



Climate Change 201

*A collective effort of
Technical Support Team members:*

Cindy Pearce, Mountain Labyrinths Inc.

Trevor Murdock, PCIC

Stewart Cohen, Environment Canada/UBC

Ingrid Liepa, Kimberley CC Planning Coordinator

Moving Beyond CC 101

The 'People Change Ladder'



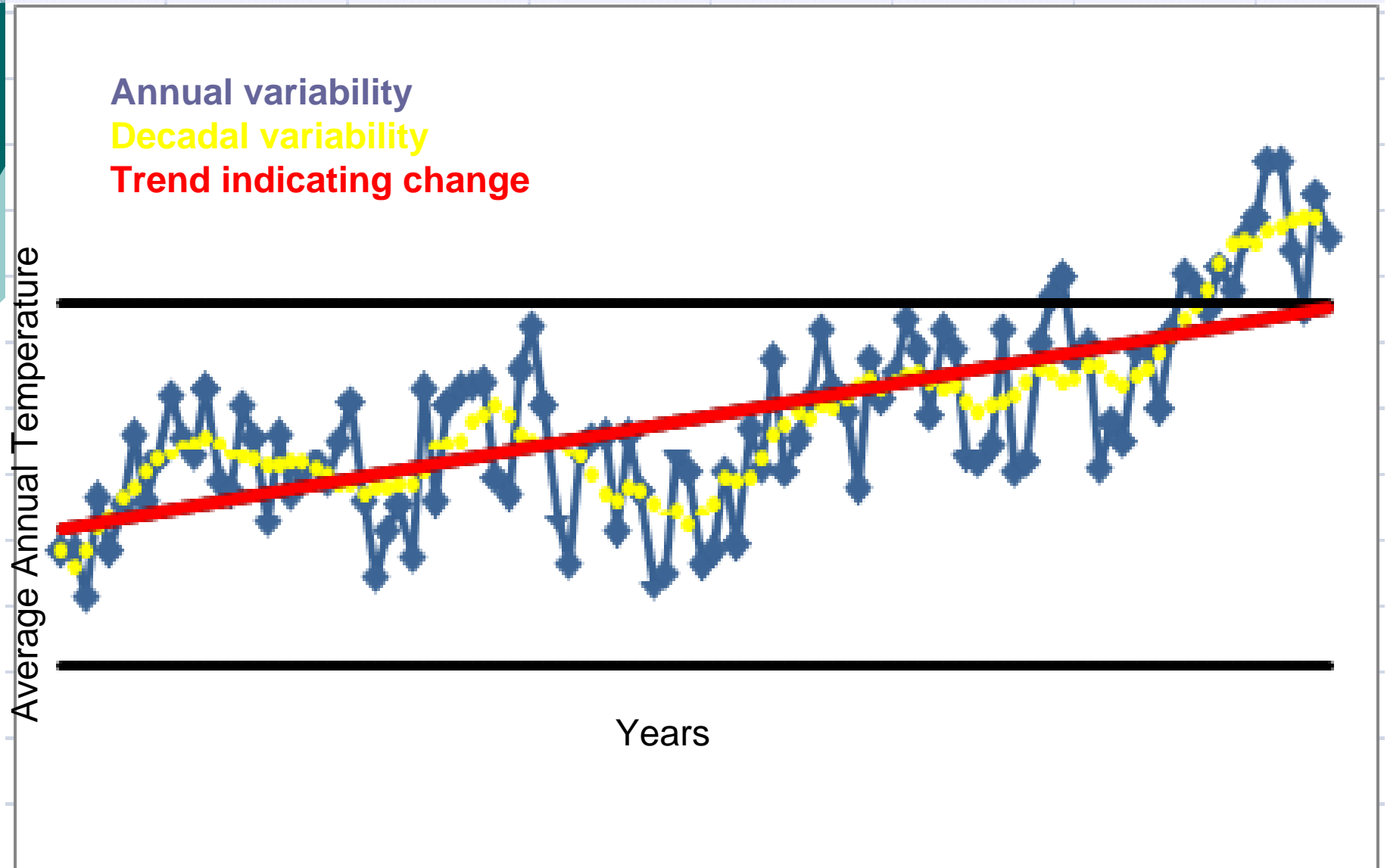
Source –UK Government
Communications *ENGAGE*



Your Top 10 Questions

1. Climate variability/change
2. Historical change in the Basin
3. Forecast change in the Basin
4. Extreme weather historically in the Basin
5. Future extreme weather
6. Climate adaptation/mitigation
7. Integrated climate adaptation/mitigation
8. Affects on local government
9. Integrating CC in local government decisions/actions
10. ???

