

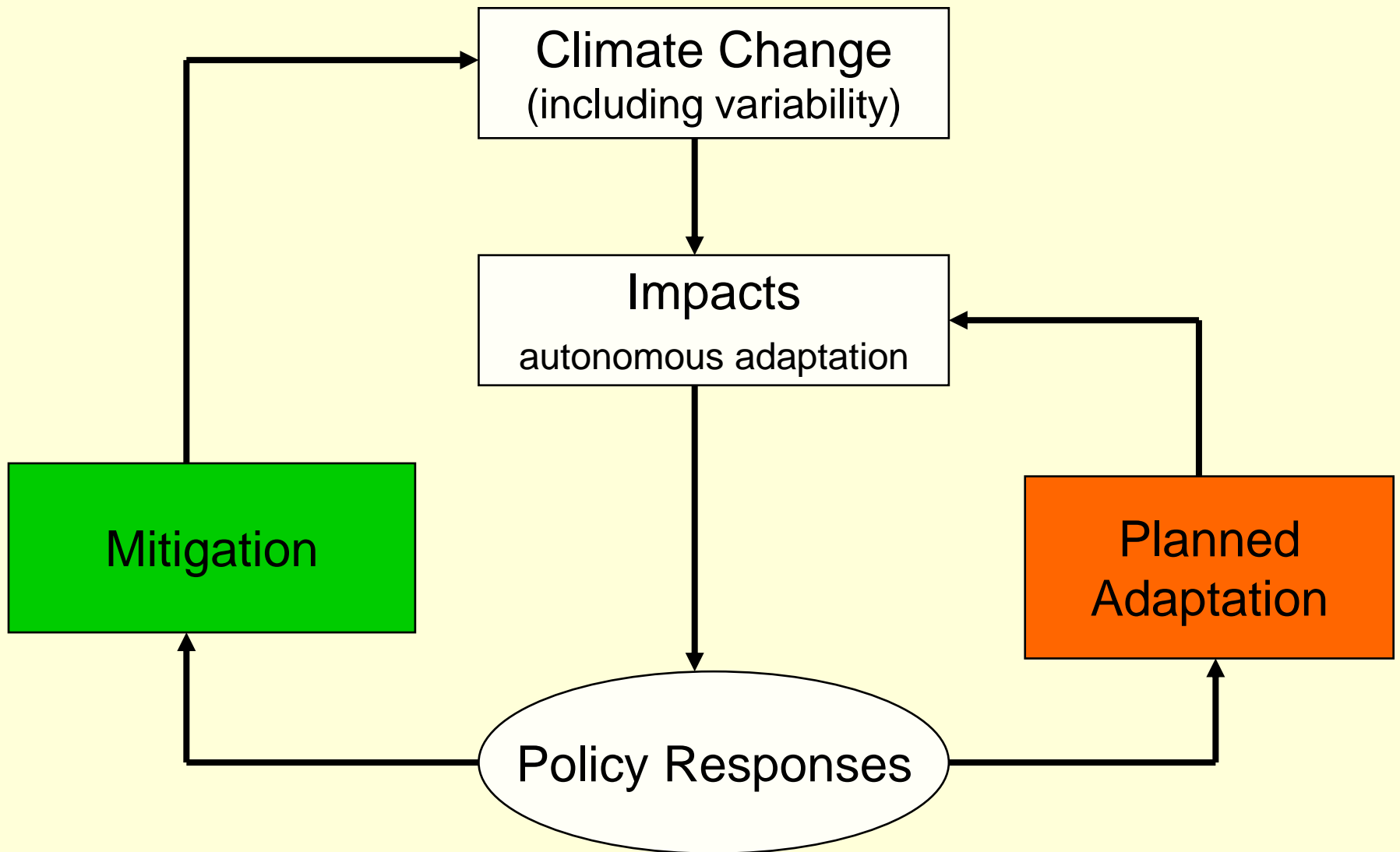
Assessing Vulnerability and Developing Adaptation Strategies at the Municipal Level

