

**SFU**

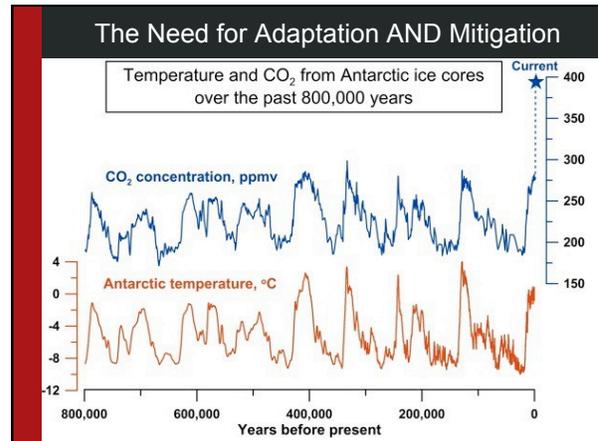
**ACT**  
Adaptation to Climate Change Team



Presentation to POLIS Watersheds Conference

**Watershed Governance in a Changing Climate**

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### Climate Change: Water-Related Impacts



**Increasingly extreme weather impacts:**

- Heat waves
- Wildfires
- Rainfall/flooding
- Ice and windstorms
- Hurricanes

**Water shortages** (both annual and during extended droughts)

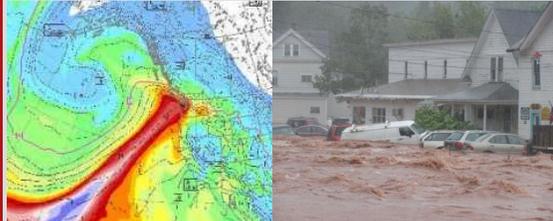
**Changes in the cryosphere:**

- Permafrost melt
- Sea and lake ice disappearance
- Snowpack and glaciers eroding

**Coastal and shoreline erosion** due to sea level rise, storm surge, storminess

### Additional Influences

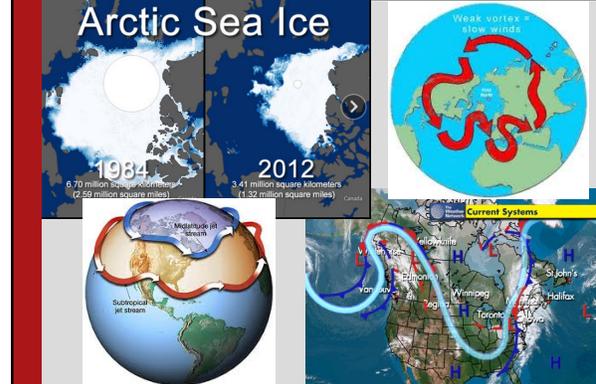
- Clausius Clapeyron relation
  - (1° warming = +7% moisture in atmosphere)
- Atmospheric rivers
- ENSO, PDO and other cycles
- Arctic/permafrost melt plus ocean warming
  - Methane release (20x warming potential of CO<sub>2</sub>)



## Observed Impacts: Summer of 2013



## Loss of Stationarity: Arctic Influence



## Critical Infrastructure and Extreme Weather



### Extreme weather damage to predicted to increase:

- Canada's physical infrastructure aging; many structures and facilities approaching or have exceeded their normal service life.
- Over 80% of Canadians living in urban areas of 10,000 or more.
- Small increase in the magnitude or intensity of extreme weather events could bring about a major increase in damage to critical infrastructure systems, e.g.
  - Transportation
  - Water treatment and distribution systems
  - Energy generation and transmission
  - Communications

## Loss of Stationarity



### Result of climate changes plus additional influences:

#### Loss of stationarity

- Historical data obsolete
- Engineering and building standards no longer correct
  - (e.g. IDF curves)
- Ability to project conditions based on experience not reliable
- Extreme weather of magnitudes we cannot foresee
- Levels of damage beyond our experience
- Impacts on health, insurance, development

## Climate Change: Ecosystem Impacts



- Changing water levels and timing
  - Warmer, wetter winters
  - Longer, hotter, drier summers
- Invasive species as conditions change
- Resident species challenged to adapt
  - More pests and disease
  - Altered spawning/blooming patterns
  - Threat to fry from water temp
- Flows for nature competing with human use
- Exacerbated by habitat loss

## The Need for Adaptation Planning



“Carbon dioxide emissions will continue to contribute to warming and sea level rise for more than a millennium, due to the time scales required for removal of this gas.”