Question 1 - Climate Variability & Change



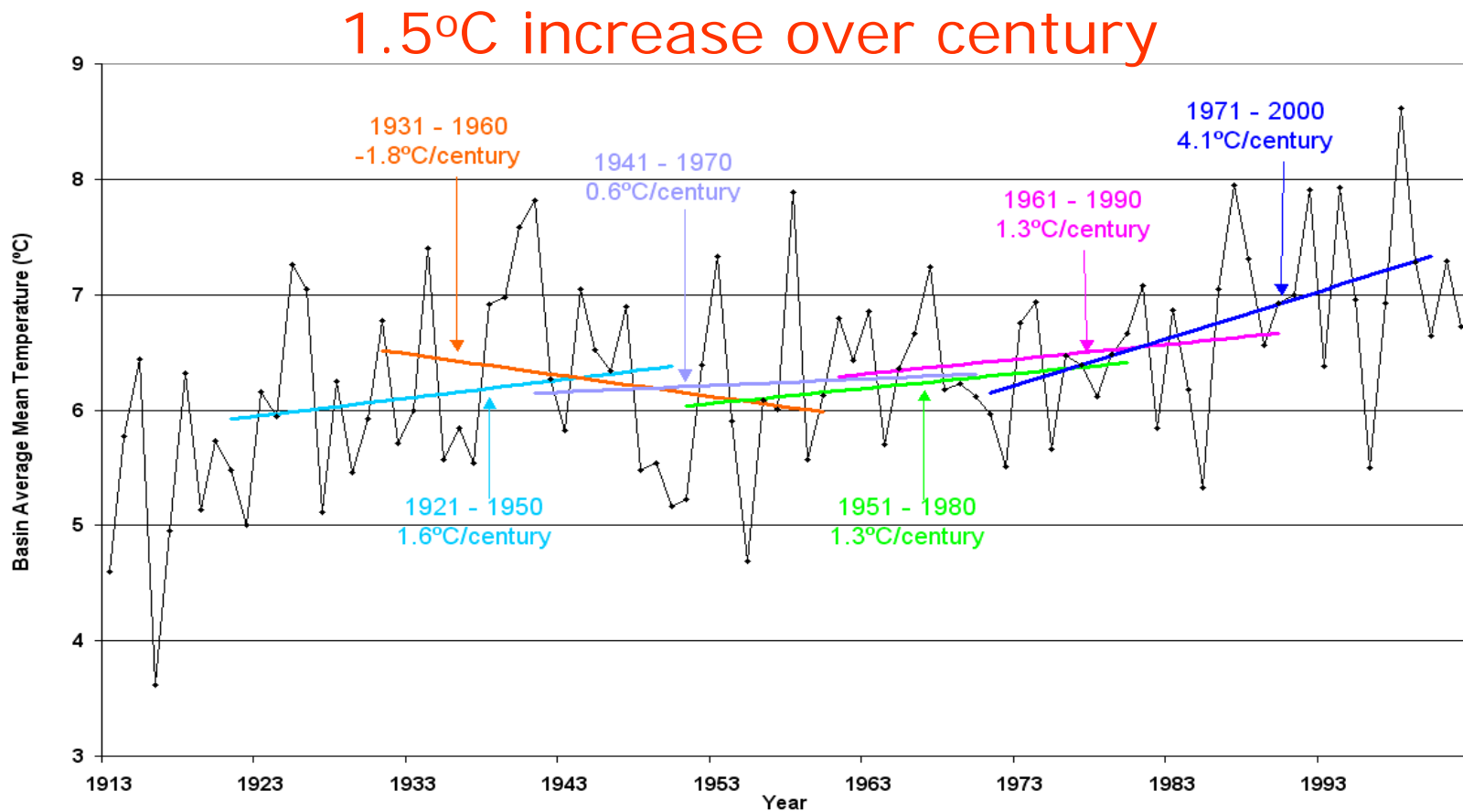


Question 2 – Historical Climate Change in the Basin

Local observations??

- Long hot, dry summers
- More wildfires and greater intensity
- Melting glaciers
- Erratic snowfall/pack at low elevation
- Sudden heavy rains
- Intense wind storms
- Changes in bird populations
- Longer, hotter garden seasons
- ...and more...

