CHILE Water Governance Assessment

Final Report

Unit 1E Institutional Adaptation to Climate Change Project

B. Reyes, S, Salas, E, Schwartz, E. Espinoza., L.Morales

October, 2009

Table of Contents

Abbreviations

Aguas el Valle. Water Utility for Coquimbo Region.

CAPR Rural Drinking Water Committees.

CNR, Comisión Nacional de Riego. National Irrigation Commission.

CONAF, Corporación Nacional Forestal. National Forestry Service

CONAMA. Comisión Nacional del Medio Ambiente, National Commission on the Environment.

DGA Direccion General de Aguas. National Water Board.

DOH. Direccion de Obras Hidráulicas. Department of Hydraulic Works

ERB Elqui River Basin

INDAP. Instituto Nacional de Desarrollo Agricola. National Institute for Agricultural Development.

JVE. Junta de Vigilancia del Rio Elqui. Elqui River Irrigation District

MINAGRI. Ministerio de Agricultura. Ministry of Agriculture-

ODEPA. National Planning Office for the Ministry of Agriculture.

ONEMI. Ofician Nacional de Emergencias Ministerio del Interior. National Emergency Office Ministry Interior.

SEREMI de Salud. Regional Health Office Coquimbo Region.

SISS. Superintendencia de Servicios Sanitarios. National Superintendent of Water Utilities.

I. Introduction

The IACC project developed by a team of researchers from Canada and Chile seeks to develop a comprehensive understanding of the capacities of institutions to formulate and implement strategies of adaptation to the expected climate change risks and the forecasted impacts of climate change on the supply and management of water resources in the South Saskatchewan River Basin (SSRB – Western Canada) and the Elqui River Basin (ERB-Chile). The project's main objectives are to identify both the vulnerabilities related to climate and water resource scarcity of a group of rural communities in the ERB and to assess the organizational capacities of governance institutions to address those vulnerabilities.

A basic premise of the IACC project is that the capacity of a community to reduce its vulnerability is determined not only by its access local resources but also by a broader governance networks that define the use and distribution of resources. This report presents the assessment of the capacities of water governance institutions to reduce the vulnerabilities of rural communities in Chile

The final version of this report is under review and some of the information and statements made in this document may be subjected to modification.

The report is divided into four sections. A short description of the methodology used in the assessment followed by a description of the main water governance institutions and followed by a summary of the main themes covered by the interviews. The fourth section presents a brief discussion of the assessment. The outcome of the interviews is presented on appendix 1. Appendix two present the Field Work Guide for the Governance Assessment, a thematic guideline used in the interview process.

Decisions over water resource use in Chile is exercised by several institutions, both public and private. The Water Code of 1981 is the legal framework for water that establishes the procedures to allocate water rights to individuals. Although water is defined as "public use resource", the Constitution on its article 9, No 24 protects those "legally registered water rights" and they become privately owned proprietary rights which although freely assigned by the State can then be sold or bought on the "water markets" as if they were a commodity. However, the very nature of water as central element in all production and life supporting systems, demand social agreements that make government regulations a must. No other country in the region has such a liberal view of water and yet, the large majority of water infrastructure and bylaws are regulated or inspired by public agencies. The fragmentation of water rights and the lack of associated ecosystem approaches that predominates both on water right allocations and decision making, seriously limit the regulatory role of public institutions which interact with the organizational structures of private users. Those public institutions with most influence on water governance were targeted for both, interviews and institutional reviews. A few private organizations with relevant roles on drinking and irrigation water were also selected.

II. Methodology

The assessment of water governance institutions involved both government agencies and private or civil society organizations with r clearly defined roles over water. The framework developed by the IACC is represented by the vulnerability assessment model" (see Figure 1) which portrays three major components of vulnerability associated with (a) the past and future exposures of communities and their adaptive capacity; (b) the assessment of future climate conditions in the study area; (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.

Water governance involves interactions between the formal institutions and those in civil society that influence an enact policies and decisions concerning water use that shape the vulnerability of rural people and their livelihoods to climate and climate-related water problems (see Diaz and Rojas, 2006).

The review of water related institutions prepared by Morales and Espinoza (2004) provided an early identification of the organizations participating on water resources management on the ERB, the Region of Coquimbo and nationally. Further consultation with team members and stakeholders, a set of institutions were selected for in depth interviews. The interviews to key informants within those institutions included some staff members associated with Santiago-based national offices and key informants closely related to regional decision making in La Serena-based offices in the Coquimbo Region (see appendix 1).

To gather relevant data to the governance assessment, a field work guide was prepared for the interviews (see appendix 3) following the methodological guidelines and operational framework for assessing governance in the area of water resources developed by Diaz and Rojas (2006). The interview was the main instrument used in the assessment to understand the role of the organization and its decision making processes with respect to water and climate stress, and the way the influence the adaptive capacities of rural people (past, present, future). A review of web sites, public documents such as technical and annual reports provided the required background and complementary information for the interviews.

The following were the main themes undertaken on the interviews:

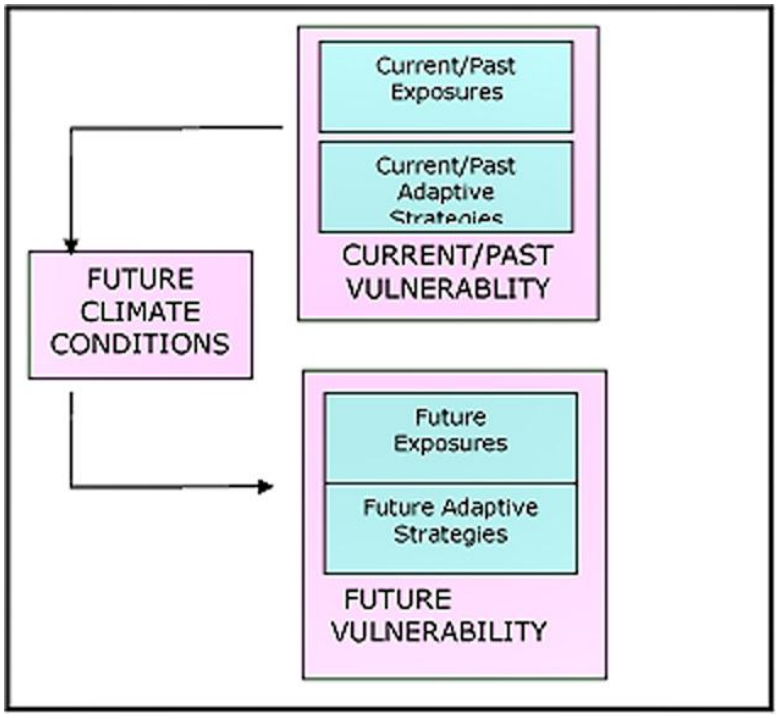
- The institutional roles of the organization in relation to water resources and climate change.
- The experiences of the organization in dealing with situations of water stress and its main experiences in dealing with these situations.
- The existence of long-term plans for dealing with water stress and the factors considered on this planning process.
- The type of information collected by the organization and its availability to other organizations in the water governance network and to the general public.
- The resources available to the organization for managing, mediating, and planning for water related issues.
- The organization's relationships and interaction with stakeholders and the contributions to management and decision making from these stakeholders.

- The accountability of the organization as a whole and the process of accountability.
- The participation of the organization in the water governance networks and the degree of collaboration/coordination resulting from this participation.
- Expected changes of the organization's mandate and activities in the context of the expected climate change scenarios.
- The capacities of the organization to address the concerns of rural communities and their capacity to promote capacity building in rural settings.
- Identification and assessment of legal instruments relevant to the organization's day to day operation.
- Identification of other factors that facilitate or constrain the capacity of the organization to both manage water stress and address rural communities' concerns.

All the interviews were electronically transcribed and coded using NVivo as support tool for the analysis.

The third section provides the main results of the analysis by theme, while Appendix 2 provides summaries of the responses obtained in each one of the main organizations of he Saskatchewan water governance networks interviews.

To facilitate the interview process, two interview teams were defined, one for La Serena and ERB area, and one for Santiago- based institutions.



III INTEGRATIVE DISCUSSION

The National and Regional components of water governance

III.A Government agencies

In Chile, the constitutional jurisdiction over water is exercised through several public agencies involving at least four minis*t*ries and one inter-ministerial agency. Some of these agencies have centralized roles closely related with their mandates. Others have regional presence to deliver their programs often play an analytical and technical support to the regional government. Most of them interact with development agencies, research institutions and productive sector representatives. The main agencies of executive government involved in water governance are:

- **The National Water Board (DGA),** under the Ministry of Public Works (MOP) is responsible for assigning consumptive and non consumptive water rights, with broad management and monitoring roles over surface and ground waters in the country.
- **The Hydraulic Work Department (DOH)** of the Ministry of Public Works, has technical and planning responsibilities over the water work infrastructure development such as large irrigation dams, irrigation systems, flood protection infrastructure, urban storm waters and rural drinking water systems.

- **The National Irrigation Commission (CNR)**, is an inter-ministerial agency integrating five ministries, headed by the Ministry of Agriculture, and whose major task is to develop a national policy on irrigation and enhance both public and private investments on water infrastructure.
- **The Superintendence of Water Utilities (SISS), also under the** mandate of the Ministry of Public Works, exerts a major regulatory role over the quality of services, the environmental performance of all urban water utilities, including the compliance with industrial effluents regulations in the country, and the definition of water tariffs and infrastructure investment plans.
- **The National Commission on the Environment (CONAMA),** an inter-ministerial coordinating body responsible for environmental assessment and monitoring, protection of natural resources, contamination control, setting environmental quality standards, among other objectives, is currently under the recently created Ministry of the Environment.
- **The National Planning Office for Agriculture (ODEPA),** is a centralized planning department of the Ministry of Agriculture. It was created to provide policy advice and information to strengthen the role of the Ministry of Agriculture and public and private agents involved in agriculture. It is also responsible for policy and program assessments. It collects and integrates information and analysis on agricultural production, and reports regularly on economic trends of domestic and international markets.
- **The National Agricultural Development Institute-INDAP** it is a highly decentralized delivery agency of the Ministry of Agriculture in charge of promoting agricultural development among family farms and peasant communities. It has a widespread network of programs to promote the integration of producers into the

markets through innovation and a large set of financial incentives for resource development and conservation.

- **The National Forestry Service-CONAF is** a public corporation under the Ministry of Agriculture (MINAGRI) with a dual responsibility: (a) to promote the development of tree plantations to sustain the forestry industry; and (b) to protect the national forestry endowment comprised of national parks and network of protected wild-lands and the conservation of biodiversity.
- **The Ministry of Health** oversees and approves all drinking water facilities and the provincial laboratory providing water testing services to municipalities and rural drinking water systems. It has a first responder role when water quality threatens public health.
- **The National Emergency Office (ONEMI).** The ONEMI is a specialized disaster relief agency under the Ministry of Interior whose main role is to coordinate civil protection and rescue operations during major natural and social disturbance and disaster.

All the above agencies have a national office centralizing information (in Santiago), and to a large extent, decision making. Their regional offices deliver national plans and programs in coordination with the Regional Governments while providing planning and analytical capacities to orient regional priorities. Few of them relate directly with local water users.

Local governments or municipalities play mostly a supportive role to drinking water services, chiefly related with granting subsidies to low income households or providing relief support during water stress conditions. Usually, Municipalities own water carts that supply drinking water to isolated areas and complement or replace drinking water systems during droughts or when floods damage drinking water infrastructure.

Although Municipalities have no legal mandate on water management, they may use bylaws to protect water resources, promote water conservation. They often play coordinating role during emergencies.

III.B Private sector roles on water management and protection

Our sampling selected two leading private sector institutions with different types of organization and clearly defined legal mandates to manage and administer water resources: (a) the Irrigation Districts known as Juntas de Vigilancia or Asociaciones de Canalistas; and (b) the Rural Drinking Water Committees –CAPRs. The former have clearly defined legal framework to operate under the Water Code. in order to manage irrigation systems. The CAPRs instead have a simplified legal structure as a neighbourhood association with the specific responsibility to maintain and supply drinking water services to concentrated and semi concentrated rural communities.

There are other private and non-governmental organizations that carry out activities around water use, but their roles in water governance are not clearly defined by law although they may to exert influence on decision making and water governance. The exceptions are producers and well organized business (mining, aquaculture, electricity

and industry), all of which influence decision and priorities on public resources and plans to build infrastructure.

Non-governmental organizations involved on water

There is wide array of NGOs developing initiatives and projects associated with water, often in coordination with some research institutions. Most of them are not specialized on water management but on protection of water resources; monitoring the impacts of productive sectors on water quality (such as the impacts of the salmon industry): Some are comprising coalitions to promote and influence policy and legal changes to the Water Code or demand the nationalization of water.

After presenting the institutional roles and capacities as they relate to water governance, we introduce and integrative discussion of the capacities of water governance institutions to reduce the water stress and vulnerabilities of rural communities and pursue the development of an adaptive capacity to climate change. This section will_

- Describe the structure of governance existing in the country and its expressions in the region of Coquimbo, the formal roles of the organizations, and their inter-linkages
- Describe and discuss the (a) main instruments that govern or affect the decision making process, including a discussion of the (b)main characteristics of climate change policies
- Describe and discuss the management and decision making-effectiveness of water governance.
- Describe and discuss the most relevant capacities and shortcoming of governance to reduce the vulnerabilities of rural communities.

IV THEMATIC DISCUSSION

The thematic discussion that follows below essentially reflects the 12 themes structure employed by the IACC interview process. A list of these 12 themes is found in the Field Work Guide for Governance Assessment available at www.parc.ca/mcri/ interviews/Fieldguide_May_2007_FINAL.pdf

1) INSTITUTIONAL ROLES, AND ACCOUNTABILITY (Themes 1 and 7)

This section provides a discussion of the roles of the major institutions involved in water governance and related climate issues in Chile. The agencies associated with legal water management mandates and their scopes are described below. Their linkages and overlaps as well as their most relevant policy initiatives and activities are discussed to portray the unfolding water governance trends and issues as they relate to climate change and adaptation.

DGA. The National Water Board

DGA is without doubt the most influential agency on water management. It was created in 1967 with a mandate to redistribute water as required by the emerging Land Reform.

DGA is the oldest of three divisions with strong roles on water governance under the powerful Ministry of Public Works. It has seven departments covering a broad range of tasks, from hydrological studies and records, to administration of water resources, legal and planning, and information system on water resources (see organigram in anex 3). It has offices on all major capital cities of the country and its major roles are[1]:

(a) Planning the development of watersheds resources and making recommendations to enhance their conservation and economic, social and environmental benefit of society.
(b) Maintain a national hydrometric service and information system; hiring out the specialized public and private research facilities required to develop monitoring capacity and research;
(c) Supervise the proper performance of Irrigation Districts according with their legal mandates;
(d) Coordinate development research by public and private institutions using public funding.
(e) A major role of DGA is to allocate water rights and licences for water withdrawals from surface and ground water in different basins and maintain a record of ownership. Over 5,000 water rights are resolved every year.
(f) It also provides hydrological expertise to assess and inform on the flow and floods of rivers and state of ground aquifers.
(g) It has the authority to declare a basin exhausted and all the relevant measures to avoid further water extraction or allocations, especially during droughts or high increases on the demand.
(h) It is also responsible for the definition and protection of ecological river flows.

The former DGA director explained that the main characteristic of the Chilean water governance institutions is the clear separation of roles. The regulatory functions are dissociated from those of resource development and promotion and from those of social support. Hence, a regulatory body like DGA is independent of the sectors using the water, like agriculture, health, electric sectors, etc.; that is why it is a dependency under the Ministry of Public Worksand not Agriculture or Energy.
Another major aspect of water governance is that water resource management is strongly influenced by market-led policies with clear definitions of private and state roles. This means that the role of private sector organizations strongly influences the management of water resources since legally they hold water rights with few use limitations. They can buy or sale water rights or they can hold those rights in perpetuity. The state, on the other hand, allocates water right free of charge and

[1] Ibid

forever; an arrangement no other country in the region could sustain. This characteristic of the Chilean Water Code meant that very early on, after its approval in 1981, practically all of the water rights in most basins were allocated. This is the case even for many of the ground water stocks, although they may have not always been properly assessed.

Although Chile's water markets seem unique, there has been a growing trend to define public policies to protect and conserve water resources and establish a basin perspective on water management. The lack of a shared vision among water agencies and the lack of a national strategy on basin management has been a major obstacle for good governance and the protection of basin ecosystem. The "National Water Policy Report" produced by DGA in 1999 is the most comprehensive policy informing document, establishing medium to long term goals to reach integrated basin management approaches (DGA 1999). This comprehensive report and its water consumption projection 20-30 years into the future influenced both the priorities and vision of several government agencies and ministries, including health, agriculture, environment and electricity.

DGA is also responsible for keeping complete and updated records of water rights and authorized water extractions in each basin, including those used for rural and urban water utilities in each basin. This information is critical for planning new infrastructure or upgrading aging water infrastructure. DGA also maintains complete records of river flow and water level of all major water reservoirs.

DGA's human and financial resource.

DGA annual budget in 2006 was approximately US$ 8,1 million with a 24.6% increase over previous years (DGA, 2007). Another US$2.1 million were generated by its water auctions and hydrological services. In 2006 US$1.9 millions (24%) were invested on research and project development. In 2007 its budget increased again to US$15,9 mills o 24,5 % . This budget was somewhat smaller for 2008 with US$15,2 millons

As for its staffing characteristics, only 45% of its total staff (374 people) are permanent staff and 55% are under contracts. This is a common characteristic of staffing policies in most of the public services. It is associated with lack of capacity to retain the most qualified personnel and legal restriction to hire permanent staff.

Institutional coordination and linkages

DGA coordinates closely with the two other water institutions under the Ministry of Public Work: The National Hydraulic Work Department (DOH) and the Superintendent of Water Utilities (SISS). Planning and research required for water infrastructure development is supervised by DOH but requires DGA's input information on water availability and on the state of water rights for the basins to be intervened. With regards to planning improvements or development of new irrigation

programs, both DGA and DOH participate actively on the Inter-Ministerial "National Irrigation Commission"-CNR, along with other five Ministries. Similarly, the investigation of complains related to drainage and/or contamination events affecting surface or ground water closely links DGA's work with SISS's own task to control and monitor sewage and industrial effluent discharge to rivers.

