Analysis of the Role of Institutions in Water Conflicts

Final Report

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IACC Project, Unit 1 B

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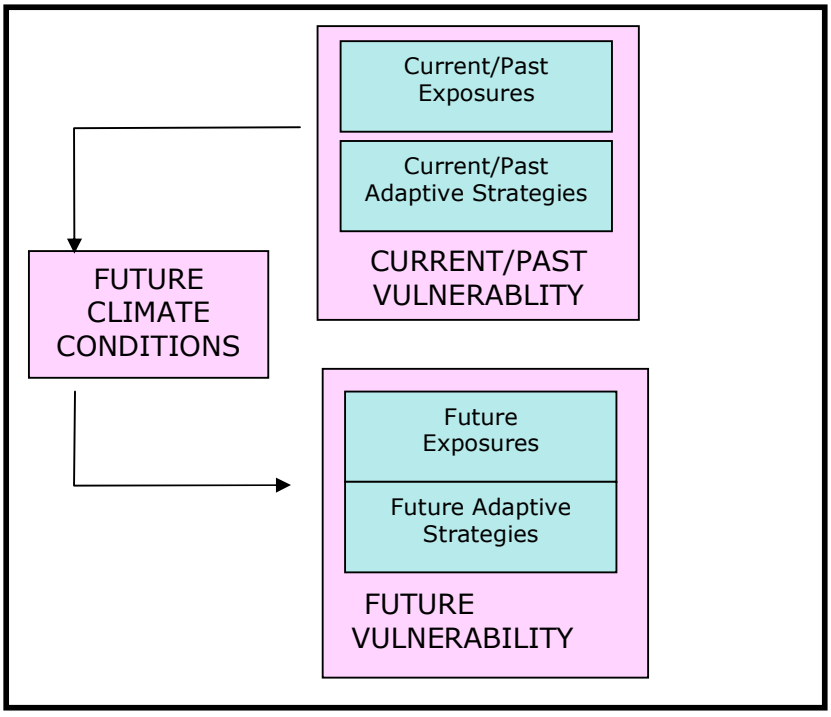
I. Problem Definition

I.a. Explanation of the overall Project of Institutional Adaptation to Climate Change and its objectives

This report presents the learnings attained from our analysis of the "Role of Institutions in Water Conflicts. The report is part of a broader project titled "Institutional Adaptation to Climate Change" (IACC). The IACC Project is being funded for five years by the Social Sciences and Humanities Research Council of Canada (SSHRCC). The project falls in the category of SSHRCC's Major Collaborative Research Initiative. The IACC project team includes researchers from Canada and Chile (Please see details of the IACC project at http://www.parc.ca/mcri/).

The main goal of the Institutional Adaptation to Climate Change Project is to develop a comprehensive and systematic understanding of the capacities of institutions to formulate and implement strategies of adaptation to climate change risks and the forecasted climate change impacts on the supply and management of water resources in dryland environments. The project's goal is addressed through a comparative study of two regions at different stages of social and environmental vulnerability: the South Saskatchewan River Basin, in western Canada, and the Elqui River Basin, in north-central Chile. Based on well established and credible global climate models that forecast an increase in climate variability that will lead to increased droughts in the two regions under study, the project focuses on water and rural communities, which is understood to be the terrain of investigation or microcosm that will allow a better understanding of the broader issue of adaptation to climate change (Diaz, et al., 2003/04).

Figure 1. The Vulnerability Assessment Approach



As mentioned in the midterm review for the Institutional Adaptation to Climate Change (IACC 2006), "a key element in the project's approach to studying adaptations to climate change has been the concept of *vulnerability*." In the IACC project, vulnerability is understood as the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Therefore, the most vulnerable systems are those that are most likely to be exposed to perturbations, have a limited capacity to adapt and the least resilience to recover. Thus, vulnerability is characterized as a function of the exposure of a system—a household, community, ecosystem, etc—to climate change and its adaptive capacity.

In broad terms, a system that is most exposed to climatic stimuli will be more vulnerable and a system endowed with greater adaptive capacity will tend to be less vulnerable because of its ability to cope with exposure to climatic stimuli.

Based on this approach to vulnerability, our team adopted a model for assessing "vulnerability," whereby a system is analyzed in the context of its current vulnerability (as well as its current adaptive capacity), and then the system is assessed in its current vulnerability in the context of future conditions as a result of climate change. Thus, as stated in Midterm Review a project document (2006), "the model in Figure 1 emphasizes the need to analyze not only the future vulnerability of systems, but also their vulnerability in the context of current and future climate conditions. The model identifies three sets of interrelated activities: (a) the development of a systematic understanding of the current exposure of a system and its adaptive capacity; (b) the assessment of future climate conditions for the area where the system occurs; and (c) the assessment of future vulnerabilities based on an analysis of how the existing vulnerabilities of the system will be affected by future climate conditions. The strengths of this vulnerability model are that it offers a consistent framework for an interdisciplinary approach characterized by the use of different methods, allows for an active engagement of stakeholders, accommodates uncertainty, is relevant to climatic science, and easily connects with decision making."

I. b. Unit 1 B: Analysis of the role of institutions in water conflicts and its importance in achieving the main goals of the IACC project.

The main goal of Unit 1 B is to understand the role of institutions in the resolution of water conflicts, a role which is understood to be of great relevance for assessing the capacity of institutions to adapt to conditions of water insecurity related to climate change.

Why study conflicts?

According to Ashton (2000) water is a "common good" because it flows naturally from one place to another which makes it difficult to establish "ownership" over it. The best management of this "common good" then is achieved through collaborative efforts among the various water users. However, an increase in competition over water due to population increase and/or human activities can result in tensions and disputes among water users or stakeholders, who From Ashton's (2000) discussion and others (UNESCO and Green Cross International, and Swart, 1996), instability, tension and disputes among water users are the key conditions for "water conflicts."

In this report we adopt Ashton's definition of water conflict: "[in] its simplest and broadest sense, the term 'water conflict' has been used to describe any disagreements and dispute over

or about water, where social, economic, legal, political or military intervention has been needed, or will be required, to resolve the problem" (Ashton, 2000, p. 69-70).

This report describes and explains the importance of the study of water conflicts and how institutions address them in order to understand the exposures experienced by communities, their adaptive capacity and their vulnerabilities to climate change. The authors start with the premise that one of the key aspects in the study of water conflicts is that power differential among the stakeholders in the resolution of the conflicts (for example, the rural communities and the political organizations that govern water resources) may increase the exposure of the communities and negatively affect their capacity and increase their vulnerability to climate change impacts.

On the other hand, the study of environmental and water conflicts (Rojas & Reyes, 2003; Rojas et al 2006) reveals that the inclusion of a wide range of stakeholders in the resolution of conflicts and that a genuine effort to understand their interests and values related to water issues may decrease the exposure, increase the adaptive capacity and therefore reduce the vulnerability or rural communities to climate change impacts. However, in the resolution of the conflicts both types of outcomes can co-exist, whereby the vulnerability of some communities to climate change impacts increases while for others it decreases.

Institutions whose roles are of most relevance to our study are those that have been stakeholders in water conflicts and participate in water governance. These are the institutions and their instruments that directly influence decision making processes, such as government institutions responsible for the management and allocation of water, a wide range of water users such as irrigation groups, and other organizations of the civil society that influence decisions on water like environmental groups. The role of these institutions in water conflicts and the learnings attained by communities involved in these conflicts are the focus of this component of the IACC project. Therefore, the study of water conflicts shows that the type of management and resolution of a conflict affects the complex relation among exposure to climate change, the vulnerability of the communities and the adaptive capacity of institutions (Figure 2). In addition, the study of water conflicts shows that the challenges of institutional adaptation to climate change require the integration of social and natural sciences and that these in turn be integrated in local knowledge and values of the communities.

From the perspective of our study, the capacity of communities to adapt to climate change impacts is to a great extent a function of the role that informal institutions, such as rural communities, and formal institutions, such as public and private organizations, play in developing those adaptive capacities (Diaz et al., 2006). The success or failure of these institutions to guide the communities to adapt to climate change and their capacity to understand the experiences of these communities is related to the vision of the institutions and to the appropriateness and effectiveness of the strategies they are developing to address impacts of climate change, in general, and water governance, in particular.

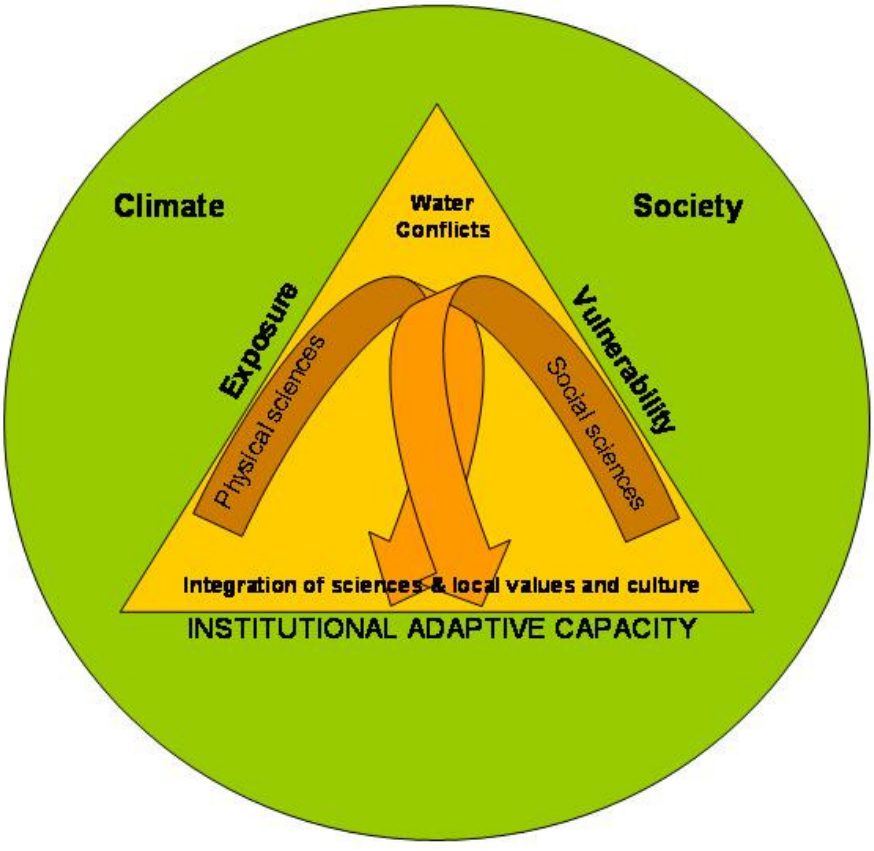
The vision and strategies that the institutions develop can be the result of anticipatory or proactive measures (based on the forecasted scenarios) or purely reactive measures developed to address a situation of crisis.

We seek to understand whether an institution's involvement in a water conflict increases or decreases its capacity to guide inform or direct communities in their efforts to adapt to

climate change impacts, and therefore, directly influencing the level of vulnerability of those communities. To address this specific objective, we analyzed three cases studies of water conflicts: the Oldman River Dam, in Canada (South Saskatchewan River Basin), and the Puclaro Dam (Coquimbo region) and the Pascua Lama project, in Chile. Despite being located 300 km to the north of the region under study in Chile, the Pascua Lama project was considered as an emerging case of critical importance for the objectives of Unit 1 B. The rationality and justification that guided the selection of case studies is discussed below, in the Methodology section, section II.

I.c. Conceptual framework and basic assumptions for Unit 1 B

Figure 2. Relation: Exposure – Vulnerability and Adaptive Capacity in water conflicts



In the context of climate change impacts, increase in water scarcity coupled with growing demand for water often lead to conflict among users. Therefore, as presented in Figure 2, although the vulnerability of rural communities is a function of their exposure to climate change and the adaptive capacity of their water governance institutions, water conflicts often mediate and influence institutional adaptive capacity because the manner in which the conflict is managed and resolved enhances or diminishes the adaptive capacity of these

institutions, as illustrated in the case studies in this report. The figure indicates that collaborative approaches between social and physical sciences, which require attention and sensibility to local values and culture, can provide opportunities to enhance institutional adaptive capacity which in turn reduce the vulnerability of communities to water scarcity conditions.

According to the 2004 Environment Canada Report "Threats to water supply in Canada" the major concerns on climate change impacts include key changes in the hydrological cycle that affect the rate of snowmelt and the frequency of occurrence of dryer summers caused by increased rates of evaporation and evapotranspiration, in spite of an increase precipitation in some regions. In addition to a general increase in water demand—as reflected in the competition over water use by agriculture, industry and municipalities—the decrease in the supply of fresh water will threaten the health of aquatic ecosystems in Canada, affecting a wide range of issues including the fulfillment of national and international water agreements, instream water values and the water rights of First Nation communities (Environment Canada, 2004).

The Environment Canada Report states that the decrease in water supply is accompanied by an increase in consumptive water uses as a result of the increase in water used for irrigation, which in turn leads to an increase in demand for more dams, especially in the prairie region of Canada where annual precipitation can be as low as 300 mm. Until now the withdrawal of water for irrigation in the prairies constitute 75% of total water withdrawals in Canada. In the province of Alberta alone there are 630,000 hectares of irrigated lands, which comprise 60% of the total lands irrigated in Canada (Environment Canada, 2004).

Alberta Environment in its recently approved Water Management Plan for the South Saskatchewan River Basin (WMPSSRB) lists a range of challenges that requires the development of a water management plan to better manage the water resources in basin. Echoing issues raised in the 2004 Environment Canada Report, the WMPSSRB addresses issues related to the increase in demand for water, relative to supply, water needs of First Nation communities, inter-provincial water agreements, the declining health of aquatic environments in portions of the SSRB and knowledge gaps concerning how the aquatic environment responds to changes in river flow regimes (Alberta Environment, 2006, p.5).

In the Americas, Chile is the country that has gone furthest towards privatization of its hydrological resources. The Water Code issued by the military regime in 1981 became the legal instrument to transfer water rights from the public domain to private individuals, companies or communities. The Law Decree 1122 of 1981 in its Article 5 establishes that "fresh water is a national good for public used that can be assigned to individuals to use…" The Code establishes that the owner can use it without many restrictions save for those established on the law and that the assigned water rights are permanent, for life, and can be sold on the market without restriction of use. There is no priority for human use.

The main objective of the Code was to create juridical certainty of water rights as incentives for private investors. This certainty, although an economic advantage, has also created water speculation and hoarding. The legislation has created a water market plagued by monopolistic control and speculation and at the same time has seriously limited the role of public institutions to save guard other critical aspects of hydrological resources, namely, the ecological and social functions of basins and aquifers (Dourojeanni, Axel, 1999). Minor modifications to the water legislation only took place in 2005 but those did not substantially

alter the water rights nor did it attend the demand for a basin approach nor the protection of glaciers on the legislation.

Another critical aspect of the Chilean water legislation is the lack of definition of adequate management levels for hydrological resources at national, regional and specially at the basin level, to deal with the increase population and growing competition for water among productive sectors. The development of a national strategy to protect basins and the ecological flow of rivers was initiated in 2007 and is still poorly developed (Gobierno de Chile, 2008).

The vast majority of Chilean rivers are snow and glacier-fed in the upper reaches of Andean highlands, running 100 to 150 kilometers until the reach the coast of the Pacific Ocean. Although the current concerns with decreasing patterns of rain, snow fall and the shrinking of glaciers has become more evident with the emerging climate change scenarios (CONAMA, 2007) a legislation to protect glaciers and headwaters is pending while water demand and competition escalate (ChileSustentable, 2008).

The recent report by UNEP on the "Global Outlook for Ice and Snow" warns that diminishing ice reserves could destabilize large ecosystem with devastating impacts on hundreds of million of people" (UNEP 2007). This warning is linked with recent scientific reports that demonstrate that over 87% of Chile's glaciers are also diminishing (Carrasco et al. 2005; Rivera, 2005). The need to urgently protect glaciers from mining activities and other human interventions has been demanded by politicians, scientific community and NGO community and is still a pending task on the Chilean parliament (Bórquez et al. 2007)

Adaptive capacity and vulnerabilities to climate change

Natural Resources Canada's Climate Change Impacts and Adaptation Directorate (2004) states that the adaptive capacity of a social system to impacts of climate change is determined by the level of economic resources, technology, information and skills, infrastructure, social institutions and equity. For the IACC project, the focus is on social institutions as we seek to "understand the adaptive capacities of *some* informal institutional actors –rural communities and rural households— and the roles played by formal institutional actors –public and private organizations—in the development of those capacities" (Diaz et al., 2005, p. 6).

In the South Saskatchewan River Basin there are examples of recent as well as potential examples of water related conflicts which water governance institutions have had to deal with and will need to address in the future, especially with increased water demand but diminishing water supply due to climate change impacts. Examples of recent extreme climatic events in the South Saskatchewan River Basin are the droughts of 1984-85, 1988-1990, and 2000-2001, which presented challenges for members of the community in the basin, but also opportunities for cooperation (Wittrock, et al., 2006).

The 1984-85 drought was the decisive trigger for the construction of the Oldman River Dam and its associated conflicts. The International Boundary Waters Treaty between Canada and the United States regarding an equitable apportionment of the waters of the St. Mary's and Milk rivers, which flow through parts of northern Montana and southern Alberta, has been

the subject of dispute between the two countries and it is a conflictive issue in that some people are calling for a new treaty to replace the existing one. Other water related potential sources of conflict include the inter-provincial apportionment agreement between Alberta and Saskatchewan and the over-allocation of water licenses in some basins.

In Chile, water related conflicts have become increasingly common as mining, energy, agriculture, aquaculture, cities, native people and environmental community claim their rights to water resources. The ongoing conflicts around the projected construction of five large dams in Patagonia has sparked a national as well as an international debate over the use of the last of pristine rivers of the country with its long chain of impacts over water ecosystems (Orrego et al, 2007). The conflict over the construction of large gold mining operations in the upper reaches that will impact on the glaciers of Huasco Valley in the Copiapo region is still confronting local communities, large land owners, government and Canadian-based Barrick Gold (OLCA, 2007).

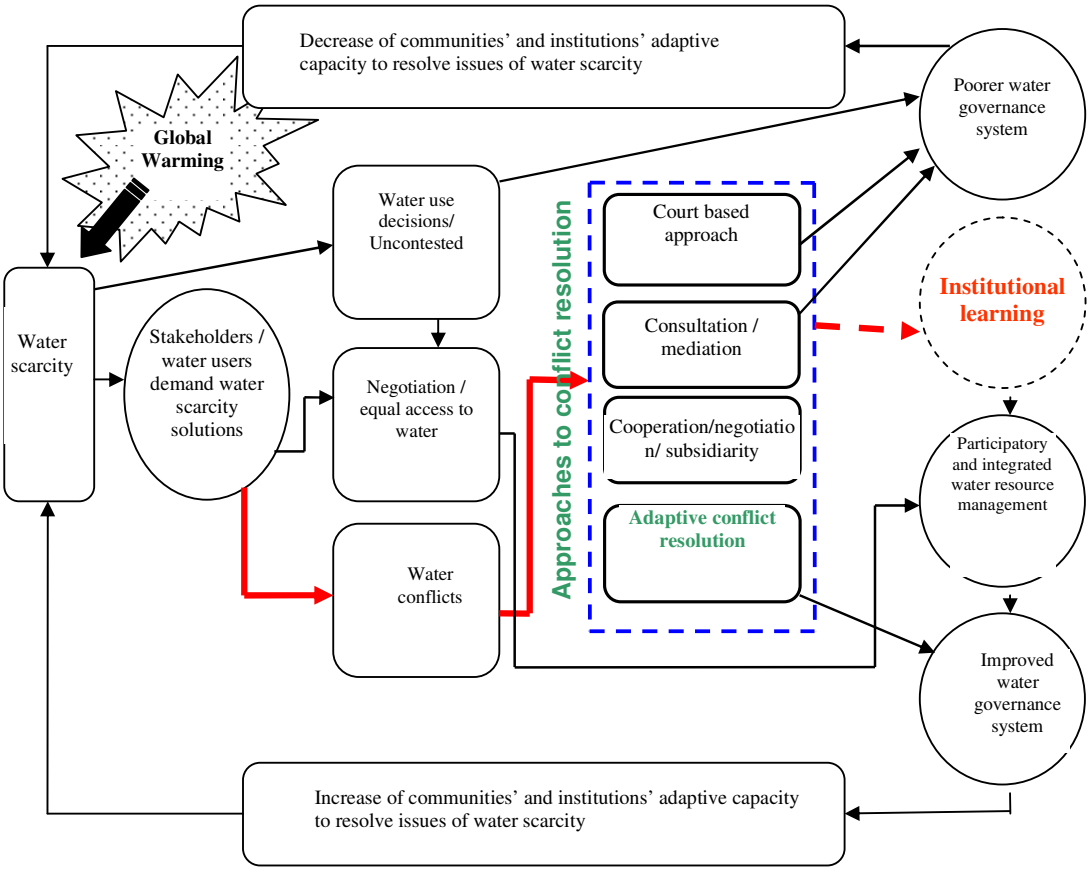
Water conflicts also when new irrigation dams are built to improve the water security of a basin and local communities are displaced by the project. As new water rights emerge and stored water provides new opportunities for those holding water rights, often the local traditional water use is drastically modified and excluded from the benefit of public works, as demonstrated in the case of the construction of the Puclaro Dam in the Elqui River basin in the late 90's analyzed in this unit.

The climate change scenarios portray serious impact on snow and ice reserves in the Andes (UNEP, 2007). As the future climate change report was being published a drought affected a large portion of the country in what has been regarded as the most extensive drought in the last 100 years. It impacted all the major agri-cultural basins all the way to Patagonia. Many rural freshwater drinking system failed and government agencies were unable to provide a timely response to the critical scenario faced by agriculture, specially small and survival agriculture communities (El Mercurio, 2008). Electricity was also affected as rivers did not feed the dams with the expected water supply. Conflicts between irrigation districts and energy companies become more acute this year (JVRío Maule, 2008). The vulnerabilities of the system and the most vulnerable communities were clearly mapped by the drought.

Figure 3 depicts a simple but useful model that presents scenarios where we can trace the path to a sustainable or unsustainable[1] water governance system, depending on the process of participation and involvement of the stakeholders, which in turn results in the level of legitimacy and validity of water governance institutions for the communities whose needs these institutions should address. When institutions are legitimate and valid, stakeholder communities are more open to accept the development of strategies and measures for the management of water during times of water scarcity, and especially when the conditions of water scarcity are further exacerbated by impacts of global warming. The case studies will illustrate the potential of this model.

[1] Sustainability is a process that in the long term maintains the biological and ecological integrity of natural resources and the material and energy flows to sustain the economic activities of farmers, agri-business and industries, contributes to the wellbeing of human society, and helps the economic development of regions and countries.

Figure 3: Path to a sustainable water governance system



In the past, in times of water scarcity water governance institutions implemented strategies and measures often without providing opportunities to the affected communities to participate in the decision making process. For example, the World Commission on Dams (WCD) states in the past groups and communities whose lives and livelihood were affected, particularly by the construction of large dams, often did not have the opportunity to participate in the decision making process and therefore the risks associated with the construction and operation of the dams were imposed on them. As late as 1990s the planning processes for the construction of dams were neither inclusive nor open (WCD, 2000). At the same time, perhaps because of the lack of information or awareness of the impacts of the dams the affected communities simply accepted the decisions without any contestation. In cases where the lack of transparency and participation in the decision making process produces more harm than benefit, the affected communities and governance institutions lose their adaptive capacity because of the harm produced such as uprooted communities and environmental degradation. Thus, the upper part of the model in Figure 3 depicts a condition where the affected communities and water governance institutions lose their adaptive capacity to address problems derived from conditions of water scarcity.

In more recent years, communities affected by water scarcity conditions have demanded participation in decisions processes because they have greater information and awareness of

the consequences of dams. For example, the WCD states that due to the construction of large dams, about 300 per year, about 4 million people were displaced annually between 1986 and 1993, and overall about 40-80 million people have been displaced worldwide by the construction of more than 45,000 dams. With greater access to this information, communities have been able to force water governance institutions to negotiate with them and accept their participation in the decision-making process. In these instances, these institutions attain legitimacy and validity for communities, thus enabling the development of decision-making processes that can contribute to sustainable forms of water governance, especially when agreements reached are based on consensus and perceived as fair by the stakeholders.

