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**Collective Action for a common resource:
A case study on the governance of the Cañete River
Basin, Peru**

Author: Tabitha Aude Sidyida Ilboudo
Supervisor: Ellen Hillbom

Abstract

Collective action can be challenging in the governance of common pool resource. While social learning has the potential to facilitate negotiations and communications, power imbalance can still challenge the common pool resource (CPR) governance. In an attempt to study collective action in that context, I undertook a qualitative case study at the Cañete basin, Peru. The primary data was mainly collected in Catahuasi, a village that lies along the basin. The data was analyzed by means of Ostrom's theory on CPR governance, and the theory of social learning. The analysis showed that collective action is more difficult in large CPR setting than smaller ones. In order to overcome the collective action challenge in larger CPR governance, Ostrom proposes nesting. The creation of a learning system in CPR governance also appears to improve stakeholders' collaboration and knowledge sharing. Even though a learning system should in some way counterbalance the power inequality between multi-actors, the present analysis shows that power imbalance can still impede multi-actors governance of a CPR.

Keywords: Common pool resource, collaborative governance, collective action, social learning

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“The world is a book and those who do not travel read only one page.”
Augustine of Hippo

List of Acronyms

ALA:	Autroridad Local del Agua Mala-Omas-Canete (Local water authority of Mala, Omas, and Canete)
ANA:	Autoridad Nacional del Agua (National water authority)
CELEPSA:	Compania Electrica El Platanal SA
CC:	Consejo Hidrico de Cuenca (water council)
CGIAR:	Consultative Group on International Agricultural Research
CIP:	Centro International de la Papa
CIAT:	International Center for Tropical Agriculture
CONDESAN:	Consortio para el Desarrollo Sostenible de la Ecorregion Andina
CPR:	Common Pool Resource
SERNANP:	Servicio Nacional de Areas Naturales Protegidas por el Estado
UNDP:	United Nations Development Programme

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2 Introduction

Water resource governance is gaining recognition and becoming institutionalized in the field of sustainability. Institutionalization of water governance is shifting from a centralized governance system managed by governmental institutions to a more collaborative system involving governments and non-governmental organizations. The paradigm shift in water governance is to allow stakeholders to collaborate and learn the management techniques that will help them deal with *uncertainties and changes* in their environment (Pahl-Wostl et al 2007).

The governance of water basins is essential. In the absence of governance and management activities, river basins can be affected by the waste that riparian communities mismanaged. Waste can then pollute and affect water access. Such a situation can motivate communities affected by waste to self-organized and locally govern the Common Pool Resource (CPR) from which they gain water. A CPR is characterized by its restricted access, and its ability, or inability, to maintain or replenish itself through use or overuse (Ostrom 1999). Thus, waste has to be managed so that it does not affect the resilience and sustainability of river basins.

The Cañete river basin can be considered a natural CPR. Despite its status as the most important river basin on the western coast of Peru, water governance is not institutionalized for the Cañete at an integrated level. Many individual communities within the river basin do practice water governance, but these efforts are not coordinated at the large “basin level,” to include important water users and governmental institutions. This absence of an integrated strategy for equitable sharing of the water contributes to disagreements among water users (Painter 2006, and Young & Lipton 2006, cited by Lynch & Galewski 2010:3). It has also prevented knowledge sharing and the establishment of proper management practices, especially of waste, which pollutes the river and blocks waterways. The challenge of building an integrated strategy to manage the basin resides in the fact

that collaboration can be difficult. In fact, many recognize that power inequality can prevent collaboration in a governance system (Ansell & Gash 2008:551).

2.1 Description of the problem

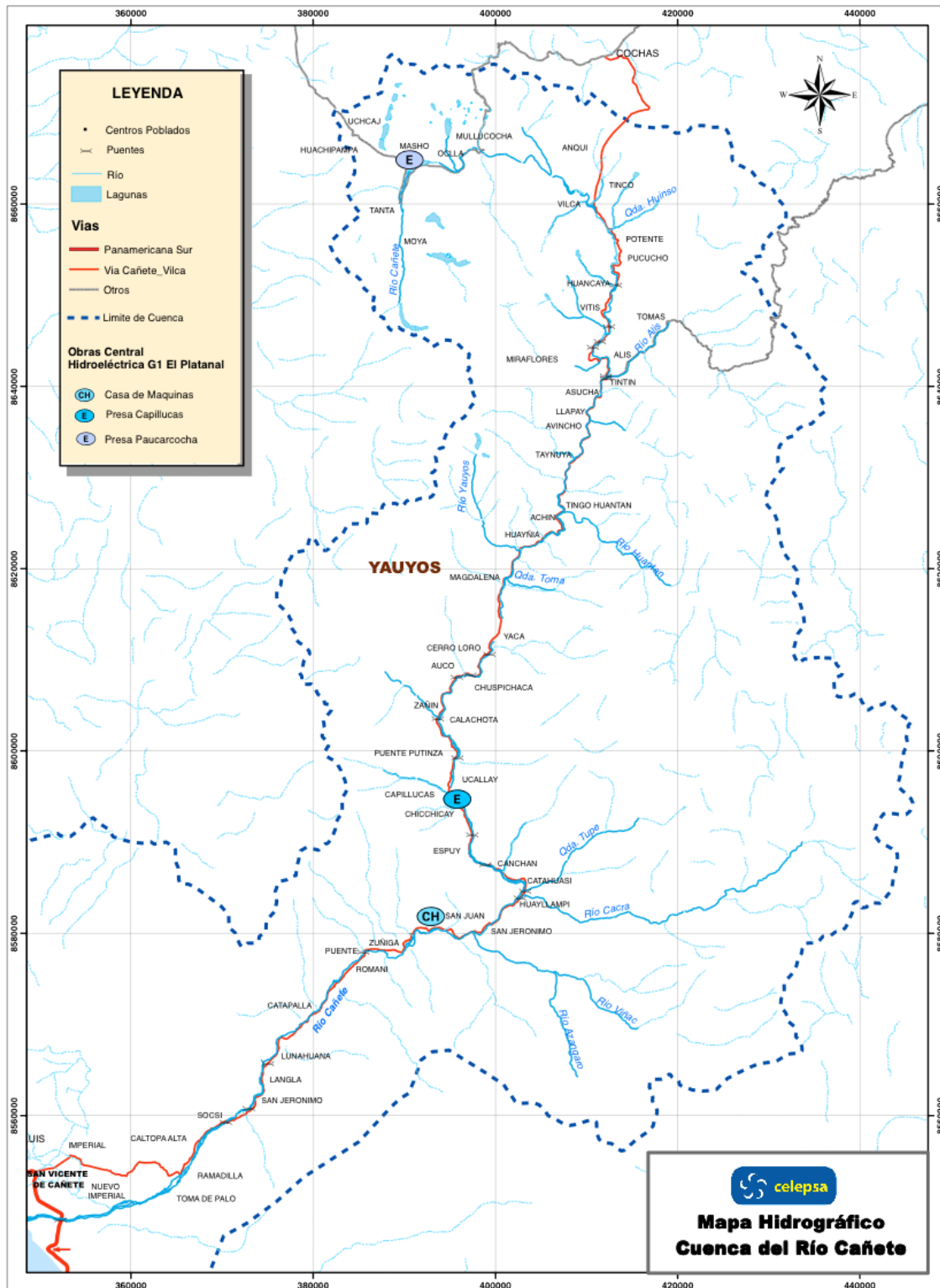


Figure 1: Cañete river basin
 Source: CELEPSA (2012)

The need for integrated water governance became clear in 2006 when the hydroelectric company CELEPSA started the construction of its hydro-electrical project on the Cañete River. Local communities feared that the hydro-electrical activities would contaminate the river, and they also feared that over time, “their water” would be privatized. After consultation, the parties reached an understanding with CELEPSA, and the company provided fair compensation to the families who had to relocate, and promised to finance projects for the communities affected by their activities. In 2010, CELEPSA started its power production, and since that time, there have been tensions between the company and some local communities. These tensions have not escalated to conflicts; rather, all parties involved affirm the situation is one of unfulfilled promises. The disputes have been qualified as latent and are in negotiation.

For this study I focused my research on the village of Catahuasi. Catahuasi (as well as other villages), is an area that the locals call in Spanish ‘el codo seco’ (dry elbow). In Capillucas, a village located a few districts up the river from Catahuasi; CELEPSA has installed the second of their two reservoirs. It is important to mention that, because the steepness of the terrain in that area of Peru, the CELEPSA did not have to build large dams for water storage, as has been necessary in other countries (e.g. China and the United States) (Condesan Internal document). The dam in Capillucas directs water away from a number of villages, including Catahuasi, which is why the area is called ‘codo seco.’ Moreover, the deviation of water from Catahuasi is not the only problem; the inhabitants of Catahuasi complain that the activities of CELEPSA have caused waste gathered upstream of ‘codo seco’ to be discarded so that it blocks the already diminished water that they get.

2.2 Research problem and research questions

The focus of this analysis is on the collective action challenges in the governance of the CPR. The analysis takes into account the relationship between CELEPSA, an important water user of the Cañete basin, whose activities have affected the water

availability to villages such as Catahuasi. The discussion also addresses the importance of managing the waste of communities who live near the river, and their involvement in the governance of the river through social learning.

The following questions will guide the analysis:

1. What are the challenges of collective action and CPR governance that water users face in the Cañete River basin?
 - What are challenges of collective action and CPR governance in Catahuasi?
 - What are challenges of collective action in waste management and water access at the basin level?
2. How could the involvement of local stakeholders contribute to improving the governance of the Cañete CPR through social learning?

To answer the first research question I will analyze the collective action and CPR challenges to water resource governance. In Catahuasi, the challenge that requires the implementation of effective water governance relates to the community's reduced ability to access water for their irrigation system. At the basin level, the governance challenge relates to possibility of water users to organize themselves and manage their waste. To answer the second research question, I will discuss the involvement of the stakeholders, which will allow me to discuss the concept of social learning, which is the foundation for an effective water governance system.

2.3 Outline of the research

I start with an overview of the study area. The overview includes a description of the river basin, the activities of people who live along the river, and the activities of private companies. I then present the main concepts that underlie the theories on Ostrom's eight design principles on CPR governance and on social learning. The concepts are: governance, collective action, social learning and power. I then describe the theories upon which I base the empirical analysis, as well as the

3.1 Socio-demographical characteristics and development

In 2000, the population of the provinces of Yauyos and Cañete was estimated at 208750 habitants (ANA 2000: 15). The main economic activities are agriculture and herding. The province of Cañete is located on the lower part of the river. In this area the fertility of the soil, and the accessibility to river water allows people to practice an intensive irrigated agriculture, which consumes up to 90% of the basin's water. They produce mainly cotton, yellow maize, sweet potatoes, fruits, and grapes for making wine and liquor. In Yauyos, on the upper part of the river, the economic activities are mainly herding and illegal mining. Tourism is also important for the whole region (Ibid).

