Chapter 8
Water Governance in the Context of IWRM: Chile

Abstract This chapter outlines the work completed for the ACQWA project on the governance assessments for the Chilean case area and is used to provide vital background to the water governance situation and associated challenges. In the Chilean case, significant challenges persist across the governance indicators, in particular in relation to transparency and accountability. While water governance at the political level is driven through a centralised approach, water management happens in the private sphere and is driven by private interests. Despite the strong codified nature of water governance through the Water Code, the weakness of enforcement and capacity in the DGA means that provisions relating to protection of aquatic ecosystems can effectively be ignored at the basin level. The market focus on water management has meant that public institutions responsible for water rights management or water and environmental issues have very limited capacity to address water issues.

Keywords Aconcagua • Region V • Chile • Water governance assessment • Legislative and policy challenges • IWRM • Transparency and enforcement challenges

8.1 Development of Water Rights in Chile

Water rights in Chile have undergone a number of evolutionary steps over the past century. The following section provides a brief overview of the development of water rights in Chile according to the different periods of change and reform from the Agrarian Reform of 1960 to the latest changes to the radical 1981 Water Code that took place in 2005 (Bauer 2004; Carruthers 2001). Prior to the Agrarian Reform in 1968, water had been a constitutional right of the state, with water users able to obtain a right of use for this water. Water rights were linked to land rights, which meant that a separate registry of water rights did not exist, but instead were assumed to be part of the deed registries recording land ownership. In 1968, the agrarian reform effectively divided land rights from water rights, yet during this period of

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transference, there was no requirement to register the new water rights that were now separated from the land they had originally belonged to. Within the Aconcagua, the majority of land (or parcel) owners originate from the period of agrarian reform, yet while the land rights were transferred, the water rights followed without registration.

Beyond the basic nature of Chilean water rights, there are important distinctions concerning different kinds of water rights, namely whether they are permanent, eventual, provisional, continuous or non-continuous, consumptive or non-consumptive (Water Code, Art. 12), which allows the water rights holder different levels of security and timing. *Permanent* water rights are an expression of volume per time that are granted within the guaranteed flows of the water body (Water Code, Art. 16, 17). *Continuous* rights can theoretically be used 24 h a day of the 365 days a year (Water Code, Art. 19) while *discontinuous* rights are only allowed to be used during predetermined periods. However, the official assumption for calculating these rights is that they are not used permanently, but according to different factors of use, which are used to calculate the level of 'real' exploitation with the surface and ground waters of a basin. For surface water, *eventual rights* are those rights which are granted beyond the limit of secure water in the river. These rights are less secure than permanent because if flow goes below the average level of the river (e.g. in times of drought) then these rights cannot be used. The difference in qualification between permanent and eventual rights is the time that a rights holder is allowed to use it. Within the Water Code, there is an express article (Art. 18) that prohibits water from reservoirs (*las aguas lacustres o embalsadas*) being subject to eventual rights.

In restricted zones (such as a depleted aquifer or groundwater zone) all new water rights are allocated as 'provisional' *rights*, with a set of conditions (Water Code Art. 62; Resolution 425, Art. 30-41) that restricts how they can be used for the proceeding 5 years. After 5 years, if the rights holder can show that their rights did not impact the aquifer, then these rights can be converted into permanent rights (DGA source). A further classification is between consumptive and non–consumptive water rights (Water Code, Art. 13, 14, 15). *Consumptive* rights allows for the total consumption of the allocated water by the water rights holder (Water Code, Art. 13), while *non-consumptive* rights requires rights holders to use their water rights in a non-consumptive fashion, returning the water rights to the water body for usage by other water rights holders according to predetermined standards of quantity and quality (Art. 14).