On the other hand, a condition of conflict arises when communities affected by water scarcity conditions demand participation in the decision making process but water governance institutions do not allow their participation; or, even if their participation is allowed, an agreement on the decisions taken is not reached, either because the communities find that their participation in the process is not meaningful (their perspectives and values are not genuinely heard or taken into account) or the potential results of the decisions such as differential access to and benefit from the scarce water supply are perceived as unjust. The WCD (2000) reported that the majority of the more than 45,000 dams built worldwide in the 20th century were typically driven and assessed by their economic performance, but as information on the consequences of on communities and ecosystems has become more available opposition to the construction of dams have also increased.

On the other hand, there are instances when despite the emergence of a conflict, as depicted in lower path of the model in Figure 3, there are approaches to the resolution of these conflicts that could still lead to a sustainable water governance system[2]. As analyzed in other sections of this report and in other case study reports and working papers for Unit 1 B, there are various approaches to the resolution of conflicts that do not lead to sustainable water governance. When conflicts are too volatile and are not negotiated with appropriate methods, consensus solutions are difficult to achieve, and the conflict can end up in court where a decision is imposed. This type of resolution can result in winners and losers and often obstruct the attainment of novel, sustainable and adaptive solutions.

However, in spite of the volatility of some conflicts, important lessons can be learned and drawn from them which could eventually lead to more desirable outcomes. For instance, Rojas et al. (2002, 2), when discussing environmental conflicts in general conclude that "the most explosive conflicts can be channelled in culturally constructive ways […and that such conflicts] can contribute to the creation of new cultural realities." Rojas et al. (2002) add that the creation of this new cultural reality necessarily involves processes of resolution of environmental conflicts that recognize and address power asymmetries, differences in knowledge systems, values, ideas, and voices of those involved in the conflict, including First Nation communities, environmentalist and local communities as well as local industry and governments. This resolution of conflict is termed Adaptive Environmental Conflict Resolution (Rojas et al., 2002 and Rojas et al., 2006) and adopted in this model as simply Adaptive Conflict Resolution (ACR).

[2] Nowadays, water governance includes aspects such as equitable access to water, but often it does not address environmental aspects necessary for maintaining the integraty of ecosystems in the long run.

Sustainable management of water resources should enhance the ecological integrity of ecosystems by diminishing their variability and increasing their response capacity to disturbances. Sustainable Water governance from the social perspective requires a democratic framework able diminish the power differential, leading to a more equitable position in the negotiations among stakeholders. A sustainable system of water governance is inclusive of all stakeholders, diminishes power differentials and enhances collective learning and capacities to strategically plan and prepare for variations in water regimes associated with climate change. In turn, social responses should orient decisions, technology and investments for more effective and use of water resources, which in turn reduces exposure to water variations induced by climate change impacts.

According to Rojas et al., the resolution of a conflict follows the dynamics of an Adaptive Conflict Resolution if the following characteristics of resolution are observed during the process:

1. Early and equitable access to information on projects that modify water accessibility, availability and quality is ensured to all parties involved, including information on the parties' views

2. Balanced, symmetric power relations are provided in negotiations and decision-making regarding the outcome of the conflict

3. Recognition, respect and fostering of differences in values and perspectives toward creative solutions

4. The resolution of the conflict aims at securing the integrity of ecosystems and restore the negative impacts on biodiversity

5. The social capital of the communities involved is strengthened by the resolution of the conflict

6. Corporations or institutions involved in the resolution of the conflict strengthen their technological capacity and institutional adaptation toward sustainable water governance

7. Social organizations improve their creativity and capacity to negotiate because of their involvement in the conflict

8. The democratic authority of the state is strengthened when its moral authority overcomes the use of coercion in the resolution of the conflict

The above principles provide a framework to evaluate the resolution of water conflicts. Adaptive conflict resolution should increase the adaptive capacity of communities by increasing dynamics of collaboration and mutual support and establishing fairer mechanisms for sharing scarce water resources. The resolution of water conflicts that leads to greater inclusiveness, transparency, and respect of all stakeholders'values will add legitimacy, thus this will diminish vulnerability to respond to climate induced water variability.

To summarize, regardless of the approach used in the resolution of the conflict or the type of results attained, there are important learning's that can be drawn and used to inform a more

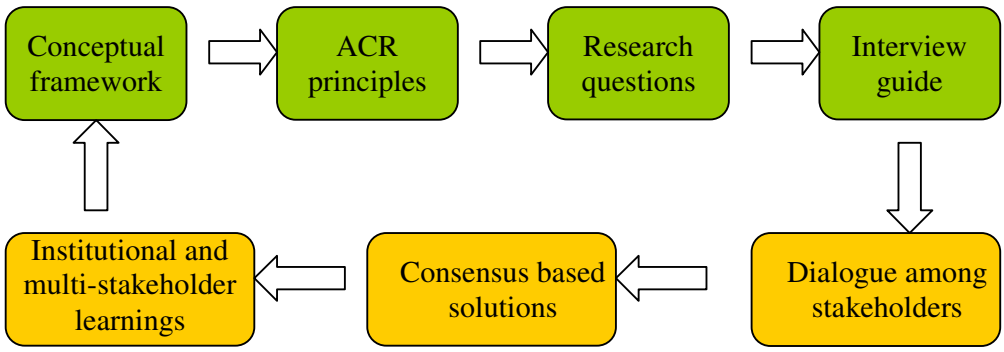
sustainable system of water governance, thus increasing the adaptive capacity of communities to address water scarcity problems. However, a vision of what constitutes "successful adaptation" allows the establishing of criteria that help define this adaptation through dialogue among the stakeholders in the conflict.

II. Methodology for Unit 1B on water conflicts and its relation to the broader project of Institutional Adaptation to Climate Change

The research methodology aims at establishing a feedback loop among the a) adaptive conflict resolution and vulnerability conceptual framework, b) the research questions guided by the ACR principles and the vulnerability model to assess how the conflicts have been resolved, c) the interview guide utilized in interviewing key informants, d) the dialogue among the stakeholders that seek consensus solution, e) evaluation of how consensual those solutions were and f) institutional learnings derived and g) the extent to which institutional adaptations diminished the vulnerability of communities.

The scheme below illustrates those methodological steps.

Figure 4: Methodological steps for the study and evaluation of water conflicts and their outcome



II.a. Overall research questions

The following broad research questions guided the research for Unit 1 B

1. Do the approaches to water conflict resolution and the role of institutions in the conflicts contribute to the development of water security policies that increase or decrease the vulnerability of communities to water regime changes related to climate change?
2. What do water conflicts teach us on the adaptive capacity of the institutions and communities to address conditions of water scarcity?
3. What have been the roles of water governance institutions in the resolution or management of water conflicts?

II.b. Specific research questions

In turn, the above broad research questions were integrated into the following specific research questions that structured the strategy for data collection for unit 1. B:

a) Have the conflicts been resolved satisfactorily from the stakeholders' perspective?
b) Perception of key stakeholders on climate change: What are the risks and what is the state of the discussion and preparedness of your organization with respect to the expected changes as result of climate change?
c) Degree of confidence of key stakeholders on their levels of preparedness and adaptive capacity or the response of water governance institutions
d) Quality of communication between the communities and water governance institutions
e) Was there power parity among the stakeholders in the resolution of the conflict?
f) Lessons learned by the organization/institution.
g) Level of consensus on the sustainable management of water (are visions shared?)
h) Was there equal and timely access to information?
i) Was there dialogue in order to understand the different problem definitions and the different positions of the stakeholders?
j) Type of knowledge system used in the dialogue and opportunity to express the plurality of other knowledge systems
k) Quality of representation and participation during the negotiation of the conflict
l) What have been the impacts on the biodiversity of the region and were the environmental concerns justified?
m) Has the adaptive capacity of the productive system increased or decreased as a result of the construction of the dam?
n) Are the most vulnerable groups better off as a result of the construction of the dam?
o) What lessons from the conflict have been drawn on by the water governance institutions?
p) Has the adaptive capacity of the environmental organizations increased?
q) Did the legitimacy and authority of water governance institutions improve or worsen?
r) Did the legitimacy and authority of the judicial system improve or worsen after the conflict?

II.c. Strategies of data collection

The methodology followed for Unit 1 B reflected the collaborative character of the broader IACC project.

1. **Data collection for the establishment of a baseline list of the regional institutions**. This component of Unit B was benefited by the collaborative efforts developed by the research team that compiled a baseline list of the key water governance institutions[3]

[3] See Morales, H.L and R. Espinoza, 2004, "Adaptaciones Institucionales al Cambio Climático. Instituciones Relacionadas con el Agua en Chile y en la Región de Coquimbo;" also, Diaz et al., 2005, "Institutions and Adaptive Capacity to Climate Change" and Corkal et al., 2007, The case of Canada: institutions and water in the South Saskatchewan River Basin.

(Please see appendices, on Canadian and Chilean institutions). The subsequent stage focused closely on water governance institutions that had a direct role in the water conflict case studies (please see the case study explanation below in point 3).

2. **Literature review and development of conceptual papers**. The literature review on water conflicts benefited from our previous work on Adaptive Resolution of Environmental Conflicts in Chile and Canada (Rojas and Reyes, 2003). The literature review was undertaken with the intention of understanding what institutional learnings the stakeholders in water conflicts can draw on that could lead to institutional adaptations to address situations of water scarcity. At the same time, the literature review intended to identify whether there were any links between the type of conflict resolutions, lessons drawn by the stakeholders, development of new approaches to address conflicts and new ideas for adaptation to similar situations in other localities. Therefore, a broad information base was established (Rojas et al., 2006), that helped to develop the conceptual framework for Unit 1 B, which emphasized the importance of the existing power relations in the conflict resolution process as a key determinant in adaptive institutional learnings.

3. **Identification of case studies and key stakeholders**. This was the most complex and problematic element in developing the methodology for Unit B. The rational for opting for a case study approach is almost obvious: it concerned an exploratory study of specific examples of water conflicts that sought insights into the learning processes and institutional adaptation of the stakeholders. Based on their experiences from conflicts, what would these institutions do in the future when they revisit water scarcity scenarios and conflict situations generated by the clash between stakeholders?

   As indicated before, the case studies chosen were the conflicts associated with the Oldman River Dam, in Canada (southern Alberta), and the Puclaro Dam on the Elqui River (Coquimbo region) and the conflict associated with glaciers and the mining project of Pascua Lama (Copiapo region), in Chile. Each case appeared to present a wealth of information that would respond to the research questions for Unit 1 B. Thus, the main reasons for choosing these case studies are the following:

   a) The conflicts associated with the construction of dams on the Oldman River and the Elqui River represent key water conflicts in both study regions of the IACC project
   b) Over the past few decades, the construction of dams and their respective reservoirs have been the main adaptive strategies implemented by government institutions in charge of water supply management to address drought conditions in both study regions, as well as in other regions facing water scarcities. This strategy has sparked a prolonged international debate –beyond the case studies-- on the ecological, social, economic and cultural impacts of large dams.

   In the case of Pascua Lama, the main site of the conflict was located about 300 km north and outside of the boundaries of the study region in Chile, it was felt that conflict would provide rich insights for the objectives of Unit 1 B. This conflict derived from the clear intentions of the Canadian mining company Barrick Gold to disturb the already weakening glaciers in the region so that it could carry on with its gold extraction operations, thus affecting the main strategic water reserves for agricultural purposes and communities' needs in the region. This unfolding conflict was quickly established as strategic case study because it was evident that its outcome would be a rigorous test for

the Chilean environmental and water governance institutions, offering important learnings related to the adaptive capacity of institutions to climate change. Glaciers are last recourse sources of water for water security in dryland regions, yet they are not considered as such in baseline documents that support the national water legislation, the Water Code in Chile. There are few studies and monitoring of the glaciers. There is no history of their trajectory or complete knowledge related to their future behaviour (Bórquez, 2007).

4. **Ethnographic fieldwork in the affected communities.** This aspect of the methodology followed naturally from the case studies approach. To understand the institutional learnings left as the legacy of conflict events required an in-depth qualitative investigation that sought to elucidate the after-the-conflict thoughts of the various stakeholders. The ethnographic fieldwork allowed observations in specific localities and finding key informants and stakeholders, whose narratives and personal and organizational histories would provide the necessary data base from which lessons could be drawn to inform institutional adaptations.

5. **Systematization, analysis and interpretation of results and editing of reports.** The learnings from the general literature review on water conflicts converged with the learnings from the analysis of the unique historical, geographic and ecological situations as lived and experienced by the stakeholders in the conflicts—whose experiences were validated by comparing them with learnings from other cases. The systematization and analysis of the data through the conceptual framework developed for this unit guided the recommendations for dialogue among the stakeholders and toward specific institutional adaptations.

II.d. Research for whom and with whom: key stakeholders and emphasis on the issue of rural communities most vulnerable

To address environmental and water conflicts, different social groups and communities face different levels of difficulty in accessing, controlling or maintaining their cultural values associated with water. In the three cases of conflict analyzed, the most vulnerable groups are mostly rural residents, small villages or community organizations whose lifestyle are inextricably linked to the integrity of the local ecosystems and to the resources and services that they provide, either for their sustenance and/or for a critical element of their worldviews and traditional lifestyles. The transformation and appropriation of their territory and ecosystems by new users displace and strip their traditional rights and openly threaten various aspects of their social structure and cohesion. Conflicts partly reflect conflict of values, but for some groups they also reflect a loss of control and/or rights to access and use water resources, especially when there is heightened perception by the community of exposures to climatic variability or to changes in their systems of production.

The communities and stakeholders selected for the water conflict case studies have a common denominator in their interest to maintain and modify the use, control and access to water resources and yet maintain their associated traditional and legal rights. In water scarcity conditions, the supply and access to water resources for irrigation, potable water and ecological functions and services give rise to situations that are tense and challenging and of heightened competition among water users. This tension is greater in arid and semi-arid regions where the exposure to droughts is a frequent phenomenon, such as seen in the study regions in Chile, in the Elqui and the Rio Huasco valleys, and in Canada, in the South

Saskatchewan River Basin. The increase in water demand for new economic activities associated with large investments, be these public or private, can generate new water rights or changes in existing water rights and in the productive use of the lands. These new water rights or changes in the existing rights, although legally constructed, can result in the loss or risk of losing pre-existent legal or traditional rights and the rupture of social networks. This undermines the communities' social capital, including the very traditions and worldviews that enable them to challenge developmental and modernizing currents.

Therefore, from the onset of conflicts, groups emerge with contrasting and opposing interests. Those with a wider range of economic influence, political relations and social capital, attain greater support in asserting and demanding their rights. For economically disadvantaged groups, the new investments and construction projects that transform their territories may, at least, provide them with opportunities for new sources of income and the possibility of overcoming their disadvantage—poverty. However, frequently such projects are resisted, active or passively, because for the disadvantaged groups such projects result in the loss of their rights and traditional use of their territories, and even their uprooting. In addition, the communities' loss of control over their territories and resources affects their social and production relations. This loss is the root of the tension between the rural communities and the forces that seek to transform and modernize their territories and systems of production.

The stakeholders in the conflicts analyzed in the three selected case studies are therefore those groups organized and active in defending their legitimate rights of access to particular resources: the displaced and groups that seek to maintain the integrity of their territories and ecosystems; as well as groups that promote new investment and economic opportunities on those same territories and ecosystems.

III. Profile of the Case Studies

III.a. The Oldman River Dam Conflict, in the South Saskatchewan River Basin, Alberta, Canada

III.a.1. Stakeholders in the Oldman River Dam Conflict, in the South Saskatchewan River Basin, Alberta, Canada

In the case of the Oldman River Dam, located on the Oldman River in Alberta, Canada, the stakeholders in the conflict included the First Nation community in the area—the Piikani (also known as the Peigan), the irrigating farmers, the displaced farmers, residents of the communities of Lundbreck, Cowley, Pincher Creek, and Fort McLeod, the city of Lethbridge, the Friends of the Oldman River, and provincial and federal government institutions.

The dam is important to the model of regulating the waters in the Oldman River and its tributaries because it allows the storing of water for use in periods of droughts, increasing irrigation security and reducing areas of seasonal flooding. However, areas that are periodically flooded are part of a complex ecological systems which when altered affect the habitat for various species of fish, fresh water fauna, and symbolic species for the Piikani's

Black Foot culture. The cotton wood forests, whose reproduction and growth depend on the periodic/seasonal high water flows and flooding, and sweet grass (*Muhlenbergia filipes*) are two species of great cultural importance for the Piikani.

Various environmental organizations such as the Friends of the Oldman River opposed the construction of dam because they were concerned that the alteration of the Oldman River flow would have significant and permanent impacts that would be very difficult to mitigate, on the fragile ecosystems of the river. This organization, mostly urban and without strong links to the First Nation community in the area, posed strong opposition to the construction of the dam based on their concerns for the river's riparian health, wildlife habitat, and aquatic life downstream from the dam. The Friends of the Oldman River together with the Piikani and the Committee for the Preservation of the Three Rivers (CPTR)—made up of displaced farmers—formed the main opposition to the construction of the dam.

Alberta Environment, the public institution that develops policies for the reduction of the risks of flooding and droughts including engineering projects aimed at regulating the flow of rivers, was the initial proponent of the Oldman River dam and responsible for its design, location, construction and operation. However, in response to the concerns of environmentalists who claimed that the Environment department was in conflict of interest because it was both the proponent and regulator of water development projects, the responsibility for the construction of dams was transferred to the department of Public Works (Glenn, 1999 and Marchildon and Daschuk, 2005). Although some environmentalists were satisfied that the transfer of responsibility of dam construction from the department of Environment to Public Works addressed the issue of conflict of interest, for others it was no more than a public relations strategy (Glenn, 1999).

III.a.2 Fieldwork in the Oldman River Basin

The fieldwork for the study of conflict in the Oldman River Basin was conducted during the summers of 2005 and 2006. The aim of the fieldwork was to identify impacts that as a result of the conflict may have affected the vulnerability of water governance institutions and communities in the Basin under current and predicted climate change impacts. The focus was on the identification of different impacts as reflected in changes in water use behaviour, organizational structures, and strategic approaches by water governance institutions and communities.

The fieldwork and data collected for the Oldman River Dam conflict case involved the review of literature—reports, books and websites; observations and visit to the Dam site; and interviews with various provincial entities, the municipality of Fort McLeod, the city of Lethbridge, displaced farmers, benefited farmers, residents of the communities of Cowley, Lundbreck, Pincher Creek, representative of environmental organizations, and members of the Piikani Nation.

Background

Dendrochronology data—the use of the width of tree rings to date climatic events over history—for the period between 1562 and 2004 shows dramatic fluctuations in the Oldman River flow, with period of intense floods and droughts (Sauchyn, 2006). At times, extreme drought event periods have lasted between 10-20 years (Sauchyn, 2006). However, the

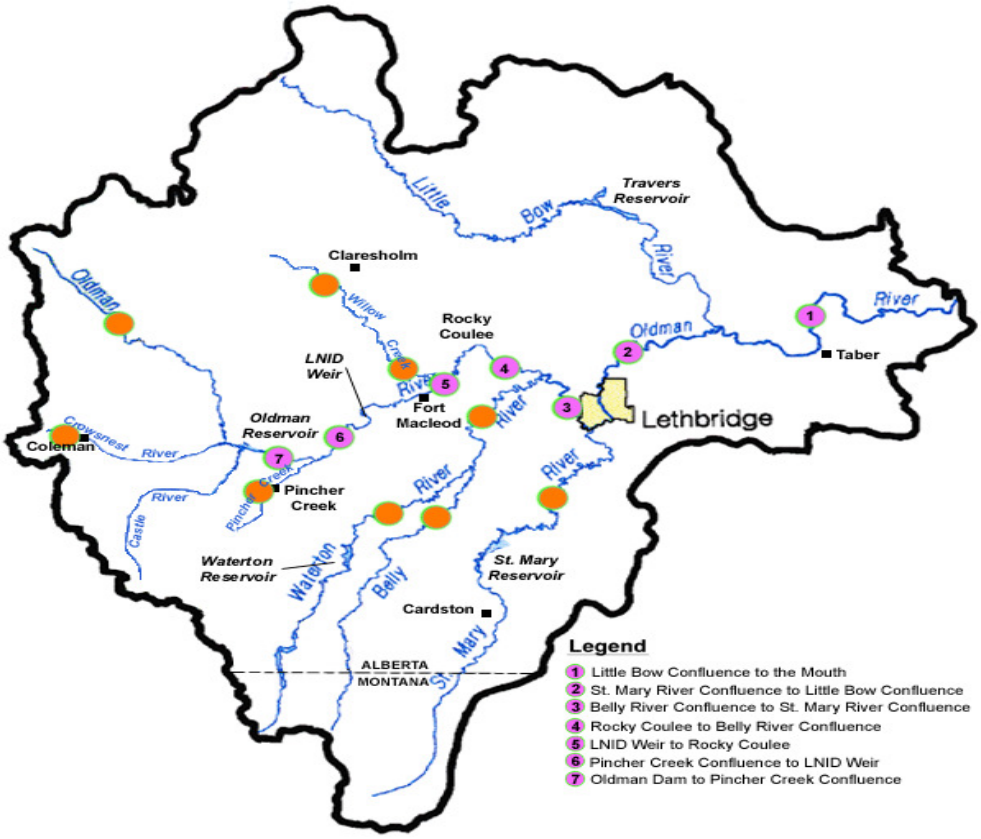
current capacity of the Oldman River reservoir can only safeguard against a water deficit of drought events of 3-5 years.

The Oldman River has traditionally been a poor source of steady water supply for the various communities that lie along its course in the Oldman River Basin. With evidence of melting glaciers, less snow pack on the eastern slopes of the Rocky Mountains, and the predicted increases in temperature and rates of evapotranspiration in the Oldman River Basin, the uncertainty of the future water supply from the Oldman River is even greater. This uncertainty will pose great challenges for the communities that depend on it. According to Sauchyn (2006), "a projected increase in climate variability, including more frequent drought and major hydroclimatic events, is the most challenging climate change scenario. More extreme climate anomalies are more likely to exceed natural and engineering thresholds beyond which the impacts of climate are much more severe."

In the past, this uncertainty over the supply of water from the Oldman River resulted in challenges for communities in the Basin, especially in the late 70s and early 80s when consecutive drought years threatened the supply of water for irrigation farmers as well as limiting the supply of water for other users. Irrigation farmers lobbied the Alberta government in the 1970s to build an on-stream reservoir on the Oldman River, which sparked a decade of conflict among the stakeholders who opposed this idea, including displaced farmers; residents of Lundbreck, Cowley, Pincher Creek, Fort McLeod, the city of Lethbridge; the Friends of the Oldman River, and members of the Piikani Nation.

The Oldman River Dam was officially opened in 1992 and is located at Three Rivers, just downstream from the confluence of the Oldman, Castle and Crowsnest rivers and about 10 km northeast of Pincher Creek (Figure 5). Forty three kilometres of the river valley are flooded by the reservoir which captures part of the river flow. Owned and operated by Alberta Environment, the function of the Oldman River Dam and its reservoir is to impound water for present and future water demands of municipalities, industries and agriculture, and provide good quality water and river flow downstream of the dam for ecological purposes including aquatic and riparian environments. The water impounded is also used for recreational opportunities and hydro-electric power generation. In addition, a key function of the dam is to provide the province of Alberta with the flexibility to meet its inter-provincial apportionment agreement with Saskatchewan (Alberta Environment, website).

Figure 5: Oldman River Basin, the dam and its tributaries



Source: Alberta Environment, 2006

Along with capturing the peak flows of mountain snowmelt, during May and June, the Oldman River Dam, together with other major structures including the Lethbridge Northern Irrigation District diversion weir, the Belly River diversion weir and the St. Mary's River Dam, supply water in the Oldman River Basin to 13 out of the 14 irrigation districts of Alberta. The Oldman River reservoir's storage capacity of 740,000 cubic decametres of water increased the potential for irrigated lands in the basin by an additional 121,000 hectares, for a total of 344,000 hectares (Glenn, 1999).