The village of Catahuasi is located south of Yauyos, and it is characterized by a sub-tropical desert climate, dry and semi-hot, with an average rainfall of 24.8mm/ year (ANA 2000: 20). The main activity in Catahuasi is agriculture. The village has 12 irrigation canals, which are local CPRs and are managed by them. The 12 canals irrigate an area of 117.9 ha, and 87 farmers depend on them for their agricultural production (ANA 2000: 235).

3.2 CELEPSA

CELEPSA is a private hydropower company located between the provinces of Yauyos and Cañete, in the department of Cañete. The company started its commercial activities in 2010, and produces annually an average of 900-1400 GWh of electricity depending on the water volume (1GWh = 1billion watt/hour). The company's electrical production represents 3% of the hydroelectricity produced in the country, and they sell their energy to electrical companies, and to companies that need more than 200KW for their activities (CELEPSA 2012: 20). CELEPSA is considered the most modern company in Peru in the hydro-electrical sector. Their first reservoir is located at 4220 above sea level in Tanta, Yauyos, and the second is located in Capillucas, Yauyos. The first reservoir can store up the 70 million cubic

meters during the rainy season, which is then used during the dry season. These reservoirs have helped to diminish inundation during the rainy seasons. Although there have been disagreements between some communities and the company, the company claims that it has always tried to be a good neighbor by:

- Informing communities about their activities,
- Creating means for dialogue and building trust with communities,
- Respecting the environment, and minimizing the impact of their activities on the environment.

They have also financed projects (e.g. irrigation systems for agriculture, aquaculture of shrimps and trout, recreational space, etc.) requested by the communities (CELEPSA 2012: 39). The activities of the company have also been beneficial to the agricultural community by increasing the water available to farmers in the dry seasons through the release of water from the reservoirs. CELEPSA is not the only private company that depends on the river; there are also the mining companies. However, compared to the mining companies (whose usage of water is consumptive), hydropower activities usage of water is non-consumptive (FAO 2013).

3.3 The Cañete river basin

The Cañete River begins in the highlands of the western coast of Peru at 5.500m above sea level, and flows 220km to the Pacific Ocean. The main sources of water of the river basin are precipitation, glaciers, natural lakes and springs. The Cañete is the only river on the coast of Peru that flows throughout the entire year with an annual average flow of 52.09m³/S (Condesan.org 2013a, FAO 2013). The river contributes to agriculture, production of hydro-electric power, and tourism (e.g. rafting). It also provides water to the city of Lima (FAO 2013). Along the river the landscape changes from Paramo (upstream in the Andes), to desert (downstream along the coast) (Mayer & Fonseca 1979: 14). Consequently, the populations in the lower part of the river rely on it for agriculture, which accounts for an average of 90% of the total water consumption. In the region of Yauyos, there is a protected

reserve called 'Nor Yauyos-Cochas,' which is a nature reserve mainly of springs, small waterfalls, and lakes. This ecosystem constitutes 23% of basin water, and attracts tourists (FAO 2013). Consequently, the government is trying, through the SERNANP, to protect the ecosystem and the biodiversity of the area, and regulate human activities to make better use of the water.

Water governance is important in Peru. Although the country is one of the 17 countries in the world with the most freshwater, it is among the top 30 countries that suffer from water stress and scarcity (Alegria 2007: 1). Unfortunately the scarcely populated of the Amazonian basin has abundant freshwater, while 70% of the Peruvian population who live in the semi-arid and arid area (e.g. Lima) of the country have little water (Ibid). For example, the mountainous region of the province Yauyos (upper part of the Cañete River), has an average precipitation of 281.2mm/ year and a population of 30556, while the agricultural province of Cañete (lower part of the Cañete river Basin) has an average precipitation of 7.8 mm/ year and a population of 133,666 for the year of 2000 (ANA 2000: 115). Low availability of water is increased in areas where households waste blocks the waterways. The Peruvian water problem is not only a problem of economics or technology, but also of governance and management of natural water CPRs, which prevents the reasonable distribution of water to the populations (Alegria 2007:2).

4 Survey of the field

This section focuses on the explanation of some concepts that are essential to understanding the theoretical framework and the analysis. These concepts (e.g. governance, collaborative governance, collective action, power, social learning) are discussed in the context of CPR governance, and the problem of the Cañete basin is used as an example. The decision to focus on these specific concepts is because they are related to the main theories of the analysis, which are: Ostrom's eight principles for CPR governance, and social learning in water governance. Ostrom (1990) in her analysis of long enduring CPRs takes into account the ability of people to collaborate

in governance, and undertake collectively the management of activities. She also underlines that the rules that govern long enduring CPRs are collectively established through social understanding and learning. Although Ostrom omits to analyze power in CPR governance, the concept is taken into account because human relationships always involve power relationships. In this section, I first discuss governance, collaborative governance, and power in a CPR system, and then analyze the logic of collective action and power. I end with a broad analysis of the concept of social learning in the arena of water governance.

4.1 Why is water governance important?

The term *governance* is derived from *government*, which refers to state monopoly, legitimate ability, and exercise of coercive power (Stoker 1998:17). In the social sciences the concept of *governance* evolved, and now refers to “ ... a new process of governing ... or the new method by which society is governed” (Rhodes 1996, cited by Stoker 1998: 17). In recent years, the debate on governance has leaned toward the concept of *collaborative governance*, mainly in natural resource management. The definition of the concept varies, but always implies the notion of collective action, or the ability of different societal actors to work together in an orderly manner to manage resources. For the purpose of my analysis, collaborative governance will be defined as “the processes and structures of public policy decision making and management that engage people constructively across the boundaries of public agencies, levels of government, and/or the public, private and civic spheres in order to carry out a public purpose that could not otherwise be accomplished” (Emerson et al 2012: 2). The definition is broad enough to be linked to Stoker 's (1998) definition of governance, which describes the ability of a governmental institution like the ANA, to go through processes of creating organizations with a private company like CELEPSA, and farmers, peasants and indigenous communities, in order to achieve the sustainable governance of a CPR such as Cañete River Basin. Some studies show that people usually prefer for an elected public official be in charge of the institutions that provide social services, but when it comes to the

governance of a natural resource on which populations depend, they usually prefer to be part of the decision making processes that affect their living conditions (Miller & Dickson 1996, cited by Stoker 1998: 19). Ostrom (1990) affirms that populations would rather manage their resources by organizing into self-governing networks openly accessible to everyone, rather than having the resources managed for them.

I am interested in collaborative governance to manage water because water is a scarce resource, which moreover is unevenly distributed. Water stress increases with population growth requiring that water resources be managed efficiently so that people can continue have clean water. Water is becoming increasingly scarce, so much so that it is being called “blue gold.” In certain areas of the world water availability is handled as a national security matter, the Nile for instance (Gleick 1993). Water is considered a resource that can lead to insecurity if its availability were to be abruptly disrupted (UNPD 2006: 133).

It is therefore crucial to consider as a state priority not only the management of water, but also its governance. For Pahl-Wostl (2009: 355) *resource management activities* include: “analyzing and monitoring, the development and implementation of procedures that will contribute to keep the resource within appropriate bounds.” For UNDP “*water governance* encompasses the political, economic and social processes and institutions by which governments, civil society, and the private sector make decisions about how best to use, develop and manage water resources” (UNDP 2004: 10). Management of water resources is impossible, or inefficient, without a governance system, and governance cannot be achieved through public institutions alone; government institutions need to work in tandem with the private sector, and people from civil society. Governance of water resources is a process by which different groups of people think about, discuss, and manage water resources (Franks & Cleaver 2007: 292).

In collaborative governance people usually have a common problem that requires collaboration to resolve. Emerson et al (2012) state that *interdependence* is one of

the drivers for collaboration. Interdependence exists when individuals find themselves unable to achieve something on their own, and are obliged to work with others who share their concern and objectives (Emerson et al 2012: 9). When collaborating, risk and cost are shared, and decrease uncertainty (Emerson et 2012 and Stoker 1998). I mentioned earlier that research shows that people usually prefer for an elected official be in control of institutions that provides the social services. This is due to the fact that the elected official is also responsible for the negative outcomes related to the distribution of the service. In a collaborative situation of the public and private sectors, or even with civil society actors, the responsibilities tend to be diffused (Stoker 1998: 20). In a case of a CPR management where decisions and actions are taken with the approval of the group, responsibilities are also shared within the group.

A discussion of governance cannot exclude the power relationship within the governance system. In a governance system, different actors hold different levels of power (Stoker 1998: 22). In the case of the Cañete basin the social, financial, and constitutional powers are held by the communities, CELEPSA and the ANA/ALA respectively. In order to achieve sustainable governance of the CPR, these actors negotiate, exchange resources, and share responsibilities (Ibid). The division of responsibilities entails that there is also a division of power. The process of power devolution between actors is done through a process called decentralization. When power is decentralized, the authority to make decisions is delegated to the appropriate lowest authority, with the consultation of the public and involvement of users (World Bank 2006: 217, cited by Lynch 2012: 370).

In Peru, water can be a contentious topic depending on one's location in the country. In the Andes for instance, water access is limited by the inequity of water governance caused by unequal power distribution (Lynch 2012: 365). A system of collaborative water governance would be valuable for the Peruvian government if we take into account the size of the country (1,285,216 square km), the number of river basins (an average of 159 basins), and the complicated system used to

govern the water resource in the country. The complication of the governance structure lies in the fact that in Peru competing ministries have authority over the water resources¹. However, in 2008 a national water authority (ANA) was created to resolve this issue. Although Peru is moving towards a new water governance regime, the transition of responsibilities from the ministries to the ANA may take a long time (Lynch 2010: 16). Nevertheless, the new water regime is including water users in the governance system, through the creation of water councils, which are discussed in the following section.

