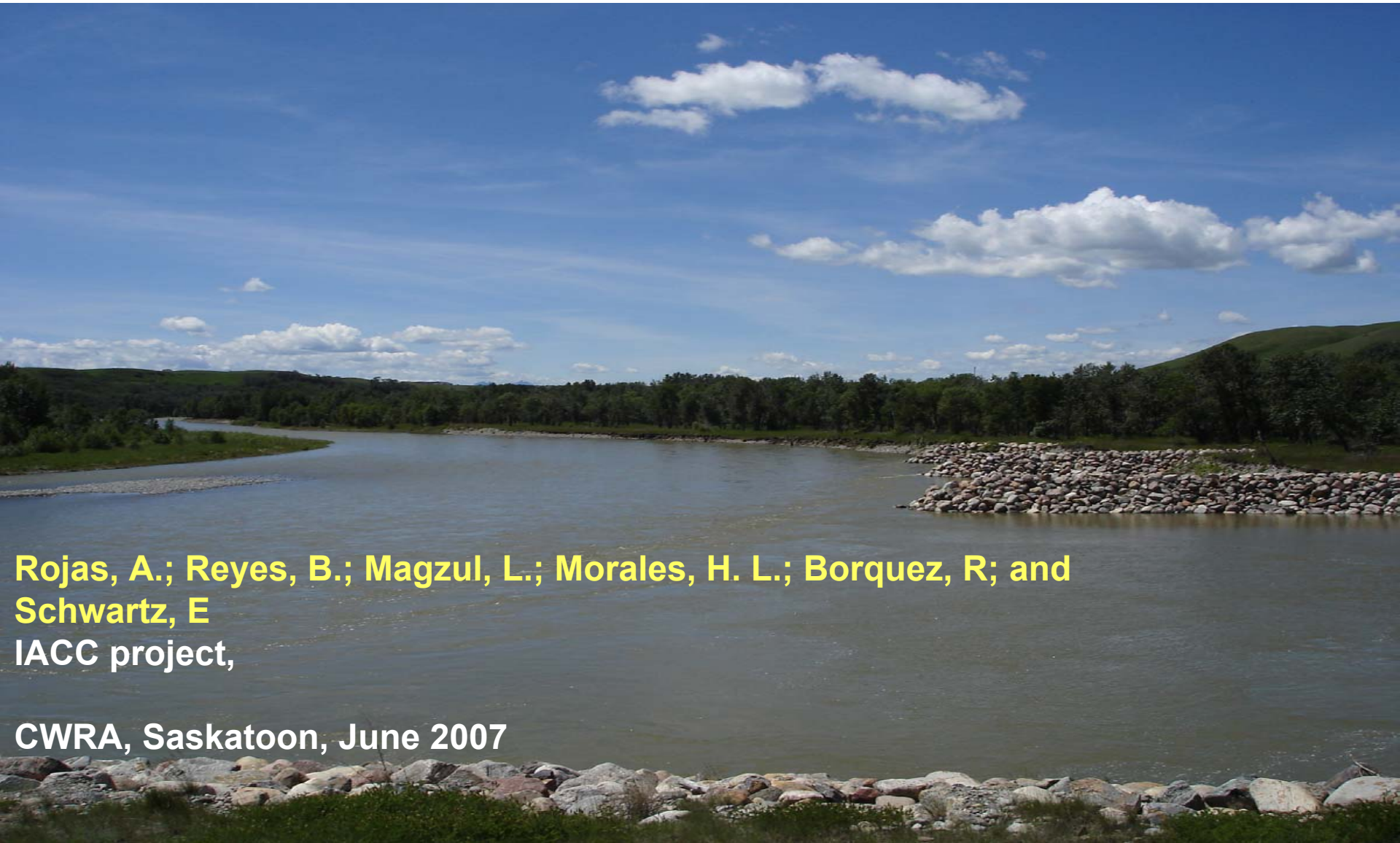


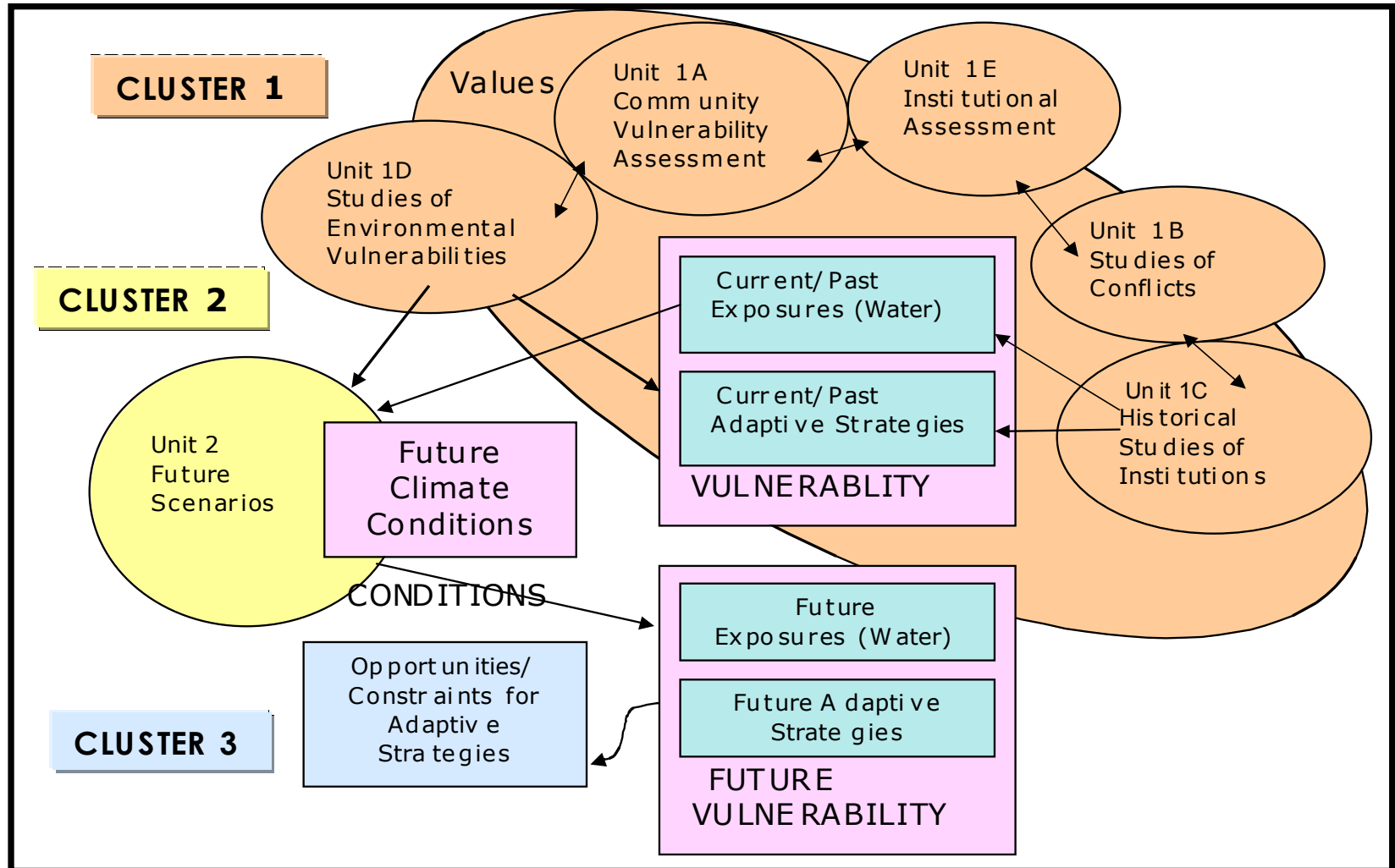
# Role of Institutions in Water Conflicts



Rojas, A.; Reyes, B.; Magzul, L.; Morales, H. L.; Borquez, R; and  
Schwartz, E  
IACC project,

CWRA, Saskatoon, June 2007

# Institutional adaptation to climate change



# **Stern Review Report on the Economics of Climate Change (2006)**

## **Commisioned by UK Treasury**

- **Droughts, water scarcity and other climate-related shocks may spark conflict and violence**
- Effects of climate change + rapid population growth → national and cross-border conflicts in some countries
- Long-term climate deterioration will exacerbate the competition for resources
- Long periods of drought in the 1970s and 1980s in Sudan's Northern Darfur State: widespread poverty + breakdown in methods of coping with drought → contributor to the current crisis

# Climate change predicted impacts in NA

- Warming in NA is projected to cause decreased snowpack, more winter flooding, and reduced summer flows (IPCC, 2007)
- Predicted increases in temperature across the whole North America will impact the distribution of rainfall (IPCC, 2007)
- Precipitation is expected to increase in Canada with regional variability
  - 1- 6 °C annual average temperature increase
  - Drier summers due to increase evaporation rates
  - More rain rather than snow
  - Stream flows will reach maximum discharge earlier in the season rather than during irrigation period

# Climate change predicted impacts in NA

## Impacts

- Regional rainfall variability will affect the quantity and quality of fresh water—significant impacts
- Increase demand, less supply
  - Human and ecological systems affected
  - Challenges for meeting agricultural, industrial and municipal needs
  - Predicted impacts of water scarcity will be exacerbated by population growth