III.a.3. Oldman River Dam chronology of events and key stakeholders (unless otherwise stated, the source for this section is Glenn, 1999 and Marchildon and Daschuk, 2005)

Discussion regarding the withdrawal of water from the Oldman River for irrigation purposes dates as far back as 1910, when irrigating lands north of Fort McLeod was first considered. However, it was not until 1919 when the Northern Lethbridge Irrigation District (NLID) was established by the farmers that the allocation of irrigation water from the Oldman River was approved by the federal Department of the Interior.

Following the approval of water withdrawal from the Oldman River for irrigation purposes, in 1922 the federal government began the construction of a diversion weir, a flume and a canal to divert water for irrigation. These irrigation works were located on a 205 acre right

bought by the Northern Lethbridge Irrigation District from the Piikani Nation—on whose territory the Oldman River flowed—who claimed that the 205 acre rights given to the NLID from the federal government was done without the consent of the members of the Piikani Nation. In addition, the construction of the irrigation works occurred on Piikani burial grounds, and all of this sparked the strained relationships between the Piikani and the federal government and the NLID.

In the 1970s the federal government ceded ownership and control of irrigations systems to the province of Alberta, which in turn committed to increase investment in irrigation infrastructure and introduced a cost-sharing program to rehabilitate irrigation works in southern Alberta. With the increase in irrigation investment, the NLID expanded its operations and by 1975 it committed to supply water for 44,000 hectares; however, periodic water shortages limited its capacity to consistently supply water for the irrigation district farmers and the provincial government sought ways to increase water availability in the district.

The Progressive Conservative government of Peter Lougheed won the provincial election of 1971 on its commitments to increase investment in irrigation development and the development of a diversified agricultural sector. The re-election of the Lougheed government in 1975, followed with a commitment to increase investment in the development of the Oldman River Basin for irrigation. The following year, the Alberta Environment Department announced the need to construct a dam on the Oldman River for irrigation purposes, and listed nine potential sites for the dam, including the Three Rivers site where the dam is presently located.

Farmers who would be displaced because their land would be flooded by the reservoir soon organized the Committee for the Preservation of the Three Rivers (CPTR) to oppose the project. The Piikani community joined the affected farmers in opposing the project because they were concerned that the dam would threaten their rights over the river flow as the Oldman River flowed passed over their territory. They argued that the terms of Treaty 7[4], conceded them rights over the Oldman River.

In response to the opposition by the farmers and the Piikani Nation to locating the dam at Three Rivers, the government of Alberta undertook further studies on other potential dam sites, including a site in Brocket on the Piikani Nation territory. However, the impacted farmers and the Piikani community voiced their dissatisfaction with the process followed, claiming that environmental and aboriginal interests were underrepresented while heavily favouring irrigation interests.

During the years of investigation to determine the site for the dam, the Alberta government sought additional lands from the Piikani nation in order to increase the capacity of the NLID headworks. On the other hand, the Piikani Nation was seeking compensation for the original headworks before negotiating additional acre rights for the new project. In the meantime, the Piikani Nation issued a permit to the Alberta government to conduct surveys and studies for the expansion of the capacity of NLID headworks. But after years of waiting for the Alberta

[4] Treaty 7 was signed in 1877 between several Blackfoot First Nations communities—settled in what today is southern Alberta—and the government of Canada. It is one of the 11 numbered treaties signed between First Nations and the government of Canada. First Nation communities signatories of Treaty 7 include the Piikani, Blood Tribe, Siksika, Stoney and Tsuu Tina (Indian and Northern Affairs Canada, http://www.ainc-inac.gc.ca/pr/trts/hti/guid/tr7_e.html)

government to address the issue of compensation for the initial construction of the NLID headworks, members of the Piikani revoked in 1978 the permit and blockaded access to the NLID headworks. Soon after, NLID obtained a court injunction to end the blockade, while at the same time the government of Alberta agreed to enter into negotiation with the Piikani on the compensation issue.

In the process of investigating the potential site for the dam, the Environmental Council of Alberta (ECA)—whose mandate was to conduct public hearings on matters related to the environment and advise the cabinet—conducted public hearings and in 1979 recommended that an on-stream storage on the Oldman River was not necessary at the time, nor in the foreseeable future. However, the ECA qualified the recommendation by stating that an on-stream reservoir was not necessary to support the irrigation expansion because off-stream storage would be sufficient. Moreover, the ECA declared that should a dam be required, the sites at Brocket or Three Rivers were preferred, and that between these two sites the preferred location was at Brocket because the site at Three Rivers, after all factors were considered, would create the greatest environmental and social impacts.

In 1980, the Piikani community and the Alberta government reached a cash settlement agreement over the 1922 diversion weir agreement. Almost concurrently, the Alberta government announced the construction of a dam at Three Rivers, largely ignoring the ECA recommendation that Brocket would be a better location for the dam and despite knowing that the Piikani were developing a proposal for the dam to be located at Brocket. However, later on (1989) the Piikani elected a new Band Council which promptly cancelled the 1980 settlement agreement, and negotiated a new compensation package worth $ 4 million, compared to $ 2.5 million for the previous agreement, and a commitment from the federal and provincial governments to support the Weasel Valley Water Study. The study's objective was to assess the impacts of the dam on the reserve.

A severe drought in 1984 triggered the Lougheed government to unilaterally announce the construction of the dam at Three Rivers, which sparked opposition from the Piikani, who were still in the process of developing a proposal for the construction of the dam at Brocket, and from the farmers around the Three River site, who would be displaced. By 1986 the Piikani filed a claim and requested an injunction to stop the construction of the dam. They claimed ownership of the riverbed on their territory and expressed concerns over the negative impacts from the operation of the dam.

The Alberta government, navigating through the opposition began construction of the dam in 1987. Soon after, environmentalists representing organizations that included the Alberta Fish and Game Association, the Canadian Parks and Wilderness Society, Trout Unlimited and others, met in Lethbridge and founded the Friends of the Oldman River (FOR) and elected Cliff Wallis and Marta Kostuch as president and vice-president, respectively, of the organization. FOR immediately challenged in the courts on the issuing of the license by the Alberta government for the construction of the dam, and claimed that the government had failed to fulfill the requirements set out in the Water Resources Act. In addition, they argued that the voices of the affected parties including the Piikani and displaced farmers had not been heard, and demanded a stop to the construction of the dam. The courts ruled in favor of FOR, a decision that was followed by years of court appeals by the Alberta government and challenges by FOR. Nevertheless, the construction of the dam continued and by 1992 the Supreme Court of Canada ruled that under the Environmental Assessment and Review

Process Guidelines, the federal minister of Transport was legally required to conduct an environmental impact assessment of the Oldman River dam project.

In the years since the inception of the idea of the construction of the Oldman River Dam to today, the Piikani Nation's position on the dam has reflected the challenges that the community has experienced: internal division between those in favour of the dam and those against it, and the dilemma of negotiating for a compensation settlement or opposing outright the construction of the dam. This division in the community was highlighted in 1990 when a group of the Piikani community formed the Lonefighters Society to challenge and stop the construction of the dam. In the summer of 1990 the Lonefighters Society began attempts to divert the supply of water away from the NLID irrigation works. This ensued a few weeks of tense confrontation between the RCMP and the Lonefighters Society, which at the end of the day resulted fortunately in no more than a couple of gun shots fired into the air.

The division in the Piikani community also highlighted the differences in values of the members of the community; on the one hand, those in favor of the dam sought to address economic development challenges in the community while at the same time accepting the potential negative environmental impacts; on the other hand, members who outright opposed the construction of the dam prioritized spiritual and cultural values associated with the Oldman River and its ecosystem, claiming that the change of water flow regime would jeopardize the cultural and spiritual values attained by their connection with the natural environment.

In 1992, the Supreme Court of Canada ruled that the federal government must conduct an environmental impact assessment of the dam, and singled out the Ministry of Transport to initiate the assessment because the dam interfered with navigation in the Oldman River. The results of this assessment, contained in a report by the Environmental Assessment Review Panel, found that the "Oldman dam project has many social and cultural consequences for the Piikani. Most significant among these are the following: the Peigan were not sufficiently involved in key decision about the project: many resources important to their culture, such as cottonwoods, fish game and willows will be affected by the project; the potential for mercury contamination of fish downstream from the dam could have health consequences for the Piikani; and important culturally and spiritually valued areas within the reservoir were flooded. The Panel concluded that the Oldman River Dam project could be very detrimental to the Piikani Band. On the other hand, the Piikani could reduce the negative impacts and derive some benefits if they were able to reach an agreement with the proponent" (Report of the Environmental Assessment Panel-Oldman River Dam 1992: 1).

The report listed 22 recommendations including the decommission of the dam because "the environmental, social and economic costs of the project are not balanced by corresponding benefits and found that, as presently configured, the project is unacceptable " (Report of the Environmental Assessment Panel-Oldman River Dam 1992: 6). In addition, the recommendations also stressed the need for the implementation of biophysical monitoring programs and a resolution of the pending issues with the Piikani nation, including the negotiation of a settlement agreement and an assessment of the environmental impacts of the dam on their territory.

The federal government rejected the recommendation of decommissioning the dam, alleging that the operation of the dam could be made environmentally acceptable. Regarding the recommendation of reaching a resolution with the Piikani, in 2001 a settlement agreement

was achieved between the governments of Alberta and Canada with the Piikani Nation over damages resulting from the construction of the Oldman dam project. The Piikani secured a $64.3 million dollar payment, to be paid in annual payments of $500,000 and a compensation of $1,000 to each of the 2600 members of the band. In addition, they secured a commitment by the provincial and federal government for an ongoing study of the impacts of the dam on the environment and the Piikani's culture (Houck, 2006). The ongoing study of the impacts of the dam on the Piikani Nation constitutes the pending issue of the resolution of the Oldman River Dam conflict.

At the end of June 2006, Indian and Northern Affairs Canada placed the management of the Piikani's financial affairs under third party management because of the dire state of governance on the Piikani Nation. This development may have also been the result of the accusations by members of the community—signed in the summer of 2005 by about 700 members—of financial mismanagement by the leaders. Piikani Councillor Edwin Yellow Horn was quoted as saying that he hoped that the "new system will resolve some of the issues regarding the nation's leadership's disrespect for the band's finances" (Pincher Creek Echo, 2006). Some community members believe that the $ 64 million in compensation from the construction of the dam has made the community leaders take on attitudes and beliefs of monetary abundance, which has resulted in the mismanagement of the funds. Dissatisfaction felt by some community members with the leadership and their management of the community's affairs has resulted in repeated attempts to get the current Band and Council to resign and hold a new election.

III.a.4 Results from the Oldman River Dam Conflict case study

As stated earlier, the analysis of the Oldman River dam conflict aimed to identify those impacts that as a result of the conflict may have affected adaptive capacity water governance institutions and communities to current and predicted climate change impacts. The focus was on the identification of changes in water use behaviour, organizational structures, and strategic approaches by water governance institutions and communities

Therefore, findings from the fieldwork for the Oldman River Dam conflict are classified in the following categories:

- Change in water use behaviour by community members;
- Changes in organizational capacity and strategies by communities and other stakeholders
- Changes in organizational structures and strategies used communities and water governance

Changes in water use behaviour

- There are discrepancies among the various stakeholders about whether or not the conflict over the construction of the dam has made people more aware of water issues and the need of sustainable use of resources. Some claim that the conflict has indeed made people more aware of the issue of water scarcity, and therefore have taken measures to minimize water use (e.g more efficient irrigation technology, improved treatment of sewage and storm water put back into the Oldman River by the city of Lethbridge). Others believe, however, that people are more aware of water issues, and other

environmental issues, because in general today people everywhere are more knowledgeable and interested about environmental issues.

- Government agencies (Alberta Environment, Alberta Agriculture and Food) recognize that the need for meaningful stakeholders' consultation is a key learning from the Oldman River Dam conflict.
- Northern Lethbridge Irrigation District farmers recognize that conflict has made them more aware of the value that water has for other stakeholders, and sympathize with the farmers affected and displaced by the construction of the reservoir.
- A drought event in 2001 and 2002 showed how municipalities, industry, irrigation districts and many other water users—all of whom generally compete over scarce water supplies—avoided conflict by discussing and reaching a voluntary water sharing agreement, instead of abiding to the "first in time first in right" water allocation regulations, which would have given water access priority to those holders of older licenses.
- The city of Lethbridge is planning to engage in a market approach for water allocations, with the intention of trading/selling the bulk of its junior water allocation licenses and buying older licenses. The city is looking to diversify their licences' priority in order to minimize the risk of water supply. Given the "first in time first in right" water allocation regulations and a large portion of the city's licenses in the junior category, the city is vulnerable to a water scarcity event. In time of droughts, the "first in time first in right" regulations would give priority to older licenses over younger ones.
- The city of Lethbridge also has water restriction programs in the summer time in order to reduce water use.

Changes in organizational capacity and strategies by communities and other stakeholders involved in the conflict

- Before the construction of the Oldman River Dam, the unpredictability of water supply limited farmers to cultivate crops that were more drought tolerant, but with low economic value, such as wheat and other grains. With the Oldman Dam, farmers have been able to diversify their crops to ones with higher economic value, or added value, such as corn, canola, flax, peas and other specialty crops.
- The Alberta Irrigation District Association has developed an irrigation model that monitors the level of available moisture in the soils by using sophisticated environmental data, including temperature and evapotranspiration rates, in order to more efficiently predict the volume of water needed for irrigating crops.
- The Oldman River Dam operation is strictly monitored: winter snow pack accumulation and the volume of spring run off is closely monitored to determine the volume of water stored in the reservoir and therefore the volume of water supply available for crop irrigation; this information is readily available for the farmers in the NLID. Although extreme events such as sudden dry spells or heavy precipitation are difficult to predict, the 2-3 years of storage capacity of the reservoir is sufficient to minimize the short term vulnerability of water users in the Basin.
- A related beneficial outcome of the Oldman River dam is its potential to produce a significant amount of electrical power—25 Megawatts—for Southern Alberta; this "green" source of electrical power, although relatively small, means a cut back in CO_2 emissions.

Changes in organizational structures and strategies by communities and water governance institutions involved in the conflict

- Meaningful and inclusive consultation of stakeholders in the water governance of the Oldman River Basin is now conducted through the Oldman Watershed Council, in which government agencies, businesses, NGOs and environmental organizations participate. First Nation communities have been invited to participate, but so far they have declined the invitation because they perceive themselves not just as another "stakeholder"/water user in the region but as sovereign First Nation; and also because the process of resolution of the conflict has lost credibility. . However, this cross-sectoral representation in the council is the result of the recognition of the importance of the inclusiveness of perspective and values in management of the water supply at the local level.
- Sharing information among stakeholders is undertaken with the intent of communicating the efforts taken in the sustainable use of water. For example, the Alberta Irrigation Project Association, the public relations arm of the Alberta Irrigation Districts, is striving to stay on the leading edge of efficient irrigation technology as much as focusing on the importance of recognizing the multiple uses of water. One of the association's objectives is to actively communicate to the general public about steps taken by the District Associations in the sustainable use of water and how these steps are very important to the long term viability of agriculture and the Alberta economy in general.
- Environmental organizations recognize and take pride in referring 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, be conducted as early as possible in the planning and proposal stages of a project. This is echoed by David Boyd (Globe and Mail, 2001) a professor of environmental law, who has stated that Canada's Supreme Court has become a significant force for environmental protection, and he cites the federal environmental assessment of the Oldman River Dam as one of the key decisions that Supreme Court has ruled on for environmental protection. This ruling has established the precedence that an Environmental Impact Assessment must be undertaken prior to commencing any mega project. The court's ruling places the onus on the federal government for protecting the environment in areas of their jurisdiction. Moreover, the decision states that an environmental assessment should include the physical environment as well as the social and economic implications of a project.
- Some government agencies such as Alberta environment recognize the need for an ecological baseline assessment around the location of a large project several years before it is carried out in order to better determine its future ecological impacts.
- Over the last decade, Alberta Environment has been engaged in developing phase I and phase II of the South Saskatchewan River Basin planning. This planning appears to be the result of the reorientation and restructured approach by water governance institutions, as discussed by Corkal et al. (2006), and that the federal and provincial governments have undertaken to meet the needs of a sustainable and ecosystems approach for the management of water resources. The SSRB phase I planning has put in place a policy of 10% conservation holdback on all permanent or temporary transfer (selling and buying) of water licences in the Basin, and a complete stop to the issuing of further licence allocation in the Belly, Waterton, and St. Mary's rivers. For the second phase of the planning process, a similar policy of a moratorium on further license allocation is put forth for the Oldman River; moreover, the second phase also emphasizes the need to maintain a sufficient instream flow for the aquatic and natural systems in the Basin.
- The visionary document Water for Life (2003) prepared by Alberta Environment is another initiative that highlights important learnings by government institutions. This

document establishes long term policies for sustainable water use. It links water and land uses through land use planning, and the creation of a water governance structure that includes all stakeholders. Various water governance institutions interviewed for this study and stakeholder participants in a workshop organized by the IACC project team and the Prairie Farm Rehabilitation Administration (PFRA) (April, 2006), coincided in pointing out that the vision in the Water for Life document is an example of the influence of the learnings drawn on by stakeholders in the conflict.

Vulnerabilities

- Members of the Piikani Nation see themselves as the most affected because the process of negotiating for the monetary compensation and the amount of compensation agreed upon created severe divisions in the community. Some members of the community feel that those in favour of the settlement amount agreed on—$64 million—manipulated the rest of community members into voting in favour of the settlement by offering an immediate monetary benefit of $1,000 per individual member. Other members feel that the $64 million is not a sufficient compensation for the division created in the community, the environmental impacts on their territory and the loss of culturally significant services and uses of the river and its riparian areas: the reduction of cotton wood forests, the loss of swimming holes, the loss of berry picking and sweet grass spots.
- A comprehensive environmental impact assessment of the Oldman River Dam on the territory of the Piikani is still pending. Some preliminary assessments have been conducted but not finalized. At present the administration of the Piikani Nation has been taken over by a third party because of financial irregularities and insolvency, therefore the environmental impact assessment has now stopped and will only resume once the Piikani Nation takes over its own administration again.
- The environmental impact assessment on the territory of the Piikani Nation is the outstanding issue to be resolved from the Oldman River Dam conflict; however many of the stakeholders interviewed (except some government agencies) thought that the conflict had been resolved.
- Members of communities nearby the dam and the reservoir see little or no economic benefit from the construction of the dam. Although during the construction of the dam some community members were hired as labourers, once the dam was finalized the jobs were terminated. There were also deep divisions between community members who were in favour of the dam and those who were against. One interviewee who was against the construction of the dam said that she believes that she lost her job because most of her colleagues were in favour of the dam.
- Although most displaced farmers (about 18 in total) moved onto other farms not too far from where they had farmed before, there were some who had to move far away because they were not able to find/buy a farm nearby. A resident of Cowley said that she lost good friends because they had to move to as far away as the Peace River Valley area.
- Opponents to the Dam point out that the beauty of the stretch of the Oldman River Valley where the reservoir is now located is forever gone; in addition, recreational activities such as fishing and swimming were also affected.
- Although the Water Management Plan for the South Saskatchewan River Basin and Water for Life Strategy contain visions and plans for a more sustainable management in the South Saskatchewan River Basin, some environmental organizations and activists feel that some of the key measures mentioned in these documents will be difficult to implement. For example, although water rights can be transferred (bought and sold), efficiency of water use and the health of aquatic ecosystems is not guaranteed because

irrigation districts refuse to transfer water rights to non-members; thus, should an environmental organization want to buy water rights and use those rights for keeping water back in the river, they would not be able to buy water rights from the districts. They also feel that the "first in time first in right" approach to water licenses support the continuation of the irrigation districts' historic rights of irrigation to declining water supplies. At the same time, they also feel that critical measures such as water pricing and enforcement of the province's water regulations are missing in these documents, and despite that 68 per cent of respondents during the consultation process for developing the Water for Life Strategy supported a water pricing system for individual consumers.

Findings from the fieldwork for the Oldman River Dam conflict confirm that the adaptive capacities of communities to address climate change impacts are determined by various factors, including the role played by formal institutions—both private and public organizations—in influencing the development of such capacities, for example the development of integrative policy approaches like the Alberta Water for Life Strategy.

Adaptive Resolution of conflicts

As explained earlier, one of the main focuses of analysis of the research was to understand to what degree the resolution of the Oldman River Dam conflict had Adaptive Conflict Resolution characteristics; that is to say, to what degree the principles of Adaptive Conflict Resolution appear in the resolution of this conflict. In addition, when applying the model in Figure 3, the analysis of the resolution of a conflict in light of the Adaptive Conflict Resolution principles allows a visualization of the institutional responses that address the power differences among the stakeholders. The general literature review on water conflict resolution and our own work on Adaptive Conflict Resolution make significant links between this issue of power differential and the levels vulnerability of the communities involved in conflicts.

Using the Adaptive Resolution principles as criteria to assess the management and resolution of the Oldman River Dam conflict, the findings were as follows:

1. **Early and equitable access to information is ensured to all parties involved, including information on the parties' views**

- Civil organizations did not consider access to the information to be equitable.
- The perspectives and values of the different stakeholders were only expressed in the media or at public meetings. However, at these public meetings there was neither access to the documented scientific information nor opportunities to dialogue with the experts. From the beginning of the process of designing the dam there was no assurance made to the Piikani and the environmental organizations of a meaningful participation.

2. **Balanced, symmetric power relations are provided in negotiations and decision-making regarding the outcome of the conflict**

- The lack of equitable relations between the different stakeholders was a key characteristic of the conflict; like in other cases, it became the main obstacle for an Adaptive Conflict Resolution. The decisions in favour of the construction and operation of the dam were taken and implemented based primarily on the powers of the federal and provincial

governments, who allied with the irrigation farmers, dismissed the court decisions that demanded a halt to the construction works and subsequently a decommissioning of the dam. This exacerbated the conflict.

3. **Recognition, respect and fostering of differences in values and perspectives toward creative solutions**

- Although the Oldman River Dam conflict did not follow this principle, it appears that at present the public consultations carried out in the processes of water governance in the South Saskatchewan River Basin are more inclusive now than before the conflict, through such entities such as the Oldman Watershed Council, where stakeholders including government agencies, farmers and industries, non-governmental and environmental organizations participate. The First Nations in the Basin have been invited but have declined to participate for now, as noted earlier. The multi-sectoral participation in the Council is an acknowledgement of the importance of the principle of the inclusiveness of perspectives and values in the management and governance of water at the local level.

4. **The resolution of the conflict aims at securing the integrity of ecosystems and restore the negative impacts on biodiversity**

- The assessment of the environmental impact on the Piikani territory continues and it is one of the key pending issues for the resolution of the Oldman River Dam conflict. However, public policy documents regarding the future management of water in Basin now appear to pay significant attention to the protection and restoration of biodiversity.

5. **The social capital of the communities involved is strengthened by the resolution of the conflict**

- The Piikani see themselves as the sector most affected because the process established for the negotiation on the amount of the monetary compensation has created serious divisions in the community weakening their social capital. Among some of the Piikani, it persists a feeling of dissatisfaction over the $64 million in compensation because it has heightened divisions in the community and because of the environmental impacts of the dam on their territory.

6. **Corporations or institutions involved in the resolution of the conflict strengthen their technological capacity and institutional adaptation toward sustainability**

- Water for Life Strategy is an initiative that will significantly influence the future governance of water in Alberta. Government agencies at all levels acknowledge the need to conduct ecological baseline assessments regarding the location of mega-projects several years before the project is carried out in order to better determine its future ecological impacts. During the last decade, Alberta Environment has focused on developing phase I and II of the South Saskatchewan River Basin plan. This planning process appears to be the result of the reorientation of the federal and provincial governments to address the demands for a sustainable ecosystems approach to water management. The need to share information is another key learning. This sharing of information among the stakeholders is done with the intension of communicating widely on the efforts toward the sustainable uses of water.