4.2 Collective action and power relations in the CPR

The common pool resource (CPR) is defined as a natural or man-made resource system that is large enough to make costly the exclusion of beneficiaries through physical or institutional means, and in which the exploitation of the resource by some users reduces its availability for the others users (Ostrom 1990: 30, Ostrom et al 1999: 278). This definition highlights some characteristics that could make the governance of a CPR difficult: the 'exclusion of beneficiaries', and the reduction of the resource availability through use, or overuse. These characteristics mean that a CPR is not open access, and that availability of resources is reduced over time by the use of others (Ostrom et al 1999:279). Other variables could also challenge the governance of a CPR. They concern:

- The characteristic of the resource, which concerns the resource mobility, unpredictability and boundaries. Indeed, in a CPR system, it is important to be able to monitor and measure the quantity of the resource, its use or overuse. When it comes to rivers such as the Cañete, monitoring the use of the water can be difficult and expensive because it is mobile and difficult to store (Blomquist et al 1994, cited by Agrawal 2003: 249). The collection of

¹ Ministry of Energy and Mines, Ministry of Agriculture, Ministry of Health, Ministry of the Environment, Ministry of Defense, Ministry of Production, Ministry of Construction and Sanitation, Ministry of Education, Ministry of Housing, and Ministry of Economy and Finance.

reliable information in this case is difficult, and therefore costly (Dietz et al 2003: 1908). It can therefore be difficult to know the amount of the water used, and the amount that is left in the resource system. Nevertheless, monitoring helps prevent the abuse of the resource. In CPR governance, it is also important to be able to establish the boundaries of the resource system, and restrict access and use of the resource. Establishing the boundaries of the resource system will contribute to the better management of the resource (Ibid).

- The characteristic of the group relates to the heterogeneity of the group (gender, wealth, ethnicity, etc.), its size, its governance regime, and the ability or inability of resource users to trust each other, collaborate and be accountable to each other. In a CPR system, collaboration and trust reduce the costs of monitoring (Agrawal 2003: 251, and Dietz et al 2003).

In Cañete, the goal of the ANA and ALA is to be able to implement a collaborative governance system on the Cañete River, the common pool resource, with its main water users. The governance system will be implemented through the 'Consejo hidrico de Cuenca' or water council, a group that will gather water users and other organizations that have interests in the governance of the Cañete River. However, the implementation procedure of the Consejo de Cuenca has been challenging. These challenges reflect the difficulties of organization and undertaking of collective action endeavors that would lead to the sustainable governance of the common pool resource.

In his work "The logic of collective action" Olson (1980) argues that when people form an organized group, it must have a purpose, and this purpose is to fulfill the interest of the group members. The group will disintegrate if it fails to accomplish the common interest of its members (Olson 1980: 7-8). In the case of the Cañete River, the interests of the water users may not be harmonious because the problems concerning the management of the CPR can vary according to one's location on the river. The mismanagement of waste that blocks some waterways may not be the

problem of all. Nevertheless, communities and organizations may still join the group because of many underlying interests that they will enjoy as members of the group (Olson 1980).

The problem with collective action is that people want to benefit from the 'collective good,' but they do not want to participate in the activities or costs that produce the collective good (Olson 1980: 21). This situation is called 'free-riding' and it varies according to the size of the group. In *small groups*, members usually participate to the provision costs of the collective good without recourse to coercive methods. In small groups the personal gain from the collective good is greater than the provision costs. This may be due to the fact that the production of the *collective benefit* is the basic nature of existence of the small group (Olson 1980: 21). In *big groups*, coercion and sanctions are usually required to encourage individual members' participation. Indeed, in big groups, the lack of contribution of members is not always perceived; therefore, some tend to forgo it if they are not coerced (Olson 1980:36). The difference between the big and small group lies in the fact that members of a small group will provide themselves with the collective good because of the '*attractiveness of that good*.' However in big group, the degree of members' common interest to the good is usually low, or I might say, different, leading to the low probability of the whole group contributing to the production of the good (Ibid). Accordingly, in Cañete, the villages that are not affected by the waste may decide to 'free-ride' the waste management strategy, which can cause the failure of the management system.

Previous research concerning power relation in collective action assumed that actors may decide to unite in order to solve the problem of unequal power distribution between low-power holders and high-power holders (Simpson & Macy 2004: 1374). Thus, the peasant communities along the river for instance, could join the Consejo Hidrico de Cuenca as a group in order to have a better negotiating power with other high-power water users on the river (Ibid). Previous research also affirms that free-riding, especially when it comes from those with low power, can cause a coalition to fail (Cook and Gilmore 1984 as cited by Simpson & Macy 2004:

1374). In order to solve the free-riding problem and establish a successful governance system, coercive measures owe to be in place (Agrawal 2003: 257). However, the issue usually is that coercion is usually applied on those with less power, which aggravates the sense of injustice and sustainability (Ibid).

There are many solutions to solving the common problems. In fact, CPR problems differ according to the characteristic of the resource, the environmental settings, and the socio-cultural framework in which the problem is unfolding (Ostrom 1990: 14). The rapid changes in the environmental settings disrupt existing social structures, as such, some kind of learning and re-adaptation processes owe to be in place. These learning and re-adaptation processes require effective communication and dialogue between all resource users. Ostrom (1990: 21) discusses internal and external factors that could prevent effective governance of a CPR:

- *Internal factors*: relate to the incapacity to communicate, which also prevent the ability to build the *trust* within the group. In Cañete, there are some who believe that hydroelectric activities pollute the river such as mining activities. Consequently, the hydropower company has to better communicate with the communities to change that belief, build trust and erase populations' apprehension of their presence on the river.
- *External factors*: could relate to the incapacity to adapt to environmental changes. In my case that could refer to the incapacity to adapt, and/ or the unwillingness to accept CELEPSA on the river as another water user. It could also refer to the financial incapacity or inability to adopt effective technology that would increase livelihood productivity (e.g. better irrigation system for agriculture).

4.3 Social learning, from psychology to resource governance

The theory of social learning was developed in the field of psychology in order to respond to research shortcomings in explaining reasons behind human behavior (Bandura 1971). The early studies on social learning focused on the individual

cognitive learning abilities, and explained that human beings learn through direct experimentation of the consequences of their actions (Bandura 1971: 2). Bandura, in his analysis of the concept concluded that if learning were only based on the reward-punishment schema, learning would be difficult and dangerous, and mistakes costly. The author explained that most of us learn through examples displayed by others, and through interactions with others (Bandura: 1971: 5).

Thus, the early aspect of social learning only focused on individuals learning in their environment, and not on the aspect of group learning. In order to apply learning to a group, Argyris and Schön (1978) have developed the concept of organizational learning. The authors explain that there is a difference between individual learning and organizational learning. The difference relates to the fact that individuals may hold more knowledge than organizations, and that organizations learn through the experiences and actions of their people (Argyris and Schön 1978: 9). They define organizational learning as “the *testing and restructuring* of organizational theories of actions and, in the organizational context as in the individual one.” These organizational learning procedures relate to the concept of *learning loop* (Argyris and Schön 1978: 11). Learning loop in an organization refers to the organization’s capacity to “match or mismatch of expectations with outcome.” In cases of mismatches, the organization has to revisit, test and restructure its norms in order to respond to changes in its internal and external environments (Argyris and Schön 1978: 18). The theory of learning loop (single-loop, double-loop, and triple-loop learning) in water governance analyzed by Palh-Wostl (2009), derives from Argyris & Schön (1978) development of double-loop learning of organizations. There are three levels to the concept:

- In *single-loop learning*, change is limited “to a refinement of actions to improve performance.” At this level, the learning system does not question the established guidelines; it is limited at detecting the fixing errors in order to improve performance (Argyris & Schön 1978: 19, Palh-Wostl 2009: 359);
- In *double-loop learning*, the frame of reference or organizational norms are called into questioned and changed (e.g. rules of the CPR institutions). A

change of the established norms will also lead to a reframing of the problem (Argyris & Schön 1978: 21, Palh-Wostl 2009: 359);

- *Triple-loop learning* “refers to a transformation of the structural context and factors that determine the frame of reference;” it refers to a change in the governance regime. To reach this level of learning, CPR actors should recognize that the established structural measures impede governance and management practices, and therefore have to change (Palh-Wostl 2009: 359).

The author also affirms that double-loop learning can be effective only if followed by triple-loop learning. Double-loop learning may require a change of established norms, which takes place at the third level of the learning-loop. The criticism of the learning-loop concept is that it can prevent progress if social actors were to frequently rethink and change ethical standard and beliefs. It is also important to recognize that if processes were not revisited, there would not be any innovation or a progress of adaptive capacities (Ibid).

The changes in social processes have compelled us to develop methods to sustainably manage the scarce resources. Wals et al (2009:8) affirm that social learning can help us develop ‘learning system’ in which people learn *from* and *with* one another and collectively become more capable of withstanding setbacks and dealing with insecurity, complexity and risks” related to the resource management. According to them, a learning society is essential for the building of a sustainable world (Wals et al 2009: 11). In order for learning to take place in a CPR institution for instance, some authors have evoked the importance of *trust* building, a social capital indispensable to social learning (Folkes et al 2005, Wals et al 2009, and Pahl-Wostl et al 2007).

In water governance and management, social learning is usually discussed in harmony with concepts such as adaptive co-management, adaptive management, and adaptive governance. The adaptive capacity of a governance system relates to the ability of the system “to first alter processes and if required convert structural elements as response to experienced or expected changes in the societal or natural

environment” (Pahl-Wostl 2009: 355). Thus, the adaptive capacities of CPR managers refer to their abilities to constantly adjust and adapt their understanding of management methods to the changes in the environment. These new methods should be considered as opportunities to further learn to adapt to changes (Folke et al 2005: 447).

Social learning and adaptive governance are considered necessary to the governance of socio-ecological systems such as the river Cañete, which are constantly changing (Folke et al 2005). In fact, the authors state that social learning is essential for resource governance because it combines the opinions and knowledge of the local people, with scientific knowledge, which increases populations’ sense of commitment, ownership and responsibilities toward the decisions that are implemented (Folke et al 2005: 446). The concepts of *participation*, *learning*, and *collective action* tackle the social dimension of CPR governance (Folke et al 2005: 447). Thus, in order to build knowledge and skills that will be accepted by social actors and contribute to a good adaptive management of dynamic and complex ecosystems, it is essential that individuals learn from their experiences. Learning is a dynamic ongoing process between actors (Ibid).

Social learning also implies interdependency between actors; consequently, it is necessary to establish effective information and communication channels so that actors can participate in the social exchange of knowledge and ideas. In order to set-up a learning community for CPR governance, it is essential to organise social actors and define their role in the governance and learning community (Folke 2005). Moreover, as it is the case in any social exchanges, power balance or imbalance has to be addressed in learning communities. Adaptive governance refers to the “devolution of management rights and power sharing that promotes the participations” of stakeholders (Folke et al 2005: 449). A devolution of power between government institutions, private organizations and communities requires an ability to collaborate, communicate and trust others stakeholders.