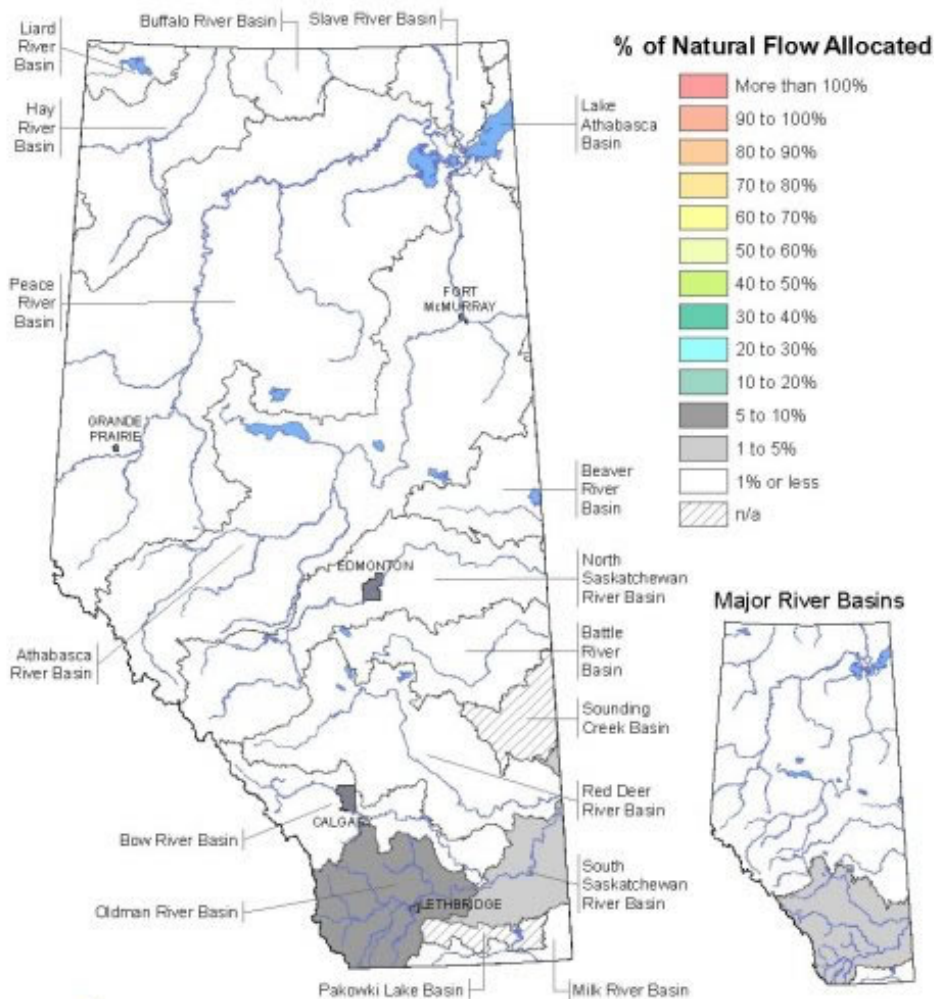
# Observed (2005) and projected (2031) population for Canada, provinces and territories (millions)

	2005	2031
Canada	32.27	36.26–41.81
Manitoba	1.17	1.25–1.45
Saskatchewan	0.99	0.93–1.02
Alberta	3.25	3.92–4.41

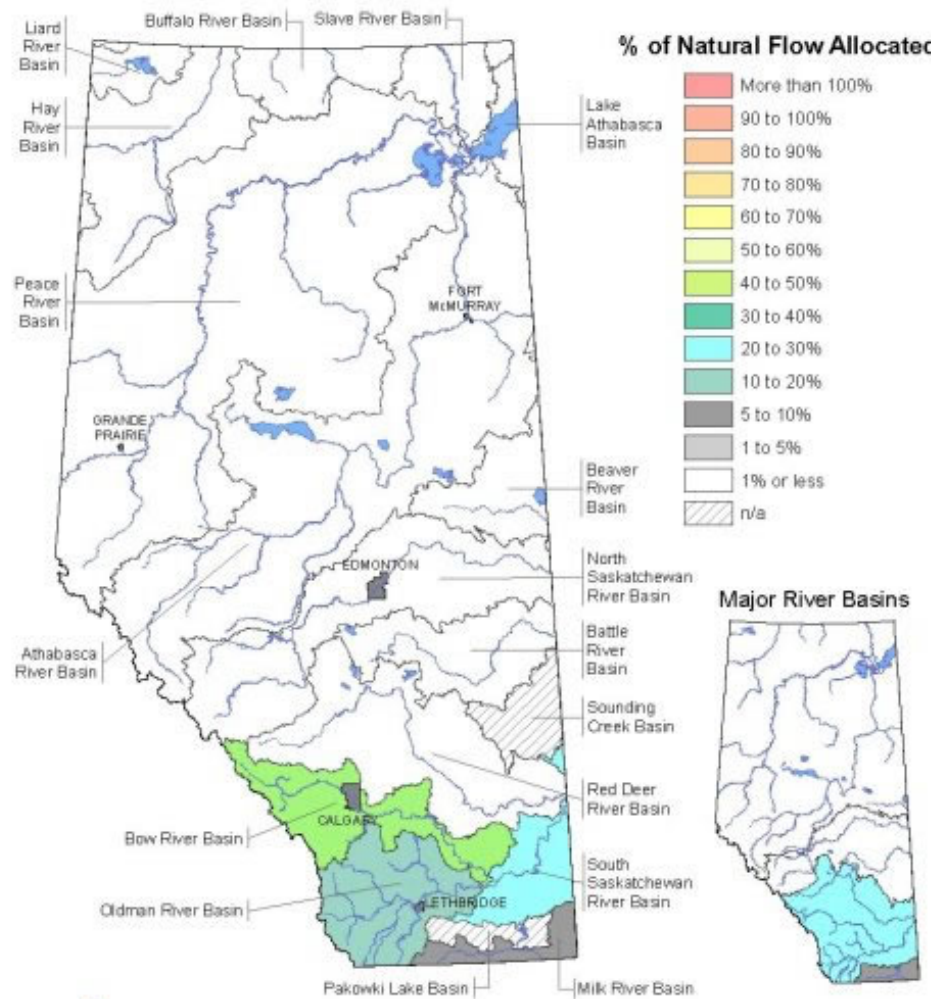
(statistics Canada)