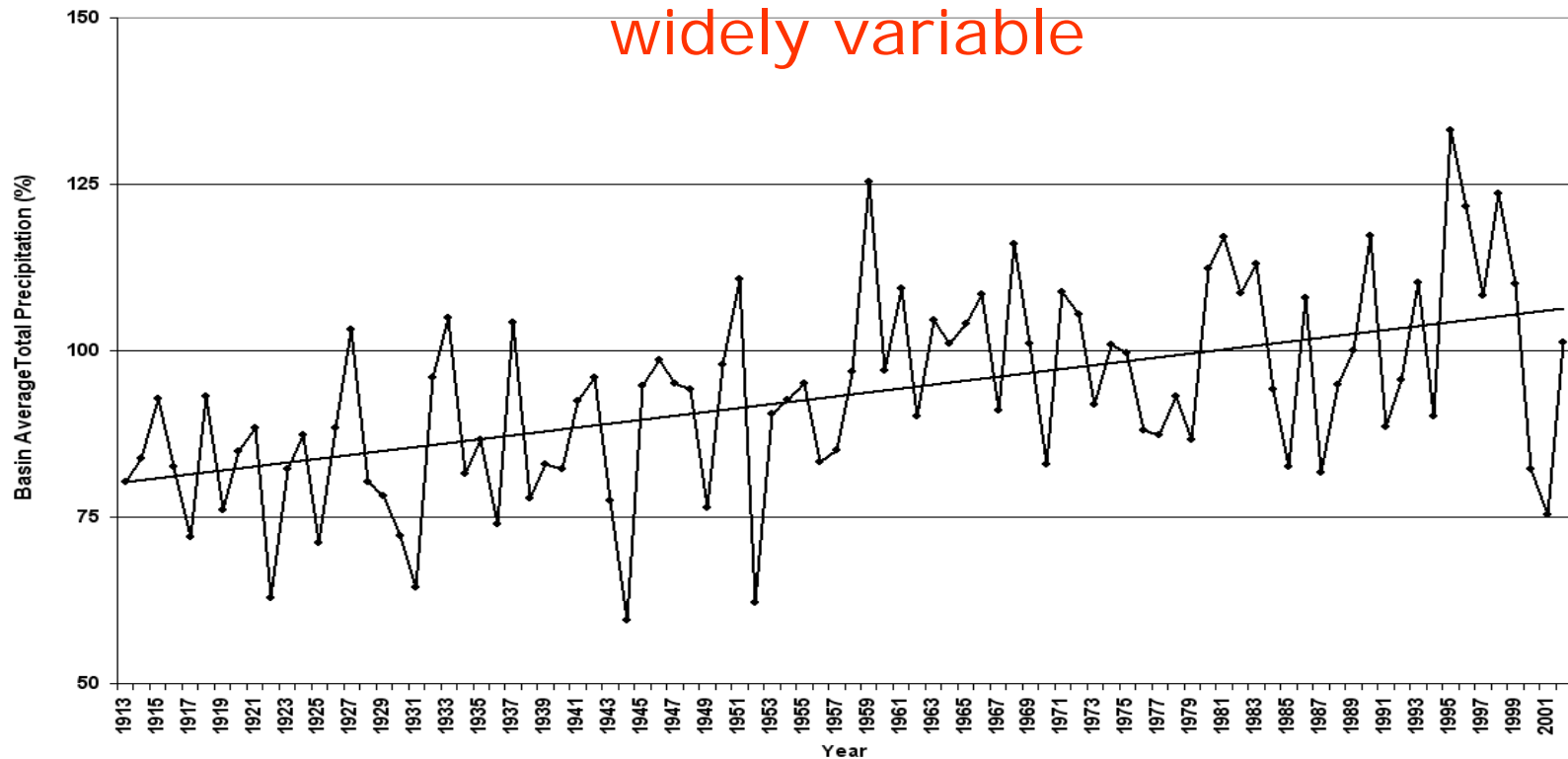
Basin Temperature Trends



Source: PCIC

Basin Precipitation Trend

Approximate 30% increase over century – widely variable



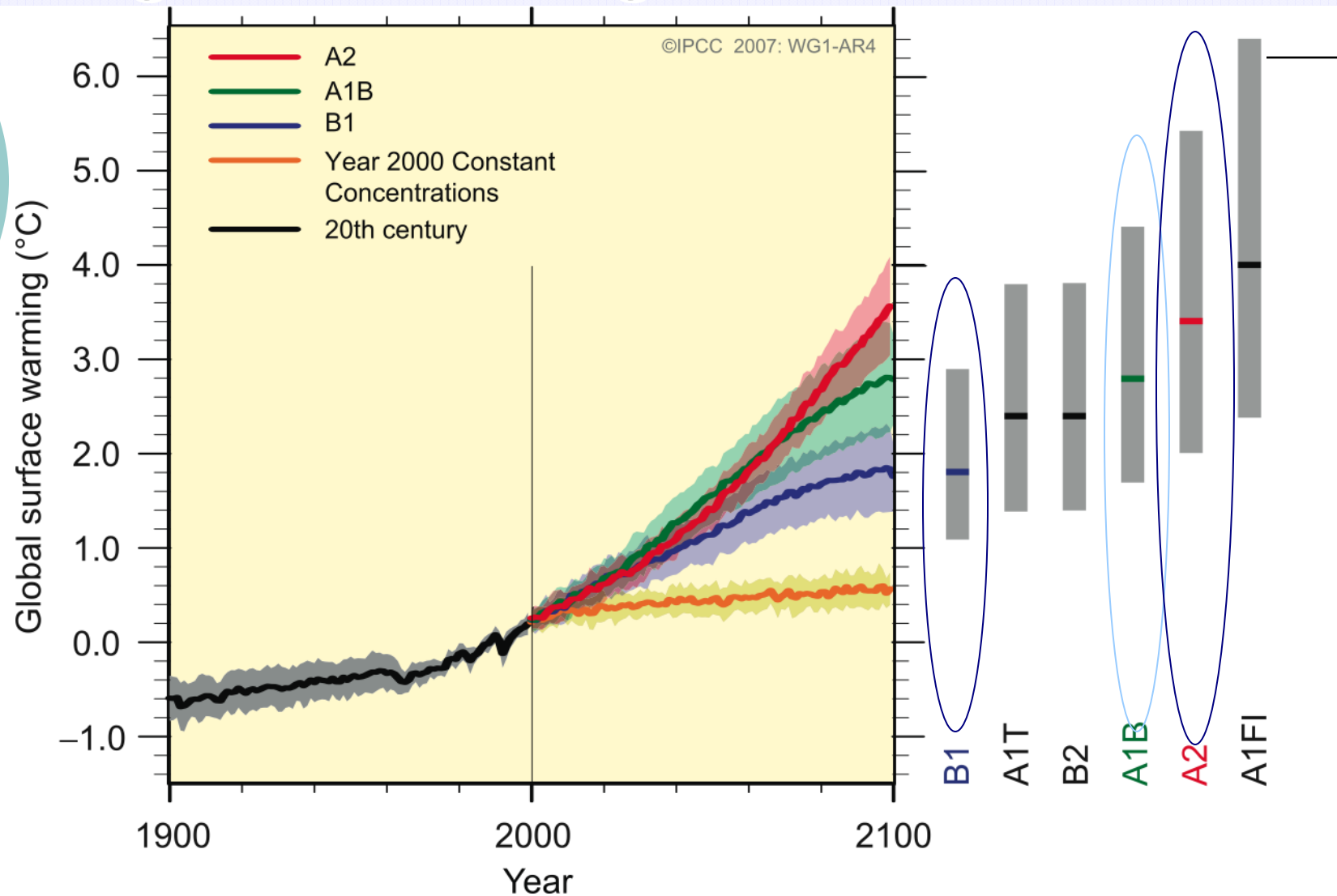
Source: PCIC

Question 3 - Basin Climate Projections

Projections for the 2050s

	Annual	Summer	Winter
Temperature	+1.6 to 2.3C	+1.9 to 3.0C	+1.4 to 2.4C
Precipitation	0 to +8%	-4 to -10%	+1 to +13%

Amount of climate change depends on greenhouse gas emissions



November 4, 2009

IPCC AR4 Figure SPM.5



CC and Basin Communities?

Basin examples?

- Water shortage during droughts
- Increased flooding in spring and during heavy rainfall
- Increased risk of intense interface wildfires
- Transportation and communication disruptions from intense winds and heavy rainfall/snow
- Recreation/tourism changes
- Forest sector disruption from wildfires, pest/disease outbreaks, transportation failures
- ...and more...



Question 4 – Extreme Weather Events

What is an extreme weather event?

- An event that is rare (below 10th or above 90th percentile of observed probability) at a particular place and time of year.

