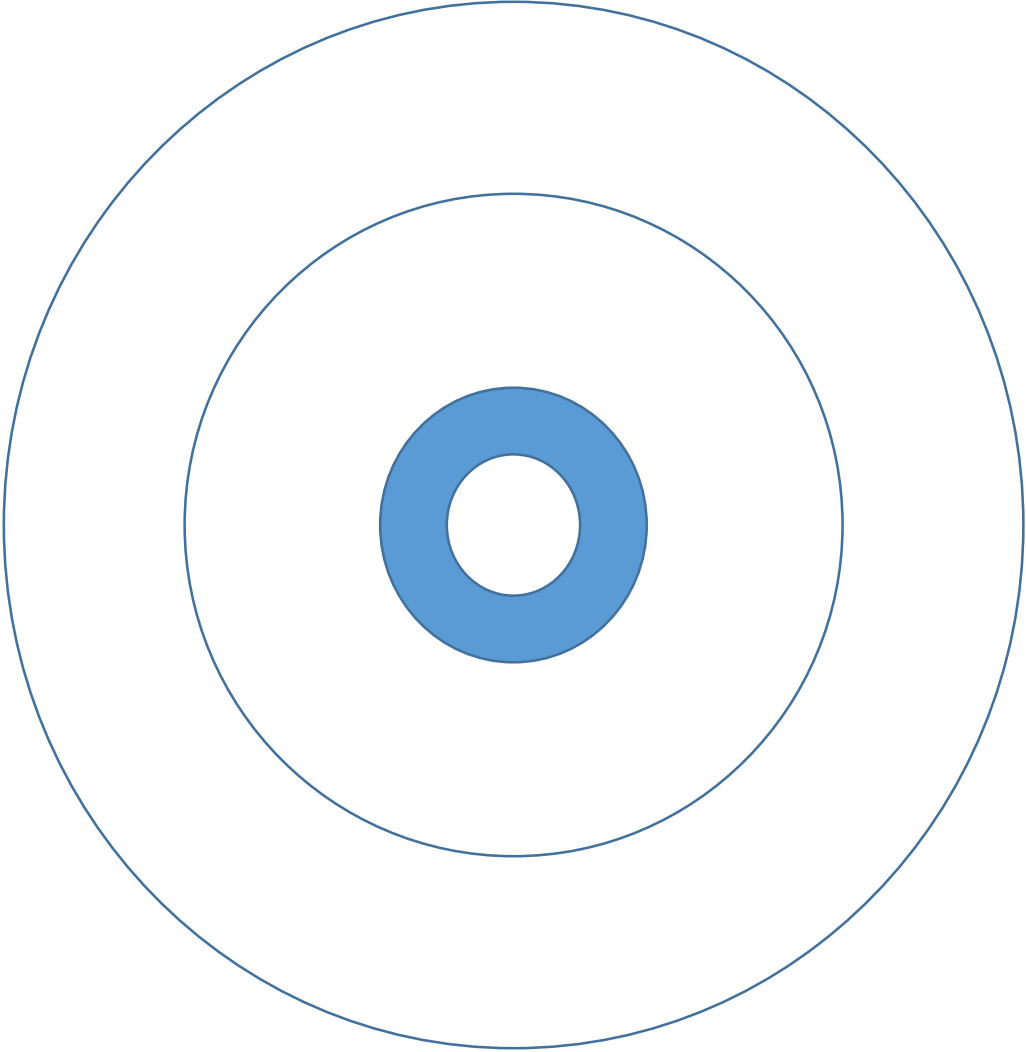


# Resilient Policy or Program characteristics

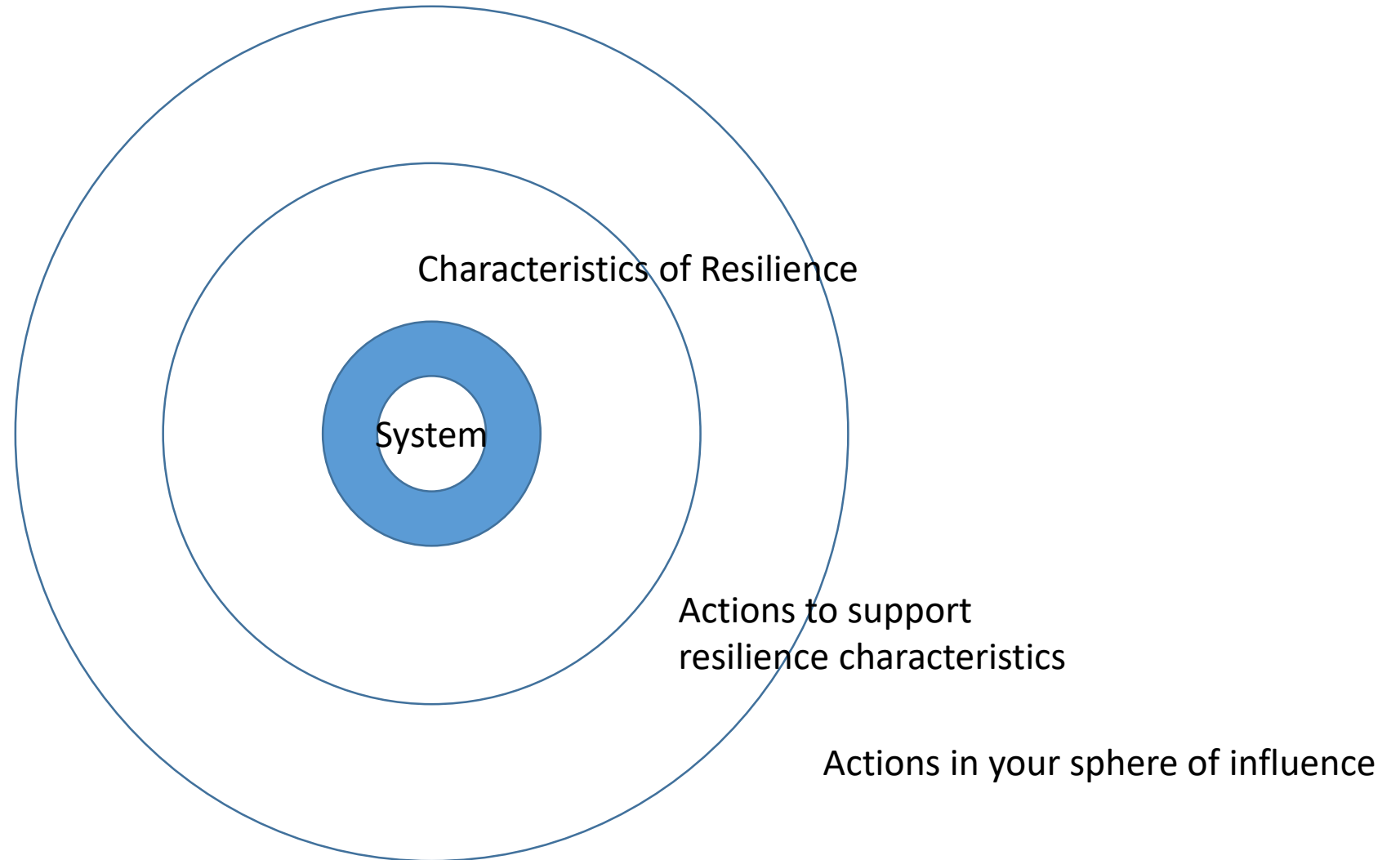
- Characteristics that support anticipated adaptation:
  - Vulnerability assessment & risk management
  - Capacity building
  - Multi-stakeholder engagement
- Characteristics that support adaptation to unanticipated events:
  - Multi-stakeholder deliberation/ collaboration
  - Self-organization/ social networking
  - Decentralized decision making
  - Variety in policy mechanisms
  - Regular policy review