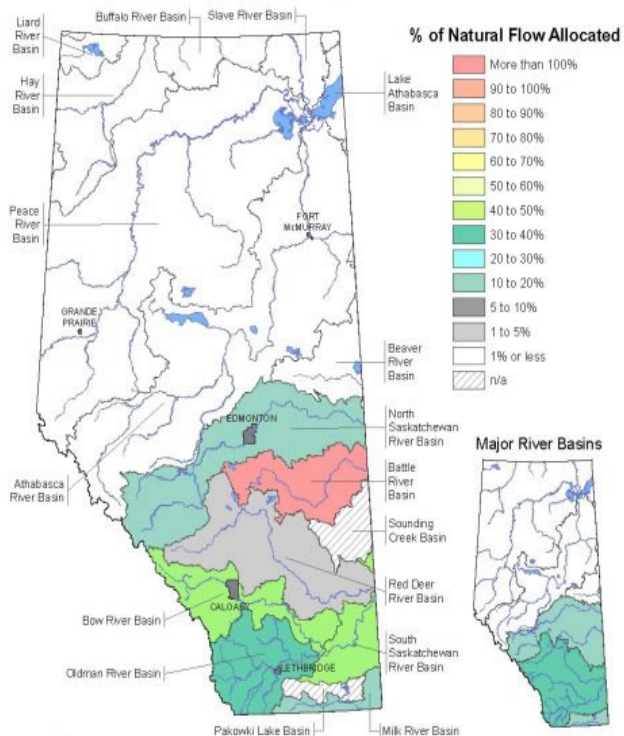
## Allocations in 1900 by River Basin Compared to Average Natural Flow