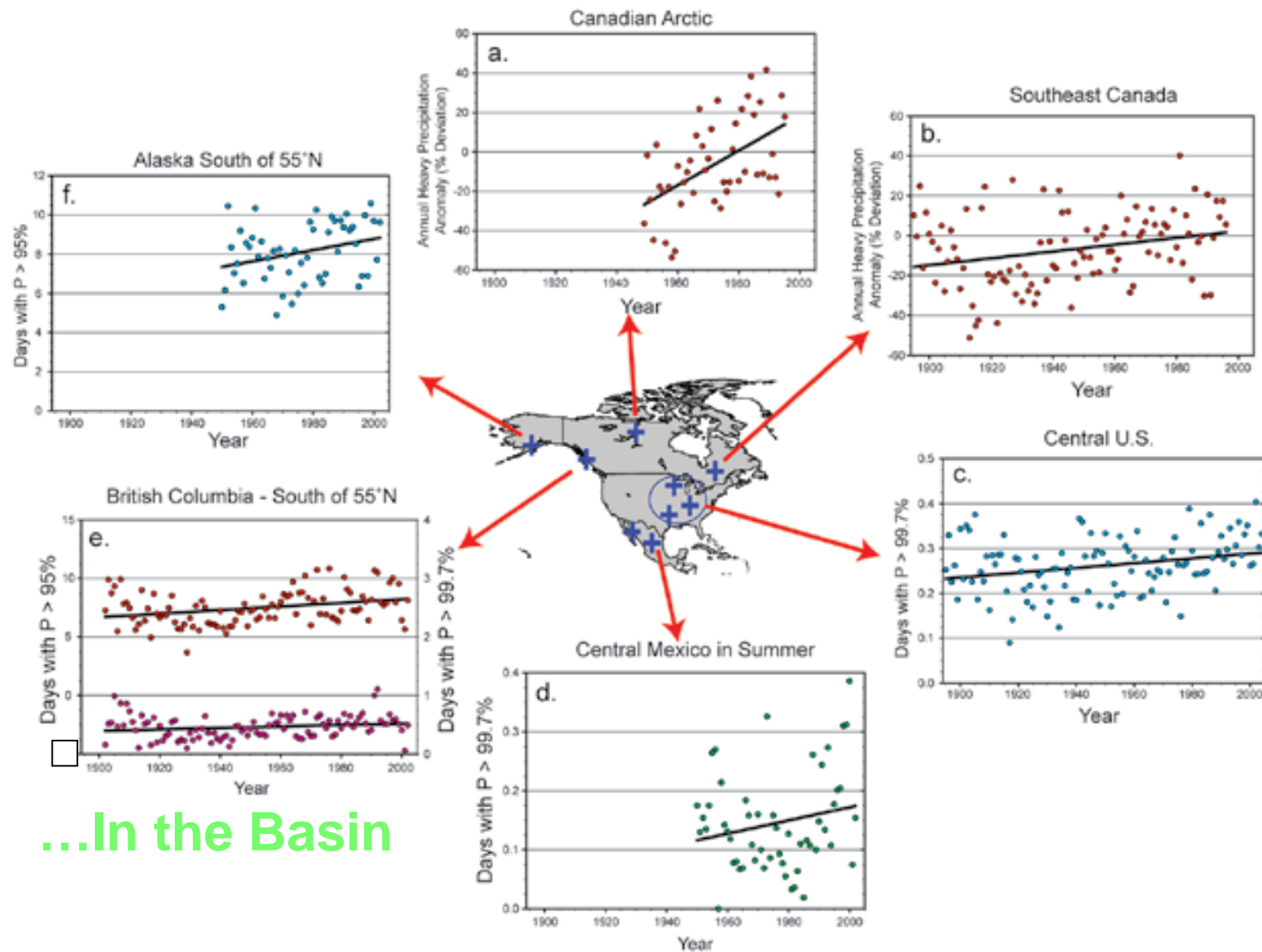
New term - extreme seasonal event

- When a pattern of extreme weather persists for some time (e.g. *drought* or heavy rainfall over a season).

Basin examples?

Observed Increases in Heavy Precipitation

(Karl et al., 2008)

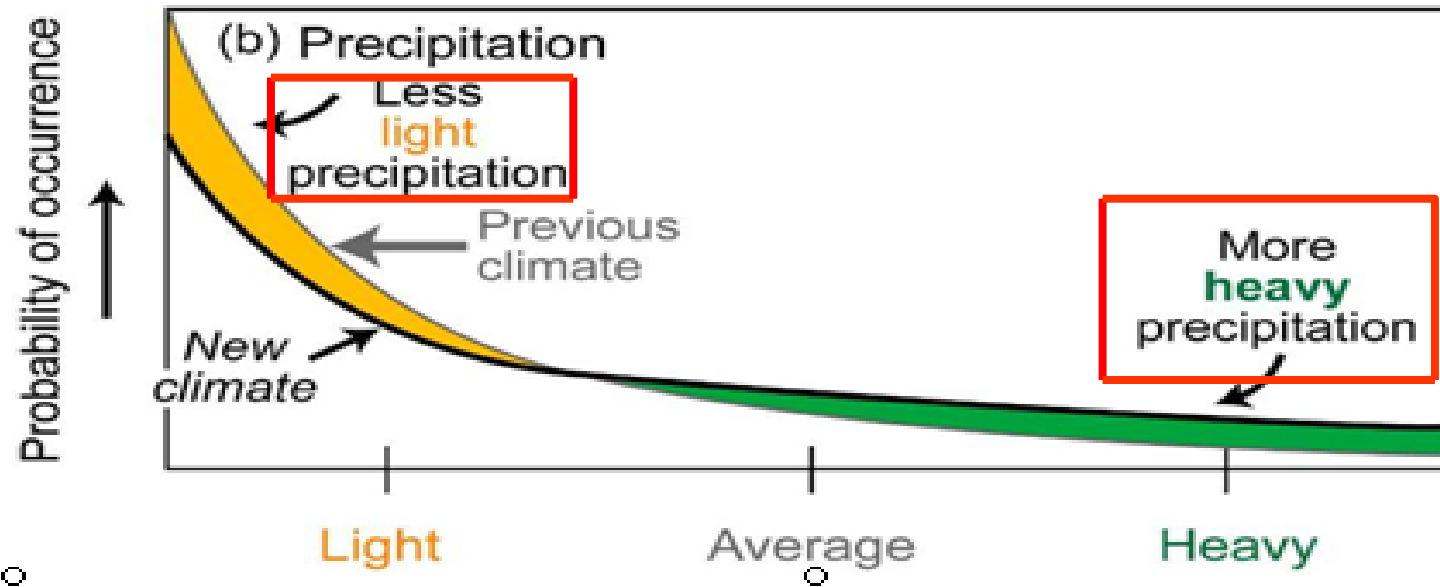


...In the Basin

Regions where observed increases in heavy P are greater than changes in mean annual or seasonal P