5 Theoretical framework

The challenges concerning the CPR governance of the community of Catahuasi, and the issues of waste management at the basin level are analyzed by means of Ostrom's eight design principles. The involvement of local stakeholders in CPR governance is analyzed in the framework of social learning. The section presents these theoretical frameworks, but in tandem with power relation because power cannot be dissociated from CPR governance and social learning.

5.1 Ostrom on the governance of the common pool resource

In the governance system of a CPR, it is important to “distinguish between the *resource system* and the flow of the *resource units* produced by the system” (Ostrom 1990: 30). The resource system refers to the stock of the resource (e.g. the Cañete River) and resource units are what individuals get from the resources system (e.g. the amount of water). These two elements are dependent and define the appropriation (consumption of the resource unit) and provision (provision of the resource) rules of the CPR (Ibid). In order to organize and govern a CPR, Ostrom recognizes eight design principles that may be taken into account. These design principles are used in the empirical analysis to discuss water access and waste management:

1. ***Clearly defined boundaries of the CPR***: this principle consists in defining the boundaries of the resources system and identifying those allowed to use the resource itself (Ostrom 1990: 91). This is a necessary step to the constitution of a governance system because if the number of users is not limited, the resource system will be considered openly accessible to all. Those who invest in the resource will lose the return of their investments because there are non-investors who benefit from the resource system. The limitation of the resource users also protect the resource system from over-harvesting, which can potential destroy the CPR (Ibid);
2. ***Congruence between appropriation and provision rules and local conditions***: the principle can be considered as a protective measure to the

- CPR such as the first one. In CPR discussions *appropriation rules* concern the allocation of the resource to the appropriators (e.g. irrigators). The appropriation rules may restrict the amount of resource units allocated to each user, as well as the time, place, and technology used to harvest the resource, depending on the local condition (Ostrom 1990:92). The *provision rules* are concerned with the irrigation infrastructure itself (Ostrom 1990: 47), they relate to the labor, material, and funding required for the maintenance of the CPR infrastructure (e.g. irrigation canals) (Ostrom 1990:92);
3. ***Collective choices arrangement***: this principle is concerned with *operational rules* relating to the usage of the resource. It states that those affected by the *operational rules* of the CPR can participate in modifying those rules (Ostrom 1990: 90). The operational rules of a CPR are the rules designed by CPR appropriators to govern the appropriation and provision rules. The operational rules are then designed to fit the environmental and social setting of appropriators (Ostrom 1990:93);
 4. ***Monitoring***: in a CPR setting, the operational and provision rules may not be respected by all CPR users. Thus, a monitoring activity may be implemented for the surveillance of appropriators' behavior toward the CPR, and potential violations reported to the CPR community. Thus, sanctions can be applied to those who violate the rules (Ostrom 1990: 94). Monitoring also provides the information necessary for the governance of the CPR. The information can relate to the available stock of the resource, its flow, the methods of governance used by the CPR institution, and the interaction between people and the CPR. The human-CPR interaction can relate to the way the resource is used or overused. The information collected through monitoring also allows resource managers to deal with uncertainties related to the availability of the resource, its use and the technology used to harvest the resource (Dietz et al 2003: 1908, Agrawal 2003: 250).
 5. ***Graduated sanctions***: concern the sanctions applied to those who violate the operational and provision rules of the CPR. Appropriators apply sanctions to

other appropriators, and these sanctions can vary depending on the severity and context of the offense (Ibid). Research has demonstrated that actors will comply with the established rules if they perceive “that the collective action objective is achieved” and “that others also comply with the rules (Levi 1988, as cited by Ostrom 1990: 95). Nevertheless, the general presumption evoked by Olson (1980) and Ostrom (1990:94) is that actors will not spend time and effort on monitoring and sanctioning activities because the personal cost of these activities may be too high, and the relative benefit diffused to everyone. Other evidence shows however, that appropriators are willing to spend time and effort to carry monitoring and sanctions activities themselves, because the benefit is higher than the cost (Levi 1988, cited by Ostrom 1990: 95).

These five principles organize the CPR community and define the resource boundaries, set the regulations (appropriation, provision and operational rules), and the monitoring system, and define the sanctions to be applied in case of the violation of the rules.

6. ***Conflict-resolutions mechanism***: the principle states that CPR actors and their officials should have rapid access to a low-cost platform to solve conflicts among CPR actors, and between them and their officials (Ostrom 1990: 100). Although the rules governing a CPR may be clear, the application of those rules can be debatable. Thus, rules should accommodate and distinguish between those who unwillingly violate them from the free-riders. Setting a conflict resolution mechanism does not guarantee the existence of an enduring CPR system, but it is necessary to maintain and govern CPR systems, which are usually complex (Ostrom 1990: 101);
7. ***Minimal recognitions of rights to organize***: this principle states that CPR appropriators should have the right to devise their rules (e.g. provision, operational rules) locally, without an interference of the governmental authorities (Ostrom 1990: 101). An involvement of the external authorities could challenge the local governance of the CPR by allowing some appropriators to override the local rules for the external rules (Ibid);

8. ***Nested enterprises***: this principle usually applies to large and complex CPR organizations. In the nested enterprises, “the appropriation, provision, monitoring, enforcement, conflict resolution, and the governance activities are organized in multiple layers.” The problems encountered at one layer of the nested enterprises may be different from the problems encountered at other levels of the nested enterprises (Ostrom 1990: 102).

It is important to underline that these design principles are not blueprints for establishing long enduring CPR; they are chosen according to the social and environmental context (Ostrom 1990: 90). Thus, in the analysis, I will also define: the *characteristic of the group*, the *characteristic of the resource*, the *relationship between the group and market and technology*, and the *power relation* between the different stakeholders that I interviewed Agrawal (2003).

In the development of her theory, Ostrom omits to discuss power relations in CPR governance. However, in order to understand the challenges that are related to CPR governance and management strategies, one should also understand the power and micro-politics within the governance community (Agrawal 2003: 257). Ansell and Gash (2008: 551) stipulate that in a governance system, if some stakeholders do not have an equal status equal with other stakeholders, the process of collaborative governance will be a process of manipulation by the most powerful. Accordingly, theorists such as Agrawal state that the institutional choices of those in power are designed to exclude the powerless (Ibid). The imbalance of power relations can indeed lead the disintegration of a governance structure, or prevent stakeholders from taking part to the decision-making and negotiations (Gray 1989, cited by Ansell & Gash 2008: 552).

The CPR design principles will be taken into account in the empirical analysis of the of the first research question: ‘What are the challenges of collective action that the water users and the Peruvian government are facing in the Cañete River basin?’ However, as this first question will be analyzed in two parts (the community level and the basin level). The analysis at the community level will be limited to the first

two principles because the operational rules, the monitoring, the sanctioning, conflict resolutions and the other governance activities are established and known by the members of the community. Moreover, due to the small number of the appropriators, conflicts are not an issue within the community. The analysis at the basin level, which makes the CPR more complex, will incorporate all design principles, and the discussion on power will be incorporated in the section on nested enterprises.

5.2 Framing a Learning system in water governance

Social learning in this section will be narrowly discussed in relation to Ostrom's CPR governance. It will define the conditions under which a learning system can be established in a CPR institution.

Social learning is concerned with developing and maintaining the capacity of "different authorities, experts, interest groups and the general public to manage their river basins effectively," mend their differences, and design and implement collective decisions (Palh-Wostl et al 2007: 2). This definition relates to Ostrom design principles two and six. Indeed, in order for CPR actors to design and implement collective decision or rules, they have to live together long enough to test, restructure and establish the norms that govern their behaviour, and sanction those whose behaviours violate established rules (Ostrom 1990: 89). The processes of testing, restructuring and establishing norms take place through the stages of the learning loop.

Learning also contributes to reduce uncertainty; uncertainty is the lack of knowledge about a resource characteristics and resilience, which can trigger the creation of a CPR institution (Ostrom 1990:33). In a CPR institution, such as in a learning system, it must be recognized and accepted that individual can self-organize and self-govern their institution through rules that they design and establish themselves. Those rules will be used to monitor behaviors and sanction infractions committed by the CPR users (Ostrom 1999:25).

In a CPR institution:

- Learning-loop takes place in a multi-party interaction. Therefore, it is necessary to allow the development of an *informal network*, also called *shadow network* or *adaptive network*. Adaptive networks are “self-organizing groups of policy makers who enable joint fact finding and visualizing a direction towards improvement” (Palh-Wostl 2009: 361). The informal networks value innovative ideas, and are necessary to establish a learning system. These networks are influential and knowledgeable about different power networks, and they try to distant themselves from the formalized policy networks. In fact, policy making in formal networks is qualified as a bargain between actors rather than an open innovative discussion. Moreover, power in formal networks is not negotiable; it follows the command-control paradigm, which is not the case in informal networks.
- The goal of the informal network should be specific, and members should be willing to experiment with different approaches;
- The network should be a ‘community of practice.’ In a community of practice, individual members collectively engage in the learning process of subjects that interest the whole group. Through such learning system, the group can create and shape its identity (Palh-Wostl et al 2007: 7).

Social learning appears as an ‘upgrade’ of CPR governance because its goal is to make the governance system adaptive to environmental changes through the innovations of informal networks. The involvement of informal networks allows me to discuss the social dimension of the governance system.

In a social structure, power relation between actors has to be defined. However, informal networks in learning systems are established in order to allow members can distant themselves from the formal (top-down power) imposed by formal governmental structures, and ensure the collaborative nature of the governance system. I have previously defined that the adaptive capacity of a governance system requires that actors share their management power and responsibilities (Folke et al 2005). However, the problem is that the structure of informal networks does not clearly define how responsibilities should be shared in a case of governance failure

(Rhodes 2000, cited by Palh-Wostl 2009:358). Moreover, the informal networks are supposed to be flexible in terms of incorporating new members, defining the members' roles, and in power relationship between actors. However, the network can turn out to exclude outsiders, handle issues that may not be of public interest, or be insufficiently representative of resource users and of less powerful members (Ibid).