Making a Great Lake Superior
Duluth, MN
October 30, 2007

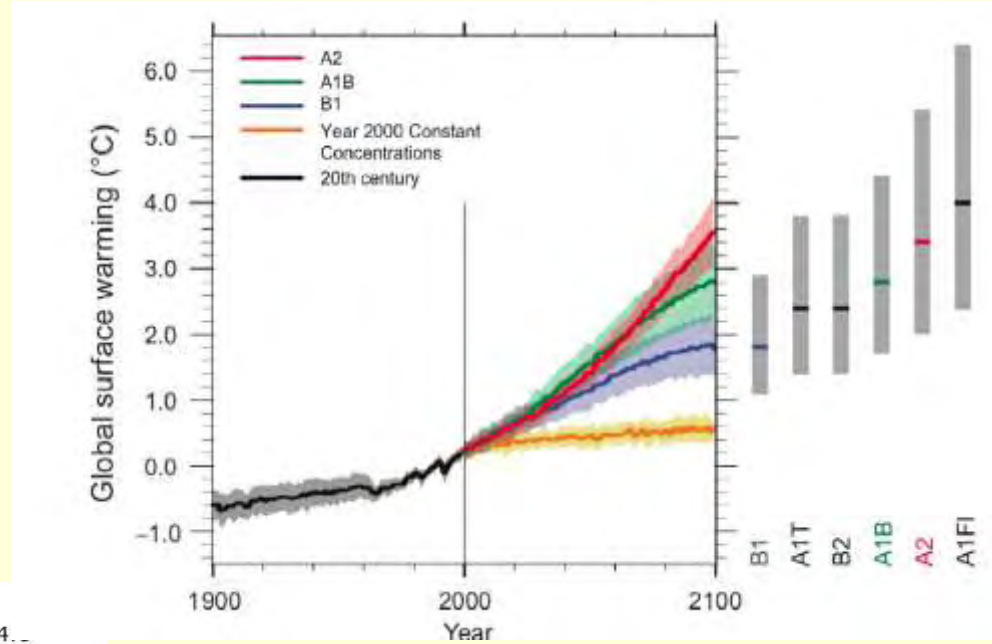
Al Douglas
Laurentian University
adouglas@mirarco.org



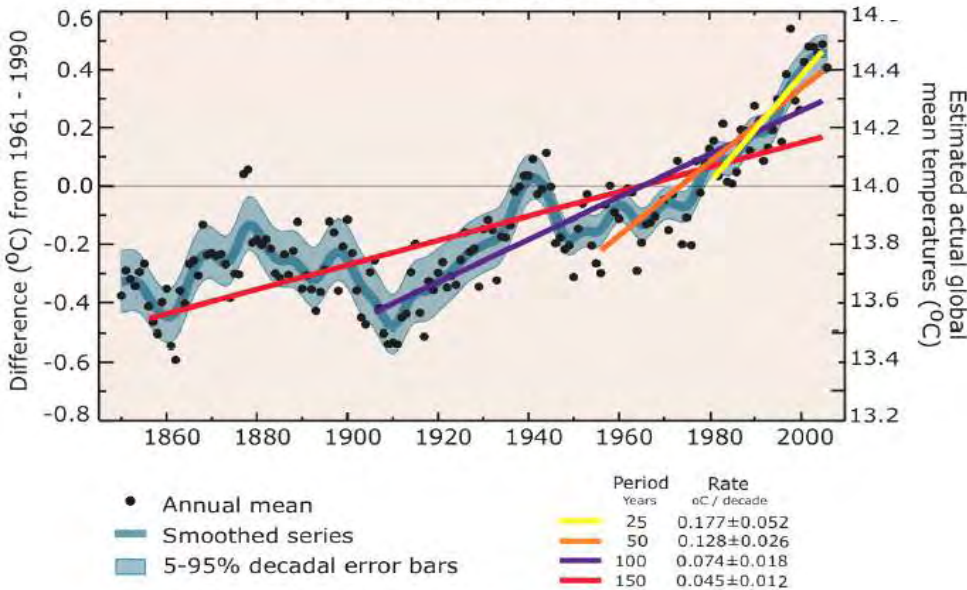
Complementary Policy Responses



Changes in Climate - Global



Global mean temperature



On our Hands...

- Warming of the climate system is unequivocal
- Variability and changes in climate potentially not seen before
- Impacting both natural and human systems

Communities – Where it all Comes Together

Priority Issues for Communities

- Water (quality; quantity; Storm water management)
- Energy (generation; distribution, demand)
- Public Health
- Infrastructure

