

# **Governance and Adaptation to Climate Change: the cases of Chile and Canada**

by

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## **Abstract**

It is becoming increasingly clear that despite all the mitigation efforts, the concentration of greenhouse gases will remain high for a long period of time. In this context the development of a proper adaptive capacity is a fundamental task to ensure that future generations will be able to cope with the new climatic conditions. One of the most important determinants of this adaptive capacity is the existence of adequate institutions. Their role in the development and strengthening of adaptive capacity is paramount. Strong and well organized institutions can support adaptation activities and reduce undue hardship and intolerable risk. The paper focuses on the potential contribution of governance institutions to address the challenges of climate change. Using the cases of Chile and Canada the paper discusses how different architectures of governance in the area of water resources could contribute to foster the development of a strong adaptive capacity in arid areas in Canada and Chile.

*Keywords: governance, institutions, climate change, water resources, adaptation*

## **INTRODUCTION**

The focus of this research project, entitled “Institutional Adaptation to Climate Change” is to develop a systematic understanding of the capacities of regional institutions to formulate and implement strategies of adaptation to climate change risks and the forecasted impacts of climate change on the supply and management of water resources. Rural communities will be studied to identify current vulnerabilities to water and climate conditions. Potential future scenarios of climate change will be modeled. Institutions will be investigated to better understand regional institutional capacities to reduce the future vulnerabilities of rural communities to climate change and its impact on water resources. This research project is currently underway. This paper is a very basic and simplified overview of the governance aspect of the study. For more detail, see “Institutions and Adaptive Capacity to Climate Change”, by Diaz, Harry, Alejandro Rojas, Liska Richer, and Stephanie Jeannes, 2005.

## STUDY SITES

Research is being conducted in two semi-arid regions of the world. The Canadian site includes the South Saskatchewan River Basin (SSRB) in Alberta and Saskatchewan. The SSRB site has experienced recent periods of drought, increasing competition for water supply, and increasing societal concerns about water contamination from a variety of land use practices. The Chilean site includes the Rio Elqui river basin in the Coquimbo Region of Chile. This region is considered the gateway to desertification in Chile with the driest desert in the world, the Atacama, located immediately to the north. Predictions for future global climate change suggest these two semi-arid regions will experience increases in temperature, variable changes in precipitation, and a net decrease in available water for agriculture. Both regions would seriously suffer from such changes; the ability of society to adapt to such changes is unknown.

## STUDY METHODOLOGY and THE CONCEPT OF VULNERABILITY

Historic, present and future climate scenarios (Year 2050) will be documented by physical scientists from the Universities of Regina, Canada and La Serena using Global Climate Change models.

Past, present and forecasted societal vulnerabilities resulting from limited water resources induced by climate will be researched. Social researchers from a number of Chilean and Canadian universities will study such vulnerabilities as: access to water resources, water conflict, political stability, economic security, population demographics, poverty, health risk, wealth distribution, *etc.* The social research will focus on assessing society's institutional capacity to adapt to climate change impacts on water resources. Historic and present vulnerabilities on water resources, induced by climate will be investigated and future scenarios will be forecast. The intent is to integrate both social science research and physical science research findings (Figure 1 – Integration Model). Research results will be disseminated using geographic information system (GIS) mapping methods depicting climate change scenarios and potential social impacts.