Question 5 – Increase in Probability of Precip Extremes in a Warmer Climate

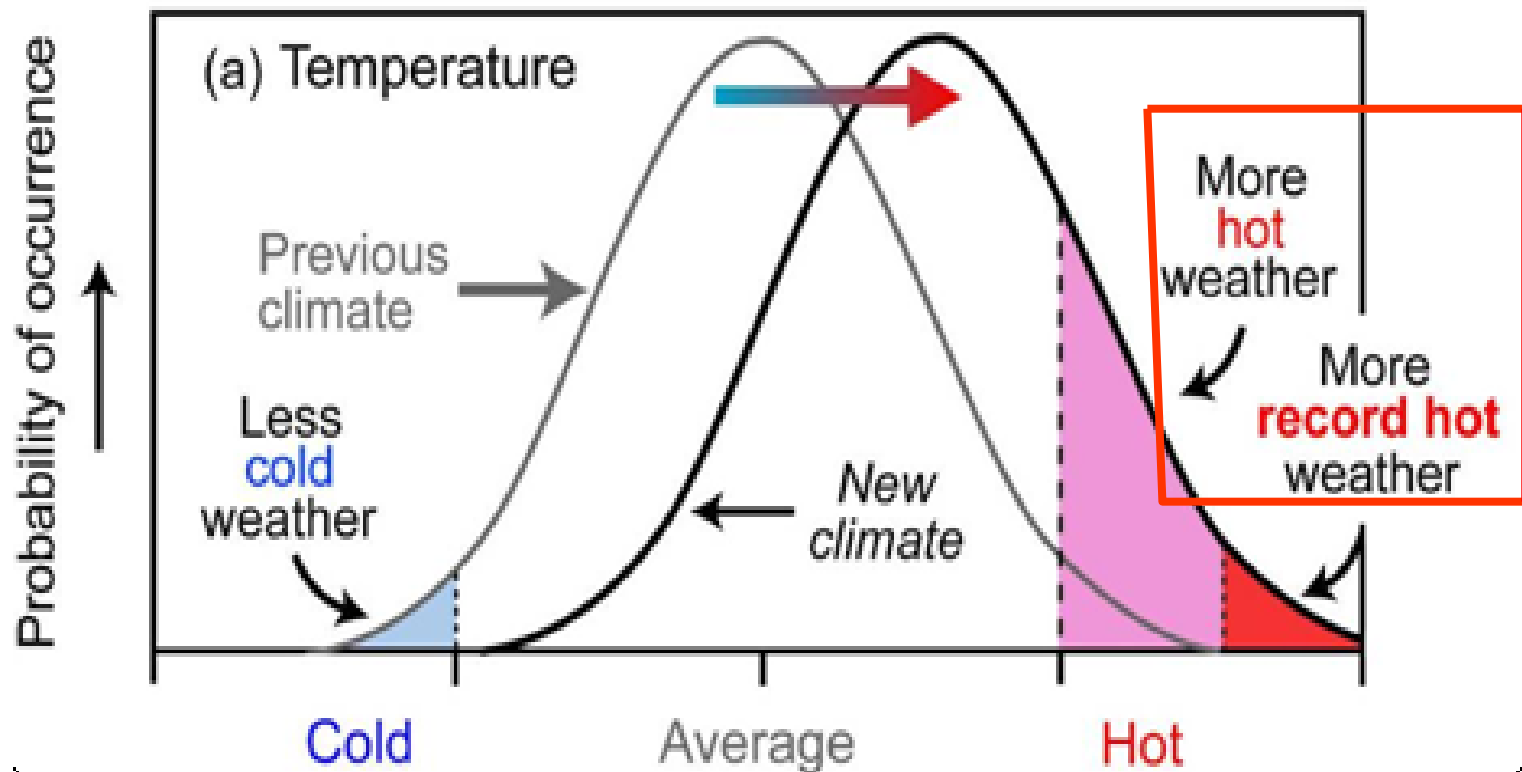
Small changes in mean or extremes can yield large changes in risk



NOTE: does not include snowmelt amount or timing

Source: T. Peterson

Question 5 – Increase in Probability of Temp Extremes in a Warmer Climate



Source: T. Peterson

Heavy Rainfall Forecasts

Increases in the heaviest
(0.3%) rainfall events for a
doubling of CO₂
concentrations
(Karl et al., 2008)

Infrastructure sensitive to:

- rate of climate change
- changes in mean climate (weathering)
- changes in extremes (thresholds/failure)
- adaptive capacity (ability to plan, respond, design, maintain)

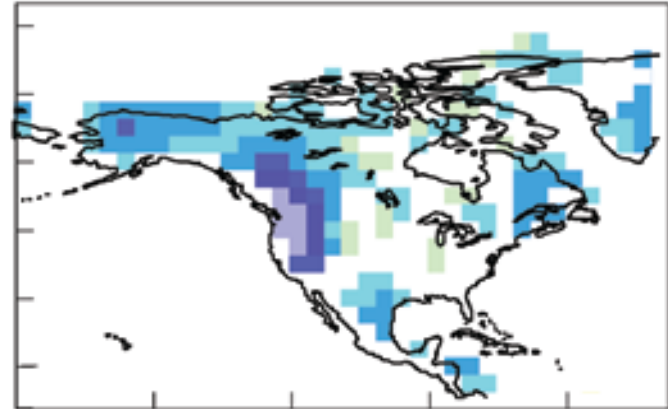
Balance between safety, reliability
and cost of design

Model 1 = CGCM2
Model 2 = HadCM3

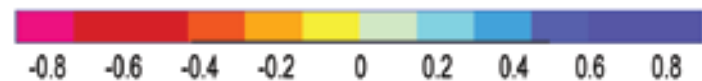
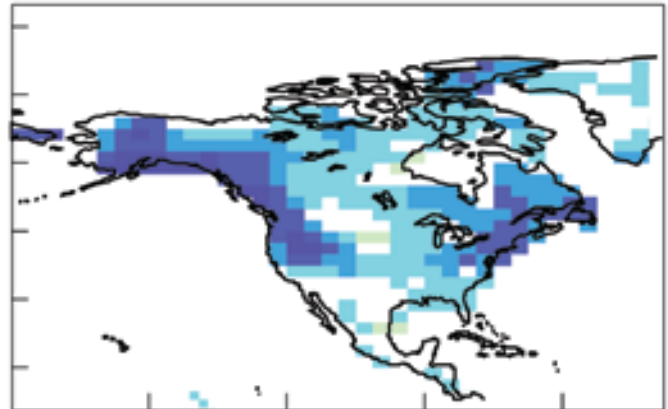
November 4, 2009

Projected Increases in Very Heavy Rainfall Events (Heaviest 0.3%)