# Resilience Brainstorming Exercise

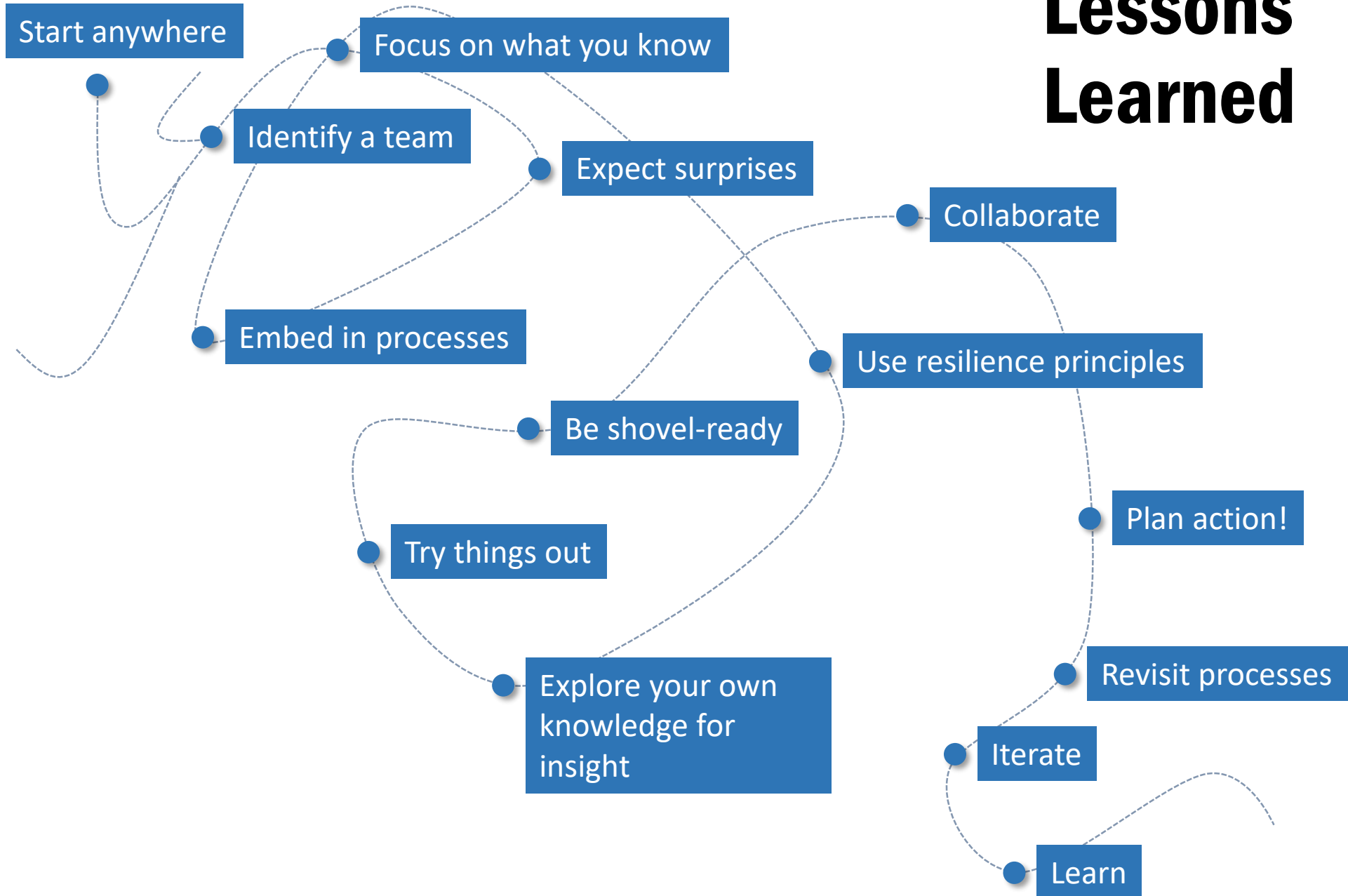


# Resilience Brainstorming Exercise





# Lessons Learned

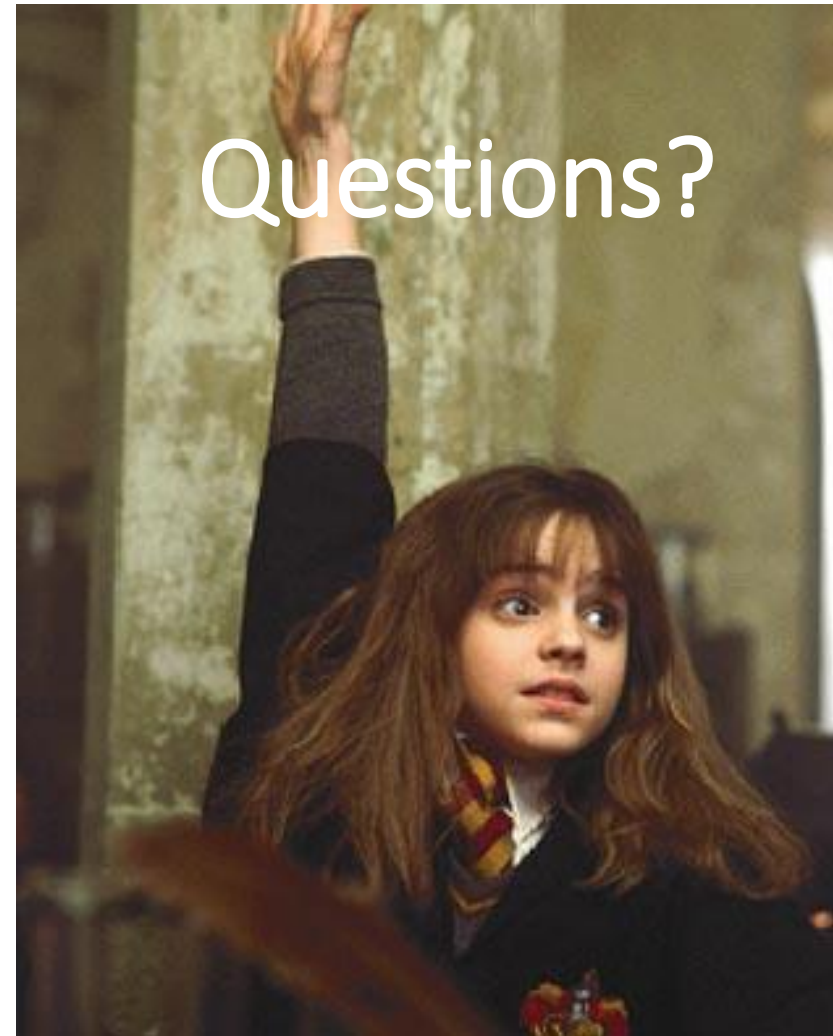


# Thank you

Kari Tyler [ktyler@uvic.ca](mailto:ktyler@uvic.ca)

<https://www.pacificclimate.org/>

[www.climatedata.ca](http://www.climatedata.ca)



# Resource: what to do with all the climate feels

[EcoAnxious.ca](https://www.ecoanxious.ca)

[twitter.com/EcoAnxiousCa](https://twitter.com/EcoAnxiousCa)

## TAKE A DEEP BREATH

tips for individuals  
navigating eco-anxiety

### make room for mixed emotions



think both/and

- Make space for conflicted feelings without jumping to judgement about "good" & "bad" ways to feel/think.
- Find constructive ways to express what you're experiencing.



practice self-companionship

- Model compassion and balance how much you take in that is distressing.
- Rather than repress things, focus on building skills for a life-long relationship with your feelings about the climate crisis.