## Allocations in 1930 by River Basin Compared to Average Natural Flow

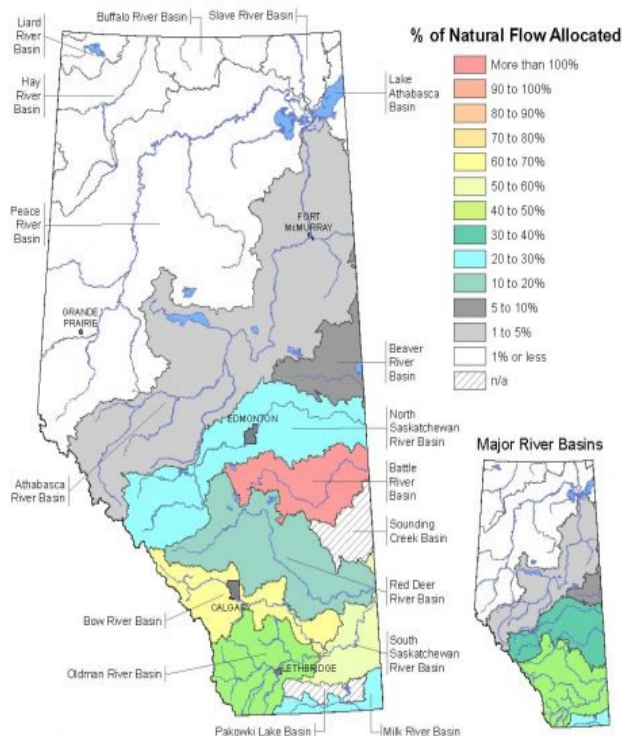


## Allocations in 1960 by River Basin Compared to Average Natural Flow



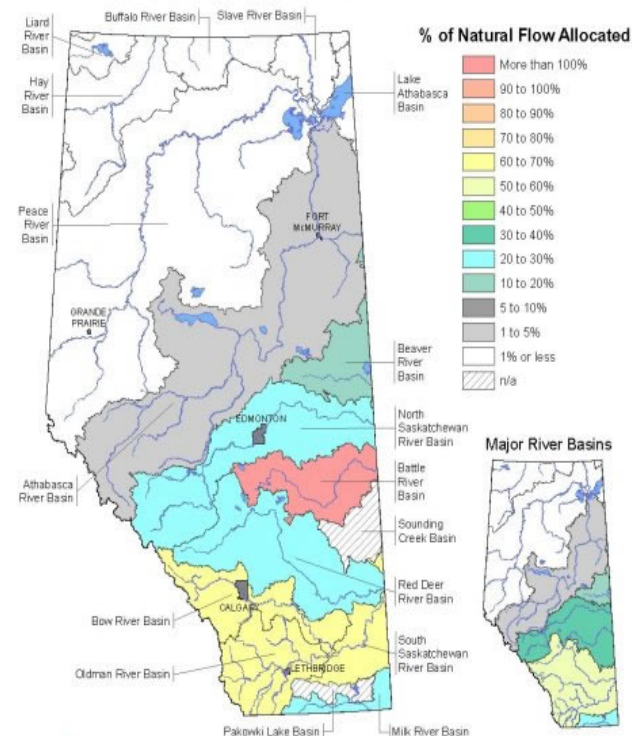
Note that allocations do not represent actual water use - only the maximum amount that can be used under the terms of a license. For further explanation please refer to the text in the section "Why is it important?"

## Allocations in 1990 by River Basin Compared to Average Natural Flow



Note that allocations do not represent actual water use - only the maximum amount that can be used under the terms of a license. For further explanation please refer to the text in the section "Why is it important?"

## Allocations in 2005 by River Basin Compared to Average Natural Flow



Note that allocations do not represent actual water use - only the maximum amount that can be used under the terms of a license. For further explanation please refer to the text in the section "Why is it important?"



## Other factors that can exacerbate impacts of water scarcity

- High interdependence while availability of water is declining
  - Inter-provincial apportionment agreements
  - International agreements
- Poor governance and political instability
  - Unresolved First Nations water rights

# Conflicts and potential conflicts

- Oldman River Dam construction in the 1980s
- Competition over water during drought events: of 1984-85, 1988-1990, and 2000-2001
- Dispute between Montana and Alberta over the Milk and St. Mary's river water sharing agreement
- Inter-provincial water agreement
- Over allocation of water flow

# Adaptation to Climate change impacts

Array of potential adaptive responses:

- Technological (e.g., sea defenses)
- Behavioral (e.g., altered food and recreational choices)
- Managerial (e.g., altered farm practices)
- Policy (e.g., planning regulations)

(IPCC, 2007)



# Institutional Adaptation to Climate Change:

- formal and informal institutions, ranging from social mores and cultural patterns of behavior, to organizations and rules
- to understand the adaptive capacities of rural communities and rural households and the roles played by formal institutional actors in the development of those capacities to adapt to climate change-induced water scarcities