Climate Model 1

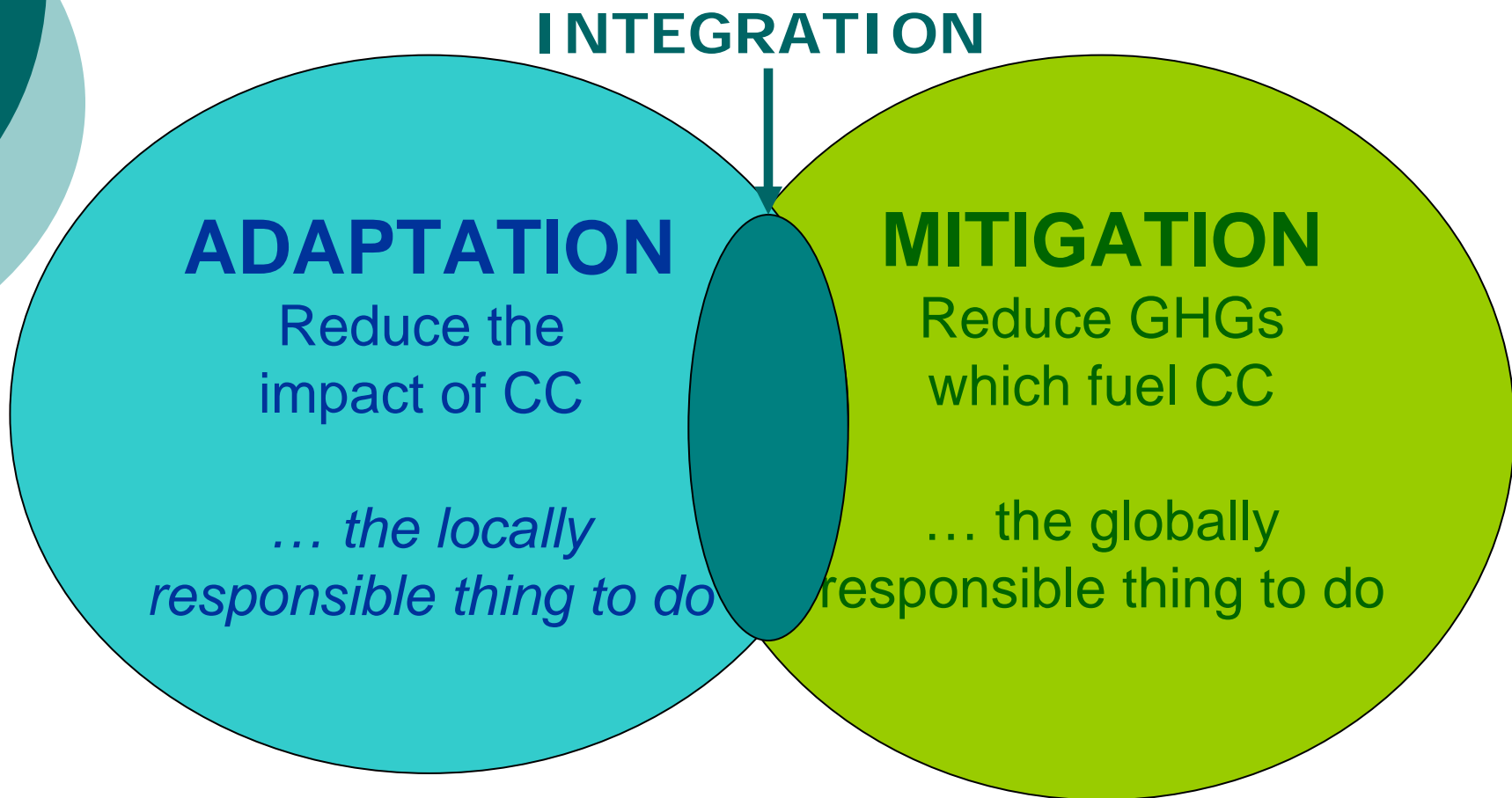


Climate Model 2



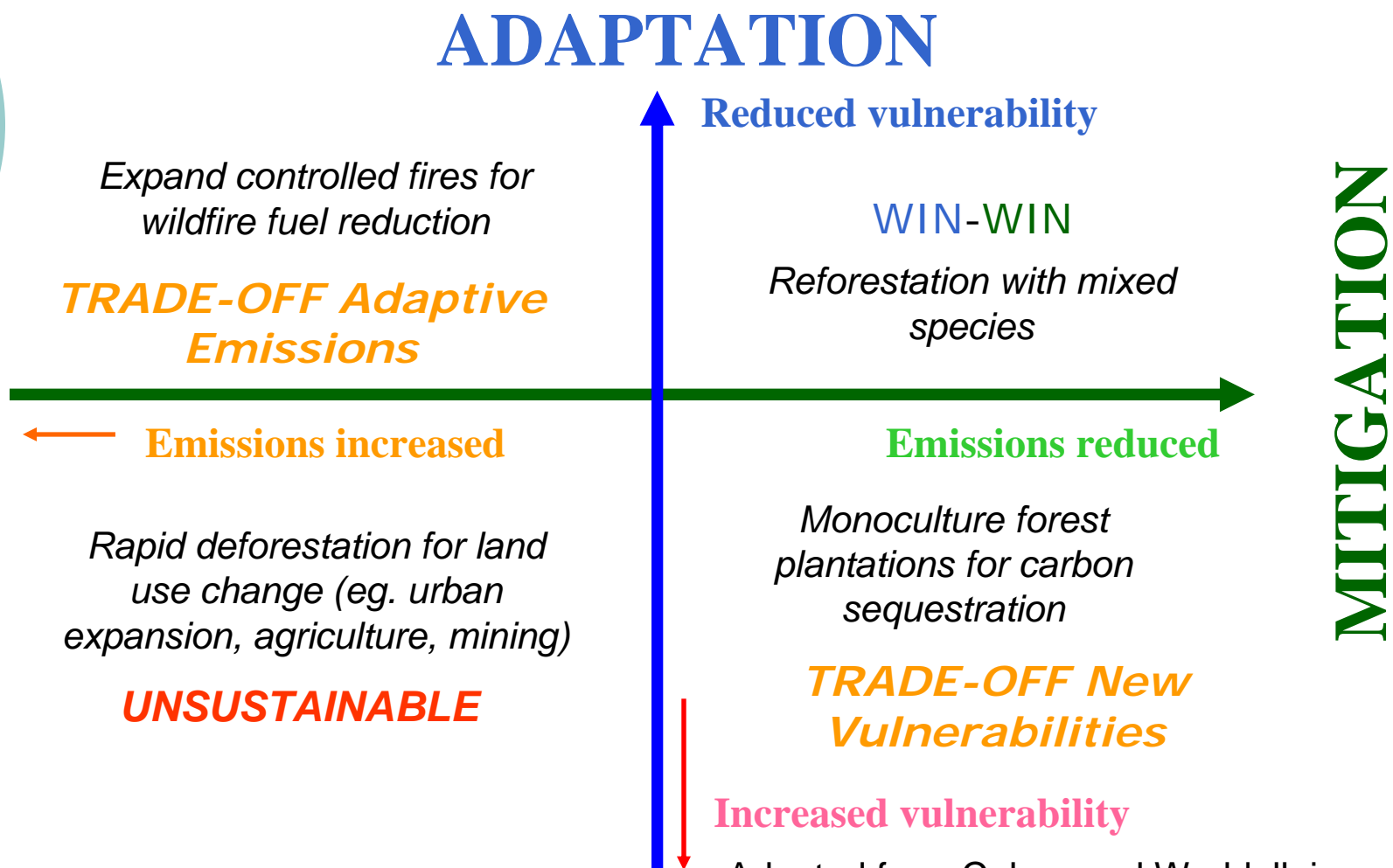
Change in the number of times/yr
that very heavy rainfall occurs