DGA also coordinates with CONAMA and several other public services from the Ministry of Agriculture (SAG, CONAF and ODEPA) in the process of establishing the National Strategy for Integrated Basin Management.

Water quality monitoring is an area with overlapping responsibilities. Both, CONAMA and DGA are involved in water quality monitoring, and have priorities in different basins. The SISS also carries out water quality controls. DGA and CONAMA define the environmental and bio-physical parameters to be adopted as secondary water standards for specific rivers. Another agency of the Ministry of Agriculture, specialized on promoting the development of animal husbandry and controlling legal compliance with existing productive and environmental legislation is SAG, the Agriculture and Animal Husbandry Service. They also carry out water testing in some pilot basins. The information generated by all these public services is not always shared or compiled. In fact, although water quality is such an important issue, a data registry on water quality with integrated information from different public agencies, easily accessible to the public is yet to be developed and assumed by either DGA or CONAMA.

Thus, overlapping authority even within the same ministry has not been resolved. This could become a thornier issue once the emerging policies and plans for the National Policy on Integrated and Sustainable Basin Management (NPISBM) complete the second phase of implementation. The basin strategy is led by DGA in conjunction with CONAMA. This new policy is still on its initial stages of development on three pilot basins. Certainly, the experience and know-how of DGA and the mix of participatory and integrated approach associated with CONAMA's environmental expertise are good complement. It is not clear yet who will lead that process and who will have the main management role coordinating, monitoring, reporting and administering the process.

Complementary efforts are particularly relevant since neither DGA nor any other agencies have recently undertaken a comprehensive nation-wide basin reports on the state of the nation's waters. The trends on water quality in the most important basins of the country are only partially reported and there are important gaps. The most updated information comes from baseline studies associated with the presentation of EIA studies and the development of "secondary water quality norms" for 17 rivers.

There is a gap on the institutional capacities to enforce and audit compliance on several fronts, including water extractions, water quality controls and reduction of contamination processes and other externalities associated with productive sectors.

This is an area that only recently is being reinforced with both human and financial resources.

The Department of Hydraulic Works-DOH

DOH is under the Ministry of Public Works is the specialized department in charge of planning and construction of irrigation infrastructure, urban storm water and flood protection and recovery of agricultural lands. It is the oldest water agency, created in 1953 with new and expanded role in promotion of irrigation and urban storm protection since 1997. Its technical support role is critical for the Irrigation Promotion Law 18.450.

It has offices in all major regional capitals of the country and internally has departments in charge of irrigation, rain and storm waters, coastal and river flood protection; flood emergency; and planning, assessment and construction of drinking water infrastructure. The running annual budget for the maintenance, expansion, and new CAPR has been around US$20-24 millions per years (about US15 per person/year).

The budget allocation for 2006 through 2008 has increased by over 50% from US$90 millions in 2006 to close to US$140 millions in 2008. This increase is associated with new priorities requiring technical and feasibility studies and the resources for construction of large dams and irrigation projects. The expansion of the irrigation capacity is a direct result of current priority to turn Chile into a "World Power on Food Production". There are also some major public works related to urban floods and storm protections in several cities.

DOH, as other government agencies complains about the shortage of well qualified professional personnel and the difficulties to retain its specialized personnel. There is a large number of contracted staff with a high turnover rate. DOH has a very reduced percentage of permanent staff, only 27% of its 420 professional and technical personnel.

Institutional coordination and linkages

DOH coordinates with DGA on water development and water management plans for different basins. DOH has the largest technical expertise on irrigation and the construction of water infrastructure and as such it provides advises and support the role of the National Irrigation Commissions-CNR and several other agencies associated with coastal and flood protection. Its role on urban storm water and flood protection is also associated with the Ministry of Housing and Urban Development. DOH also provides technical training and support to water district associations and maintains statistics on irrigation.

DOH offers supports and training to the local operators and administrative the Rural Drinking Water System-CAPRs. It has role on planning , construction and operations

of the drinking water systems. It provides technical advice on their operations to CAPRs. Recently, some of this supervision and support role has been contracted out to private water utilities with more personnel and skill. But the great majority of small CAPR have rejected the idea of becoming dependent on the private water utilities. They fear losing control over their water systems and having to pay higher costs. They would not relinquish their autonomy nor the administrative and technical support role they received from DOH. Proper inter-agency coordination efforts to secure and maintain water quality controls and risk prevention is a weak links between DOH, the Ministry of Health,the local governments and the CAPRs.

The priorities for irrigation, storm water and flood protection projects are usually identified and requested by the regional governments and local producers associations. Their requests are presented to CNR and other agencies of the Ministry of Agriculture, with whom they also negotiate the financial arrangement to carry them out. Historical demands for large irrigation schemes, the associated political and economic clout of the producers associations and the commitment of high rank politicians all influence the rationale for decision making. Other influencing factors are the total cost-benefit analysis of the public works; the stages of development of the engineering components of feasibility studies; the organizational strength of the producers associations and their willingness to reimburse the public investments for irrigation.

According to our respondent from DOH, the Regional Government of Coquimbo has been the most pro-active in making the initial investment required to complete both the prefeasibility and feasibility studies for large irrigation projects. This is a shortcut to the long and more tedious centralized procedures to secure the financial support for project development. The decision to fund from regional government's resources the feasibility studies has allowed that region to get faster approval for its proposed irrigation projects. There is a learning curve that a few other regional governments are beginning to follow on the southern central regions in order to speed up the investment approval of large and medium size reservoir and irrigation schemes. According to our respondent, the decisions to support a project are not based on the technical projections or evolution of water availability of a basin under the recently released climate change scenarios, but on political priorities supported by regional capacities to invest.

The National Irrigation Commission-CNR

CNR was created in 1975 to coordinate the efforts to improve irrigation efficiency with public and private sector participation. CNR also supervises the irrigation investments throughout the country. Its inter-ministerial council is composed by the ministries of Agriculture (is the secretariat of the Commission), Public Works, Economy, Treasury, and Planning and Cooperation. In 1985 its role was expanded to lead the Law 18.450 to Promote Private Investments on Irrigation and Drainage Works, a key instrument to expand the area under irrigation and drainage by

enhancing the role of private investors and producers. CNR has recently targeted small and medium size agricultural producers by supplementing with up to 75% their investments efforts hoping to improve the coverage and efficiency of irrigation systems. It also provides technical assistant to producers associations and irrigation districts.

In 2007, irrigation incentives amounted to US$60 million, a number that has continued to expand.

The National Irrigation Plan is the strategic planning tool of CNR which was approved by the Council of Minister of CNR in December of 2005. This policy tool was formulated after a thorough review of former failures and decades of poorly designed irrigation programs. The assessment process set the basis for more realistic programming of irrigation programming.

"Save for few exceptions, irrigation work has not followed a set of national priority criteria; there has been poor institutional coordination and poor methodologies for project development; also there were inadequate assessment of the agricultural development associated with the irrigation works and often lacking meaningful participation by the potential beneficiaries"(National Irrigation Plan, 2005)

There has been strong criticism associated with the national assessment of irrigation programs and institutions as perceived by beneficiaries and a wide array of public and private institutions. Currently, there are clearly spelled out strategic objectives and guidelines for future irrigation programs, integrating a basin management approach to highlight the relevance that irrigation will have on future development of agriculture and the national economy.

"Irrigation has been an important factor on the evolution of agricultural innovation and exports. The area under irrigation provides 60 to 65% of the GDP of agricultural sector. Over 80% of agricultural exports are based on irrigation agriculture"

The new specific policy objectives for irrigation and drainage have been set by the National Agricultural Policy and the National Water Policy (CNR, 2005).

- Irrigation has to be designed from a basin management approach and should integrate the environment.
- To increase water efficiency by promoting more and better use of technology, infrastructure, research and technology transfer.
- To increase the managerial capacities and efficiency of farmers.
- The irrigation and drainage infrastructure should support the open market and internationalization of Chile's economy.
- To create differentiated and socially sensitive mechanisms to enhance the economic participation of farmers in accordance with their socioeconomic conditions.

- To strengthen and improve the capacities of public institutions associated with irrigation and their coordination

The current irrigation plan identified the regions and basins where irrigation programs will be focussed. One of the goals of public incentives is to increase the participation, investment and commitment by private enterprises and farmers on irrigation, land drainage and public irrigation infrastructure. The plans also include restoration and improvement of aging irrigation system. The investments are informed by the future scenarios for agriculture developed by ODEPA, the Agriculture Planning Office of the Ministry of Agriculture (ODEPA, 2005). The plan has led to the creation of the Inter-Institutional Coordinating Table (Mesa de Coordinación Inter-institucional-MCI) comprised by the executive secretary of CNR, DOH, DGA, ODEPA, Planning Office of Ministry of Public Works and the future National Irrigation Service. This body is coordinating all programs and operations on irrigation and drainage. It will have a decentralized regional chapter to help improve the coordination and consultation with the private sector.

CNR has established an ambitious goal to reach 460,000 hectares of newly irrigated land by 2014. Yet, in order to integrate in these goals the small farmers and rural communities without access to irrigation, major limitations such as lack of water rights need to be addressed. Presently, most basins have water rights fully assigned and some with water demands greater than the existing water stocks. Furthermore, the goal of integrating rain-fed farming communities will require a cumbersome legal and technical procedure in order to obtain new rights, such as ground water rights. These structural limitations leave most of the small farmers and vulnerable groups without access to the incentives. Clearly, medium and large farmers are in better position to meet the legal requirements to take full advantage of the incentives and programs promoted by CNR.

The budget and personnel of CNR has been expanding in the past few years. In 2006 it had an allocation for irrigation schemes of US$45.7 millions and for 2007 there was a 21% increment reaching a total of US$ 55,3 millions. The staff is comprised of 85people but only 15 of them have a permanent contracts.

Institutional coordination

CNR coordinates closely with the technical teams and agencies of the Ministries that comprise its Inter-Ministerial Council. The most relevant of those agencies are those associated with irrigation programs such as DOH, DGA, the National Development Institute for Agriculture and Animal Husbandry-INDAP, the Agriculture and Animal Husbandry Institute-SAG, the Institute for Agricultural Research-INIA, the Planning Office of the Ministry of Public Works and ODEPA

Until recently, CNR only had two regional offices throughout the country for each of the northern and southern macro-zones. It is through those institutions that CNR

reaches small and medium size producers with water rights and/or irrigation potential. In the last few years the financial allocations have also expanded accessibility to subsidies to some of the vulnerable groups and communities in poor Municipalities.

The National Commission on the Environment- CONAMA

It was created by a Presidential decree in 1990. . It has played a key role in developing and upgrading the environmental legislation during the democratic transition from 1990 to 2000. Its main role is to define and develop an environmental policy for the country, and develop the legal and institutional framework for the protection of the environment.

The main environmental management instruments are associated with:
(a) the creation of an Environmental Impact Assessment System-SEIA;
(b) the promotion of broad public participation on environmental issues
(c) developing environmental quality standard and regulations for the protection of nature and preservation of natural capital;
(d) defining the emission and air and water quality standards;
(e) the formulation of management, prevention and decontamination plans.

CONAMA is a decentralized body with regional offices in all 15 regions of the country. They resolve and approve or reject investment projects submitted to EIA and qualify the conditions for legal permits.

CONAMA's five departments oversee: (a) Environmental assessment and monitoring; (b) protection of natural resources; (c) control of contaminants; (d) environmental education ; (e) and International Relations

CONAMA's environmental management tasks closely relate to other water management institutions under the Ministry of Public Work and Agriculture in several ways:

a) The Environmental Impact Assessment System– EIAS.
The EIAS is a key instrument in evaluating investment projects that can impact on water quality and availability. If a project is to have any impact on the hydrological dynamics it is required by law (Environment Law 19.300) to present an EIA to explain the ways those impacts will be mitigated. The Project's EIA is evaluated by the respective Regional Environmental Council-COREMA which in turn requests the different government agencies to review, assess and approve or reject.

b) Public participation
The participation of technical agencies and local citizens affected by a given project takes place during the assessment of environmental permits through the SEIA. Yet

all final decisions to approve or reject a project are made by COREMA where political priorities often are confronted with technical considerations. A common complaint by civil society is that public participation processes are too short for citizen observation and can extend almost indefinitely for the proponents to improve the projects. Citizen observations have no legal weight and most often controversial projects are politically pre-approved.

c) Environmental Quality Rules
The environmental law 19.300 assigns CONAMA the coordinating role in the formulation of environmental quality rules, the program and timeline for its adoption. There are two quality norms: Primary and Secondary Quality Norms. The former are aimed at protecting the health of the population and the secondary norms are to protect the environment and preserve current water quality to avoid future deterioration and an acceptable level according to science and technical recommendations. Secondary quality norms are specific to each basin and DGA and the National Agriculture Service-SAG oversee its compliance. In the Elqui river basin, the secondary quality norms were established in 2006 and they became mandatory in 2008.

d) Emission rules
They set the limits of contaminants that can be emitted to air and water by industry or other emission sources. The goal is to help to re-establish acceptable air or water quality levels where they have been surpassed (www.conama.cl).

CONAMA also plays a major role on policy formation on the management of water resources through the formulation of a National Strategy for Integrated Hydrological Basin Management, comprised by an inter-ministerial commission led by CONAMA. It also involves Public Work, Agriculture, Mining, Energy, Housing and Urban Development, Defense, Economic, Treasury, External Affairs, Planning and Cooperation and Health Ministries.

The strategy is in its initial implementation period with three pilot basins in Copiapo, Rapel y Baker rivers. There is a four year timetable for the formulation of the basin management strategy and the implementation of pilot plans in three rivers. This process will lead to new institutional arrangements to carry on the integrated basin management (CONAMA, 2007).

A summary of the functional institutional map used by CONAMA to develop the strategy is the following:

The other key policy forming role is CONAMA´s contribution to formulate a national policy on the protection of Glaciers. But several attempts to formulate a national law to protect glaciers failed due to lack of support by the executive and the strong lobby of the mining sector. As result CONAMA is leading a broad commission aimed at formulating a national policy to protect glaciers which should be approved by 2009

Institutions	Roles
DGA	Administration of water resources, Water monitoring and enforcement
CONAMA	Regulation of water quality
CONAMA, CONAF, DGA, DIRECTEMAR, SERNAPESCA, SUBPESCA	Protection and environmental conservation
SISS	Regulation and monitoring water utilities
CNR, DOH	Development and promotion
SAG, Seremi de Salud	Enforcement and control of water quality
SISS, Seremi de Salud	Enforcement and control of effluents

Source: National Strategy for Integrated Hydrographic Basin Management

Institutional relations

Its decentralized functions link the regional offices of CONAMA with the regional governments and other decentralized government agencies in relation to political and technical environmental and management priorities as well as the qualification of projects submitting their EIAs for approval. CONAMA relates to a large number of companies and private institutions due to its role on environmental assessment and qualification of projects.

A large number of civil society organizations, including NGOs and academic groups interact with CONAMA through their participation on the national and regional Sustainable Development Councils. Its national environmental fund provides financial support to community based conservation and environmental innovations and environmental education programs.

ODEPA. National Planning Office fro Agriculture

It was created in 1992 as a policy advisory unit to the Minister of Agriculture, the National Irrigation Commission –CNR and several national and regional bodies engaged on decision making and information analysis. It collects and integrates information and analysis on agricultural production, and reports regularly on economic trends of domestic and international markets. It also provides specialized advice and analysis to External Affairs and other officers engaged in the negotiations and follow up of free trade agreements, commercial exchange and international cooperation agreements. ODEPA provides feedback information on the impacts of policies, instruments and programs through its performance assessment activities. It plays a role in assessing the budget performance and requirements by different agencies of the Ministry of Agriculture.

ODEPA conducts studies on different aspects of agricultural development needs and priorities, recommending the type of scientific and technical research and development that is required to inform policy making.

ODEPA has seven departments that cover a broad range of activities from data gathering, information analysis and dissemination to policy development activities including advice to External Affairs on international agricultural negotiations, to policy innovations to improve the impacts and performance of CNR's irrigation programs, to assistance on technical cooperation agreements (odepa.cl). ODEPA is in charge of the architecture of agricultural (macro) policies and strategies for external trade, coordinating activities of several agencies and programs to ensure adequate focus and correct application of policies and resources. Other more specialized services coordinate the design and implementation of more specific policies.

Its role on water governance
Although ODEPA does not have direct mandate on water resource issues, it has an important role as advisor to the National Irrigation Commission- CNR and to other irrigation programs of the Ministry of Agriculture.

Budget and personnel
Its annual operating budget for 2007 was close to US$16 millions, a substantial increase from its 2006 budget in order to cover the costs of the VIIth Agricultural and Forestry Census developed in conjunction with the National Institute of Statistics-INE (BGI-DIPRES, 2007. The cost of this census was US$10,5 millions. The agriculture and forestry census are updated every ten years and provide key information on the transformation and trends in agriculture, land use changes, productivity, etc.

A total of 106 people comprise the staff of ODEPA; of those, 39% are permanent staff. ODEPA is a centralized unit with no offices in other regions of the country.

Institutional relations
On its policy forming, advisory and information role, ODEPA relates with different levels of the Ministry of Agriculture, specially the Minister and the Undersecretary's office. It also provides statistics and technical information regarding agricultural markets to the Ministry Secretary of the Presidency, the National Budget Office, the National Corporation for Production Promotion-CORFO; the Economic Relations Board and the Central Bank. It provides policy advice, technical information and coordinates activities with several parliamentary commissions of Senate and Lower House (Agriculture, Environment, Budget, etc.). Different levels of producers associations, agribusiness and technical personnel for the public and private sector also seek ODEPA's specialized agro-economic and market information.

National Institute for Agriculture Development –INDAP

INDAP is an agency of the Ministry of Agriculture created in 1962 to promote agricultural development
Its main objective is to turn small and subsistence farmers into self-sustaining productive units enhancing their productivity, the quality of agricultural produces and their competitiveness in national and international markets. Its programs aim at building their capacities and productive assets by overcoming their access to credit, markets and irrigations infrastructure.

INDAP has offices in all of the regions and in 70% of Chile's Municipalities through its "Program for Local Agricultural Development-PRODESAL"[2], one of the most extended services and training networks of the Ministry of Agriculture. It attends over to 50,000 families per year and it has developed specialized programs to respond to drought, floods, and other climatic stressors. INDAP has the most extensive technical service support staff in the country with 861 people in 260 rural municipalities.