Other Important Sectors for Ontario

Agriculture

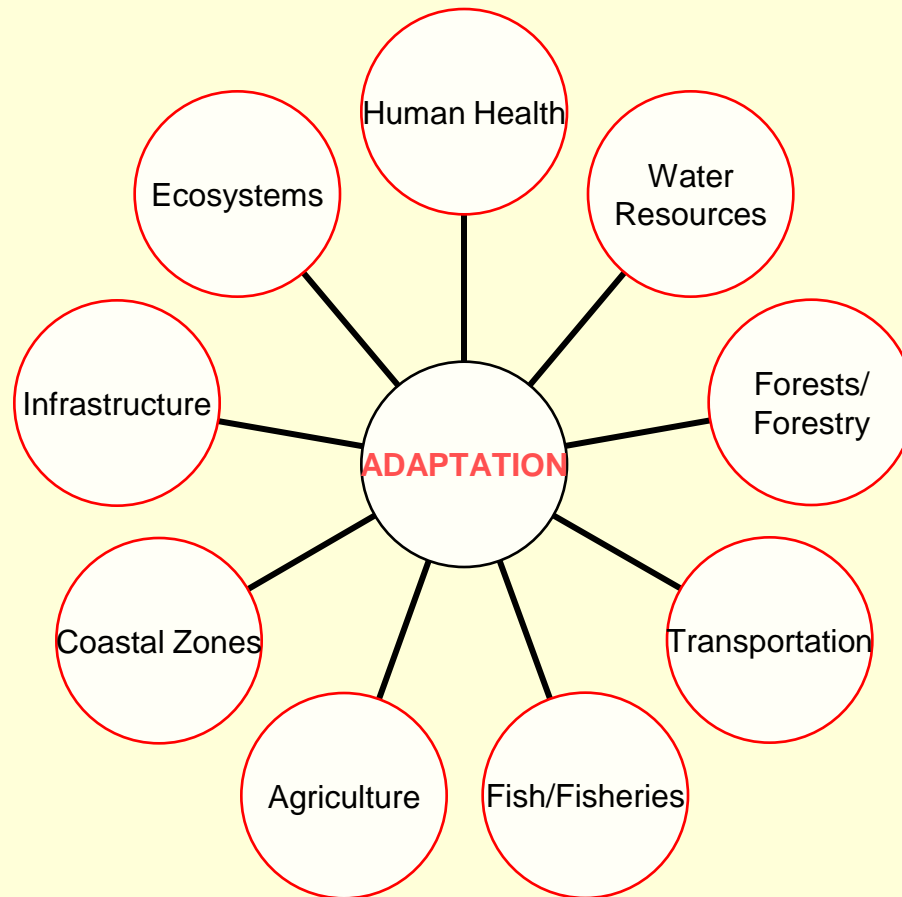


Tourism



Forestry

Knowing the Sectors



...and more

Impacts: *Extreme Events*



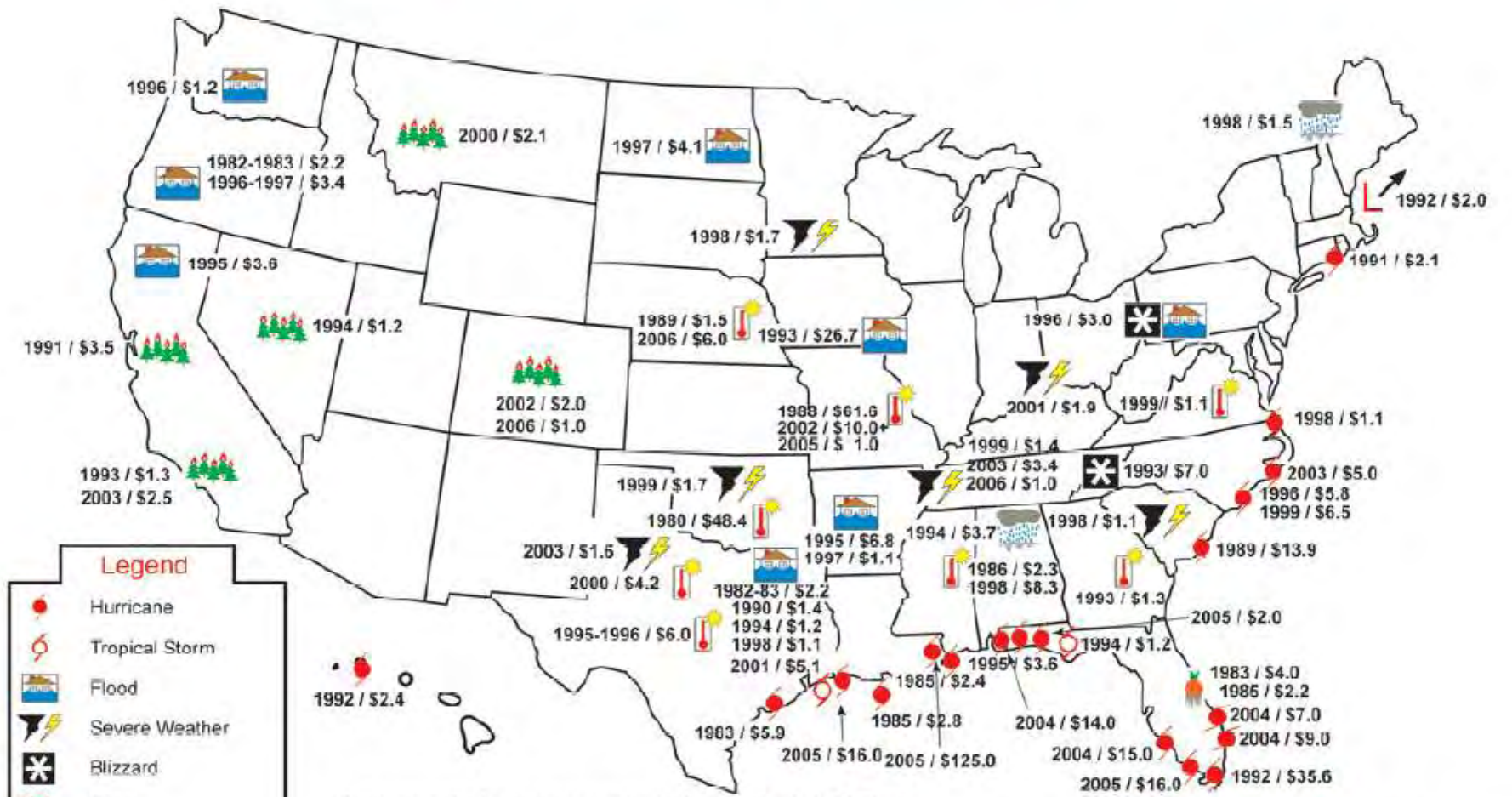
Peterborough July 14-15, 2004



Toronto August 19, 2005



Billion Dollar Weather Disasters 1980 - 2006



Dollar amounts shown are approximate damages/costs in \$ billions.

Location shown is the general area for the regional event. Several hurricanes made multiple landfalls.