- The Alberta Irrigation Project Association is striving to stay on the leading edge of efficient irrigation technology as much as focusing on the importance of recognizing the multiple uses of water, and actively communicates to the general public about steps taken by the District Associations in the sustainable use of water and how these steps are very important to the long term viability of agriculture and the Alberta economy in general.
- The perception of irrigation farmers is that the Oldman Rive Dam has allowed them to diversify their crops including corn, canola, flax, peas and other specialty crops, crops that have higher economic value, or added value.
- The Alberta Irrigation District Association has developed an irrigation model that monitors the level of available moisture in the soils by using sophisticated environmental data, including temperature and evapotranspiration rates, in order to more efficiently predict the volume of water needed for irrigating crops.
- The management system of the Oldman River Dam operation allows for the monitoring of snow pack accumulation and the volume of spring run off, which help to determine the volume of water stored in the reservoir and therefore the volume of water supply available for crop irrigation. This information is readily available for the farmers in the NLID.
- Although extreme events such as sudden dry spells or heavy precipitation are difficult to predict, the 2-3 years of storage capacity of the reservoir is sufficient to minimize the short term vulnerability of water users in the Basin. However, according to Sauchyn (2006), dendrochronolgy records show historically extreme drought events in the region have lasted between 10-20 years, thus the storage capacity of the Oldman reservoir would not provide sufficient security for one of these events.

7. As an outcome of the conflict social organizations improve their creativity and capacity to negotiate

- Environmental organizations recognize and take pride in referring 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, be conducted as early as possible in the planning and proposal stages of a project. The fights of the Friends of the Oldman River in the courts for the rights of citizens and the enforcement of environmental regulations have been milestones for environmental organizations.
- On the other hand, the Piikani are experiencing difficult times; the community is divided and Indian Affairs has taken over the administration of the band. The legitimacy of their leaders is at its lowest levels, and so is their capacity to negotiate.

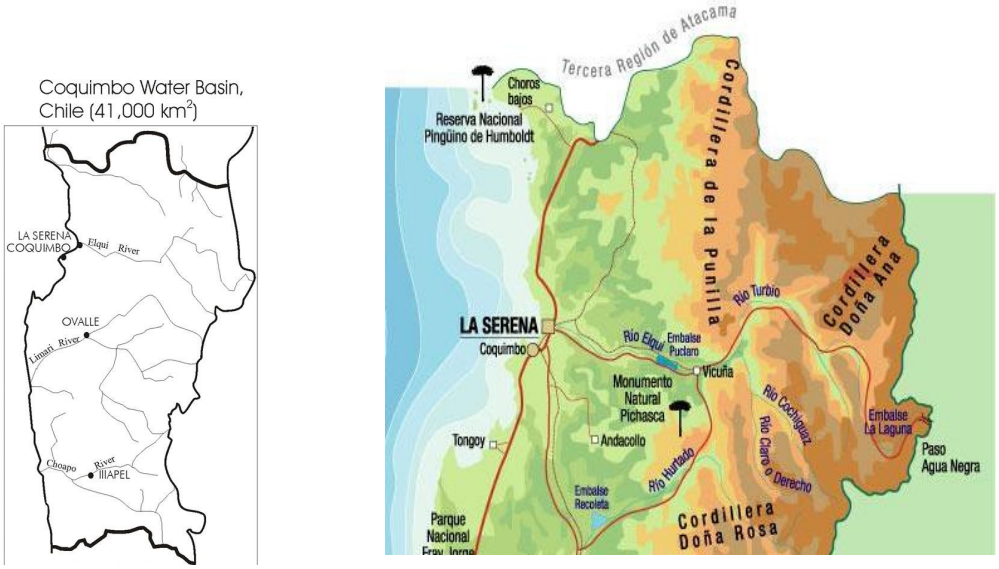
8. The democratic authority of the state is strengthened when its moral authority overcomes the use of coercion in the resolution of the conflict

- The Supreme Court of Canada has become a major force in the protection of the environment. The Environmental Impact Assessment of the Oldman River Dam requested by the Supreme Court was a key decision in establishing precedents for EIA of major projects in Canada. The Courts ruling places responsibility for the protection of the environment on the Federal government in areas where they have jurisdiction.
- The decision by the Federal and Provincial governments to continue with the construction of the dam despite the courts demand for an EIA, called into question their legitimacy and moral authority.

III.b. Puclaro Dam conflict in the Elqui River Valley

Background

The Puclaro Dam is the public authority's response to the continuous periods of water scarcity in the Elqui River Valley. The reservoir allows the storage of water, mainly for agricultural use and for regulating the water supply the Basin[5], given the irregularity and drecreasing trends of precipitation (see appendix 3).



The Coquimbo Region and the location of study are

In 1995, the Direccion de Obras Hidráulicas (DOH)—Department of Hydraulic Works—Ministry of Public Works, developed a project for the construction of a dam on the Elqui River, which later became known as the Puclaro Dam. According to the records of DOH, the plans for this project began in the 50s. The Dam's purpose was to regulate the water levels in the river at its middle section (please see Appendix 4—Puclaro Reservoir in the Elqui Basin)

The Puclaro Reservoir is located in the Elqui Valley, about 50 km to the east of the city of La Serena, in the IV Region of Coquimbo, and at 432 m above sea level. The wall of the dam is 83 metres in length and 525 metres in height. The reservoir has an estimated storage capacity of 207,000,000 m^3 (see Appendix 5 –Puclaro Reservoir photo).

Puclaro is in the Coquimbo Region, located between the arid desert and the temperate Mediterranean, a zone of transition from a desert environment to one with higher moisture conditions. It is characterized by arid conditions as a result of the scarce and irregular precipitation.

[5] Droughts are frequent in the Coquimbo region. In the last 30 years, there have been key droughts in 1993 to 1997. And before that, in the years 1985 and 1986, and 1988—1990, and in the years 1981 and 1982, 1972, 1973—1974, 1978—1979.

The construction of the Puclaro Reservoir, conducted by Direccion de Obras Hidráulicas,did not go through an Environmental Impact Assessment (EIA) because when it was proposed (1995), the Environmental Legal Framework (ELF) (Law 19300 of the year 1994), which initiated the institutionalization of the environment government department in Chile (Comisión Nacional del Medio Ambiente–CONAMA), did not yet have regulations in place in accordance with the rules of the law[6] to apply to the System of Environmental Impact Assessment (SEIA) and to include community's participation. Given these conditions, it was the proponent's decision to include, or not, measures for mitigating the social and environmental impacts from the construction and operation of the dam.

Although the construction of the dam on the Elqui River was a demand that local medium and large scale farmers had made for over forty years, its design, location, construction and the eventual filling up of the reservoir generated conflicts with the communities that were relocated (5 communities of 250 families in total) because of the flooding of 800 hectares of land. For the owners of irrigated lands for agro-industrial use—the main beneficiaries of the dam—above and below the dam, the greater regularity and supply of water heightened production opportunities, provided incentives for new investments and technological and production transformations in the Elqui Valley.

The forecasted impacts contained in the only study done[7], which recorded the social and environmental impacts of the project, determined that in the communities to be relocated because of the flooding "[…] the general impacts can be characterized as the disintegration of the socio-cultural system of organization of a population of rural origin, whose main economic activity is in agriculture and its mode of socio-cultural organization is of the peasant type" (Ministerio de Obras Publicas, Volumes VIII - T.1 y 2 / IX / XIII) However, the measures taken to evacuate the communities and the conditions for compensating their losses as a result of the relocation were not foreseen nor budgeted for in time. The main causes of the conflict included losses associated with the relocation of the communities, losses in their economic and production structures and the lack of a legal framework and of a democratic process for the citizens' participation in the resolution of the conflict.

Key stakeholders in the conflict and governance institutions that emerged from the conflict

In the case of the Puclaro Dam, the relevant stakeholders in the conflict are the communities flooded by the reservoir and subsequently relocated in the region (5 communities and various small villages for a total of 1000 people). This represents the sector most vulnerable given the socio-economic and cultural characteristics of the groups; the majority depends on a traditional subsistence agriculture that is being radically affected by new investments and production models in the region. The land tenure system as well as the size of the various communities give rise to two population groups: those with access to irrigated land and water rights, and the small subsistence agriculture and landless peasants. The two with distinct capacities of organization and political influence over the conflict (see Appendix 6—land tenure in the communities). The other stakeholders in the conflict are the decision-makers and State institutions, responsible for the design, construction and operation of the Puclaro

[6].The D.S. No. 30 of 1997, Ministry of the General Secretariat of the Presidency, establishes the Regulation of the System of Environmental Impact Assessment, regarding the processes of citizens' participation, among others.

[7] Republica de Chile – MOP – D. De Riego. Puclaro Dam Project; Study of the social and environmental impacts. Volumes VIII - T.1 y 2 / IX / XIII. Consorcio de Ingeniería Ingedesa EDIC Ltda..

Dam, and the associations of irrigators—the benefited group of stakeholders because of the greater security for irrigation linked to the dam.

In the literature on the analysis of dams it is widely recorded that the risk and the opportunities associated with their construction are distributed unequally and that displaced populations—removed from their lifestyles and traditional territories—face the greatest impacts (WCD, 2000). In the case of the Puclaro Dam, this is even more evident because the irrigators that benefit from greater water security do not even live in the region, whereas the displaced populations lost everything. Therefore, for the different stakeholders in the conflict, their perceptions and experiences of risks, vulnerabilities and opportunities contrast and are at polar opposites—the typical perspectives and outcomes associated with modernity and globalization.

Timeline for the case study

The fieldwork established two key moments. One, focused on the identification and initial contact with key stakeholders, which included familiarizing with and exploring the region, as well as visits and conversations with the locals and leaders of the relocated communities. Also, the review of documents and publications related to the construction of the dam, including newspaper articles for that time period. The second moment focused on conducting in-depth interviews using an interview guideline adapted to the local conditions, but similar to the one used for the Oldman River Dam case (see Appendix 2).

The general approach to the study of conflicts was to establish a set of visits and interviews with relevant stakeholders and key informants that would allow an understanding of the different visions and experiences of the communities when faced with the conflict and relocation (see Appendix 12 –list of stakeholders interviewed).

The main limitation encountered during the investigation was the scarcity of information at the institutions that participated in the conflict. One of the key stakeholders, the Dirección de Obras Publicas (DOP) (Department of Public Works), for two years could not provide access to its archives because of maintenance works at its library, where various studies related to the project were kept and not accessible at other regional or national institutions[8]. Nor was it possible to access the records of the meetings, official documents of the agreements and records of the resolutions between the public entities and the leaders of the relocated communities, if they existed at all.

Local stakeholders were identified and interviewed, mainly representatives of the uprooted communities; also other sectors stakeholders, including mainly government and private institutions linked to the administration and development of water infrastructure; political stakeholders, people that played an influential role in the decisions that affected the institutional resolutions regarding responses on the relocations.

[8] The document that contains the study and the plan for the relocation of the affected communities by the Puclaro Dam and which will contain the alternatives, proposal and possible solutions for an Inter-sectoral Commission was never located, in spite of the relevance and importance of the study.

Local stakeholders—the communities

There were five communities affected by the construction of the Puclaro Dam: El Chape, La Polvada, Punta Azul, Gualliguaica y San Carlos (see Table 1 for a brief description of their demographics).

El Chape was the smallest community; it had been located right where the dam wall rose. With a population of approximately 21 people, this community had a close relationship with the nearby community of La Polvada. Its leaders and members had a passive role in the development of the conflict.

La Polvada was a small village with approximately 159 people. It was located about 1 km upstream and southeast of the dam. It had a school, electricity and drinking water that came from a channel fed by a stream. Its leaders were very active in the conflict. It was one of the communities most affected because it was very close to works taking place for the construction of the dam wall and for the new road. Therefore, for a long time the community was subjected to psychological stress, until they left the location so that the construction works could proceed. Its temporary relocation was a camp supposed to be in place for three months as agreed upon with the authorities. However, this deadline was extended to almost three years; at which time the people were relocated into new housing units, at a place named Villa Nueva de Puclaro. The families were affected by the continuous explosions from the blasting of rocks to accommodate the location of the dam, which caused stressed and illness for the inhabitants, especially for the elderly.

In spite of the impacts of the construction of the dam, the leaders of the community could not establish clear and stable mechanisms of negotiations with the authorities in order to reach timely and adequate solutions. Even now, the leaders' perception is that they did not achieve the expected results in their dialogue with the authorities, and that their merger with other communities and relocation to Villa Nueva Puclaro was an inadequate, late and inequitable response to their demands.

Punta Azul was a community with an important agricultural development even though the members were mostly small scale land owners, peasants and goat herders. Before the construction of the dam the community was located on the road Serena-Vicuña and had a population of about 200 people; it had electricity and potable water. The community's neighbourhood leaders did participate in dialogues with the authorities in search for a solution to their situation. However, they decided to form a coalition with the leaders of la Polvada, which generated internal disputes with regards to their influence at the negotiating table, giving rise to intense recriminations and tension between the two communities. Today, they have to share the same land where they were relocated, and live with the same people who they perceive to be responsible for a bad negotiation process.

Gualliguaica was located on the north slopes of the River Elqui. At the time of the construction of the dam it had a population of 338. It was an old town with great heritage due to its previous role and constructions such as a train station that had functioned as the centre for freight and transport between 1875 and 1975. Gualliguaica, unlike the other relocated communities, had greater political influence in the decision-making process during the conflict. This was partly because of the links between its leaders and influential people such as Marcelo Olivares, member of Consejo del Gobierno Regional (Council of the Regional Government). Olivares is recognized by the Gualliguaica citizens for his important

role in fostering the internal cohesion of the community, and establishing the conditions for accepting the project and the relocation of the community. In addition, Gualliguaica had institutional support in reclaiming its heritage as a representative town of the Elqui Valley (with a church, train station and school).

Table 1: Communities' characteristics before their relocation

General characteristics of the communities before relocation	828 people in the area
Age and work productivity	43% dependents (0-19 years) 35% highest productivity (20-39 years) 13% intermediate productivity (40-59 years0 9% non-productive (greater than 60 years)
Local population distribution in percentages	El Chape (2 %), San Carlos (14%) La Polvada (19%), Punta Azul (24%), Gualliguaica (41%)
Housing ownership	51% legally owned and 49% occupied by non-property owners
Housing occupation	39 of the housing units were occupied by close relatives (some were occupied by one, two or up to three groups of close relatives, for a total of 62 groups)
Family units that were uprooted	224 family units, which correspond with the number of heads of homes in the study area

Source: Proyecto Embase Puclaro; Estudios de impacto social y ambiental; Consorcio de ingeniería Ingedesa EDIC Ltda., 1995. Modified by the authors

San Carlos was one of the smallest communities but had great economic importance because it had a packing plant for fruits and other agricultural products and served all the local communities in the area. Its population was 115 people. Its leaders and members did not have a visible role in the conflict regarding their relocation.

Government and private institutions stakeholders

Dirección de Obras Hidráulicas (DOH) (Department of Hidraulic Works). DOH's institutional mission is to develop hydraulic works with an integrated watershed management approach, promoting the efficient use of the available resources for community development. Its functions include planning for the use of water resources and actively participate in the assessment, design, construction and conservation of water works in the basin such as irrigation, drainage, rain water collection, management of canals and design and construction of systems of rural potable water supply.[9] DOH was the institution with the greatest influence on the conflict and in the uprooting of the communities. It was the institution that through the Regional Management established an executive coordinating body that oversaw diverse institutions involved in the construction of the dam. These institutions included Bienes Nacionales, in charge of valuation and expropriation of property; Servicio Agrícola y Ganadero, linked with themes related to new titles to property when relocating the communities; Secretaría Regional Ministerial de Vivienda, related to the construction of new sites for the uprooted communities; and the Mayor's office of Vicuña.

[9] Mision Institucional: http://www.moptt.cl/oirs/preg_hidraulicas.htm#1

Secretaria Regional Ministerial de Vivienda (Seremi MINVU) y Servicio Regional de Vivienda y Urbanización (SERVIU)—Ministerial Regional Office of Housing and Regional Department of Housing and Urbanization.
SERVIU aims to overcome the lack of housing units and urban development for urban and rural populations through housing subsidies, with a focus on low income sectors of the population. This entity was in charge of coordinating the construction of the new communities of Gualliguaica and Villa Nueva Puclaro.

Junta de Vigilancia Río Elqui y sus Afluentes (JVRE)—Administering Committee for the Elqui River and its Tributaries
JVRE is a private-rights organization established by the Water Code, and its mission is to administer and allocate water rights to waters in natural river beds in the basin of the Elqui River. JVRE was founded on June 11th, 1993, replacing the Association of Canal Users of the Coquimbo River. It is preparing itself to take charge of the administration, operation and cost recovery of the Puclaro Dam once they make the due payments for construction costs to the Ministry of Public Works.

This institution did not have a relevant role in the negotiations or solutions for the affected communities, even though some of its members lost their water rights because of the relocation. In general, JVER did not make contributions to the consolidation of a solution for the relocated communities. The administrator of JVER explains that: "It is good to clarify that JVER was a spectator in this conflict. Those who had a fundamental role in the future of the communities were DOH, at one moment, and SERVIU, in another. We only provided our opinion in the field that concerns us" (Manuel Dominguez, Interview 28, July, 2006). However, during the investigation it was possible to distinguish that JVER and the community of Gualliguaica had opposing interests. The community of Gualliguaica's interests focused on the loss of water rights, whereas JVER's focused on the lake shore (formed by the reservoir) for its tourism potential, contradicting the claims Gualliguica expects to make on the shoreline area of the reservoir.

Political stakeholders—Influential people in decision-making roles

Intendente Regional—Renán Fuentealba (Regional Intendant)
The Intendant, nominated by the President of the Republic, is in charge of the administration of each of the Chilean regions. By institutional decree the intendant's function is directly related to the social, cultural and economic development of the region. Intendant Renán Fuentealba was the main advocate for the Puclaro Dam project, and was able to attain financial contributions from the State, the irrigators and from the regional government for the studies that supported the design and construction of the dam; and secured funding from the central government for the dam's operation. He was the main political defendant of, and spokesperson for, the project, as well as the promoter of the discussion tables seeking resolutions with the communities affected by the relocation. However, he delegated the responsibility to the director of DOH for the coordination and negotiations with the communities to be relocated.

Mayor of Vicuña—Fernando Guamán
The affected communities and the zone of construction of the Puclaro Dam are located within the jurisdiction of the Municipality of Vicuña. At the beginning of the construction works,

the mayor of Vicuña was Fernando Guamán. Although he was an advocate for the construction of the dam, he also played a mediator's role in the conflict and tried to influence the decisions of relocating the communities of La Polvada and Punta Azul to the city of Vicuña. His proposal was soundly rejected by the communities because relocating to Vicuña would be far from their original territories. The project's appearance as an initiative towards "progress" for the region provided an important opportunity for the mayor to play a mediator's role, with which he hoped to gain trust from the people and be seen as defending their rights. For example, he filed a claim that stopped for about a week the construction works that were affecting the community of La Polvada. Despite this intervention, this legal route was not successful and the weight of the regional government's decisions prevailed; at the end of the day, the municipality only acted as a means for rescuing the minimum of compensations (new location and housing).

The fact that Villa Nueva Puclaro (the merger of Punta Azul and La Polvada) is located right in view of Nueva Gualliguaica ("the first town of the 21 century") across the reservoir on the north shore is a symbolic account of the imbalance in the results obtained by the different affected communities.

Results from the Puclaro Dam case study

The construction of the Puclaro Dam was a response to the need of regulating the flow of the Elqui River and store about 200 million cubic metres of water in a reservoir, and hence increase water security for about 20,000 hectares of agricultural production. This public investment improved water security in the Elqui Valley, and it could also be considered as a measure to address climate change impacts, but it has also generated new forms of vulnerabilities for the five relocated communities.

The agreements reached by the public institutions on the compensation for expropriated lands and relocation were unequal with the two new communities constructed on the north and south shores of the reservoir. This has generated high levels of dissatisfaction in the relocated communities toward the public authorities. Newspaper articles at the time documented the complaints and demands from the communities and the responses by the main public authorities, including the response of the then Minister of Public Works, Ricardo Lagos, and who years later became the president of the country: "Before a drop of water is in the reservoir, the problems of the affected people will have been resolved"[10]. Obviously, the water arrived but not the solutions.

In the case of Villa Nueva Puclaro, the responses were particularly late; the relocation of the community happened three years after they had been living at a temporary camp. The people expressed profound disappointment with the responses from the public authorities and their promised solutions. The disillusion with the responses from politicians and directors of government agencies was explicit in the declarations of the leader of one of the neighbourhoods of La Polvada: "I find that the government officials are with the people when they need their votes, but then they forget about them. Here we have congressmen and senators; kisses over there kisses over here, and then, when one needs them, they are not with the people."[11]

[10] Ricardo Lagos, Minister of Public Works, 14-sep – 1996, Diario El Día, La Serena.
[11] Interview with S. Vigorena, neighbourhood leader; July, 28, 2006.

For the people of Villa Nueva Puclaro, the trauma of relocation occurred in three different moments. The first moment, associated with the negotiations before the people were transferred to a temporary camp; in this phase of the negotiation the main actors were the families who had legal ownership rights to their property, and whose homes and lands were subjected to expropriation and compensation. Families who had no legal ownership rights (land titles) had no rights to complaints or to compensation in the first phase. In a second moment, when the government after having created a commission to oversee the relocation of the communities, did not implement the options for relocation proposed by the communities; instead, it subjected the communities to live in a transition camp, the after-effects of which persist today because of the precarious conditions and a ghetto-like environment that they had to endure. And a third moment, when they capitulated to the decision of merging all of the families and create a new community, with housing units supported by a subsidy program that allowed 100 square metres per lot and 50 square metres of buildings.

Villa Nueva Puclaro, a complex and depressing merger. Today, Villa Nueva Puclaro does not have access to water or lands for irrigation and the people do not even have a small area for a garden around their homes. Neither does the community have land for future expansion to build a social gathering place or a medical outpost. It does not have a social support program and its scarce communication with the Municipality of Vicuña have transformed it into a community without dreams and with internal strife. It is important to point out that the community's greatest risks to impacts of climate change is due to its location on open hillsides and without retention walls, which in the event of an increase in sudden precipitation that results in runoffs and mudslides at the confluence of the three ravines, could create emergency conditions of great proportions. The community does not have a coordinated plan to respond to these risk scenarios.

The interviews and site visits ratified the social impacts of the dam discussed in the baseline assessment of the impacts of the dam conducted by the INGEDESA consortium.[12] A widespread state of depression affects the current population, particularly the elderly who lost their connection to the river, the landscape and its vegetation and to their farming practices. Hence, it has been stated that the elders "are letting themselves die."[13] The social networks have been profoundly damaged and the merging of various communities with different histories in one location has generated intense inter-family conflicts and a weakening of their social organizations. Their capacity of collective response in a dry and hostile environment has also been weakened. Moreover, while they can see the reservoir, they are cut off from it by a highway and do not have rights of access to the water.

Nuevo Gualliguaica and a successful negotiation

Contrary to the response given to the people at Villa Nueva Puclaro on the "other shore," for the people of the old community of Gualliguaica the response was more equitable. They challenged and negotiated their settlement location at a place not far from their place of origin, on a 600-hectare lot owned by Servicio Agricola y Ganadera of the Ministry of Agriculture, and they secured housing conditions and the implementation of an urban plan similar to, if not better than, those they had before their relocation. Their housing units covered 100 square meters, on close to 600 square meter patches with opportunities for future expansion and planting.

[12] República de Chile - MOP – D. De Riego. Puclaro Dam Project; Analysis of the social and environmental impacts. Volúmenes VIII – T.1 y 2 / IX / XIII. Consorcio de Ingeniería Ingedesa EDIC Ltda

[13] Interview with Luisa Rivera and Elvis San Francisco, neighbourhood leaders, July 27, 2006.