8.2 Chilean Assessment

In 1981, during the early years of the Pinochet regime, a new water code was passed (1981 Water Code), that was heavily informed by neo-liberal economic doctrine. After an acrimonious 15 year struggle to amend the 1981 Water Code, a set of minor reforms were passed in 2005 that aims to address issues concerning externalities caused by water market transactions, the hording of water rights from

non-consumptive water users, a lack of transparency and information concerning the market and registered water rights as well as mounting challenges from environmental externalities and the lack of river basin management (Bauer 2004). Due to the limited scope of 2005 amendments, water governance remains dominated by the provisions set in the 1981 Water Code, but is also impacted by the Energy and Mining Codes (Tables 8.1 and 8.2).

8.2.1 Accountability

In Chile, the Constitution (Art 12 (2)) provides for the right of equality before the law, as well as the more recent right to a clean environment and protection of the environment (Framework Environmental Law 19.300). Despite provisions for clear timeframes in court procedures (Water Code, Art 129 bis 11), a number of stakeholders alluded to the time and financial barriers that the court process entailed for effective and expedient conflict resolution. Instances of corruption were also reported, such as the circumvention of the EIA process during the government project to build motorway, resulting in damaging impacts on the Aconcagua River. The weak enforcement capability was also brought up in interviews, in terms of the DGA's inability to stop illegal extractions of groundwater unless it is denounced by a water user. Furthermore, interviewees and literature alike point to a lack of agency for stakeholders involved in day to day water issues to influence the system or challenge decisions by governmental bodies. Some studies have pointed to the numerous situations where an individual or company's personal bargaining power outweighs any legal norms in conflict resolution or interest coordination (Bauer 1997; Carruthers 2001).

8.2.2 Transparency

Article 31 bis (Environmental Law) provides for the right to access to environmental information[1] held by authorities, in accordance with the Constitution (Art. 19 (12, 14)) as well as Law 20.285 concerning access to public information. With respect to water resources information, water rights owners are required to register water rights with the '*Conservador de Bien Raices*' in the '*Registro de Aguas*' (Water Code, Art 112). However, it is the overall responsibility of the DGA to maintain a consolidated information system on the water rights through the '*Cadaster Publico de Aguas*' (Water Code, Art 120–122). However, the water market was referred to by a number of stakeholders as 'dark' market, with a complete lack of

[1] The process for access to environmental information is described in the Law of Access to Public Information (20.285, Art. 10–30).

Table 8.1 Legislation concerning water and environment in Chile (including rights to information on the environment and participation in decision making concerning the environment) English

English	Source/original text
Constitution of the Chilean Republic	Constitución Política de la República de Chile (1980), Santiago, 17 de septiembre de 2005. http://www.leychile.cl/Navegar?idNorma=242302&buscar=Constituci%C3%B3n+Pol%C3%ADtica+de+la+Rep%C3%BAblica+de+Chile
Water code	El Código de Aguas, Ley N°1.122, Santiago, 13 de agosto de 1981. http://www.leychile.cl/Navegar?idNorma=5605&buscar=codigo+de+aguas
	Ley 18.450 Aprueba Normas para el Fomento de la Inversión Privada en Obras de Riego y Drenaje, 30 de octubre de 1985
	Decreto Supremo N°285 – Reglamenta Procedimiento para Aplicación del D.F.L. N° 1.123, de 1981, sobre Ejecución de Obras de Riego por el Estado.
Environmental Framework Law	Ley N° 19.300 sobre Bases Generales del Medio Ambiente, 1994. http://www.leychile.cl/Navegar?idNorma=30667
Law on Indigenous Rights	Ley 19.253, Establece Normas sobre Protección, Fomento y Desarrollo de los Indígenas, y creas la Corporación Nacional de Desarrollo Indígena, 28 de septiembre de 1993. http://www.leychile.cl/Navegar?idNorma=30620&buscar=Desarrollo+de+los+Indigenas
Law on Access to Public Information	Ley N° 20.285 sobre Acceso a la Información Pública, 11 de agosto de 2008. http://www.leychile.cl/Navegar?idNorma=276363&buscar=INFORMACI%C3%93N+P%C3%9ABLICA
Administrative Procedure Law	Ley N° 19.880 sobre Bases de los Procedimientos Administrativos que rigen los actos de los órganos de la Administración del Estado, 22 de mayo de 2003. http://www.leychile.cl/Navegar?idNorma=210676&buscar=Bases+de+los+Procedimientos+Administrativos+que+rigen+los+actos+de+los+%C3%B3rganos+de+la+Administraci%C3%B3n+del+Estado
General Law on City Planning and Construction	Ley General de Urbanismo y Construcciones, 16 de abril de 1992. (FIJA NUEVO TEXTO DE LA ORDENANZA GENERAL DE LA LEY GENERAL DE URBANISMO Y CONSTRUCCIONES) http://www.leychile.cl/Navegar?idNorma=8201&idVersion=2010-01-16#área (currently being revised)
Chilean Civil Code	Norma DFL 2, DFL 2-95, Código Civil de Chile, 21 de septiembre de 1995. http://www.leychile.cl/Navegar?idNorma=3551&idParte=8896843&idVersion=