INDAP's work is indispensable to complements the efforts of CNR and DOH on large water infrastructure program, by reaching and supporting the water management capacities and resources of small farmers. It provides financial and technical support to secure legal land and water rights; technical support for submission of small irrigation projects, both individually and collectively; special crop irrigation incentives (rice and corn); soil recovery and several programs on technology transfer and on farm management. It also has programs for capacity building and financial credits for farming women and native people.

In the Coquimbo region, INDAP programs provide support to over 1,800 farming units, integrating over 500 new hectares of agricultural land to irrigation. Also over 350 hectares are equipped with high-technology irrigation and over 80 new hectares were planted with fruit trees between 2003-2007 (BGI-INDAP 2007).
Institutional relations
Coordination with many institutions is intrinsic to INDAP's role in order to provide services and support to small farmers and most vulnerable sectors of agriculture. It coordinates and creates synergies with almost all of the specialized agencies of the Ministry of Agriculture. Its links with the National Institute for Agricultural Research-INIA; the Agriculture Innovation Fund-FIA; the Agriculture and Animal Husbandry Service. Its programs associated with CNR (for US$8,1 millions in 20027) have greatly expanded its capacities to support irrigation programs and respond to a diversity of needs and challenges of family farming communities throughout the country. It coordinates with Municipalities and regional governments to deliver its programs.

The Superintendence of Water Utilities- SISS

This department was created in 1990 under the authority of the Ministry of Public Works to oversee the process of privatization of the state-owned water utilities during that decade. Its role has been expanding as new environmental and health goals and standards are developed. The main role of SISS is to ensure that water utilities fulfill the water quality standards and effluents discharges on all their operations. Hence, its main role is related to safeguard water quality, both as drinking water and the compliance by industry (including mining operations) of treatment of their effluents discharges to water bodies (water quality in rivers and coastal areas).

SISS controls all of the water utilities, including those in the Coquimbo region attending urban areas (Aguas del Valle). Also, since 2006 its role was expanded to control effluent discharges by industrial and productive sector as part of national policies developed by CONAMA to improve the environmental quality of rivers and other water bodies.

SISS also regulates the charges for water services and intervenes in situation when consumer groups cannot resolve their controversies with the water utilities.

SISS has offices in all of Chile's regions and in the Coquimbo region it has a team of two field officers in charge of control and enforcement. SISS controls the reliability of water analysis reported by water utilities and if required may carry out audits through external and independent water laboratories. By en large SISS relies on industry's auto-control and reports.

The Coquimbo region's staff participates on regional and national priority setting plans in coordination with several regional ministerial agencies such as CONAMA and other agencies involved in water management and public health.

SISS also monitors that the industry complies with the agreed investment plans to maintain and expands water coverage and the quality of its services. To this aim SISS sets multi-annual contracts with water utilities to secure investment plans to expand and improve sewage treatment.

Health Ministry at Coquimbo region-SEREMI SALUD

The Health Ministry has the mandate to set the rules and regulations to grant safe drinking water and proper treatment of effluents. The Department of Environment Program –DPA has the mandate to oversee, control basic sanitation services and registers basic data on health monitoring. Thus, the Health Office in the Coquimbo region has responsibility to safe guard the quality of water for human consumption and for maintaining controls over potential contaminants and vectors of disease. The respondent from the Regional Health Authority recognized that they have a major

pending challenge in relation to the rural drinking water systems. Many of APRs do not have an operating license extended by the health authority. The regular quality controls often are not carried out nor reported timely back to operators of those rural water utilities. It is unclear to what extent they have an effective coordination with DOH on water sampling and water testing, and the functional links they may have with SISS.

The Regional Health Service participates on the assessment of EIA and environmental impact declarations of projects that may impact the quality of water and food production such as mining projects, large animal husbandry farms, water treatment plants, etc.

The Regional Health Services has nine offices in different municipalities of the region that coordinate with local government and its network of health services and medical posts.

The National Forestry Service- CONAF.

CONAF was created in the early 70's to contribute to the conservation and management and use of forestry resources in the country. The goal was to consolidate in one agency a broad set of incentives and programs to enhance the development of a forestry industry and to protect native forests species (www.conaf.cl).

CONAF's is a private corporation incorporated under the Ministry of Agriculture with offices in Chile's 15 regions. Its mandate is to protect the native forest resources, protected areas and parks and promote the sustainable use of forestry ecosystems. Its role includes financial instruments as incentives to promote reforestation programs (mostly with introduced species such as pine and eucalyptus, a drought resistant species in the semiarid regions). Among its strategic goals CONAF aims at strengthening the National Conservation and Park Lands System; and the promotion of tools and incentives to generate environmental goods and services from native forests by small and medium size forest owners. It aims to protect native forests from different impacts such as desertification, fires and land use changes, etc.

Through its programs CONAF aims at protecting relevant ecosystems such as national reserves and parks that influence and hold important hydrological resources or protect valuable watersheds. Studies and assessments of those ecological services or water yields have been partially completed and there is reasonable yet incomplete information on the impacts of agriculture, forestry, forest fires and productive operations over those areas.

CONAF has been associated with basin management with DGA since the mid 90's when a comprehensive program was developed to establish the pilot phase of an

integrated approach to basin management in several basins. This early attempt generated a wealth of valuable information on many technical aspects but it did not succeed in creating the legal and institutional framework for integrated basin management in any of the basins selected on the pilot phase (INFOR, 2009). It took another decade to get the legal basis for a national strategy on basin management and the adoption of schedule to move beyond the pilot phase.

In the region of Coquimbo, plans to develop an integrated approach to basin management have not been successful. Some of the basins, like the Elqui River and the Limari River have gone through several stages of studies to document information on users, hydrological and weather data. They have also carried out several stakeholder meetings and discussions. Those early attempts have failed to build an institutional framework to establish basins authorities, although the recent adoption of National Basin Management policy is lending more institutional support to the process.

In 2007 CONAF's annual budget was $34 million pesos or US$6.8 million. Only |36% of its staff is under permanent contract (632 out of 1,1738 people) (BGI-CONAF, 2007).

Institutional relations

CONAF relates with several agencies of the Ministry of Agriculture to define its institutional priorities and its medium to long term goals plans. It relates to several agencies of the Ministry of Agriculture on soil conservation and erosion control, such as INDAP and SAG. It also relates to large number of small, medium and large land owners to approve reforestation and forest management plans, including the application of law Decree 701 that subsidizes tree plantations (in 2007 LD 701 allocation were slightly over the US$50 million) The latter is one of the long standing incentives for reforestation since 1979. CONAF also provides technical advice to many small and medium size property owners participating in soil conservation and soil restoration programs. It has cooperation initiatives with several international development agencies such as GTZ, FAO, PNUD, etc.

The National Emergency Office-ONEMI

The Ministry of Interior created ONEMI in 1974 to organize and coordinate the plans to prevent and protect civil population in case of emergencies, natural disasters and other major traumatic events. It has regional offices and a national plan with a Management Model for Integrated Response for Civil Protection that reaches local governments and community organizations. The legal regulatory body is quite flexible to enable ONEMI to reach and mobilize resources within the territory in short time. Its planning tools identify the most vulnerable areas and populations and the localized institutional response capacities to confront natural disasters. It also has a decentralized early warning system.

During climatic events or other natural disasters such as earthquakes, ONEMI coordinates with the Ministry of Interior, Agriculture and Health in order to review the response procedures and means to reach the affected population. When the status of "Emergency Zone" is declared for any given region or district, hen, a Regional Operational Committee for Emergency is established under the direction of the regional authority (BGI-ONEMI, 2007).

Currently ONEMI is improving its National Early Warning Center with updated telecommunications and data processing equipment. Aside from national and regional coordinating efforts, ONEMI is also implementing a specialized and community focus response systems in 32 Municipalities with the highest vulnerability indexes.

A new general law for civil protection is a goal that has not been fulfilled. Recent reviews and criticism from Senate Commission (www.senate.cl), accused ONEMI's of not having capacity to react timely proposing major changes and a simplification of procedures to unable ONEMI to react more quickly and with more professional resources.. Another criticism is the reaction time to confront fires and the lack of possibilities of getting army personnel to support ONEMI on its tasks.

II. The private sector organizations in water governance

AGUAS DEL VALLE

"Aguas del Valle" is the name of the privately owned water utility that provides drinking water and sewage treatment services to all the major urban areas in Coquimbo Region since it was privatized in 2004. It provides drinking water to 509,777 inhabitants, almost 99.9% of urban population.

Aguas del Valle provides water testing services to CAPR on a monthly basis. The monthly bacterial testing is complemented by chemical and physical analysis of drinking water every three years, unless specifically requested by its users. This frequency of water quality controls for bacterial contamination would not be acceptable for an urban setting and they apply only to rural population. Furthermore the reports are frequently delivered late and the water operators cannot interpret the results. In case a bacterial contamination process is detected, it is unclear if this would reported soon enough to grant a timely reaction to protect public health,

Aguas del Valle reports to and coordinates with several government agencies: (a)to SISS in relation to their overall compliance with the sanitary law and all its regulations, including investment and management plans, rates, water quality monitoring, sewage treatment, etc.; (b)to CONAMA and DOH in relation to authorization of construction of new water infrastructure, mitigation of impacts of

operating infrastructure, operational support and water testing for APRs, etc.; (c) to DGA in relation to water rights for water extractions;

The Irrigation Districts Junta de Vigilancia del Rio Elqui.
The Irrigation Districts or Juntas de Vigilancia (JVE), are private association of producers with registered water rights and with a legal mandate (under the Ministry of Public Works and DGA) to administer, operate, monitor and distribute irrigation water that is "owned" by their associates in a given waters system.

They are also in charge of maintaining in operational conditions the water works for irrigation and associated infrastructure that they are entitled to under the water law. Its members may be water communities, irrigation associations, private individuals and institutions or agro-industry, etc., all of which must have a legal entitlement to use water. Often, they have to reimburse a portion of the construction costs of the infrastructure to the State. In most cases they pay up to 50% of the total construction costs of large water reservoirs. In other cases, they would have to pay for the service to a private company or consortium when they build and operate the water reservoir and irrigation facilities.

In the Elqui Valley, as in other basins of the Coquimbo regions, the irrigation districts in charge of managing water utilities have a great deal of experience and managerial capacities. The "Junta de Vigilancia del Río Elqui-JVRE, was created in 1993, replacing the previous JV de Coquimbo. It includes 125 irrigation canals and 16 mechanic water collection elevators. They manage the irrigation system associated with the Puclaro and La Laguna dams , with 200 and 38 cubic million of capacity respectively. Together they provide irrigation for close to 28,000 hectares.

Relations with other institutions

JVE relates closely with DGA from whom they derived their water rights and report back on change on water tenure and water availability on the dam. DOH is the most frequent partner both in terms of planning, training, operation and expansion of the irrigation infrastructure. It is through DOH that the JV negotiated the transfer and repayment schedule for dams and irrigation systems. They also relate to CNR for funding for irrigation improvement projects and institutional strengthening. The smaller producers, among the members of JV also relate to INDAP. JVE relates directly with an energy company with whom they form a partnership on energy generation. The JVE has been the first irrigation district in the region of Coquimbo to integrate energy production with its irrigation infrastructure. They created a joint venture with GPE S.A. to develop a hydroelectric project . The run-off-the river 5.8 MW hydro will earn them up US$160 per year, to help them pay back the construction costs of the dam to Chilean government (www.rioelqui.cl).

The Rural Drinking Water Committees-CAPR

The CAPR are local organizations under Municipal charter with a status similar to that of a neighbourhood association (Law 19.418/1995 and the Law Decree No.58/1997) and the Ordinance for Administration, Operations and Maintenance of Rural Drinking Water Services (www.senado.cl). They were created in early 1960's to help control water born diseases and high child mortality rates. They are autonomous organizations conformed by all the concentrated rural households connected to the water network system. Some of them supply up to thousand households in peri-urban areas. The great majority of them services from 10 to 250 household (73%). The large ones have more complex structure and many have adopted the legal status of cooperatives. Most of them, however, retain the structure of neighbourhood committee and are non-profit organizations.

Presently, close to 10% of Chile´s population have access to drinking water service through CAPR. There are close to 1,500 CAPRs throughout the country with approximately 300,000 households connected. The total government investments on the CAPRs system between 1990 to 2004 has been calculated at US$400 millions (www.aprchile.cl)

The CAPRs are considered among the most outstanding associative efforts for they constitute one of oldest and largest social network in Chile. Their national and regional associations have been extremely critical and active on the discussions of the new law proposal. They do retain their autonomy and do not want to be absorbed into the privatization drive and become controlled by the large corporate -owned public water utilities.

The main goals of CAPR is to provide secure safe drinking water supply for rural communities. The system design, the authorization for construction permits and many of the operational stages are under the supervision and assistance by the DOH. The training of operators and administrative personnel to manage the chlorination plants, maintenance, distribution and administration system is also done by the staff of DOH. The initial water quality tests and operational design are approved by the Health Authority but there is discontinuity of this link once the system is operational. The SISS is mandate by law to provide support to all water service providers but not the CAPRs. Close to 20% of the CAPR do not pursue regular water testing and this number could be much higher in practice, as performance evaluations are seldom used in about 30% of the CAPR.

The great majority of the CAPRs provide drinking water but no sewage collection nor treatment, creating major challenge for sanitation and environmental and water quality. The complexity and costs associated with sewage disposal and the health risks has not been resolved yet. The potential contamination of underground waters has been partially resolved with localized septic tanks or basic sewage treatment plants. However, a proper sewage systems rather than septic tanks in each home require major public investments, and this has been a major pending challenge for

APRs in Chile. . Until recently this type of investment could only be made by only a large agency like DOH or the regional government.

A law proposal to create the "Rural Sanitation Service" is currently on parliament and its approval is expected 2009-2010. This law will provide a legal framework and guidelines and conditions to upgrade the operations of the rural drinking water systems and establish the guarantees to secure further public investments to resolve the pending problems with water accessibility and quality. The law deals with three major challenges: (a) a new set of bylaws and norms for CAPRs; (b) to creation of a registry for technical advice and consultancy services to ensure well qualified professional services to CAPRs; and (c) the funding and new investments to renovate the infrastructure and prolong the operational life of the systems. One central issue to be resolved is the non-profit status of most CPAR which limits their access to funding from government programmes. It also limits their access to bank loans in order to expand, improve or consolidate the service as an economic activity.

The creation of a Rural Sanitary Service gives the SISS a supervisory role, as in all other urban water utilities. Hence, the SISS would provide the water concessions for 10 to 30 years and would define the water charges associated with the services. The latter has been a major issue for many CAPRs that manage their costs low to ensure that no member of the community is left out of water services because they cannot pay the water bill.

The major challenges the new institutions and legal framework will have to resolve how: (a) to protect and preserve the associative character of the community organizations providing the services; (b) to expand the services to include close to 400,000 people who leave in rurally dispersed conditions which still with no access to potable drinking water -reaching them will have substantially higher costs than reaching concentrated rural communities; (c) to confront the required investments for sewage and water treatment plans Only 105 rural water services have sewage disposal facilities (attending close to 180,000 people), but no proper sewage treatment facilities (www.apr.cl). In the latter case, Municipalities and Regional Development Division of the Ministry of Planning have provided the financial resources to develop sewage collection systems (www.subdere.gov.cl).

The following are the three major objectives of the new law for the rural sanitary services::

a) To strengthen the water management capacity of community organizations while preserving their participatory nature
b) To promote the economic efficiency and financial sustainability of the APR system which will become the System of Rural Sanitary Services;
c) To clearly define the different roles of the State in relation to the Rural Sanitary Services.

Today the Municipal government administers the financial support for those households that cannot pay regularly their water bills (provided by the Minister of Planning and Cooperation). This allows families in distress or in unemployment the financial support for basic services without affecting the economic viability of the CAPRs. The Municipalities also support them during drought conditions, when wells run dry or not provide enough water, providing water trucks to supply households. The technical support for the extension of water networks and relocation of wells is usually done by the DOH department in charge of CAPRs.

In Coquimbo region as in other parts of the country, the CAPR resist the attempts to be administered or taken over by the large water utilities, although it is unlikely that the latter would interested in managing many small and dispersed systems which t are usually not cost effective for their scales.

Institutional relations
CAPRs relate directly with DGA to register and secure water rights for their ground water extractions; with DOH for design, construction, technical advice on management and operations. The Municipal and Regional Government provide them with financial support for improvement or expansion of the water services on some occasions. Municipalities are the closest link to government they have and it is the most frequently sough help in case of emergencies. They also relate with the Ministry of Health and regional water utilities that provide technical advice and laboratory analysis to assess water quality. They also relate with some poverty reduction infrastructure programs of the Ministry of Planning.

There is also an emerging capacity to build provincial and regional associations of CAPRs and a fairly active National Federation of CAPR (www.aprchile,cl)

V. MANAGING WATER STRESS

This section deals with the planning and response capacity of the institutions to manage water stress associated with climate related events such as droughts and floods as well as other non climate related stressors such as water contamination of climatic variability on water availability and the life of communities and productive sectors. It also looks at the institutional learning processes associated with previous stress situations and on how they organize their response capacity to stress events.

The previous experiences may help to build up resources and institutional networking capacities that enhance the social capital of communities and the opportunities to adapt to climate change. New programs and plans are emerging, especially in 2008, after the Climate Adaptation Strategy and the National Plans were announced. But the initiatives described in the previous pages are the ones that have become consolidated and have proven political and financial support.

On this section we will discuss the extent to which climate change and climate risks have become part of the current planning and goal setting of the institutions associated with water resources management and agriculture.

The finding show that by enlarge, at the time of the interviews, climate change was not an institutional concern. Our key informants interviewed throughout 2007 and part of 2008 all were well aware and convinced that an agenda for climate change was required in their respective institutions. The ongoing process to identify the key elements of a national strategy to confront climate change and the adoption of priorities and guidelines were being discussed in an ad-hoc advisory committees led by CONAMA. Those discussions did not permeate the upper layer of decision makers until very recently.

During 2007 there were great climatic disturbances, with record frosts followed by as severe and extended drought. The Minister of Agriculture reacted and made some important announcements. In May 2008 it created a special advisory commission to develop a climate change response capacity within the agricultural sector. The commission is made of 22 members of a large array of institutions. It announced the creation of a specialized agricultural alert and emergency response network.