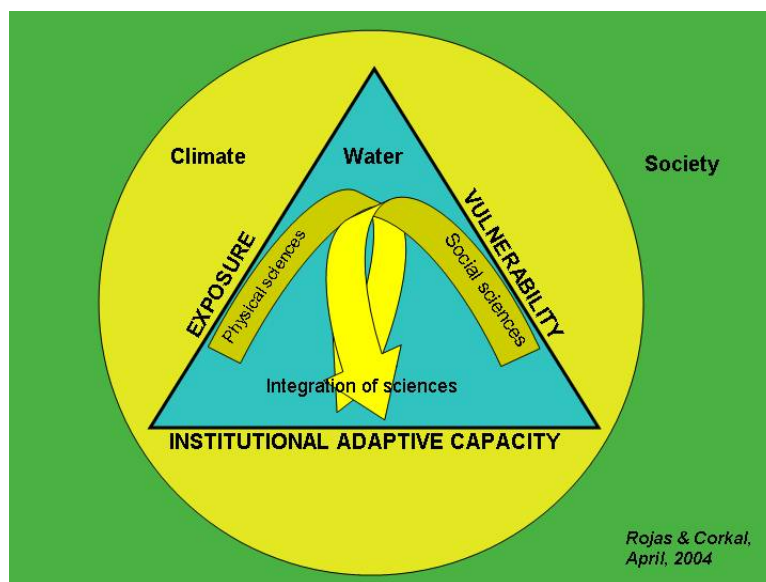


Figure 1 - Integration Model

The conceptual vulnerability model considers the exposure of a system, its vulnerability and its adaptive capacity. Adaptive capacity is the particular system's capacity to adapt to risks imposed by exposure (in this case to climate change and its effects on water resources). Successful adaptation occurs when the system is capable of reducing its vulnerabilities to the risks. In effect, the system uses its adaptive capacity to successfully cope with the exposure.

## **WATER INSTITUTIONS AND GOVERNANCE**

One aspect of the Institutional Adaptation to Climate Change (IACC) project is to better understand the roles played by governance institutional actors, in the development (or underdevelopment) of the adaptive capacity of rural communities. This aspect of the research will focus on the problematic of vulnerability within the context of an institutional system.

“Institutions” are rules, which define roles and procedures for people, and their resulting organizational forms. They determine what is appropriate, legitimate and proper by establishing cognitive and normative structures which define perceptions and interpretations.

In the context of climate change and water resources, the project is investigating the institutional governance capacity:

1. to identify problems and issues in civil society
2. to seek solutions to those problems and deal with issues
3. to implement solutions.

The focus of the IACC project is the rural communities. Formal institutions will include a variety of institutional actors. Key aspects will include issues of governance, the economy, and health. Informal institutions will also include a variety of institutional actors, from citizens to farm communities and watershed groups, etc.

Governance is defined as the processes and institutions by which authority in a country is exercised for the common good (World Bank, 2000). The exercise of authority includes three elements:

1. The process by which those in authority are selected, monitored and replaced.
2. The capacity of the local government to manage its resources effectively, and to implement sound policies.
3. The respect of citizens and the local government for the institutions that govern economic and social interactions between them.

A community is affected by the governance structure. Local water resources have the most profound effect on the local community. In general, the governance structure of water resources consists of local government, watershed groups or agencies, regional health authorities, environmental agencies, research agencies, economic development groups, provincial water management and regulatory agencies, and national water agencies. Government (local, provincial, national) is bound by formal instruments, inter-agency relations and regulations. All of these actors have values systems (formal or not), internal decision-making processes, and defined resources (capital and human).

A simple definition of “governance” is “the act, manner, function or power of government”. Governance is the process of “governing”, or, “to exercise authority over, rule, administer, direct, control, manage, etc.” Governance connotes “the maintenance of public order and the promotion of common welfare” and “orderly management”. (Websters New World Dictionary of the American Language, 1980).

The assessment of water institutions will evaluate the rules that define the use and distribution of water resources, the organizations that define and apply these rules, and the cognitive and normative structures of these institutions. This will include:

1. Organizations and their links: relationships, roles, responsibilities, distribution of power.
2. Instruments: formal legal and political rules, affecting water management, climate, environment and health.
3. Management and decision-making: the openness of institutions, their ability to identify and solve water management problems (caused by climate, and its effect on society)
4. Institutional values toward climate change and sustainability: present values, values for future planning, values toward societal vulnerability and adaptation.