The structure of informal network also allows leadership to emerge (Palh-Wostl 2009: 361). Leadership in this context is collaborative, supportive of collective findings of the different parties (Palh-Wostl et al 2007: 8). Ansell and Gash (2007: 554) define the leader as a facilitator whose role is to ensure consensus-building, and facilitate mediation and negotiation between parties. The leader's role is also to embrace and empower all stakeholders in the collaborative process (Ibid). Learning systems appear as structures elaborated to handle the power imbalances in CPR governance. These structures seem to ignore that in order to successfully enforce the rules of CPR institutions, coercion might be necessary, and that coercive measures are usually applied to the powerless (Agrawal 2003: 257).

The theory on social learning will be used to discuss the second research question: how local stakeholders' involvement contributes to improving the governance system of the Cañete basin through social learning? The contribution of the stakeholders can relate to their ability to share the local knowledge with the managers of the river basin. They can also contribute to the design of rules that will guide the 'human-river' interaction. Power will also be taken into account in the discussion, and it will relate to the role of the leader in the informal network.

6 Methodology

The section describes the research design, the methods of data collection and data analysis as well as the limitations of the present study.

6.1 Research design

The fieldwork was designed as a qualitative case study, and was carried in the district of Catahuasi, which in the province of Yauyos. The choice to undertake a qualitative research refers to my attempt to explain through the analysis that water governance is more than making and implementing regulations. Water governance is about social relations, and the ability of a society to build a collective knowledge through which the laws created will improve population relationship with the water (Roger 2002: 1). In order to generate a more sustainable use of the water resources, the policies implemented have to be socially acceptable by water users and other actors in the society (Ibid). Dezin & Lincoln have defined qualitative research as a situated activity through which a researcher chooses to study the natural subjects in their environment, and then tries to understand them through interpretive naturalistic approaches (Dezin & Lincoln 2011, cited by Creswell 2013: 44). Those naturalistic approaches, although limited, will be explained in the section on data collection.

In this qualitative endeavour, the theories of CPR governance by Ostrom, and social learning have induced the methods of data collection and data analysis. The epistemological lens that is used to understand the issues of water governance is inclined toward interpretivism. Epistemology seeks acceptable knowledge that is, or should be. The topic is then analysed and interpreted through the stories of the people who live and experience water tension with other water users, and policy makers. The ontological consideration relates to a constructionist approach. Ontology is concerned with the “nature of social entities” (Bryman 2008: 18). Thus, the constructionist views in that context believe that society is constructed through the different interactions of social actors (Bryman 2008: 366). Thus, the difficulties of water governance resulted from these social interactions. Through this research design, it is also difficult to proclaim objectivity. In fact, the purposive method of data collection and the philosophical considerations (epistemology and ontology) corroborate the lack of neutrality in this research (Ragin & Amoroso 2010: 26).

Moreover, it is believed that one's experiences and background influence the means through which they make sense and construct the social world (Creswell 2013: 25).

6.2 Case study

Yin defines a case study as the investigation of "contemporary phenomenon in-depth and within its real-life context" (Yin 2009: 18) It is in that perspective that Catahuasi is used as a single case to carry an in-depth analysis of the potential governance of the Cañete River basin. The theories chosen for the analysis are inductively used to support the collected data, to explain the challenges of collective action in CPR governance, and to describe the importance of community involvement through social learning (Bryman 2008: 13).

The design of the research and the interest in the subject were to stress the importance of collective action in water governance, and support statements such as that the results most valued in our society cannot be achieved individually (Roger 2002: 4). The use of social science theories is to allow me to scientifically analyze this idea (Ragin & Amoroso 2010: 25).

6.3 Sampling method

The population of the study was purposively sampled through snowballing. Indeed, the first contacts I have made through CONDESAN (my gatekeeper) while gathering information on my topic have allowed me to meet other participants that I needed for the study (Bryman 2008: 184). The sampled participants to the interviews are:

- The government because it has the responsibility to govern and manage the water resource, and to handle water related conflicts at the national and local levels. At the national level, the ANA has authority, and at the local level for the provinces of Cañete and Yauyos, the ALA Mala-Omas-Cañete has authority;

- CELEPSA, an important water user whose activities are viewed by the community of Catahuasi as threatening to their livelihood production (their economic activities, and activities of subsistence);
- The community of Catahuasi who is represented by their Mayor, and the president of the farmers' community of Catahuasi who represented the farmers;
- The Director of the SERNANP. SERNANP is an institution of Ministry of Agriculture whose goal is to regulate the human activities in Nor Yauyos-Cochas (a protected landscape reserve in the province of Yauyos), and ensure that the area is not endangered by pollution or other unsustainable activities. They will be included in a potential governance system because the area that it protects is a hydrological landscape, and constitutes 23% of the basin water;
- The Patronato, which is a non-profit civil association created and funded by two private companies, CELESPA and Minera IRL (a mining company) as part of their corporate social responsibility activities. The goal of the Patronato is to work with the SERNANP in the management of the protected area 'Nor Yauyos Cochas.' Their areas of activities are:
 - The conservation of the vicugna or vicuña (a threatened mammal),
 - The conservation of agro-biodiversity (native potatoes and maize)
 - Monitoring the biodiversity of the area,
 - Conservation of natural and cultural heritage, using tourism as a strategy.

The interview with the Patronato was carried with their biologist.

- Qapiriy, a consultancy firm, which was hired by the Patronato to develop a plan for the capacity building of the actors who will be involved in the management of the protected area.
- Other participants also include the UNDP, a researcher of the CIP, CONDESAN, and a participant which I will not disclose the affiliation. Although some of these participants are not cited in the analysis, they

contributed greatly with information and connections with other participants (refer to appendix A).

6.4 Data collection

The primary data of the research were gathered through in-depth and focused interviews, and the secondary data were collected through critical analysis of documents from the ANA (documents on the Peruvian water legislation and property rights) and the NGO CONDESAN (my gatekeeper). The secondary data contributed to increase knowledge on water policy in Peru, and to inquire about different projects and activities that are ongoing at the river. They also allowed me to gain more understanding concerning the relationship between the different water users. The data collection was conducted in two phases. Due to the lack of available information on my topic, fieldwork started with in-depth interviews with some researchers and individuals who have worked, or are working in the area, and are acquainted to the topic. This process allowed me to narrow my research topic and concentrate my research questions. It also contributed to the formulation of the interview questions for participants such as the ANA/ ALA, CELEPSA and the local community. The interviews were carried with one or two people at a time, and a total 16 people participated. The discussions lasted about 45mn to 1h30mn (refer to appendix A).

- Focused interviews and in-depth interviews

The format of the questions for the interviews was open-ended. Both focused and in-depth interviews were open questions because it allowed me to explore the topic on which I had limited knowledge (Bryman 2008: 232). The focused and in-depth interviews were carried on participants considered to be potential members of the governance system. The non-potential members (CIP, UNDP, CONDESAN, Qapiriy, etc.) of the governance system were subjected to in-depth interviews only because my intent was to probe more information on the subject (refer to appendix B). Although the in-depth interviews were slightly different for some participants

(government institutions had the same in-depth interviews, and the others were different), the focused interview was the same for all participants.

In-depth interviews were used to get a story and learn more about the viewpoints of each participant concerning the tension between CELEPSA and the communities along the river. These interviews have contributed to a partial evaluation of the real problem. They also helped me to delimit my research problem (Mach 2005:30). The goal of the focused interview was to allow me to have more specific/ direct answer on the topic. With the in-depth interview questions, I collected both relevant and irrelevant answers, and few stories that could have changed the topic of the case study. Thus, the plan to carry out the focused interview allowed me to collect focused answers, and to corroborate those answers with the answers of the in-depth interviews (Yin 2009).

- *Personal discussions*

The personal discussions usually happened with a colleague at CONDESAN, who was working on a pilot project on the 'Benefit Sharing Mechanism' at the Cañete river basin. These conversations were usually not planned. They consisted in explaining to me through drawing and maps, the problems experienced by various communities along the river.

6.5 Data Analysis

The analysis of a good case study starts with the description of the case (Creswell 2013: 199). The analysis also consists in "breaking phenomena into their constituent parts and viewing them in relation to the whole form" (Ragin & Amoroso 2010: 55). Thus, I tried analyzing the transcriptions of the recorded data progressively, so that I can ask follow up questions if necessary. The analysis consisted in breaking down data into categories and verifying whether or not they support the theories (Bryman 2008). Since I am dealing with a single case study, the

analysis will also consist on identifying the differences and/or similarities of the participants' viewpoints concerning some of the questions, (focused interview questions for instance). I will also use triangulation to compare the diverging answers with some of my secondary data in order to eliminate uncertainty (Mikkelsen 2005).

Qualitative research carries the hallmark of subjectivity. In order to bring some confirmability to my interpretations, I will be using quotes from the interviews (Creswell 2013: 246).

6.6 Credibility, dependability and limitations

An acceptable social research should be credible and dependable. In this study, the use of triangulation can ensure the credibility of the data. Triangulation is used in the analysis of the primary and secondary data, and for the corroboration of these data with the theories (Bryman 2008:378). The dependability of the research is ensured by the stocking of recorded data and field notes, and also through the peer reviewing of colleagues at CONDESAN (Creswell 2013: 246).

This research raises a limitation with my choice of focusing only on the village of Catahuasi. This was due to logistics constraints and the lack of resources. Consequently, one can say that I did not get the perspective of most water users. However, I can argue that I got the perspective of one of the communities most affected by the activities of the hydropower company, which makes the research appropriate and relevant, and support the internal logic of trying to link data to theories (Mikkelsen 2005: 160).

7 Empirical Analysis

As described in introduction, the water governance in Cañete is specific to each village, and does not include all water users. The lack of an integrated management

strategy for the whole basin has contributed to the neglect of household waste management around the river, which causes problems of water access in communities such as Catahuasi. The empirical analysis starts with the first research question, which consists in exploring the collective action challenges involved in the governance of a small CPR such as the irrigation system of the community of Catahuasi. In the second part of this section, I also analyze the challenges of collective action when it comes to governing an important CPR such as the Cañete basin, and managing its waste. The analysis at the community level and basin level is done using Ostrom's design principles for CPR governance. The second section of the analysis is related to the second research question, and it elaborates on how the involvement of local actors can contribute to improving water governance by means of learning systems. This section is analyzed by means of the theoretical framework on social learning. Technology and institutional rules will be taken into account in the analysis, I assume they are known and have remained unchanged during the process of the research (Ostrom 1990: 50).

7.1 Collective action challenges within the community of Catahuasi

The analysis in this section concerns the governance of the irrigation system of the community in Catahuasi. The analysis is done using Ostrom's design principles one and two.