Question 6. Climate Adaptation & Mitigation



Adapted from: City of Toronto Climate Adaptation Steering Group, 2007

Adaptation/Mitigation Linkages/Trade-offs



Adapted from Cohen and Waddell, in press

Question 7 - Integrating A&M Actions

WIN - WIN



TRADE-OFFS

UNSUSTAINABLE

**Mitigation +
Adaptation -**

**Mitigation -
Adaptation +**

*Reforestation
with mixed
species*

*Monoculture
forest
plantations for
carbon
sequestration*

*Expand
controlled fires
for wildfire fuel
reduction*

*Rapid
deforestation for
land use change*

*Water
conservation*

*Hydro-electric
power
production*

*Wastewater
recycling*

*Stream flow over-
allocated and
over-used*

Chart adapted from Besdswroth and Hanak 2008

Complementary and Conflicting Mitigation and Adaptation Actions

Complementary and Conflicting Mitigation and Adaptation Actions			
Favourable Actions		Unfavourable Actions	
Favourable for Adaptation and Mitigation Efforts	Favourable for mitigation, but unfavourable for adaptation efforts	Favourable for adaptation, but unfavourable for mitigation efforts	Unfavourable for Adaptation and Mitigation Efforts
<ul style="list-style-type: none"> • Energy demand management • Energy efficient buildings • Water conservation • Biodiversity-oriented forestry • “Smart Growth” development in cooler regions • Local food production • Green roofs • Building code changes • Public engagement and education 	<ul style="list-style-type: none"> • Forestry with non-native species • Urban forestry (shade trees with high water demand) • Some biofuels production 	<ul style="list-style-type: none"> • Meeting peak energy demand with fossil fuels • Wastewater recycling and desalination • Groundwater banking • Increased air conditioner use • Use of drainage pumps in low lying areas 	<ul style="list-style-type: none"> • Development in floodplains • Development in hotter regions • Traditional “sprawl” development

Diagrams adapted from: City of Toronto Climate Adaptation Steering Group, 2007.

Text adapted from: Climate Impacts Group,

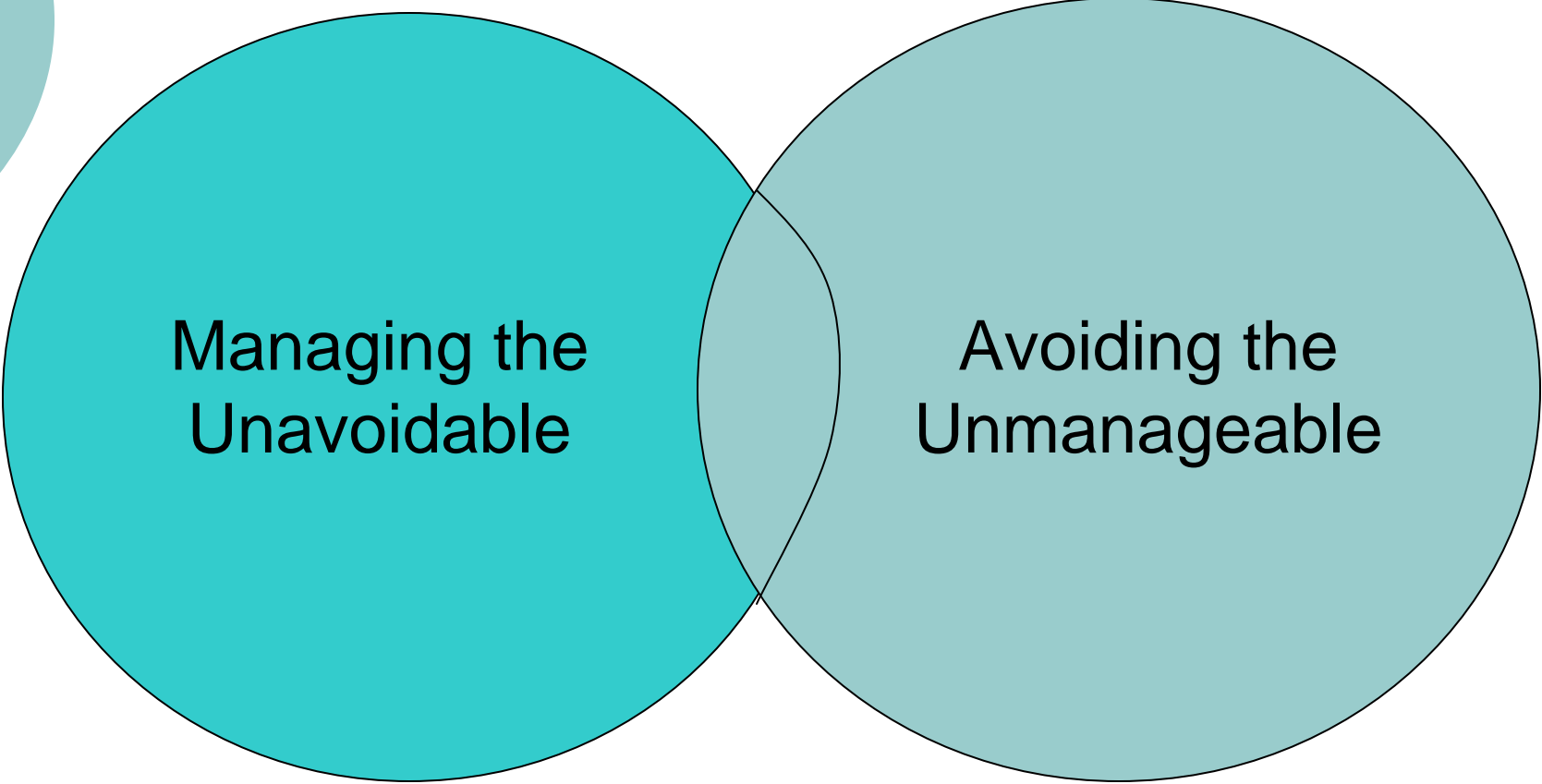
<http://cses.washington.edu/cig/fpt/guidebook.shtml>, 2007



Question 8: How Might Climate Change Affect Local Governments?