Additional information for these events is available at NCDC WWW site www.ncdc.noaa.gov/ol/reports/billionz.html

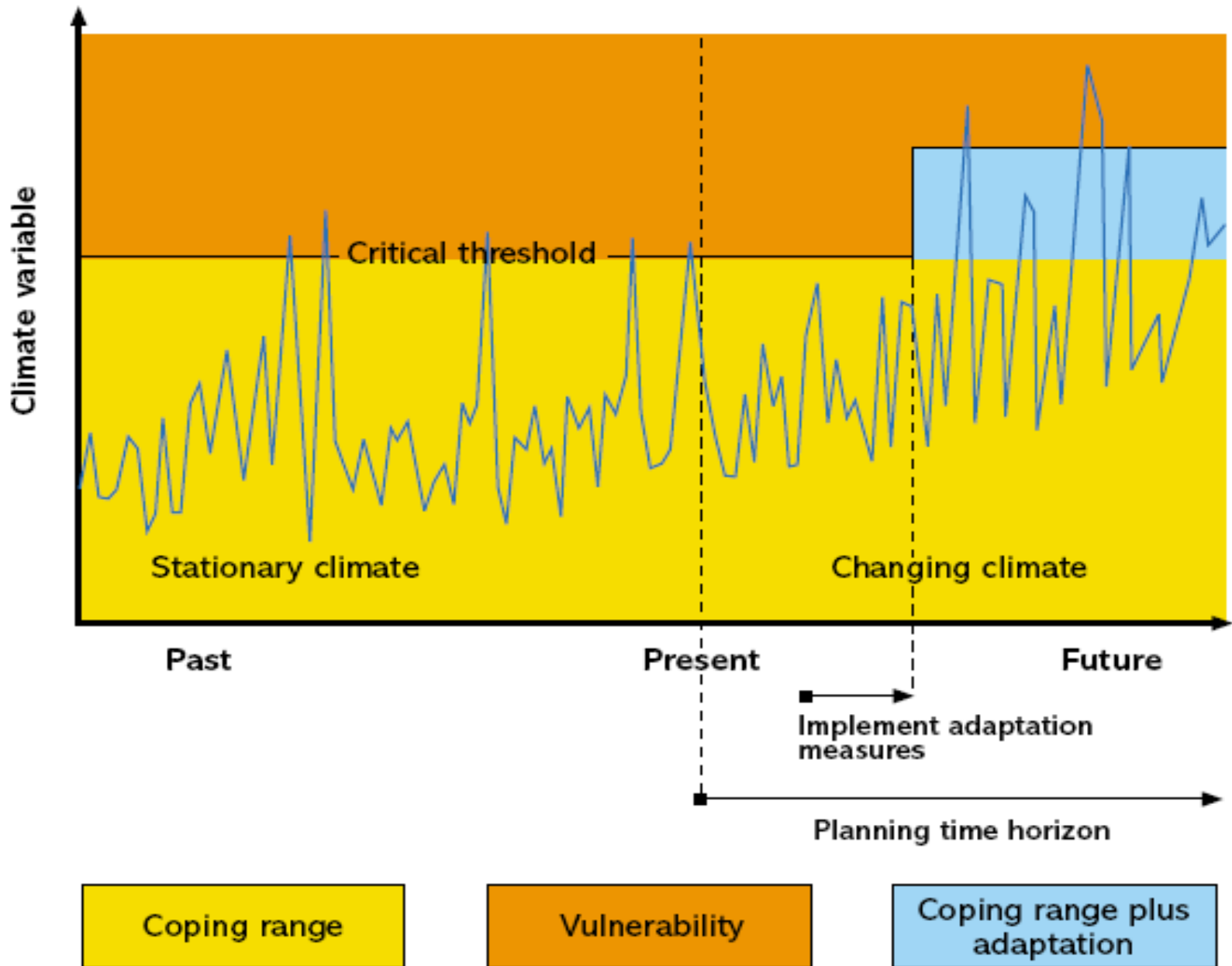
The U.S. has sustained 70 weather related disasters over the last 27 years with overall damages/costs exceeding \$1.0 billion for each event. 50 of the disasters occurred during or after 1990. Total costs for the 70 events were greater than \$560 billion using an inflation/wealth index.