The institutions that supported their demands and negotiations are recognized and acknowledged by naming the main streets after them, such as Universidad Católica del Norte, Universidad de la Serena, and there is a street with the name of the regional councilor Marcelo Olivares. Replicas of the old church and the train station were built, as icons from their heritage, alongside the modern and imposing public school building that has benefited the members of this community. The family gardens, the homes, wide and paved streets and walkways, the water reservoir, a windmill, the experimental fields at the shore of the reservoir and windsurfers on the reservoir's water are clear signs of a more balanced outcome of the negotiations. Although members of this community also lost most of their water rights, their cultural heritage and ways of life were properly documented through photos and pictorial records capturing their traditional agricultural fields and the river's environment, which for generations accompanied them. They recognized that the possibilities of employment in family scale and peasant agriculture have disappeared and that their agricultural activities has been relegated to working on small family farms of 100 square meters or as seasonal workers on orchards in the region. Their leaders recognize that without prospects for employment, other than in some potential tourism activities associated with the reservoir, the community will transform itself into a "community of the elderly and retirees."[14]

Irrigation farmers and benefits

The irrigation farmers were the main beneficiary of the Puclaro Dam, and they are currently enjoying greater economic activities, greater security for irrigation and a greater investment in irrigation and production infrastructure. Although a quantitative evaluation of the improved water security has not been done, the directors of JVRE make an optimistic evaluation of the impacts of the dam on their productivity. In addition, there is the potential to generate 6.35 Megawatts of electricity through an agreement with the GPE Company.[15]

Given this background, it can be established that the benefits of the Puclaro Dam project have not generated more fairness in the region. On the contrary, the owners of monocultures, who contribute high levels of capacity and economic productivity and with solid political representation, are the ones that have benefited most from the project. With the construction of the dam, JVER and the association of agro-exporters—who epitomize the economic development model—have improved and increased their access and control over waters in the region. Collectively and as a productive force, they represent the forces of economic development in the region and as such they are the main parties in dialogue with the State (see Appendix 8).

New vulnerabilities and a damaged social fabric

The construction of the Puclaro Dam and the associated conflicts from its operations allow the identification of social groupings positively or negatively affected with regards to their adaptive capacities and exposures. Communities with lower socio-economic conditions and with less access to lands and water were more negatively affected by the relocation. It can

[14] Interview with don José Miguel Blanco, neighbourhood leader of Gualliguaica, July, 27, 2006.

[15] The Administering Committee for the Elqui River and its tributaries and the company GPE have formed a corporation in order to build a power plant at the foot of the Puclaro Dam. The project expects an investment of $ 2,160,000,000 (Chilean pesos), which is close to US $4.05 millions, for the construction and operation of a hydroelectric power plant with the potential to generate 6,350 Kw, which would be fed into SIC. The plant would use the water stored in the reservoir, which would then be put back into the Elqui River for its natural function

also be observed that these communities had weak internal cohesion, low capacity to negotiate and low organizational capacity; these factors and their lack of direct links with influential people and institutions were determinants of the type of role they played in the resolution of the conflict and in the solutions reached.

Therefore, the Puclaro Dam has had dual and contradictory impacts. For the families that depended on subsistence agriculture there was an uprooting from their territories and productive lands and relocation onto hills where they had no access to land or water for agriculture. The displacement of subsistence agriculture and peasant economy by intensive monocultures has grave ecological and social implications, which have been widely documented in the agroecology literature worldwide (www.agroecology.org/). The social fabric of the displaced families was seriously damage in part due to the uprooting from their traditional territories and their relocations on hillsides where they currently have no access land or water for agriculture. Also, the public investment in water infrastructure has favoured monocultures and medium and large landowners, representing the modernizing sector of agriculture. Although an agroecological evaluation of the displacement of peasant agriculture by monoculture has not been done in the valley, the agroecological literature has presented evidence of the grave ecological and social impacts of such agriculture especially on hillsides.

Institution Stakeholders

It is clear that the model of economic development favoured by public institutions is one that focuses on improving the capacity of sectors endowed with productive lands and with great potential to transform the agricultural sector. To support this economic model, the public institutions' objective was, and is, focused on the design, construction and operation of projects that regulate river systems such as the Puclaro Dam. The analysis of the conflict associated with the construction and operation of the Puclaro Dam indicates an important institutional deficit in forecasting and responding to the social impacts identified in the studies conducted at the beginning of the construction works. This deficit is also manifested in the lack of leadership and coordination of actions in order to foresee, mitigate, reach consensus and reach equitable solutions for the relocated communities, and in the failure to secure access to lands and water for the community.

The institutional response to the social impacts of the Puclaro Dam project included compensation for uprooting the communities, but this response occurred within the sphere of competency of each institution and based on each institution's "good will," rather than based on institutional policies and coordinated efforts. Thus, social programs to address some of the impacts have not been sustained, and there is no other institutional support for the relocated communities.

On the other hand, after six years of operation, an assessment of the potential positive impacts of the dam on agriculture, the level of production and productivity and the efficiency of water use, is just beginning.

Local stakeholders

The analysis of the conflict indicates that the difference in the final outcomes (living space, housing, surroundings, social infrastructure, access to lands and water, public services, etc.)

for each of the uprooted communities was due to their lack of coordination and collective action. The affected communities were not able to establish a process of dialogue and coordination that would allow them to negotiate united, instead each one carried out their own negotiations by trying to "stay the same or better off than before." Thus the solutions provided by the public entities were very inequitable. La Polvada and Punta Azul, with their social capital notoriously damaged and without support from institutions or from influential individuals for their inexperienced neighbourhood leaders, were not capable of constructing or defending solutions of their own. Their priority was to resist and stay put on their territory and close to the river (which is now the reservoir). Their proposed alternative for relocation was to move to "Fundo el Porotal," but this promise was not realized because of the high costs of these lands.

Gualliguaica had greater influence in the decision making process because the Regional Councillor was a member of this community, and he was an advocate for an equitable solution for Gualliguaica. This shows the community's capacity to reach out to regional authorities and influence decision making through networking. This community also had a greater level of internal cohesion at the time when the conditions for negotiations with the public entities were established, even today there are more government supported programs in this community than in the other community located in the southern edge of the Puclaro dam.

Institutional learnings

Dams are constructed with the goal of contributing to the development of the local economy in regions where the availability of water is low and variable by providing water security. "Water security" is conceived as an opportunity to improve the productive options and decrease the risks to and vulnerabilities of communities and their production systems. By decreasing the uncertainty of water supply, new investments and more wealth are realized, which in turn transform agricultural systems and allow the development of a more fluid articulation with regional, national and international markets.[16]

Clearly, the learnings derived from this conflict indicate that equitable benefits were not the focus of the decisions. However, it was expected that the uprooting of the communities would generate an institutional response that would include a multi-dimensional perspective; a perspective with a decision matrix that would integrate economic, social and ecological costs. The analysis of the conflict indicates that this did not occur; moreover, there were no other studies that integrated the assessment of the environmental and social impacts. These then were great deficiencies of the project.

The creation of an Inter-institutional Commission that would attend to the needs of the uprooted communities responded only partially to the challenges faced by these communities.[17] Public institutions have not been able to address some of the predicted impacts nor the emerging vulnerabilities experienced by the communities. In addition, even though the Chilean environmental legislation stipulates the implementation of a complete

[16] Interview with the Regional ex-Intendant, December, 2006.

[17] This Commission constituted by representatives of the various public entities focused primarily on the costs associated with the compensations for expropriated lands and the design of the homes for the new communities, but it did not create an integrated program for the medium and long term that would allow the reconstruction of the social capital of the uprooted communities.

environmental assessment of major projects, to date there have not been any comprehensive study or monitoring of the environmental impacts of the Puclaro dam on the behaviour of the Elqui River.

Adaptive Resolution of the conflict

Using the Adaptive Conflict Resolution principles as criteria to assess the management and resolution of the Puclaro Dam conflict, the findings were as follows:

1. **Early and equitable access to information is ensured to all parties involved, including information on the parties' views**

   The project did not have an environmental and social impacts assessment that included public consultations. Access to information was partial and only related to mitigation measures implemented in relocating the communities. The efforts by institutions of providing greater access to information once the project had started, only generated further exclusion and auto-marginalization of the communities as the language used was highly technical. The communities felt that they were not able to negotiate or obtain support from institutions for their agenda and concerns. Instead, they only reacted to the responses and proposals by the authorities and each community engaged in negotiations separately.

2. **Balanced, symmetric power relations are provided in negotiations and decision-making regarding the outcome of the conflict**

- There was a lack of institutional capacity in creating scenarios and methods of negotiation that would allow the stakeholders to exercise equal power relations and articulate their concerns. Decisions concerning the relocation of the communities, valuation of the territories and family and collective heritage, and the terms and conditions of the compensation packages, were defined by public authorities or the consulting companies hired for this purpose. There was not a system that allowed an effective participation in these decisions by the affected communities. One of the recurring demands of the people from La Polvada and Punta Azul relates to the valuation of their lands. They claim that some of the leaders obtained favourable valuation for their lands as a means of co-opting them, and therefore these leaders lost their integrity and powers of representation. The asymmetry in the powers to negotiate was also reflected in the lack of time and a reasonable time frame and conditions for the communities to identify potential sites for their relocation, sites with access to land and water so they could maintain their agricultural traditions and practices.

- In a balanced negotiation process the negotiating parties recognize and acknowledge each other's values. In the Puclaro Dam conflict, the values recognized were "the rights and legal titles on land and water," but not the set of values concerning the historical use and customs held by the communities concerning these resources. At the negotiating table, the communities of La Polvada and Punta Azul did not have a set of arguments that could counterbalance the arguments presented by the authorities regarding the issue of relocation and the provision of conditions so that they could enjoy a lifestyle equal to or better than the one they had before their uprooting. Thus, there were no satisfactory

agreements reached, and the negotiation process was conducted with each individual community. But these negotiations' objectives did not include the maintenance of the social capital, community networks or the maintenance of their built and environmental heritage.

3. Recognition, respect and fostering of differences in values and perspectives toward creative solutions

- This principle was partly considered in the case of the community of Gualliguaica. This was possible because of the community's greater capacity to organize themselves, a long history and greater political influence by some of its representatives. The community was able to get their values acknowledged, including values regarding their cultural and architectural heritage, customs and landscape; all of which were adequately recorded through paintings, photographs and some of them reconstructed in the new community. However, this was not the case for the communities who did not have the same capacity and influences as Gualliguaica, and also because these communities did not readily accept the "solutions" offered, which was seen as a problem and conflictive. According to interviews done in Villa Nueva Puclaro—whose members were originally from La Polvada and Punta Azul—the dialogue with these communities was conducted with the leaders only rather than in consultations with the communities in order to avoid dissenting views from community members. Dialogue among the stakeholders was not promoted, supported or recognized as an opportunity to generate more creative and lasting solutions.

4. The resolution of the conflict aims at securing the integrity of ecosystems and restore the negative impacts on biodiversity

- This principle was not taken into account. There were no organizations from the civil society or from the communities to defend or raise concerns over the impacts of the dam. These impacts include habitat fragmentation and disappearance of fish and plant species. Responses from the interviews show that even today the concerns of most community members is focused on the loss of their fruit trees and the wet and freshness of the river environment, especially compared to the dryness of their new location. There was no mention by the authorities of any measures for the compensation or mitigation of the environmental impacts; nor did they mention follow up studies on the environmental changes and their effects on climate in the region, even though this issue is of concern for the local community. However, an independent study recently conducted (Bischoff-Gauss et al., 2006) shows significant climatic changes as a result of the dam, as well as impacts on plants and a species of shrimp that had its migratory route completely cut off by the dam wall. Recently there have been some positive developments. Through the water regulations and initiatives of biodiversity conservation in the Elqui Valley that the National Commission on the Environment (CONAMA) has been spearheading, public policies regarding the integrity of ecosystems have been established (see http://www.sinia.cl/1292/article-34316.html)

5. **The social capital of the communities involved is strengthened by the resolution of the conflict**

- The social capital of the communities—their sense of community, solidarity, mutual support, shared knowledge and social networks—should be supported and strengthened; however, as it was acknowledged early on in a baseline study conducted in 1995, the major impact of the relocation of the communities would be the "disarticulation and loss of social capital." Despite the early identification of this impact, measures have not been taken to address the conditions of depression, animosity and the conflictive internal relations of the relocated community in Villa Nueva Puclaro. The relocation to a dry and desolate place and the loss of the school, lacustrine environment, traditions and production space, all contribute to a condition that the community feels is "an extended level of depression." In contrast, the authorities perception is that the community members received "more than what they had before," and that many of them did not deserve to receive housing and a piece of land because they or their families did not have legal property titles. It is clear then that the rebuilding of the social capital lost was not an important goal or a task for the public institutions.

6. **Corporations or institutions involved in the resolution of the conflict strengthen their technological capacity and institutional adaptation toward sustainability**

- For proponents of the project such as the producers and agro-exporters, the dam represents greater stability and security for their investments and production plans. However, the Junta de Vigilancia still does not have the background information for assessing the effectiveness of the changes that the dam has had on the productions systems downstream. Also, the construction of secondary irrigation infrastructure and some of the main water canals has not been completed, and therefore there are no figures available on the number of the additional hectares under irrigation and there is no information on the technical efficiency of the irrigation systems**.**
- The Regional Government is another stakeholder, and they were represented by the Intendant and members of CORE, whose members define and decide on the priority for public investments to address the development needs of the region. For the Regional Government the assessment of past investments in terms of their social, economic and environmental effectiveness is not a priority. Thus, opportunities are lost regarding lessons learned and institutional learnings. In addition, it is not evident what technological and institutional adaptations have been implemented, and therefore it is difficult to determine which social, economic and environmental long-term aspects of sustainability can be strengthened with learnings drawn from the Puclaro Dam conflict. In fact, it is difficult to see whether any learning from the Puclaro Dam conflict can be drawn upon and applied to the construction of a dam on the Choapa River (El Bato) in the next few years. The process for the approval of the Choapa River dam has been publicly questioned by local and environmental institutions because of the damages that the dam will produce on a heritage canelo forest in El Bato (La Cuarta, 2002).

7. **As an outcome of the conflict social organizations improve their creativity and capacity to negotiate**

- The local organizations' capacity to defend, negotiate and propose creative solutions has not improved from the results of the conflict. However, in the community of Guaguillaica there are organizations taking advantage of the Puclaro reservoir by

undertaking projects related to tourism and recreation and they negotiated well their resettlement.

- The perception of the relocated communities is that the authority and legitimacy of government institutions has not been strengthened by their role in the conflict. In the case of Villa Nueva Puclaro, concerns were raised over the coercive methods utilized in uprooting the communities and over the risks that the communities were exposed to during the construction of the dam such as the explosions nearby their homes. Their subsequent evacuation "without sufficient warning and leaving behind their entire livelihood" was perceived as coercive and with no possibilities for them to exercise their rights. In the case of Gualliguaica, and even though they acknowledge that the negotiation process and its outcomes were better than for the other communities, they attribute the success of these results to their leader and member of CORE and not to capacity of the public institutions. The environmental impacts from the use of toxic agrochemicals on monocultures and the impacts on the food security associated with the traditional agriculture in the Valley have not been a priority for the institutions. There have been no agroecological assessments done on the transformation of the Valley as a result of the dam.
- For the community of Villa Nueva Puclaro, the most affected by the dam, the solutions have not been adequate; in addition, their social capital is badly damaged and with new conflictive conditions, and therefore the community lacks the cohesiveness and the capacity to formulate responses and solutions toward their needs.

III.c. Pascua Lama Project conflict

The Pascua Lama project, which is a Barrick Gold Corporation project, through an open pit mine seeks to exploit gold, silver and copper resources at the head of the Rio Huasco basin. This project falls under the Integration and Complementation Mining Treaty between Chile and Argentina (2001)[18], which enables the binational exploitation of minerals located at the boundaries between the two countries.

The Project is located in the Andes mountain range, between 3,800 and 5,200 metres above sea level, at the international boundary between Chile and Argentina, in Comuna de Alto del Carmen, about 150 km to the southeast of the city of Vallenar in the III Region of Chile, region also known as the Huasco Valley, and about 300 km to the northwest of the city of San Juan in Argentina.[19]

The Environmental Impact Assessment (EIA) of the project presented in 2000 to the Sistema de Evaluacion de Impacto Ambiental de Chile (SEIA) (System of the Environmental Impact Assessment of Chile), completed the mining plan for which studies had been conducted in the region since 1977[20]. During the process of citizens' participation, as established in the SEIA's guidelines, the corporation revealed the characteristics of the project, which sparked conflicts with the local community because they see risks for the entire Huasco Valley from implementation of the project. The location of the project at the head of the basin which feeds the hydrological systems of the Huasco River, its tributaries and streams, would

[18] Ministry of Foreign Relations. 2001. Integration and Complementation Mining Treaty between Chile and Argentina. Available from Ministerio de Mineria http://www.minmineria.cl/img/Tratadominero.pdf

[19] More detailed characteristics of the region are in Appendix 1.

[20] Mining exploration was extended to various prospectors, but in 1994 Barrick Gold Corporation acquired exclusive mining exploration rights.

generate risks and impacts on the local ecosystems affecting the quality of life of the people and agriculture, the main local economic activity.

The risks that the local community perceives from the mining operations are of three types: 1) the decrease in water flow on rivers that irrigate the valley as a result of the removal of glaciers as proposed by the corporation[21]; 2) water contamination as a result of the generation of acid waters and the solubility of some dangerous minerals from the fracturing of rocks; and 3) risks associated with the high rate of transportation of dangerous substances through the narrow valley roads, placing direct risks on the safety and health of local communities, and risks of contaminating water systems as a result of accidents.

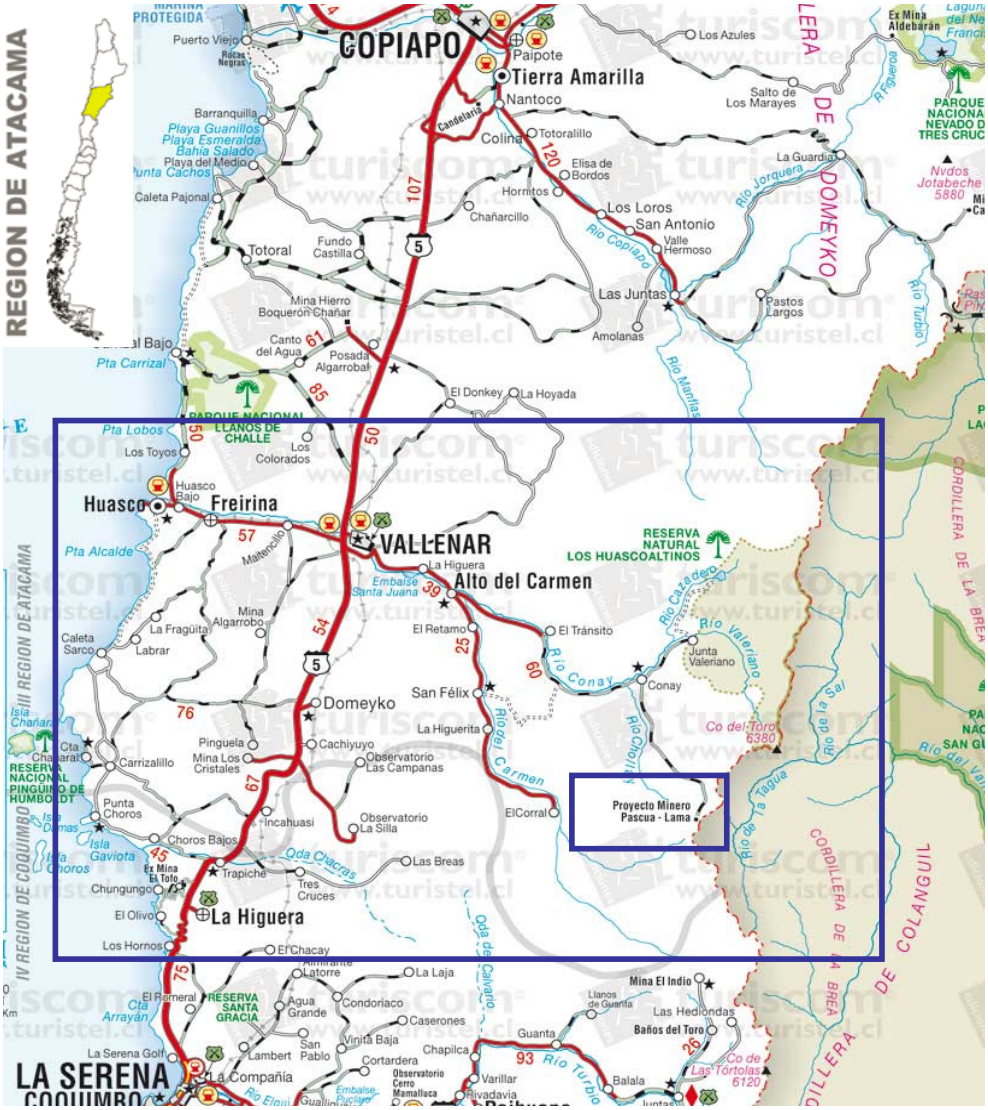
Soon after the approval of the project in 2001, by the Regional Commission on the Environment (COREMA) Región Atacama[22], Barrick Gold Corporation postponed the project claiming it had identified larger mineral reserves elsewhere and was waiting for better market conditions for metals. In 2004 the corporation presented a new environmental impact assessment called "Modification to the Pascua Lama Project". Such modifications were related to an increase in capacity and speed of extraction of the minerals, among other things.

This new development led to the re-activation of groups opposed to the project, groups that had experienced the 2000-2001 process. There were four strong opposing groups: Consejo de Defensa del Valle de Huasco, Comunidad Cristiana de la Parroquia Nuestra Señora del Carmen, Comunidad Diaguita y Agricola de los Huascoaltinos and Junto de Vigilancia de la Cuenca del Río Huasco y sus afluentes (the Council for the Defence of the Huasco Valley—which was created as a result of the conflict--, the Christian Community of Nuestra Señora del Carmen Parish, the Community of Diaguita, Agrícola de los Huascoaltinos and the Administering Committee of the Rio Huasco Basin and its tributaries).

[21] The mining plan proposed the removal of portions of three glaciers that were located in the projected mining area; glaciers that feed the rivers in the area.

[22] Resolution Exenta No.039 of COREMA, Atacama Region, April 25, 2001, which was subject to some modification in July 3, 2001 through the Resolution Exenta No. 059 of COREMA, Atacama Region.

Figure 6: Map of the Area of Influence of the Pascua Lama Project



Source: www.turistel.cl, modified by the authors

At the end of 2004, the opposing groups began to publicize news of the conflict outside of the province and region, and at the beginning of 2005 the Pascua Lama conflict took on a national and international profile, whereby the defence of the glaciers and the contamination of waters were the main flagship concerns of the groups opposing the mining project. Thus, support from various groups for the communities in the valley began to develop[23], as well as support through simultaneous marches internationally and through news reports in various media, written and televised. The main message from these activities was to demand that the National Commission on the Environment Atacama (CONAMA Atacama) and COREMA Atacama Region engage in mediating the conflict and to stop the intervention on the glaciers.

Due to the national scope that the criticisms of the project acquired, Barrick Corporation decided to intensify and widen its strategy of publicity and public relations, going from the

[23] The main ones were created in Santiago and Valparaíso, formed by university students and ENGOs.

bulletins handed out in the local communities to the regional and international written media and television propaganda campaigns with the slogan "Barrick, responsible mining." At the time, there were two strong opposing camps: Barrick Corporation, which was seeking approval for the project, and opposition groups whose goal was to get the environmental authorities to reject the mining project. During the presidential elections at the time, the removal of the glaciers by mining activities became a relevant theme in the debates and positions of the candidates. The President of the Republic elected in 2006, Michelle Bachelet, during her campaign took on the commitment with environmental NGOs to not authorize the removal of glaciers in the country. On a dialogue with the ENGOs she became aware of the critical role glaciers play on economic, social as well environmental development of the country.

Towards the middle of 2005, when the Chilean environmental institutions were immersed in the process of assessing the project (to produce a verdict of approval or rejection), Barrick Gold Corporation was able to negotiate with one of the opposition groups, a group very influential economically in the Huasco Valley, the Junta de Vigilancia del Rio Huasco y sus Afluentes. This group brings together the valley's water license holders and members of its board of directors include large scale farmers in the region. Up until this time, the Junta de Vigilancia was the organization providing the economic means to the opposition groups in their efforts to publicize the conflict. On June 30, 2005, the majority of the board of directors of the Junta de Vigilancia signed an agreement with Compania Minera Nevada (Nevada Mining Company), a subsidiary of Barrick Gold in Chile. The Nevada Company committed to handing out $60 million to the Junta de Vigilancia for the construction of a dam at the head of the basin and for the costs associated with studies and assessments of the project, with the "objective of compensating the potential impacts." On the other hand, the Junta the Vigilancia promised to "not oppose the approval and subsequent implementation of the project."