### create new patterns



reduce dissonance

- Reflect on the parts of your daily life that misalign with the future you hope to live into.
- Re-frame your personal choices as a daily reminders that conditions for choices are about to change in a big way.



focus on choices

- Remember that you're not powerless. Focus on the choices you have while acknowledging the limits you experience.
- Take time to connect with others. Start conversations and organize projects with folks you already know.

### locate a sense of belonging



link up with others

- Connect with other people who are experiencing eco-anxiety and pool your energy/resources.
- Open your eyes to new perspectives and be ready to listen to & learn from those on the front-lines of the fight.



contribute your power

- There's no one-size-fits-all approach to the climate crisis, so reflect on your unique "super-powers" and your spheres of influence.
- Offer your privilege, power, resources, voice, and energy to those already advancing meaningful solutions.

Thank you to our contributors:  
Leslie Davenport  
Dan Rubin  
Renee Lertzman



@ecoanxiousca  
www.ecoanxious.ca

Resources for you:  
How to tell your story  
How to break the silence  
How to make a difference

## START A CONVERSATION

tips for groups  
navigating eco-anxiety

### create space to share



come together

- Create opportunities for people to express their conflicted feelings without judgement about the proper way to process.
- Offer tools for working through complex feelings and thoughts.



prioritize group dynamics

- Put care and intention into the space you create for sharing about eco-anxiety.
- Establish boundaries for a safe environment, such as confidentiality, respecting others, speaking only for yourself & sharing the air.

### make actions tangible



connect the dots

- Draw connections between global impacts of the climate crisis and the local-level experience.
- Highlight values that are shared between folks in the group and explore how those values relate to collective climate action.



point to barriers

- Acknowledge barriers to meaningful action, like built environments, political structures, and cultural norms.
- Discuss policy changes, local efforts, and new systems that would make it easier to act.

### explore multisolving



focus on systems

- Analyze the systems that contribute to the conditions for our choices individually and collectively.
- Pay attention to the voices of people who study systems and of those disadvantaged by systems.



identify intersection

- Talk about how multi-level, overlapping problems offer a chance for multi-level, overlapping solutions.
- Explore how taking ambitious action on the climate crisis could improve life for those currently under-served by today's systems and structures.

Inspired by works from:  
Leslie Davenport  
Climate Interactive  
Mary Anissa Hegler  
and many more



@ecoanxiousca  
www.ecoanxious.ca

Resources for you:  
How to tell your story  
How to break the silence  
How to make a difference

# Resource: reducing emissions

[Drawdown.org](https://drawdown.org)

The screenshot shows the Project Drawdown website interface. At the top, there is a navigation bar with the Project Drawdown logo, a hamburger menu icon, social media icons for Twitter, LinkedIn, Facebook, and Instagram, a search icon, and buttons for 'email sign up' and 'donate'. Below the navigation bar, the main content area is divided into five columns, each representing a different sector. Each column has a blue header and a list of solutions. The sectors and their respective solutions are: Electricity Generation, Food, Buildings and Cities, Transport, and Coming Attractions. There is also a 'Materials' section under the Transport category.