Towards the end of 2008 and a week before the Poznan meetings on Climate Change in Poland, the government announced the National Plan on Climate Change (www.conama.cl). At the same time, there was a coordinated response from environmental organizations in the form of broad coalition of NGOs, small producers associations and urban based organisations (http://justiciaclimatica.cl)

Since most of the interviews were carried out throughout 2007 and beginning of 2008, the analysis of interviews will focus on past experiences and programs, rather than on future programming and recently created structures to enhance an effective adaptation policy framework.

During 2007 and 2008, both parliament and executive government developed a law proposal to protect glaciers, but the timeline for its approval is unclear. The powerful lobby of mining sector intervened and manage to effectively halt the discussion in parliament and put the motion on hold. At the same time, another law proposal to protect glaciers was developed and presented to the executive government by a coalition led by a rare mix of NGO, Chilean Army, the powerful National Agricultural Society, and two of the leading ecologically minded senators. Both attempts have been shelved. CONAMA decided to develop a policy framework to protect glaciers that was approved in 2009.

The following is a discussion of the main institutional responses that address climatic variability, climate change and adaptation in the institutional review.

DGA

Water stress is associated with drought and floods, two are recurrent phenomena of regional climate in North-central Chile. DGA's needs to respond to drought when they put at risk water allocated for irrigation projects or threatens hydroelectric energy generation. During serious drought events, DGA has the mandate to intervene the regular basin management organization and distribution mechanisms to reduce conflicts emerging with water allocations and also to secure the supply of drinking water to cities and localities. It may authorize the boring of new and deeper well to secure water for key activities. DGA is part of the Regional Emergency Response Committees that are organized on and ad-hoc basis every time there is drought or natural disasters. Its network of water and weather station provide the information to alert institutions ad user about climatic conditions that may lead to droughts or floods. Still, most of the institutional responses to extreme climate events are on ad-hoc basis and there are no drought nor flood plans.

At the time of the interview climate change was not a central concern for the institution. However, recurrent water scarcity and increasing demand were recognize by the respondent as the two major drivers for policy changes and the ones that may help create institutional responses and adaptive capacities.

The legal framework established by the Water Code (1981) assigns mostly a regulatory role on water right allocations to DGA. One major limitation DGA has had in confronting the increasing water demands and conflicts among productive sectors is the fact that the Water Code does not define priorities for assigning water rights like in most countries of the world. In Chile water rights are not associated with priorities in water use (e.g. t drinking water and food production versus mining and r industrial uses). There are no obligations attached to water rights: A person/community or company can change the end use of water and does not have to explain its plans to DGA as long as it does not at affect other water rights. There are no levies or taxes associated with water rights except for a levy on non-consumptive water rights when these are not been used. Hence, there is no way to obtain taxes or charges that can be redirect towards basin management or investments on restoration based on the intensity of water use.

Changing water legislation in tune with the changing priorities imposed by climate change and users demand will require constitutional amendments. But in the last 18 years, the ruling coalition has not commanded the votes required for important legislative changes on water legislation. It is that context that our DGA respondent explained that climate change *per se* is not an institutional priority. Still, several issues are building up pressure for institutional responses that integrate adaptive responses to changing climatic patterns:

a) the rapid increase in water demands on all sector of economy;
b) the water stress resulting from poor basin management practices;

c) degraded ecosystems and poor enforcement capacity by government agencies in charge of water:
d) more extreme climatic fluctuations.

DGA is confronting the challenge in several ways:
a) The unfolding of a National Strategy for Integrated Basin Management-NSIBM creates a unique opportunity for institutional coordination and broad stakeholder participation. The strategy will increase the opportunities to build an institutional base for a decentralized decision making process that may be more responsive and effective in adopting new management tools to adapt to climate change.

b) The emerging "Regional Water Consultation Round Tables" informing both the Directive Plans for Basin and the NSIBM. Most of those "water dialogues" are taking place in the northern arid regions, including the Coquimbo region. They are highlighting the concerns, priorities and opportunities of different stakeholders through a participatory approach on water resource planning. It is unclear yet, to what extent those agreements and recommendations will be integrated on future basin management priorities or investment priorities by the water institutions.

c) A join research initiative to complete the "Glacier Assessment Program", integrating efforts of DGA's Glaciology Department and the expertise of the specialized glaciology research center in Valdivia –CEC. Chile, along with Canada and Argentina have the most abundant ice reserves in the continent, but Chile has little knowledge of those so called "strategic reserves" and how they are being affected by climate change. Preliminary results show that 91 % of them are receding and only 7% remain fairly constant. Also a large proportion of the summer flows of Chile's northern and central rivers depend on snow and glacier contributions.

d) DGA has participated in the development of a legislative proposal to protect glaciers. The legislative process is on hold due to strong lobby by mining and energy industry. DGA developed the basis for a recently approved law to intervene dams and large reservoirs in case of serious climatic disturbances and flood risks.

e) DGA strengthened water monitoring network on rivers and dams is considered by the respondent as an adaptive tool because they are associated with their capacity to forecast short term water availability and act as early warning system for water users. They report instant on-line water available on dams.

f) DGA also promoted several of the initiatives integrated on the recently announced National Plan on Climate Change Adaptation including :

i. The creation of national inventory of glaciers and the installation of a network of monitoring station associated with a strategy to protect glaciers.
ii. To increase by 50% the irrigated land through a program to build new dams and water reservoirs
iii. To improve the institutional predictive and response capacities to confront emergencies associated with floods and intensive rain impacts.

iv. The development of a National Education Plan on Climate Change that will be integrated into the curricula at all levels.

DGA respondent recognized that adaptation policies are unlikely to become priorities until climatic modelling tools increase the resolution and bring the timelines closer to current planning forecasting capacities. So far, the responses are based on past experiences and its own water monitoring and data processing capacities. Even so, it is clear that the legal and analytical tools of DGA are insufficient to reverse the ongoing extractive processes that are exhausting the ground water reserves in basins like Copiapo which has at most three years of underground water supply www.chilepotenciaalimentaria.cl). A phenomena that is already beginning to affect other basins. These processes of over-exploitation of surface and ground waters are associated with DGA extending more extractive rights than the recharge capacity of aquifers, a situation they cannot correct easily (DGA, 2008)

Integrated basin management approaches are still on its early stages and it is unclear whether future political priorities under a new government will strengthen or weaken the strategy. The results and assessment of the pilot phases of basin management will be available by the end of 2010. . In any case, the experience will no doubt help build the capacities to confront the diversity of stressors impacting on water availability.

DOH

Among the major water stress recognized by DOH respondent, floods are the most damaging for they impact on the APRs, roads and irrigation infrastructure. DOH has built a map of high flood risk zones and a plan to build containment system to protect infrastructure and communities. These are adaptive responses, associated with DOH capacities to mitigate and repair damage caused by extreme climatic events.

The flood risks are aggravated by the expansion of rural hamlets that continue to build and cultivate on flood risk areas; and by the accumulation of non-stabilized tailings from mining operations. Often river overflows are associated with construction activities altering the river bed. DOH can stop or limit those activities for it has the legal tools and mandate to protect river beds from activities interfering with river beds such as extraction of gravel and sand for road construction.

On the other hand, DOH has confronted droughts by building infrastructure to regulate river flows and improve irrigation security with the construction of large water reservoirs. In the Coquimbo region, practically all three major rivers have well developed water reservoirs and irrigation systems.
Drought can also impact on drinking water systems, especially those servicing rural communities and depending on well that may dry up or substantively reduce their output. In those cases DOH is responding by either boring deeper or building new wells. Another major threat to drinking water supply is the contamination associated

with the accumulation of mining, industrial and domestic wastes in river beds and creeks. DOH has much less attribution in this respect.

At the time of the interview, the DOH respondent recognized that for the Ministry of Public Works climate change was not a priority nor was it considered a relevant issue. They are not gathering data on the issue yet. They expect that slowly it would be internalize by society. Hence, there are no specific plans or mandate to initiate adaptation programs to confront climate change, but many of its activities are responses or contingency plans that deal with drought, floods and climate risks.

DOH respondent explained that this is an unusual time regarding construction of large water infrastructure in the country. They received a mandate and the resources to build three new large irrigation dams almost at the same time (El Bato, Ancoa and Convento Viejo in Coquimbo, Maule and O'Higgins regions respectively). A fourth one, is being repaired and expanded (Tutuven in Maule). This is an unusual concentration of public and private investments that will further the irrigation potential in two regions with growing water demands: Coquimbo and Maule regions.

Thus, for DOH, climate change adaptations will require an increased capacity to confront extended periods of drought and intensive rains and floods. Both conditions require improved capacities to regulate the basins in order to harvest during the period of water abundance and regulate water supply at the time of scarcity.

DOH respondent explained that they perceive that

"*..if 65 % of the population in the country is located in areas with high water stress and low availability (less than 1,000 cubic meter per person),with most of the economic activity concentrated on the area, this speak for successful hydrological regulation and adaptation*".

However, the decision to build new dams are often based and influenced by historical demands for large infrastructure by water users and cost-benefit analysis rather than on the evolution of the water availability associated with climate change scenarios. The new National Irrigation Program is addressing this issue and current policies have identified the priority areas.So far, priority is given to those project with the larger economic potential or lower costs, or the advanced state of the engineering design and studies or where the irrigation associations are better organized and more willing to pay their share of the costs. Is not a response based on vulnerability scenario.

According to our respondent the above arguments explain why those sectors most vulnerable to water availability (peasant and family farming) are not at the center of the water development policies. Furthermore, the legal framework under which CAPRs operate to secure safe rural drinking water was established in the mid 60's. There is real weakness in current policy responses to those sectors.

CRN

CNR has not received any special mandates to respond to climate change or extended water stress situations. Its mandate relates directly with increasing the area under irrigation and to enhance more efficiency irrigation capacities, which in turn, reduce the vulnerability of crops to water stress. Nonetheless, there has been ah-hoc relocation of resources during drought periods during recent years to improve irrigation systems and water efficiency (CNR,2008).

The CNR respondent explained that the irrigation law (Law 18.450)
"...was not designed to confront emergencies but instead to promote the development of irrigation systems and water efficiency. We should not ask this law to solve the farmer's very specific problem of drought" (CNR1.Para15).

Still, improving water efficiency is a sound adaptation to decreasing precipitation trends and the increasing water demands.

The decision to turn Chile into a "World Food Power" has been accompanied by an increase in resources and influence of CNR among water related government agencies. The goal is to put under irrigation 460 thousand hectares of land currently under traditional rain-fed cropping system (CNR1.Para33). This goal is reflected on the priorities of the National Irrigation Plan led by CNR and integrating large, medium and small irrigation infrastructure.

CNR resources are also aimed at enhancing the transfer of technology to improve irrigation efficiency by medium and small farmers in areas of high agricultural development potential. The subcontracted programming and optimization services are reinforcing the competitiveness, the productivity, the quality and regularity of agricultural products. In areas with large irrigation schemes, CNR provides training and support to strengthen the organizational and management capacities of water users. At the regional level, CNR coordinates its efforts with the Regional Irrigation Commissions to secure adequate supervision, reporting and control of programs and project funded by CNR.

Recently, in 2006, and as a result of the energy crisis, a new objective was integrated on CNR mandate: to review and develop the hydro-energy generating potential of irrigation systems through small and medium hydropower plants. A recent study projected a potential of at least 860 megawatts from existing irrigation infrastructure (Procivil,2007). To this aim, CNR and the Energy Commission are working to engage the irrigation districts (Juntas de Vigilancia) to develop the energy generation potential of irrigation. The integration of energy generation on the Puclaro dam in the Elqui basin is a recent successful case

CNR acknowledges that irrigation incentives in the law were designed for farmers with greater access to resources, higher levels of organization and economic capacity. It goes without saying that such a policy tends to increase the socio-

economic differences among farmers with access to irrigation and those excluded and located in more exposed and vulnerable areas.

According to CNR, reaching small farmers and poor farming communities under the current irrigation law is difficult. Too often they do not have water rights (unclear land titles are also a limiting factor), and if they do, they are not clearly defined and it takes time to secure them. CNR respondent said that there are enough resources available, but the trends show access to water rights is a limiting factor. Precisely this is the reason CNR has established a working agreements with INDAP, so the latter more decentralized institution, can helps farmers to regularize the legal conditions of land and water rights of small farmers. For CNR a 36% increase in resources in its 2007 budget demonstrate the political will to integrate small farmers into irrigation and water security schemes and respond to climatic variability.

Our respondent from CNR explained that "irrigation is intrinsically a private sector issue" (CNR1 Para100). The Water Code imposes a legal ceiling that limits the intervention capacity of all water-related agencies on issues that pertain to its use and administration since it is a privately owned resources. Only those with legally established water right can fully access all the incentives and subsidies for irrigation, drainage, and water efficiency.

The dominant perspective is that a strong economy should naturally protect itself against climate impacts. *"...all economic activities need better planning capacities to become more efficient and productive... it is a bias view to plan irrigation as function of climate change... it has to be planned from an economic perspective .. that is what we try to do*".

"*The idea is that farmers should find the social an economic means to solve their problems and only when they cannot do so, the government should intervene".* (CNR1.Para 33)

This leads to mitigation responses such as the declaration of emergency or extreme drought in region by DGA or at the request of users, when they cannot solve the conflicts of water redistribution among themselves. This means that institutional information and capacities to anticipate measures should only be in place when it is called upon by water users.

The above view, although prevalent among the market-oriented and liberal minded government officers, is challenged crisis after crisis, when the private sector in not capable of resolving their problems autonomously. Soon after a drought or floods strike, they demand the timely support of government agencies as in the early spring frosts of 2007 with damage over 50% of the crops or the drought of 2008. All the farming associations demanded financial support to recover from the economic losses imposed by climatic disasters. Over US$ 48,4 millions were assigned to only partially offset the economic losses during the drought of 2008 (www.odepa.cl).

The irrigation promotion law 18.450 has created several financial instruments to support private investments on irrigation and drainage activities that reimburse up to 70% of the total costs. Those incentives also apply to soil rehabilitation activities and more recently, integrate financial support for crop insurances. Still, a major portion of the funding is associated with large irrigation infrastructure (over US$ 35 to 40 millions). By 2012 four new large water reservoirs will be operating: El Bato, Ancoa, Tutuve and the second stage of Convento Viejo which will imply and investment of US$325 millions to retain 411 cubic million water capacity to irrigate 78,500 hectares. Between 1990 and 2007 the government invested up to US$ 855 millions, increasing by 58.5% its water storage capacity and its irrigated surface by 55.4% (MINAGRI-FUCOA, 2008).

The financial resources for medium size infrastructure and irrigation upgrade is close to US$35 million per year and growing. Whereas the funding for small irrigation and drainage program jumped from US$5,5 million to close to US$76 millions, including the resources to respond to the impacts of drought of 2008.

Clearly the amount of financial resources allocated to irrigation programs has reached historical records. But is not clear to what extent a performance assessment will indicate that these resources are fulfilling the goals of securing irrigation potential for an expanding and diversifying agriculture and helping to reduce the huge inequalities characterizing Chile's agricultural sector.

CONAMA

It does not have an early response capacity to drought but it has specific roles on contamination affecting water resources. But if the mitigation capacity to reduce water stress is not among its mandate, it has a very relevant role on policy formation.

Soon after CONAMA was created, the Chilean government ratified the UNCCC (1994) it received the mandate to lead the creation of the National Advisory Committee on Climate Change. In 2002 Chile signed the Kyoto Protocol, adopting several commitments, particularly those associated with emission reductions linked with the Clean Development Mechanism, preparation of First National Communication (2000) to report on the GWG inventory, and commitment to develop a National Plan on Climate Change. Currently a "Second National Communication" to UNCCC is being prepared by a committee headed by CONAMA with participation of External Affairs, the National Energy Commission, the Ministry of Agriculture and the Council on Clean production. The reports to UNCCC focus on the inventory of GWG, the vulnerability scenarios for agriculture and forests by 2040 and adaptation measures for this sector. The content also proposed mitigation scenarios for 2020 for energy industries, manufactures, construction, transport and forestry, etc. The completion of the Second National Communication on Climate Change is a voluntary act by the Chilean government. Hence, two major research

pieces are under way to complete an updated emission inventory and the vulnerability scenarios for agriculture and forestry.

To respond to its commitments on climate change, CONAMA created a Unit on Climate Change under the Department of Natural Resources Protection. The Unit is in charge of coordinating the process to define a National Strategy On Climate Change (approved in January 2006). The three major components of the plan are: a) Adaptations to Impacts of Climate Change; b) Mitigation of GWG; and c) capacity building tools and programs on climate change.

At the beginning of 2008, CONAMA presented a complete study on climate variability for the XXIst Century in Chile (Conama, 2007). The climate scenarios were developed by the Faculty of Engineering of Universidad de Chile. Towards the end of the year, CONAMA completed the National Plan on Adaptation to Climate Change that was officially launched a week before the Poznan Climate Change meeting in Poland (www.conama.cl).

Clearly, CONAMA has a mandate and has been the most active public agency in preparing the legal and institutional frameworks to face the challenges associated with climate change. Among those is the NS IB M, the National Plans on Biodiversity Conservation, the inputs required for legislations and a national policy to protect glaciers and the Action Plans on Climate Change Adaptation and Mitigation.

a) **Climate Change and the support of international negotiations.**
   CONAMA's respondent valued the high public profile of international negotiations on climate change for they have captured the interest of local authorities and many other sectors of society. They argue that multilateral agreements have opened the door for public commitments and some concrete actions in Chile. Since 2006 the interest in developing a national public policy and instrument to confront climate change has been growing. This was further reinforce with the Stern Report when it brought the economic costs of inaction o delayed, moving the climate change debate beyond the realm of environmental policies and concerns. The last report of IPCC and Al Gore's visit to Chile and the designation of former president Lagos as special UN envoy on Climate Change have strengthened the political interest on climate change responses. Thus, climate change has moved beyond the label and realm of CONAMA to other sectors that are incorporating climate change on their policy and management approaches.

b) For CONAMA mitigation is an instrument for adaptation.
   Mitigation is for most developing countries an entry point to identify concrete measures and mechanism to relate with "carbon markets" while reducing their GWG output. The latter provide opportunities to generate short term gains and mobilize resources to deal with more complex processes and measures associated

with adaptation. This explains the early priority and bias towards the Clean Development Mechanism-CDM and the delay in facing adaptation measures, perceived as medium to long term measures by policy makers. Thus, CONAMA's respondent said that mitigation becomes a road towards adaptation.