Tribunal Code	Código Orgánico de Tribunales (Ley N° 19.665), 25 de febrero de 2000. http://www.leychile.cl/Navegar?idNorma=160254&buscar=C%C3%B3digo+Org%C3%A1nico+de+Tribunales
General Norms of Citizen Participation	Norma General de Participación Ciudadana, Santiago, 17 de abril de 2009. http://www.leychile.cl/Navegar?idNorma=1001531&buscar=cambio+clim%C3%A1tico
Law on Legal Authority and Legal Aid	Ley N° 17.995 sobre Concede Personalidad Jurídica a los Servicios de Asistencia Jurídica que se Indican en las Regiones que se Señalan, 8 de maya de 1981. http://www.leychile.cl/Navegar?idNorma=29425&buscar=CONCEDE+PERSONALIDAD+JURIDICA+A+LOS+SERVICIOS+DE+ASISTENCIA+JURIDICA+QUE+SE+INDICAN+EN+LAS+REGIONES+QUE+SE+SE%C3%91ALAN
Law on Public Defence	Ley N° 19.718 sobre Crea la Defensorio Penal Publica, 27 de febrero de 2001. http://www.leychile.cl/Navegar?idNorma=182755&buscar=CREA+LA+DEFENSORIA+PENAL+PUBLICA
Law on Freedom of Speech and Information and Practice of the Journalism	Ley N° 19.733 sobre Libertades de Opinión e Información y Ejercicio del Periodismo, 19 de mayo de 2001. http://www.leychile.cl/Navegar?idNorma=186049&buscar=LIBERTADES+DE+OPINION+E+INFORMACION+Y+EJERCICIO+DEL+PERIODISMO

Table 8.2 Legal provisions of particular relevance to discussion in this book: excerpts taken from the full text of the Chilean Governance Assessment (Torres 2010)