- *Clearly defined boundaries*

The community of Catahuasi has always managed its irrigation system itself. The community can be described as a robust CPR institution because people have lived long enough together, and have been able to develop rules that have evolved to meet the collective and institutional choices of the group before being implemented (Shepsle 1989 as cited by Ostrom 1990: 89). The members of the group have mostly common ethnicity, social class, and economic activity, being a group of small farmers who consume and sell what they produce. The community undertook to form and manage their irrigation system because their livelihood depended on it. The

community practices agriculture all year long because water is available the whole year. They have 14 irrigation canals, which serve 87 farmers (ANA 2001: 235). The water system is limited to these 14 canals, and is only available to the 87 farmers who belong to the community, and who participate by either paying for its maintenance, or doing some physical work (ANA internal document 2000).

The resource unit, in this case the irrigation water, is characterized by its mobility. It is a potentially a storable resource, but in Catahuasi it is not stored: "*We do not store the water, we take it directly from the river*" (Jorge).

Because waste blocks the waterways the availability of water is unpredictable during the dry season.

Regarding power relations within the community, they have an elected president who represents them at discussions and negotiations: "*The president is only elected for a year, and afterward we have to elect a new one*" (Jorge). They also have a mayor who represents them in the Peruvian government. Although imbalanced power relations can challenge the governance of a CPR such as an irrigation system, in Catahuasi, power does not influence water access. The designated administrator of the irrigation system allocates the water to each farmer according to the local rules of water sharing. The lack of conflict in this area may be due to the small number of appropriators, the ethnic homogeneity of the community, or the availability of water, which is fairly stable except during the dry season. During the dry season, with the water volume decreasing, the waste that blocks the waterways reduces the water available for agriculture.

- *Congruence between appropriation and provision rules and local conditions:*

In a CPR discussion, *appropriation and provision rules* need to be addressed. *Appropriation* rules concern the allocation of the resource to the appropriators. In this case, the resource is the water from the irrigation system (Ostrom 1990: 47). The farmers (the appropriators) know the time and day at which their farms are irrigated, and the quantity of water available to them. Jorge stated that: "*the farmers here respect the rules, and we do not have conflicts related to the theft of water. There*

is a person in charge, an administrator, who holds the key to the irrigation infrastructure.” Consequently, monitoring is indirectly incorporated in the rules of appropriation at the community level. The *provision rules* are concerned with the irrigation infrastructure itself, its maintenance, reparation, and its ability to provide water to the farmers (Ostrom 1990: 47). In Catahuasi, *“the administrator also cares for the irrigation canals. If there is a problem, he informs the farmers and we collect money for the maintenance”* (Jorge).

The analysis shows no evidence of CPR challenges within the community. The existing challenge is external to the community, and it relates to the decrease of water availability due to the waste that blocks the waterways. It is an appropriation challenge that touches Catahuasi and other villages on the ‘codo seco,’ but in order to overcome it, all the communities along the basin have to participate. The absence of important challenges observed within the community could be explained by the community’s capacity of self-organization without involvement of external authorities in the devise of their operational rules: *“the government is not involved in the functioning or in the devise of the regulations of local irrigation systems such as the one in Catahuasi”* (Ricardo).

Thus, in Catahuasi, the governance of the irrigation system appears to be non-conflictual, and there are no challenges that prevent the collective activities of the farmers. In fact, the governance of small CPR institutions tends to be less difficult than larger ones. Moreover, in a small CPR institution such as in a small group, collective action is relatively more efficient than in a large group. In a large group, members may have numerous interests when they join the group, and it can be difficult to satisfy all of them. However, when a small group such as the CPR institution of Catahuasi is formed, its goal is to specifically address the common interest. In this case, the common interest is the irrigation system for agriculture. Agriculture is the main economic activity of the community, which may explain the absence of collective action challenges in the governance of the irrigation system (Olson 1980:53).

7.2 Collective action challenges for the Cañete water users

In resource governance, people usually want to participate in the decision-making concerning the resource that affects their lives. However, within a large group, resource governance can be challenging because it is hard to address individual concerns of the members. Consequently, participants of a large collective action group can be reluctant to contribute to the decision-making process, or support the group financially. When they do decide to contribute, their financial contribution tends to decrease with the increase of the group size (Olson 1980:53). Thus, the water governance of the entire basin of Cañete will be challenging. To achieve the governance at this level, the ANA is planning to implement a water council or “consejo hidrico de Cuenca” at the basin level, which will include all interested water users. The goal of the members of the Consejo hidrico de Cuenca (CC) is to plan, coordinate, and collaborate in governance in order to achieve the sustainable use of water resources. Thus, they have to develop and implement water management activities for the river basin (ANA.org 2014). The concern is that in the CC, individual communities concerns such as those of Catahuasi would get lost into a “sea of concerns” brought by other communities. In addition, some concerns can be contradictory.

The potential members of the CC for the Cañete basin are:

- The regional governments of Lima and Junín. The region of Cañete belongs the department of Lima, but the upper part of the river also runs in the department of Junín,
- Local governments (municipality of Catahuasi)
- Organization of water users (farmers and non-farmers)
- Peasant communities,
- Private company: CELEPSA,
- Water authorities: ANA and ALA.

I am limiting the present analysis to the above-cited actors because I was able to talk to most of them. The department of Junín will not, however, be taken into account

because the regional government was not included in my research. Other actors such as hotels and mining companies should be taken into account when it comes to establishing a plan for waste management along the river. They will not be incorporated in the present analysis because I was not able to discuss with them.

The analysis is structured following Ostrom's eight design principles, and each subsection represents a design principle:

- *Clearly defined boundaries of the Cañete River basin:*

The Cañete basin covers an area 6, 192 square km (CONDESAN 2013a). In a context of collaborative governance, all the communities who live along the river have to be taken into account because the purpose of such a governance system is to allow the representation of the less powerful in the CC. The CC will then include communities that have conflicting *interests*, practice varied activities, use different technology for the water exploitation, and possess different kind power (Olson 1980). For instance, the technology used by CELEPSA is very modernized (CELEPSA 2012), and cannot be compared to the irrigation system in Catahuasi, which is just simple enough to meet the farmers' needs. For now, CELEPSA will be the only participant in the CC that produces electricity; as such, its interests are different from those of the farmers or herders in Cañete and Yauyos. Even between farmers, interests differ depending on their location along the river. For instance, the farmers of Cañete find the activities of CELEPSA beneficial, which is not the case for the farmers of Catahuasi.

The power relation between the members of the CC is unequally distributed. According to Hector: "*We possess the financial power, but the communities possess the social power.*" Thus, CELEPSA possesses the financial power, and the communities (e.g. Catahuasi) possess the social power, and the ALA, which is the local governmental water authority, possesses the legislative power. The power relations will be further discussed in the section on *nested enterprises*.

The property right of the water resource is regulated by the Peruvian water law No. 29338 of 2009. According to this law, the water resource is a national heritage and the ANA is the only institution with a right to manage and deliver licenses of water exploitation (Ministry of Agriculture & ANA 2010: 2). From my discussions with ANA/ ALA, they explained that the law 29339 also recognizes the ancestral rights, and that peasant and indigenous communities “are *entitled to water through their ancestral rights, but they still have to get a license from the ANA or the ALA in order for that ancestral right to be legally valid, especially if they are undertaking an important scale of economic activity*” (Ricardo y Marcos). The goal of the water license would ease any potential judicial actions, and enable the ANA/ALA to monitor and estimate the amount of water used. The challenge is that ANA/ALA is not very present in the communities. In Catahuasi Jorge affirmed that: “*they have never had a dialogue with the ALA of Cañete.*” Thus the ALA’s legitimacy may not be recognized at all level, and some may even ignore the necessity of having a water license from the water authority.

- *Congruence between appropriation and provision rules and local conditions:*

In Cañete, the use of the water is both consumptive (agriculture) and non-consumptive (production of hydroelectricity). At this level, it is easier to witness a CPR challenge because the activities of a water user can reduce or obstruct the water availability for another user. At the basin level, the *appropriation* problem that Catahuasi faces is potentially caused by the activities of CELEPSA, but also by other water users who throw their household waste into the river. The community complains that: “*the quantity of water we receive, especially, during dry season has decreased. The water quality is not as it used to be. We are now receiving troubled water*” (Jorge). The appropriation problem of Catahuasi is also caused by the provision problem. The provision problems are related to the supply side of the resource, the blockage of the waterways (Ostrom 1990:49). It is then necessary that each community take care of their waste so that it does not block waterways or pollute the water itself. Jose stated that: “*we are trying to fund a waste management project with other districts in the codo seco to increase the water availability for the*

irrigations.” However, this endeavor will not be efficient if all communities are not included in the waste management project. The situation forces us to take into account the condition of *interdependency* between the different communities. According to Emerson et al (2011: 10), interdependence is a precondition to the induction of collective action.

The design of appropriation and provision rules can be considered as protective measures to the basin system. For instance, when the use of water is for consumptive activities, the ANA/ ALA should be able to determine the volume of water that is ecologically acceptable to consume without destroying the river. For a CPR such as the Cañete basin, this aspect is important because agriculture consumes up 90% of the basin’s water. Following that concept, Ricardo stated that: “*water licenses would allow the ANA/ALA to determine the number of water users, so that the ANA can better balance the quantity of water available with the number of water users.*” Indeed, such knowledge will allow them to reduce any uncertainties they may have concerning the resource availability. It will also allow them to be able to control the water overuse, and avoid any potential destruction of the resource system.

- *Collective-choices arrangements*

Collaborative governance has been defined as “processes and structures of public policy decision making and management that engage people constructively [...] to carry out a public purpose that could not otherwise be accomplished” (Emerson et al 2012: 2). This definition states that governance is a process that should engage those concerned by the decision-making. Moreover in resource governance people are usually interested in being part of the decision-making that affects their living conditions.

In Cañete, this design principle relates to the potential regulations that will be made by the members of the CC concerning the management of the water resource. Although at the local level the different communities should have the possibility to

enact some of the *operational rules* that will affect their daily activities in their relationship to the river, when it comes to the waste management, the CC should also establish some operational rules concerning monitoring, sanctioning, etc., (Ostrom 1990: 52). Nevertheless, the regulation should allow communities to adapt the management activities to their local conditions. In fact, the Articles 90.2 and 91 of the law 29933 state that peasant communities and indigenous communities can (but not obliged) organize themselves and use their knowledge and technology to conserve and manage the uses of the water resources (Ministry of Agriculture & ANA 2010: 31).