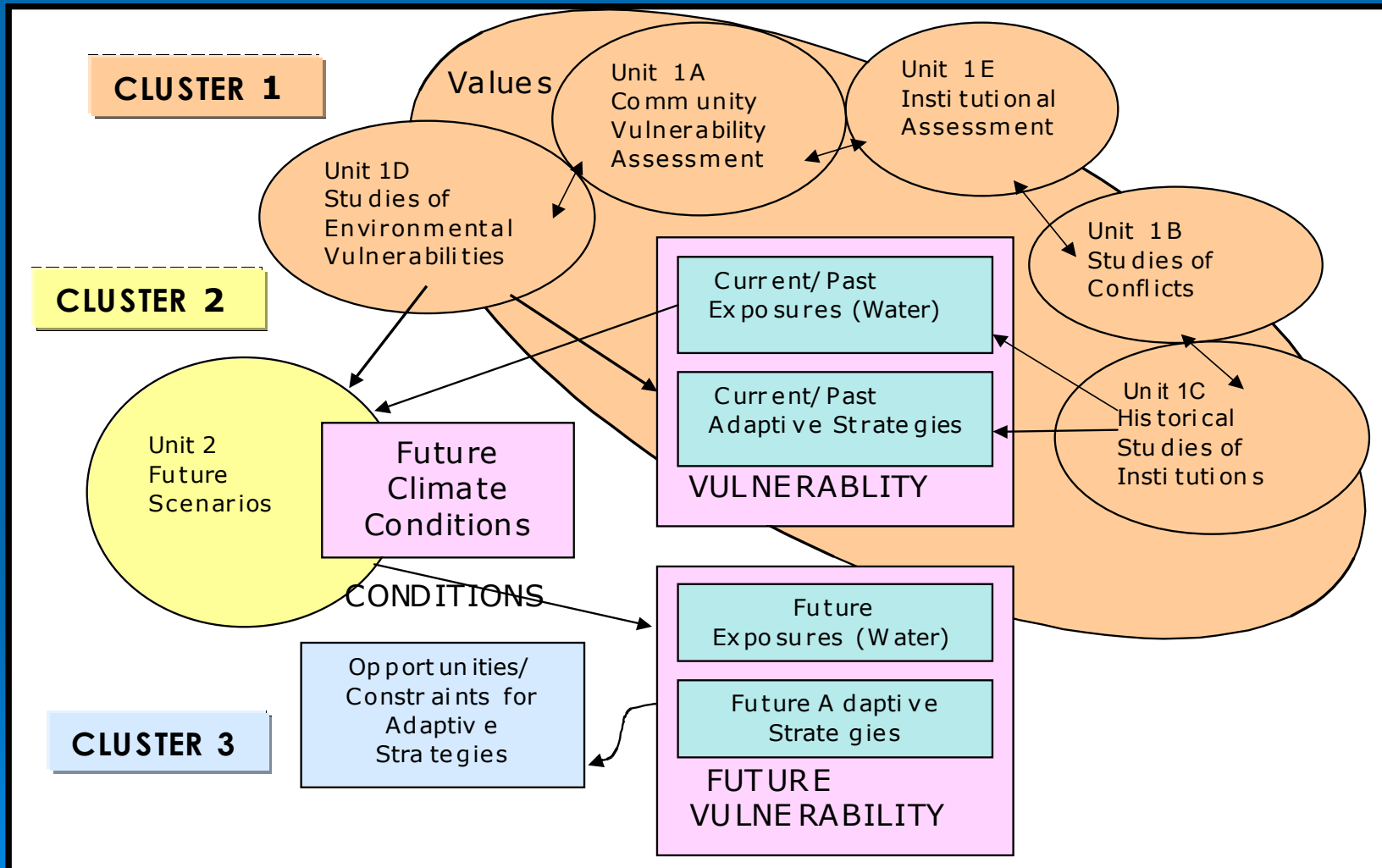


# Institutional adaptive capacity

- ability to access resources (financial, technical, human) and knowledge
- flexibility and legitimacy of its existing institutional arrangements
- Strong networks with others sectors and civil society's trust
- Leadership, vision, ability to learn from past experiences

# Institutional adaptation to climate change

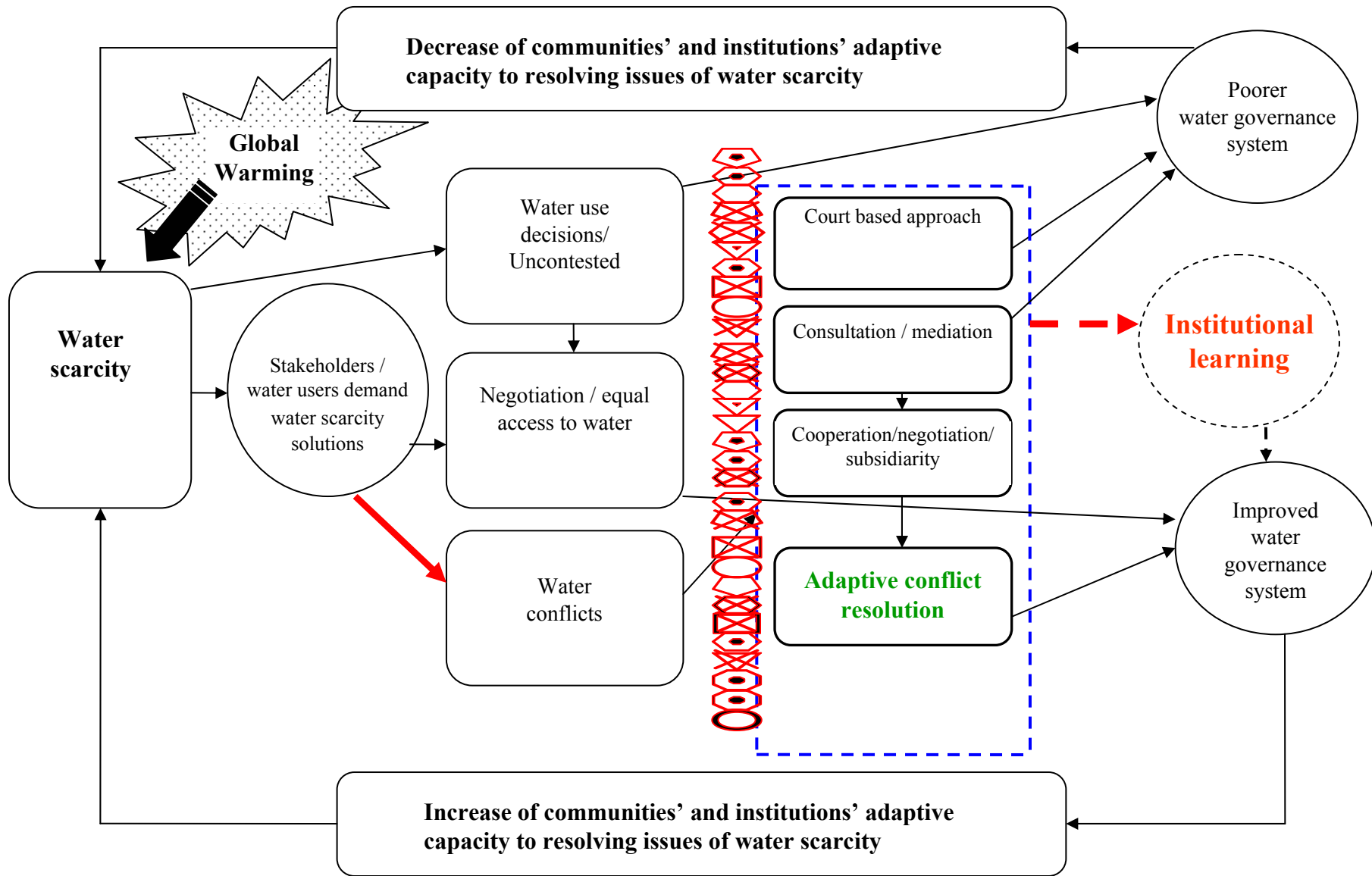
## The Research Activities of the IACC Project



