



PRESENTS

**Climate Change Adaptation and the  
Energy-Water Nexus**

SFU

# ACT

Adaptation  
to Climate  
Change Team



Presentation to CRIMS 2010:

## **Climate “Disruption”: Adaptation, Mitigation, and The Energy-Water Nexus**

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# The Need for Adaptation

“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)*

“Current levels of CO<sub>2</sub> are enough to raise temperatures to their highest levels since the end of the last Ice Age.”

*Ceres, a coalition of more than 80 investor, environmental and public-interest organizations*

## **In other words...**

The emissions we have already released, combined with those we are emitting now and will continue to emit, will affect us well into our grandchildren's lifetimes.

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

# Observed Water Impacts Around the Globe

## United Kingdom: Flooding



10% of the UK - equivalent to two million homes - is in danger of flooding. Insurers may become hesitant to renew home insurance policies. (DEFRA - now DECC)

2007 = UK's wettest summer since records began in 1914. Torrential rainfall affected 1000s of homes. Rivers burst their banks in 4 counties. Nine lives lost; 350,000 people lost access to clean water; many lost their homes, possessions and businesses.



# Observed Water Impacts Around the Globe

## Australia: Unprecedented Drought



The Murray River and its tributaries water a vital agricultural region in which 60,000 growers produce US \$30 billion in crops annually. Now, 4 out of 10 days, the river doesn't have enough flow to reach its mouth in the Southern Ocean near Adelaide.

Australia has been gripped for a decade by its worst drought in a century, hindering the country's economic growth and sparking drinking water restrictions in all major cities. On average, 15% less rain falls now. If trends continue, rainfall will continue to diminish and the temperature will be 4.4° F warmer by 2050. (CSIRO)



Source: AFP-Getty Images file

# Observed Water Impacts Around the Globe

## South America: Retreating Glaciers

Glacier Yanamarey, Ancash, Peru

1997



Evidence from glaciers and ice caps on every continent shows that global warming is affecting the water and glacial cycles of the planet.

2004



The largest implication is the fact that the seasonal meltwater from glaciers, especially in Asia and South America, supports billions of people.

# Current and Projected Impacts in Canada



- Extreme weather (floods, fires, etc.)
- Water shortages/drought
- Changes in the cryosphere
- Disease, pest and invasive species migration
- Coastal and shoreline erosion due to sea level rise/storm surge

# Specific Impacts on Water

## **Surface water** availability reduced:

- Snowpack decline
- Earlier snowmelt/flood events (storage issues)
- More frequent, extended drought

## **Groundwater** use problematic:

- Monitoring non-existent
- Recharge decrease + usage increase = water table decline
- Deeper and more difficult to obtain groundwater supplies = increase in pumping and associated electricity costs

# Impacts on Energy

- Traditional/renewable energy sources dependent on water supply.
- Pumping oil uses more water now - aging reservoirs/increased operations.
- Transitional energy sources such as shale gas highly water-intensive (3:1).
- Hydro dependent on predictable water flows: Longer low flow/hot periods = higher energy demand when reservoirs lowest.
- Pressure on climate-stressed ecosystems.
- Flooding/storms threaten infrastructure.
- Conflicting user demands = rights/allocation challenges.

# Additional Driver for Energy-Water Crises



Global demand for both energy and water expected to steadily increase -> 2050.

# Current Challenges - Examples



Climate changes forcing some regions to choose between energy and water distribution:

- California energy crisis in 2001: risk of larger, more frequent blackouts because severe drought in the Pacific NW drained hydro resources.
- Low municipal water has led to water restrictions. E.g. 2003: Colorado River flowed at 25% of its historic average.

*Water Energy Technology Team, Lawrence Berkeley National Laboratory (LBNL)*

# Current Challenges - Examples

Renewables are problematic too:

- US irrigation required for grain grown for ethanol: At least 40 gallons for every mile traveled by ethanol-powered vehicles.
- Replacing all gas-powered vehicles with electric ones would require 17 x more water, nearly 11 gallons per mile, compared with 0.6 gallons of water per mile for gas engines.
- Hydrogen power is even more water-intensive, as energy is generated by electrolysis.