Carlos stated that the: "*law is not static.*" Consequently, the rules are to be adjusted until they conform to local rules. These rules, however, have to be in accordance with the *constitutional rules*, which in this case is the ' water law 29338' (Ostrom 1990). The goal of this law is to regulate and manage the use of the water resources of the country (Article 1 of the law 29338) (Ministry of Agriculture & ANA 2010:1). Victor also explained that: "*since the community holds the social capital power any rule taken has to be legitimized by the communities living along the river.*" This endeavor requires an education and a learning system between the different parties, which will be discussed in the second research question.

- *Monitoring:*

In a large CPR institution, monitoring is usually required in order to ensure credible commitments (Ostrom 1990: 45, Olson 1980). Along the river, the communities that are not directly affected by the negative consequences of the waste may ignore the damage that it causes to others. In order to ensure that populations manage their waste properly, the CC or the municipalities may have to implement a monitoring system within each community. The monitoring process will contribute to detect free-riders. However, the concern addressed for monitoring is that the cost of monitoring should not be higher than the reward. Thus, if free-riding is not sanctioned, or the monitoring rewarded in some way, the cost of monitoring becomes higher than the reward. The high cost of monitoring in that context is

caused by the fact that those who break the law receive the same reward as everybody else (e.g. clean water), including the members who undertake the monitoring (Ostrom 1990: 95).

Concerning the challenges of commitment to rules, Ostrom et al (1999: 281) state that if the first five principles are established in a governance institution, appropriators can make credible commitment to operational rules as long as others make the same commitment. CPR appropriators will also commit to the rules if the long-term benefit of the established strategy is greater than the short-term benefit, which consists of breaking the rules. However, if a monitoring system is set to monitor commitment or breaking of rules, individuals 'commitment to the rules will be respected because an infraction will be followed by sanctions (Ostrom 1990: 186).

- *Graduated sanction:*

The presumption is that people will not spend time and effort to monitor and sanction those who break the operational rules of the CPR because it is too costly. To ensure that monitoring is not too costly to those who monitor, sanctions should be incorporated in the operational rules of the CPR. The seriousness of the sanctions should correspond to the seriousness of the infraction. Ostrom (1990: 186) refers to the sanctions as 'graduated' because the gravity of the sanction can increase with the numbers of infractions. Sanctions could also be applied within a community, instead of the CC, but they still have to be in agreement with the constitutional and operational rules in place. Sanctioning is a way to affirm that monitoring is functional and that violations to the rules will not stay unpunished.

- *Conflict-resolution mechanisms:*

The water users or appropriators should have an inexpensive solution to resolve their conflicts. CELEPSA and Catahuasi have been able to handle their tension until the period of the present research through dialogues and negotiation. Hector says

that: *“the tensions are never-ending because new issues always arise as we evolve.”* Nevertheless, conflict can be a reason for creating a CPR institution, and if it does not worsen, conflict can contribute to learning and change (Dietz et al 2003: 1908).

- *Minimal recognition of rights to organize:*

The water law states that communities have the right to enact the operational rules that suit their social and environmental context, as long as it does not contradict the water law itself. In a governance system for the entire basin, this liberty might also be necessary to ensure the commitment of individual communities. Ricardo and Marcos stated that: *“the populations have the opportunity to participate in the water law making, but the method might not be convenient for many interested actors because it requires the use of internet.”* Thus, an eventual implementation of the CC would require a change of methodology to allow concerned actors to participate in the governance of the river.

- *Nested enterprises:*

Ostrom's (1990: 101) 'nested enterprises' is close to Olson (1980:63) 'federal organization.' The idea is that in a large CPR institution such as the CC, there should be subgroups, which organize and set the rules of appropriation, provision, monitoring, enforcement, conflict resolution, and waste management activities at the local level. For instance, each community could represent a subgroup. As a mayor heads each community, it would make it easier to establish the operational rules of waste management locally. It would also make the governance of the basin more efficient because it would allow devolution of power from the central authority to the communities for instance (Dietz et al 2003: 10).

The ANA/ ALA and Qapiry recognize that the river basin should be managed due to the environmental pressure and the growth of economic activities along the river (Ricardo & Marcos, Carlos & Jesus, Victor & Gonzalo). However, the main challenges remain the organization of each community, the definition of roles and

responsibilities of the members in a governance institution because organization cannot be dismissed in a group dynamic (Olson 1980: 129). In one of the discussion, some respondents stated that: *“it is important to define stakeholders’ roles because most sources of conflicts in the protected area as well as along the river basin are caused by the fact that people do not know their roles and responsibilities concerning the water management. In order to establish an effective democratic governance system, the different stakeholders should know their roles and responsibilities and fulfill them. If everybody knows their roles, it will then be easier to better define the role of the governance committee.”* (Victor).

“Some conflicts would be easier to handle if some communities were better organized. Mediation can become difficult if we have to investigate everywhere to find out what is really going on” (Ricardo and Marcos).

The organizational challenge of a governance institution for the CPR of Cañete is caused by the dispersion of populations and the lack of communication between them. Communication is important in this situation because it builds trust and generates a social capital (Dietz et al 2003: 1908). Another challenge resides in the ability or inability of the communities to find a reason, or an incentive to join the potential CPR institution such as the CC. An attractive incentive should be something that they would not enjoy if they were outside the CC (Olson 1980: 133). Olson (1980) discusses a challenge that I mentioned earlier, and which relates to people’s integration to large groups. The author explains that people usually want their *specific interests* to be considered when they join a large collective action group (Olson 1980: 58). I have explained that the interest of the community in Catahuasi contradicts with the interests of the farmers’ union in Cañete because the latter receives more water from the activities of CELEPSA. Nevertheless, I can state that the common goal of all stakeholders is to enjoy clean water with a regular flow. However, the methods employed to achieve this goal may not be convenient for all stakeholders. Consequently, in order to ensure that the communities feel that the CC is useful for them, they should also feel that their needs and opinions are also being taken into account. An example of a group incentive can be observed through a pilot

project on the Benefit Sharing Mechanism (BSM) that was conducted by CGIAR, CIAT, and CONDESAN and the Peruvian Ministry of Environment on the Cañete basin. The goal of the BSM is to redistribute the costs and benefits of a healthy river basin equitably to all; it is an example of a payment for environmental services (Condesan.org 2013b). The findings of the project showed that the farmers union downstream in Cañete are willing to reward communities upstream in Yauyos so that they can keep undertaking the activities that contribute to the water conservation (Condesan.org 2013b). Such an example proves that there may be ways to take into consideration specific interest of communities.

The *power the relation* between members of a potential CC will also challenge their ability to collaborate in a CPR institution. Agrawal (2003: 257) stated: “all successful enforcement institutions are also coercive.” Consequently, in order to ensure the success of the CC, monitoring and sanctioning are necessary. Dietz et al (2003: 1909) state that effective governance entails some compliancy to rules, and that modest violations must be handled reasonably.

The power relationship issues are not limited to monitoring and sanctions. Collaborative governance also implies some sharing of power and responsibilities. However, some authors believe that if the notion of power is evoked, it excludes exchange because there is no exchange in power relationships. For the authors, there are only ‘winners’ and losers’ (Curry and Wande 1968 as cited by Baldwin 1978: 1229). As previously defined, the concept of collaborative governance is to allow the less powerful have their say. The critic is that governance is not strategy, “but an idealized scheme of interaction between idealized actors,” and that the process allows political actors to exercise their political power (Castro 2007: 106). Water governance is asymmetrical and it evolves in a structure where actors tend to have unequal proportions of political power and knowledge (Castro 2007: 107). Moreover, the sustainable use of the resource is ensured by unequal distribution of the resource by those in power (Agrawal 2003). The question in this case is whether a balance of knowledge through social learning could contribute to a balance of power in CPR governance.

7.3 Social learning in water governance

Applying the concept of social learning to CPR governance means that the users of the shared resource must collaborate in a way that leads to the democratic legitimacy of the management system (by giving the voice to the less powerful) as well as to the promotion of conflict resolution (Palh-Wostl et al 2007: 2).

One of the reasons for creating a CPR institution is to reduce uncertainty that comes from the lack of knowledge. In order to reduce uncertainty, it is essential to blend indigenous knowledge with scientific knowledge because the production of knowledge can be costly if it is designed by those unfamiliar to the CPR, and imposed to CPR users Ostrom (1990: 34). Thus, it is recommended that CPR appropriators engage in 'trial-and-error' learning. It is a process that allows CPR owners to make their own decisions and design rules that may be positive or negative for the CPR institution. It is a process through which they learn more about the CPR and the behaviour of other appropriators. The trial-and-error process also allows them to design the rules for monitoring the CPR and sanctioning the behaviour of appropriators (Ibid).

The inclusion of social learning in the analysis extends the concept of water governance by including adaptability in the system structure, because learning systems contribute to communication, knowledge and power sharing, and trust building. The relationship between CELEPSA and some of the communities along the river was initially characterized by poor communications and insufficient education concerning the activities of the power plant. Consequently, some people think that: *"CELEPSA uses radiation or some other processes to pollute the water and cause the fish to die. But it is not true"* (Carolina). Lina stated that: *"the power plant also needs clean water to operate."* When I questioned locals in Catahuasi about the water pollution, they were not sure about the cleanliness of CELEPSA's activities but confirmed that most of the waste comes from the villages upstream (Jose & Jorge).

Although some understand that the waste comes from others villages, others do not and it has contributed to create the tensions between the two parties.

In order to integrate learning to CPR governance, informal networks of learning and knowledge sharing must exist because learning cannot take place in rigid governance systems where power is centralized. Rigid governance systems impede innovations within the concept of learning loop (Pahl-Wostl 2009: 361). Some authors have emphasized the importance of trust building in social learning. Indeed trust is a prerequisite for collaboration, power sharing, negotiation, social cohesion, etc. (Berkes 2009, Pahl-Wostl 2007, & Wals et al 2009). However, from my discussions with the different respondents, I can say that there is a lack of trust and communication between some communities and CELEPSA. One of the reasons of the tension between the parties is that CELEPSA did not keep the promises it made at the beginning: *“CELEPSA promised us many things as part of their corporate social responsibility projects, but did not comply”* (Jose). CELEPSA on the other hand affirms that they have implemented some important projects (trout farming for instance), but the community did not take ownership and the project failed (Hector).

Moreover, even though CELEPSA invested in monitoring the water quality, some communities do not trust their results and have requested that the water be monitored by a laboratory of their own choosing: *“they have requested a participative water monitoring with other actors such as the ANA and Ministry of Environment, and CELEPSA agreed”* (Ricardo y Marcos).