| <b>ELECTRICITY GENERATION</b> | <b>FOOD</b>                    | <b>BUILDINGS AND CITIES</b>         | <b>TRANSPORT</b>       | <b>COMING ATTRACTIONS</b>       |
|-------------------------------|--------------------------------|-------------------------------------|------------------------|---------------------------------|
| Biomass                       | Biochar                        | Bike Infrastructure                 | Airplanes              | A Cow Walks Onto A Beach        |
| Cogeneration                  | Clean Cookstoves               | Building Automation                 | Cars                   | Artificial Leaf                 |
| Concentrated Solar            | Composting                     | District Heating                    | Electric Bikes         | Autonomous Vehicles             |
| Energy Storage (Distributed)  | Conservation Agriculture       | Green Roofs                         | Electric Vehicles      | Building With Wood              |
| Energy Storage (Utilities)    | Farmland Irrigation            | Heat Pumps                          | High-speed Rail        | Direct Air Capture              |
| Geothermal                    | Farmland Restoration           | Insulation                          | Mass Transit           | Enhanced Weathering of Minerals |
| Grid Flexibility              | Improved Rice Cultivation      | Landfill Methane                    | Ridesharing            | Hydrogen-Boron Fusion           |
| In-Stream Hydro               | Managed Grazing                | LED Lighting (Commercial)           | Ships                  | Hyperloop                       |
| Methane Digesters (Large)     | Multistrata Agroforestry       | LED Lighting (Household)            | Telepresence           | Industrial Hemp                 |
| Methane Digesters (Small)     | Nutrient Management            | Net Zero Buildings                  | Trains                 | Intensive Silvopasture          |
| Micro Wind                    | Plant-Rich Diet                | Retrofitting                        | Trucks                 | Living Buildings                |
| Microgrids                    | Reduced Food Waste             | Smart Glass                         |                        | Marine Permaculture             |
| Nuclear                       | Regenerative Agriculture       | Smart Thermostats                   |                        | Microbial Farming               |
| Rooftop Solar                 | Silvopasture                   | Walkable Cities                     | <b>MATERIALS</b>       | Ocean Farming                   |
| Solar Farms                   | System of Rice Intensification | Water Distribution                  | Alternative Cement     | Pasture Cropping                |
| Solar Water                   | Tree Intercropping             |                                     | Bioplastic             | Perennial Crops                 |
| Waste-to-Energy               | Tropical Staple Trees          | <b>LAND USE</b>                     | Household Recycling    | Repopulating the Mammoth Steppe |
| Wave and Tidal                |                                | Afforestation                       | Industrial Recycling   | Smart Grids                     |
| Wind Turbines (Offshore)      | <b>WOMEN AND GIRLS</b>         | Bamboo                              | Recycled Paper         | Smart Highways                  |
| Wind Turbines (Onshore)       | Educating Girls                | Coastal Wetlands                    | Refrigerant Management | Solid-state Wave Energy         |
|                               | Family Planning                | Forest Protection                   | Water Saving - Home    |                                 |
|                               | Women Smallholders             | Indigenous Peoples' Land Management |                        |                                 |
|                               |                                | Peatlands                           |                        |                                 |
|                               |                                | Perennial Biomass                   |                        |                                 |
|                               |                                | Temperate Forests                   |                        |                                 |
|                               |                                | Tropical Forests                    |                        |                                 |



# Resource: climate justice

## Home is Always Worth It



Mary Annaïse Heglar

Follow

Sep 12 · 5 min read ★



## Climate Change Isn't Racist — People Are

We cannot assess the damage without looking at the impact on people of color



Mary Annaïse Heglar

Follow

Aug 13 · 5 min read ★



Illustration: [Fei Fei](#)

[medium.com/@maryheglar](https://medium.com/@maryheglar)

**Resource:  
reducing  
emissions**

# OUTRAGE AND OPTIMISM



[globaloptimism.com/podcast](https://globaloptimism.com/podcast)

# Resource: climate change myth busting



[SkepticalScience.com](http://SkepticalScience.com)

# Resource: general climate education



<https://www.youtube.com/channel/UCi6RkdaEggRVKi3AzidF4ow>



# Resource: critical thinking in general

YOU ARE NOT SO SMART  
*A Celebration of Self Delusion*



[YouAreNotSoSmart.com](http://YouAreNotSoSmart.com)

# Resource:

## PICS climate insights 101

1  
Climate Science Basics


2  
BC Climate Impacts & Adaptation

3  
Mitigation

Climate change is already here and will speed up over time. This course is a how-to guide for projecting future climate within British Columbia and preparing for those changes.


### The Climate of British Columbia

BC's climate variability over time, decadal oscillations, how baselines are changing...