### **THE CONTEXT OF WATER INSTITUTIONS IN CHILE AND CANADA**

Different institutional contexts exist between Chile and Canada. Water resources in Chile can be characterized as being governed by centralized authority (national government). However, the free market is the central organizational mechanism affecting the management of water resources. Water rights are granted by the national government, but these water rights can be privately held, and can be freely bought, sold or traded on the market (based on the Chilean Water Code established in 1981, revised in 2005). The Chilean Water Code is established in Chile’s Constitution, and this establishes water management principles for the country.

In contrast, water resources in Canada can be characterized as being governed by decentralized authority. Complex governance systems have been established to define the roles for federal, provincial and local governments. Provinces retain the legal and political water management roles. This complexity of governance is a key factor affecting water management in Canada. Provinces grant water rights but water rights cannot be privately held, traded or sold in Canada. Water resources and water management are not explicitly mentioned in Canada’s Constitution.

### **Chile and the Rio Elqui Basin: A Brief Synopsis of Climate and Water**

The study site in Chile is the Rio Elqui in the 4<sup>th</sup> Region, the Coquimbo Region. The Elqui River flows westerly from the Andes mountains into the Pacific Ocean. The Atacama Desert lies to the north of the Coquimbo Region. The Region has been experiencing a decrease in yearly precipitation and an increase in evapotranspiration. Aridity has been increasing and there is a concern that the desert is encroaching further south. There are increasing unbalances between water supply and water demand. Significant development has occurred in the recent past, particularly with intensive, high-value irrigated crops. The potential for water conflict is very real. Table 1: Water Use in Chile, provides an overview of the major water use pattern

in Chile. Note that the Energy increases are related to hydro-electricity, which is a non-consumptive use of water. Agriculture is a consumptive use. Irrigated agriculture is the largest consumptive user of water in Chile.

**Table 1: Water Use in Chile, in m<sup>3</sup>/s**

Sector	1993	2015
Agriculture	6,550.7	9,925.4
Human Consumption	354.0	603.6
Industrial	639.6	1,580.4
Mining	546.0	799.2
Energy	19,236.6	172,138.0
<b>Total</b>	<b>27,326.9</b>	<b>185,046.6</b>

Source: Universidad de Chile, *Informe País. Estado del Medio Ambiente en Chile*, LOM Ediciones, 2002

### **Institutional capacity to deal with water scarcity in Chile**

Chile's institutional capacity to deal with water scarcity is restricted due to legal and political conditions. The access to, and use of water, is defined by Chile's Water Code (1981, rev. 2005). The Code established a water market, and has limited the state's power to regulate water resources. The core of the Chilean Water Code is that water rights are separated from land rights. Water rights may be freely bought, sold or traded. Water rights are allocated by the national government. The rights are not conditional on the type of use and there is no priority list for granting water rights. In the event of water conflict, the role of the state is limited. (Galaz, 2003).

One of the main reasons for establishing the Water Code in Chile was to take advantage of the country's potential for agricultural economic development with irrigated agriculture for high value crops. In recent years, there has been significant economic investment in agriculture and hydro-electricity. This has included large investments in state-of-the-art agricultural infrastructure for water delivery, food processing and manufacturing, and for transport and export of fruits, vegetables, and value-added foods and beverages. The Water Code has resulted in some positive aspects of the leasing of rights during periods of drought, and improvements have occurred in the delivery of water to consumers.

Negative impacts have also occurred. Conflicts have emerged between consumptive and non-consumptive uses of water. Some hoarding and speculation of water rights have occurred. There is also a concern of "stealing from the poor". "The Chilean water market is characterized by the "law of the jungle", where the powerful can do what they want with the water rights of the small". (Galaz, 2003). Public and private institutions have limited capacity to resolve these conflicts, and the judicial system is slow, costly and unpredictable.