# Proposed Actions

**The World Business Council on Sustainable Development has identified key actions including:**

- Prepare for potential supply disruptions/upgrade costs
- Redesign facilities to minimize water use/improve resilience
- Measure insurance vs. mitigation costs
- Integrated assessment of ecological, socio-economic, benefits, costs
- Ensure sustainable operations that yield regulatory certainty and social license to enable continued operations
- Develop markets for energy-efficient water-saving technologies/services
- Engage with communities to reduce conflict and risks to license to operate
- Impose constraints on water use: regulations, limited supply
- Express challenges clearly in measurement tools and policy

# Policy Challenges and Responses

“We use a lot of water to produce energy, especially fossil fuel energy. And we use a lot of energy to produce water — for food, to treat water, to capture and treat wastewater.

Energy constraints are beginning to affect water policy, and water policy is beginning to affect our energy choices. And yet, almost never do we integrate these two policies.”

*Peter Gleick, director of the Pacific Institute for Studies in Development, Environment, and Security in Oakland, California*

- No one committee in Congress has jurisdiction over energy and water issues. This lack of cohesion extends to state and local levels, where it drives rivalry between neighbours over access to resources.

# ACT (Adaptation to Climate Change Team)

ACT is an SFU-based research program with three main objectives:

- Address climate change with a proactive, inclusive mindset that acknowledges and works with people in communities, sectors and eco-systems facing the impacts;
- Formulate policy recommendations through research, consultation and dialogue, that will help to guide both the public and private sectors as they meet the challenges of climate change;
- Build awareness of the need to ACT swiftly and knowledgeably to address the impacts of climate change.

ACT has been working with Zurich since 2008.

## **Five-year series of six-month sessions on top-of-mind topics. Key outcomes:**

- Multi-stakeholder conferences
- Policy R&D/recommendations
- Awareness raising/media relations
- Creation of networks
- Development of resources



# Key Instruments/Tools

- **Planning**

Incorporate adaptation lens to inform long-term decisions that reduce vulnerability and enhance adaptive capacity, e.g. land-use planning can limit exposure of key assets.

- **Insurance**

- Will play an important role, e.g. adaptive adjustments during rehabilitation of insured structures
- Variable, risk-based premiums can offer incentive to reduce risk/relocate
- However, failing to address underlying vulnerability issues will limit effectiveness of insurance as an adaptive tool - must be incorporated into a suite of complementary measures.

- **Codes and standards**

Building codes and standards can be a powerful adaptation tool if climate change is incorporated as a risk factor. Canada National Building Code periodic revisions provide opportunities to mainstream adaptation into construction.



# Key Adaptation 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



# Policy Challenges and Responses

- **ACT: Biodiversity Recommendations**
- **Recommendation #2:**
- That the government transition to a governance structure in which all land- and water-based decisions are either made by a single agency, or coordinated across several agencies through the oversight of a single agency, to ensure consistency in maintaining ecosystem functionality.

*Jon O'Riordan, ACT 2008*

# Policy Challenges and Responses

- **ACT: Extreme Weather Recommendations**
- **Recommendation #3:**
- Provincial and local governments should incorporate climate adaptation principles into infrastructure design and land-use planning decisions in order to reduce exposure and vulnerability to extreme weather events.
- 3.4 Undertake an integrated approach to infrastructure and land-use planning, designing within nature's limits; distributing infrastructure such that it is not singularly vulnerable to extreme weather events; and recovering water, energy and other resources rather than relying on new supplies that can be affected by extreme events.

# Upcoming ACT Report

## **SNEAK PREVIEW of ACT ENERGY REPORT** **Release scheduled for late October, 2010**

Three key challenges:

**Energy Challenge** (peak oil, volatility, prices)

**Climate Challenge** (climate impacts, new emissions regulations)

**Ecosystem Challenge** (over-exploitation, pollution)

Proposed responses will include collaboration with the insurance industry to ensure full utilization of the insurance tool in both adaptation and mitigation of climate change, and resistance to government actions that undermine or distort insurance incentives designed to mitigate and manage risk.

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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:**

Wilburforce Foundation, Bullitt Foundation, Zurich, BC Ministry of Environment, AMEC Engineering, BC Hydro, Plutonic Power, PICS, INAC, and the Real Estate Foundation of BC.

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