Those comments can be interpreted as a clear signal that mitigation and adaptation still does not permeate economic agents and policy makers in the country. On the one hand, Chile is the South American country with the largest increase on its GWG, close to 5% for the period 1990 – 2004, while the global average has been around 1.7%. On the other hand, the long exposure to information and arguments on the need to integrate adaptation measures on agriculture and other government policies has yet to be undertaken. Even less proactive has been the energy industry, public works, transport or territorial planning. Plainly, i is not a priority.

d) On the regional context, the XIV Summit of head of States on Climate Change created the Network of Climate Change offices with the aim of developing a cooperation program on climate change among Latin American countries. Initially, the Network was focussed on CDM. More recently, it has integrated adaptation to climate change, and the focal program in charge is CONAMA.

   One of the weak aspects of CONAMA's work has been the poor focus on vulnerability assessment and the links with policies to reduce the impact on low income groups, coastal communities, peasant and indigenous communities and the lack of participation citizen participation on planning and policy definitions.

ODEPA

Up to the time of our interview**,** ODEPA did not have a formal mandate to study develop policy proposals in relation to climate change, although they participated actively on the process leading to the development of the National Strategy on Climate Change-NSCC (ODEP1.Par56).

Following the announcement of the NCSCC in 2007, ODEPA in conjunction with CONAMA and the Foundation for Agrarian Innovation -FIA signed an agreement to study the required policy measure on climate change adaptations on the agricultural and forestry sector. The study was initiated in 2008 should be completed by mid 2009 with concrete policy recommendations (BGI-ODEPA, 2007). The studies are reviewing and systematizing national and international adaptation experiences in agriculture, water and soil resources (www.fia.cl). Aside from building a data base on current policies, strategies, funding possibilities, research initiatives and adaptation practices in the agricultural sector, water and soil resource management, it will provide a set of policy options for the Ministry of Agriculture and the Environment.

The three institutions also promoted the creation in May 2008 of the "Climate Change and Agriculture Council", involving 33 representatives of production, research and public agencies. The "Council", headed by the Minister of Agriculture has defined two stages for its actions:

1) They will review the GWG mitigation potential of agriculture and forestry sector. The assessment of carbon stocks associated with current forestry incentives will provide the learning curve to propose policies and instruments to turn carbon neutral the export fruit sector.

2) The assessment is also analyzing the climate vulnerabilities of the forestry and fruit export sector and adaptation measures such as the introduction of new crops and varieties; the expansion of automatic meteorological networks to provide early warning and improve water efficiency. The studies also include a review of current adaptation models such as those implemented by New Zealand.

3) The joint institutional initiative is also aimed at establishing a new "Risk Assessment and Management System for Agricultural Emergencies" to move from current "crisis management" to "risk management" and preventive measures (www.minagri.gob.cl).

ODEPA's roles in orienting climate adaptation policies of the Ministry of Agriculture will no doubt increase in face of the ambitious political goals aimed at turning Chile into a "World Food Power" which needs to contend with its high vulnerability to climate change. The Ministry of Agriculture has recognized that to sustain the big increase on food exports (almost six fold increase from US$2,000 millions in 1990 to US$11,000 millions in 2007) in a scenario of increasing water scarcity and competition with other economic sectors, will require more efficient irrigation system. The Minister of Agriculture, has recognized the challenge of adaptation and its implication for the future. She announced "*the need to improve at a faster pace water efficiency, diversification of fruit and cereal production with new species better adapted to changing temperature and water availability scenarios; changing agricultural practices and pest control, etc*. (Ibid) ".

So far, the efforts of ODEPA, FIA and CONAMA to build the scientific evidence on the risks and opportunities associated with climate change has been very productive. Using both internationally recognized scientific sources and recent national studies they are building the evidence to support policy recommendations for adaptation measures (Conama, 2007).

INDAP

INDAP has been involved directly on the responses to water stress, specifically providing relief to rural communities and producers during droughts INDAP is able to provide seeds, forage and financial resources to compensate for agricultural losses associated with extreme climatic events. In 2008, for example, INDAP's emergency and relief programs (its "Agricultural Emergency Bond") to mitigate the impact of

drought reached up to 58,000 people throughout the country (average support of US$300 per capita) in 35% of the Municipalities. During 2007-2008 Coquimbo's regional agriculture suffered severe losses due to frost in the winter and an extended drought in the summer. This drought also affected most of the country's agriculture during the hottest summer registered in 100 years. INDAP´s energy was oriented to provide rescue funding to help farmers recover from their losses. It also provided over 12,000 tons of food relief and hay to feed close to a million cattle. It reported close to US$500.000 on emergency aid and other additional resources to help recover losses to over 600 families. However, a common complaint by farmers in the ERB was that INDAP's help arrived too late and small to cover their real losses.

Although INDAP does not have a clear mandate to build adaptation capacities to face the emerging climate change threats, its programs are doing precisely that, - improving the access to water for irrigation. Its current programs are helping to regularize land titles and water rights to overcome the legal limitations that small farmers have to apply to CNR's funding programs to improve irrigation and water efficiency. However, this role is being limited by the lack of new water rights on most basins, whose water resources were assigned time ago. The latter is the greatest obstacle, even more so than funding (INDAP, 2007).

In summary, INDAP's current role does integrate specific tools and targets to enhance adaptation to climate change, and it is an effective institution to deliver g mitigation measures and in supporting family farming innovations to reach markets. In the region of Coquimbo it has programs in all the municipalities with dryland farming and the most vulnerable population. Its suit of "bonus" and relief funds make it very effective in delivering emergency aid to farmers and migrating goat herders.

The Regional Health Office

Although the health services are aware of the higher risks of water contamination associated with droughts, a recurrent phenomena in the region, the monitoring of water quality of the rural drinking water systems (APRs) is inadequate and not properly informed to CAPRs. Furthermore, the health authority is aware that many rural drinking water systems do not have a sanitary license to operate. During drought the early response system with water trucked to households depends only on the resources and actions of the Municipalities, the Health Services are not directly involved. Health Services complain for the lack of adequate coordination with Municipalities on drinking water systems.

The health authority is aware of the potential risks of ground water contamination associated with mining activities in the region. They recognize that it is their responsibility to monitor ground water contamination but it is unclear if this is being done regularly (SSCO1.Par 234). Communities claim they do not have access to reports on their findings.

Furhermore, all three basins in the ERB, have mining operations and abandoned tailing sites. Records of uncontrolled spills or floods contaminated with tailings from mining operations are not uncommon. In fact in the Elqui River basins, those flood situations associated with mining contaminants have been reported in the recent past and no preventive action has been taken to protect the health of local population (Salas et al 2009).

The respondent from the Health Service explained that a risk assessment map is being build in order to properly monitor the areas of higher risks of contamination events. This map will also integrate the results of sampling in all CAPRs and the information collected by several other governmental agencies. It is yet not available and is unclear if it has been completed.

Health concerns have not yet been associated with climate change, much less with an adaptation agenda. Health and climate change programs are not yet a component of any of the Health Ministry. Even water stress situation affecting drinking water supply is not within the mandate of Health Office but on other government agencies and the local Municipalities and the CAPRs themselves.

Reducing the health exposures and vulnerability of rural communities to traumatic climatic events will require improving the enforcement and data collection capacities as well as effective reporting and communications. This should include stricter sanitary certification of rural drinking water systems and better water quality monitoring protocols along with online risks assessment maps. All of these are pending task mentioned by respondent from the Regional Health Office. The health risks associated with climate change is still a pending task for the Ministry of Health.

CONAF

CONAF does not have a clear role during periods of water stress. But in the medium to long term it does have a mandate to protect the vegetation of watersheds and water production areas.

More recently the Minister of Agriculture requested its agencies to participate on the assessment of the impacts of climate change scenarios on forest growth. The climatic variability scenarios released by CONAMA in 2007 also sparked concern on how these new scenarios would impacts on native forests, industrial plantations and water resources. For over 33 years CONAF has administered and supervised forestry subsidies and technical support aimed at increasing the number of hectares with pine and eucalyptus plantations (currently over 2,3 million hectares), the building block of Chile's expanding pulp and wood industry. To complement research initiatives on mitigation scenarios, the Ministry of Agriculture has made a priority to know how

much carbon stocks have been built over the past decades and how effective those incentives could be to increase the mitigating potential of plantations in the future.

The mitigation potential of tree plantations has been linked with the fruit export sector for future reduction of their carbon emission, setting zero emission as a goal. There is concern that markets may soon request or set "carbon footprint limits" to food exports and the forestry sector may provide an opportunity to mitigate the impacts of intensive agriculture The impact of rising temperatures, decreasing precipitations, less cold nights on forest growth and forest ecosystems are now being assessed(CONAMA.2007). The goal to make Chile's fruit exports carbon neutral make this task even more relevant.

Another area of recent concern is related to the impact climate change may have over natural reserves and the biodiversity in protected areas. Many of the national parks and reserves also play an important role on protecting basins and have key roles regulating water flow of rivers. These ecosystem services may be partially impaired by climate change. Studies may yield important clues on the need to adopt new management tools or expand the connectivity of those areas. So far this is an area lacking information and research funding.

In the Coquimbo region, CONAF respondent is concerned that resources and efforts to confront the impact of climate change are insufficient to provide effective responses to desertification and much less adaptation measures. Forestry incentives and policies need to be reviewed and adjusted to fit the urgent regional needs for reforestation programs aimed at preventing further deterioration of soil, water retention capacity and biodiversity. Policy instruments and funding to protect head waters, key environmental services, high conservation value forests and basin restoration efforts are urgently required in semiarid zones.

ONEMI

ONEMI has a clear mandate to respond to water stress situations, particularly with those associated with floods and mudslides. It is mostly a reactive and a crisis response institution. Most of its resources and goals are associated with emergency response rather than anticipating them. Its response capacity to confront recent climatic events and other disaster situation has been strongly criticized by a special commission on Congress (Senate, 2008). As a result ONEMI is developing new tools to develop more effective early responses. It is integrating more specialized professionals and upgraded communication systems. Recently t created the National Early Warning Center. It But a major piece of legislation, the New Civil Protection Law (announced two years ago), still has not reached parliament.

ONEMI has recently announced four major efforts and goals for the coming years: (a) to increase ONEMI's preventive and early response capacities with more resources by hiring the technical and scientific advice and professional personnel

required to upgrade its risks assessment capacities and responses; (b) the modernization of National Center for Early Warning (C.A.T.); (c) the creation of 15 regional offices to decentralize the service; (d)the construction of four large emergency warehouses to maintain a stock of supplies and emergency equipment (www.onemi.cl)

ONEMI's regional role will continue to provide relief during emergencies and anticipate catastrophic events through its early warning systems. It is unclear though, to what extent it will be able to improve the adaptive capacities of high risk localities and town s in flood and mudslide prone areas such as the ERB.

Aguas del Valle

The respondent from the regional **water utility** explained that climate change is not an issue for them. At most, in times of drought, it may imply the construction of deeper wells. However, they do not feel adequately informed on climate change impacts at the regional level. The recurrent droughts of the region so far have not affected its capacities to continue delivering water.

The Irrigation Distric of Elqui River

The Irrigation District of the ERB, perceives that the impacts of recurrent droughts have been partially controlled by the two dams regulating the water of the Elqui River. They feel their agriculture is much less exposed after the construction of Puclaro dam which greatly increased the irrigation security. Even under extended drought events they can resist for two to three years. Longer drought would certainly be extremely difficult to confront and adapt to. But they are concerned that climate change may bring more floods which can deteriorate the irrigation infrastructure and generate water and financial losses**.** It is precisely this concern that has moved to create a specialized company to build and repair canals to reduce both water losses and the damage produced by mudslides after the short and intensive rains that characterise the ERB (JVE, 2009).

During water stress situations such as drought or floods, they have the legal tools and training to reduce the water by aliquots according to availability. In the Elqui Valley, as in other basins of the Coquimbo regions, "Junta de Vigilancia" in charge of managing water utilities have a great deal of experience and managerial capacities. Still, in case of conflicts or serious water restrictions and impacts on river ecosystems, DGA may declare emergency zone and may take on its own the water redistribution role.

There are no clearly defined institutional approaches to deal with drought and floods, other than water redistribution. Crop insurances to minimize climate change impacts is still very much an individual decision. Climate change is an emerging concern but

the precise implications on their day to day productive activities is unknown, said the JV respondent

Although the members of JVE feel generally well informed about the risks and trends associated with past and present climate, they are not aware on how the future climate change will impact on their agriculture or water resources. They feel lack the expertise, training and financial resources to confront major climatic changes. Yet, they have been very dynamic in creating new enterprises to improve their access to the irrigation promotion funds of CNR and other resources to improve irrigation canals and introduce more technology. They have taken some bold decision to move towards t income diversification when they integrated irrigation water with hydro energy generation. The income from energy generation will ease the payments for the dam infrastructure and diversify their farm income. New drought resistant crops and drip irrigation are still open opportunities they can explore for future adaptations.

CAPR

Water stress is major threat and challenge for the Rural Drinking Committees-CAPRs. Extreme climate events are associated with drought, floods and mudslides that can destroy their infrastructure and dry up their well.. Although droughts rarely dry up the wells, when that happens, it is the Municipalities that provide an effective system to truck water to those affected. The costs of water increases significantly while the consumption rates go down and the health risks increase: CAPRs feel they do not have the relevant information to understand the potential risks associated with future climate scenario in the ERB.

In the Elqui river basin the most regular threat to CAPRs are floods, which may damage pumping stations and holding tanks and contaminate the water. On occasions these flood may be associated with mining tailings in many of Chile's northern communities (Salas et al 2009). Drought may decrease ground well yields and some occasions they run dry. When this happens they rely on water trucked to their homes by Municipal government. Their concerns about water quality have not been resolved, nor are they a major issue save in few locations where mining activities have created serious contamination hazards in the past.

The CAPRs recognize a large set of deficits and needs which render them more vulnerable to situations of climate and hydrological stress. Among them they mention the lack of information; the exhaustion of water rights in many basins; the impact of droughts and floods affecting the most vulnerable communities; uncertainties to regularize the water rights for their wells; lack of professional and managerial capacities and processes; lack of direct channels of communications with authorities; lack of planning and control tools and processes; emerging competition between CAPRs and large water utilities that may want to take them over; conflicts with technical units and; contamination processes associated with mining and agriculture; and the lack of an adequate regulatory framework.

In general, in the region of Coquimbo, like in most regions outside Santiago, the information and institutional concerns on climate change are not very well established nor well informed. Santiago, on the other hand, seems to concentrate the information exchange opportunities through national and international seminars, workshops, conferences and many of the research initiatives. Also, the directives that may impinge on new programs, personnel, research priorities, etc. are defined in Santiago.

4. DATA COLLECTION AND SHARING (Theme 4)

The discussion below summarizes the information provided by the institutions interviewed in this review. In some cases the information used for decision making is quite complete and complex (DGA for example), in other cases, most regional institutions rely on information and decision made in central offices in Santiago. Regional information is segmented and scattered.

Although some respondent recognized that there were specialized data gathering units, by en large, the majority acknowledge that there was an enormous need for current and reliable information on ground water, ice and snow deposits, and climate change impacts on water and other resources. There were recurrent complains for lack of relevant and accessible information.

Surface Water Data: The collection of information and monitoring of surface water in Chile is done mostly by DGA. The information collected by the Irrigation Districts, for example, is sent to DGA to be processed and integrated into their reports. DGA reports on line on the state of all major dams across the country. The reports are also used as planning tools and to prepare forecast for agriculture.

DGA maintains a large network of measuring station in most of Chile's rivers and reports regularly on the evolution of river flows. It also keeps very reliable historic data series frequently used by researchers. On the most isolated southern regions, DGA has recently established new automated measuring stations to gather information. In the last two years it has received additional resources to modernize and improve its data collection instruments.

DGA is the institution in charge of maintaining the registry of all water rights and water rights transaction in each region and basin. The system to track and report on those rights was recently upgraded as part of the priorities to improve decision making by policy makers. The respondent from DGA explained that water rights based on surface water are almost completely assigned in all basins of the country.

Information on water quality is still a major challenge. Several agencies carry out activities that monitor water quality of rivers and lakes. DGA has its own laboratories to carry the task. Other government agencies, like CONAMA, the

Ministry of Health and SAG also carry out water testing and monitoring activities. There is no consolidated system to report those finding and they are not available on line.

A "National Report on the State of Water" is an important missing instrument for decision making and for informing the public. The most comprehensive report was done ten years ago, in 1999 as part of the National Water Policy Report, prepared by DGA 1999).

The projection of water availability, ecological water flows and the impacts of climate on water availability is yet another missing piece of information that still has not been integrated into modelling basin behaviour with the regular data collection protocols of the institution.

Groundwater Data: DGA is also responsible for gathering and collecting data on ground water. Several other institutions and some specialized programs have helped map ground water resources in the arid northern regions (Celedon, 2001) . Tracking water extraction is still a major challenge even though DGA has developed a large program aimed at registering and authorizing the water extraction. For most aquifers, and for those in The Coquimbo region, there is no comprehensive reports on the amounts of water extraction and on how these may affect the recharge capacity of the aquifers. There is no integration and easy access to the information of different studies and project assessing ground water.

For most basins, comprehensive hydrological modelling is not feasible due to lack of adequate climate data linking ground and surface water. The climatic trends at high altitudes is very poorly documented and understood. This introduces great uncertainties on the models attempting to explain future river flows in basins highly dependent on snow and glacier deposits. This is not the case of the ERB whose ground reserves have been studied by several initiatives (Celedon, 2001).

Climate Monitoring: Several institutions play a role in tracking climatic information. The most specialized weather tracking office is Direccion Meterologica de Chile. Also some research institutions and universities are tracking climate records and establishing new weather stations. By en large, the records are incomplete, especially for the high elevations in the Andes with only a handful of recently installed weather stations. There are even fewer records for the evolution of most of the glaciers that supply the summer flow of rivers (www.glaciologia.cl)

The Ministry of Agriculture has recognize the importance of online weather monitoring and weather records for planning and forecasting and for moving from crisis response to crisis management. INIA has been in charge of establishing a large network of weather stations and early warning system known as "Red Agroclimática" with over 400 weather monitoring station in Chile (www.agroclima.cl). But, there is much missing information of the past 50 to 100 years.