### **Canada and the South Saskatchewan River Basin: A Brief Synopsis of Climate and Water**

The study site in Canada is the South Saskatchewan River Basin, extending along the South Saskatchewan River which flows from the Rocky Mountains easterly across Alberta, and

northeasterly across Saskatchewan until it joins the North Saskatchewan River past Prince Albert, SK. The region is largely a dryland farming region, but relies on significant investments in irrigated agriculture in southern Alberta, and in portions of southern Saskatchewan near Outlook, SK. The region is particularly susceptible to drought and has experienced significant droughts since settlement in the 1900s. The historic impact of drought has been dramatic on the population, and resulted with relocation of settlers in the 1930s. Governments have responded to drought with policies and programs, but the region remains affected by climate and its effect on water. Dryland farmers are obviously most affected by drought. While potential exists for expanding irrigated agriculture, the potential is limited by the hydrologic limitations of the resource, and the economic limitations to deliver water within an affordable distance. Water resources in southern Alberta are essentially fully-allocated.

### **Institutional capacity to deal with water scarcity in Canada**

Canada has many institutions with an interest in water resource management. These include institutions from federal, provincial and local government, such as departments of environment, health, natural resources, watershed agencies, power, agriculture, Indian and Northern Affairs, fisheries, parks and recreation, communities, municipalities, non-government organizations and citizens.

In essence, water resources of rural communities are managed by the local government, which is overseen by rules and regulations that are established at arm's length by provincial and national governments. The local governments are left to implement those regulations by their own resources. The local governments have significant local knowledge. They are often stretched to become experts in all areas of management, such as legislation, budgeting, environmental issues and business. Often, rural communities are small, and are challenged to research and learn each issue they might be faced with. This is particularly the case where local governments of rural communities are comprised of rural citizens who are also striving to manage farms, ranches and undertake other full-time work.

Some preliminary project findings from two small rural communities in the South Saskatchewan River Basin in Saskatchewan found positive capacities to adapt to climate change impacts on water resources. These included establishing:

1. local water conservation program to deal with drought.
2. household water management techniques.
3. farm water management strategies.
4. community solidarity working together to manage water
5. diversifying crop varieties.
6. diversifying income sources.

These two small communities also expressed a negative critique towards provincial and national governments. Small communities expressed complaints about:

1. having to deal with a large number of government agencies
2. the lack of available information about government roles and responsibilities (who does what)
3. a lack of "sufficient government understanding" of the local situation

4. the challenge of having to apply “province-wide regulations” to their local context  
Local government was not viewed as government.

## **SUMMARY**

Chile and Canada both recognize water as a public good. Governments are involved in the allocation of water rights, and are involved to some degree in the legal and administrative control of water resource management. Both countries have numerous government and non-government institutions involved in water resource management. Chile relies on its Water Code to guide water resource management, and the Code has established water rights as a commodity. This has placed a certain economic values to water. Canada does not expressly manage water in its Constitution. Provincial governments are responsible for water resource management. Numerous water acts and regulations exist. Canada relies heavily on government agencies to manage water resources, while Chile’s government is more detached from direct water management responsibilities. The water market in Chile has been very useful for agricultural economic development, but may have limitations for environmental management and the resolution of water conflict. Canada’s multi-governance approach is likely advantageous for environmental protection, but may be limited in recognizing the economic value of water resources. The complexity of agencies is also very confusing to understand roles and responsibilities, and to co-ordinate activities. Rural communities and government institutions will need to find ways to deal with climate change exposure, and resulting water resource vulnerabilities. Working together, new adaptation strategies may be beneficial in increasing the capacity of the communities to deal with these risks. Institutional governance will be a key factor in helping increase adaptation to water resource management issues.

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<http://www.parc.ca/mcri/index.php>

*Follow the links to Current Projects, Institutional Adaptation Project*

Aspects of this overview paper were extracted from “Institutions and Adaptive Capacity to Climate Change”, by Diaz, Harry, Alejandro Rojas, Liska Richer, and Stephanie Jeannes, 2005.

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