Code/law	Articles and descriptions/original text
Chilean Constitution Article 24 (Right of Property)	Article 24º recognises and guarantees the right of property. The right of ownership in its diverse aspects over all classes of corporeal and incorporeal property. Only the law may establish the manner to acquire property and to use, enjoy and dispose of it, and the limitations and obligations derived from its social function. Said function includes all the requirements of the Nation's general interests, the national security, public use and health, and the conservation of the environmental patrimony In no case may anyone be deprived of his property, of the assets affected or any of the essential faculties or powers of ownership, except by virtue of a general or a special law which authorises expropriation for the public benefit or the national interest, duly qualified by the legislator. The expropriated party may protest the legality of the expropriation action before the ordinary courts of justice and shall, at all times, have the right to indemnification for patrimonial harm actually caused, to be fixed by mutual agreement or by a sentence pronounced by said courts in accordance with the law The rights of private citizens over waters, recognised or constituted in conformity with the law, shall grant proprietorship to the owners thereof
Water Code Article 5	Article 5 states that water is a national good of public use, for which particular rights of use can be awarded in compliance with the regulations set out in the current Code (refer to Chilean Constitution, Art 18 (24) & Chilean Civil Code, Art 589)
Article 122	The DGA is required to establish a Public Cadaster of Water
Article 129 bis 1	The Water Code has limited scope for protection of water related ecosystems. In issuing new water rights, the DGA has to protect nature and the environment by establishing a 'minimum ecological flow' which will be applicable only to future allocation of water rights. Such minimum water flow should not surpass the 20% annual mean flow of the superficial water course. In exceptional cases, such limit if increased until the 40% (Art 129 bis 1). Another rule considered in the Water Code is its article 58 forbids explorations -and thus, exploitation- for water in headwater zones for wetlands in the north of Chile (Regions of Tarapacá and Antofagasta), unless authorized by DGA. Moreover, its article 63 declares the same zones as 'prohibition areas', where no further exploration and exploitation will be permitted, unless authorised by DGA
Article 129 bis 3	The DGA must establish a network of stations in each basin to monitor water quality, quantity and levels both in superficial and subterranean waters. The information must be available to the general public
Article 299	The DGA must fulfil certain functions, including: development planning of natural water sources, including recommendations on how they are used; observation and monitoring of the resource, including maintaining and operating the national hydrology service and supplying and publishing related information; commission technical studies for resource and infrastructure planning; police water resources to avoid un-authorised destruction or modification of hydrological work; in cases where a Junta de Vigilancia is not legally constituted, to impede the extraction of water without rights or over-extraction

Article 32	The Water Code forbids construction on the river bed, unless an administrative authorization is issued (Art. 32). Furthermore, the Construction Law ("Ordenanza General de Urbanismo y Construcción") bans or limits edification on flooding prone terrain, and in protected areas of natural value resources (e.g. wetlands). Such restriction areas should be contemplated in the City's Zoning Instrument ("Instrumentos de Planificación Territorial")
Prioritisation of Uses	In Chile there is no legal preference of one use over another, as the rule "first come, first served" is applied (Vergara, 1998). Notwithstanding, according to the Law 19.253 on Protection, Promotion and Development of Indigenous People, article 64 provides on protection of the water of Aymaras and Atacameña Communities. The law granted property rights over the water of those communities, such as rivers, canals, irrigation ditch, slopes notwithstanding the right granted for third parties according with the Code of Water. No new water rights will be granted on to lakes, ponds, streams, rivers and aquifers that supply water owned by various indigenous communities established by law without ensuring in advance the normal water supply to the affected communities
Regulations on the Control of Water Contamination	The most overarching rule is the statutory instrument to control water pollution ("Reglamento para el Control de la Contaminacion Acuatica", Decreto 1, Ministry of National Defense, 06 January 1992). It establishes the general regime for prevention, control, and combat of pollution in sea water, ports, rivers, and lakes. Most of its rules are related with water related activities, such as navigation, fishing, etc.
Law 19.300 Environmental Framework Law	The environment legal framework does provide for protection of water. However, general legislation is scarce and scattered. The main pillar of protection is given by the Environmental Impact Assessment system considered in the Environmental Law (Ley N° 19.300), which assess the environmental impact of particular projects
Article 31 bis (Access to Environmental Information)	Provides for the right of every person to access environmental information obtained by the Administration, as required by the Constitution and Law Nº 20.285 on Access to Public Information
Article 7 (Strategic Environmental Assessment)	According to article 7 bis, the President of the Republic shall decide on the policies and plans subject to the strategic environmental that have an impact on the environment or the sustainability, on proposal of the Council of Ministers. The development of policies and plans should include the design and approval stages. In doing that, the design stage of a policy or plan another relevant bodies should be incorporated to ensure a coordinated action of public entities affected by the policy or plan
Article 4 & 26 (Public Participation)	According to Article 4, the State is required to facilitate citizen participation and allow for access to environmental information as well as promote educational campaigns on environmental protection. Article 26 provides for the establishment of mechanism to allow for public participation in the Environmental Impact Assessment process, which itself is provided for in Article 27 (EIA)

clarity and oversight on the DGA's part on the trading and transactions of water rights. Stakeholders also alluded to the lack of transparency in decisions and data from *Conservador* or even judges, in terms of the information that judicial decision making was based on.