Data Sharing: The lack of well defined process for data exchange among public institution is reflected in tthe absence of consolidated reports on climate related issues, including water monitoring. However, there are some recent collaborative initiatives between specialized agencies that could help build integrated data prcessing capcities and data protection. One recent public-private collaborative example is the recent agreement between the Ministry of Agriculture- INIA and the private Foundation for Fruit Development -FDF aimed at improving weather forecasts and early response to climatic and fire hazards.

There are other recent efforts to integrate resources and research results on climate change and modelling being carried out by CONAMA,ODEPA and FIA; between DGA and CNR; and between DGA and the CEC on a recent initiative to monitor glacier behaviour.

There is need to establish well defined protocols for nformation sharing among public service agencies and specialized research units to build integrated data processing systems and data protection. This is an area that requires strategic planning to integrate the specialized capacities of university research facilities and public agencies to improve information integration and modelling.

5. RESOURCE REQUIREMENTS (Theme 5)

In the previous section we reported on the budget and staffing conditions of many of the public agencies interviewed. This section will discuss briefly the trends and constraints affecting the institutional planning and managerial capacities on water related issues.

The respondents from both the Ministry of Public Work and from the Ministry of Agriculture explained that there were important increments of budget allocations for new infrastructure to expand irrigation and water storage capacities and to respond to climate related disasters such as droughts and frosts. There has been substantive allocation of resources to rural drinking water systems. But staffing conditions in most institutions seem less than optimal.

A large proportion of the staff, over 55 % in most cases, was contracted on annual basis. This means that a lot of technical and professional capacities are not "in-house"capacities, but contracted out. Much institutional experience and learning is lost at the end of the contract period. This is a model associated with a free market economy that promotes private entrepreneurial capacities and advocates for small public service and small regulatory bodies. Yet, very few respondents from public agencies complained for lack of human resources, with the exception of the Ministry of Health that felt their staffing were insufficient to complete their tasks.

On the other hand, private organizations were more critical about the lack of proper dialogue with many agencies due to poor staffing. . The CAPRs complain that supervision and technical advice from DOH personnel was insufficient due to poor staffing conditions o the department in charge of assisting them. They also complain that Health Department personnel had rarely, if ever, visited their installation. There was a general complain by the APRs' association about the lack of opportunities to have a direct dialogue and access to the senior officers of public water agencies.

The water district association also complained that government agencies did not have enough personnel to inform and provide capacity building on water management and administration.

Large programs, such as those of the CNR can only be delivered through other agencies within the Ministry of Agriculture. Its staffing restriction allow only for two regional offices outside of Santiago, one for the northern and one for the southern regions.

Only INDAP has personnel and office in permanent and direct contact with local government and the most vulnerable sectors.

The pilot initiatives for integrated basin management programs are still at very early stages of formation and its human and financial resources are heavily dependent on subcontracting without dedicated staff on behalf of the leading institutions. This is also reflected on the staffing conditions of CONAMA's integrated basin management program as well as the climate change unit.

6. COMMUNITY NEEDS AND STAKEHOLDER ISSUES (Themes 1 and 6)

This section describes the capacity of institutional players to meet the water and adaptation needs of rural communities, with emphasis on the Coquimbo rural areas.

The research findings show that there is a growing participation and interest of community and stakeholders on water governance and climate issues. Communities in rural areas have developed formal and informal water-related organizations that attempt to develop capacities to deal with scarce water resources, the growing water demand and the impacts of climate change. However, education and capacity building on this areas is missing and there is poor access to relevant and updated technical information on water resource availability at the municipal and local level.

Communities at local level are integrating their housing and water needs with help from local governments. Concentrated rural settlements are able to obtain at the same time government support for housing and to build their rural drinking water system.

This leads to a growing numbers of CAPRs being formed to solve local water needs. The sustained government investments on drinking water services are integrated with the local management contributions of communities to develop a very successful adaptive solution. Chile ranks third on rural water coverage according the Wordl Health Organization (PAHO, 2008).

To attain water for irrigation, rural communities rely first and foremost on their capacities to tap local surface and ground water resources and organize water distribution systems when water resources are abundant enough to be shared by several farms. The "Water Community" concept developed by DGA is one of the primary stages of organization of traditional irrigation committees. In many cases, water rights may not be registered under the DGA, but this is a pre-requisite to have access to government support programs to develop irrigation projects of any sort. DGA has been active in contracting consultant services to map out those needs and provide technical advice. Almost all rural municipalities have completed some sort of processes to register existing water extraction rights.

What seems to be missing is the information and expertise to explore ground water resources to generate new water rights for poor farming communities. This could expand the potential for irrigation while helping them to fulfill a requirement to access other government support programs. The information on ground water resource availability is not adequately known at the regional level much less so at municipal level. Mapping of those resources and making that information available to the farmer association, water communities and local government is a pending task that would require coordination and integration of several government agencies dealing with water (DGA, DOH, INDAP, INIA, MIDEPLAN, etc). Without that knowledge a very relevant piece of information for water governance is missing.

The exhausted ground aquifers of Copiapo demonstrate the risks associated with the localized approach to authorize exploitation of ground water rights over and above the available resources. When an ecosystem perspective and water resource modelling does not integrate ground and surface water, the risks of overexploitation turns into a major social an economic threat as demonstrated by the exhausting Copiapo basin.

It is not clear that an ongoing process of institutional learning is indeed happening in this respect. There is a lack of technical capacities and resources to complete a thorough review of ground resources in the region.

Municipalities, community organizations and water communities do not seem to be integrating climate change on their agenda. Local government do not have the technical nor the legal tools to support a local water agenda. However, the recent attempts by DGA and CONAMA to build a broad-based regional consultation process on water issues through the "Mesa Regional del Agua" may set the basis for of an integrated basin management strategy in the future. At least the "water

dialogues" approach is listening and integrating community concerns on future regional water management plans (DGA2.Par 183).

The irrigation infrastructure, especially for export -agriculture has been expanding, with many support programs aimed at increasing productivity and integrating sophisticated technologies to support water efficiency, food quality and product diversification. The construction of large water reservoirs, like the Puclaro dam and La Laguna in the Elqui River basin, and other large investments on the other two basins of Coquimbo region have had a positive impact on water security for agriculture. Furthermore, the recent adoption of a plan to install energy generation capacity in the Puclaro reservoir demonstrate an adaptive strategy that is helping farmers pay the costs for the irrigation infrastructure and strengthening the organization of their irrigation district (Junta de Vigilancia del Río Elqui). Puclaro dam and power plant is the first innovation in this direction in the region. The technical and financial support from several public agencies made possible the successful arrangement between the irrigation district and a power company.

After the Ministry of Agriculture defined its major goals and investment programs to turn Chile into a "World Food Power", water management and irrigation programs have expanded their budgets and they have also expanded the regional coverage (MINAGRI.2007). Many o f those programs are helping farmers to overcome the risks associated with recurrent droughts. Yet, many of the programs are aimed at reinforcing the rights and productive capacities of a sector of producers that already control water, technology and good productive land. The increased irrigation infrastructure and funding opportunities are reflected on the increased productivity and diversified production of the ERB. It is unclear how effective those policies are in addressing social equity issues and the environmental sustainability concerns of small farmers that do not have access to water rights and carry out subsistence and rain-fed agriculture.

Environmental concerns are not often expressed as central issues by community organizations associated with water issues. Still, the risks of water contamination by mining activities or pesticides from intensive agriculture are often raised by the communities. Communities do not identify the institutions that can answer those concerns or provide updated information on environmental quality or climate issues.

7. COORDINATION (Theme 8)

A diversity of public and private institutions participate in the governance of water defining its use, distribution and protection to sustain its intrinsic qualities and values.. An integrated water management approach has not yet firmly establish foothold. A single coordinating body is no one's mind and regional and national priorities on water issues vary according to the area of expertise or institutional mandate. The Water Code acts as major limiting factor to integrate social, economic and environmental concerns on water management.

The recent announcement of a National Basin Management policy has created renewed expectations, but few seems to know what sort of new institutional arrangement or authority will emerge out of the pilot phase of the integrated basin management program underway. A "productivist" perspective seem to dominate most government programs. The drive to increase agricultural exports to diversified markets is the major goal for most water governance institutions. The integration of family farming into this export model seems to take for granted pending issues involving equity, social and environmental demands of local communities. It is not clear at this stage how those two realms of concerns will be integrated on the emerging water agenda associated with the "Water Dialogues" and provide guidance for future basin management plans.

A brief review of coordination and linkage issues that relate to some of the leading agencies involved in water and climate is presented below.

DGA has retained a most influential role on water policies such as in the emerging integrated basin management program. Its coordinating role on the National Strategy for Integrated Basin Management along with CONAMA is a unique opportunity to integrate many of the legal, economic and social learning with the environmental and ecological concerns that CONAMA represents. These two organisations are inviting the social and economic actors to participate in the "Water Dialogues" to provide inputs and orientations to advance a watershed planning process. At the same time, the three powerful water agencies under Ministry of Public Works; DGA, DOH and SISS, have not adopted an ecosystem approach on water management, nor have they integrated climate change as a major challenge to Chile's diverse and fragile water resources.

CONAMA has been the leading public institution actively engaged in coordinating efforts with a broad range of institutions and sectors to develop a national policy on climate change. It has used the installed scientific capacities and evidence to build future climate scenarios and national strategy on climate change and adaptation. Still, its role on watershed management is fairly recent and its policy influence role is not as pre-eminent and influential as those of CNR, DGA or DOH that directly relate with the productive sectors in mining, agriculture , fisheries and water utilities. CONAMA 's environmental protection role can only be reinforced through active networking with public services, civil society and local communities to counterbalance the power of leading economic groups. One major missing link on the institutional coordination efforts is the link between the Health Ministry and CONAMA's environmental role. The role of Health Services on protecting water quality and water sanitation is much less active than it was when sanitation programs were a priority in the early 60's and 70's. Today the integration of health concerns on the emerging integrated basin management approaches is not visible.

Thus, both CONAMA and DGA are the two leading agencies that may help untangle the complex web of institutional relations associated with water governance and move forward the integrated basin approach.

Private organizations such as the irrigation districts and APRs also play relevant, roles in coordinating efforts to influence public policies through their national associations. However, their roles are mostly focus on local or basin management approaches because of their limited human resources and access to information.

8. OTHER LIMITATIONS

On the water governance assessment several respondents mentioned issues that did not fir on the assessment framework. Some of them will be mentioned briefly for they influence water governance issues.

Short term political gains versus long term planning. The short political cycles that characterize government initiatives (4 years) and the ensuing shifts in priorities has important repercussion on the continuity of efforts and program priorities. It is not unusual that recently appointed officials in key ministerial positions impose their own priorities, often undermining efforts to improve citizen participation and public engagement or attempts to set long term planning goals. The pressure to demonstrate results, means that initiatives involving complex social processes and broad participation are postponed or drop or pick up years later. The lack of clear policy guidelines, with medium and long term targets and performance indicators, often impacts on the conviction and commitment by staff of water institutions and civil society. Short term political gains and unfulfilled promises also make local community organizations suspicious of participatory process and new initiatives. For example, they have seen promises on watershed and integrated water management efforts in the mid 90's that were later shelved. Hence, recent efforts to establish consultation processes in the "Water Dialogues" require time and clear processes and goals to overcome distrust among participants.

Climate change is not a political priority and the long term programming and complex set of information it requires to downscale its regional and local impacts does not fit with the political timing of many political authorities which pay lip service to climate adaptation measures.

The Urban Bias. Almost 87% of Chile's population lives in cities. Most rural communities are decreasing in size and aging. This has profound implications on the allocation of resources towards newly created urban sprawl. All basic services including water, electricity, health, education and communications are in high demand from the expanding urban population. Resources for basic services flow to areas with concentrated populations. The influence of "social cost-benefit analysis" has a strong influence over decision makers. Cost recovery is yet another urban-biased concept that seriously limits public investments on the most vulnerable

sectors. For example, environmental cleanup operations to remove mine tailing, or point source contaminations that pose health and environmental risks are rare. Risk and vulnerability mapping without proper mitigation or restoration efforts seem like public relations exercises rather than integrated efforts to solve the root cause of problems. If the risks are associated with isolated rural communities, the likelihood is that they will face time and again the same risks, as it has been observed with regular flood risks by several communities in the Elqui River valley (Salas et al 2009).

Water quality testing is done regularly for drinking water services for urban population and they are strictly supervised by SISS. But the standards for rural drinking water services, is not as strict. Costs, distance and political risks imply that those living in rural areas, especially the rural poor will bear the risks and costs.

The missing ecosystem approach. Very few of the respondents mentioned more than once the word ecosystem, nature and vulnerability. The word sustainability was also hardly used, although sustainable development was mentioned more often. The economic jargon and productivity approaches seem to dominate the institutional concerns. Poverty alleviation and programs to overcome economic distress in rural areas are within the limits and institutional capacities but not those dealing l with complexities such as carrying capacity of territories or basins. Economic growth is a must, way ahead of most environmental or sustainability considerations. Thus, it is not surprising that climate change and adaptation so far have received so little consideration in policies aimed at improving quality of life and services for rural population. Ecosystem health and ecosystem-based production systems are concepts that have not yet permeated the public sector concerns.

The ecological flow of river which was integrated into the Water Code only 2005 to secure the ecological integrity of river ecosystems, is not yet considered a social and institutional concern that would demand DGA's action**.**

VI CONCLUSIONS

The following are some of the major findings of Chile's governance assessment that were discussed throughout this report in relation to the various points included in the thematic discussion.

1.The overall policy framework is constricted by water property rights.
Chile's National Water Policies are framed and constrained by the legal mandate of the Water Code of 1981 and later modifications. Water under the Water Code and by extension under the Constitution, is treated as a commodity. Recognized as "public-use good", the water rights, both permanent and temporary are assigned for free and in perpetuity by the State. The holder of those rights may trade them as commodity in the markets. The law does not assign a priority for drinking water,

agriculture or animal husbandry on the allocation of water rights. Permanent-private rights over ground and surface water is perhaps the single most important aspects of water management in Chile. Hence, the owners of those water rights need to be consulted by government agencies if any re-structuring or modification of existing regulations may impinge on those legally constituted rights. Medium to long term planning on a basin is restricted to approval by all stakeholders to change a given set of rules and water use regimes. Strategic coordination and discipline to improve resilience to climate variability is difficult to attain and most formal mechanisms are linked with the construction of water regulation infrastructure and not with a basin, ecosystem or watershed management approach. In fact, multi-agency coordination is weak and aside from the emerging policy on integrated management of basin, there are no major concerted efforts to build adaptive capacity and multi-agency planning. The latter is required to anticipate the more extensive drought and flooding events associated with climate change scenarios with the exception of those associated with more water regulation infrastructure.

2. Data on water availability is incomplete and limits decision making. Although DGA has a comprehensive record of the assigned water rights and water right holders, there is insufficient knowledge on the available ground water and recharge capacity for most aquifers in the country. In some basins there are more water rights than water available, creating unsustainable pressure on aquifers. There are important gaps in the data recollection and integration, especially around water quality, quantity and climatic data. The modeling capacities to integrate information on how ground reservoirs and glaciers will be affected by future climate change scenarios is not yet well developed. The uncertainties in data and modeling affects medium and long term planning capacities of water governance institutions, both regionally and nationally. Locally, most stakeholder complain they do not have access to relevant and updated data in order to fully understand the challenge of climate change.

3. Bsin management capacities. The institutional structures to promote and enhance an integrated approach on basin management was a major political commitment of the current government. The National Strategy and Pilot Plans for Integrated Basin Management are fairly recent and it is unclear if the three pilot basins will yield timely and relevant results to secure further political support for its expansion to all regions of the country. Earlier attempts have failed to secure political and financial support never reaching beyond the pilot phase. A major challenge is the integration of information and the different stakeholders into the planning process. The recent integration of local and regional stakeholders into the "Regional Water Dialogues" is an innovative and potentially powerful approach, but so far stakeholder participation is only at the "consultation" stage. The integration of climate change scenarios into those "dialogues" seems critical for well informed future basin management initiatives, but climate change concerns still does not permeate the government policy concerns. The structure of the watershed institutions and the role of local and regional stakeholders is still unclear.

4. Climate mitigation strategies. Both droughts and floods are a regular feature of most of Chile's agricultural valley. The average length of rives is rarely more than 130 kilometer as they rush fast from high Andes elevations to the sea in few hours. Water management policies have prioritized the construction of water retention infrastructure to regulate the rivers to reduce the impacts of floods as well as save water for the long summer months and face recurrent droughts. The expansion of dams and irrigation infrastructure as well improving water efficiency and technology has been a priority for the past decade. The ambitious goal to turn Chile into "World Food Power" require further infrastructure to secure the integration of irrigation yet another 450,000 has by 2014. One of the deficit of this approach has been the focus on large infrastructure and lack of proper expansion and investment on irrigation systems, many of which have substantial loss of irrigation water and are prone to frequent destruction by floods. CNR along with INDAP have been tackling the issue with expanding irrigation programs for large, medium and small farmers.
No doubt, better and more expanded water saving capacities is a form of adaptation that allows farmers to reduce the vulnerability of rain-fed crops. Yet, as recognized by the National Irrigation Plan, irrigation programs are not always associated with proper knowledge on current and future water availability and all too often respond to political influences. Furthermore, recent droughts and cold spells demonstrate that irrigation is one among many other requirements to face extreme climatic variability.
Long term planning and the integration of stakeholder on those plans is an essential requirement to move beyond current mitigation strategies during droughts, floods or cold spells. The concentration of decisions in the capital city of Santiago has hindered the development of regional approaches to confront climatic variability with a medium to long term planning perspective.