Adaptation is

Adjustments in ecological, social or economic systems in response to actual or expected climate change stimuli, their effects or impacts

- to reduce vulnerability
- to moderate damages
- to realize opportunities

Smit, 2001



Adapting to Change - Methods

- Assessing current vulnerabilities and how they will change in the face of climate variability and change
 - Vulnerabilities, adaptive capacity and future climate
- Understanding, assessing and managing risks associated with current/future climate scenarios
 - Monitoring, science development, projections/modeling

Types of Adaptation

Anticipatory

Reactive

**Natural
Systems**

**Human
Systems**

Private

Public

		<ul style="list-style-type: none">• changes in ecosystem composition, location• wetland migration
	<ul style="list-style-type: none">• crop diversification• purchase insurance• house designs	<ul style="list-style-type: none">• crop development• borrow, change activity• reconstruction, relocation
	<ul style="list-style-type: none">• building codes• infrastructure	<ul style="list-style-type: none">• disaster relief• relocation incentives

Vulnerability to climate change depends on

- **Exposure** to climate change risks
and
- **Adaptive Capacity** to cope with risks

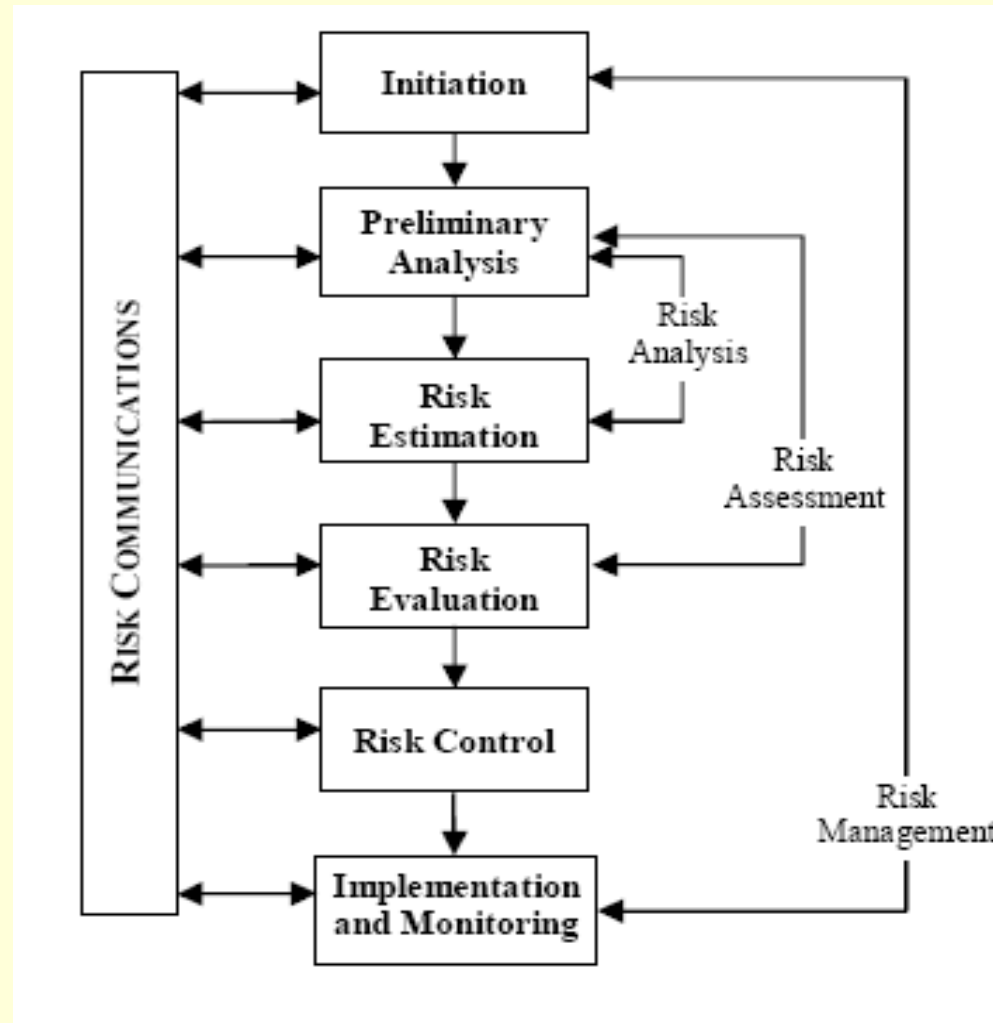
Adaptive capacity depends on

- Resources
- Knowledge and awareness of potential impacts, risks, and plausible future scenarios
- Planning and decision making ability
- Social and cultural circumstances
- Other

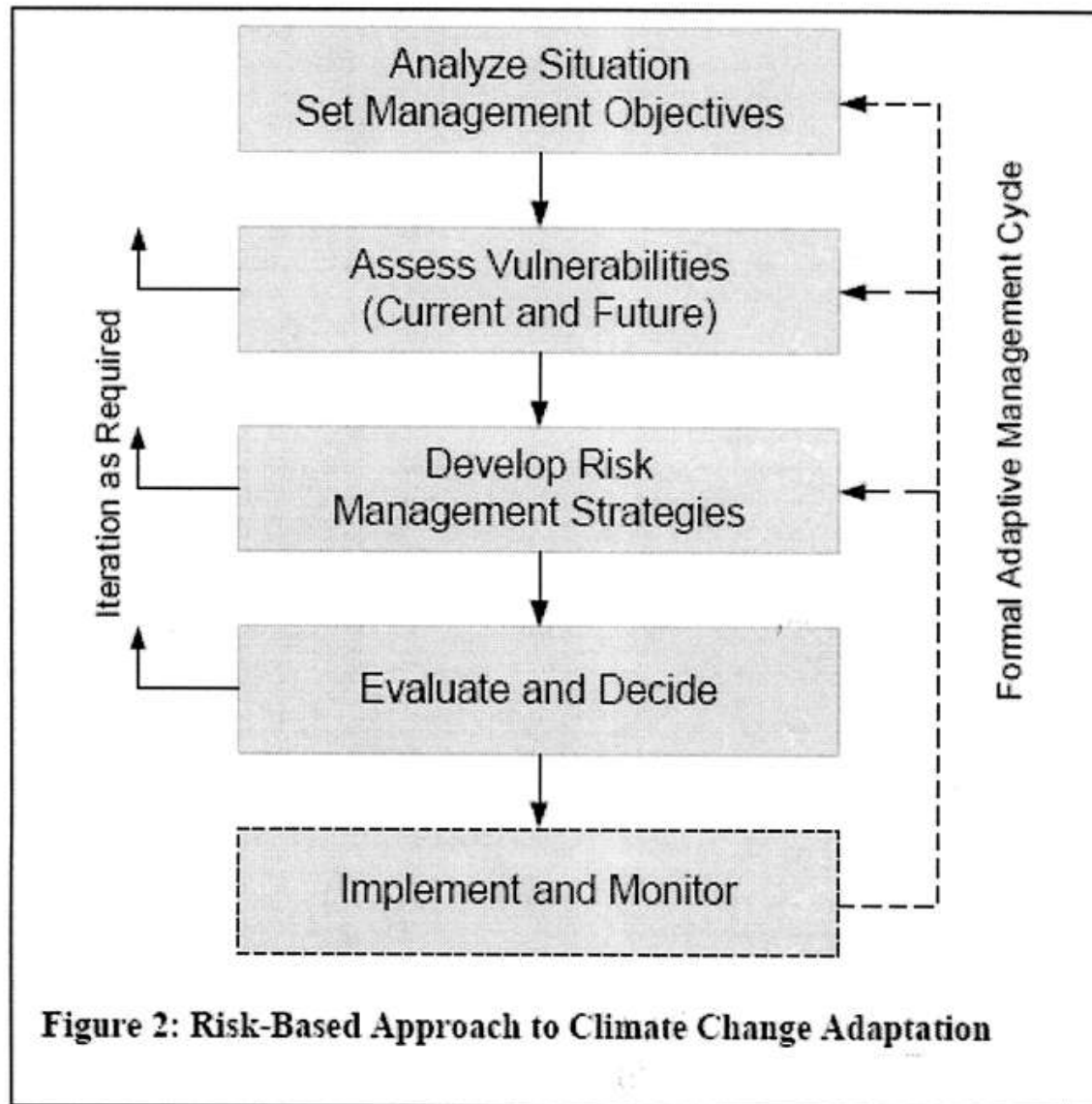
U.S. Climate Change Science Program Synthesis and Assessment Product 4.7