This agreement led to a series of significant impacts on the local opposition groups. The dissociation of Junta de Vigilancia from the conflict significantly diminished the strength of the opposition and generated in the other community groups a feeling of disillusion and loss in their struggle. The effect of this agreement on institutions is discussed further.

In February 2006, before the new president assumed power, the project's EIA was approved by the environmental authorities with the condition that glaciers Toro 1, Toro 2 and Esperanza[24] would not be removed. However, the local opposition was not quelled, and its mistrust increased towards the company, the environmental institutions and the local authorities. They claimed that conditions were not in place to guarantee that the glaciers would not be damaged and that the waters would not be contaminated in the implementation of the project. They also raised the contradictions generated when such an invasive activity is allowed: an open-pit mine at the head of the basin where the state has made high levels of investments to strengthen agricultural activities and where a big dam has been constructed to provide water security for the valley. The monetary compensation for the future implications of the project on the environment was the focus of the public debate on the agreement between Barrick Gold and the Administering Committee.

[24] Resolución Exenta N°24, February 2006, Comisión Nacional de Medio Ambiente.

Chronology of the conflict study

The first phase of the work for this case study involved an extensive literature review and an analysis of the media documentation and environmental resolutions issued by the public entities on the process and approval of the project. This allowed a preliminary identification of the characteristics of the institutional stakeholders and a list of potential people to interview. To complement the literature review, two fieldwork sessions were conducted, in April and October 2006, and institutions and key informants from social and producer organizations were interviewed.

First, semi-structured interviews were conducted which allowed the construction of the reality from the experiences of the respondents. Afterwards, interviews were conducted using a survey that integrated the principles of adaptive resolutions of environmental conflicts and following the methodology proposed by Rojas et al. (2003). The survey integrated elements and questions common to the Puclaro River Dam and Oldman River Dam cases. The interviews were developed in four sections:

1. General opening questions, which gained insights into the general perspectives on the significance of climate change, glaciers, water and the attitude of the organizations related to these issues.

2. Specific questions on the agreement between Junta de Vigilancia and the Compañia Minera Nevada, given that the signing of this agreement had profound influence on the events at that time.

3. Questions related to the Adaptive Resolution of conflicts, which allowed insights into the evaluation of the resolution of the conflict by the different stakeholders.

4. Questions related to institutional learnings.

Fieldwork

The two fieldwork sessions enabled in-depth interviewing of 13 key informants in the Atacama region. No representatives of Barrick Gold were interviewed because they declined interview requests, also, they did not respond to written questions. The second fieldwork was conducted in order to interview representatives of additional institutions.

In addition, interviews were conducted with a member of parliament and representatives of government institutions who provided insights into the level of knowledge and involvement in the issue by two government branches: the executive and legislative branches. The list of interviewees can be found in Appendix 5.

The development of a spatial map (see Appendix 4) allowed the organization of the visits, given that in the case of Pascua Lama, government entities—technical support and decision-making institutions—are located in the capital of the region, Copiapó, in the Province of Copiapó, whereas all of the local organizations are located in the Province of Huasco. The large distance between these institutions has created a large physical and cultural gap between them.

Stakeholders in the Pascua Lama Conflict and governance institutions that emerged from the conflict

Barrick Gold Corporation. It is a Canadian mining company that is currently exploiting minerals from 27 deposits and has 7 projects of exploration worldwide. The company's subsidiary in Chile is Compañía Minera Nevada, a company that carries out all of the administrative procedures for acquiring the appropriate permits for the operation of the mine. The Pascua Lama Project, with a projected lifespan of 20 years, will extract gold, silver and other minerals from deposits found under glaciers located at the border region between Chile and Argentina. Processing of the minerals will be done mostly in Argentina, whereas 75% of the open-pit mine itself will be on the Chilean side. Also, the slag heaps will be located on the Chilean side.[25]

Comisión Regional de Medio Ambiente Región de Atacama (COREMA Atacama). (Regional Commission on the Environment of Atacama) (COREMA Atacama).
COREMA Atacama is part of the political authority of the environmental institutions at the regional level. It is responsible for coordinating the management of the environment in the region. Among its tasks include the decision to accept, modify or reject the environmental impact assessment studies of projects admitted into the System of Environmental Impact Assessment (SEIA). The National Commission on the Environment—CONAMA Atacama is the technical advisor for the assessments. COREMA is composed of the Intendant of the Region, the regional secretaries of the ministries that form the advisory board of CONAMA[26], four regional councillors, the provincial governors and the director of CONAMA Atacama; all of whom are appointed by the president of the republic or by the Advisory Board, and therefore they are all political appointees. COREMA Atacama approved the two studies submitted on the Pascua Lama project, the first in 2001 and the second in 2006.

Comisión Nacional de Medio Ambiente Atacama (CONAMA Atacama) **(**National Commission on the Environment Atacama). This is the committee that provides technical advice to COREMA, and it is composed of the Regional director of CONAMA Atacama and the regional directors of the public services competent in environmental issues.[27] The technical people are in charge of the assessment of the projects in the Atacama Region that are admitted into SEIA, but because it is an advisory orgnanization it has little influence on the final decision for the approval or rejection of a project.

Dirección General de Aguas-DGA (General Directorate of Water). It is one of the public services that form the technical committee that advises on and asesses projects submitted to SEIA. In order to assess the potential impacts of the Pascua Lama Project, the regional office of DGA should have requested support from the national office of DGA because they lacked trained personnel to assess the project. Also, it should have resolved the request by the community of Diaguita and Agrícola de los Huascoaltinos who demanded that the agreement between the Junta de Vigilancia and Barrick Gold be declared illegal. The DGA rejected the

[25] Located on a glaciar, at the headwaters of the Estrecho River, a tributary fo the Huasco river.
[26] The advisory board of CONAMA is composed of the Ministers of: General Secreatary of the Presidency, Economy, Promotion and Reconstruction, Public Works, Transportation and Telecommunication, Agriculture, Housing and Urban Planning, National Heritage, Health, Mining, Planning and Cooperation, Education, Defence and External Affairs.
[27] Dirección General de Agua (DGA), el Servicio Agrícola y Ganadero (SAG), la Corporación Nacional Forestal (CONAF), who express a favorable or unfavorable position based on their expertise.

request stating that the agreement was between private organizations and it was not an administrative act by the State. However, it did acknowledge its fiscal powers toward the Junta de Vigilancia, as established by the Water Code, and therefore stated that the Junta de Vigilancia was not authorized to sign the agreement with Barrick without the approval of an extraordinary general assembly, but this was not abided by, as documented by the Junta de Vigilancia itself.[28]

Junta de Vigilancia del Río Huasco y sus Afluentes (Junta de Vigilancia) (Administering Committee for the Huasco River and its Tributaries). It is the organization of irrigators in the Huasco Valley, a successor of the Asociación de Canalistas Del Rio Huasco (established in 1908), and since 2005 it is in charge of the administration of the Santa Juana Dam. Regarding the decision-making process, one water allocation is equivalent to one vote; therefore, those who have the greatest number of allocations have more influence on the decisions taken.[29]
At the beginning, Junta de Vigilancia was one of the main opposition groups to the Pascua Lama Project, but after signing the agreement with Barrick Gold its position changed and supported the implementation of the project (there was only one Director that did not sign the agreement and questioned the decision-making process and demanded a General Assembly of the holders of water allocations). After the agreement was signed, Junta de Vigilancia has had various internal changes: the manager that arranged the agreement was fired and the president resigned—even though he was one of the main advocates for signing the agreement.

Consejo de Defensa del Valle del Huasco (Coucil for the Defense fo the Huasco Valley). Consejo de Defensa del Valle del Huasco emerged as a result of the Pascua Lama Project conflict and it is the main local civil society group that opposes the project. Its membership consists of people from the different communities in the province of Huasco and it has remained active after the project's approval, widening its interests for the protection of the basin since the possibilities are high that other projects of high environmental impact, mainly mining projects, will be developed in the province. Currently, the Council leads peaceful occupations of roads to prevent heavy machinery from entering the area (http://www.olca.cl/oca/chile/region03/pascualama223.htm).

Community of Diaguita and Agrícola de los Huascoaltinos. It is one of the most numerous indigenous communities in the area, of the Diaguita ethnic group, which has protested against the expropriation of their lands as a result of the Pascua Lama Project and throughout the country's history. Since it does not have a legal structure to support its demands, it has turned to other institutions for support. Thus it has linked up with Universidad Diego Portales de Santiago, from whom they requested support in their efforts to declare illegal the agreement between Barrick Gold and the Administering Committee; and demanding that Dirección General de Aguas immediately suspend the implementation of the agreement. This action taken by the community of Diaguita questions the abilities of the Junta de Vigilancia to decide on this type of agreements that involves the issue of water rights.[30]

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[28] Workshop on Actions of Public Interest and Human Rights, Universidad Diego Portales, 2006. General Directorate of Water questions the agreement signed by Pascua Lama. May 05, 2006 News. Available at http://www.udp.cl/derecho/noticias/0506/comunicado_pascualama.htm

[29] Generally its board of directors consists of those who have the greatest number of water allocations.

[30] According to the community, this agreement is "a private agreement on public resources," by referring to Article 5º of the Water Code which states that they are: "[…] National Resources of public use and individuals are awarded this right of use," therefore the Administering Committee has overstepped its functions since their responsibility is to only administer and distribute water, to which its members have the rights.

Comunidad cristiana de la Parroquia de Nuestra Señora del Carmen, Alto del Carmen (Christian Community of Nuetra Señora del Carmen Parish, Alto del Carmen) (Catholic group). The priests and nuns of Nuestra Señora del Carmen parish and from other neighbouring communities since the beginning of the conflict have had a very important role in opposing the Pascua Lama Project. They were the first to warn the community about the Pascua Lama Project and they are responsible for increasing the broadcasting coverage to the whole basin of the catholic radio station "El Profeta," which is the only radio station that opposes the mining project. Although the nun and parish priest most daring and vocal in their opposition to the project were transferred to other regions, their replacements continued to oppose the project.

Local Authorities. The local authorities include the municipalities of the Huasco Province, with their respective Mayors and Councils.

All of the mayors in the region have shown, at one time or another, a favourable position toward the project by linking its implementation with greater employment opportunities. The councillors have taken diverse positions, some in favour and others against the project.

The mayor—a woman—of Alto del Carmen has had an indecisive position toward the project. When she was consulted with regards to the municipality's position toward the Pascua Lama project, she made it known to CONAMA that the municipality was in favour of the project, even though the report developed by Municipal employees in charge of environmental issues contained a technical document that rejected the project. [31]

Results from the Pascua Lama case study

Although in the Pascua Lama Conflict one of the main focus points has been the protection of the glaciers—which are the water source for the Huasco basin—before the conflict there were no concerns or public debates about them. It is precisely the conflict that generated a process of institutional learning regarding the importance of the glaciers as water reserves for the future of agricultural production downstream. Therefore, the Pascua Lama project represents a test of the capacity of response by the public institutions. The System of Environmental Impact Assessment was tested and the extensive and the successive demands for reports from the authorities reflect to a great extent the questioning and scrutiny of the project by the public organizations. These demands also reflect the concerns of the different sectors of society.

Before the conflict, for the institutions in the Huasco valley the word glacier was unknown or seldom used because they knew them as "eternal ice;" a term that for them characterized the snow and ice on the peaks of the Andes and therefore as an "eternal" source of the runoff and streams that form the Huasco River. For the valley farmers, who were the first to raise concerns over the risks of disrupting the high zones and headwaters of the basin, their experiences of drought events reinforce their perception of the importance of the "eternal ice" in maintenaning river flows. Therefore, this local knowledge began to challenge the scientific knowledge (or lack of) relied upon by the public institutions.

[31] This report was modified by the Mayor when submitting it to CONAMA Atacama.

The Huasco valley is located in a desert area and its inhabitants are aware of the importance of the mountains on the hydrological cycle. Yet, there are few studies on the mountain ecosystems located in the north of the country (Borquez, 2007).

Also, knowledge is scarce regarding the regional effects of climate change and what preparatory measures government organizations and local water users need to implement to address and adapt to the expected climate variability. However, based on previous drought event experiences, local water users have developed a system of sharing scarce water supply by taking turns withdrawing water (see appendix 1). However, this measure addresses drought as a local phenomenon rather than as a phenomenon influenced by global processes.

However, it is the decrease in rain and the frequent droughts that forced the Ministries of Public Works and of Agriculture to plan for the construction of a system to regulate the water in the Huasco basin. The construction of the Santa Juana dam in 1995[32] led to an increased in irrigation security from 30% to 85%. However, government institutions are aware that in the event of a drought lasting several years, the dam would be a solution for at most 3-4 years because of the short-term drought capacity of the reservoir and its dependence on the glaciers for water supply.

When analyzing the Pascua Lama conflict, it is clear that one of the milestones in its development was the agreement between the Junta de Vigilancia and the mining company; however, for the public officials interviewed for this study, the agreement had no weight on the project's approval:

> "[T]he position that CONAMA took regarding the agreement was: 'it does not exist;' the environmental assessment of the project does not consider the agreement between the Junta de Vigilancia and Barrick. The agreement is an action that occurred between private organizations who can have whatever agreements they want; but at the time of the assessment these agreements are not added nor subtracted, so the terms of the agreement were not considered" (Susan Henry, CONAMA Atacama).
>
> "It's an agreement between private organizations […] regardless of this agreement we will continue to hold our position, which goes beyond the agreement between them" (Marco Larenas, Regional Director, Direccion General de Aguas)
>
> "Definitely not, because we did not even see the terms of the agreement; we did not want to participate in any of meetings between them because we understood it to be an agreement between private organizations, and therefore it was not appropriate for the government to participate […] the agreement has no connection to the environmental impact assessment" (Rodrigo Rojas, ex intendant of the Atacama region and president of COREMA during the project's process for approval).

Despite the position of COREMA and CONAMA that the agreement between "private organizations" did not influence the final decision on the approval of an environmental impact assessment for the Pascua Lama project, a majority of the civil society and those interviewed for this study perceive that there was an influence, which triggered the approval

[32] The Santa Juana dam is located 20 km to the east of the city of Vallenar. It was built in 1995 with the goal of regulating irrigation water from the Rio Huasco. It has a height of 115 metres and it floods 410 hectares and stores water in a reservoir with a capacity of 160 million cubic metres of water and provides irrigation security for 12,000 hectares.

of the project by COREMA Atacama. For most, the trust and legitimacy of the authorities diminished.

One of the clauses of the agreement indicated that the Junta de Vigilancia would stop its public rejection of the project. Although this term of the agreement decreased the strength of the opposition groups, the groups remained in the region, and even after the approval of the project the opposition groups have persisted. The agreement did not decrease the fears or increase the certainty or guarantee that the operations of the open-pit mine will not cause grave impacts on the supply and quality of water for the entire Huasco Valley.

Regarding citizens' participation, respondents from the communities have the perception that the opportunities and space for citizens' participation in the Environmental Impact Evaluation System (SEIA) is less than satisfactory. There was no adequate access to information and the issues were very complex and could not be addressed satisfactorily given their scope and the lack of complete scientific knowledge. The possibility of dialogue with the mining company was minimal because during the public information sessions on the project there was a lack of in-depth discussions on the issues of concern to the community. Also, questions posed by the citizens were given superficial responses limiting the dialogue in the participation process.

Institutional learnings

Although there have been different levels of conformity or non-conformity with the Pascua Lama conflict, given that there are those who feel they are the "losers" and others who feel they are the "winners," the conflict generated many learnings that can be drawn on by institutions and communities for addressing future water issues.

For the public institutions, as expressed by the regional director, one of the main lessons drawn from the conflict is the understanding that the regional public services are not prepared for assessing large and complex projects such as this one. This lack of preparation is due to the lack of qualified professionals, which limits the scope of analysis of a project; in addition, sufficient scientific information is also lacking.

The initial approval of the Pascua Lama project in 2001 was influenced by the lack of experience of the Environmental Impact Assessment System, which had been established in 1997, and resulted in an approval with very lax environmental demands. However, the 2006 project approval contained aspects that reflected the demands and expectations of a more vigilant civil society. Therefore, civil society perceived the 2006 assessment of the project was a test of the Chilean environmental institutions.

Clearly, the Environmental Impact Assessment process could improve with stronger institutions and better regional capacity of these institutions—economic and technically—which would allow on-the-ground verification of the information presented by the company. Such institutions should also be able to respond to the demands for maintaining the integrity of ecosystems and the sustainability of water governance in the basins. It would be ideal to be able to verify early on the studies on a project presented by the proponent with studies done by institutions or other independent agencies. This is particularly relevant in areas that require technical support—rather than after the process is well advanced and with limited time for presenting objections.

Regarding the process of citizens' participation, for government authorities one of the important lessons is that the process should be more transparent and planned. The Pascua Lama conflict was full of rumours and events that were not very clear.

For the Junta de Vigilancia, the learnings were from the procedures and ways to generate an internal discussion that would strengthen rather than weaken its role in managing water. The recent changes in the composition of its board of directors, the concerns raised over the manner in which it reached the agreement with Barrick Gold and the way in which the monetary compensation will be conducted, have resulted in the organization's internal tensions and less cohesion, which have affected its public image. Also, for the Junta de Vigilancia it was very important to be able to influence, within its area of competence, public policies on the directions of development in the region.

For the groups opposed to the Project, even though they were disillusioned by the approval of the project, there have been important learnings. First, they have developed the capacity to organize themselves around an important issue common to all of them and the capacity to coordinate and dialogue among people from different communities and professions. Second, the need to express their demands and make their voice heard through the media forced them to acquire in-depth scientific knowledge which prior to the conflict they may not have been interested in or able to understand. Third, the need for publicizing the conflict made them seek out alliances and support from outside of the region (nationally and internationally). Fourth, they have been able to analyze the process of public participation in the Environmental Impact Assessment system, and have identified weaknesses such as the non-binding nature of the public input in the assessment. They have also now decided not to participate in dialogue with the mining company because they feel that their inputs and opinions are used by the company in order to "strengthen its public relation strategies" and to weaken the opposition to the project. They have used this same no-dialogue approach in their dealings with other mining companies because in their perception when dealing with Barrick: "it was ourselves who had to define and propose answer on what was expected from them; so there is a need to be knowledgeable, to be able to think a great deal, and not to pay too much attention to the heart, but to reason."[33] Finally, after the project's approval they have decided to go from focusing specifically on opposing the Pascua Lama project to widening the scope of their struggles and concerns, by adopting a long-term perspective, and focus on a strategy of "protecting the water" for the entire basin.

1. Early and equitable access to information is ensured to all parties involved, including information on the parties' views

- Formal participation occurred during the process of citizenship participation. During this process Barrick Gold provided information on the project to the community; they then had 60 days during which could provide observations to the Environmental Impact Assessment process.

- For community organizations the access to information was not equitable: documents on the project were long and complex and the few institutions at which the documents could

[33] Mirna Inostroza, member of the advisory board of Defensa del Valle del Huasco

be accessed provided very limited time for visits; therefore, access to information was restricted and few people could access it.

- The views of the stakeholders were only made known through the media or at public meetings, but there was no access to documented scientific information or dialogue with experts.

2. Balanced, symmetric power relations are provided in negotiations and decision-making regarding the outcome of the conflict

- Although the Environmental Impact Assessment process guidelines allowed for public input, this input was not binding; the project proponent was not obligated to respond to the public input. Also, the environmental institutions did not have instruments to enforce the public demands. Therefore, the powers of Barrick Gold and of the community to negotiate and influence decisions were unbalanced and asymmetric.

- The process of negotiating the "Protocol of Agreement" (the agreement) between Junta de Vigilancia and the mining company is well known. In this process there was greater equity in accessing information, even though the agreement focused on the monetary compensation and mitigation measures for future risks to the production systems of the members of the Junta de Vigilancia. In exchange for the compensation obtained, the Junta de Vigilancia stopped their opposition to the project and discontinued their support to other opposition groups.

- For the community members linked to Comité de Defensa del Huasco, the negotiation conducted with Barrick Gold was not their objective. For them the goal was to stop the open-pit mine because of its many impacts and risks posed to the entire basin.

3. Recognition, respect and fostering of differences in values and perspectives toward creative solutions

- The dialogue between the mining company and the opposition groups was very tense as a result of the differences in interests and the coercive measures used by the company and by the inflexibility of the positions taken by some of the opposition groups

- The mining activities stood in stark contrast to the rural life and agricultural production values, which led to constant tension and conflict. The mining interests and its employment promises contrasted with the culture and quality of life of the members of the community of Alto del Carmen. In addition, negotiations between the mining company and irrigators arrived at agreements that only reflected a focus on economic compensation and greater future investments in protecting water for irrigation, but without reflecting the need to protect water because of its other important uses, such as domestic, ecological, industrial and recreational

4. The resolution of the conflict aims at securing the integrity of ecosystems and restore the negative impacts on biodiversity

- The Environmental Qualification Permit needed for the approval of the project, makes many technical demands not foreseen in the original project. There is a restriction on the

removal or disruption of the glaciers. However, there is no guarantee of the effectiveness of the measures proposed for minimizing the impacts on the glaciers by mining activities such as road construction, explosions and the risks associated with transportation of hazardous substances. Therefore, there are still great uncertainties associated with the project.

- The integrity of ecosystems of the basin was considered during the negotiations, but it is unknown the extent and real effects that the mining operations will have on the ecosystems.
- Considering that during the surveying and exploratory phases of the project there were serious disruption to the glaciers, the community does not trust the suggestion that the impacts of the mining operations on the glaciers will be minimal or non-existent.
- On the other hand, the environmental protection demands made to the project are derived from assumptions which currently lack scientific base to guarantee the integrity of the highland ecosystems which include the glaciers in the region.

5. The social capital of the communities involved is strengthened by the resolution of the conflict

- The conflict led to the mobilization and articulation of the various social organizations of the region in a way never before seen in the province. The conflict also led to greater links made with regional, national and international organizations. During this networking phase the social capital was strengthened, and the various organizations were integrated through common issues of interest.
- The agreement reached between the Junta de Vigilancia and Barrick weakened the opposition to project; it created tension among the various local groups and the feeling of disillusionment weakened the groups. The Junta de Vigilancia lost influence and legitimacy because the process of decision-making in negotiating the agreement was even questioned by some of its members.[34]

6. Corporations or institutions involved in the resolution of the conflict strengthen their technological capacity and institutional adaptation toward sustainability

- Barrick faced demands not foreseen in the initial project proposal. These demands require the partial modification of production processes and minimizing the potential impacts of the project. These demands could be considered as requirements of technical adaptation that the mining company has to fulfill, thus establishing important precedents for future mining projects.

- The Junta de Vigilancia, on the other hand, from the agreement reached with Barrick obtained financial means for improving its irrigation infrastructure. This financial compensation requires that investments be made only in these types of initiatives.

7. As an outcome of the conflict social organizations improve their creativity and capacity to negotiate

- The opposition groups never sought negotiations with the mining company. However, they improved their capacity to network with other sectors of the Chilean society beyond the Valley. Also, they learned to mobilize resources and to publicize their demands. Through this approach the Ley de Protección de los Glaciares (Law for the Protection of

[34]Junta de Vigilancia brought together powerful groups with important public influence

Glaciers) bill has been tabled in congress, and will be debated at the beginning of the 2007 legislative sitting.

8. The democratic authority of the state is strengthened when its moral authority overcomes the use of coercion in the resolution of the conflict

- The conflict weakened the legitimacy and authority of the state. To the public, the government institutions' lack of technical resources weakened their position in relation to a politically influential and well financed transnational corporation. The conflict also highlighted the weaknesses and failures of the water legislation and policies to protect basins and hydrological resources in a desert region where water is such a critical resource for economic development. For many of the participants in the conflict, the project's approval was a given since the beginning because it was a political decision. However, the opposition groups were able to focus the public's attention on the project and to make sure that the process for the projects' approval be followed correctly.
- The authority of the regional environmental groups increased. It also increased its capacity to elicit public opinion and experts' reports, which were needed to support their demands from the mining company. Through the authority of environmental groups, a provision was established in the approval of the project to not remove or disrupt the glaciers. However, to date clear measures have not been defined for monitoring the impacts of the mining operations on the glaciers or measures to ensure that the impacts are minimal. And there are no clear measures for stopping the operations if the impacts are major.

