GOVERNANCE INSTITUTIONS AND COMMUNITY VULNERABILITIES TO CLIMATE-INDUCED WATER STRESS

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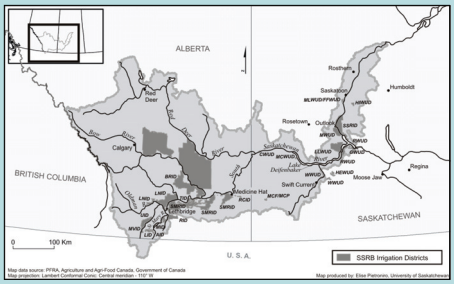
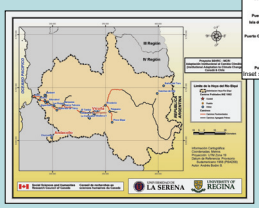
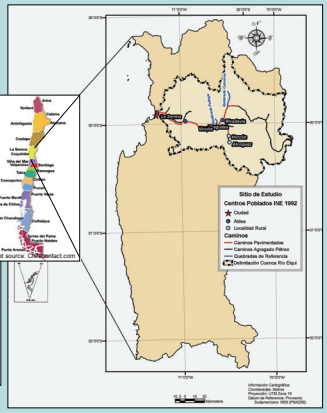


Goal: To better understand how formal governance institutions affect the adaptive capacity of rural communities facing climate-induced water stress.





CANADA	CHILE
Democratic Federation Population: 33 million 10 provinces, 3 territories De-centralized government with significant provincial government powers	Democratic Republic Population: 16 million 15 regions Centralized government located in Santiago (6 million)
Water management: - provincial government mandate - water is not mentioned in the constitution; - *Key driver:* water is managed by **shared jurisdictions** (a complex mix of provincial, federal, local government, non-government)	**Water management:** - national government mandate - 1981 Water Code (rev. 2005), Water Code is constitutionally-enshrined - *Key driver:* the **water market economy.** Water rights may be bought, sold, traded (giving power to the holder)

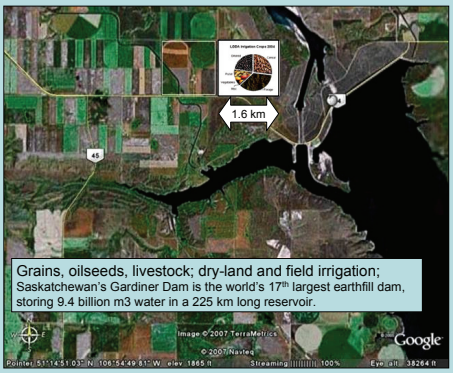
Canada's South Saskatchewan River Basin (SSRB)
Location: Provinces of Alberta & Saskatchewan, Canada
Land: 168,000 km² **Population:** 2.2 million, mostly in urban centers
Agriculture: Field crops (grains and oilseeds); Livestock (pasture)
Ag land: 15.2 million hectares – mostly dry-land (rain-fed field crops, pasture)
Irrigation is practiced on 772,000 hectares (adaptation to semi-arid climate)
- 5% of basin's land (77% of Canada's irrigated land)
- extracts 22% of the South Saskatchewan River's natural flow
- Accounts for over 90% of the basin's water consumption
The SSRB is vulnerable to repeated drought and climate variability.
40 droughts occurred in the last 100 years; historic decade-long droughts (e.g. 1920s-1930s); flood events in extreme-wet years; spatial variability.

Study Site: Elqui River Basin (ERB)
Location: Coquimbo Region, Chile
Land: 9,800 km² **Population:** 365,000 (mostly urban)
Agriculture: Vineyards, Avocado, value-added diversification (Pisco brandy)
Ag land: most arable land is irrigated; rocky land is utilized
Irrigation is practiced on valley floor and mountain slopes
- state of the art drip irrigation is used
- water flows by gravity from snowmelt mountain runoff
- irrigation accounts for 84% of Chile's water consumption
The ERB is vulnerable to water scarcity, climate variability, and desertification (reduced precipitation trend; anticipated encroachment of Atacama desert).