5. Water and health. Chile has been able to confront successfully a major challenge to provide access to drinking water to a vast majority of rural population. Over 1,5 million rural inhabitants are supplied by a systems that built water management capacities in over 1,500 rural drinking water systems reaching most of the concentrated populations in rural areas. The model is extremely effective both in coverage and costs. Yet, some major challenges are pending, such as reaching a rural population of close to 450,000 people still without access to safe drinking water. The same costs-benefit analysis applied to concentrated areas will no longer be effective and more and sustained government funding will be required. Water sanitation, specially sewage collection and sewage treatment is a major pending task for most APRs. Current cost-recovery programs associated with drinking water fees will not meet the costs of sewage and treatment, demanding important financial commitment by government. Another major challenge is to improve the management capacities and r personnel of CAPRs, whose current legal status is similar to that of a neighborhood association. The law proposal to recognize APRs as economic entities in charge of water service provision may undermine its social capital and they also fear that this may set a stage for privatization of water utilities. Another pending challenge is water quality monitoring in basins, in surface and ground waters as well as on rural drinking water systems. There is a lack of coordinated and sustained efforts on capacity building and investments to secure high standards for water safety

in CARs.. Ultimately, this lack of concerted efforts mean health risks conditions for many communities. Risk assessment, updated information and connectivity is a pending task that has not been seriously undertaken

Contamination of ground water is a real possibility when rain and floods act together. Emergency response is not yet a built in feature of CAPRs. The institutional learning has not been able to mobilize synergies and resources to move towards adaptive measures rather than mitigation. As a result most rural communities find support on their own CAPR networks or local municipalities which become first respondent in cases of emergencies providing local solutions

6 Decentralized decision making. The centralized nature of decision making processes of public institutions has delayed the emergence of a coherent and well coordinated regional water agenda and an integrated basin management approach. There are too many specialized institutions dealing with water, creating a mosaic of responsibilities that lack coordination and that rarely act together to integrate and share information in order to provide an integral support to communities. Thus, to secure proper support from central offices, programs are based on year to year planning. One clear example are the early attempts to set in motion integrated basin management, frustrated by lack of political and financial support from central government. The current "Water Dialogues" involves basin's stakeholders and diverse institutions on a debate on priorities and major concerns. This process is building the basis for a common regional water agenda and a social learning process that can uplift the participation of social actors in the basins. But discussion s are at the early "consultation stage". It is unclear if they will be able to propose or link with new water governance institutions.

7. Institutional Coordination. The specialized role of different public water agencies is often an obstacle to maintain an active information exchange and s effective joint planning efforts. This is a regular feature both at the national as well as the regional level. Information exchange, common database, resource sharing has been largely postponed. Thus, gaps on information and technical support has not been resolved and the potential for modelling current and future scenarios on water availability and climate change is often missing or poorly developed. Communities often complain that they do not understand the roles of public institutions since save for few exception, most institutions do not have a clear communication strategy to reach the rural communities. Too many rely on their web sites, expecting that local and rural communities resolve their connectivity problems, excluding them from relevant information. Also many of the institutions recognize they do not have fluid communication channels with local governments and their municipal programs. An exception is INDAP, whose services are well coordinated with local governments through the Rural Development departments of the municipalities. The regional planning structures of the regional Government where Majors exchange with regional ministerial officers and other public agencies seem insufficient to resolve the challenges of coordination and communication and institutional learning.

8- Climate change and adaptation. A National Strategy on Climate Change was announced towards the end of 2007 and by the end of 2008, Chilean government presented its National Climate Change Program. At the time of the interviews, in 2007 and early 2008, climate change and adaptation were not institutional concerns. Furthermore, with the exception of estreme and extended climatic events, droughts and floods are integrated on the ad-hoc mitigation responses of public institutions. In this context there has been little systematization and efforts to sustain an institutional learning processes. Also, new authorities often imply new priorities and shifts in programming that often ignore the lessons of previous interventions. Perhaps, some of the program assessment units in the Ministry of Agriculture, like ODEPA, are among the few that can integrate institutional learning with policy reforms. The integration of community knowledge and experiences barely moves beyond the local or basin realm.

9. Private institutions are not developing adaptive capacities. The Irrigation Districts and different types of water associations are confronting some basic survival problems before they can tackle planning and adaptation capacities. They lack properly trained administrative and technical staff and this often leads to conflicts among its members. Their leaders do not have adequate training or adequate knowledge of public institutions. Most of their efforts are geared to resolve short term issues and improve the deficit on infrastructure or mitigate damages of recent climatic events. They do manage information on the future impacts of climate change in the water resources of their region. They lack good knowledge about government plans and funding programs for irrigation. This limits their access to relevant information and funding opportunities. Dissemination and systematization of information is not common among irrigation districts and CAPRsLack of information on the potential impacts of climate change on their systems does not allow for early preparation. They learn to rely mostly on the local government to bail them out when floods or drought impair the water services.

References

APR CHILE. 2007. Proyecto de Ley para Servicios Sanitarios Rurales. See http://www.aprchile.cl/modules.php?name=News&file=article&sid=747

Celedon, E, 2001 Importancia de los Embalses Subterráneos. See http://www.aguabolivia.org/situacionaguaX/IIIEncAguas/contenido/trabajos_rojo/TC-129.htm

Chile Potencia Alimentaria. 2001- "Por sobreexplotacion Copiapó enfrenta agotamiento". http://www.chilepotenciaalimentaria.cl/content/view/399802/Por_sobreexplotacion_Copiapo_enfrenta_agotamiento_de_acuiferos.html

CNR. 2008. Balance de Gestin Integral 2008 Comisión Nacional de Riego. http://www.dipres.cl/574/articles-45267_doc_pdf.pdf

CNR .2005. Politica Nacional de Riego" aproved by Council of minister in December 2005 in www.cnr.cl

CONAMA. 2005. Guía CONAMA para el Establecimiento deNormas Secundarias de Calidad Ambiental para AguasContinentales Superficiales y Marinas. http://www.bcn.cl/carpeta_temas/temas_portada.2005-12-27.4449440028/GuiaNormaPract.pdf

CONAMA.2007. Estudio: Variabilidad climática en el territorio chileno en el siglo XXI. CONAMA - Departamento de Geofísica y Matemáticas de la Facultad de Ingeniería de la Universidad de Chile. 2007

CONAMA .2007. Estrategia Nacional de Gestión Integrada de Cuencas Hidrográficas. CONAMA 2007. p46

DGA 1999. Política Nacional de Recursos Hídricos. http://www.cepis.ops-oms.org/bvsarg/e/fulltext/chile2/chile2.pdf

DGA. 2008. Informe Derechos, Extracciones y tasa unitarias de consumo de agua sector minero. Regiones centro-norte de Chile www.consejominero.cl/doc/SIT_N_146_informe_Derechos_Extracciones_Tasa_Consumo_Agua_Sector_Minero%20Rev.pdf

DGA. 2007. Balance de Gestión Integral 2007, Dirección General de Aguas.www.dga.cl

FIA.2009. The study "Systematization of national and international climate change adaptation policies and strategies in the agricultural sector and on water and soil resources" was delegated to the Faculty of Agricultural Sciences of Universidad de Chile. Source: Radio Universidad de Chile 28/March/2008 http://www.fia.cl/proyec/convocatorias_2009/BASES_CAMBIO_CLIMATICO_20082009.pdf

INDAP. 2007 Balance de Gestión Integral – BGI, INDAP 2007 p22

INFOR-DHV Consultants B.V. 1999. Programa de Manejo de Cuencas Hidrográficas. Financiado por: BID – MIDEPLAN (Programa de Pre-Inversión) 1999. Consultores: Instituto Forestal – DHV Consultants B.V. – ICSA Ltda. – Brown y Ferrer- http://www.infor.cl/webinfor/PW-GMA/proyectos/finalizados/finalizados-1.html

Junta de Vigilancia del Río Elqui y sus Afluentes. 2009. Memoria de gestión 2008-2009. See
http://www.rioelqui.cl/paginas/memoria_gestion.php

MINAGRI-FUCOA. Nuestra Tierra. MINAGRI-FUCOA. No.254, 2008: 10, en *www.minagri.gob.cl/tips/descargar.php?file=NuestraTierra254.pdf*

Agricultura Chilena 2014. Una perspectiva de Mediano Plazo". Octubre de 2005.

MINAGRI.2009. Balance MINAGRI. Avance 2008 y Metas 2009. Nuestra Tierra256.pdf://www.minagri.gob.cl/noticias.php?code=DQJaC0xcB1oDDgZSAwhSAAk6NTg3MDc1MDg%3D

MINAGRI. 2009b. Cambio Climático, Medio Ambiente y Agua. Nuestra Tierra . http://www.minagri.gob.cl/descargas.php

Ministerio de Obras Públicas. 2006. CHILE: ESTRATEGIA PARA EL AGUA POTABLE RURAL. Sustentabilidad de los Servicios Rurales de Agua Potable y Saneamiento. INFORME ESTRATEGICO. Diciembre de 2006. 1-150/R1S http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=958313

MOP.2005. Manual de Gestión Ambiental, Territorial y Participación Ciudadana para Proyectos de Infraestructura. MOP. Capitulo 5.p1. See. http://164.77.209.180/goremagallanes/ESTUDIOS/Archivos/Archivo%20Estudios/30060455/Bases%20ATP%20Obras%20PTO%20TORO.pdf

Morales, H. and R. Espinoza,2004. Adaptaciones Institucionales al Cambio Climático. Instituciones Relacionadas con el Agua en Chile y en la Región de Coquimbo. www.parc.ca/mcri

ODEPA. 2008. Fuente: Política agraria. Artículo 06/03/2008. http://www.odepa.gob.cl

ODEPA. 2007. Balance de Gestión Integral -2007, ODEPA. See http://www.odepa.gob.cl/odepaweb/servlet/contenidos.ServletDetallesScr?idcla=7&idn=1729

ONEMI.Sistema nacional de Alertas. See http://www.onemi.cl/index.php?option=com_content&task=view&id=2204&Itemid=1957

ONEMI, 2007-Fuente: Balance de Gestion Integral, 2007 -ONEMI p9

PAHO,2008. Health Statistics in Latin America. Basic Indicators 2008:10. PDF. http://new.paho.org/hq/index.php?option=com_content&task=view&id=220&Itemid=317

Peña. H. 2003. Gestión Integrada de Recursos Hídricos y Desarrollo Sustentable. Presentación en Seminario Taller: Gestión Integrada de Cuencas Áridas y Semiáridas. Iquique, octubre 2003.

Procivil Ingeniería Limitada. 2007. Estimación el potencial hidroeléctrico asociado a obras de riego existentes o en proyecto. Resumen de resultados.

Salas, S. 2009-

Senado, 2006. Derechos y deberes de los Usuarios y consumidores y Resolución de Conflictos. Drinking Water Department, DOH. Seminario Sobre Agua Potable Rural.

Senado, 2008. See special Senate review session on emergency response by ONEMI and other agencies. In www.senador.cl/prontus_senado/site/artic/20080115/pags/20080115213312.html

SENADO. 2008. "Fuertes críticas al sistema de protección civil. Senadores piden cambios a la institucionalidad" http://www.senador.cl/prontus_senado/antialone.html?page=http://www.senador.cl/prontus_senado/site/artic/20080115/pags/20080115213312.html

SUBDERE, 2005. "la igualdad de oportunidades tienes que llegar hasta el último rincón del territorio". Adriana del Piano, 27/03/2005, See http://www.subdere.gov.cl/1510/article-66925.html

www.chileriego.cl/opensite_det_20080507151618.aspx

ANNEX 1. List of Institutions Reviewed in the Governance Assessment

DGA Direccion General de Aguas. National Water Board. National and Regional offices

DOH. Direccion de Obras Hidráulicas. National office

CONAMA. Comisión nacional del Medio Ambiente, Natyional Commission on the Environment. National office.

SISS. Superintendencia de Servicios Sanitarios. National Superintendent of Water Utilities. Regional office

CNR, Comisión Nacional de Riego. National Irrigation Commission. National Office.

CONAF, Corporación Nacional Forestal. National Forestry Service. National and regional respondent

ODEPA. National Planning Office for the Ministry of Agriculture. National respondent

INDAP. Instituto Nacional de Desarrollo Agricola. National Institute for Agricultural Development. National respondent

Aguas el Valle. Water Utility for Coquimbo region. Regional respondent

Junta de Vigilancia del Rio Elqui. Elqui River Irrigation District. Regional respondent

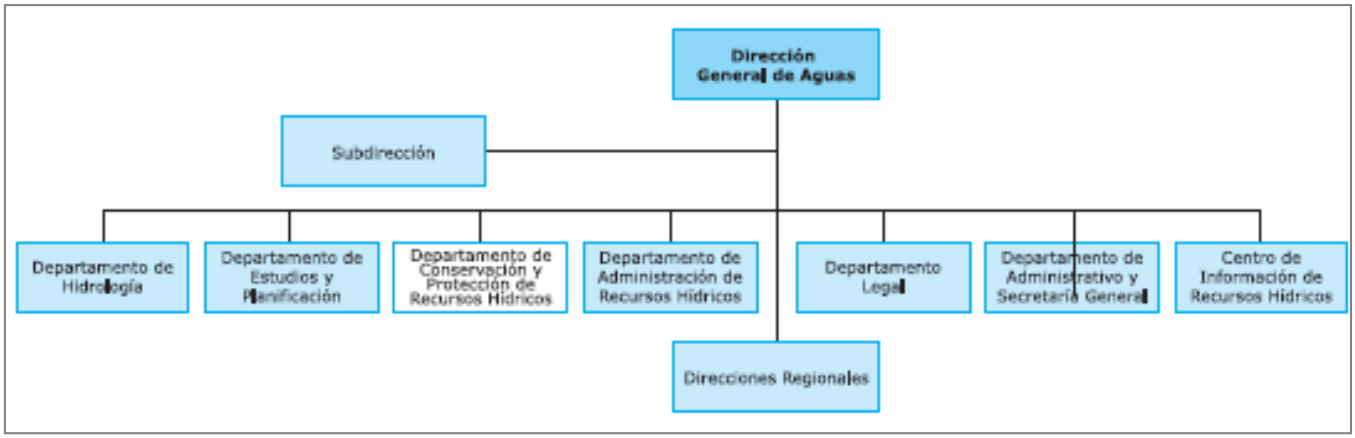
ONEMI. Oficina Nacional de Emergencias Ministerio del Interior. National Emergency Office Ministry Interior. Regional office respondent

SEREMI de Salud. Regional Health Office Coquimbo Region. Regional respondent

CAPR Rural Drinking Water Committees. Regional respondent

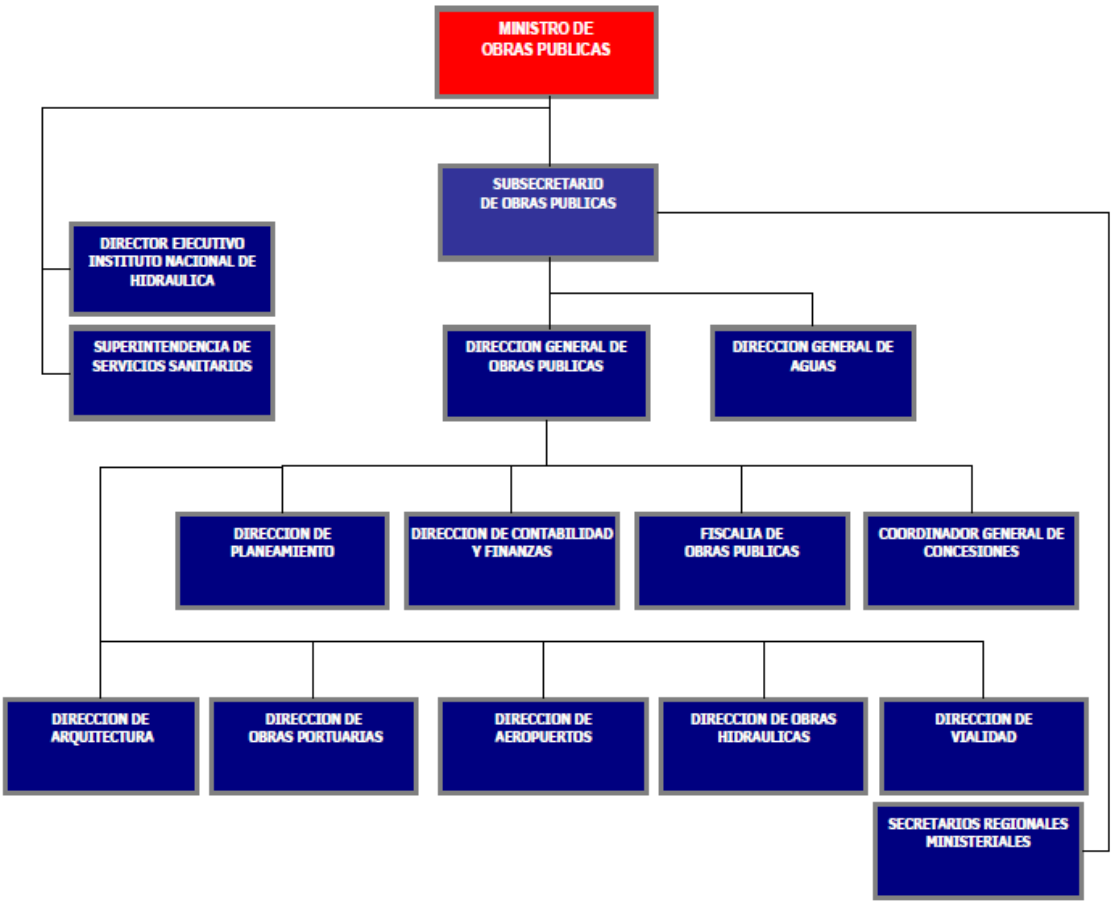
Annex 2. Organizational structure of leading water agencies