~ *The Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC 2007)*

“Smart” adaptation proposes that we prepare for the short and long term effects of climate change while we work to reduce emissions (mitigation).

## “Smart” Adaptation



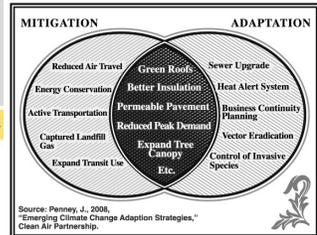
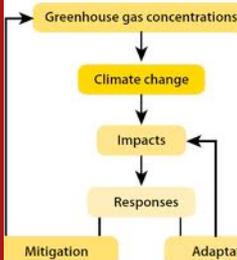
**Adaptation is intended to reduce vulnerability and enhance resilience, defined as follows by the IPCC:**

*“The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change.”*

It is important to couple efforts to **mitigate** the cause of the problem with efforts to **adapt** to the current and anticipated effects of climate change. (Save time, money... Lives?!)

## Conclusion

**Adaptation planning can protect communities, resource sectors, and critical infrastructure.**



It will save time & money if we **consider adaptation and mitigation as one issue/seek win-win solutions.**

## Watershed Governance & Climate Change



### Key Challenges:

•The policy vehicles that dictate how water is currently used were built for a different time:

- Population was lower and more dispersed
- Fewer competing uses for water supplies

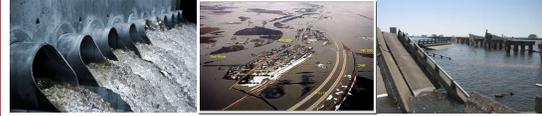
### Two Converging Issues:

•Legislation for 19th century water allocation needs within the context of 20th century technology and hydrological understanding

•Current water management inadequate for 21st century requirements:

- Integration of nature's need for water
- Broader ecological protection of water sources
- Adaptation to climate change

## Watershed Governance & Climate Change



### Key approaches:

- Regional water conservation guidelines
- Formal allocation of water to meet nature's needs
- Design and sustainability of water supply and waste disposal infrastructure should be based on ecological principles
- Comprehensive on-going monitoring needed
- Manage watersheds through collaborative governance
- Importance of groundwater must be recognized
- Strengthen and harmonize flood protection strategies

## Aspects of "Vulnerability"

The extent of damage from climate change depends to a great extent on vulnerability:

### Exposure

- E.g. geography/energy infrastructure

### Sensitivity

- E.g. vulnerable population groups/continuity of systems

### Adaptive capacity

- Information
- Expertise and networks
- Fiscal capacity
- Political support



## Key Adaptation Policy Principles

ACT identifies five key principles of adaptation policy:

- Intergovernmental collaboration
- Stakeholder engagement
- Assessment of current and future risk (exposure, sensitivity, adaptive capacity)
- Acting strategically
- Mainstreaming



## Adaptation Planning – Key Approaches

- **Engage professionals through associations**  
Require certification, raise awareness, client education opportunities
- **Update floodmaps/create integrated climate models**  
Essential to drive planning and develop awareness (PSC, BCREA)
- **Financing and economic case studies (e.g. CBAs)**  
NRCan funding research into mechanisms and incentives (ACT etc)
- **Establish liability in the floodplain**  
Emerging issue as stakeholders begin to assert that govts "should have known" – what are implications for engineers? Developers? Insurers?
- **Initiate regional/collaborative projects**  
Implementation is the biggest issue – need innovation publicized
- **Extension agents?**  
Could help implementation, support govts

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# ACT

Adaptation  
to Climate  
Change Team



For more information about ACT, our policy reports, and adaptation resources, please go to:

[www.sfu.ca/act](http://www.sfu.ca/act)

**ACT thanks past and present partners:**

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