Criticism was also directed at the lack of regular monitoring and assessment of water quality and quantity (which are carried out by MMA and DGA respectively), as well as at challenges arising from a lack of impartiality and objectivity in research and monitoring studies to provide accurate scientific information upon which to base decisions. It has been estimated that over two thirds of water rights are based on the return flow of other rights in the upper watersheds (Pena 1997, 2001). In areas of the country such as the Copiapo, the legal over exploitation of groundwater has reached 18,000,000 m^3 per year (MMA, Expert). Again, this issue can partly be assigned to the DGA, which set a very wet period (just 1 year as opposed to a longer time period) when water availability was high as the baseline from which to calculate abstraction levels (MMA, Expert), meaning that abstraction levels are simply too high for more recurrent dry periods.

8.2.3 Participation

Article 4 of the Environmental Law requires the State to facilitate public participation, access to environmental information and promote educational campaigns to protect the environment. Article 186 of the Water Code provides for the establishment of water user communities (Junta de Vigilancia) where more than two rights owners share the same watercourse. However, while the deregulated approach places water management in the hands of the water rights owners, participation in the broader issues that affect water resources in the basin is very limited. The EIA has been the principle mechanism since 1997 through which public participation is envisaged, with the MMA and its regional agencies responsible for its implementation (Environmental Law, Art, 4). However, many authors have criticised the EIA in the Chilean deregulated neoliberal model because a meaningful enforcement power of provisions for the process is practically non-existent (Carruthers 2001). In reality it has been seen to have been used as a pre-emptive tool to demobilize conflict and local opposition to mega projects, such as controversial hydro-electric projects (Bio Bio, Baker), and has been described as 'inherently cautious and exclusionary where environmental concerns might challenge economic priorities' (Carruthers 2001, p 350).

After decades of citizen exclusion from public debate and destruction of Chilean social fabric, citizen culture is returning. There is now a growing movement of activism and unrest on issues related to environmental and social injustices, as well as a growing consensus that there is a need for a new constitution, that enables a fairer balance of power between citizens and corporations (see Guardian 2011; Patagonia 2011; Nacion 2010). More recently, a new public participation law has been brought into effect (Law N° 20.500), that provides for broader public participation than just the EIA through the right of the people to participate in policies,

plans, programmes and actions. Art 70 requires that each body of the Civil Service should establish a formal and specific method of participation for people and organisations, which it must update and publish through electronic or other means.

8.2.4 IWRM

8.2.4.1 Adopting a Basin Approach

The Treaty between Argentina and Chile on the Environment (DS N°67) states that both parties are concerned about the deteriorating state of the global environment, recognising the need for joint action on environmental protection. Specifically, the Protocol on Shared Water Resources provides for the integrated management of watersheds on shared waters that drain across or overlap the national borders of the two countries (Art 1, 4). Beyond this, the legislative framework in Chile does not take account of IWRM[2] or even water resources management, with the Water Code providing for the allocation of water rights. During the Bachelet period a set of IWRM projects were piloted in three different basins (Dourojeanni 2010), which were criticised as being weak at the time, but have not been prioritised in the Piñera government. However, the Water Code does provide for the establishment of Junta de Vigilancia (Art 186), which although it does not prescribe a basin approach, does allow for the formation of user communities sharing canals, reservoirs or aquifers (though as separate sources).