# Why study role of institutions in resolutions of conflict?

- provides insights into institutional challenges for adaptation to climate change-induced water insecurities
- How institutions resolve conflicts affects the adaptive capacity and vulnerability of communities and stakeholders
  - Positive outcomes increase adaptive capacity, reduce vulnerability
  - Negative outcomes decrease adaptive capacity, increase vulnerability

# Conflict resolution over water scarcity





# Identification of cases

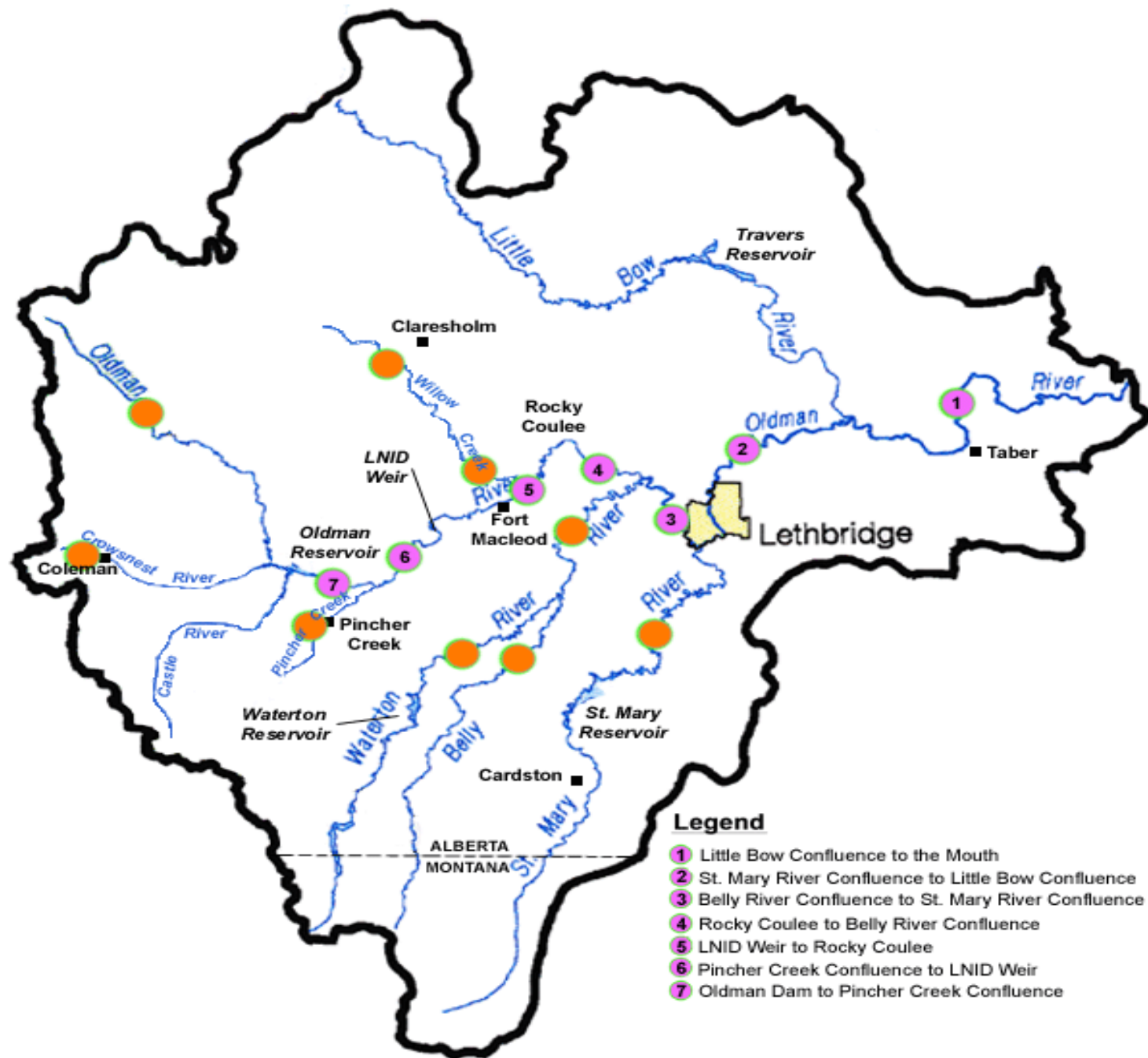


## Canada

- Oldman River Dam conflict

## Chile

- Puclaro Dam conflict
- Pascua Lama conflict











# Lessons learned

## ➤ Changes in behaviour

- people more aware of water scarcity,
- Northern Lethbridge Irrigation District farmers sympathetic with other stakeholders
- drought event in 2001 and 2002 stakeholders reached a voluntary water sharing agreement
- The city Lethbridge is looking to diversify their licences' priority in order to minimize the risk of water supply