IV. Discussion of the results from the three case studies

Responses as the expression of globalization at the local level

In Chile and Canada, and like elsewhere in the world, the construction of dams expresses, in various dimensions, the impetus of the forces of modernization and globalization. The needs and opportunities for new markets generate demands that are taken up by producers that can take advantage of their competitive conditions: favourable climate, alternate seasons according to the hemisphere and seasonal cycles, advanced financial, technological and transportation systems, and a well trained and orderly labour force. The neoliberal logic of globalization seeks to intensify and internationalize the processes of production in order to generate conditions that would allow greater access and diversity of markets. It is precisely the insertion into the global markets that set in motion the intensification of agricultural production and water demand.

Increased water demand for agricultural production such as in the Elqui Valley in Chile and the Prairies in Canada are examples of this intensification of agriculture. However, water supply in these regions is highly dependent on climatic variability such as droughts and floods. Yet, when the demands for water increasingly comes from agricultural, industrial and other economic related uses, it becomes only an input of production or a commodity, while losing attributes of an ecological good vital to the integrity of ecosystems.

The development of projects of great economic and technical importance such as the dams in the Coquimbo Region like the Puclaro Dam in the Elqui Valley, in Chile, and the Oldman River Dam in Alberta, Canada, cannot be viewed and understood only as projects of water

infrastructure that support modern agricultural production. The construction of these dams also set in motion forces that accentuate tensions and contradictions among social, ecological, cultural and economic values and interests, which in turn reflect different worldviews and potential conflict.

The construction of dams is the result of a logic that seeks to build a support system for the production of high value export crops, but the cultivation of these crops often clash with local peasant agricultural systems characterized by small scale farms, family based labour, low-impact technology and geared toward agricultural production for the local and regional markets.

In Chile, the agricultural export model of economic development favours economies of scales. Companies that control the export of agricultural products enjoy comparative advantages and have sufficient means to achieve productive efficiency as a result of economies of scale, product specialization and access to technology and markets. In Canada, similarly, the prairies continue to be the bread basket region that supports the agricultural export sector, a sector that has been consolidated into few large scale farms while the medium and small scale farms continue to disappear. Yet the institutional policies to build dams to increase water storage capacity for times of water scarcity are one of the leading approaches to deal with adaptations to water uncertainty, but these public investments and technological innovations tend to be appropriated by the most dynamic economic sectors of agriculture and industry. Thus, equity to water accessibility is jeopardized.

Participation: legitimizing globalization or seeking local sustainability

The construction of the dams in the case studies presented here involved the participation of a large diversity of stakeholders. Stakeholders include more than just the agricultural sector—though this sector seem to be the pioneer in catalyzing the construction of the dams—, the State is also a very important stakeholder because its institutions provided the initial resources for the construction of dams. Stakeholders that contested the construction of the dams included indigenous communities, displaced farmers, and other local residents of communities affected by the dam and reservoir. These stakeholders were able to make their existence and opposition to the project known through protests and other high profile public events.

Stakeholders that have opposed the construction of dams have often been considered—even in regulations and environmental impact assessments—as a social mass that have to be compensated for the expropriation of lands and territories and relocated to new communities, and provide them with seed money for micro enterprises and other such benefits. All of which, of course, are measures that address only the short term needs of these stakeholders. As revealed by the case studies, neglecting to provide substantial participation in decision making that address the long term needs of the affected communities leaves them in a vulnerable position when confronting future water scarcity issues associated with impacts of climate change. In the cases in this report, the focus was on compensation to the affected communities, addressing only their short term needs and not their social capital nor their ecosystem integrity. The focus on compensation, as revealed in these case studies, neglected the need for early and meaningful consultation and participation in the project design.

The monetary compensation provided to the affected communities accounted for the visible and readily identifiable impacts; however, in the case studies discussed in this report, there is

an acknowledgment by the stakeholders of impacts on "intangibles" that are difficult to value in monetary terms such as cultural heritage and social capital and sense of place.

The control of water resources through the construction of dams as well as through the distribution of tradable water allocations, have substantially improved the efficiency and the predictability of water for large scale agricultural production , yet communities that were displaced were left worse off in their capacity to address future water related challenges. It remains an open question whether for the great majority in the Elqui Valley the displacement of peasant agriculture is a blessing or a curse.

The dam as a technological response

The construction of dams is also justified as a technological response to water scarcity challenges, but the assumptions on which this justification is based are not made explicit or evident. The case studies analyzed indicate that this technological response to water scarcity is a function of the demands of the forces of globalization that require that secure agricultural supplies satisfy the appetites of a global market. This is not surprising given that the government of Chile and Canada for decades have accepted and committed to supporting an agricultural export model through the signing of free trade agreements.

V. Conclusions and recommendations

1. **Vulnerability, power relations in conflict and the adaptive capacity of communities and governance institutions**

   Our empirical research in the three case studies confirms the tendencies that emerge from the literature review on environmental and water conflicts. Examples of the increase in stakeholders' participation in the resolution of conflicts -challenging the dominant forms of conflict resolution- lead to processes that deepen democratic values and strengthen institutional mechanisms for sustainable water governance. Thus, institutions that develop adaptive capacities to address water scarcity are those that actively seek the participation of all stakeholders in decisions regarding water governance. The uncertainties associated with climate change greatly increase the complexity of water governance and democratic values offer the potential to integrate diversity of knowledge and responses from different social actors to the that complexity. Therefore, a willingness from all stakeholders to participate in a meaningful manner is required in order to reach decisions that address their various interests.

   The three case studies indicate that during the resolution of water conflicts the dominant technical-scientific discourse and knowledge is intrinsically linked to power. The sectors that control this discourse and knowledge have greater odds of "winning" at the negotiating table and in influencing the process of consultation. The only effective way to overcome the power asymmetries among the stakeholders in a conflict and in the negotiations to resolve it is in the implementation of explicit measures aimed at "levelling the voices" of all of the stakeholders involved in the negotiation. This in turn means that somebody has to provide the necessary resources so that all of the stakeholders' voices are genuinely expressed and heard. And it is expected that the provision of these resources is the responsibility of the public authorities and institutions and the stakeholders must be responsible to participate. The genuine and equitable representation

of all of the stakeholders' voices increases their capacity to negotiate, which in turn increase their adaptive capacity to address future water governance issues.

In the three cases analyzed, the issue of local participation in the consultations and negotiations to resolve the conflict was addressed to a certain extent. However, it was done only in a general and superficial manner since it was perceived that the inclusion of stakeholders in formal meetings was sufficient and above what was required to validate the process. Yet, the final decisions were often taken based on the opinions and voices of those who had the greatest political and economic means.

The lessons obtained from the analysis of environmental and water conflicts provide an opportunity to understand the levels vulnerability to impacts of climate change of the communities involved, particularly with regards to their accessibility to water, which is a critical issue in the context of climate change impacts.

The manner in which conflicts are managed and resolved can increase or decrease the vulnerability of rural communities to impacts of climate change. The investigation on the lessons learned by communities and institutions from their participation in water conflicts reveals important insights regarding their adaptive capacity. These insights are supported through the literature review and our own research in the three case studies. Our results highlight the need to have public policies oriented toward the creation of appropriate institutional scenarios for the resolution of water conflicts.

An institution loses opportunities to improve its adaptive capacity by not learning from the lessons generated from water conflicts because it diminishes its legitimacy and authority and consequently its capacity to articulate the needs and interests of the stakeholders it is expected to serve. Also, lessons from water conflicts are not drawn on because stakeholders in the conflicts stay firmly entrenched to their own narrow interests and values. However, the case studies indicate that there are examples of efforts where lessons generated by water conflicts have been drawn upon to improve water governance decisions and policies as reflected in the Alberta Water for Life strategy.

2. **What institutional learnings and adaptations can be identified as the result of water conflicts**?

It can be observed that there are contradictory attitudes between some government institutions and the proponents of projects such as dams. On the one hand, the project proponents tend to "divide and conquer," to monetarily compensate as soon as possible in order to stop dissident voices. Those who are not prepared to negotiate an agreement will be the least benefited, and the most vulnerable because of the possible dissolution of their organizations as a result of the conflict. On the other hand, those institutions whose mandate is to assess the impacts on the integrity of ecosystems can not exercise their authority because their efforts are undermined by decisions based on short-term visions and focused on short term economic results.

However, there also indications from water conflicts that some institutions and stakeholders do gain a new understanding regarding the participation of citizens in decisions regarding water governance. These institutions and stakeholders understand that the negotiation process needs to be more explicit, inclusive and open. From the participation of communities in the conflicts, especially in cases where all stakeholders

are able to convey their interests and values, some of the institutions and stakeholders appreciate and enhance their understanding and analysis of the issues from a holistic perspective. One such example is when a community goes from a position of firmly opposing a project to one where it proposes the need to protect the basin and focusing its strategy in protecting the water resource as a public good such as in the Pascua Lama case.

There is an increasing recognition by water governance institutions of the need for an ecological baseline assessment around the location of a large project several years before it is carried out and ecological monitoring after the project is built in order to better determine its ecological impacts. There are also examples of institutional learning and adaptation that are promising, such as Alberta Environment's 10-year dedication to developing Phase I and II of a plan with an ecosystems approach to manage the water resource in the South Saskatchewan River Basin. This plan reflects the re-orientation and restructuring of the federal and provincial governments' approach toward one which emphasizes a sustainable and ecosystem-based management of water. Documents such as the *Water for Life Strategy* appear to be examples of direct learnings from water conflicts. Water governance plans outlined in these two documents are examples in Canada where a wide cross-section of society is summoned by water governance institutions to participate in water governance decisions, which reflect these institutions' efforts to integrate lessons learned from water conflicts into their organizational structures and decision making processes.

Unlike institutions, communities need to adapt quickly when they face a new reality—such as when a community is relocated—if not, they can quickly cease to exist. An institution's slow adaptation to a new reality can be a detriment to a community's adaptation and development of adaptive capacities, and in some cases, it can contribute to the acceleration of the communities exposure and risks, for example their lack of accessibility to water, in which case their vulnerability to climate change impacts is greater.

3. In Chile, the water conflict cases indicate that the regional public institutions lack the capacity to assess the environmental impacts of large and complex projects such as Pascua Lama, mainly due to a shortage of trained professionals, as well as a shortage of studies and scientific information related to such projects. The precautionary principle is barely applied when insufficient knowledge/data is available. However, there is a rich base of information and capacity related to the economic development of the region, which could potentially be mobilized to monitor the impacts of the project.

There is no doubt that the absence of a political mandate toward institutional adaptation to climate change can affect the adaptation of the communities they are expected to serve. The policy framework and a national plan for adaptation to climate change is currently missing in Chile and its is much more clearly assumed in the Canadian Prairies, where water policies have shifted towards long term planning, as is the case in Alberta. Depending on whether the institutions develop and/or follow an adaptation plan to confront the impacts of climate change, they may be able to meet the needs and adaptation of communities confronting these impacts. Whether these institutions integrate and value the economic, ecological and socio-cultural aspects that are important to the communities, rather than a general nation-wide approach on adaptation without due

consideration to cultural and political specificities of an area or region is also of critical relevance.

4. In Chile, the Pascua Lama conflict brought to light the fact that communities possess local knowledge and appreciate the value of the glaciers as water reservoirs for times of drought; while public institutions in turn recognize the lack of sufficient/adequate technical-scientific knowledge on the role of glaciers in river flows. . Despite counting only with their local knowledge of the glaciers, the communities have demanded that government agencies acknowledge the role of the glaciers feeding the Huasco basin and protect their role as future water reserves. Yet, to date studies related to the importance of mountain ecosystems and glaciers to basins in the northern region of the country are scarce (Rides, 2005)

5. In Chile there is a relatively weak capacity for coordinated institutional responses to address water conflicts and the uprooting of communities following water development by large projects. The institutions' missions do not have explicit guidelines for an integrated approach in addressing and providing solutions to these issues, focusing instead on firm sectoral approaches. Hence, the responsibilities of public works institutions in a conflict are unclear, which makes it difficult to coordinate actions, and the outcomes often fall short of what is desirable.6. Dams are constructed in order to support local economic development and to provide water security in regions where water supply is low and variable. Water security is conceived as an opportunity to improve on the production options and to decrease the risks and vulnerabilities of communities and their production systems. By decreasing the uncertainties of water supply, new investments are made that spur economic activity and transform agricultural systems that can lead to a closer link and coordination with regional, national and international markets. Yet the benefits are not equitably shared by all members of society; the more powerful economic groups tend to have greater control over the water resources and infrastructure. Therefore, individuals with the largest number of water allocations have the greatest influence in the decision making process.

Greater supply of water nearby not always means less scarcity of water for everyone, at least not in the case of the Puclaro Dam. Paradoxically, communities located only meters from the reservoir do not even have access to the shore; they also have no rights to water use for agriculture and there are no plans for future public investment to address their needs. Therefore, it is necessary to analyze the entire range of outcomes from the construction of dams in order to determine their benefits and negative impacts.

To address the power imbalance in water governance decisions in Chile, there is a need for developing and establishing basin advisory councils similar to the advisory watershed councils established in Alberta, Canada, where there is an equitable representation of all of the basin's water users. These types of water governance institutions provide better opportunities for the sustainable use of water resources while generating organizational structures with long-term projections and greater adaptive capacity to address climate change impacts.

7. It remains to be seen the full ecological impacts of the two "dams of discord" discussed in this report: the Puclaro and Oldman dams. To date, there have not been studies conducted to assess their full ecological and social impacts. In the case of the Oldman River dam, a complete ecological and cultural assessment of the dam's impact on the Piikani territory and people is still pending. In the case of the Puclaro dam, in the Elqui

Valley, the following are pending: a comprehensive environmental impact assessment, an agroecological assessment of the Valley's production system including its irrigation system, management of the hillside lands for production, and the socio-cultural impacts of a type of production that does not allow space for unionized labor, thus accentuating temporal work, insecurity and instability for the communities.

The study also shows that an institution's adaptation to address climate change impacts is a function of its own adaptive capacity, which is determined by access to resources, the quality of information base, flexibility in institutional arrangements, capacity of networking with other institutions, type of leadership and abilities to minimize and resolve water related conflicts.

The future of water conflicts in both regions will be largely determined by the broader institutional framework and policies, integrating the uncertainties of climate change, the mandate of institutions to develop adaptive capacities, interdisciplinary approaches and consultation with stakeholders based on power-balancing approaches.

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Appendices

Appendix 1: Interview guidelines—English version

General, opening questions:

1) From your point of view, has the conflict of the Oldman River been resolved?
   1.a If yes, in a few sentences, what are the main elements of the resolution? Are you and your organization satisfied with the outcome? Please explain

   1.b. If in your opinion the conflict has not been resolved, what are the pending issues? What future awaits this conflict? What would be a satisfactory outcome from your point of view?

2) The scenarios forecasted by the climate change community indicates that the region of the Oldman River, and that of the entire South Saskatchewan River Basin or the Elqui River Valleywill experience significant changes in the water regime, with sudden increase in intensive water precipitations followed by serious periods of water scarcity and drought. What is your perception and that of your organization of these expected changes? What potential risks would changing water regimes have on your community? What is the state of the discussion and preparedness of your organization with respect to these expected changes?

3) According to your knowledge, are the institutions responsible for water management prepared to adapt to changes in the water regime in the region? If not, what needs to be done? If yes, what are the main adaptive steps taken by those organizations? What are the communication channels between those bodies and your communities? How could they be improved and or created if they are weak or non existent?

Specific questions about the resolution of the conflict:

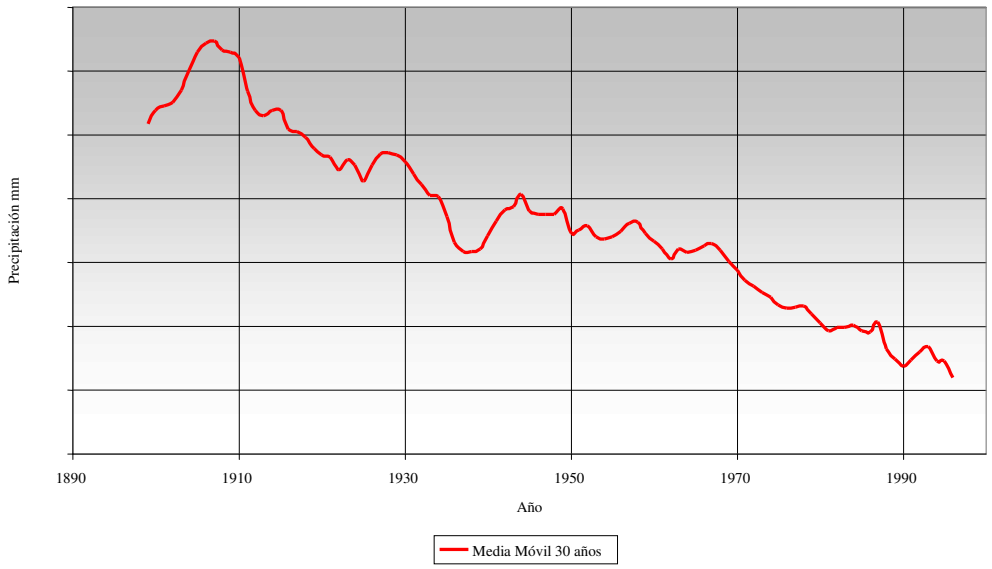
4) Did the process of resolution of the conflict and its outcome created conditions for a situation of power parity or balance among the different stakeholders?
5) What are the main lessons learned by your organization in the case of the Oldman River Dam conflict?
6) Did the main stakeholders in the conflict come to any kind of consensus after the conflict about how to manage in a sustainable way the water resources in the area? If yes, what are the main elements of the consensus? If not, does your organization have a vision about how water resources could be managed in a sustainable way?

Questions related to Adaptive Resolution of this conflict

7) In hindsight, do you agree with writers about the Oldman River Dam conflict who think that one of the main problem in the generation and unfolding of the conflict was the insufficient sharing of information among stakeholders, about the Dam Project, and about the way each stakeholders view the problem.
   a. Did the different stakeholder have some understanding of the others' ways of explaining the problem of the Dam and how it affected them? Some sharing of their respective knowledge and cultural values? Or was it all framed only in terms of the expert scientific knowledge?
   b. Was there any kind of forum (besides the media and the courts) to share views and explore the possibility of a common ground? If "Yes", which one(s)? If "No", what could have been done to create them?

8) What is your opinion of the process of negotiation in the conflict? Do you think that all stakeholders felt well represented and with their voices properly heard in the negotiations? Could you share with us your experiences in or about the negotiations?
9) In your opinion, how has the Dam affected the biodiversity of the region where it was built? In hindsight, were the concerns about fish habitat and about natives species of flora and fauna justified?
10) Are the farming community and the agricultural industry of the region better off now that the Dam is operating? What advantages and disadvantages does the Dam offer to adapt to climate change-induced changes in water regimes? Has it increase adaptive capacity? If yes, what are those new adaptive capacities? And if not, why not?
11) Are the communities most affected by the construction of the Dam better of? If yes, in what ways? If not, why not? (Please comment if you can about the Peigan, the farmers, fishermen and the environmentalist).
12) Has the resolution (or outcome) of the Dam increased the ability of proponent industries to create technological and organizational adaptations towards ecological, economic and social long-term sustainability. If yes, could you provide examples? If not, why not?
13) Has the capacity of environmental organizations to advocate, negotiate and propose creative solutions been improved with the experience of this conflict?
14) What is you opinion about the role of the Federal and Provincial government in this conflict? Has their authority and legitimacy been enhanced or undermined by their role in the conflict?
15) What is you opinion about the role of the courts in this conflict? Has their authority and legitimacy been enhanced or undermined by their role in the conflict?

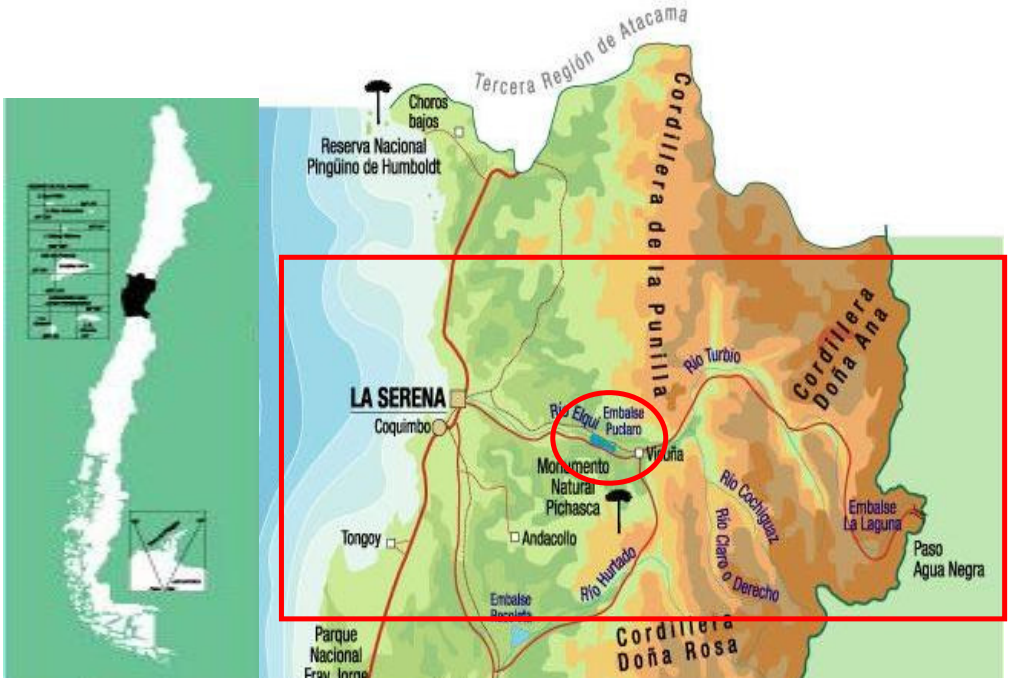
Appendix 2: Decrease in precipitation in La Serena, from 1869 to 2000.



Media móvil de 30 años de las precipitaciones registradas en La Serena, desde 1869 hasta 2000.

Source: Libro Rojo de la Flora Nativa y de los Sitios Prioritarios para su Conservación: Región de Coquimbo. (F.A. Squeo, G. Arancio y J.R. Gutiérrez, Eds.). Ediciones Universidad de La Serena, La Serena, Chile (2001)

Appendix 3: Location of the Puclaro Dam conflict



Región de Coquimbo, zona de estudio dentro del contexto geográfico nacional

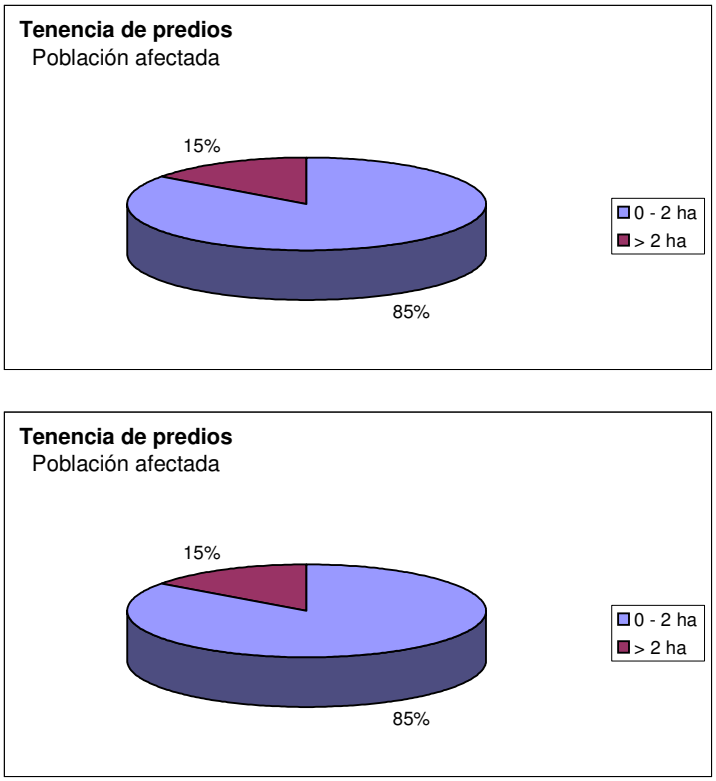
Valle de Elqui dentro de la Región de Coquimbo

Embalse Puclaro dentro de la cuenca del Elqui

Appendix 4: Photos of the Puclaro Dam

Izquierda: Foto aerea de la cortina al inicio del periodo de llenado del embalse.
Derecha: Cortina en su función de represamiento de aguas.