8.2.4.2 Water Allocation and Prioritisation Measures

Water is treated as any other property right, for which there can be a one off payment, and then allocation of this resource will be corrected through the market for it. There is, therefore, no legal preference for one use over another, as a 'first come, first served' rule is in place. The only exception is during official periods of drought (Water Code, Art. 314), when there is an official intervention in a river basin (but not as soon as a scarcity zone has been declared). However, the water market is deemed to be inactive outside of the southern regions of Chile and therefore inoperative (Dourojeanni and Jouravlev 1999). At present, water rights holders pay a one off fee for the initial purchase of a water right, and afterwards pay for the costs of distribution, operation and maintenance of the infrastructure, according to their amount of rights (whether to a utility as a domestic consumer, or as a farmer to the Junta or the Canal Association). However, beyond these costs, there is no on-going

[2] Except for the last amendment of the Environmental Law (Law N° 19.300) in January 2010 that introduced the Strategic Environmental Assessment. It establishes that it is subject to, among other requirements, integrated watershed management. Therefore, the Chilean counterpart is obliged always to make a Strategic Environmental Assessment according to article 7 bis.

volumetric cost for water.[3] After the initial transaction costs, there is no payment for the water itself (in comparison to the water market in Australia where there is a volumetric fee), nor is there a basin authority setting priorities for different uses (as in areas of the USA).

The application of usage factors, or 'factor de uso' in Chile has been complex.[4] The application of this principle exists as an internal DGA estimate, and therefore comes with no legal obligation for the water rights holder to respect it. In some areas of Chile, this legislative gap has led to disastrous consequences for the over-exploitation of basins such as the Copiapo and more and more water rights being relegated to 'derechos de papel' (paper rights) in that granted use rights far exceed availability. According to interviewees (irrigators and administrators), there is little incentive for farmers to reduce the amount of water they use, or sell it on, as most feel that as scarcity situations mount, it is better to keep use rights for years in which there is proportional reduction in the basin (currently most years).

8.2.4.3 Protection of Aquatic Ecosystems

Broadly, the environmental and ecological impacts of the market are not considered, despite the fact that ecological flows are now in the Water Code (Art 129 bis 1). However, these provisions are only in effect for new rights, of which there are none in most of the regions in central and northern Chile, including the Aconcagua. While the environmental legal framework (Environmental Law, 19.300) does provide protection for water resources and aquatic ecosystems (on a case by case basis), the main pillar of protection is provided through the EIA (Environmental Law, Art 8-25[5]), which has already been highlighted as a highly flawed instrument in Chile. Furthermore, quality rules are subject to a cost benefit analysis (Environmental Law,

[3] A positive outcome of the market has been seen to be the highly developed and well-connected water services provision. Yet in recent years, the tariffs have been rising quite considerably, with a corresponding fall in consumption per person. While the costs of water have been rising considerably for domestic consumers, the cost of water for companies (utilities) is deemed to be relatively inexpensive and water losses are rising (Lentini 2011). A similar perversity in the market system is that efforts to improve irrigation efficiency tend not to lead to water savings, since the incentive is to reduce water use for increased profits rather than decrease water to decrease costs.

[4] Most water rights are registered as permanent (DGA, Expert), yet in reality these rights are not permanent as rights holders do not tend to permanently use their water 24 h a day for the duration of a year. This common contradiction in water rights terminology led to a new classification, introduced in 2005, for 'effective use' (*factor de uso*). For example, a rights holder whose right is 10 l/s, 24 h a day, is unlikely to use that amount throughout the year, so the DGA introduced an 'effective use' calculation to estimate the amount of water used, as opposed to the exact amount of the water right. However, farmers are still allowed to sell the amount that they don't use from their total water right. So, if out of that 10 l/s, a farmer only uses 6 l/s, then the farmer would be able to sell the remaining 4 l/s. Or if a farmer only uses the water right 4 days a week, the remaining 3 days per week could also be sold.