- Public Confidence
- Risk Management & Legal Liability
- Emergency Planning
- Need for New Expertise, Information, Data
- Training/Education for Staff
- Need for new or revised plans, policies, bylaws, codes, procedures, etc
- Municipal Infrastructure
- Economy & Local Tax Base
- Budgeting
- Project Design & Tendering
- Operations
- Land Use Planning/OCP
- Funding & grant opportunities
- Community visioning

Two Key Principles



Managing the
Unavoidable

Avoiding the
Unmanageable

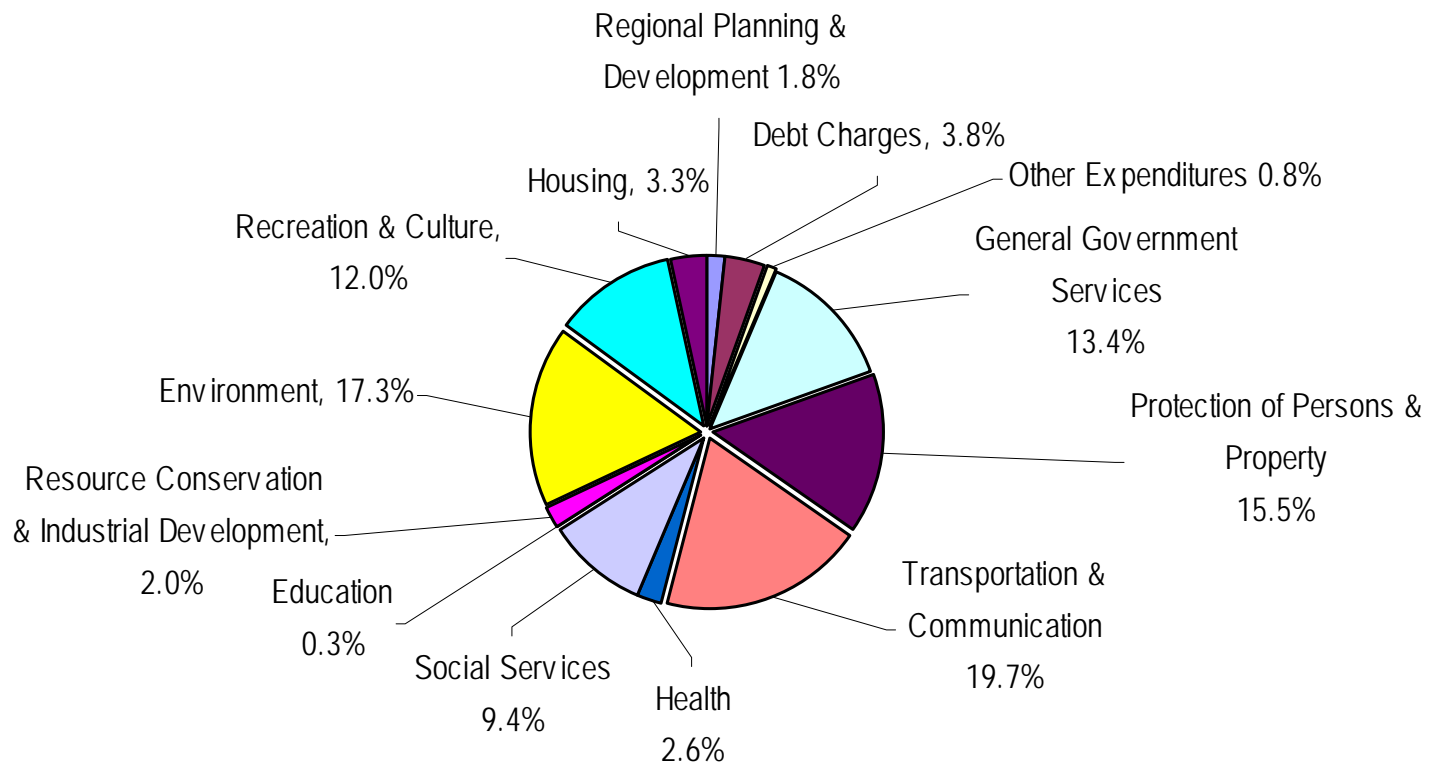


Basis for Possible Future Liabilities

- Development approvals in flood prone or other at-risk areas
- Adequacy of building standards to withstand extreme weather events
- Responsibility for erosion, land slides etc, resulting from extreme weather events
- Adequacy of emergency procedures & preparedness
- Failure to undertake disease prevention programs
- Failure to preserve 'public' natural assets in the face of climate change

Source: **Climate Change: What Are Local Governments Liable for?** By Philippa England, Urban Research Program, Issues Paper 6, March 2006

Balancing Local Priorities



***Data courtesy Statistics Canada, 2005**



One Key Objective: Be Prepared

- Understand the prospects of new short, medium and long term weather extremes
- Understand your community's risks and vulnerabilities
- Initiate planning and action



Question 9 - Integrating climate action in local government decisions/actions

- Land Use Planning: OCP & zoning
- Taxation (including incentives)
- Building Codes & Design Standards
- Utility Rates/Fees
- Public Safety Rules & Regulations
- Infrastructure Design & Upgrading
- Community Visioning

- Emergency Management
- Permitting & Bylaw Enforcement
- Management Practices
- Operational Plans
- Contracts, Tenders & Special Projects
- Outreach & Education
- Staff Training, Hiring, Development
- Monitoring & Reporting



No-Regrets & Mainstreaming

1. No-Regrets/Multiple Benefits:

Benefits accrue regardless of future weather/climate

e.g. water conservation, riparian protection, urban tree plan

2. Mainstreaming:

Integrating with existing municipal procedures, projects, processes

e.g. adding climate impacts & adaptation considerations to committee TofR, OCP, & operational plans



Question 10 - ??



*Hope this is the start of an
incredible day!*