a. DGA Institutional structure



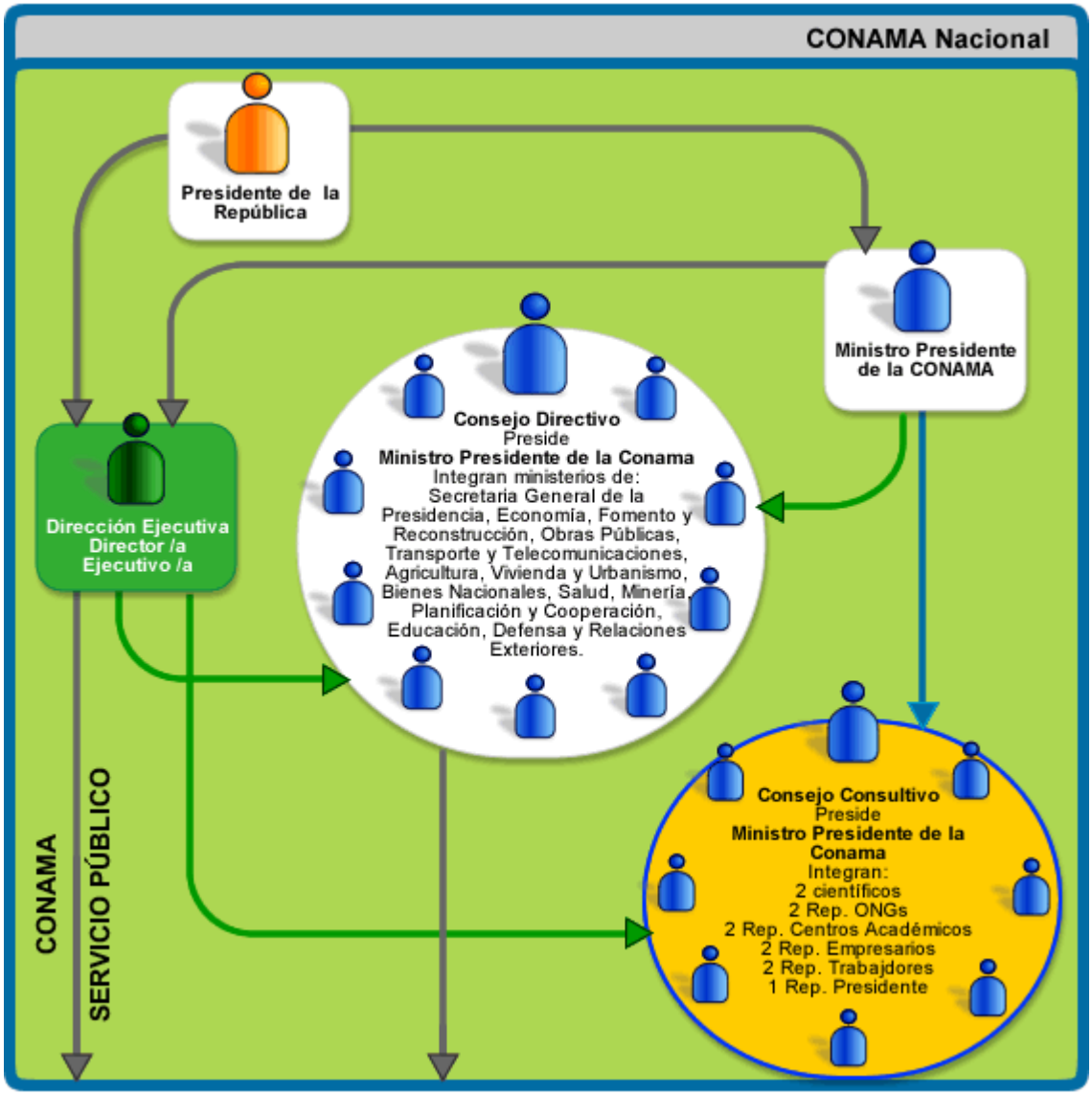
Fuente: Manual de Gestión Ambiental, Territorial y Participación Ciudadana para Proyectos de Infraestructura. MOP. Capitulo 5.p1

2.- DGA Organigram with the Ministry of Public Works



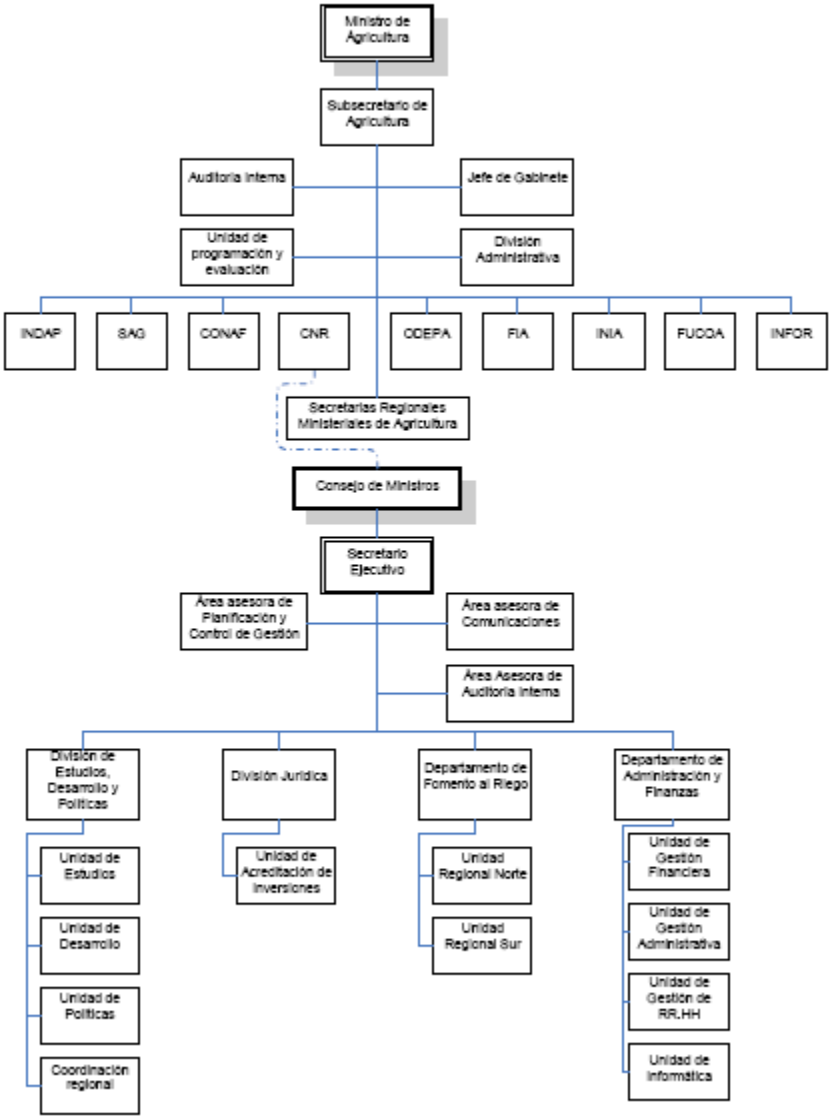
Fuente: Balance de Gestión Integral – DGA 2007. Pagina 16

b. CONAMA organizational structure

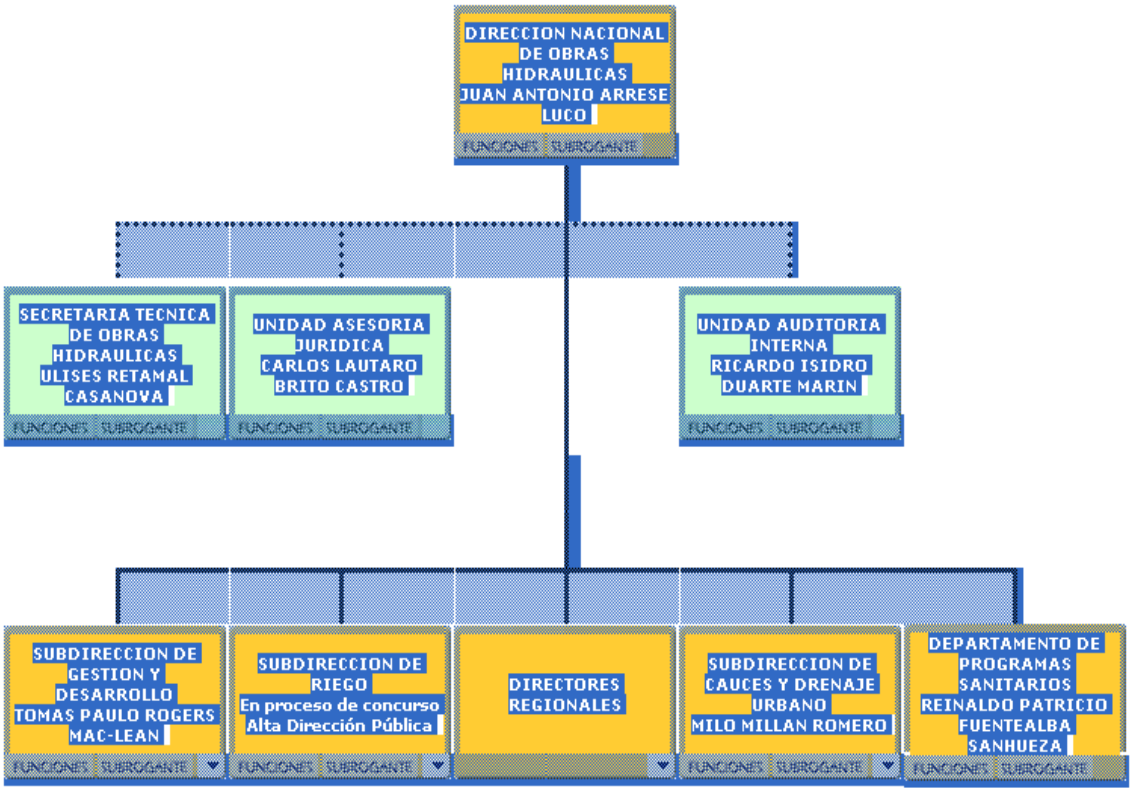


CNR Organizational structure

• Organigrama y Ubicación en la Estructura del Ministerio



DOH Organizational Structure



APPENDIX 3: IACC FIELD WORK GUIDE - GOVERNANCE ASSESMENT

This appendix contains the fieldwork guide used by the IACC researchers to organize each one of the assessment interviews.

A. PURPOSE AND SCOPE

The Governance Assessment Field Work Guide is an outline of research themes and questions which should be addressed in the semi-structured research interview. ***This is a practical guide, designed to help you with the scope of the interview, and is not designed to be used as a questionnaire - think of it more as a checklist of themes that need to be addressed.***

The goal of the interview is as natural and free-flowing a conversation as possible. How you word particular questions, the order they are asked, and how much depth you go into will vary.

The themes outlined below will allow for the collection of information which will allow the IACC project to assess

a. The openness of political institutions to identify problems and issues in the civil society

b. The ability of political institutions to seek solutions to those problems and dealing with issues, and

c. The capacity of political institutions to implement solutions.

B. SET-UP AND GENERAL BACKGROUND PREPARATION:

Which organizations you will be interviewing, who you will speak to in that organization, and how you approach for an interview needs to be decided by the researchers in collaboration with Unit 1E of the IACC Team.

In addition, all researchers are expected to have a thorough understanding of the general principles of institutions and water management in the Elqui River basin and the rationale for the research of Unit 1E.

C. PRE-INTERVIEW:

Research the organization – know its mandate and geographic scope, as well as the position of your contact. You should have spent some time with the organization's website and have acquired good knowledge of its areas of concerns, issues, etc. If there are publicly available documents produced by the organization, be familiar with them. (Bottom Line: be thoroughly prepared before you ask people for their time)

D. THE RESEARCH INTERVIEW AND THEMES

Goal of the Interviews: To understand the role of an organization and its associated decision-making processes with respect to water and climate stress, including identifying factors (beyond the public self-presentation in websites and public documents) which facilitate or hinder adaptation to changing conditions and how they do so (past, present, future).

The points below represent **themes** that should be explored. However, the order in which
these are addressed and the language used will vary by interview. Depending on the context, there will be instances where particular topics warrant greater depth than the questions below indicate to meet the goal of the interviews. The interview guide assumes that the interviewer has a high degree of familiarity with the subject matter and comfort with open-ended, loosely structured interview techniques.
The main points (in bold) are general themes. The bulleted lists are points you need to address. It is always preferable to gather the information in an open-ended fashion, and you should resort to specific prompts only if necessary. Think of the questions as questions to you, the researcher – you should be able to answer these based on what you learned in the interview?

1. What is the role of the institution with respect to water and climate and what
is the role of the respondent within the institution?

- What is the role of the institution with respect to water and climate change? What is its area of institutional responsibility or jurisdiction? How do water and weather condition relate to its mandate?
- What decisions does this organization routinely make with respect to water and climate conditions?
- Does the organization directly relate to (manage, mediate) the needs of rural communities? What is its relationship to rural communities?
- What is the position of the respondent in the organization? What decision making or administrative tasks relative to water and climate does he/she routinely perform?

2. What past water stress has this organization faced, managed, and mediated,
and how?

- In what instances has the institution faced water stress in the past? When? What were the effects of it?
- Was there an institutional response to water stress? If so, what was the nature of the response? Was this part of the institution's existing mandate at the time?

- In times of crisis, were there unprecedented measures/ad hoc responses whichbecam necessary? How were these implemented? Were new protocols developed?
- How flexible has the institution been when it comes to responding to water stress? If the past water stress occurred now, how would things be different?

3. Does this institution plan for water/climate stress, and how?

- What type of long-term planning is done w.r.t. water/climate (refer back to routine decisions, past times of stress as needed)? How many years is the planning time frame?
- How is planning for variability done? What factors are considered? Is there explicit consideration of climate change / long-term scenarios of water availability / moisture deficit / forecasted demand?
- Are there contingency plans (emergency preparedness or business continuity plans) for particular situations? Are these short, medium, long term? How is the decision made to implement these both procedurally and substantively?

4. What information inputs are used by this institution in its operation and decision-making? How are these obtained? How secure are information flows?

- What data are routinely used (refer back to points made in other parts of the interview)? What level of information is collected by the institution/individual and what data come from secondary sources? How spatially disaggregated is the information used)? Are there non-quantitative data which are used or collected?
- If primary data is collected, what is the purpose of collecting this information (to monitor, to diagnose, to manage)? Does that data permit the identification of problems? Does the collected information provide the organization with a comprehensive picture of potential problems within its mandate?
- Is collected data made available to other organizations? To the public? Is this information relevant to rural communities, and if so, is it accessible to them?
- How do they know about the data collected by the institution, and how is it
- accessed?
- Where does the individual/organization get the secondary information he/she needs (agency, contact, informal/formal network of data dissemination)? Are these data public?
- If your respondent's contact for one of his/her data needs retires, is access to data affected?
- What data are needed that aren't currently available? What data does the individual/institution have difficulty obtaining?

5. What resources does the institution have access to, what are its resource
constraints, and how does this affect its activities with respect to managing,
mediating, and planning for water-related issues?

- How is this organization funded? How secure is this funding? What time horizon does funding encompass?
- Does the organization have the necessary financial and technical resources to carry out its activities? How are further resources sought?
- Are there programs and activities which the organization has identified as necessary which are inadequately supported?
- How secure are the financial resources of this institution? Does security of resources match the planning timeframe? What are the consequences of insecure funding for technical and human resources?
- Are there currently particular areas of priority for funding? How were these set? How does the respondent anticipate these will change? In response to what?

6. Who are the institution's stakeholders, how do stakeholders relate to the institution, and how is their input incorporated into the institution's management and decision-making?

- Who are the institution's stakeholders? On what basis does the respondent consider them stakeholders? How do the institution and the stakeholders interface? Is there a formal process for soliciting stakeholder input?
- How accessible are decision-makers / planners within the institution to stakeholders?
- Has the input of stakeholders ever or changed a decision? How are the interests of various stakeholder groups balanced in routine decisions/ management activities and times of conflict? Do some stakeholder groups have more influence than others, and why?
- When confronted by a conflict of stakeholders, how does the institution respond? Is the organization sensitive to the various resources available to the different stakeholders? How does access to resources influence/affects significant participation of various stakeholder groups? Is the knowledge base of the different stakeholders considered?
- Does the institution facilitate the process of negotiation of the interests of different stakeholders with respect to particular interests?
- Has the institution's relationship to stakeholders changed over time? How and why?
- Are there areas where the relationship with stakeholders could be better?
  Why?
  How?

7. To whom and how is the institution accountable?

- To whom is the institution accountable? What is the process for this (fiscal accountability, progress reports, elections? Against what is this accountability measured (the institution's mandate, public opinion polls, balanced budget…)?
- How are individuals within the institution accountable (performance reviews from superiors, progress reports)? Does final responsibility rest with any one individual/group of individuals?
- Are there established ways to monitor/evaluate the success of particular policies/programs? If yes, to whom are the results of this monitoring/evaluation given?
- What is considered "poor" performance? What are the consequences of this (for the institution, for individuals – decreased funding, less responsibility…)?
- Have there been changes in the institution in response to poor performance? What happened?
- Is the institution's performance public record? How is this information made public?

8. In what networks does this institution operate, and how?

- To which organizations do you give direction? From which organizations doyou receive direction? Which organizations work within parameters heavily influenced by your institution? How does this work? Do these organizations influence how these parameters are set? Is there a formal process for this? How does this work?
- Which organizations/institutions do you co-manage/collaborate/coordinate with? What is the nature of this collaboration/coordination?

9. How will things change for this institution as climate/water stress changes?

- Has this organization's mandate with reference to water/climate changed overtime? If yes, how? What prompted this change? Did the change improve the overall ability of the organization to address a particular problem?
- Does the respondent anticipate changes in the way things are done in light of predicted warmer temperatures, lower flow in river, higher evapotranspiration (i.e. Fiebig data)? Is business as usual feasible if drought becomes longer, more frequent? What would have to change for this organization to maintain effectiveness as an organization?
- Are there anticipated future conflicts which may arise in relation to water and climate change?
- What are the main problems faced in management of water resources? Doesthe capacity to solve this problem exist? Is it improving?
- How does the respondent characterize changes in the pattern of development of the region? How do these changes relate to water management? How will these change as climate changes?

10. How does this institution relate to rural community vulnerability?

- IACC work has identified various concerns raised by stakeholder during community work. Does this organization help address these concerns? Is this part of your official mandate? How does the organization become aware of concerns (link to stakeholder discussion)? How does it know the outcome of actions taken?
- Does this organization promote capacity building and problems solving in rural communities? How does the respondent define community capacity building?

11. What legal instruments are relevant to this institutions day to day operation?

- Which are the main instruments (key policies, plans, regulations) that govern or affect the decision-making within this institution?
- What are the main key issues and concerns with these instruments? Are they adequate and effective in the management of water-related problems? If they are not, what are their main problems?
- How does the current water legislation relate to the ability of this institution to alleviate the problems of communities? How would the respondent improve upon current legislation?
- How does the current environmental legislation affect this institution's ability to adapt to changing water and climate conditions? Does it affect the institution's capacity to respond to the needs of communities? How would the respondent improve this legislation?

12. What other factors facilitate or constrain the institution's ability/capacity to manage water stress/respond to the needs of stakeholders/meet the needs of communities?

- Are there any other factors/compounding stresses that the respondent identifies which are relevant to the overall purpose of this assessment?