[5] http://www.prodiversitas.bioetica.org/doc56.htm

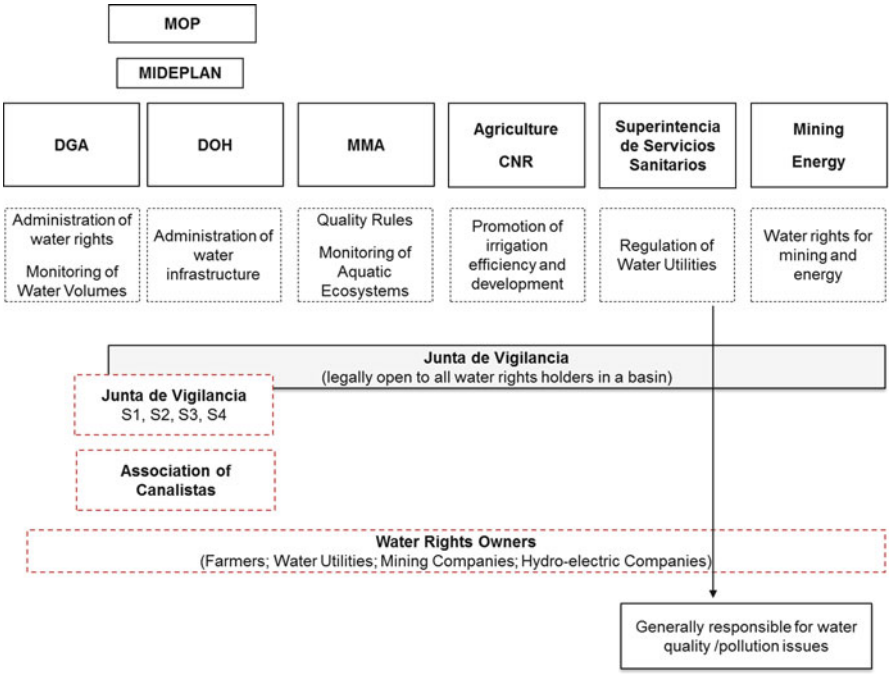

Fig. 8.1 Chilean water institutional framework (with reference to local situation in Aconcagua Basin)

Art 32–39). While it may not have direct implication on the short term protection of aquatic ecosystems, the recent elevation of CONAMA (Environment Commission) to ministry status (MMA) and the establishment of three environmental courts (*Tribunales Ambientales*)[6] are positive signs that the issue of environmental protection might begin to hold more sway.

8.2.4.4 Institutional Arrangements and Challenges Related to IWRM

Officially, the DGA is the primary administrative body with responsibility for water resources, through its administration of water rights (Water Code, Art 130). However, Fig. 8.1 depicts the complex institutional arrangement across which different aspects of water are managed. Water is therefore fragmented across the different Ministries of Mining, Energy, and Public Works. The Ministry of Public Works further separates aspects relating to water rights to the DGA, water infrastructure to the DOH, while any projects plans need to be passed by MIDEPLAN. Monitoring of water

[6] However, these environmental courts have not yet come into effect as the implementation law is yet to be passed (see http://www.mma.gob.cl/1257/w3-propertyvalue-16001.html).

quality is the responsibility of the MMA (Environmental Law, Art 70 (u)), while monitoring of water quantity is fragmented across the DGA and the Junta de Vigilancia (Water Code, Art 122 & 146). Power imbalances across the different ministries and institutions further complicate the fragmented water institutional landscape (i.e. MMA is weak in comparison to MOP, which is less powerful than Ministries for Mining and Energy).

Moreover, Map 6.3 in Chapter 6 shows the set of boundaries that separate the basin in four different sections. The division of the resource in the basin along the administrative boundaries of the juntas is echoed in the legislative framework through the separation of subterranean and surface waters (Water Code, Art 2). The Water Code (Art 186) does provide for multi-sector participation where two or more parties own water rights in the same canal, reservoir or aquifer in the Junta de Vigilancia. However, non-agricultural stakeholders do not take part in the different Junta de Vigilancia in the Aconcagua, nor are there any such organisations for groundwater. In general, hydroelectric companies have been reluctant to become Junta de Vigilancia members, leading to issues in how users co-habit basins across the country.