# Lessons learned

- **Changes in organizational capacity and strategies by communities and others stakeholders**
  - farmers have been able to diversify their crops to ones with higher economic value
  - Alberta Irrigation District Association has developed an irrigation model that monitors the level of available moisture in the soils
  - The Oldman River Dam operation is monitored: winter snow pack accumulation and the volume of spring run off

# Lessons learned

- **Changes in organizational structures and communities and water governance institutions**
  - consultation of stakeholders in the water governance of the Oldman River Basin through the Oldman Watershed Council
  - Sharing information among stakeholders
  - Environmental organizations refer to the Oldman River Dam conflict as the seminal case that has made Environmental Impact Assessments a critical requirement for large projects, such as a dam
  - The SSRB--10% conservation holdback on all permanent or temporary transfer

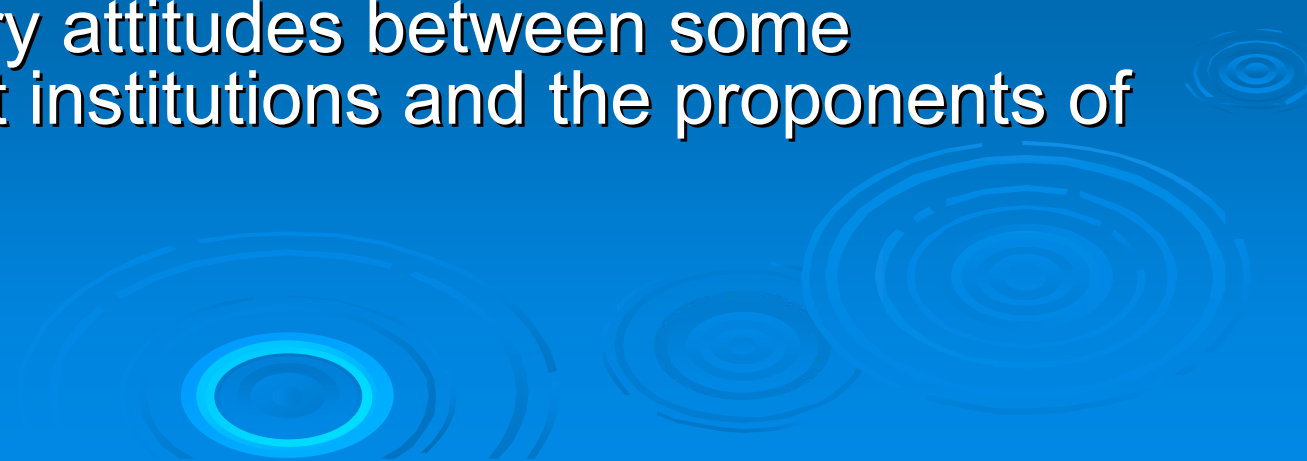
# Lessons learned

## Negative outcomes

- Civil organizations did not consider access to the information to be equitable – felt that their participation was not meaningful
- Stakeholders power and influence asymmetrical
- Some stakeholders felt their views were not heard
- Unresolved issues with the Piikanin Nation
- monetary compensation has created serious divisions in the community



# Similarities Chile-Canada

- Dams are constructed in order to support local economic development and to provide water security in water scarce regions
  - Influential stakeholders control discussion/debate through technical scientific language
  - “consultation” with local communities and stakeholders in general done superficially
  - contradictory attitudes between some government institutions and the proponents of projects
- 

# Similarities Chile-Canada

- institutions and stakeholders gain understanding regarding the participation of citizens in decisions regarding water governance
- recognition of the need for an ecological baseline assessment
- need to have public policies oriented toward the creation of appropriate institutional scenarios for the resolution of water conflicts
- Examples of integrating lessons learned from conflicts into water governance decisions

# Differences Chile-Canada

- Chile weaker capacity for coordinated institutional responses to address water conflicts
- Chile, water rights are governed by market rules and resources are concentrated mainly in the hands of powerful economic groups in the basins
- Operations of dams in the hands of farmers associations; dam benefit the big investors in irrigation systems
- water governance decisions in Chile is still not as inclusive as in Canada

# Conclusion

- The study of water related conflicts provide opportunity to understand adaptive capacity and vulnerability of communities
- role of institutions in managing or resolving water conflicts influences adaptive capacity and vulnerability of communities
- need of enabling public policy orientated to the creation of appropriate scenarios for water conflict resolution

Thanks!!!!