Appendix 5: Land tenure of the displaced communities



Fuente: Elaboración personal a partir de "Estudio Puclaro" – Ingedesa EDIC Ltda.

Appendix 6: Environmental baseline: Use of the land in the flooded area

Características generales	**Area de inundación afecta 831 há**
Usos del área de inundación	512 há vegetación natural (62%), 292 há cultivos (25% parronales, 10% cultivos diversos)
Sectores del área de inundación	Fdo. Puclaro, Qda. El Chape, Qda. La Polvada, Gualliguaica, El Sauce, Maintencillo, S. Carlos
Predios en área de inundación	Ochenta y nueve
Caracterización de 30 predios (25 encuestados, 5 observados)	De 1334 há, 11% eran cultivadas, 6% estaba sin uso productivo y 83% no tenían uso productivo
Uso agropecuario en 30 predios	17 tenían ganado (caprino), 16 tenían vid, 12 frutales y 10 tenían praderas (números no aditivos)
Comercialización en 30 predios	Principalmente dentro del área, excepto por la uva de exportación
Uso de insumos en 30 predios	En todos: maquinaria agrícola, semillas o plántulas, fertilizantes, fitorreguladores y biocidas
Rendimientos en 30 predios	Todos substandard para la IV Región; mejor rendimiento: uva exportación (69%), pisquera (63%)
Tenencia en 25 predios	72 % de los encuestados son propietarios, 24% capataz o equivalente, 4% es "amparado"
Mano de obra en 25 predios	En 56% trabaja sólo una persona, en 44% trabajan varios familiares
Calidad de vida en 25 predios	32% tienen buena calidad, 36% regular, 28% mala, 4% no resp.

Appendix 7: Social baseline: Benefited population

Características generales	**Encuesta a propietarios y otros (n = 50)**
Tipificación productiva	0% dependientes (0-19 años), 38% en máxima etapa productiva (20-39 años), 36% en productividad intermedia (40 y 59 años), 26% en etapa improductiva (> 60)
Distribución local	En 22 localidades, entre El Almendral por el Este y Compañía Alta por el Oeste
Ocupación general	100% se ocupan en actividades agrícolas, (10% mujeres, 90% hombres)
Tenencia de predios	2% con predios pequeños (2 há), 54 % con predios medianos (5 - 20 há), 40% con predios grandes (hasta 300 há)
Autoimagen de comunidad	35% entre buena y muy buena, 17% entre mala y muy mala, 48% como "regular"
Valoración de la tierra	50% buena o muy buena, 2% mala, 48% la considera de calidad intermedia
Actitud ante el embalse	89% de acuerdo en su construcción porque traerá desarrollo económico por mayor desarrollo de la agricultura, mayor cantidad de fuentes de trabajo y menor precio de las acciones de agua

Fuente: Jaksci, A.,PUC, 1998.

Appendix 8: Agreement between Junta de Vigilancia and Compañía Minera Nevada[35]

El 30 de junio de 2005 en la ciudad de Santiago se llevó acabo la firma del acuerdo entre parte del directorio de la Junta de Vigilancia y la Compañía Minera Nevada (CMN), subsidiaria de Barrick en Chile.

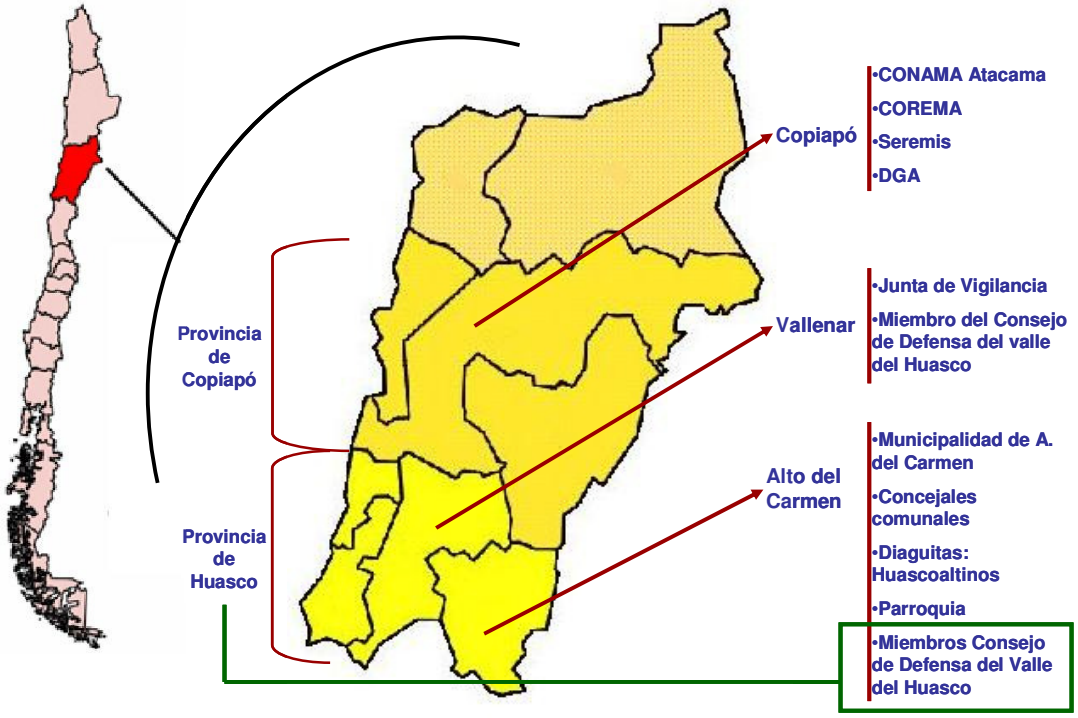
Por parte de la empresa firman Ron Kettes, Director del Proyecto Pascua Lama, y John Mc Donough, Presidente del directorio de Compañía Minera Nevada. Por Parte de la Junta de Vigilancia firmaron Guillermo Fernando González Grey, Omar Campillay, Francisco BROS Barroeta, Daniel Llorente, Efraín Alday, Mauricio Santelices y Sergio Torres. Se negó a firmar dicho acuerdoMauricio Perelló, Séptimo Director.

En términos Generales las partes firmantes acordaron, en los puntos más importantes:
1.- El compromiso de CMN de ejecutar el conjunto de medidas ambientales propuestas por el directorio de la Junta de Vigilancia presentes en el Anexo A de dicho protocolo.
2.- Elaboración conjunta del documento de respuesta al Informe Consolidado de Solicitud de Aclaraciones, Rectificaciones y Ampliaciones (ICSARA II) que la CONAMA le hiciera llegar a la empresa en mayo de 2005.
4.- Una vez consensuada el Adenda 2 y suscrito el documento complementario, **la Junta de Vigilancia se compromete a no oponerse a la aprobación y posterior ejecución del proyecto**.
5.- La CMN financiará todos los estudios necesarios (11.650 UF).
6.- CMN ratifica su "voluntad expresa de evitar, como consecuencia de las actividades del proyecto, la acidificación de los recursos hídricos aguas abajo del proyecto y afectar los recursos naturales de la cuenca en las etapas de construcción, producción y cierre del proyecto".
Además la empresa se compromete a suspender la ejecución del proyecto si los recursos hídricos aguas abajo con acidificados, pudiendo reanudarse la producción una vez acreditada la no implicancia de riesgos.
7.-"Las partes acuerdan desarrollar un estudio y evaluación de los recursos hídricos en el área de influencia directa del proyecto".
CMN se obliga a construir un embalse de cabecera en el sector alto del río El Carmen, que permita la regulación de la parte alta, dicho embalse podrá tener capacidad mínima de 5 millones de m3, entregando un máximo de 5 millones de dólares.
8.- Para compensar los impactos potenciales y efectos adversos, tanto directos como indirectos, CMN se obliga, siempre y cuando el proyecto sea aprobado por COREMA, a aportar una suma de US$ 60 millones a la Junta de Vigilancia[36] para que esta desarrolle obras de mejoramiento de sistema e riego, mejoramiento, construcción, reparación y/o modernización de infraestructura hidráulica, desarrollo de proyectos y programas, obtención de nuevas fuentes hídricas. Estos proyectos deben realizarse con cofinanciamiento de aportes públicos, nacionales, internacionales y regionales.
La administración del fondo se realizará por un comité permanente de seis miembros, tres de la Junta de vigilancia, 2 de la CMN y un designado por el intendente.

[35] Protocolo de acuerdo disponible en: http://www.riohuasco.cl/Protocolo.pdf
[36] entregándose US$ 3 millones anuales por un periodo de 20 años a partir del inicio de la construcción del proyecto.

13.- El protocolo no implica que la Junta de Vigilancia renuncie a ninguna acción judicial por daño ambiental.
14.- Cualquier controversia o dificultad será sometida a arbitraje.

Appendix 9: Spatial map of institutions that influenced the conflict



Appendix 10: Interview guide for the Pascua Lama conflict

Preguntas generales de apertura

1. A nivel mundial se pronostica una disminución de los glaciares debido al cambio climático, lo que puede hacer más críticos los periodos de escasez de agua, pero además en el Valle del Huasco se suma la posible disminución de glaciares producto de la intervención minera en las zonas cercanas a los glaciares, lo que haría experimentar cambios en el régimen de agua, con una disminución de la disponibilidad del recurso.

    a. ¿Cuál es la importancia de los glaciares en la disponibilidad del agua en la cuenca del Huasco?
    b. ¿Cómo se organizan en esa cuenca para los periodos de escasez?
    c. Si se genera la disminución de los caudales del río, ya sea producto del cambio climático o de la actividad minera
        i. ¿Que potenciales riesgos involucraría una variación en los regímenes de agua en su comunidad?
        ii. ¿Cuál es el estado de discusión y preparación de su organización respecto a estos cambios esperados?

    d. ¿Cuál es su percepción y la de su organización ante estos posibles cambios?

2. Según su conocimiento, las instituciones responsables de la administración del agua en su región, ¿están preparadas para adaptarse a cambios en los regímenes de agua asociados al CC?
    a. Si su respuesta es No, ¿qué es necesario hacer?
    b. Si su respuesta es si, ¿de qué forma están preparados?

Preguntas específicas sobre el Protocolo de Acuerdo entre Barrick y Junta de Vigilancia

3. ¿Cuál o cuales son los conflictos principales que se han generado entre la empresa Barrick y la comunidad? Descríbalos
    a. ¿Se han solucionado algunos de los conflictos entre la Comunidad y la empresa?

        i. Si es Sí, ¿cuáles? Y ¿Por qué?
        ii. Si es No, ¿Por qué no?
    b. ¿Por qué se genera un conflicto entre agricultura y minería?
    c. ¿Existe un conflicto entre integridad ecológica de la cuenca y el proyecto de explotación minera de Barrick Gold?

4. Según usted recuerda ¿Cuál era la posición de la Junta de Vigilancia antes de firmar el acuerdo con Barrick (a favor o en contra)?

5. ¿Qué opinión le merece el Protocolo de Acuerdo entre Barrick y la Junta de Vigilancia?
        a. ¿Por qué cree que se logró este acuerdo?

6. Luego de la firma del acuerdo ¿disminuyó la oposición general al proyecto Pascua Lama?

7. ¿Se ha resuelto el conflicto Pascua Lama con la firma de este acuerdo?
        a. ¿Qué es lo que queda pendiente?

8. ¿Cree que la firma del Protocolo influyó en la aprobación del Proyecto por parte de la COREMA?

9. ¿Cree que se vulneró la institucionalidad ambiental con la firma de este acuerdo?

10. ¿Ha sido resuelto, con la firma del Protocolo de Acuerdo, el conflicto generado por los posibles impactos del proyecto en el Valle del Huasco?
    a. ¿Ha sido resuelto el conflicto entre agricultura y minería?
    b. ¿Cuáles son los elementos centrales para una solución?
    c. ¿Usted y su organización están satisfechos con los resultados?
    d. ¿Con este acuerdo, se ha resuelto el conflicto con los otros usos y la conservación del ecosistema de la cuenca?

11. ¿Fue el proceso y sus resultados capaz crear las condiciones de igualdad de poder entre los diferentes tomadores de decisión involucrados?

12. ¿Cuál es su percepción acerca del proceso de evaluación de impacto ambiental del Proyecto Pascua Lama? ¿Fue transparente, efectivo y con amplia participación? ¿Qué faltó, falló, o y cuáles fueron sus fortalezas?

13. Sabiendo que la COREMA aprobó el proyecto Pascua Lama con la condicionante de no intervenir glaciares.

    a. ¿Ha sido resuelto, con esta aprobación, el conflicto del impacto del proyecto en el Valle del Huasco
        i. Si es Sí:
            -¿Cuáles son los principales elementos de resolución?,
            -¿Usted y su organización están satisfechos con el resultado?, explique.
        ii. Si es No:
            -¿Cuáles son los asuntos pendientes?,
            -¿Qué futuro le espera al conflicto?,
            -¿Cuál sería un resultado satisfactorio desde su punto de vista?

14. ¿Cuales fueron las principales lecciones que su organización aprendió en el caso del Proyecto Pascua Lama?

15. ¿Lograron los principales tomadores de decisión en el conflicto alcanzar algún grado de consenso posterior, en relación al manejo de forma sustentable de la cuenca y sus recursos hídricos de la zona?
    a. Si la respuesta es Sí, ¿Cuáles son los elementos centrales de ese consenso?

    b. Si la respuesta es No, ¿Tiene su organización una visión de cómo pueden ser manejados de manera sustentable los recursos hídricos de su zona?

Preguntas relacionadas con la "Resolución Adaptativa" del conflicto:

16. Se dice que uno de los principales problemas entre los distintos actores involucrados en el caso de Pascua Lama fue el traspaso de información y el nivel de conocimiento de los temas tratados, ya que los documentos entregados por la empresa eran bastante complejos.
    a. ¿Esta de acuerdo con esta afirmación? Explique.
    b. ¿Existieron condiciones para que ustedes pudiesen tener mayor comprensión del estudio entregado por la empresa?
    c. ¿Usted considera que los estudios "científicos" entregados por la empresa eran suficientemente claros y válidos?
    d. ¿Cómo lograron comprender los temas que estaban fuera de su conocimiento?
    e. ¿Existieron intercambios de conocimientos y de valores culturales respectivos o el marco fue solamente en término del conocimiento científico experto?
    f. ¿Existió entre los actores un acuerdo sobre las distintas alternativas de solución del problema?

17. ¿Cuál es su opinión respecto del proceso de negociación entre Barrick y la Junta de vigilancia?
    a. ¿Cómo se tomó la decisión de firmar el Protocolo de Acuerdo?
    b. ¿Cómo fue el traspaso de información entre la Barrick y la Junta de Vigilancia?
    c. ¿Cuál fue el grado de discusión y análisis por parte de los regantes?
    d. ¿Existieron instancias donde se compartieron visiones?
    e. ¿Existía alguna clase de foro (aparte de los medios y la justicia) para así compartir visiones y explorar posibles espacios comunes?
    f. ¿Cree usted que todos los grupos de interés se sintieron representados y que sus opiniones fueron escuchadas en el proceso de negociación?

18. ¿Podría usted compartir con nosotros sus experiencias en o sobre las negociaciones?

19. En su opinión, ¿hasta ahora el proyecto Pascua Lama ha afectado la biodiversidad y los ecosistemas de la zona? En retrospectiva, ¿fueron justificadas las preocupaciones acerca de los humedales, lugares sagrados y las especies nativas?

20. ¿Los habitantes, las comunidades agrícolas y la industria agrícola y el turismo de la zona se encontrarán en mejores condiciones en el futuro?

21. ¿Qué ventajas y desventajas ofrece el proyecto Pascua Lama para generar condiciones de adaptación tecnológica frente al cambio climático, especialmente frente al cambio en los regímenes de agua?

22. La resolución (o resultados) del conflicto entre la Barrick y la Junta de Vigilancia ¿Genera un incremento en la capacidad de los proponentes del proyecto (Barrick) para crear adaptaciones tecnológicas y organizacionales en una perspectiva de sustentabilidad económica, social y ecológica de largo plazo?

23. ¿Tienen las organizaciones ambientales locales una mejor capacidad de defender, negociar y proponer soluciones creativas luego de la experiencia de este conflicto?

24. ¿Cuál es su opinión sobre el rol del gobierno local en este conflicto?
    a. ¿Luego de este conflicto, la legitimidad y autoridad de las organizaciones gubernamentales pertinentes se ha realzado o minado?

25. ¿Cuáles son los canales de comunicación entre esas instituciones y su comunidad?
    a. ¿Cómo podrían ser mejorados y/o creados si ellos son débiles o inexistentes?

Appendix 11: Oldman River Dam—list of stakeholders interviewed

N°	NAME	INSTITUTION	ROLE
1	***Henry E. Komadowski,***	Trout Unlimited Canada	Biologist, Instructor
2	***Patrick Spanos***	Northern Lethbridge Irrigation District	Manager
3	***Dough Orhn***	South Saskatchewan River Basin Water Management Plan - Phase Two Alberta Environment	
4	***Brent Paterson***	Irrigation Branch Alberta Agriculture and Food	Head Officer
5	***John Mahone,***	Water Management Operations, Alberta Environment	Senior Environmental Biologist
6	***Mr. Brian Nauta***	Northern Lethbridge Irrigation District	Farmer
7	***LeRoy Fjordbottom***	Lethbridge Northern Irrigation District, former Minister of Agriculture at the time the Oldman River Dam was negotiated and constructed	Farmer
8	***Stephen VanderValk***	Northern Lethbridge Irrigation District	Farmer
9	***Bob Westrop***		Displaced farmer—now farming in Pincher Creek
10	***John Renners***		Displaced farmer—now farming in Pincher Creek
11	***Doug Kaupp***	Water, wastewater and stormwater City of Lethbridge	General Manager
12	***Shawn Wells***	Town of Fort MacLeod	Municipal Manager
13	***Cheryl Bradley***	Southern Alberta Environmental Association Also, former member of Friends of the Oldman River	
14	***Judy Huntley***	Castle-Crown Wilderness Coalition	Also, former member of Friends of the Oldman River
15	***Hilton Pharis***	Active stakeholder in the Oldman River Dam negotiations	Lundbreck resident,
16	***Audrey Johnson***		Cowley resident

17	***Sid and Audrey Marty***	Also, former members of the Oldman River Dam	Lundbreck residents
18	***Jim Potts***		Piikani Nation resident
19	***Dila Provost***		Piikani Nation resident
20	***David Hill***	Alberta Irrigation Projects Association	Executive Director
21	***Kirby Smith***	Piikani Nation	CEO
22	***Norine Ambrose***	Alberta Riparian Habitat Management Society	
23	***Piet Osterlee***		Olman River Dam chief operator
24	***Wendy Devent***	Oldman Watershed Council	

ANEXO 11:List of Interviews Puclaro Dam Conflict

N°	Entrevistado	Descripción
1	Renán Fuendentealba	Ex – Intendente Regional (Hoy es Asesor jurídico de la Municipalidad de La Serena)
2	Mirtha Meléndez	Directora Dirección Obras Hidráulicas
3	Mardoqueo Bitrán	Ministerio Obras Públicas
4	Humberto Peña	Ex Director Dirección general de Aguas
5	Claudio Salcedo Alemparte	SEREMI de vivienda (periodo 95-99, hoy Director Regional SERVIU)
6	Paz Walter	Directora Escuela de Arquitectura de Universidad la Serena
7	Fernando Guamán	Ex alcalde de Vicuña
8	Alejandro Ayres	Ex presidente Junta Vigilancia Rio Elqui
9	José Izquierdo	Presidente de Junta Vigilancia Rio Elqui
10	Manuel Domínguez	Administrador de la Junta Vigilancia Rio Elqui
11	Marcelo Olivares	Ex consejero Regional
12	Rene Arias Cabrera	Docente Escuela de Gualliguaica “Amelia Barahona”
13	Alda Vaccarezza	Directora del IER
14	Gonzalo Ampuero	Museo Regional
15	Miguel Vigorena	Habitante Villa Puclaro, ex dirigenta Vecinal La Polvada
16	Silvia Vigorena	Habitante Villa Puclaro, ex dirigenta Vecinal La Polvada
17	Luisa Rivera	Junta de Vecinos Villa Puclaro
18	José Miguel Blanco	Actual tesorero Junta Vecinos Gualliguaica
19	Violeta Cáceres	Presidenta Junta de Vecinos de la época Gualliguaica (1996)
20	Manuel Rojas Pasten	Presidente Junta Vecinos Gualliguaica (2001-2005)
21	Carlos Quiroz Escobar	Director – INIA Intihuasi
22	Ángela Rojas	Directora – Comisión Nacional de Riego Serena

Appendix 12: List of interviews Pascua Lama

N°	**NAME**	**IINSTITUTION**	**ROLE**
1	Rodrigo Rojas	COREMA	Ex Intendente de la III Región de Atacama
2	Luis Mansilla	COREMA	Ex Seremi de Agricultura
3	Rodrigo Alegría	COREMA	Actual Seremi de Agricultura
4	Placido Ávila	CONAMA Atacama	Director regional
5	Susan Henry	CONAMA Atacama	Jefa de unidad de evaluación y seguimiento ambiental. Encargada del proceso del Proyecto Pascua Lama
6	Marco Larenas	Dirección General de Aguas (DGA) (Servicio asesor CONAMA Atacama)	Director Regional (Atacama)
7	Cedomir Marangunic	Asesor CONAMA Atacama	Glaciólogo
8	Humberto Peña	Dirección General de Aguas	Ex Director Nacional
9	Mesenia Atenas	Dirección General de Aguas, apoyo a DGA III Región	Jefa de Depto. De Conservación y Protección de RR. Hídricos
10	Alejandro Escudero	Ministerio de Agriultura	Seremi de agricultura subrogante, Ex director de INDAP
11	Fernando González	Junta de Vigilancia del río Huasco y sus Afluentes	Ex presidente, hizo el acuerdo con Barrick
12	Mauricio Perelló	Junta de Vigilancia del río Huasco y sus Afluentes	Director del V Tramo
13	Mirna Inostroza	Consejo de Defensa del Valle del Huasco	Dedicada al turismo, miembro del consejo de defensa
14	Miguel Salazar	Comunidad de Chollay	Agricultor, trabajó en sondajes mineros en la zona del proyecto
15	Francisco Bou	Asociación de Agricultores del Valle de San Felix, perteneciente al Consejo de Defensa del valle de El Huasco	Presidente, en contra del proyecto
16	Luis Faura	I. Municipalidad de Alto del Carmen y C. de Defensa del Valle del Huayco	Concejal en contra del proyecto y miembro del Consejo de Defensa
17	Héctor Páez	I. Municipalidad de Alto del Carmen	Concejal, a favor del proyecto
18	Julio Retamal	I. Municipalidad de Alto del Carmen	Alcalde subrogante, administrados municipal
19	Sergio Campusano	Comunidad Diaguita y Agrícola de los Huasco	Presidente

		Altinos	
20	Enrique Sarneguet	Parroquia Nuestra Señora del Carmen	Párroco
21	Hugo Würth	Agrosuper	Gerente de Proyecto Freirían
22	Jaime Mulet	Poder Legislativo	Diputado por la zona
23	Leopoldo Sánchez	Poder Legislativo	Ex diputado, presenta 1er proyecto de ley de protección de glaciares
24	Antonio Horvath	Poder Legislativo	Senador, presentó 2do proyecto de ley de glaciares