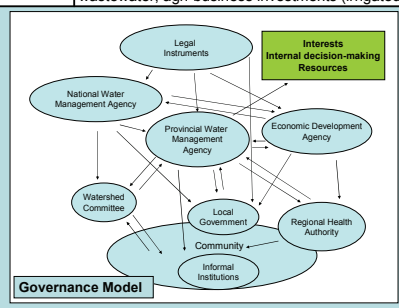
Water Governance Institutions

CANADA	CHILE
- Alberta Environment (water rights/ resource management, environmental protection) - Saskatchewan Watershed Authority (water rights/ resource management) and Saskatchewan Environment (environmental protection)	- General Directorate of Water (water rights and water resource management) - Commission of the Environment (environmental protection; developing River Basin Management policy) - the Water Market is a strong force
Provincial & Federal ministries of Health, Agriculture, Environment, Fisheries and Oceans, Natural Resources. 19 Federal agencies have some role in water. Local municipalities (drinking water and waste water systems).	National government agencies: - Superintendency of Sanitary Services (water, wastewater), Hydraulic Works (infrastructure), Health, National Irrigation Commission, Environment. Agriculture, Maritime Directorate & other ministries.
Prairie Provinces Water Board, International Joint Commission, Irrigation districts, Rural utilities, Watershed advisory councils, environmental advocacy groups, numerous NGOs.	Long history of civil society engagement (e.g. Rural Potable Water Associations, Irrigation Vigilance, Canal Associations, Water Community Groups). Private companies: community drinking water, wastewater; agri-business investments (irrigated Ag).

Grapes and value-added Pisco brandy in river valleys; Avocado plantations rise several hundreds of meters on steep mountain slopes.



Grains, oilseeds, livestock; dry-land and field irrigation;
Saskatchewan's Gardiner Dam is the world's 17th largest earthfill dam, storing 9.4 billion m3 water in a 225 km long reservoir.



Canadian Rural Stakeholders express concern over:
- long-term policy/ program needs to address climate/ water stress
- the need to simplify water governance (too confusing)
- environmental protection, water quality / quantity, climate impacts (variability, drought, flood)
- sustainable development
- adaptation for economic viability
- citizen engagement: citizens want to participate but have limited capacity (technical, financial, time, resource limitations)

Conclusions:
Canada's **"shared jurisdictional roles"** in water management are not always clear to stakeholders, creating challenges for regional and local decision-makers. Rural communities desire long-term planning to address climate variability and water stress. Canada has made positive advances in environmental protection, but rural communities continue to be concerned about water quality and the environment.

Chile's "**water market**" has created a positive economic growth in agriculture and industry. However, rural people express concern about water equity, and safeguarding the water needs of the small farmer and rural citizens. The Water Code (1981, 2005) was reformed to address issues related to hoarding of water rights, to safeguard ecological needs, and to address equity. Stakeholders are concerned about environmental monitoring, protection, climate impacts, and access to water.

While the governance models in Canada and Chile come from different paradigms, future climate-induced water stresses will require institutional adaptations to address community vulnerabilities in both countries. Flexibility, timely decision-making, conflict resolution, and clarity of roles of all orders of government are needed. Both countries have made strides to adopt integrated water resource management approaches. Citizens are seeking proactive roles in water management and active citizen engagement.

Chilean Rural Stakeholders express concern over:
- a need to know more about regional climate/ water stress
- a separation/ gap between local water issues and centralized management
- environmental protection, water quality/ quantity, climate change impacts and management options
- equitable access to water and competition for water with industry/business; improvements for reconciling differences
- a strong desire for citizen engagement; an increased recognition by the national government for the role of citizens in participatory planning for water management

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