- **Impacts of Climate Change and Variability on Transportation Systems and Infrastructure: Gulf Coast Study, Phase I**
- **Concern Grows About Health Risks Posed by Climate Change**
 - **Floods, heat waves, insect-borne diseases threaten global health security**
- **Preliminary review of adaptation options for climate-sensitive ecosystems and resources**

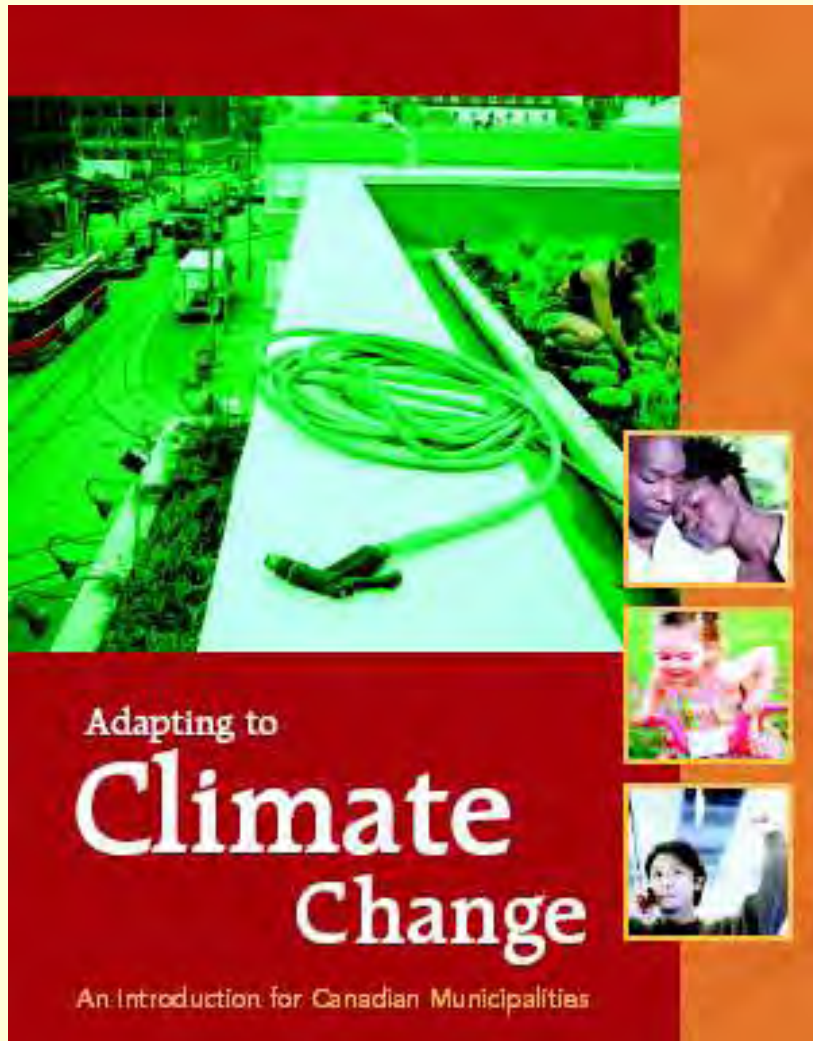
Risk Assessment Framework



Based on CAN/CSA-Q850-97 Risk Management Guideline for Decision Makers



Introduction for Canadian Municipalities



Adapting to Climate Change
– An **Introduction** for
Canadian Municipalities

www.adaptation.nrcan.gc.ca

Introduction for Canadian Municipalities



- Municipal and community leaders across Canada are concerned about the impacts of climate change
- They are expressing interest in adapting
- This ‘Introduction’ is a preliminary aid to the adaptation process