Although the activities of CELEPSA are not without some consequences (water deviation, fluctuation of water volume), some of the misconceptions of the riparian toward CELEPSA may be due to a lack of communication and education: *“the communities think that since the company has the financial power, it does what it wants”* (Carolina). In order to build its social capital for learning, CELEPSA has to better communicate with the communities and alleviate or eliminate their misconceptions. Communication and knowledge sharing should also exist between the governmental structures and the communities. The concept of learning-loop

would require that the members of an informal network first take knowledge of the frame, values and regulations in place, which may not be the case in Cañete. Jorge affirmed that: “*we never had a dialogue with the ALA,*” and it seemed they also ignored the fact that it is necessary that for them to get license for their irrigation system.

A learning system gathers multi-actors with different types of knowledge (indigenous or scientific), power, but with a common interest in informal network. The actors have to try to understand each others’ knowledge and then collectively make a decision that will improve the management of their river system. Power in this context is supposed to be shared between the actors, but at the Cañete River, there is a power imbalanced between the community and CELEPSA.

In a learning system, leadership can emerge. The leader of a learning system is not hierarchically superior to multi-actors; it is a person who shares responsibility with other (Palh-Wostl et al 2007a). The leader of the learning system in CPR governance is there to make sure that actors meet their goals, and to get the most out of the variety of perspectives, competencies, and resources of actors (Vansina 199, cited by Palh-Wostl et al 2007a). Thus, a learning system may contribute to the devolution of power in water governance.

8 Conclusion

The analysis supports Olson’s theory and shows that collective action of the small CPR of Catahuasi is less difficult than collective action at the basin level. Analysis of possible governance systems for a large CPR like the Cañete basin revealed that challenges exist because of the diversity of interests, and because of the difficulty in organizing and defining roles and responsibilities of the group’s members. Effective governance for large CPRs, like the Cañete basin, requires the use of nesting to better organize and improve the governance system. Nesting allows individual communities to set up their own operational rules, and ensures that management activities are carried out.

As with any organization, a water governance system also has to manage the power relations between actors. In the second part of the analysis I considered social learning as a method for the members of a governance system to use. As discussed previously, social learning is better undertaken in informal networks; thus, in order to improve collaboration between learning actors, power in informal networks is shared between actors. Although the informal network can have a leader, their role is mainly to improve the performance of the group, and share responsibilities with other members of the group.

I think that learning system may improve communication and negotiation, and allow social learning in governance system, but will not solve the problems of power that come with the politics of governance. The theories on resource governance are too well crafted, and do not take into account the disarray of the “real world.” Thus, I agree with Agrawal’s statement that: “if institutions are the product of conscious decisions of specific individuals and groups, as many commons theorists argue, then it may also be reasonable to suppose that institutional choices by powerful groups deliberately aim to disadvantage marginal and less powerful groups. The other side of the coin of institutional sustainability then turns out to be unequal allocation of benefits from commonly managed resources: not as a by-product but as a necessary consequence!” (Agrawal 2003: 257).

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10 Appendices

10.1 Appendix A: Research Participants

	Institution	Location	Code	Name	Number of people	Type of interview	Date of Interview
1	SERNANP	Lima	CB1*	Pedro	1	FI & II	15/11/2013-11/12/2013
2	Undisclosed participant	Lima	CB2	Lina	1	II	25/11/2013
3	UNPD	Lima	CB3*	Juan & Gisela	2	II	26/11/2013
4	Patronato	Lima	CB4	Carolina	1	FI & II	03/12/2013
5	Centro International de la Papa (CIP)	Lima	CB5*	Fabian	1	II	04/12/2013
6	CELEPSA	Lima	CB6	Hector	1	FI & II	04/12/2013

7	ALA-Mala-Omas- Canete	Canete	CB7	Ricardo y Marcos	2	FI & II	13/10/2014
8	Municipality of Catahuasi	Catahuasi	CB8	Jose	1	FI & II	14/01/2014
9	President of farmers	Catahuasi	CB9	Jorge	1	FI & II	14/01/2014
10	Qapiriy	Lima	CB10	Victor & Gonzalo	2	II	15/01/2014
11	ANA	Lima	CB11	Carlos & Jesus	2	FI & II	17/01/2014
12	CONDESAN	Lima	CB12*	Luis	1	II	Continuous

CB*: Participants who are not cited in the text, but whose participation contributed to the understanding of the problem

FI: Focused Interview

II: In-depth Interview

10.2 Appendix B: Interview guides

Assessment of the situation		Comments
Person title		
Who officially and legally has water rights?	<ul style="list-style-type: none"> - Government - Community - Private Company - Other 	
Number of people benefiting from water	<ul style="list-style-type: none"> 0-10 10- 99 100-999 1000- 9999 10000- 99,999 +100000 	
What is the current situation of the conflict?	<ul style="list-style-type: none"> - Ongoing/ steady - Escalating - Settlement under 	

	negotiation - Settled - Settlement with agreements violated	
How do you define the issue of the conflict?	- Contamination - Unequal access to water - Deviation of water - Competing claims of access for consumptive use-quantity - Water regulation/flooding - Privatization of water resource - Other.....	
Who are the people directly involved in the conflict?	- Domestic water consumers - Farmer (individual or group) - Community leader - Fisherman (individual or group) - Government (Local or national) - NGOs - Company (ies)	
Beginning of the conflict:		
End of the conflict (if ended):		
How did you try to solve the conflict	- With government - NGO mediation - Agreement with stakeholders in conflict - Legal endeavor/court ruling - Other	
How does each party	- Land ownership	

support their claims for water rights?	<ul style="list-style-type: none"> - Ancestral rights - Payment of fee to use the water - Payment of fee to own water resources - Government sanctioned right - Other 	
Does the government officially recognize the conflict?	<ul style="list-style-type: none"> - Yes - No - Partially - Other... 	
How is water managed?	<ul style="list-style-type: none"> - At the community level? - By government? - By water users: <ul style="list-style-type: none"> o farmers, o private company, o local consumers o NGOs 	
Do the taxes paid by the private company to the government invested back in the community?	<ul style="list-style-type: none"> - Yes - No - Partially - Don't know 	
If yes, how? If not, why not?		
Is there room for learning opportunities between stakeholders involved in conflict?	<ul style="list-style-type: none"> - Yes - No - Partially - Don't know 	
Does learning from each other would guarantee the sustainability of solutions for conflicts?	<ul style="list-style-type: none"> - Yes - No - Partially - Don't know 	
Is social capital important to you?		
Are water users involved in making water policies?	<ul style="list-style-type: none"> - Yes - No - Partially - Don't know 	
Is there a system or a structure for coordinating	<ul style="list-style-type: none"> - Yes - No 	

the water management/ and governance	- Partially - Don't know	
Who does this system of water governance involve?		

Questions for SERNANP and Patronato:

1. What is the role of SERNANP/ Patronato?
2. How strong is your relationship with the community?
3. Is water provision threatened at the protected reserve during the dry season?
4. What would be the SERNANP/ Patronato role in a potential governance system?
5. What in your opinion would be the challenge to overcome in order to implement a water governance system?
6. Would you consider the potential actors of the water governance as potential learning partners?
7. In what way would the governance system contribute to a better water management?
8. Does population growth increase the water pressure in the region?
9. Will governance committee also implement a system for sanction, accountability, and arbitration?
10. What is the main economic activity in Cañete?
11. If this economic activity is directly linked to water availability, does water availability also affect the economic gains?

Questions for CELEPSA:

You are part of the benefit sharing mechanism. The mechanism requires a certain level social networking, right?

1. Are you part of the BSM because the government required it, or because you think you have a certain responsibility in the river system?
2. What do you qualify as fair benefit sharing?
3. How do you decide about compensation system?
4. Do you think you are in a position to network socially/ build a social capital with communities?
5. Do you have social connections/ social capital in the Cañete valley?
6. Is the BSM a mechanism that will allow you to contribute to improve water governance between you and the community?
7. Does CELEPSA have a facilitation process in having a dialogue with the community?
8. What is your role in the river system?
9. How would you contribute to the governance of the river system?
10. Do you think a system of governance would improve your relationship with the communities? How?
11. What do you think of the role of the community upstream in conserving the water?
12. Why is it important that all stakeholders are happy?
13. How do you plan the sustainability (long or short term) of the solutions you use to solve any conflicts that might exist between you and the communities?
14. Is there a part in the design of the power plant that could threaten the sustainability of the river?

Power relation:

15. Do you think you have more power than the community?

16. Would say it is partially your responsibility to give to the communities the necessary information so you can have fair negotiation? Or is it more of the government responsibility to share information with the communities?
17. How do you ensure that the community gets all the information necessary for the negotiations? Or how do you ensure that negotiations are fair?

Interview for ALA and ANA:

1. Who are the actors involved in designing and implementing water regulations?
2. Are those regulation defined by law? Constitution? Or other procedures?
3. Is it possible to change regulations in order to adapt to the evolution of society/ or changes in social structure?
4. What kind of rights does CELEPSA or the Cañete communities have rights on the Cañete River?
5. What is the procedure for granting rights of exploitation of water resource to a Company like CELEPSA?
6. Who are the actors allowed to govern the Cañete River?
7. Is it possible to establish a system of joint governance with the actors who exploit the river (water users)?
8. In your opinion what would be the challenges to overcome in order to implement a water governance system?
9. How would a governance system contribute to a better water management system?
10. Would the governance system also implement a system for sanction, mediation?
11. In the Cañete River, has there been a conflict between the community and the company CELEPSA? If yes, could you define the motif of the conflict?
12. Was the government involved in this conflict resolution? Is the government usually involved in these sorts of conflicts?
13. How can the government help water users to learn more about the water regulations?

14. What would be the goal of the water governance in the Cañete River? Would it be to manage water quantity or quality? Or would it be for conflict resolutions?

Question for the Community (ies):

1. What do you as community think about the operation of CELEPSA on the Cañete River?
2. Before the implementation of CELEPSA, how was water rights shared between users?
3. Did the implementation of CELEPSA change the customs of water usage? How?
4. Could you define the conflict between the community and CELEPSA?
5. How did all involved stakeholders try to solve the conflict?
6. Were you satisfied with the resolution? If not, why not?
7. What are the consequence (positive or negative) of CELEPSA activities on you and your activities?

If negative: how do you think this could be solved?

There is plan to implement a governance system for the Cañete River. Would be willing to be part of this governance system? How do you think you could contribute to this governance?