[WATCH LESSON 1](#)


### Projected Climate Change in British Columbia

Why BC will heat faster than the global average, downscaling, and handy tools to predict local climate...

[WATCH LESSON 2](#)


### Climate Impacts in British Columbia

What lies ahead for BC's critical river basins, forests, marine habitat and shorelines...

[WATCH LESSON 3](#)

### Adaptation

Minimizing risk for BC communities, new opportunities for agriculture and a how-to guide for adaptation planning...

[WATCH LESSON 4](#)

# Resource:

[CBC Podcast](#)



# Resource – BC climate projections reports

[Metro Vancouver](#)

[Capital Regional District](#)

[Cowichan Valley Regional District](#)

[Vancouver Coastal Health](#)

[BC Agriculture & Food Climate Action Initiative](#)



# Resource – guidance documents

[BC Ministry of Transportation and Infrastructure Technical Circular](#)

[EGBC guidance document](#)

[National guidebook on climate scenarios](#)

# Resource: online tools

Resources to accompany BC Regional Adaptation Collaborative webinar  
30 November 2016

Plan2Adapt <http://pacificclimate.org/analysis-tools/plan2adapt>

PICS short course [http://pics.uvic.ca/education/climate-insights-101#quicktabs-climate\\_insights\\_101=1](http://pics.uvic.ca/education/climate-insights-101#quicktabs-climate_insights_101=1)

## ClimateBC

- HectaresBC <http://www.hectaresbc.org>
- ClimateWNA <http://genetics.forestry.ubc.ca/cfcg/ClimateWNA/ClimateWNA.html>
- ClimateBC Online <http://www.genetics.forestry.ubc.ca/cfcg/ClimateBC40/Default.aspx>
- BC Climate Explorer <http://www.bc-climate-explorer.org/>

PCIC Data Portals <https://pacificclimate.org/data>

## Data Basin

<https://nplcc.databasin.org/galleries/5a3a424b36ba4b63b10b8170ea0c915e#expand=105363%2C106698%2C106712%2C110010%2C105359%2C105364>

<https://pacificclimate.org/news-and-events/news/2016/webinar-climate-tools>

Summary

Region & Time

Temperature

Precipitation

Snowfall

Growing DD

Heating DD

Frost-Free Days

Impacts

Notes

References

### Summary of Climate Change for Fraser-Fort George in the 2050s

| Climate Variable                   | Season | Projected Change from 1961-1990 Baseline |                                 |
|------------------------------------|--------|--|---------------------------------|
|                                    |        | Ensemble Median                          | Range (10th to 90th percentile) |
| Mean Temperature (°C)              | Annual | +1.7 °C                                  | +1.2 °C to +2.6 °C              |
| Precipitation (%)                  | Annual | +7%                                      | -1% to +13%                     |
|                                    | Summer | -1%                                      | -8% to +5%                      |
| Snowfall* (%)                      | Winter | +10%                                     | -3% to +18%                     |
|                                    | Spring | -2%                                      | -10% to +9%                     |
| Growing Degree Days* (degree days) | Annual | +245 degree days                         | +152 to +407 degree days        |
| Heating Degree Days* (degree days) | Annual | -624 degree days                         | -944 to -432 degree days        |
| Frost-Free Days* (days)            | Annual | +20 days                                 | +12 to +31 days                 |

The table above shows projected changes in average (mean) temperature, precipitation and several derived climate variables from the baseline historical period (1961-1990) to the 2050s for the Fraser-Fort George region. The ensemble median is a mid-point value, chosen from a PCIC standard set of Global Climate Model (GCM) projections (see the 'Notes' tab for more information). The range values represent the lowest and highest results within the set. Please note that this summary table does not reflect the 'Season' choice made under the 'Region & Time' tab. However, this setting does affect results obtained under each variable tab.

\* These values are derived from temperature and precipitation. Please select the appropriate variable tab for more information.