Introduction for Canadian Municipalities

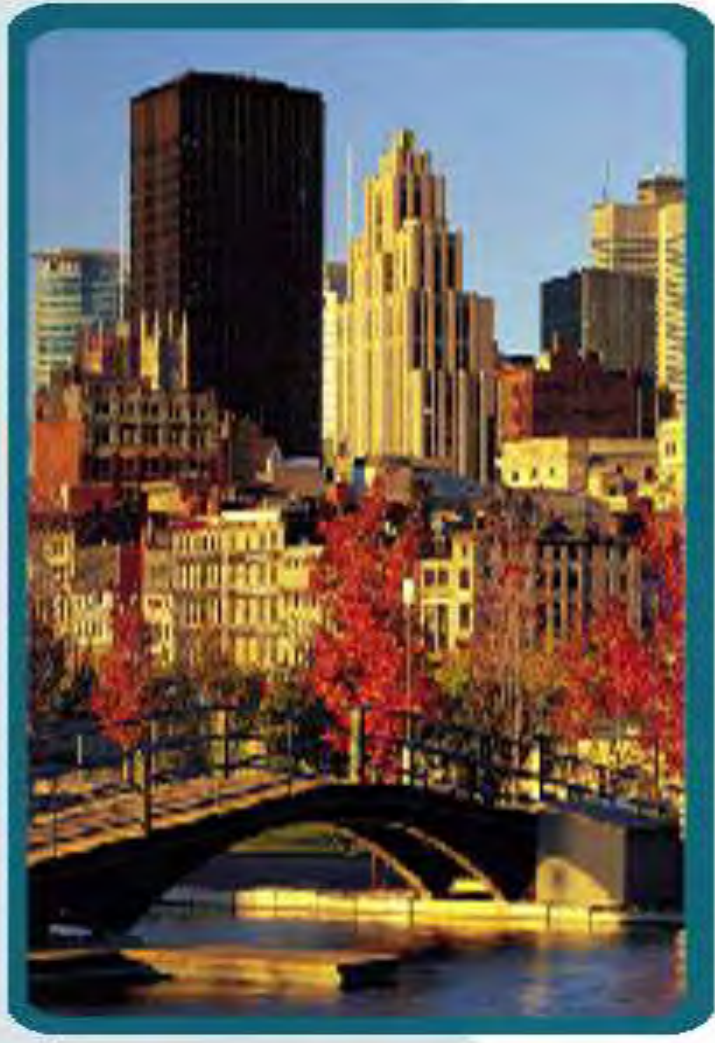
Who is the 'Introduction' for?



- Elected officials
- Senior staff

- Management staff
- Administration staff
- Planning staff

Introduction for Canadian Municipalities - Objectives



- To provide decision makers with information on climate change adaptation
- To help reduce vulnerability to impacts
- To describe decision-making processes for adaptation
- To teach by example: showcases six examples of municipal adaptation

Introduction for Canadian Municipalities

- Larger municipalities:
 - Toronto: heat wave
 - Vancouver: water supply
- Medium-sized municipality:
 - Halifax: Climate SMART
 - Sept-Îles: coastal erosion
- Small-sized municipalities:
 - Iqaluit: sustainable development
 - Annapolis Royal: storm surge protection

Introduction for Canadian Municipalities

Moving forward with planned adaptation

- Incorporating consideration of climate change into decision making ('mainstreaming')
- Proactive approach may avert need for higher costs associated with reactive measures



Summary

- Community systems are currently stressed by a variety of factors.
- Climate change is expected to exacerbate current community vulnerabilities.
- The ability of a community to cope with these changes is a function of their adaptive capacity.
- The analysis of risk is one method whereby communities can assess risk associated with climate change and develop adaptation strategies.
- Unlike natural systems that can only react to changes once they have occurred, communities have the ability to anticipate and respond proactively.

Conclusions

- Institutional capacity building
- Community-based management systems - ownership
- Coordination and collaboration
- Mainstreaming
- The right solutions
- Mitigation + adaptation + sustainable development
- Build resilience and protect the people and systems



Thank you



Al Douglas
Laurentian University
ADouglas@mirarco.org