8.3 Conclusions

In Chile, the informal approach to water management is driven through its conception as an economic good. While water governance at the political level is driven through a centralised approach, water management happens in the private sphere and is driven by private interests. Despite the strong codified nature of water governance through the Water Code, the weakness of enforcement and capacity in the DGA means that provisions introduced to build some resilience in the system (i.e. residual flows and sustainable use of aquifers) can effectively be ignored at the basin level. The governance approach has also produced a number of blind spots, including one on the ecological impacts of the market driven approach. It is a common saying, that what you measure you manage. While water rights are supposed to be recorded and administrated by the DGA, quality issues and ecosystem impacts are not being consistently measured or managed.

Another blind spot in the system are issues that will arise from increased uncertainty and climate change impacts. Investments are being made now, which do not incorporate any sense of uncertainty or climate impacts in the basin. It is clear that the market commodity definition of water rights in Chile has impaired a holistic view of water resource management that looks beyond the limited definition of water as an economic input for agriculture, mining or energy production. It is only during presidentially declared drought periods that water is prioritised for human consumption, and the even then, the declarations of drought periods also allow for the exploitation of underground water to which one does not have constituted rights.

In times of such extreme drought in other areas, water extractions are limited to protect fragile ecosystems, in Chile, it seems the opposite. The economic and market focus on water management has meant that public institutions responsible for water rights management (DGA) or water and environmental issues have very limited capacity to address water issues, yet the DGA is expected to step in at the most extreme time of drought to manage water conflict as soon as the drought is formally declared. Unsurprisingly, this has tended not to end well.

8.4 Summary of Chilean and Swiss Governance in the IWRM Context

The descriptions and analysis in Chap. 7 provide a baseline understanding of the governance systems relationship with sustainable water management, and can be taken as a point of departure from which to develop a better understanding of adaptive capacity. The aim of the STRIVER/BRAHMATWINN indicator based approach is to better understand how the governance systems can assist in the implementation of IWRM. The full governance assessments provide a rich and detailed picture of the governance framework in relation to IWRM and highlight the core challenges in each case area to the development and implementation of an IWRM based approach. While these full reports were developed for use in the ACQWA project, abbreviated versions included in this book provide a useful baseline from which to better understand the governance context and associated challenges in adaptive capacity that must be developed and mobilised. In addition, as highlighted in Chap. 4, some adaptation assessments have utilised these indicators as determinants of adaptive capacity.

Despite the very contrasting legislative frameworks across the two cases, significant challenges persist in each according to the indicators of IWRM. In the Swiss case, despite better fulfilment of accountability, transparency and participation indicators, there remain institutional fragmentation and the challenges of implementing federal policy at the local level of implementation. Furthermore, findings from the Swiss case suggest that there may be a limit to the level of devolvement, and that it can only be effective when combined with requisite levels of experience and resources as well as a propensity for stakeholders to work across the other levels of decision making. In Chile the key institutional challenges relate to the lack of data and information on the market, challenges in holding water users to account due to the lack of enforcement capacity and informality of the governance approach, and finally significant barriers to integrating environmental and social considerations in the water governance framework.

The analysis provides a useful baseline from which to explore factors affecting adaptive capacity. Results from the governance assessment in the Swiss case area showed that despite the water governance system performing well under the indicators of accountability, transparency, participation, there are concerns about ability to cope and adjust to a changing climate and rising competition for water use, mainly

through the challenges that the strength of local autonomy generates for ross scale integration and collaboration, effective decision making in the face of new challenges and the acceptance of innovation from higher administrative levels. Issues also arose in interviews which suggested that a correlation between 'participation' and 'decentralisation' and greater adaptive capacity should not be taken as a normative assumption. Chile performs less well according to the indicators, which would suggest that governance challenges in relation to IWRM are likely to be further exacerbated by issues relating to climate change impacts.

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